AMERICAN FISHERIES SOCIETY

ONTARIO CHAPTER

ANNUAL GENERAL MEETING

March 2 – 4, 2017
Geneva Park, Orillia, ON

"Biodiversity Conservation in the Face of Development"

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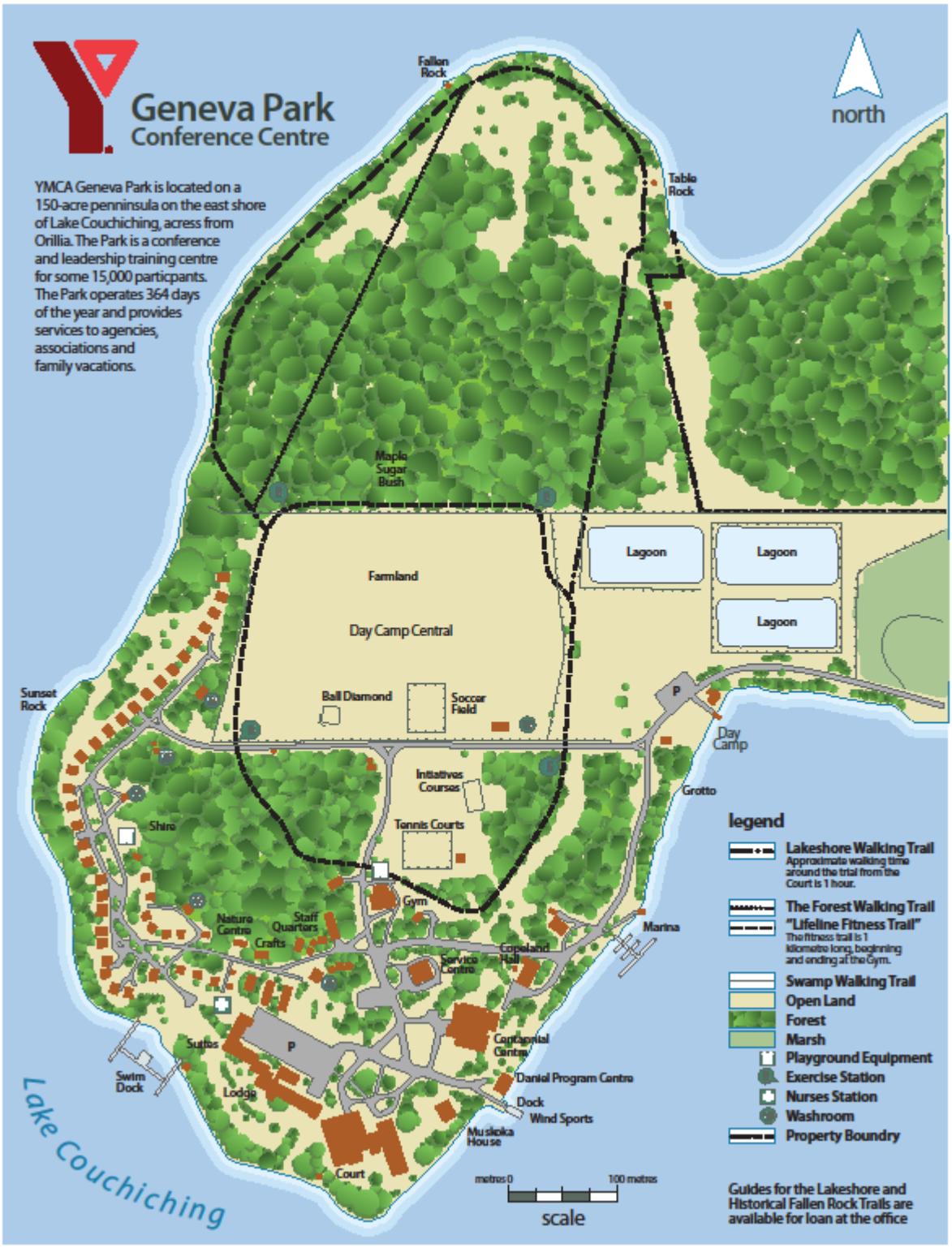
Geneva Park
Conference Centre
YMCA Geneva Park is located on a 150-acre penninsula on the east shore of Lake Couchiching, acress from Orillia. The Park is a conference and leadership training centre for some 15,000 particpants. The Park operates 364 days of the year and provides services to agencies, associations and family vacations.
north
Fallon Rock
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Day Camp Central
Ball Diamond
Soccer Field
Sunset Rock
Day Camp
Grotto
Initiatives Courses
Tennis Courts
Shire
Gym
Nature Centre
Staff Quarters
Crafts
Service Centre
Copeland Hall
Marina
Suttos
Swim Dock
Lodge
Canoe Centre
Daniel Program Centre
Dock
Wind Sports
Muskoka House
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metres 0
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Lakeshore Walking Trail
Approximate walking time around the trial from the Court is 1 hour.
The Forest Walking Trail
"Lifeline Fitness Trail"
The fitness trail is 1 kilometre long, beginning and ending at the Gym.
Swamp Walking Trail
Open Land
Forest
Marsh
Playground Equipment
Exercise Station
Nurses Station
Washroom
Property Boundry
Guides for the Lakeshore and Historical Fallen Rock Trails are available for loan at the office

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Thursday March 2nd

1:00-5:30 **Working With Indigenous Communities 101 Workshop (Tuck Shop, Centennial Centre) **Pre-registration required****

5:30 **Arrival, Registration (Registration/General Office, Centennial Centre)**

6:00-10:00 **Opening Mixer (Hospitality Suite, Lodge Lounge)**

Friday March 3rd

7:30-8:30 **BREAKFAST (Dining Hall, Geneva Court Building)**

08:30 **GREETING AND CONFERENCE OUTLINE (Auditorium, Centennial Centre)**

08:40 ***Keynote Talk:*** *Fisheries Science as a Profession: Personal Reflections.* **Dr. John Casselman**

Session 1

09:15 ***Talk 1:*** *Tributary Effects in Rivers: Interactions of Spatial Scale, Network Structure, and Landscape Characteristics.* **Nick Jones**

09:30 ***Talk 2:*** *Discontinuities in Stream Networks: The Likelihood of Ecological Change Downstream from Tributaries.* **Melissa Brochu**

09:45 ***Talk 3:*** *Pipeline Associated Watercourse Crossings Fisheries Self-Assessment Tool.* **Sean Stuart**

10:00 **COFFEE, TRADE SHOW, POSTER SESSION (Lobby & Auditorium, Centennial Centre)**

Session 2

10:15 ***Talk 4:*** *First evidence of spawning-site fidelity in Spotted Gar.* **Bill Glass**

10:30 ***Talk 5:*** *Does proximity to wastewater effluent alter bluegill sunfish behaviour?* **Adrienne McLean**

10:45 ***Talk 6:*** *The Spatial Ecology of a Reintroduced Population of Walleye (Sander vitreus) in an Area of Concern, Hamilton Harbour.* **Jill Brooks**

11:00 ***Talk 7:*** *Lake Sturgeon in Lake Superior: life history, movements, and other interesting information.* **Bill Gardner**

11:15 ***Talk 8:*** *Ontario Women Anglers.* **Yvonne Brown**

11:45 **LUNCH (Dining Hall, Geneva Court Building), TRADE SHOW & POSTER SESSION (Lobby & Auditorium, Centennial Centre)**

"MNRF Brook Trout Symposium"

12:45 *Opening Remarks and overview of Book Trout in Ontario.* **Helen Ball (MNRF)**

1:15 *Conservation Authority Fisheries Monitoring: Trends and Insight on Brook Trout in southern Ontario streams.* **Brian Morrison (GRCA)**

1:35 *Brook Trout Population Status in the Nottawasaga River Watershed: A Physiographic Perspective.* **Fred Dobbs (NVCA)**

1:50 *10 years of monitoring: Impacts of groundwater taking, sediment load events, and water temperature changes on Brook Trout populations in two water courses in Caledon East.* **Jan Moryk (TRCA)**

