



AMERICAN FISHERIES SOCIETY  
**ONTARIO CHAPTER**  
**ANNUAL GENERAL MEETING**

March 25 – 26, 2022  
Virtual Meeting

*“Rebuilding from the ground up:  
Fundamental interactions in aquatic  
restoration and management”*

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**ONTARIO CHAPTER**  
ANNUAL GENERAL MEETING  
March 25 – 26, 2021  
Virtual Meeting

*“Rebuilding from the ground up:  
Fundamental interactions in aquatic  
restoration and management”*

Sessions will be hosted on Zoom unless otherwise noted

Friday March 25<sup>th</sup>

**1:00 pm**      **GREETING AND CONFERENCE OUTLINE**  
**Sarah Steele (she/her), AFS-OC President**

**1:10 pm**      *Keynote Speaker: Using Two-Eyed Seeing (Etuaptmumk) as a tool for  
collaboration: Successes & lessons learned in aquatic research & fisheries  
management at UINR*  
**Jennifer Sylliboy**

Lightning Session 1

**2:10 pm**      *Talk 1: The secret to (not) becoming an armchair ecologist*  
**Barb Elliot**

**2:20 pm**      *Talk 2: Effective small-scale stream rehabilitation*  
**Kat Lucas**

**2:30 pm**      *Talk 3: Aquatic Habitat Toronto: a multi-agency partnership delivering effective  
ecological restoration*  
**Don Little**

**2:40 pm**      *Talk 4: Conservation management for future aquatic biodiversity in Ontario*  
**Jonathan L.W. Ruppert**

**2:50 pm**      *Talk 5: Don River Mouth naturalization project: Restoration of fish habitat in  
Toronto – The first piece in a very large puzzle*  
**Angela Wallace**

3:00 pm *Lightning Session 1 – Q&A and Discussion*  
Questions to presenters of the lightning round

3:20 pm **BREAK**

*Aquatic Restoration and Management Session 1*

3:30 pm *Extended Talk 1: Aquatic stewardship in Kahnawà:ke: Community-based monitoring and conservation*  
**Brandon Rice, Tyler Moulton**

3:55 pm *Extended Talk 2: Shoreline hardening and fish habitat concerns in Saugeen Ojibway Nation (SON) Territory*  
**Emily Martin, Kathleen Ryan**

4:10 pm *Extended Talk 3: Saugeen Ojibway Nation Coastal Waters Monitoring Program*  
**Emily Mansur**

4:55 pm **BREAK**

*Professional Development Session*

5:05 pm *Extended Talk 1: Conservation Authority Level 1 Electrofishing Course Update*  
**Jon Clayton**

5:25 pm *Extended Talk 2: Many hands make light work: Partnerships in creek restoration*  
**Amanda Draves**

5:50 pm *SpatialChat Demonstration*

6:00 pm **DINNER BREAK**  
[Join on SpatialChat]

7:30 pm **MENTORSHIP EVENT – Fisheries Scavenger Hunt**  
[Join on SpatialChat]

9:00 pm **SOCIAL EVENT – Fireside Chats**  
[Join on SpatialChat]

*Saturday March 26<sup>th</sup>*

*Mussel and Host Relationships Session*

09:30 am **OPENING REMARKS**  
**Sarah Steele (she/her), AFS-OC President**

- 9:40 am**      *Mussel Talk 1: Hitchhikers guide to the watershed. What makes freshwater mussels better than fish?*  
**Kelly A. McNichols-O'Rourke**
- 10:20 am**      *Mussel Talk 2: Combining malacology and underwater cave exploration in the Ottawa River*  
**André L. Martel, Jill Heinerth**
- 11:00 am**      *Mussel Talk 3: Collections of the Canadian Museum of Nature: Irreplaceable tools for conservation research on fishes and mussels*  
**Katriina L. Ilves, Noel Alfonso, André L. Martel**
- 11:40 am**      **BREAK**
- 12:00 pm**      **ANNUAL BUSINESS MEETING**

**Lightning Session 2**

- 1:00 pm**      **SESSION INTRODUCTION**  
**Sarah Steele (she/her), AFS-OC President**
- 1:05 pm**      *Talk 1: Electrofishing: Applicability for fall spawning collection*  
**Bradley E. Howell (Student Presentation)**
- 1:15 pm**      *Talk 2: Field-based critical thermal maximum (CT<sub>max</sub>) demonstrates intraspecific variation in thermal tolerance of a stream salmonid*  
**Erin M.C. Stewart (Student Presentation)**
- 1:25 pm**      *Talk 3: Exploring seasonal variation of mercury burdens in lake trout (*Salvelinus namaycush*)*  
**Sofia Pereira (Student Presentation)**
- 1:35 pm**      *Talk 4: Species difference in response to light and their implications for selective passage of desirable fishes at in-stream barriers*  
**Emily N. Fields (Student Presentation)**
- 1:45 pm**      *Talk 5: Understanding species life-history and ecology for improved conservation and recovery of the threatened Silver Shiner (*Notropis photogenis*)*  
**Jacob Burbank (Student Presentation)**
- 1:55 pm**      *Talk 6: The effectiveness of potential uses of muskrat midden searches as a qualitative survey method in the Lower Grand River, Ontario*  
**Sam Turner, Mitchell Shorgan, Emma MacLennan-Nobrega (Student Presentation)**
- 2:05 pm**      *Talk 7: Spatial ecology of muskellunge during a winter drawdown in a regulated, urban waterway in Canada*  
**Jordanna N. Bergman (Student Presentation)**

2:15 pm      *Lightning Session 2 – Q&A and Discussion*  
*Questions to presenters of the lightning round*

2:40 pm      **BREAK**

2:50 pm      **POSTER SESSION**  
*[Join on SpatialChat]*

*Aquatic Restoration and Management Session 2*

3:20 pm      *Extended Talk 5: The FINS Project: A large scale study of the nearshore aquatic ecosystems of the St. Lawrence River*  
**Matt Windle**

3:40 pm      *Extended Talk 6: Lake Sturgeon (*Acipenser fulvescens*) monitoring in Eastern Georgian Bay: A two-eyed approach*  
**Carter Rouleau**