2:05 *Brookies in Bronte Forever! A Multi-Pillar Conservation Program to Stabilize Local Brook Trout Populations.* **Beth Anne Fischer (Conservation Halton)**

2:20 *Brook Trout Stocking in Ontario and Database Demonstration.* **Changhai Zhu (MNRF)**

2:35 ***BREAK & POSTER****: Measuring thermal stress and tolerance of Brook trout under chronic exposure.* **Yiminuxe Zheng (University of Toronto)**

2:50 *Identifying potential benchmarks and thresholds for the management of Brook Trout in Ontario.* **Jacquelyn Wood (MNRF)**

3:10 *Limited variability in upper thermal tolerance among pure and hybrid populations of a cold-water fish.* **Zachary Wells (Concordia University)**

3:25 *Past Present and Future Brook Trout Habitat in the Lake Simcoe Watershed.* **Nick Jones (MNRF)**

3:45 *Next Steps - Policy/Monitoring/Science.* **Helen Ball (MNRF)**

3:55-4:30 *Brook Trout Symposium Open Discussion*

4:30-5:30 **ANNUAL BUSINESS MEETING (Auditorium, Centennial Centre)**

5:30-6:30 **TRADE SHOW, POSTER SESSION (Lobby & Auditorium, Centennial Centre)**

6:30- 7:30 **DINNER (Dining Hall, Geneva Court Building)**

7:00-11:00 **MENTORSHIP SESSION AND SOCIAL (Geneva Court Lounge, Geneva Court Building)**

Saturday March 4th

7:30-8:30 **BREAKFAST (Dining Hall, Geneva Court Building)**

Session 3:

8:30 ***Talk 9:*** *Density and occupation of round goby in streams with barriers.* **Chelsea May**

8:45 ***Talk 10:*** *Impacts of climate-induced changes on lake ice freeze up on lakes across the Northern Hemisphere.* **Bailey Hewitt**

9:00 ***Talk 11:*** *The effects of climate change on water level fluctuations in north temperate lakes.* **Katrina Gaibisels**

9:15 ***Talk 12:*** *The Effects of Climate Change on Lake Ice.* **Lianna Lopez**

9:30 ***Talk 13:*** *Lake Erie's hypolimnetic oxygen history told by the non-biting midge community.* **Dmitri Perlov**

9:45 ***Talk 14:*** *Ecosystem engineers and multiple stressors: Can algae "mussel" their way into the nearshore of Lake Huron?* **Samantha Stefanoff**

10:00 ***Talk 15:*** *Preliminary Assessment of Asian Carp Spawning Potential in Tributaries to the Canadian Lake Ontario Basin.* **Tej Heer**

10:15 **COFFEE & POSTER SESSION (Auditorium and Lobby, Centennial Centre)**

10:30 ***Talk 16:*** *Asian Carp surveillance and Early Detection Efforts in the Canadian Waters of the Great Lakes Basin.* **Alex Price**

10:45 ***Talk 17:*** *The need for consistency in post-construction monitoring programs of stream restorations projects.* **Jeff Muirhead**

11:00 ***Talk 18:*** *Stream restoration and instream structures.* **Heather Amirault**

11:15 ***Talk 19:*** *The Riffle...An Allegory of the Practice of Natural Channel Design in Ontario - From Riverflies to Standard Drawings.* **Mark Hartley**

11:30 ***Talk 20:*** *The ROM's Ichthyology Collection: Why do we keep so many fishes?* **Erling Holm**

11:45 ***Talk 21:*** *The Provincial Bait Policy Review: Considering options for the management of baitfish and leeches into the future.* **Scott Gibson / Shannon Fera**

12:00 **PRESENTATION OF STUDENT AWARDS AND CONFERENCE WRAP-UP (Auditorium, Centennial Centre)**

12:25 **LUNCH (Dining Hall, Geneva Court Building)**

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Poster Presentation Abstracts

Keeping it level: Characterizing the time course of baseline blood physiology with sampling stressors in wild sportfish

Michael J. Lawrence, Sofia Jain-Schlaepfer, Aaron J. Zolederdo, Dirk A. Algera, Kathleen M. Gilmour, and Steven J. Cooke

Alterations in teleost blood physiology often reflects a great deal of insight into the organism's respiratory, energetic and stress status. Assessing a fish's baseline blood physiological status makes use of blood sampling via caudal venipuncture requiring handling of the animal. Over extended sampling durations, handling-induced activation of the stress axis may perturb blood metrics from a baseline state. To date, no recommended guidelines have been provided in assessing an optimal sampling duration for obtaining a representative baseline blood sample in teleost fish. This work addressed the time course of physiological changes in a number of blood metrics across six species of wild sportfish in Lake Opinicon (Chaffey's Lock, ON). Animals were caught using standardized angling techniques and held in a water filled trough. Blood samplings, via caudal venipuncture, occurred over a span of 11 minutes post-capture to investigate time-course effects of handling stressors. Blood was assessed for concentrations of whole blood glucose, lactate, hematocrit, and plasma cortisol. Breakpoint analysis was then used to determine the timing upon where these blood metrics began deviating from a baseline state. In almost all species, assessed blood metrics were found to positively correlate, linearly, with time. Breakpoint analyses indicated that values for blood lactate and hematocrit did not deviate from baseline conditions until after~3-5 minutes of handling for all species whereas blood glucose concentrations generally did not deviate significantly from baseline conditions. In all

species, plasma cortisol concentrations began deviating from a baseline state between 4-8 minutes post-capture. These results indicate that the stress-response occurs in a time dependent manner resulting in a deviation of the animal's blood physiology. Additionally, we recommend that to ensure representative baseline sampling across multiple blood metrics, that sampling be limited to under 2.5 minutes in teleost fishes.

Swot Matrix Analysis of Algae Derived Biofuel as a Fourth Generation of Bioenergy Prospect for Nigeria

Karounwi Okunade*, Isa Elegbede and Bukola Dawodu

The recent continuous decline in the utilization of fossil fuels as means of energy production has significantly become a global issue and Nigeria as a developing country is grappling with the means of identifying alternative means of energy sustainability. This is the baseline for which this study was conducted as the principle of sustainability is fundamental to natural resources management.

The use of various biofuel productions which has been adopted in Nigeria for a while was measured against the adoption of algae biofuels using the Strengths, Weaknesses, Opportunities and Threats (SWOT) Analysis which was incorporated into the data analysis of comparison of bioenergy production. Here, SWOT Analysis was used to explore new solutions to problems, Identify barriers that will limit objectives of this review, decide on direction that will be most effective and additionally reveal possibilities and limitations for change and positive end result of the adoption of algae biofuels.

The results revealed that algae- derived biofuel forms the basis for fourth generation biofuel production which can meet the much-needed need for energy sustainability in Nigeria. Also, biofuels were found to be inevitably important to a decarbonized means of transportation (especially trucks, ships and aircrafts). Further study can be done to include other developing countries, particularly the non-oil-producing nations where large potential of bioenergy production are yet to be tapped. If appropriate policies and related technological innovations are promoted and effected, the production and utilization of biofuels in Nigeria can potentially help solve the economic, social and environmental problems.

TABLE 1: showing 4 generations of Biofuels and their sources.

S/N	Generation of biofuel[3]	Sources
1)	First generation Biofuels	Grains and sugar to Ethanol , Vegetable oil to Biodiesel.
2)	Second Generation Biofuels :	Lignocellulose to Alcohols , Lignocellulose to Green Diesel ,Vegetable oils to Green Diesel.
3)	Third generation	Biomass to Hydrogen , Algal Hydrogen , Algal Oil/Biodiesel.