4:00 pm      *Extended Talk 7: Making space: Support of Indigenous-led approaches to fisheries research, management, conservation, and protection*  
**Clint Jacobs**

4:15 pm      *Extended Talk 8: Navigating Indigenous relationships: Listening, building, partnering*  
**Katrina Keeshig**

4:35 pm      *Extended Talk 9: Re-framing aquatic habitat restoration in human-impacted landscapes: The transformative role of partnerships in research and practice*  
**Catherine M. Febria**

4:55 pm      *Extended Talk 10: Co-developing knowledge with Indigenous communities to facilitate sustainable fisheries management: a 'FISHES' perspective*  
**Dylan J. Fraser**

5:20 pm      **BREAK**

5:30 pm      **PRESENTATION OF STUDENT AWARDS & CONFERENCE WRAP**

6:00 pm      **SOCIAL EVENT – Fireside Chats**  
*[Join on SpatialChat]*

# Oral Presentation Abstracts

(\* Presenting Speaker)

**Friday March 25, 1:10 pm**

**Keynote Speaker:** *Using Two-Eyed Seeing (Etuaptmumk) as a tool for collaboration: Successes & lessons learned in aquatic research & fisheries management at UINR*

**Jennifer Sylliboy**

*Unama'ki Institute of Natural Resources (UINR)*

The effective management of aquatic habitats and fisheries are essential to ecosystems and society. To be truly effective, partnerships with science, communities and decision-makers are required at a range of scales. By approaching aquatic research & fisheries management through an Indigenous lens means that cultural values, beliefs and protocols, ceremony, storytelling, and government (according to our own laws, policies, standards and understanding), play just as crucial a role as does scientific observation and experimentation.

Mi'kmaq understandings are but one view in a multitude of Indigenous views and, moreover, that all of the world's cultures (which include the Western sciences) have understandings to contribute in addressing the local to global challenges faced in efforts to promote healthy aquatic habitats and ecosystems. Drawing from my own Mi'kmaq and Western Science education, teachings, and work experience, I will take you on the path to how Mi'kmaq in Mi'kma'ki have "Rebuilt from the ground up". I will describe the fundamental interactions and outline how the integration of Mi'kmaq values are the foundation to Two Eyed Seeing, and have been a solution to many aquatic and fishery management issues in our territory.

## Lightning Session 1

**Friday March 25, 2:10 pm**

**Lightning Talk 1:** *The Secret to (NOT) becoming an armchair ecologist*

**Barb Elliot**

*Fleming College*

In this presentation, Barb Elliot, the 2021 AFS-OC recipient of the Outstanding Mentor Award, shares her experiences, memories, and lessons learned over the past 41 years as an aquatic ecologist and environmental educator. Follow her journeys from Dorset, Ontario, to Hoedspruit, South Africa, with a 26-year stop at Fleming College in Lindsay, Ontario, along the way. Come with your questions and your curiosity!

**Friday March 25, 2:20 pm**

**Lightning Talk 2:** *Effective small-scale stream rehabilitation*

**Kat Lucas**

*Ontario Streams*

Ontario Streams is a registered environmental charity dedicated to the protection and rehabilitation of streams and wetlands, through education and community action. Established in 1995, we have worked closely with numerous communities, conservation organizations, and landowners to develop lasting partnerships environmental stewardship.

With over 26 years of environmental restoration experience, Ontario Streams continues to demonstrate leadership in freshwater ecosystem rehabilitation through our impactful conservation projects and programs. Our most significant work to date has taken place in Southern Ontario, particularly in the Greater Toronto Area (GTA) where the ever-increasing rates of urbanization have resulted in a dire need for rehabilitation. Our priority is on restoring streams and wetlands through on-the-ground work, including in-stream habitat enhancement, native tree and shrub planting, and garbage cleanups. We developed the Ontario's Stream Rehabilitation Manual which outlines bioengineering techniques to restore stream function and habitat.

This lightning talk will highlight Ontario Streams' methods for effectively improving cold-water streams in the GTA. We prioritize using techniques that mimic natural channel design to ensure impactful and long-lasting enhancement of the habitat. We invite you to learn more about stream rehabilitation and how to develop your own projects to protect and restore these sensitive ecosystems.

**Friday March 25, 2:30 pm**

*Lightning Talk 3: Aquatic Habitat Toronto: a multi-agency partnership delivering effective ecological restoration*

**Don Little\*<sup>1</sup>, Morgan Piczak<sup>2</sup>**

*<sup>1</sup>Toronto and Region Conservation Authority (TRCA), <sup>2</sup>Carleton University*

Aquatic Habitat Toronto (AHT) is a consensus-based partnership comprised of three levels of government agencies and academic partners making it unique on account of the varying perspectives that are brought to the table. These partners include practitioners, academia, researchers, resource managers, and regulators who complement each other's rolls and experiences, resulting in meaningful knowledge co-production and effective ecological restoration. This committee provides consultation to proponents by helping to facilitate project approvals and uses leading-edge scientific research to inform the management of aquatic habitats. Using best management practices illustrated in the Toronto Waterfront Aquatic Habitat Restoration Strategy (TWAHRS), AHT has collaborated on over 44 projects and created over 55 hectares of aquatic habitat. This talk will focus on how AHT was formed, the function it serves, and the success it has had since it was formed in 2006.



**Friday March 25, 2:40 pm**

*Lightning Talk 4: Conservation management for future aquatic biodiversity in Ontario*

**Jonathan L.W. Ruppert**

*Toronto and Region Conservation Authority (TRCA), University of Toronto*

The Greater Toronto Area has the most densely populated watersheds in Canada, which presents its own unique set of challenges to conserving nearby ecosystems. Specifically, it is expected that future urbanization and climate will further impact the health of aquatic ecosystems in the region. To protect and conserve aquatic ecosystems for future generations this will require maintaining the form and function of the hydrologic cycle and understanding the capacity of aquatic systems to adapt to future scenarios. We recently completed a comprehensive mapping of Water Resource System (WRS) features (Wetlands, Seepages/Springs, Watercourses, and Inland Lakes) and areas (Significant Groundwater Recharge Areas, Highly Vulnerable Aquifers, Ecologically Significant Groundwater Recharge Areas, and Significant Surface Water Contribution Areas), which is a necessary first step to mitigating impacts to aquatic ecosystems and informing development planning processes. Secondly, to assess long-term conservation goals, we assessed how the aquatic ecosystem may change under future land use and climate. Considering both stressors we demonstrate, using a relatively simplistic modelling approach, where on the landscape restoration efforts may have the biggest impact for achieving future conservation goals. Altogether this work better informs development and restoration planning processes to achieve desired aquatic ecosystem outcomes.

**Friday March 25, 2:50 pm**

*Lightning Talk 5: Don River Mouth naturalization project: Restoration of fish habitat in Toronto – The first piece in a very large puzzle*

**Angela Wallace**

*Toronto and Region Conservation Authority (TRCA)*

The Don Mouth Naturalization and Port Lands Flood Protection Project is one of the largest infrastructure projects in Toronto's history. The project involves creating a new, kilometer long river valley and a new naturalized river mouth that will flow into Lake Ontario in 2024. The future naturalized river mouth will include the creation of 11 ha of coastal wetland, 5 ha of upland terrestrial habitat, and almost 14 ha of aquatic habitat. Recently, the Cherry Street Stormwater & Lake Filling (CSLF) project was completed in autumn 2019. CSLF is a sub-project of the larger project and includes the completion of two fisheries coves. These coves are located near the existing Keating Channel (current Don River mouth), an area known to have very limited fish habitat. These coves were constructed as part of a lake infilling project and were designed to create aquatic habitat heterogeneity. This presentation will look at two years of post-construction aquatic monitoring results.

*Aquatic Restoration and Management Session 1*

**Friday March 25, 3:30 pm**

*Extended Talk 1: Aquatic stewardship in Kahnawà:ke: Community-based monitoring and conservation*

**Brandon Rice, Tyler Moulton**

*Kahnawà:ke Environment Protection Office (KEPO)*

Kahnawà:ke is a Kanien'kehá:ka (Mohawk) community on what is now known as the "South Shore" of the St. Lawrence River across from Montreal. The history of the territory is fraught with colonial territorial encroachments, perhaps none more damaging than the expropriation of Kahnawà:ke's shoreline to build the St. Lawrence Seaway. The violent disruption of the natural shoreline fundamentally altered Kahnawàkeró:non's (people of Kahnawà:ke) relationship to the land and water. Kahnawàkeró:non have nonetheless continued effective stewardship of their land and water. Kahnawà:ke has extensive wetland and forest habitat of great ecological and cultural value, contrasting sharply with the sprawling industrial, residential, and agricultural development of the South Shore. Furthermore, the St. Lawrence River around Kahnawà:ke supports diverse aquatic communities and provides key spawning habitat for many fishes including Teiotién:taron (lake sturgeon, *Acipenser fulvescens*). The Kahnawà:ke Environment Protection Office (KEPO) began in the 1980's as a grassroots initiative to fight further damming and disruption to the St. Lawrence River and to stop illegal dumping and pollution in the territory. The organization has since expanded its scope to include environmental monitoring and policy in collaboration with community and external entities. KEPO's Aquatic Stewardship Program is working to strengthen community stewardship of Kahnawà:ke's waters by integrating scientific monitoring approaches with extensive community environmental knowledge. We will present a brief modern history of the major disturbances to and protections of the ecosystems in and around Kahnawà:ke and discuss monitoring efforts.

**Friday March 25, 3:55 pm**

*Extended Talk 2: Shoreline Hardening and Fish Habitat Concerns in Saugeen Ojibway Nation (SON) Territory*

**Emily Martin, Kathleen Ryan**

*Saugeen Ojibway Nation (SON)*

Projected impacts of climate change, including more frequent and intense storms as well as more extreme lake levels, pose concern for infrastructure built too close to the current shoreline. Certain methods to protect existing infrastructure are harmful to fish and fish habitat (e.g. armour stone walls). SON would like to increase public awareness about these impacts and share results of initial research into less harmful alternatives and building a more resilient shoreline for the future. We look forward to making connections with others doing related work.

**Friday March 25, 4:10 pm**

*Extended Talk 3: Saugeen Ojibway Nation Coastal Waters Monitoring Program*

**Emily Mansur**

*Saugeen Ojibway Nation (SON)*

The Coastal Waters Monitoring Program is a nearshore community assessment created to test the differences in habitat characteristics (vegetation, substrate) and benthic & fish composition between altered (hardened) and unaltered sites within Lake Huron and Georgian Bay. This will contribute to our understanding of the ecological consequences of hardened shorelines in Great Lakes ecosystems and more importantly, understanding the cumulative impacts within the Saugeen Ojibway Nation Territory.

**Professional Development Session**

**Friday March 25, 5:05 pm**

*Extended Talk 1: Conservation Authority Level 1 Electrofishing Course Update*

**Jon Clayton**

*Credit Valley Conservation (CVC)*

The Class 1 electrofishing course allowed certified practitioners to operate boat, towable barge (punt) and shore unit electrofishing units, as well as train others on operation of the backpack unit. The course was led by the Ministry of Natural Resources and Forestry (MNRF) and the Institute for Watershed Science (IWS) at Trent University and was last held in 2018. Practitioners have, therefore, been left to develop their own training. Conservation Authorities (CAs) have been discussing revised training and have developed a revised course (now called Level 1 Electrofishing Training). The course was first taught in 2021 to CA staff only. This course is largely based on the MNRF course materials but does contain some changes. CAs have discussed training external staff but under current insurance policies, this is not permitted. Future discussions are anticipated to assess the possibility of training of non-CA staff.

**Friday March 25, 5:25 pm**

*Extended Talk 2: Many hands make light work: Partnerships in creek restoration*

**Amanda Draves**

*Conservation Halton (CH)*

When implementing aquatic restoration projects, we are often faced with many logistical challenges; there are never enough funds, time and staff to do every project on a restoration practitioner's wish list. While there are many cost-efficient ways to improve the health of a creek, most of them require significant time, and many hands, to successfully complete.