4)	Fourth generation Biofuel	Biofuel from high solar , efficiency cultivations

The Impacts of Wetland Restoration on Fish Productivity in Nigeria

Karounwi Okunade*, Olubukola Ayorinde, Bukola Okunade, Damilola M. Agboola and Zainab A. Adesokan

Wetland is one of the resources of high value which has been exposed to indiscriminate use. It is an important ecosystem to fish and loss or degradation of wetland will have a direct consequence on sustainable fisheries. This paper reviewed the term "wetland", its functions and values, importance to fish production in Nigeria and threats to its sustainability. The term "wetland" has been defined by various researchers especially based on their profession and their needs but up till today there is no single definition accepted by all users. In Nigeria, the most commonly adopted is that of RAMSAR convention. Wetland has both marketed and non-marketed functions and values. They provide essential link in the life cycle of 75 percent of the fish and shell fish commercially harvested in the world and are vital to fish health. Despite the importance, there have been exceptional losses of wetlands. Lagos state alone has witnessed more than 96 percent loss. Major threats to wetlands are: agriculture, development, pollution and climate change. Therefore proper management of the wetland ecosystem is important in other to ensure continuous fish production.

Pollution of Nigerian Aquatic Ecosystems by Industrial Effluents: Effects on Fish Productivity

Okunadeo Karounwi*, Nwagwu, S., Ndimele, P.E.

Nigeria is uniquely endowed with vast water resources. The near-shore, estuaries, rivers, lakes and pond all taken together, offer tremendous opportunities for fish production. Globally, water bodies are primary means for disposal of waste especially the effluents from industrial, municipal, sewage and agricultural practices near the water body. Studies carried out in most cities in Nigeria has shown that industrial effluent is one of the main sources of water pollution in Nigeria and less than 10% of industries in Nigeria treat their effluents before discharging them into the water bodies. This effluent can alter the physical, chemical and biological nature of the receiving water body resulting in the death of the inhabiting organisms including fish. Untreated industrial waste discharged into water bodies have resulted in eutrophication of aquatic ecosystem as evidence by substantial algal bloom leading to dissolve oxygen depletion and eventually massive mortality of fish and other organisms. Industries like textile producing factory, paper manufacturing plants, oil refinery, brewery and fermentation factory and metal producing industries discharge their wastes into the aquatic ecosystem. These industrial wastes contain pollutants like acids, heavy metals, oil, cyanide, organic chemicals, pesticides, polychlorinated biphenyls, dioxins etc. Some of these pollutants are carcinogenic, mutagenic and teratogenic while some are poisonous depending on the level of exposure and intake by aquatic organisms and

man. These pollutants affect the biological growth and reproduction of fishes in the aquatic ecosystem thereby reducing the amount of captured fishes. Fish and other aquatic lives face total extinction due to destruction of aquatic lives and natural habitats by pollution of water bodies. Effluents and wastes produced by industries should be minimized by using low and non-waste technologies; and effluents should be properly treated before they are discharged into aquatic environment.

Survey Protocol for Unionid Mussel Species in Wetlands in Ontario

Sarah Hogg[1], Scott Reid[2], and Rebecca Dolson[1], 1 - Species Conservation and Policy Branch, Ontario Ministry of Natural Resources and Forestry, 2 - Aquatic Research and Monitoring Section, Aquatic Biodiversity and Watersheds Unit, Ontario

Effective protection and recovery of species at risk and their habitat requires comprehensive and up-to-date knowledge of species' occurrence and distribution. This survey protocol proposes standardized field methods to detect mussel species at risk at wetland sites in Ontario, with a focus on Eastern Pondmussel, Mapleleaf, and Lilliput. Two survey types, a Timed Search with Random Starts and Half-Hectare Timed Search, are proposed for mussel detection at wetland sites of > 50 ha and 0.5-50 ha, respectively. Both survey types can utilize visual, tactile, or "scooping" techniques to detect mussels as appropriate for site conditions. It is also proposed that sampling should occur when water temperatures are greater than 16oC, typically between June 1 and September 30th. Additional guidance on records review, qualification requirements, mussel processing, and data management are provided. Finally, the protocol proposes a method to determine the required search effort to assess, with reasonable confidence, the absence of mussel species at risk from a wetland site. Search effort is determined based on the probability of detection, a function of predicted mussel density and search efficiency. For this protocol a probability of detection of 0.8-0.95 is recommended. Methods to predict mussel density are provided and a simple matrix is used to categorize search efficiency. This Species at Risk Survey Protocol is intended to meet the need for reliable, science-based survey methods for mussel species at risk in wetlands in Ontario.

Size spectra variation in the aquatic food web in the Bay of Quinte

Tessa Brinklow, Cindy Chu, Dak de Kerckhove

Food webs are critical to understanding how communities function and how energy is transferred through trophic levels. In aquatic communities, the size of the organism determines trophic position, as larger organisms tend to feed on smaller organisms. This size-abundance relationship can be plotted as a negative linear regression, also known as a size spectrum. However, under stressful periods or changing environmental conditions this transfer of energy through the food web may change and become less efficient. In this study, I will be using long-term data from the aquatic community in the Bay of Quinte (Lake Ontario) to determine how the community has responded to various disturbance events. I will be building size spectra to compare seasonal and annual variability in this transfer of energy from

phytoplankton, to zooplankton, and finally to foraging and predatory fish. I aim to determine how these events impact the community through changes in slopes of size spectra over periods of intense changes. I expect to see the greatest variability across these periods of intense changes such as invasive species and changes in water quality. I predict gradual changes in size spectra due to angling pressures and climate change, as well as seasonal changes due to natural variability. Outcomes of this project will aid in determining the effects of these disturbances and human pressures on aquatic communities. The results of this project will assist with lake health assessment and conservation of species that are critical to fisheries management.

To share or not to share - Perspectives from fish telemetry researchers on data sharing

Vivian M. Nguyen, Jill Brooks, Robert J. Lennox, Neal Haddaway, Frederick G. Whoriskey, Rob Harcourt, Nathan Young, and Steven J. Cooke

The potential for biotelemetry data to help answer complex questions about animals and their interactions with the environment across large scales is limited by the capacity to store, manage, and access its expanding data across the research community. Large biotelemetry networks and associated databases exist, but are still not reaching their full potential because of reluctance or unawareness among research scientists to share their telemetry data. Establishing appropriate data sharing protocols is therefore the next step needed to take advantage of big data in ecology. To do so we must understand why do some individuals share data and why some don't, and what the barriers are to sharing fish biotelemetry data. This presentation focuses on exploratory analyses on characteristics of individuals who share or do not share their data, identify perceived barriers to sharing data, and document actual examples of both benefits and concerns that have materialized from sharing biotelemetry data.

Spatial ecology of juvenile esocids in a large river system

Sarah Walton

Identifying temporal patterning of the spatial ecology of wild fishes is critical to defining habitat requirements of early-life stages of target species. Although habitat requirements of adults are well-studied, emigration and habitat use of age-0 muskellunge (*Esox masquinongy*) and Northern pike (*Esox lucius*) remain poorly understood. An observed declined in abundance of muskellunge populations in the St. Lawrence River prompted additional study of seasonal habitat use and the underlying behavioral mechanisms driving the spatiotemporal distribution patterns of individual age-0 esocids. Age-0 muskellunge (N = 41; mean TL = 164 mm, SD = 28.9) and Northern pike (N = 30; mean TL = 238.4 mm, SD = 54.7) from the Thousand Islands section of the upper St. Lawrence River, USA, were captured via seining and surgically implanted with JSATS (Lotek, L-AMT-1.416), the smallest commercially available transmitters. Individual movement data as well as ambient temperature were collected by acoustic receivers and HOBO temperature loggers deployed throughout the studied embayment area. This research will assess critical knowledge gaps related to the basic ecology of

early-life stage of esocid species, particularly 1) the timing of emigration from nearshore embayments, and 2) how patterns of embayment residency and habitat use vary between age-0 muskellunge and their competitive, sympatric congener, Northern pike. Our findings may enable the collaborative management of self-sustaining populations of these culturally and recreationally valuable sportfish

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Oral Presentation Abstracts

Friday March 3, 08:40
Keynote: *Fisheries Science as a Profession: Personal Reflections*

John M. Casselman, Queens University

Science has evolved dramatically over the centuries to become a highly specialized profession. It can be many things: an occupation, a career, a job, or a means of employment. This presentation expands on some of these and progresses into a personal introspection considering examples from a journey of more than five decades. The insights draw on personal experiences involving a broad range of species, locales, projects, scientific challenges, and efforts ranging from the Canadian Arctic and long-lived, unexploited fishes to fish production in the Rift Valley lakes of Ethiopia, as well as rare and endangered species on the Tibetan Plateau. Where once only fish and fish communities were studied, we now realize that environmental conditions and ecological associations are equally important. Fish are more than just a resource to be exploited. Knowledge teaches respect and encourages appropriate and wise use. Indeed, conveying science to schoolchildren can be extremely rewarding, especially overhearing them exclaim, "Eels are awesome!" The elusive and mysterious eel provides a glimpse of the changes seen from Aristotle to the present. Fisheries science as a profession can provide considerable personal satisfaction because of the people involved and the tools now available (telemetry, micro-chemical analyses, etc.). Rewards can come over time: working for five decades on pike, a species that once was considered to be of little importance or concern and now, in some places appropriately managed as a commercial fishery officially certified as sustainable – the latter signaling a way for the future. Summary reflections are provided on what contributes to strong attributes of

professionalism. Fisheries science in Ontario continues to be in highly professional and worthy hands. Fish and fisheries have a very bright future.