At Conservation Halton, the Landowner Outreach and Restoration Team has partnered with a multitude of government, non-government, and volunteer groups over the last 25 years. This has resulted in long, lasting, meaningful partnerships and community engagement in local restoration work. This presentation will highlight a few of these relationships, with special focus on Conservation Halton's Volunteer Core. Entering it's sixth year, this program has brought young professionals and community members together to work and learn valuable skills from practitioners, while completing aquatic restoration, stewardship, and outreach projects. Since 2017, the Volunteer Core has donated 3,200 hours of their time to assist staff in their day-to-day work. We will also highlight the Core's ability to act as a creative solution; to bridge gaps between a lack of resources to complete restoration projects and a lack of entry level field experiences for new graduates in the environmental field.

### **Mussel and Host Relationships Session**

**Saturday March 26, 9:40 am**

*Mussel Talk 1: Hitchhikers guide to the watershed. What makes freshwater mussels better than fish?*

**Kelly A. McNichols-O'Rourke\*, Margaret N. Goguen, Todd J. Morris**

*Fisheries and Oceans Canada (DFO)*

Freshwater mussels of the unionid family are one of the planet's most imperilled groups, and almost 67% of the species found in Canada are considered at-risk. They provide a variety of ecosystem services within a diversity of aquatic ecosystems where each individual can filter up to 40 L of water per day. Despite an increased awareness of their importance, much remains unknown regarding their critical life history characteristics. These animals have a fascinating lifecycle that requires a parasitic stage on a host – generally fish - and they have evolved complex mechanisms to attract these hosts and to ensure successful juvenile development. With life-spans capable of exceeding 90 years, these relatively sessile animals are highly susceptible to human activities and regional, national and global declines have been consistently observed over the last half century. In order to conserve these species, we need to continue to elucidate their basic life history characteristics, understand threats and their impacts and monitor and track populations through time. Beyond that we can continue to promote their importance and awesomeness through education and outreach.

**Saturday March 26, 10:20 am**

*Mussel Talk 2: Combining malacology and underwater cave exploration in the Ottawa River*

**André L Martel<sup>1</sup>, and Jill Heinerth<sup>2</sup>**

*<sup>1</sup>Canadian Museum of Nature (CMN), <sup>2</sup>Canadian Geographic Explorer in Residence*

The Ottawa River is the location of the longest and most complex underwater cave network discovered to date in Canada -- a fact largely unknown to most Canadians.

These caves are underground extensions of the main channel of the Ottawa River with tunnels running under the mainland and through Islands of the Paquette Rapids, adjacent to Allumettes Island (QC) and the town of Westmeath (ON). The first written mention of the presence of underwater caves or large underground river channels in the Ottawa River is in the field journal of explorer and geologist Sir William E. Logan, during his 1845 survey of the Upper Ottawa Valley while paddling at the Paquette Rapides, next to Allumettes Island. On 28th August 1845, Logan wrote "...The first thing that struck my attention was the appearance of the Ottawa at one place where it boils up from under a solid bank, with a breadth of 50 yards and a depth which I could not ascertain: but McNaughton thinks that one third of the river comes out..." (source reference: Charles H. Smith and Ian Dyck, 2007, in their book entitled: William E. Logan's 1845 survey of the Upper Ottawa Valley. Mercury Series History Papers 54. Canadian Museum of Civilisation). Starting in July 2019, underwater cave diving aimed at specifically examining the freshwater mussel fauna (and other aquatic species) found inside the cave network was conducted by cave diver Jill Heinerth. To our knowledge this is the first study on freshwater mussels living in caves. The habitat comprises cave tunnels of 2 to 5 m wide, 1.5 to 3 m high, with cave walls and ceilings commonly covered by sponges (summer conditions), and with moderate to strong water current (dependant on season and discharge of the hydro dam located ca. 100 km upstream). Following 32 cave dives totalling 69 hours of diving work, hand collected specimens as well as underwater photographs and video footage to date reveal five species of freshwater mussels living inside the Gervais and Three Island Caves network. Mussel species includes, by decreasing order of abundance, live and empty shells of the species Eastern Elliptio (*Elliptio complanata*), Plain Pocketbook (*Lampsilis cardium*), Hickorynut (*Obovaria olivaria*) and Black Sandshell (*Ligumia recta*), as well as empty shells of the Triangle Floater (*Alasmidonta undulata*). Mussels predominantly prevail in areas of fine sediment deposition, where current eddies occur at the turning portions of cave tunnels, or inside cave channel expansion chambers where water current is reduced, with densities commonly 10-100 ind. / m<sup>2</sup>. Fishes observed include Northern Pike, Lake Sturgeon, Smallmouth Bass, Logperch, as well as schools of unidentified cyprinids, some of which are the presumed hosts required to sustain mussel reproduction and stable populations inside the caves. Future research on this unique community includes documenting further regions of the caves, determining mussel population density, studying the ecology of mussel species, including the fish-mussel linkage for species such as Hickorynut mussel, and its presumed host, the Lake Sturgeon.

**Saturday March 26, 11:00 am**

*Mussel Talk 3: Collections of the Canadian Museum of Nature: Irreplaceable tools for conservation research on fishes and mussels*

**Katriina L. Ilves, Noel Alfonso, André L. Martel**

*Canadian Museum of Nature (CMN)*

Natural history collections provide a verifiable record of species' occurrences in space and time. These irreplaceable voucher specimens and their associated data are not only used as the basis to define biodiversity (species discovery) but are of particular

importance for understanding the impacts of our rapidly changing world on biodiversity. The Canadian Museum of Nature has holdings of over 14 million specimens representing bio- and geodiversity of Canada and the rest of the world. As with each biological collection, the National Ichthyology and Malacology collections are in active use for studies on pressing questions about the evolution and ecology of their biotas. Here, we detail the holdings of these two important national collections situated by two ongoing fish + mussel research projects in the Ottawa River drainage: the changing biota of the aquatic habitats of Gatineau Park and an exploration of the relationship between the Hickorynut mussel (*Obovaria olivaria*) and its presumed host, the Lake Sturgeon (*Acipenser fulvescens*), and their ecological context.

### Lightning Session 2

Student Presentations Eligible for Best Student Paper Award (E.J. Crossman Award)

#### **Saturday March 26, 1:05 pm (Student Presentation)**

**Lightning Talk 1:** *Electrofishing: Applicability for fall spawn collection*

**Bradley E. Howell\*<sup>1</sup>, Erin M. C. Stewart<sup>2</sup>, Vince R. Frasca<sup>3</sup>, Chris C. Wilson<sup>3</sup>, Graham D. Raby<sup>2</sup>**

<sup>1</sup>University of Winnipeg, <sup>2</sup>Trent University, <sup>3</sup>Ontario Ministry of Northern Development, Mines, Natural Resources and Forestry (OMNDMNRF)

Electrofishing is widely used to capture fish in freshwater systems. Fisheries assessment and fish culture activities that occur during spawning do so in the absence of a meaningful base of evidence about the potential effects of electrofishing on fish reproduction. In this laboratory experiment, we assessed whether electrofishing adult Brook Trout (*Salvelinus fontinalis*) affected the survival of their embryos. We used two genetically distinct strains of Brook Trout (domestic and wild-origin strains) to do so. Both strains and sexes of fish were exposed to pulsed-DC electrofishing techniques in a fully factorial design (i.e., male shocked, female shocked, both parents shocked, or neither parent shocked [control]), after which their incubating offspring were monitored for survival to the eyed egg, alevin, and fry stages. We did not detect any effects of our electrofishing treatment or interactions with the sex or strain of the fish exposed to electrofishing, suggesting that electrofishing did not negatively impact gamete viability. Our results support the use of responsible electrofishing to collect spawning salmonids for the purpose of gamete collection for hatchery rearing.

#### **Saturday March 26, 1:15 pm (Student Presentation)**

**Lightning Talk 2:** *Field-based critical thermal maximum (CT<sub>max</sub>) demonstrates intraspecific variation in thermal tolerance of a stream salmonid*

**Erin M.C. Stewart\*<sup>1</sup>, Chris C. Wilson<sup>2</sup>, Graham D. Raby<sup>1</sup>**

<sup>1</sup>Trent University, <sup>2</sup>Ontario Ministry of Northern Development, Mines, Natural Resources and Forestry (OMNDMNRF)

Understanding the drivers of intraspecific variation in thermal tolerance of salmonids is increasingly important in the age of climate change. Brook trout (*Salvelinus fontinalis*) are under threat in their native range because of several stressors including warming. In southern Ontario they are limited to stream habitat where temperatures can vary widely and temperature extremes are increasingly likely to occur. Brook trout thermal tolerance has been studied for decades, though we lack data on if and how genetically-isolated populations vary. Critical thermal maximum (CT<sub>max</sub>) can be used to study upper thermal tolerance, but has come into question as a methodology given that CT<sub>max</sub> values within a species often vary due to use of different warming rates and acclimation temperatures. We quantified *in situ* CT<sub>max</sub> for 19 populations of stream-resident brook trout across Ontario to investigate intraspecific variation of thermal tolerance using a standardized, repeatable approach that included quantification of acclimation. Our study demonstrates brook trout resiliency to climate change related warming and extreme events in their native range.

**Saturday March 26, 1:25 pm (Student Presentation)**

*Lightning Talk 3: Exploring seasonal variation of mercury burdens in lake trout (Salvelinus namaycush)*

**Sofia Pereira\*, Garth Covernton, Igor Lehnerr, Faduma Jama, Stephanie Varty, Kristin Eccles, Taylor Luu, Bailey McMeans**

*University of Toronto at Mississauga*

Mercury (Hg) is a dietary-derived contaminant that can reach high concentrations in predatory fishes, posing a significant human health concern. Many studies have characterized the ecological and physiological factors that influence Hg burdens in fishes, with diet and growth rates appearing particularly important. However, little is known about how seasonal changes in fish behaviour and physiology may drive shifts in fish Hg burdens across the course of a year. Furthermore, the roles of sex and reproductive status in influencing Hg contamination in fishes are also poorly characterized. Here, we explored whether ecological or physiological factors better explain seasonal Hg variation in lake trout (*Salvelinus namaycush*), a popular sport fish with distinct seasonal behaviours. Lake trout were sampled during all 4 seasons across two years in two different lakes in Algonquin Park, Ontario, Canada. Total mercury concentrations were measured in the liver and muscle tissue of each fish along with a suite of ecological and physiological traits. We found that liver and muscle Hg concentrations in lake trout were strongly related to seasonal variation in physiological factors associated with reproduction (gonad mass) and to dietary factors ( $\delta^{15}\text{N}$ -based trophic position). Our findings stress the importance of both reproduction and the seasonal timing of life history events for dictating Hg burdens in temperate freshwater fishes. Consequently, this may become important when establishing consumption advisories, which are traditionally based solely on summer sampling.

**Saturday March 26, 1:35 pm (Student Presentation)**

*Lightning Talk 4: Species differences in response to light and their implications for selective passage of desirable fishes at in-stream barriers*

**Emily N. Fields\*<sup>1</sup>, Aliana Hellmuth<sup>1</sup>, McLean R. Smith<sup>1</sup>, Ryan Booth<sup>2</sup>, Gale A. Bravener<sup>2</sup>, Thomas C. Pratt<sup>2</sup>, Robert L. McLaughlin<sup>1</sup>**

<sup>1</sup>University of Guelph, <sup>2</sup>Fisheries and Oceans Canada (DFO)

Increasingly, river managers are facing a connectivity conundrum. Removal of in-stream barriers can facilitate freer movement of desirable native and non-native fishes and improve fish production and diversity, yet it can also facilitate the spread and reproduction of invasive fishes and their unwanted impacts on the production and diversity of native fishes. Selective passage of desirable fishes and blocking or removal of invasive fishes at in-stream barriers could resolve the connectivity conundrum, but requires efficient mechanisms for sorting desirable species from invasive species. We tested experimentally if desirable fishes differed in their responses to light in a two-chambered trap-and-sort fishway used to sort invasive sea lamprey from desirable fishes at an inflatable sea lamprey barrier on Big Carp River near Sault Ste. Marie, ON. Addition of light was predicted to improve the efficiency of size-selective sorting in the fishway if desirable species responded similarly to the light. The experimental design consisted of 17 two-night strata where one night within each stratum was assigned randomly to a lit treatment and the other night assigned to an unlit treatment. Model comparisons based on Akaike's Information Criterion (AIC) demonstrated that desirable fishes differed in their responses to light. The species differences indicate that integration of multiple sorting mechanisms will be needed to achieve selective fish passage and resolve the connectivity conundrum.