Friday March 3, 09:15
Talk 1: *Tributary Effects in Rivers: Interactions of Spatial Scale, Network Structure, and Landscape Characteristics*

Nicholas E. Jones* and Bastian J. Schmidt, River and Stream Ecology Lab, Aquatic Research and Monitoring Section, Ontario Ministry of Natural Resources and Forestry, Trent University, DNA Building 2140 East Bank Drive, Peterborough, ON K9J 7B8 nicholas.jones@ontario.ca Telephone: 1-705-755-2268; Fax: 1-705-755-1559

Landscape characteristics in combination with the physical structure of branched stream networks define the environmental conditions available for lotic biota. From simple stream network "laws" can emerge a spatially explicit understanding of habitat heterogeneity. Based on geographic information system analyses, we explore how stream networks integrate spatial heterogeneity of the landscape and form new characteristics as stream segments accumulate into progressively larger drainages, and how these changes in landscape characteristics relate to confluence symmetry ratio and drainage size. Simple expectations for stream networks include: (i) abrupt changes in longitudinal patterns are more probable among the numerous small and diverse headwater streams than in large, rare, and characteristically similar tributaries, (ii) the many small tributaries flowing into large main stem channels cause individually small, yet collectively gradual changes in longitudinal patterns. Such a spatial understanding of where change is likely to occur helps to reconcile gradual river continuum and abrupt discontinuum views of patterns in rivers and predict the locations of significant confluences, ecological transitions, longitudinal gradients, and patterns of biodiversity in stream networks.

Friday March 3, 09:30
Talk 2: *Discontinuities in Stream Networks: The Likelihood of Ecological Change Downstream from Tributaries*

M. Brochu[1]*, N.E. Jones[2], B.J. Schmidt[2], P.C. Frost[3], and S.J. Melles[4], 1 - Environmental and Life Sciences, Trent University, Peterborough, Ontario. 2 - Ontario Ministry of Natural Resources and Forestry, Trent University, Peterborough, Ontario. 3 - Trent University, Dept. Biology, Peterborough, Ontario. 4 - Ryerson University, Dept. Chemistry and Biology, Toronto, Ontario.

Network perspectives of branching systems have only recently gained the attention of stream ecologists. Within this paradigm shift, there is a keen interest in habitat spatial heterogeneity in terms of ecotones and biodiversity "hotspots" found at tributary confluences. There has been little research, however, to understand what types of tributaries lead to ecological change at larger scales (e.g., stream segments) downstream of tributaries. Differences in confluence symmetry ratio (tributary size relative to the mainstem) and stream type (landscape characteristics) may affect the

likelihood of change downstream from tributaries. For example, a relatively small and warm turbid tributary flowing into a cold clear trout stream may cause greater changes downstream than a similar sized tributary that is also cold and clear. We sampled confluences (n=34) in southern Ontario to examine what types of tributaries lead to ecological changes downstream with a focus on benthic macroinvertebrate (BMI) communities. Our results showed that BMI community did not change as predicted indicating that abrupt changes in stream networks are not as common as the theory may suggest. The lack of changes we note might be related to the community-based measures of (dis)similarity used and the relatively small range of stream types within our study area. Pursuing this research using a wider range of stream types could show greater ecological change below confluences

Friday March 3, 09:45
Talk 3: *Pipeline Associated Watercourse Crossings Fisheries Self-Assessment Tool*

Sean Stuart[1], Lucas Warner[2], Doug Chiperzak[2], 1 -Stantec Consulting Ltd., Markham,ON, Canada, 2 - Stantec Consulting Ltd., Calgary, AB, Canada

Revisions to the federal *Fisheries Act* came into effect in November 2013, along with a new Fisheries Protection Policy Statement in October 2013. Changes to the Act include a prohibition against causing *serious harm to fish* that are part of or support a commercial, recreational or Aboriginal fishery. The Policy Statement supports the changes made to the *Fisheries Act* by explaining the fisheries protection provisions of the Act and outlining how Fisheries and Oceans Canada (DFO) will implement the provisions. The fisheries protection provisions have implications for conducting work in and around water. Many of the activities associated with pipeline projects are not included in DFO's self-assessment criteria; however, DFO will recognize and support the use of externally-developed guidelines that provide clarity and certainty to proponents, while maintaining the sustainability and ongoing productivity of CRA fisheries. DFO is also moving to a one-window approach to reviewing projects with requirements under the *Species At Risk Act* (SARA).

Stantec was retained by the Canadian Energy Pipeline Association (CEPA), Canadian Association of Petroleum Producers (CAPP), and Canadian Gas Association (CGA) to update the 4th Edition of their Pipeline Associated Watercourse Crossing document to a 5th Edition that incorporates the 2013 Policy Statement and changes to the *Fisheries Act*. Representatives from DFO's operations and science branches, as well as members from the National Energy Board, collaborated throughout this project.

This presentation outlines key changes in the *Fisheries Act* and provides guidance on the interpretation and application of the revisions to the Act and policy as it applies to the pipeline industry. A key component of this presentation is the introduction of a Canada-wide guidance framework. The framework was designed to assess the likelihood for pipeline associated watercourse crossings to cause serious harm to fish, the likelihood that they will comply with the SARA, and to determine when to submit projects to DFO for review. This framework, called the Fisheries Self-Assessment Tool

(FSAT), is available through an online interface that guides the user through the assessment process. The FSAT was reviewed by DFO and subject matter experts through the Canadian Science Advisory Secretariat (CSAS) review process and is currently being considered for publication as a CSAS report. The presentation will also summarize the key results of the CSAS review. Although developed for the pipeline industry, the regulatory framework applies to other linear corridor projects. A similar approach and online interface could be developed for the self-assessment of linear corridor projects such as roads and railways.

Friday March 3, 10:15
Talk 4: *First evidence of spawning-site fidelity in Spotted Gar (Lepisosteus oculatus)*

William R. Glass & Nicholas E. Mandrak

Spawning-site fidelity in fishes may lead to the development of population genetic diversity in a species in a single water body. In such cases, it is important to protect each spawning site in order to preserve the overall genetic diversity of the species. Spotted Gar is a Threatened species in Canada and is found in three coastal wetlands of Lake Erie. Recent genetic evidence suggests that Rondeau Bay, home to the largest number of Spotted Gar in Canada, has multiple genetically distinct populations, despite the lack of any physical barrier to movement and gene flow. Fifty Spotted Gar were radio-tagged at several spawning sites previously identified in agricultural drain tributaries of Rondeau Bay, during the spawning season in the spring of 2015. Active radio-tracking was conducted around the perimeter of Rondeau Bay during the spawning season in 2016 to determine if individual Spotted Gar returned to the same site at which they were captured and tagged the previous year. Fifteen Spotted Gar were located during tracking in 2016. Of the individuals located in 2016, 11 were observed or assumed to have spawned; 6 in the same location they were tagged, and 2 in a tributary adjacent to the one in which they were tagged, 3 were located in spawning areas large distances from their initial capture site. The majority of tagged individuals were not located at spawning locations during the study, indicating that many Spotted Gar did not spawn in consecutive years. The spawning-site fidelity observed in Spotted Gar may explain the multiple genetically distinct populations in Rondeau Bay. Protection of each of the spawning sites is important for the conservation of the species and the observation that individual Spotted Gar do not spawn every year reinforces its status as a Species at Risk in Canada.