**Saturday March 26, 1:45 pm (Student Presentation)**

*Lightning Talk 5: Understanding species life-history and ecology for improved conservation and recovery of the threatened Silver Shiner, *Notropis photogenis**

**Jacob Burbank\*<sup>1,2</sup>, D. Andrew R. Drake<sup>2</sup> and Michael Power<sup>1</sup>**

<sup>1</sup>University of Waterloo, <sup>2</sup>Fisheries and Oceans Canada (DFO)

Conservation and recovery strategies are typically developed with the best available information. However, for many imperilled small-bodied freshwater fish species there is often a lack of basic information available on species life-history and ecology that restricts the capacity to effectively evaluate the impacts of threats and develop comprehensive conservation and recovery action. Here I discuss and summarize 5 years of research on the life-history and ecology of Silver Shiner, *Notropis photogenis*, a small-bodied freshwater fish species listed as threatened under Canada's *Species at Risk Act*. I outline results of studies that evaluate the growth, survival, fecundity, spawning phenology, diet and thermal occupancy of Silver Shiner within Sixteen Mile Creek, Oakville, Ontario, Canada. Silver Shiner growth and survival were found to be negatively impacted by urbanization. Logistic regression models were developed that predict spawning phenology in relation to a cumulative thermal cue. Fecundity was estimated and parasite infections were observed and quantified during the reproductive



period. A species-specific otolith thermometry equation was developed to facilitate examinations into the thermal occupancy of the species. Furthermore, the diet of Silver Shiner was quantified, the species was found to consume significant amounts of terrestrial prey and exploit more terrestrial prey in areas with intact riparian vegetation. I distill how the findings of these 5 years of research on the life-history and ecology of Silver Shiner can help develop comprehensive, well-informed conservation and recovery action for the species in Canada.

**Saturday March 26, 1:55 pm (Student Presentation)**

*Lightning Talk 6: The effectiveness and potential uses of muskrat midden searches as a qualitative survey method in the Lower Grand River, Ontario*

*Sam Turner\*, Mitchell Shorgan\*, Emma MacLennan-Nobrega\*, Lenka Trivett, Hossam Ehab*

*University of Guelph*

Species richness and community composition are key metrics used to evaluate Ontario's freshwater mussel populations (family: Unionidae). Currently, timed searches are used to detect species presence, but as a visual-based survey method they are biased towards conspicuous and large mussels resulting in underrepresentation of small and cryptic species. Consequently, they are also unsuitable for estimating relative species abundance. Muskrat middens have been suggested as an alternative qualitative survey method, although no study in Ontario has evaluated their effectiveness. To do so, we collected 1540 shells from 12 middens in the Lower Grand River and compared our findings to timed search and an intensive mussel relocation within the same reach. We found that muskrats preferred mussels between 30 to 80 mm in length, whereas the timed search was dominated by mussels >100 mm. Middens yielded a greater species richness than timed searches, and we found that neither method was suitable for estimating relative abundance due to biases towards certain species. However, in an equal-weighting approach, combining middens and timed searches provided a better estimate of relative species abundance. Our findings suggest that midden surveys may be effective tools for determining species presence and have the potential to provide approximations of relative species abundance in conjunction with timed searches. We encourage future investigations across multiple reaches to find additional support for our preliminary work.

**Saturday March 26, 2:05 pm (Student Presentation)**

*Lightning Talk 7: Spatial ecology of muskellunge during a winter drawdown in a regulated, urban waterway in Canada*

*Jordanna N. Bergman\*<sup>1</sup>, Kate Neigel<sup>2</sup>, Sean Landsman<sup>1</sup>, Danny Glassman<sup>1</sup>, Luc LaRochelle<sup>1</sup>, Joseph Bennett<sup>1</sup>, Colin Rennie<sup>2</sup>, Jesse Vermaire<sup>1</sup>, Steven Cooke<sup>1</sup>*

*<sup>1</sup>Carleton University, <sup>2</sup>University of Ottawa*

Winter is an ecologically challenging time for fish in Canada. In systems that experience annual winter water drawdowns, many of the pressures that already threaten fish survival during winter can be exacerbated. In a northern portion of Canada's historic Rideau Canal, water levels are lowered each October by more than 2-metres in some areas; because much of the area is narrow (~151-metres) and shallow (~5.5-metres), the drawdown considerably reduces the availability of overwintering habitat to fish. The Rideau Canal is home to one of the few wild, urban muskellunge populations in North America – a population threatened by persistent anthropogenic disturbances and potentially in decline. By ensuring critical habitats are protected, like overwintering areas, we can proactively work against population declines. To determine key winter habitats, we tracked 15 muskellunge during winter 2020-2021 using acoustic telemetry, and blended movement data with water-level data to determine focal areas used. We discovered several interesting movement patterns that will support management and conservation of this iconic species.

### *Aquatic Restoration and Management Session 2*

**Saturday March 26, 3:20 pm**

*Extended Talk 1: The FINS Project: A large scale study of the nearshore aquatic ecosystems of the St. Lawrence River*

**Matt Windle\*<sup>1</sup>, Kate Schwartz<sup>1</sup>, Evan Rundle<sup>1</sup>, Emily Cormier<sup>1</sup>, Mackenzie Wylie-Arbic<sup>1</sup>, Mary Ann Perron-1, Maegan Mitchell<sup>2</sup>, Britney Bourdages<sup>2</sup>, Abraham Francis<sup>2</sup>, Jeff Ridal<sup>1</sup>**

*<sup>1</sup>River Institute, <sup>2</sup>Mohawk Council of Akwesasne*

In 2015 the River Institute and the Mohawk Council of Akwesasne's (MCA) Environment Program staff began a project with a simple goal: to describe the nearshore fish populations of the Akwesasne and Cornwall section of the St. Lawrence River. Under the moniker FINS (Fish Identification Nearshore Survey), the project was initially designed to fill in knowledge gaps and address community concerns regarding the state of small fish populations in the area, which were perceived to be declining. Since 2015 the FINS Project has grown considerably in terms of geographic scope, research focus, technological tools, and collaborative relationships. It has developed into a platform that has provided numerous local and regional benefits: high quality training opportunities for young professionals and volunteers; continuity of research and strengthening working partnerships between the River Institute and the MCA; filling in critical knowledge gaps for species at risk; monitoring the spread of aquatic invasive species (AIS); developing the use of new technologies such as Remotely Piloted Aircraft Systems (RPAS) and environmental DNA (eDNA); providing public outreach and education on fish species and their habitats; providing opportunities for university graduate students and collaborations; and identifying areas for restoration and conservation activities. To date the project has surveyed over 200 sites from Kingston to Montreal and documented over 155,000 fish from 67 species, and has built one of the largest and most unique baseline datasets of the Upper St. Lawrence River

nearshore habitats. This presentation will focus on the highlights, successes and challenges of the FINS Project, with insights into plans for future directions and goals.

**Saturday March 26, 3:40 pm**

*Extended Talk 2: Lake Sturgeon (*Acipenser fulvescens*) monitoring in Eastern Georgian Bay: A two-eyed approach*

**Carter Rouleau\*<sup>1</sup>, Katrina Krievins<sup>2</sup>**

<sup>1</sup>Shawanaga First Nation, <sup>2</sup>Georgian Bay Biosphere

The Lake Sturgeon (*Acipense fulvescens*) is a large freshwater fish currently listed as endangered in Ontario, Canada. Shawanaga First Nation and the Georgian Bay Biosphere are collaborating on a Lake Sturgeon monitoring and conservation initiative. The project revolves around the marriage of Western scientific monitoring techniques with a two-eyed approach to conservation. Monitoring is conducted at sites known to have current or historic Lake Sturgeon spawning activity. The aim of this monitoring is to identify areas along eastern Georgian Bay where Lake Sturgeon are currently spawning, as well as identify potential stressors in the habitat. This monitoring is run in conjunction with an initiative to gather Traditional Ecological Knowledge (TEK) from First Nations communities on Eastern Georgian Bay. Through the gathering of TEK, sites of potential interest are identified. These sites are then monitored for signs of Lake Sturgeon spawning, and the quality of the habitat is assessed. This monitoring provides members of First Nations with training and employment, as well as the opportunity to become stewards of their lands and waters. In conjunction with monitoring, TEK and community feedback are utilized to identify key biological and cultural issues related to declining Lake Sturgeon populations. Through these lines of communication, we can suggest conservation actions that accurately reflect the concerns of First Nations communities throughout the eastern Georgian Bay area. We will discuss preliminary results from monitoring, as well as our approach to weaving TEK and Western scientific methods to create effective and sustainable conservation measures.

**Saturday March 26, 4:00 pm**

*Extended Talk 3: Making space: Support of Indigenous-led approaches to fisheries research, management, conservation, and protection*

**Clint Jacobs**

Walpole Island Heritage Centre, University of Windsor

Through the spirit of reconciliation things are changing from the status quo in Canada and there is a lot to unlearn, relearn, and co-learn. This presentation focuses on insights from Bkejwanong Territory, otherwise known as Walpole Island First Nation, in southwestern Ontario that lives with over 80 of Canada's species at risk. Despite growing projects, partnerships, and collaborations, at a range of scales, there is need to make space for Indigenous-led approaches to fisheries research, management, conservation, and protection. This talk aspires to initiate a broader network across

Turtle Island leading to guidance on putting reconciliation into practice by bringing together Indigenous ways of knowing and science with the goal of achieving ecological sustainability.

**Saturday March 26, 4:15 pm**

*Extended Talk 4: Navigating Indigenous relationships: Listening, building, partnering*

**Katrina Keeshig**

*FishCAST, Healthy Headwaters Lab, Great Lakes Institute for Environmental Research (GLIER), University of Windsor, Traditional Territory of the Three Fires Confederacy*

There is a growing awareness of and commitments to reconciliation between Indigenous and Non-Indigenous people across academia, government, and non-governmental organizations. However, a huge gap between words and actions, and between meaningful versus symbolic remains. A common question in many workshops on Indigenous Relationship Building is ‘where do we start?’ The reality is that there is no rulebook for reconciliation, however the Truth and Reconciliation Commission’s ‘94 Calls to Action’ and the now dated, yet important Royal Commission and the Rights of Aboriginal Peoples (RCAP) offered very clear starting points. In the absence of top-down changes and concrete steps towards reconciliation, important strides are being made by individuals and by our ability to share space with those who have different views and experiences from us and respectfully listening. Bottom-up approaches are often spear-headed by women and BIPOC, with Indigenous persons working in connector roles, bridging the gap between often disparate groups. There are growing examples of ethical partnerships and guides for meaningful relationship building with Indigenous communities. And sometimes its just a matter of providing funding, without restriction or agenda. In this talk I offer my personal insights as an Indigenous person working between two worlds, towards a common goal.

**Saturday March 26, 4:35 pm**

*Extended Talk 5: Re-framing aquatic habitat restoration in human-impacted landscapes: The transformative role of partnerships in research and practice*

**Catherine M. Febria**

*Healthy Headwaters Lab, Great Lakes Institute for Environmental Research (GLIER), FishCAST, University of Windsor, Traditional Territory of the Three Fires Confederacy*

The recovery and effective management of aquatic habitats are essential to fisheries, ecosystems and society. To be truly effective, partnerships with science, communities and decision-makers are required at a range of scales. From research co-design, the implementation of research in local communities, and engagement with legislative tools and frameworks, the dimensions influencing aquatic habitat research are numerous.