Friday March 3, *10:30*
Talk 5: *Does proximity to wastewater effluent alter bluegill sunfish behaviour?*

McLean*, A.R., Du, S., Choi, J., McCallum, E. S., Scott, G., and Balshine, McMaster University, Hamilton, ON

Pharmaceuticals are becoming more prevalent in aquatic systems due to increased human consumption and their release into the environment *via* treated wastewater effluent. Some of these pharmaceuticals are designed to alter human

behaviour and act on similar biological targets found in other taxa, such as fish that encounter pharmaceuticals in released effluent. To date, most studies of effects of pharmaceuticals and even of effluent have taken place in a laboratory setting. We examined if and how fish behaviour might be altered by wild exposure to environmentally relevant doses of treated wastewater effluent. Here we tested if bluegill sunfish (*Lepomis macrochirus*) differed in their activity and willingness to take risks after being held (i) near a wastewater effluent release pipe, (ii) downstream of this wastewater effluent pipe, and (iii) in a nearby control stream without wastewater effluent release. Preliminary results suggest that fish held downstream of the wastewater effluent release pipe exhibit more risky behaviours compared to those held at the other two sites. This could have important implications for survival of fish downstream of wastewater effluent release pipes.

Friday March 4, 10:45
Talk 6: *The Spatial Ecology of a Reintroduced Population of Walleye (Sander vitreus) in an Area of Concern, Hamilton Harbour.*

Jill Brooks

Freshwater ecosystems provide many ecosystem services; however, they are often degraded as a result of human activity. Hamilton Harbour, an embayment in the western end of Lake Ontario, was Canada's largest contaminated site in the Laurentian Great Lakes and designated as an Area of Concern in 1985. Historically, the harbour was a productive wetland area; however, it has lost 65% of available fish and wildlife habitat since industrialization in the early 1900s. Remediation efforts include 376 ha of restored fish and wildlife habitat and 12 km of new shoreline. Additionally, in an attempt to increase the levels of piscivores, Ontario Ministry of Natural Resources and Forestry (OMNRF) have over the last two decades stocked walleye (*Sander vitreus*), a previously extirpated native predator. Beginning in fall 2015, sexually mature walleye were captured and tagged with acoustic transmitters with pressure (depth) sensors. Fixed acoustic biotelemetry receivers were placed throughout and adjacent to the Harbour to determine residency patterns of walleye, with a particular focus on identifying aggregation areas during the spawning season. Results will help assess whether stocking efforts have been effective and will also help to direct future habitat protection and enhancement efforts.

Friday March 3, 11:00
Talk 7: *Lake Sturgeon in Lake Superior: life history, movements, and other interesting information*

William Gardner* and Thomas Pratt, Fisheries and Oceans Canada, Great Lakes Lab for Fisheries and Aquatic Sciences, 1219 Queen Street East, Sault Ste. Marie, ON, P6A 2E5

Lake Sturgeon are an imperiled species throughout their native range of Eastern North America. In Lake Superior numbers appear to be greater than in many other parts of their range but are still much lower than was historically the case. Recent sampling

efforts by a number of agencies in Lake Superior have led to a better understanding of the challenges to recovering the species. In this talk we will provide details about short and long range movements of individuals within Eastern lake Superior as well as throughout the lake. We will discuss the life histories of several genetically distinct populations in Lake Superior, Eastern lake Superior and the Pic River. We will also discuss the low incidence of fin anomalies and higher incidence of tag loss. We will close our talk discussing why the future is looking brighter for Lake Sturgeon in Lake Superior.

Friday March 3, *11:50*
Talk 8: *Ontario Women Anglers.*

Yvonne Brown

Yvonne will be speaking about the Ontario Women Anglers organization, how and why it was started and some of the trends she has noticed with women in the fishing community.

Friday March 4, 08:30
Talk 9: *Density and occupation of Round Goby in streams with barriers*

May CM[1], Burness G[2] and Fox MG[2,3] , 1 - Trent University, Environmental and Life Sciences Program, Peterborough, ON, 2 - Trent University, Department of Biology, Peterborough, ON, 3 - Trent University, Trent School of the Environment, Peterborough, ON

Habitat preference of the Round Goby has been widely studied in the Great Lakes but much less is known about the factors that affect its occupancy in small tributary streams. We examined density and occupation of this invasive fish in four streams in south central Ontario as a function of depth, width, distance from the mouth, substratum and velocity. Cavan and Baxter creeks are Otonabee River tributaries, while Cobourg and Gages creeks are tributaries of Lake Ontario, a more dynamic source environment. All have barriers limiting the extent of upstream migration, and gobies have reached the barriers in all four streams. Previous studies indicate gobies prefer coarse substratum and our results support this. However, preliminary results suggest that the patterns of occupation differ between the Otonabee River and Lake Ontario tributaries. Gobies occupy Cavan and Baxter creeks year-round, reaching the highest density just below the barriers, indicating that distance from the stream mouth is the most important factor affecting density. The next highest density was observed in sites with coarse substratum, regardless of distance from the stream mouth. Unpublished data suggest Cobourg and Gages creek gobies seasonally migrate in and out of the streams, inhabiting Lake Ontario in the winter, moving into the streams in the spring/summer and returning to Lake Ontario in the fall. In these streams, Round Gobies reach highest density in sites with coarse substratum, not at the barriers to upstream migration, suggesting that invasion front dynamics differ according to local habitat features and source environment.

Friday March 4, 08:45
Talk 10: *Impacts of climate-induced changes on lake ice freeze up on lakes across the Northern Hemisphere*

Bailey Hewitt and Sapna Sharma, York University, Department of Biology, Toronto, Ontario

Throughout the last century, Northern Hemisphere lake ice breakup has become earlier, freeze up has become later, and ice duration has become shorter with increasing rates over the last few decades. Our study examines how climate-induced changes on lake ice freeze up will influence ecosystem structure of 74 lakes across the Northern Hemisphere. We collated lake ice freeze up dates from 1950-2014 from the National Snow and Ice Data Center, as well as updated ice freeze up records from collaborators. We obtained monthly air temperature, precipitation, and cloud cover data from the University of East Anglia Climatic Research Unit and large-scale climate drivers (i.e., indices of El Nino Southern Oscillation, North Atlantic Oscillation, sunspot cycles) from various open source databases online such as the National Oceanic and Atmospheric Administration (NOAA). We found that lakes across the Northern Hemisphere froze 1.6 days per decade later (2 days per decade earlier to 3.7 days per decade later) over the last 65 years. Since 1950, we found that lakes froze 10 days later on average. Air temperatures, precipitation, cloud cover, and large-scale climate drivers explained the advancement of freeze up dates in lakes across the Northern Hemisphere. One third of our lakes experienced a breakpoint with higher rates of warming following a significant El Nino event in 1965, 1986, 1991, and 1997. These shifts in lake ice phenology suggest significant climate warming in lakes since 1950 and suggest the prospect of less ice cover in lakes under future scenarios of climate change.

Friday March 4, 09:00
Talk 11: *The effects of climate change on water level fluctuations in north temperate lakes*

Katrina Gaibisels and Sapna Sharma

Maintaining water levels provides drinking water, water for agriculture, maintained biodiversity, and continued use of waterways for recreation, fishing, and shipping. Our study investigates how water levels have changed over time, the drivers of water levels in northern Wisconsin lakes, and forecasts water levels in 2050 and 2070 under scenarios of climate change. During the study period (1984-2014), the regional climate became warmer and drier, with a 2.3 °C increase in air temperature and a 7.3 mm decrease in precipitation, resulting in a decrease in water level between 6 – 120 cm, with the greatest changes seen in fall. Proportionally, 48.9 % and 29.6 % of the variation in annual and seasonal water levels was explained by precipitation and temperature respectively. Teleconnections indices explained 22.4 % of the variation in water levels. On both the annual and seasonal scales, positive phases of the Pacific Decadal, Western Pacific, Sunspot Cycle, Atlantic Multidecadal, and the Polar Eurasian Oscillations, and negative phases of the Tropical Northern Hemisphere and El Niño Southern Oscillations were important drivers of lower water levels. Water levels will have fallen by an average

of 72 cm from historical levels by the year 2050, and by 68 cm by 2070, with climate projected to become warmer and wetter over the next century. The changes in water level could lead to alterations in lake functioning, such as altered frequency of algal blooms, changes in water clarity, and shifts in the foraging and reproductive success of different fish species.

Friday March 4, 09:15
Talk 12: *The effects of climate change on lake ice break-up across the Northern Hemisphere.*

Lianna Lopez

Lake ice phenology is highly sensitive to changes in climate. Long-term ice phenology records can serve as an important indicator of climate dynamics over time. Our objective was to determine the historical changes in ice break-up trends from 1951-2014 in 137 lakes across the Northern Hemisphere. We obtained ice phenology data from the Lake Ice Analysis Group (LIAG) and updated records from international collaborators. Across the Northern Hemisphere, we found that lake ice break-up occurred on average 8 days earlier since 1950 ranging from 2 days later to 25 days earlier during the indicated time period. We also found that 22% of lakes had up to three significant breakpoint years in their ice break-up records, suggesting years of abrupt changes in trends. The most common breakpoint years were 1972, 1988, 1997 and 1998 among the lakes. These years corresponded to strong and very strong El Nino events as well as a shift to the positive phase of the Arctic Oscillation, North Atlantic Oscillation and Pacific Decadal Oscillation. Further, we found that a combination of air temperature, precipitation, cloud cover and large-scale climate drivers were driving earlier lake ice break-up. Under scenarios of climate change, we forecast that lake ice break-up will be earlier in the spring, leading to consequences in lake ecosystem structure and function across the Northern Hemisphere.

Friday March 4, 09:30
Talk 13: *Lake Erie's hypolimnetic oxygen history told by the non-biting midge community*

Perlov D.A.[1], Reavie E.D.[2], and Quinlan R.[1], 1 - Department of Biology, York University, Toronto, ON, Canada, 2 - Natural Resources Research Institute, University of Minnesota Duluth, Duluth, MN, USA

Since European settlement, Lake Erie's water quality has degraded due to land-use changes within its catchment, cultural eutrophication, climate change, and the effects of invasive species. The effects of nutrient inputs have been particularly influential and have had serious implications for the lake's metabolic status and hypolimnetic oxygen concentrations. Since hypolimnetic oxygen monitoring data are only available for recent decades, paleolimnological methods can be used to infer the long-term trends. Changes in nutrient loading to lakes, whether natural or anthropogenic, have strong influences on benthic community composition, including non-biting midges (Diptera: Chironomidae), which have been used as a key indicator for short- and long-term environmental changes. The distribution of profundal chironomids

is especially indicative of changing hypolimnetic oxygen concentrations as they are one of the few aquatic groups whose species possess a wide range of tolerances to oxygen conditions typical of profundal environments. The present study examined the subfossil chironomid remains preserved in dated sediment cores from the central and western basins of Lake Erie in order to assess the cumulative effects of multiple anthropogenic stressors on water quality over the last century. Lake Erie is annually subjected to hypoxia, which has implications on fish communities and nutrient recycling. Data obtained from subfossil chironomid remains in the central basin of Lake Erie suggests that the lake has exhibited mesotrophic to eutrophic conditions since approximately 1850 AD. However, the disappearance of oxic-type taxa (*Micropsectra* sp.) circa 1950 AD suggests that the severity and duration of hypolimnetic anoxia has been increasing with no indications of improvement.

Friday March 4, 09:45
Talk 14: *Ecosystem engineers and multiple stressors: Can algae "mussel" their way into the nearshore of Lake Huron?*

Samantha Stefanoff[1], Richard Vogt[2], Todd Howell[3], and Sapna Sharma[1,] 1 - Department of Biology, York University, Toronto, ON, 2 -Department of Biology, University of Quebec at Montreal, Montreal, QC., 3 - Ontario Ministry of the Environment and Climate Change, Toronto, ON

Observed increases in the occurrence of shoreline fouling by algae in the southeast region of Lake Huron have been attributed to changes in surrounding land use and to the invasion of dreissenid mussels. Here, we quantify the relative influence of land use, water chemistry, spatial patterns, and invasive species on algal production along the shoreline of Lake Huron using water chemistry data collected by the Ontario Ministry of the Environment at 46 sites for the Inverhuron region, and 47 sites for the Point Clark region. An additional 30 sites along the south-east shoreline are used to investigate the influence of invasive dresseinids on benthic algal growth. We developed multiple regression models and used a variation partitioning framework to quantify the variation in chlorophyll *a* concentrations and *Cladophora* biomass/percent cover explained by land use, water chemistry, invasive species, and spatial patterns. Our results suggest that total phosphorus is the most important predictor of chlorophyll *a*, explaining between 62-99% of variation, with both nutrient and chlorophyll concentrations showing spatial structure at the mouths of tributaries and in close proximity to development along the shoreline. In addition, between 13-47% of *Cladophora* biomass/cover was explained by invasive dreissenid mussel cover and biomass. This study demonstrates that nutrients and algae are spatially contingent, with benthic algae biomass being associated with higher dreissenid cover, highlighting the need for water quality management strategies that are sensitive to the spatial scales and the benthic habitat conditions associated with these algal problems.

Friday March 4, 10:00
Talk 15: *Preliminary Assessment of Asian Carp Spawning Potential in Tributaries to the Canadian Lake Ontario Basin*

T. Heer, M.G. Wells, and N.E. Mandrak, University of Toronto, Scarborough, ON

Due to the potential for an Asian carp invasion in the Great Lakes, prevention efforts (e.g. early detection, rapid response) require the knowledge of where carps are likely to spawn. In 2015, six diploid and three triploid Grass Carp were caught in Lake Ontario in the Toronto area. A preliminary assessment was completed to predict the suitability of nine Toronto-area tributaries for Asian carp spawning, using data from 2009 to 2014. The assessment estimates the time to maturity, time of year of potential spawning, and the stream length required for successful spawning using daily velocity and temperature data. The results of this assessment show high inter-annual variability in suitability. On average, only one tributary is suitable; however, in 2012, most of the tributaries were suitable due to higher water temperatures, with a high-flow event needed to trigger spawning. This assessment highlights substantial inter-annual variation in suitability for Asian Carp spawning and uses more robust data than previous assessments. The results of this preliminary screening can be used to identify tributaries that require detailed assessment using more rigorous hydrodynamic models

Saturday March 4, *10:30*
Talk 16: *Asian Carp surveillance and Early Detection Efforts in the Canadian Waters of the Great Lakes Basin.*

Alex Price, Fisheries and Oceans Canada

This presentation will provide an overview of the current sampling methods used in the detection of Asian carps in the Canadian waters great lakes basin. Descriptions of the various gears, deployment techniques, and the pros and cons of each gear type will be discussed. A summary will be provided of some of the achievements of the Asian Carp early detection surveillance program's first four years.

Saturday March 4, 10:45
Talk 17: *The Need for Consistency in Post-Construction Monitoring Programs of Stream Restoration Projects*

Jeff Muirhead, Stantec Consulting Ltd.

A stream restoration project requires 3 – 5 years to fully vegetate and stabilize following completion of construction and planting. Prior to the complete establishment of vegetation, the stream is vulnerable to erosion which can alter the as-constructed planform and profile and damage in-stream structures. Left unmitigated, these alterations can escalate into costly reach-scale failures in the constructed watercourse. It is therefore important to monitor stream restoration projects for 3 – 5 years following completion of construction, to ensure the long-term success of the restoration.

Unfortunately there is currently a lack of consistency in post-construction monitoring programs of stream restoration projects in Canada. In some cases,

monitoring programs are not performed at all. Where they are performed, the specifics of the monitoring program vary greatly depending on regulatory jurisdiction, project objectives, budget considerations, and permit requirements. This presentation presents several stream restoration case studies illustrating the variability in post-construction monitoring approaches. The examples are used to outline the risks and consequences which have, or could, result from protocol deficiencies or lack of program altogether. A model of a meaningful and cost-effective post-construction monitoring protocol is proposed as a starting point for discussion between proponents, consultants, and regulatory agencies.

Saturday March 4, 11:00
Talk 18: *Stream Restoration and Instream Structures*

Heather Amirault, Stantec Consulting Ltd.

Stream restoration is a continuously evolving practice that is both a science and an art. New innovations are introduced, tested, and modified on a regular basis. The practice has evolved at different rates in different geographic regions and rapid changes can be difficult to keep up with and understand. For various reasons, other geographic regions are well ahead of Canada in restoration techniques and practices. Being a little behind has allowed us to learn from the mistakes of others and select the best that there is on offer, particularly as it relates to the design and construction of instream structures for hydraulic, geomorphic, and biological functions.

This presentation will explore the evolution of instream structures and present a number of structures, with discussion around the biological, geomorphological, and hydraulic functions of each. Stream practitioners can always learn from each other, and it is through these discussions that new and innovative ideas can lead to better and better restoration practices.

Saturday March 4, 11:15
Talk 19: *The Riffle...An Allegory of the Practice of Natural Channel Design in Ontario - From Riverflies to Standard Drawings.*

Mark Hartley

It is well known that rivers are complex systems that are a product of the interaction between flowing water and the boundary sediment (Lane 1955). It is also know that natural channels form characteristic bedform sequences that are diagnostic of the balance of the dynamic river forces. One of the characteristic bedforms of the low-gradient, gravel-bed river is the riffle. The evolution of the identification, design and construction of the riffle over time with emphasis on its recognition in various provincial guidance documents and its use in the practice of natural channel design will be presented. An evolutionary time line of the riffle will be illustrated and will include the "before-Rosgen" and "Boulder" Eras as well as the "Transition" and "Enlightenment" Ages. The roles that the availability and timing of design guidelines from three different

provincial ministries, including the Ministry of Natural Resources (pre-MNRF), Ministry of Environment (pre-MOECC) and Ministry of Transportation, plays in this evolutionary time line will be discussed. Finally, it will be shown how the riffle is viewed from the three disciplines typically involved in NCD namely the biologist (benthic and fish habitat), geomorphologist (bedform feature) and engineer (grade control structure).

Saturday March 4, 11:30
Talk 20: *The ROM's Ichthyology Collection: Why do we keep so many fishes?*

Erling Holm, *Department of Natural History, Royal Ontario Museum*

The fish collection at the Royal Ontario Museum is over 100 years old and has grown into the largest and most diverse ichthyology collection in Canada. This presentation explains how and why fishes are archived and the importance of the over one million specimens for research, conservation, and education, with an emphasis on its relevance to Ontario fishery biology.

Saturday March 4, *11:45*
Talk 21: *The Provincial Bait Policy Review: Considering options for the management of baitfish and leeches into the future.*

Scott Gibson / Shannon Fera, Ontario Ministry of Natural Resources and Forestry

The harvest and use of live bait has been an important part of Ontario's fishing industry for nearly a century. However, management of the bait resource has become more challenging due to new environmental pressures. The movement of bait poses ecological risks related to the spread of disease and invasive species and poses a significant risk to Ontario's fisheries, protected areas and biodiversity. The Ministry of Natural Resources and Forestry (MNRF) has conducted a comprehensive review of its provincial bait policies to determine how the ecological risks associated with the movement and use of bait (i.e., baitfish and leeches) can be minimized while reducing the complexity of current management regimes and providing business certainty to the bait industry. The bait review covers topics associated with: 1) Angler Use and Movement; 2) Parks and Protected Areas; 3) Commercial Sales and Transport; 4) Allocation; and 5) Reporting. This talk will provide an overview of the process being taken and to discuss options that are being considered as part of the policy review.

AMERICAN FISHERIES SOCIETY
ONTARIO CHAPTER
ANNUAL GENERAL MEETING
March 2 – 4, 2017
Geneva Park, Orillia, ON

"Biodiversity Conservation in the Face of Development"

"MNRF Brook Trout Symposium"

Saturday March 4

Opening Remarks and overview of Brook Trout in Ontario

Helen Ball, MNRF

Wild Brook Trout are an important component of Ontario's native aquatic biodiversity, the only trout native to streams and rivers of Ontario, and only one of two species of trout found in a limited number of inland lakes. Brook Trout survive in only the coldest and cleanest water with high oxygen content, and depend on groundwater discharge for spawning and nursery. They are poor competitors and survive where competition is non-existent or extremely limited. Sensitive to habitat degradation on the landscape and environmental change they serve as primary indicators of healthy aquatic ecosystems.

Historical and current anthropogenic induced stresses, such as poor land and water management, overfishing, log drives, dams, invasive species and climate change, have affected and continue to affect the water quantity, quality, habitat and biodiversity of aquatic ecosystems, leading to widespread declines in lake and stream/river populations of brook trout across North America, including Ontario. Climate change has already, and will continue to add stress to this species with predictions that the number of watersheds with Brook Trout in 2005 will be reduced by 50% in 2050 in Ontario.

Building on a successful Lake Simcoe Brook Trout information sharing session in March 2016, the MNRF hosted a multi-partner workshop bringing more than 80 Brook Trout science, policy and management experts in Ontario together in January 2017. The objective of the workshop was to share knowledge and information, and to provide impetus for the development of a more focused, integrated and coordinated approach in our efforts to conserve and rehabilitate brook trout, with the ultimate goal of keeping brook trout, a common species, common.

We are currently working to complete the:

- Brook Trout workshop proceedings
- Brook Trout in Ontario report
- Vulnerability analysis of Brook Trout populations in Ontario
- Historical and current stocking database and tool
- Recommendations and prioritization of monitoring, science, policy and management actions

We are very pleased to have the opportunity to host a dedicated to Brook Trout symposium at the 2017 Ontario Chapter of the American Fisheries Society meeting. This will allow us to connect with others working on brook trout, and to continue to share and build understanding and momentum towards the goal of conserving brook trout in Ontario.

Conservation Authority Fisheries Monitoring:
Trends and Insight on Brook Trout in southern Ontario streams

Brian Morrison, Ganaraska Region Conservation Authority

Brook Trout were historically ubiquitous across southern Ontario, but have undergone dramatic declines since European colonization. Many Conservation Authorities have been undertaking fisheries monitoring activities across portions of southern Ontario through integrative watershed monitoring programs. Data indicate that Brook Trout (*Salvelinus fontinalis*) and other coldwater indicators are continuing to show declines in abundance and distribution. Continued monitoring is required to determine magnitude, extent, and cause(s) of declines.

Brook Trout Population Status in the Nottawasaga River Watershed:
A Physiographic Perspective

Fred Dobbs, B.Sc., Manager of Stewardship Services

The distribution of native brook trout (Salvelinus fontinalis) in southern Ontario is restricted to streams receiving significant groundwater inputs which moderate summer temperatures and provide spawning habitat. Stressors including habitat degradation and competition with introduced salmonids have eliminated brook trout from many of the groundwater-rich streams which they historically occupied.

Physiographic and soils conditions in southern Ontario watersheds have played a strong role in shaping historical and current brook trout distribution. These parameters determine both groundwater discharge characteristics as well as the locations of land use practises which contribute to stream habitat degradation. Physiographic conditions also influence the locations of barriers to fish migration which have prevented introduced salmonids from accessing headwater brook trout habitats. In this presentation, the Nottawasaga River watershed provides the context for a case study examining historical and current brook trout distribution in a diverse physiographic setting

10 years of monitoring: Impacts of groundwater taking, sediment load events, and water temperature changes on Brook Trout populations in two water courses in Caledon East

Jan Moryk, M.Sc, Toronto and Region Conservation Authority

To support growth planning within Caledon East (CE), the Region of Peel completed a Class Environmental Assessment (EA) in November 2007. The EA included assessing implications to the natural system due to water taking increases from existing water supply wells. Extending from this assessment, the Region together with the Toronto and Region Conservation Authority (TRCA) have coordinated annual monitoring and review efforts since 2007 as per the Natural Heritage Monitoring Program (NHMP). The NHMP included the monitoring of Brook Trout abundance, and the number of redds in order to quantify spawning activity. Monitoring of abiotic variables such as stream temperatures, turbidity, and sediment size also occurred. The observed trends in Brook Trout abundance are discussed in the context of groundwater taking, stream temperature, allochthonous sediment input, and turbidity.

Brookies in Bronte Forever! A Multi-Pillar Conservation Program to Stabilize Local Brook Trout Populations

Beth Anne Fischer, Conservation Halton

In response to the declining population of Brook Trout in the Bronte Creek watershed Conservation Halton launched the *Brookies in Bronte Forever!* program in 2015. This multi-pillar program is actively focusing conservation efforts on protection, rehabilitation and monitoring of local Brook Trout. Utilizing Conservation Halton's existing long term monitoring program, landowner stewardship program, external funding grants and local partnerships the program is implementing high priority habitat rehabilitation projects. Case studies will be explored including the currently active large-scale rehabilitation construction in Courtcliffe Park, Carlisle, Hamilton, ON. This multi-phase project includes channel re-alignment, implementation of Natural Channel Design, culvert removals, installation of replacement span bridges, channel narrowing and riparian plantings. Unique to this restoration project is inclusion of a free family enviro event in Courtcliffe Park to foster community wide investment in the long-term protection of the restored Bronte Creek channel.

Brook Trout Stocking in Ontario and Database Demonstration

Changhai Zhu, MNRF

Brook Trout (*Salvelinus fontinalis*) have historically been a popular sport fish species among anglers in Ontario. As a result, Brook Trout were and continue to be one of the most commonly stocked fish species in the province. Records of Brook Trout stocking in Ontario date back to as early as 1857, and have been stocked in Ontario waters for a variety of purposes. The OMNRF maintains electronic records of Brook Trout stocking from 1905 to the present, however over this period of time, changes in stocking practices as well reorganization within the ministry resulted in the stocking records being stored in multiple databases and in multiple formats. In order to better serve science and management needs, this discontinuity in stocking data was addressed by consolidating all available stocking records into one up-to-date and succinct database. Furthermore, an interactive online tool was developed to allow ministry staff and partners to easily query and georeference Brook Trout stocking data from the new database.

*Measuring thermal stress and tolerance of Brook trout under chronic exposure . ***Poster****

Zheng, Y.[1], Boostra, R.[1], Wilson, C[1]. and Mandrak, M.E.[2] 1 - University of Toronto Scarborough Campus, Toronto, Canada; 2 - Ministry of Natural Resources and Forestry, Peterborough, Canada

Brook Trout (*Salvelinus fontinalis*) have been in decline in the Greater Toronto Area (GTA) since the late 1800s. Today, its range has shrunk towards the headwaters as multiple stressors continue to threaten existing populations. Development is now occurring in areas of historical Brook Trout habitat in GTA headwaters. As stream water temperatures increase to climate change and increasing urban development, coldwater species such as Brook Trout are the most severely impacted. To test the ability of Brook Trout to adapt to changing temperature conditions, and to identify possible physiological markers for monitoring purposes, yearlings were raised under three different temperature treatments (13, 21, 23 °C) for a month, then returned to ambient waters for another month. Every two weeks during this experiment, several physiological samples were taken (blood glucose, plasma cortisol, hematocrit, blood smears) and the fish were challenged to a critical thermal maximum protocol. We hypothesize that there will be differences in the physiology and thermal tolerance of fish raised in different temperatures, and that the effects will be measurable for some time after fish are returned to ambient conditions. These results will provide an indication of the extent to which Brook Trout will be able to adapt to changes to its thermal habitat.

Identifying potential benchmarks and thresholds for the management of Brook Trout in Ontario

J. Wood, MNRF

An important step towards developing effective policies and action plans that can manage and protect Brook Trout populations across Ontario will likely involve identifying indicator benchmarks and ecological thresholds that have been scientifically demonstrated to be associated with Brook Trout status. In a management context, knowledge of benchmarks and thresholds can help to define the sensitivity of Brook Trout to various stressors, aid in prioritizing populations and habitats for management, and potentially act as targets to guide habitat restoration and population rehabilitation efforts. They can also play a key role in monitoring in an adaptive management framework and in assessing risk by informing the severity and probability of specific outcomes. The Brook Trout literature provides a useful starting point for identifying benchmarks and thresholds that might, from a policy standpoint, be effective in protecting and managing Brook Trout in Ontario. Candidates include indicators operating at both broad and local scales for a variety of land use, habitat quality, and biological variables. Whether the benchmarks and thresholds that have been identified in the literature to date are transferable to Ontario systems and whether these indicators constitute the best options for protecting Brook Trout in Ontario is an open question. Important considerations that warrant further discussion include defining the scale of management that is relevant for Brook Trout, how to account for variability in response to disturbance at sub-watershed scales, and developing benchmark and threshold values that are robust to uncertainty.

Limited variability in upper thermal tolerance among pure and hybrid populations of a cold-water fish

Zachery Wells, Concordia University

As climate warming threatens the persistence of many species and populations, it is important to forecast their responses to warming thermal regimes. Climate warming often traps populations in smaller habitat fragments, not only changing biotic parameters, but potentially decreasing adaptive potential by decreasing genetic variability. We examined the ability of six genetically-distinct and different-sized populations of a cold-water fish (brook trout, *Salvelinus fontinalis*) to tolerate acute thermal warming, and whether this tolerance could be altered by hybridizing populations. Critical thermal maximum (CT_{max}) assays were conducted on juveniles from each population to assess thermal tolerance, and agitation temperature was recorded for assessing behavioural changes to elevated temperatures. An additional metric we have called the 'CT_{max}-agitation window' (CT_{max} – agitation temperature) was also assessed. CT_{max} differed between 5 out of 15 population pairs, though the maximum CT_{max} difference was only 0.68 °C (29.11-29.79 °C). Hybridization between one large population and two small populations yielded no obvious heterosis in mean CT_{max}, and no differences in agitation temperature or CT_{max}-agitation window were detected among pure populations or hybrids. Summer variation in temperature within each stream was

negatively correlated with mean CT_{max} and mean CT_{max}-agitation window, though the maximum difference was small. Despite being one of the most phenotypically divergent and plastic north temperate freshwater fishes, our results suggest that limited variability exists in CT_{max} among populations of brook trout, regardless of their population size, standing genetic variation, and differing natural thermal regimes (temperature variation, minimum, and maximum). This study highlights the level to which thermal tolerance is conserved between isolated populations of a vertebrate species, in the face of climate warming.

Past Present and Future Brook Trout Habitat in the Lake Simcoe Watershed

Nick Jones, MNRF

Brook trout are experiencing population declines throughout their native range and in the Lake Simcoe watershed due to a variety of human disturbances. Information is lacking regarding the current distribution of brook trout, barriers, and habitat quality in the Lake Simcoe watershed but this information is needed to direct conservation and management efforts. We developed models to predict the thermal habitat and distribution of brook trout. The occurrence of brook trout was positively related to overburden thickness, base-flow index, channel slope, stream power index, elevation, and treed area, whereas brook trout were negatively related to the maximum monthly air temperature. The hindcasted distribution was 47% larger than the current distribution and revealed that brook trout have retreated into the headwater regions of the watershed. Presently, most headwater streams in the Lake Simcoe watershed are cold water habitat but the model projects a substantial decrease in the amount of cold water streams over the next 50 years. Since pre European development, coldwater thermal habitat has decrease by 73%, and with an A2 climate change scenario (2065), is likely to decease to just 14%. Coolwater habitat has increased by 284% and will be 687% by 2065.