**One thing is certain when it comes to successful restoration: Partnerships are key.**

This talk focuses on diverse ways in which the Healthy Headwaters Lab situated in the Traditional Territory of the Three Fires Confederacy and the University of Windsor’s Great Lakes Institute for Environmental Research has implemented a series of

interconnected research projects and networks to enhance and foster Indigenous and local knowledge systems in their efforts to implement and accelerate habitat restoration efforts. Research efforts have been inclusive of aquatic species at risk, invasive/non-native species, agricultural conservation measures and more. Working from land into water, engaging real world constraints around drainage systems in working and settled landscapes, this talk will show through example how decolonial approaches to science, the harnessing of equity, diversity, inclusion and reconciliation in science-based efforts, and investment in partnership networks make way for different and diverse outcomes in support of habitat restoration and a more prosperous and sustainable future for our lands, water and future generations.

**Saturday March 26, 4:55 pm**

*Extended Talk 6: Co-developing knowledge with Indigenous communities to facilitate sustainable fisheries management: a 'FISHES' perspective*

**Dylan J. Fraser<sup>\*1</sup>, Kia Marin<sup>1</sup>, Hyung-Bae Jeon<sup>1</sup>, Sozos Michailides<sup>1</sup>, Hari Won<sup>1</sup>, Raphael Bouchard<sup>2</sup>, Louis Bernatchez<sup>2</sup>**

<sup>1</sup>Concordia University, <sup>2</sup>Laval University

The co-development of knowledge and complementarity of different ways of knowing is an emergent hallmark of natural resource management in Canada's North. FISHES (Fostering Indigenous Small-scale fisheries for Health, Economy, and food security) is a Genome Canada Large-Scale Applied Research Project co-led by Concordia. FISHES addresses critical socio-economic challenges and opportunities related to sustainable fisheries across Canada's North through an interweaving of Indigenous knowledge, genomics and fisheries science. In this talk, we introduce FISHES partnerships, with particular emphasis on a long-standing research partnership with the inland and coastal Cree of Eeyou Istchee, Quebec. This partnership combines Indigenous knowledge with genetic/genomic, morphological and ecological data on several freshwater fishes for management decision-making within Quebec's largest lake (Mistassini Lake) and wildlife reserve. The unification of knowledge types has provided critical information on local fish population dynamics, seasonal movements and harvesting trends, while addressing Indigenous fisher concerns. Through mutual respect and co-development of monitoring projects, such partnerships can contribute to fostering culturally appropriate management decision-making and Indigenous-led stewardship of natural resources.

## Poster Presentation Abstracts

*Student Presentations Eligible for the Best Student Poster Award (AFS-OC President's Award)*

*The environmental impacts of Fast Fashion on water quality: A systematic review*

**Kerrice Bailey\***, Aman Basu, and Sapna Sharma (Student Presentation)

York University

The fashion industry is the second most polluting industry contributing 8% of all carbon emissions and 20% of all global wastewater, with an anticipated 50% increase in greenhouse gas emissions by 2030. To gain a better understanding of the state of academic literature on the environmental impacts of the proliferation of the fast fashion industry, we systematically identified 65 publications from 1996 to November 2021 that were subjected to (i) bibliometric (ii) text and (iii) content analysis. We found that: there is a growing research interest surrounding fast fashion and water quality with 74% of articles published in the last 5 years, and the majority of publications and citations are from China and European countries. We summarize the evaluation of production processes, such as carbon and water footprints, along with recycling practises, aimed to increase the sustainability of the fashion industry. Circular economy, social environmental responsibility, and sustainability governance are key areas for future research in this growing field.

*Habitat use and movement patterns of muskellunge in the Jock River, Ontario*

**Jessica Reid\*<sup>1</sup>**, Steven Cooke<sup>1</sup>, Jon Midwood<sup>2</sup>, Sean Landsman<sup>1</sup> (Student Presentation)

<sup>1</sup>Carleton University, <sup>2</sup>Fisheries and Oceans Canada (DFO)

River ecosystems are experiencing cumulative stressors including wide-scale fragmentation from urbanization and agricultural activities. In a time of rapid transformations to riverine and riparian habitat, it is important to study the habitat use and movement of aquatic species. In Ottawa, the Jock River is experiencing rapid urban development that may threaten water and habitat quality. Despite being situated in a heavily populated urban center, this river supports a diverse fishery, including a self-sustaining population of the apex predator species muskellunge (*Esox masquinongy*) but their movement patterns are currently unknown. To determine the seasonal movements of muskellunge, including their use of previously restored areas, biotelemetry techniques such as acoustic telemetry and Passive Integrated Transponders to track fish movement in the Jock River. Given the ongoing global biodiversity crisis, it is important to be proactive with muskellunge management so that resource-managers can adopt evidence-based approaches for balancing anthropogenic impacts and ecosystem health.

*Assessing biotic homogenization in lake fish communities over the past 50 years in Alberta, Canada*

**Shahanaz Akter\*†**, Danica Pring†, Sapna Sharma (†Joint first authors, alphabetically listed) (Student Presentation)

*York University*

Freshwater fish communities worldwide are sensitive to natural and anthropogenic stressors such as climate change, land use, and non-native species introductions. These stressors can alter the distribution of freshwater fish species across spatial and temporal scales. For example, biotic homogenization of communities can arise through the extirpation of native specialist species, proliferation of native generalist species, introduction of non-native generalist species, or various combinations of all three. In this study, we seek to evaluate the patterns of change in fish community composition across 21 lakes in Alberta over the past five decades. Specifically, we ask: 1) Is freshwater fish community composition in Alberta changing over time?; 2) Are the changes in community composition associated with lake morphology, climatic change and land-use changes over time?; 3) Are the changes in community compositions attributed to biotic homogenization? We have acquired fish species occurrence and lake morphology data from 21 lakes in Alberta, in addition to climate and land use. We will quantify the changes in community composition for each lake by calculating the temporal beta diversity index (TBI) using Sorensen and Jaccard dissimilarity indices. Next, we will perform a redundancy analysis (RDA) to assess the relationship between the pattern of change in different stressors and temporal beta diversity over the same period. Finally, we will decompose the TBIs into species losses and gains to identify whether the pattern of change is attributable to biotic homogenization. Our study will address the research gap in temporal biotic homogenization attributed to multiple freshwater stressors.

Notes: