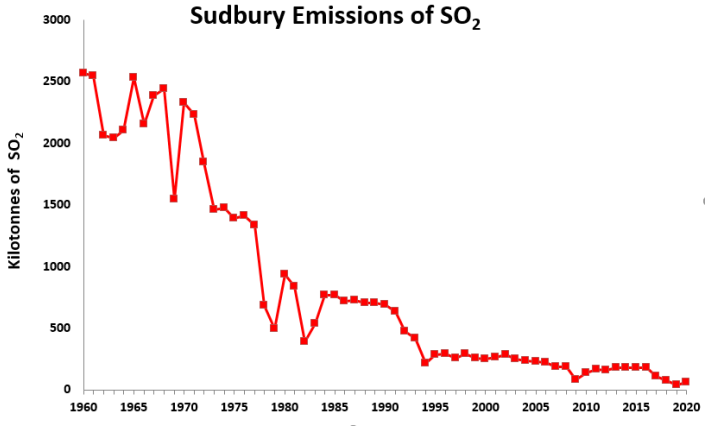
Cooperative
Freshwater Ecology Unit
Unité Conjointe
D'écologie D'eau Douce



2023 Annual Report

Cooperative Freshwater Ecology Unit

"Clean Water Now and Forever"

A Message from the Director
March 2024

Hello Co-op Unit friends and partners,

I am pleased to share with you the 2023 Annual Report of the Cooperative Freshwater Ecology Unit (CFEU) at the Vale Living With Lakes Centre. In 2023, we paddled hard, the boat sometimes rocking with our energy, and we made excellent progress. Last year I promised to do my best to stay the course and to fill the boat with people who have common goals and innovative ideas for reaching new horizons.

Along those lines, I'm excited to share some updates on our team members. Our Business Manager, Karen Oman (the keel on the boat) is now secure in a permanent position supported by Laurentian University (LU). As I navigated my new role as Director over the past 14 months, Karen's wealth of long-term institutional knowledge, organization and enviable soft skills were instrumental in keeping me and the boat pointed forward. Our Sci Comm team finally has permanence: Chantal Barriault is an Associate Professor in a tenure-track position in the School of Natural Sciences (SoNS), and Michelle Reid is a Master Lecturer in SoNS. Chantal Sarrazin-Delay is taking on more of a leadership role in the Up North On Climate program under a new title as Climate Change Outreach Scientist and is also now an Adjunct Professor in SoNS.

In last year's Annual Report, I shared three main messages about that work that I was planning for the future, focused on partnerships, faculty hires, and graduate students. I feel like this is a good place to reflect on progress towards those goals. We solidified our partnership with NRCan with the renewal of our MOU. We're building more partnerships through the submission of an NSERC Alliance Grant in December 2023, led by our MECP (Brie) and MNRF (Tom) scientists and myself, with colleagues from Queen's and Lakehead among other universities and NGOs, and supported by Vale and Glencore SINO. The research funded by the Alliance Grant will allow us to continue the Co-op's long-term work on lake recovery and to recruit several new cohorts of students and post docs. We hope to hear about this grant in the next month. Laurentian is currently accepting applicants for three faculty positions in the School of Natural Sciences including an Aquatic Animal Ecologist to replace John Gunn on his retirement in July 2024. These new hires will contribute to a new undergraduate environmental program currently being developed by a small team including Anastacia Chartrand (ESC, NPU), Jeff Gagnon (SoNS), and myself. The development of the BSc in Environmental Solutions program is supported by a MITACS grant with the Greater City of Sudbury, a testament to the community's recognition of LU as a leader in environmental knowledge generation. We would be pleased to welcome these new faculty and their graduate students to the Vale LWLC. The building is buzzing with science

chatter as grad students bring life to the space upstairs, in the desk carrels and in the kitchen. Regular R coding club meetings led by Tom Johnston added to team building and collaborative approaches to problem solving. Our LU Environmental Sustainability Committee (ESC) members and the Nature Positive University (NPU) team have been busy hosting programs, acquiring funding, and making sure LU meets its promises to be nature positive. Please see their informative infographic in the pages of this Report.

A true highlight of the past year was the release of the Jane Goodall IMAX film, *Reasons for Hope*, which showcased the Sudbury Story of recovery as one of the vignettes. Filming was done on one of the long-term study lakes, and the film includes John Gunn and other Lake Centre folks as "extras". Dr. Goodall came to Sudbury for a lovely event at Science North to open the film, and on her visit, I had the special opportunity to sit and chat with her. If we all aspire to be such energetic protectors of the environment at 90 years old, the world will be a better place.

Dr. Jackie Litzgus
Director, CFEU @ Vale Living with Lakes Centre

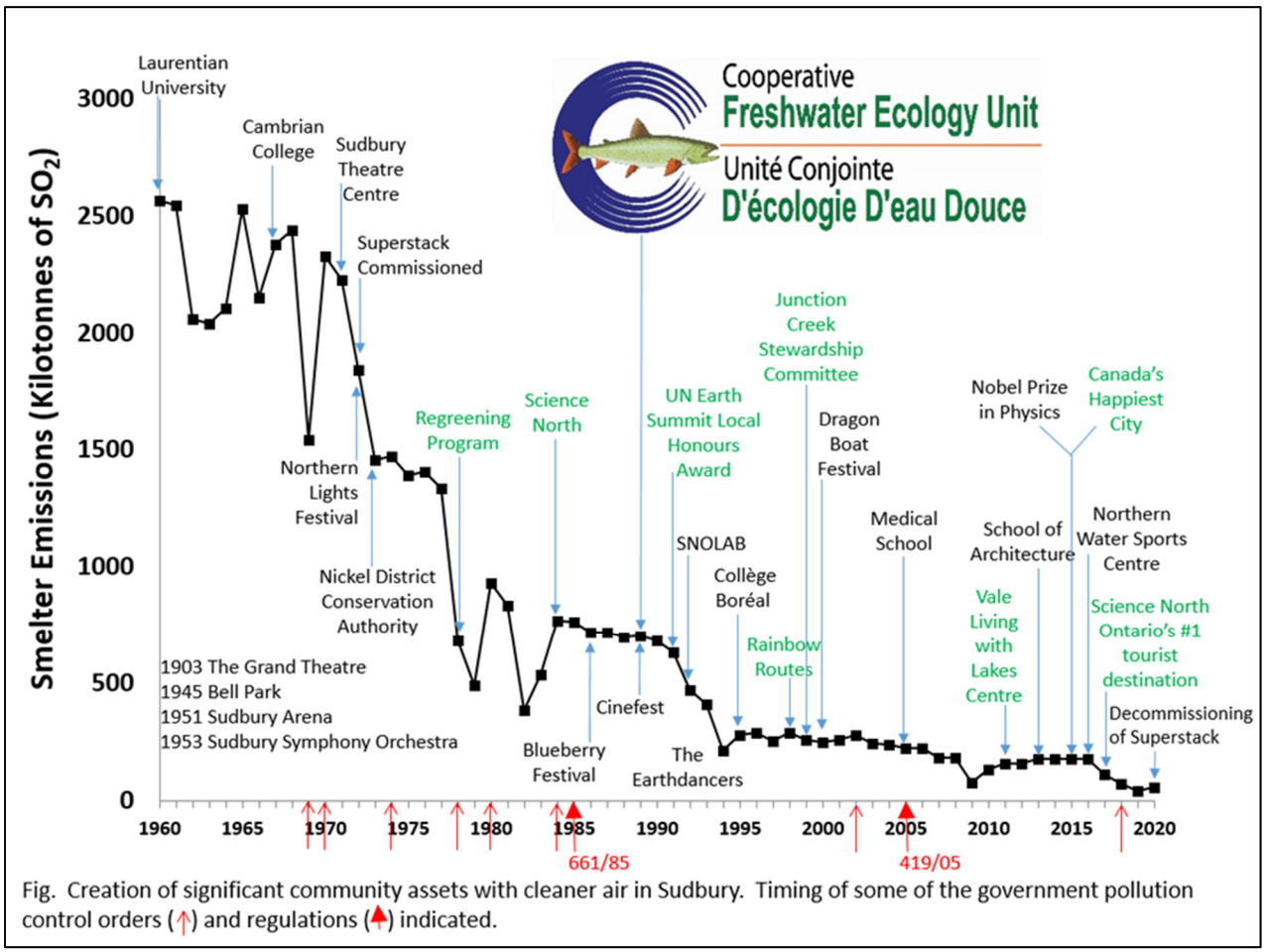


Fig. Creation of significant community assets with cleaner air in Sudbury. Timing of some of the government pollution control orders (↑) and regulations (▲) indicated.

Awards and Recognition

- Science North hosted a Gala event on May 30, to release the IMAX film *Jane Goodall – Reasons for Hope* featuring Sudbury's regreening efforts (with Peter Beckett and VETAC team) and lake recovery stories (with John Gunn and other CFEU members). The invitation-only event was attended by Dr. Jane Goodall who discussed the global significance of the Sudbury Story. The film is now available for viewing in IMAX®, giant screen and digital cinemas in museums, science centres, and other cultural institutions worldwide, and had a special screening for world leaders at COP28 climate change conference in Dubai in Dec.

- Our Environmental Sustainability Committee student leaders, Avery Morin and Anastacia Chartrand, were also featured at the COP28 meeting, serving as youth ambassadors on the 'Greening of Education Panel' though their involvement with the Nature Positive University Alliance. We are very proud of how well they performed on this world stage.

- Dr. Andrew Tanentzap was inducted into the Royal Society of Canada College of New Scholars, Artists and Scientists. He was also nominated by Trent University to represent Canada for the Frontiers Planet Prize and was part of the author team for a paper that was nominated to represent Poland in this same competition (Bogdziewicz et al. 2023 Global Change Biology). Congratulations on these prestigious accomplishments Andrew!

- Congratulations to Dr. Jacqueline Litzgus, who was awarded the Dr. Jane Goodall Research Fellowship in Conservation Biology. This esteemed recognition is in honor of Dr. Litzgus's groundbreaking work in safeguarding endangered species, particularly the reptiles facing critical challenges in Ontario.

- CFEU members are to be congratulated as a group for reaching into their own pockets to establish the Jane Goodall Biodiversity Conservation and Restoration scholarship with PhD Candidate Tharusha Wijewardena as the first recipient. Community members are now supporting this CFEU scholarship.

- Congratulations to Dr. Chantal Barriault who was promoted to Associate Professor (Tenure Track) in the School of Natural Sciences in 2023. Bravo!

- Congratulations to Michelle Reid who was hired as a full time Faculty member and Master Lecturer in the Science Communication Program in the School of Natural Sciences, in the Fall of 2023. Michelle won the Teaching Excellence Award in 2022.

- Congratulations to Karen Oman for being awarded a permanent position as our CFEU Business Manager in September 2023. What a wonderful thing!

- Congratulations to Dr. Gretchen Lescord who was hired as an Assistant Professor in the School of Forests, Fisheries and Geomatic Sciences at the University of Florida. Dr. Lescord is

also the Director of LakeWatch, a large citizen science program that monitors the water quality of lakes, rivers and estuaries across Florida. Gretchen remains an Adjunct Professor at Laurentian University and a contributing member of the CFEU. Very proud to have her on our team!

Student Scholarships, Fellowships, Bursaries

- **Meg Britt**, PhD Candidate Queen's (Lougheed/Litzgus), was awarded a MITACS Accelerate Fellowship.

- **Victoria Camp**, MSCom Candidate Laurentian (Barriault) was the Laurentian University 2023 3MT winner and provincial competitor representing Laurentian.

- **Brooke Carroll**, MSc Candidate Laurentian (Litzgus), received a Queen Elizabeth II Science and Technology Scholarship.

- **Lisa Cicchetti**, MSc Candidate Queen's (Arnott), won a Craigie Fellowship.

- **Emily Fields**, MSc Candidate Laurentian (Johnston) received the Fisheries and Oceans Canada Habitat Restoration Scholarship ($5,000) and the Goodman School of Mines Scholarship ($2,500).

- **Erin Ford**, MSc Candidate Queen's (Arnott), won a McLaughlin Fellowship.

- **Christopher Forneste**, MSCom Candidate Laurentian (Barriault) won the Best Student Poster Award at the 2023 Science Writers and Communicators of Canada Conference.

- **Andrea Gigeroff**, PhD Candidate Laurentian (Litzgus/Riley), received a Laurentian Entrance Scholarship.

- **Ashley Grew**, MSc Candidate Queen's (Arnott), won the Biology Faculty Award of Excellence.

- **Dhruv Kapoor**, PhD Candidate Trent (Tanentzap), was awarded an Entrance Award, the Dean's PhD Scholarship and a Research Fellowship Award.

- **April LaFlamme**, MSc Candidate Queen's (Arnott), won a McLaughlin Fellowship.

- **Vincent Lau**, MSc Candidate Trent (Tanentzap), received an Entrance Award.

- **Sabrina Lounsbury**, MSc Candidate Laurentian (Litzgus), won an OGS Scholarship.

- **Aidan Maloney**, MSc Candidate Laurentian (Litzgus), was awarded a Queen Elizabeth II Science and Technology Scholarship.

- **Troy Martin**, MSc Candidate Queen's (Arnott), won a Craigie Fellowship and an OGS Scholarship.

- **Celeste Milli**, PhD Candidate Trent (Tanentzap), was awarded an Entrance Award, the Dean's PhD Scholarship and a Research Fellowship Award.

- **Taylor Nicholls**, MSc Candidate Laurentian (Lescord/Gunn) was awarded a Wahnapitae First Nation Scholarship/Day Construction Scholarship, the Wahnapitae First Nation Gordon Roque Scholarship and a Weston Family Fellowship through the Wildlife Conservation Society Canada (WCS).

- **Stephane Thibeault**, MSc Candidate Laurentian (Litzgus), won an NSERC-CGS Scholarship.

- **Julie VanLeeuwan**, MSCom Candidate Laurentian (Barriault) won 2nd place for Graduate Students, ACFAS Nouvel-Ontario Conours Photovoix. Julie also received the St. Dunstan's University Award sponsored by the St. Dunstan's University Board of Governors, PEI.

Community Outreach

- Dr. Shelley Arnott gave a lecture entitled 'Freshwater salinization and the impact on aquatic organisms' at the Museum of Lennox and Addington, Napanee, ON. Apr 2023.

- Dr. Chantal Barriault participated in the following outreach initiatives in 2023:
  - ~ Presentation for School of Natural Sciences (SoNS) French thesis class on career paths and key skills for research communication. Oct 2023
  - ~ Participated in the Green Economy North and ReThink Green Conference with SCOM students. Nov 2023
  - ~ Feature interview for Radio-Canada Sudbury's afternoon show "Jonction 11-17" with host Éric Robitaille. Chantal was featured on a series called "Paysage humains" about francophones in Sudbury who have made an impact in the community through their work. https://ici.radio-canada.ca/ohdio/premiere/emissions/jonction-11-17/episodes/753481/rattrapage-jeudi-21-septembre-2023 21 Sept 2023

- Dr. Chantal Barriault and Michelle Reid jointly participated in the following outreach initiatives:
  - ~ Held a virtual open house for Science Communication. 20 Jan 2023
  - ~ Provided support to the LU Environmental Sustainability BioBlitz. Sept 2023

- Dr. Peter Beckett is the Outreach Coordinator with the VLWLC. He served in the following capacities in 2023:
  - ~ VETAC: Chair
  - ~ Canadian Land Reclamation Association (Ontario Chapter): Director
  - ~ American Society of Mining and Reclamation: Chief Student Presentation Judge
  - ~ Junction Creek Stewardship Committee: Technical Advisor and Board Member
  - ~ Rainbow Routes: Environmental Advisor and Board Member
  - ~ Sudbury Naturalists: Co-chair
  - ~ Friends of Mashkinonje Park: President
  - ~ Reclamation Member of the Society of Ecological Restoration (SER) Working group within the UN Decade on Ecological Restoration Framework
  - ~ Cambrian College Public Advisory Panel (Environmental Technician and Environmental Monitoring Programs)
  - ~ Member of the Mayor's 30x30 Task Force for the City of Greater Sudbury
  - ~ Director of the BioSki Skiing and Snowshoe Club

  Dr. Beckett also participated in the following activities:
  - ~ Gave a presentation at Cambrian College on 50 years of Healing the Sudbury Landscape to 30 students from the College's Environmental Monitoring and Impact Assessment Program and Environmental Technician Programs. 21 Mar 2023
  - ~ Provided a ZOOM presentation on Sudbury's Regreening story to a mining group from Chile. 23 Mar 2023
  - ~ Delivered an invited plenary address to 140 delegates, entitled "The Long-Standing Landscape Regreening Program in Sudbury, Canada – 50 years of Healing and Creating Biodiversity on a Smelter-Impacted Landscape" at the Ontario Nature Annual Gathering at Collège Boréal in Sudbury. 9-11 Jun 2023
  - ~ Hosted a field trip where 20 conference delegates toured the Kelly Lake Hill, Dynamic Earth and Copper Cliff areas of Sudbury. 11 Jun 2023
  - ~ Co-organized and chaired a special symposium on 'Emerging Perspectives on the World's Largest Regreening Project: A 50- Year Retrospective' at the RE3 Reclaim, Restore, Rewild Conference in Quebec City. He also presented on "Outcomes from 45 years of the Landscape Regreening Program in Sudbury, Ontario, Canada: A Synopsis". 15 Jun 2023
  - ~ Participated in a discussion and regreening tour with Dr. Pete Whitbread-Abrutat (Future Terrains), from England, for a second edition of his bestselling book "101-Things To Do With A Hole In The Ground". 20 Jun 2023
  - ~ Led a workshop for 45 participants of the Ontario Architects Association (OAA) Conference in Sudbury, on 50 years of the Landscape Regreening Program in Sudbury. 21 Jun 2023
  - ~ Led a Regreening Tour for 35 participants from the OAA conference in and through Copper Cliff, Dynamic Earth and Lake Laurentian Conservation Area. 22 Jun 2023

- ~ With Tina McCaffery, led a group of 51 people on a special tour to the older regreened sites in the south end of Sudbury to mark 50 years of VETAC and Regreening in Sudbury (in conjunction with the Rainbow Routes Association). Sept 2023
- ~ Provided a regreening presentation and tour to a delegation from Peru. 17 Oct 2023
- ~ Provided a lecture on 50 years of urban regreening, followed by a field tour of regreened sites to students and professors from the Masters of Landscape and Urban Design Program at the Université de Montréal when they visited Sudbury. 19-22 Oct 2023
- ~ Discussed 50 years of regreening the Sudbury landscape as part of the 'Highlights of Sudbury, recapping the Ontario Association of Architects conference in Sudbury' to over 200 webinar participants. 26 Oct 2023
- ~ Led a tour to Kelly Lake Hill and Copper Cliff for 24 students of the Sir Sandford Fleming and Trent University Restoration Program. 30 Oct 2023
- ~ Gave a presentation to the 15 Mongolian delegates (including the Mongolian Ministry of Environment) on the 50 years of change of the Sudbury landscape. The indoor session was followed by a tour of regreened areas. 24 Nov 2023

- Dr. Erik Emilson participated in the following public outreach initiatives in 2023 :
  - ~ Participated as a Waterlution Water Innovation Lab Great Lakes Resource Guest Host, and in the development of a video feature of the Turkey Lakes Watershed
  - ~ Hosted a field tour of the Turkey Lakes Watershed for Lake Superior State University
  - ~ Dr. Emilson also serves on outreach committees:
    - City of Sault Ste. Marie Environmental Sustainability Committee
    - Sault College School of the Natural Environment Advisory Committee

- Kim Fram actively posted climate change awareness material on the UpNorthOnClimate Facebook page and in the ACClimateNOW Facebook group.

- Dr. John Gunn participated in the following public outreach initiatives in 2023:
  - ~ Member of the Mayor's 30x30 Task Force for the City of Greater Sudbury
  - ~ Was featured, along with Anastacia Chartrand and SGA President Avery Morin, in article "LU students, prof share Sudbury regreening story at COP15'. Sudbury Star, 3 Jan 2023
  - ~ Gave a presentation to the 15 Mongolian delegates (including the Mongolian Ministry of Environment). 24 Nov 2023
  - ~ Facilitated the showing of 'Jane Goodall: Reason for Hope' at COP28 in Dubai at the UAE Pavilion as part of a presentation by Bruce Mau.
  - ~ Hosted the RBC Jane Goodall film viewing at Science North. Dec 2023
  - ~ Gave a talk entitled 'Sudbury Lake and Watershed Recovery' at the Ontario Nature Annual Gathering at Collège Boréal in Sudbury. 9-11 Jun 2023
  - ~ Gave a lecture to the Duke of Edinburgh Commonwealth Study Conference at Laurentian. Jun 2023
  - ~ Gave a presentation to the Nickel District Conservation Authority

~ Gave a presentation to ICP Waters Team

- Dr. Tom Johnston serves as a member of the Clearwater Lake Stewardship Committee.

- Dr. Gretchen Lescord participated in the following public outreach initiatives in 2023:
  ~ Co-created the 'Learning for Lake Sturgeon' project magazine, a graphical communication piece designed to inform the Indigenous community about our research: https://learningfromlakesturgeon.ca/news/new-booklet
  ~ Was a guest on the 'Working in the Weeds' podcast through the UF/IFAS Center for Aquatic and Invasive Plants. Jul 2023 https://podcasters.spotify.com/pod/show/ufifascaip/episodes/Florida-LAKEWATCH-Successful-Citizen-Science-e26r4ud
  ~ Was featured in 'Sudbury researchers to study safety of consuming fish', Amanda Hicks, CTV, Northern Ontario news. 13 Jan 2023

- Dr. Jackie Litzgus participated in the following public outreach initiatives in 2023:
  ~ Was interviewed and featured in "This biologist wants to make Ontario's roads safer for turtles", by Jonathan Migneault, CBC News. 10 Jun 2023
  ~ Was interviewed for 'Crossing the road is a dangerous risk for turtles', https://www.cbc.ca/listen/live-radio/1-41-morning-north/clip/15989929-crossing-road-dangerous-risk-turtles.-heres-done-help), Morning North, CBC Radio. 8 Jun 2023
  ~ Was interviewed and featured in "Sudbury biologist chosen for inaugural Jane Goodall Fellowship", Sudbury.com. 31 May 2023
  ~ Was featured in "Northern biologist chosen for inaugural Jane Goodall Fellowship", Sootoday.com. 31 May 2023
  ~ Was featured in "Dr. Goodall in Sudbury celebrating two achievements", myespanola.com. 31 May 2023
  ~ Was featured in "Dr. Goodall in Sudbury celebrating two achievements", aroundandabout.ca. 31 May 2023
  ~ Provided technical advice on turtle physiology to the production team at 'The Nature of Things', CBC. Prepared for film shoot with partners at Magnetawan FN. Apr 2023

- Dr. Nadia Mykytczuk participated in the following outreach initiatives in 2023:
  ~ Was featured in episode of 'The Unlikely Innovators', Cambrian College. 26 Sept 2023
  ~ Was featured in 'Sudbury's mine waste worth billions; new project to find ways of extracting valuable minerals', The Sudbury Star, 8 Mar 2023
  ~ Was featured in 'NOBA 2022: Nadia Mykytczuk is the Innovation Award winner', Casey Stranges, Sudbury.com, 3 Jan 2023

- Dr. David Pearson played a significant role in 2 episodes and was featured in 1 episode of the "Living History" series on Warren Schlote's YouTube channel:
  ~ "Northern Ontario helped astronauts understand the moon. Will they return?"

- "Following the footsteps of astronauts in Sudbury, Ont. [BONUS VIDEO]"
- "Living History Footnotes: Sudbury astronaut training"

- Dr. Charles Ramcharan serves as the Coordinator of the Laurentian Community Garden

- Michelle Reid participated in the following outreach initiatives in 2023:
  - Developed and facilitated a 3-hour interactive workshop to meet the "Media and Communications" learning objectives of the NOSM University Public Health and Preventative Medicine Program annual education summit for medical residents. Mar 2023
  - Developed and facilitated two interactive workshops, *Communicate with Intent* and *Present with Intent*, for students enrolled in the PhD Program in Interdisciplinary Rural and Northern Health at Laurentian University. March and May 2023
  - Gave a presentation to Senate on her Teaching Excellence Award
  - Consulted on redevelopment of the Living with Lakes Centre and School of Natural Sciences website and digital strategy throughout 2023
  - Presentation for SoNS Thesis Course (NATS 4005) on career paths and key skills for research communication. Oct 2023
  - Co-delivered Northern MedTalks 2023 with Science North and Eastlink. Michelle also led the event logistics and coordinated experiential learning deliverables associated with SCOM courses. The live event featured 10 presentations and was broadcast on Eastlink Community TV and live streamed on YouTube. 350 people attended the live event in person. 27 Apr 2023

- Dr. Pascale Roy-Léveillée was interviewed for and featured in these news stories in 2023:
  - "Université Laval research team seeks to help Nunavik adapt to thawing permafrost" on Quebec AM, BCB radio. 26 Jul 2023
  - "Les changements climatiques peuvent-ils aussi affecter le cours des rivières?" on Moteur de recherche, with Mathieu Dugal, Radio-Canada. 12 Apr 2023
  - "Northern sentinels track Earth's fastest-changing regions", Nature Portfolio. 13 Oct 2023
  - "Comprendre la fonte du pergélisol pour s'y adapter", Le Devoir. 23 Sept 2023
  - "Au Nunavik, résidents et chercheurs collaborent pour s'adapter à la fonte du pergélisol", Radio-Canada, Espaces autochtones. 28 Jul 2023
  - "Landslides and uncertainty: As Nunavik's permafrost thaws, locals and researchers focus on adaptation", CBC news. 26 Jul 2023
  - "Group studying Nunavik's melting permafrost gets cash boost", Nanatisiaq News. 11 Jul 2023
  - "Arctic river channels changing due to climate change, scientists discover", Stanford Earth Matters. 9 Mar 2023

- Chantal Sarrazin-Delay offered an Ontario Benthos Biomonitoring Network (OBBN) training workshop to Nokiiwin Tribal Council Climate Change Champions and Youth Ambassadors in

benthic invertebrate sampling with subsequent hands-on training in communities. Aug- Sep 2023

- Dr. Graeme Spiers participated in the following outreach initiatives in 2023:
  - ~ Served as a member of VETAC
  - ~ Dr. Spiers has been in Peru assisting with local issues by communicating the successes and lessons learned in Sudbury. While there he has provided the following lectures co-authored by Dr. Peter Beckett:
    - ~ From Black to Green. Nearly Fifty Years of Regreening in Sudbury, Ontario. Presented by ZOOM from Canadian Light Source, Saskatoon, SK, to Environmental Engineering Classes at Universidad Nacional de Moquegua, Cuidad Jardin, Ilo, Peru. May 2023
    - ~ From Black to Green. Nearly Fifty Years of Regreening in Sudbury, Ontario. Public Community Annual Meeting on Mining Impacts. Torata, Peru. Jul 2023
    - ~ From Black to Green. Nearly Fifty Years of Regreening in Sudbury, Ontario. Universidad de Jorge Basadre Grohman, Ph.D. International ZOOM Symposium. Tacna, Peru. Jul 2023.
    - ~ An Overview of Community Regreening in Sudbury, Ontario. Presented to the Governor of Tacna Province, Tacna, Peru. Jul 2023
    - ~ From Black to Green. Nearly Fifty Years of Regreening in Sudbury, Ontario. High School Teachers, Universidad a Moquegua, Cuidad Jardin, Ilo, Peru. Aug 2023
    - ~ From Black to Green. Nearly Fifty Years of Regreening in Sudbury, Ontario. Instituto del Mar de Peru (IMARPE), Ilo, Peru. Sept 2023
    - ~ From Black to Green. Nearly Fifty Years of Regreening in Sudbury, Ontario. Presented at the Annual Science Week Special Symposium, Universidad Catolica de Santa Maria, Arequipa, Peru. 21 Sept 2023

- Dr. Andrew Tanentzap participated in the following outreach activities in 2023:
  - ~ Hosted sabbatical visitors Professor Vanina Villanova from National University of Rosario and Daniel Cossey, a PhD student from Cambridge funded by Mitacs

- Dr. Norman Yan participated in the following engagement activities in 2023:
  - ~ Gave talk on the wide-reaching impact of road salt on the environment to the Muskoka Field Naturalists, 5 Jan 2023
  - ~ Was a guest speaker for the Coalition of Haliburton Property Owners' Association AGM. 6 May 2023
  - ~ Was featured in article 'Time to act on lake health, says CHA' by Lisa Gervais, The Highlander 23 Mar 2023
  - ~ Gave a talk at event 'The threat of algal blooms in Muskoka with Research Scientist Norman Yan', organized by Muskoka Chautaugua at their Theatre in the Woods. 10 Aug 2023

2023 Watershed Lecture with Dr. Justina Ray

Dr. Justina Ray, President and Senior Scientist at Wildlife Conservation Society Canada, gave the annual Watershed Lecture on Friday, October 20, 2023 entitled: 'Our Amazing Biodiversity: The Moment for Canada is Now'.

Dr. Justina Ray has been President and Senior Scientist of Wildlife Conservation Society Canada since its incorporation in 2004. In addition to overseeing the operations of this non-governmental organization, Dr. Ray is involved in research and policy activities associated with conservation-based planning, impact assessment and biodiversity conservation, with a particular focus on mammals in northern boreal landscapes. She has been appointed to numerous government advisory panels related to species at risk and land use planning in Ontario and Canada and served as co-chair of the Terrestrial Mammals Subcommittee of the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) between 2009-2017. Justina is Adjunct Professor at the University of Toronto (Department of Ecology and Evolution; Graduate Department of Forestry) and Trent University (Environmental & Life Sciences Graduate Program).

On the same day, Dr. Ray, along with CFEU Project Biologist Adam Lepage, hosted LU graduate students for the Watershed Student symposium. Lake Centre and School of Natural Sciences students presented their research projects and Dr. Ray provided feedback and guidance. While here, Dr. Ray was presented with a Green Leaf of Hope pin by the Environmental Sustainability Committee.

Watershed Lectures can be found on our website at: https://laurentian.ca/living-with-lakes/research/instructional-videos

Environmental Sustainability Committee

YEAR IN REVIEW 2023

ENVIRONMENTAL SUSTAINABILITY COMMITTEE

NATURE POSITIVE UNIVERSITIES LAURENTIAN

Laurentian became a member of the **Nature Positive University Alliance**. The ESC is working to support this commitment to enhance campus biodiversity.

Presented as student ambassadors at **COP28** during the World Climate Action Summit.

Released the first report on Lake Laurentian's biodiversity changes in **partnership with Nickel District Conservation Authority.**

Developed a **webpage** for ESC transparency and information sharing.

Water Testing to assess Laurentian's road salt impacts on local lakes.

Received TD Friends of the Environment grant to **fund a student garden.**

Opened the **Reclamation Trail** featuring Anishinaabemowin signage for interactive learning. Hosted a trail opening event.

Joined the 2023 **Watershed Lecture** with Dr. Justina Ray, President of the Wildlife Conservation Society, CAN.

Conducted Bioblitz to engage youth in use of new biodiversity mapping technologies.

Extras in the Science North IMAX production of "Jane Goodall: Reasons for Hope".

Assisted with creation of the Jane Goodall Student Scholarship in Conservation Biology.

Joined Dr. Jane Goodall's youth leadership program, Roots and Shoots.

Contributed to the ongoing **development of the Bachelor of Environmental Solutions** (BES) program.

Harvested red currants on campus to create unique food security gifts for supporters.

Measured key functions of **Beppi's Model Forest** (e.g. cooling potential) to create educational materials.

Presented Board of Governors with recommendations for changes to the **Laurentian University Environmental Policy** (Dec 15)

Advocated for the integration of sustainability into the university's **strategic plan**.

Developed a proposal for a free **climate change course** to motivate positive environmental behaviours.

Installed the **class of 2023 tree** at the Climate Science Parkette.

Engaged with community: Junction Creek, Coalition for a Liveable Sudbury, Nepahwin Lake Watershed Stewardship Group (NLWSG).
Pictured: Rain Garden Planting with Ramsey Lake Stewardship Committee

Educated students on campus biodiversity through **social media engagement.**

Introduced a **convocation pledge** and pin, engaging students in sustainability goals. Dr. Jane Goodall received the first pin.

Worked on the continuation of international allyship: Dr. Jane Goodall, Honourable Bob Rae, Margaret Atwood, Bruce Mau, Honourable Steven Guilbeault.

Participated in year 2 of **restoring lake trout** to Lake Nepahwin. *(NLWSG)*

2023 Environmental Sustainability Committee

Collaborated with the Student General Association to execute '**Eco Week**'.

Sudbury Long-Term Inland Lake Monitoring

The Ministry of the Environment, Conservation and Parks (MECP) at the Cooperative Freshwater Ecology Unit (CFEU) leads two lake monitoring programmes as complementary components of the long-term Inland Lake Monitoring Program: Intensive Sentinel lake monitoring and Extensive Spatial lake monitoring. Dr. Brie Edwards leads these programmes.

The Intensive Sentinel programme includes a set of 11 lakes sampled monthly through the ice-free season for a wide range of physical, biological and chemical parameters (water chemistry, Secchi disc water clarity, temperature/oxygen profiles, zooplankton, and phytoplankton), which provides a greater variety of data sampled more frequently, on a smaller group of lakes.

The Extensive Spatial programme includes a set of 44 lakes, located within a 100-km zone around Sudbury. These lakes were all acidified to below pH 5.5 in the early 1980s but are now in various stages of recovery. These lakes are sampled once annually during the period from late June through July. The data are intended to provide information on regional patterns in water quality and lake recovery in the lakes near Sudbury.

Associated with the Spatial lakes are a set of 24 Reference lakes, all of which fall within the historical acid deposition zone yet remained non-acidic during the original lake surveys in the 1980s. These lakes have historically been visited cyclically in the same mid-summer window, for three consecutive years per cycle with approximately 10-20 years between cycles (1981-1983; 2003-2005 and 2016-2018). For both Spatial and Reference lakes, sampling for water chemistry occurs on every visit, and sampling for other parameters (physical and biological) occurs periodically.

In 2023, both programmes conducted the third year of a new rotating sampling regime. The majority of Sentinel and Spatial lakes are being sampled in alternate years, whereas Reference lakes are now sampled on a 3-year cycle. In accordance with this rotational schedule, 2023 field season achieved monthly sampling of 7 Sentinel lakes, and mid-summer sampling of 44 Spatial and 8 Reference lakes.

MECP also provided information and analytical support for a chemical and biological recovery assessment of Killarney Provincial Park, in collaboration with Ontario Parks, Dr. John Gunn and MSc graduate Haley Moskal.

Database management activities during 2023 included: 1. Polishing a subset of the Sentinel chemistry data set, and posting it to the Province's open data portal, data.ontario.ca, 2. Updates to the Zooplankton and Phytoplankton databases to complement chemical and physical data and support environmental effects based assessments in Sentinel lakes, the development of internally facing interactive dashboards, and eventual posting to the open data portal, 3. In addition, several data requests were addressed from partners and collaborators. Support for other projects, including graduate student projects, was also provided (data, expertise and logistics).

These monitoring programmes continue to be a critical component of Canadian and international efforts to assess the effects of acid deposition and the responses of lakes to sulphur emission controls, as well as numerous emerging concerns for Boreal Shield waters. Results from these sampling programmes have been presented and interpreted by CFEU partners and numerous collaborators.

Northern Benthic Biomonitoring

Biological indicators such as benthic macroinvertebrates (BMI) are useful in gauging the degree of impact due to human activities. The Reference Condition Approach (RCA) to bioassessment is implemented when traditional before-after/ upstream-downstream designs are not feasible and is based on the premise that when a site is to be assessed, its BMI community is compared to that of many minimally impacted reference sites with similar habitat characteristics. Effective implementation of the RCA design requires a large network of reference sites encompassing many habitat types from which to best match a site of interest. Such a network is currently maintained by the MECP's Ontario Benthic Biomonitoring Network (OBBN).

The Northern Benthic Biomonitoring program based in Sudbury at the CFEU, initially termed "Freshwater Invertebrate Research Network of Northern Ontario (FIRNNO)" was designed to assist the metal mining industry in locating suitable reference sites to meet the Environmental Effects Monitoring (EEM) requirements of the Fisheries Act.

Since 2003, BMI data for over 400 sites have been collected in the vicinity of 4 mining centers including Red Lake, Hemlo, Sudbury and Timmins along with accompanying water chemistry as well as site, channel, and watershed level habitat data. Between 2013 and 2018, sampling was extended to include more than 200 additional sites as part of MECP's Ring of Fire (ROF) Baseline Environmental Data Collection Program. Crews from the Co-op Unit and Marten Falls First Nation worked collaboratively to collect samples from across the Attawapiskat River Basin and Upper Albany River Basin, distributed across both the Hudson Bay Lowlands and Boreal Ecozones, with a subset of sites selected for temporal repeat sampling. These data provide information on the unique freshwater environments that potential resource extraction activities could impact.

The Northern Biomonitoring Program also includes a set of 16 Sudbury area Sentinel Stream locations, consisting of both local reference and impacted sites, which are monitored every 4 years beginning in 2005. In 2023, taxonomic enumeration and identification was completed to enable updated trends assessments to understand community responses to changing environmental conditions.

Now integrated into the broader OBBN, the program objectives include the maintenance of an accessible database of BMI abundance and chemical/physical habitat characteristics for Northern Ontario lakes and streams, and use of these resources to assess and monitor anthropogenic effects on surface waters by detecting any change in BMI community structure. Community data are now available on the Province's open data portal, data.ontario.ca.

Northern Fisheries Research Program

This program improves our understanding and aids the management of the fish populations that support the recreational, commercial and subsistence fisheries of Northern Ontario. The program is led by Dr. Tom Johnston (MNRF) and has included a variety of projects examining the biology, ecology, and ecotoxicology of northern fish populations. Work on this program in 2023 was primarily directed at two fields of research:

i) **Assessing fish biodiversity recovery at the drainage basin scale.** This work was supported in 2023 by MNRF Aquatic Research and Monitoring Section and NSERC. The geographic focus of this work is on Near North waters, particularly in the historical acid-deposition zone of NE Ontario.

ii) **Reproductive ecology of northern fishes.** This research was funded in 2023 by the MNRF Aquatic Research and Monitoring Section. We initiated a controlled-breeding experiment to determine the influence of parental traits on gamete quality and egg survival for inland lake trout spawning stock.

Contaminants in Fish Studies

Dr. Gretchen Lescord, Assistant Professor in the School of Forests, Fisheries and Geomatic Sciences at the University of Florida and adjunct professor in the School of Natural Sciences (SoNS) at Laurentian, has led an impressive team of graduate students over the last couple of years tackling several pressing issues related to contaminants in fish in Ontario. Calvin Kluke MSc, completed a statistical study of the landscape and biological community factors that affect arsenic bioaccumulation in a number of fish species across northern Ontario. His recently published paper showed that migratory species that access marine food resources in James and Hudson Bays have elevated levels of arsenic (https://doi.org/10.1139/cjfas-2022-0106). MSc student Adam Lepage did a novel follow-up analytical study to Calvin's study to determine which chemical species of arsenic occur in various species of fish to determine if elevated values expressed as total arsenic actually contain the more toxic forms. This important study was presented at the Canadian Society of Aquatic Science Conference in Montreal in Feb 2023. MSc Student Taylor Nicholls from Wahnapitae First Nation is currently doing an assessment of contaminants in fish from lakes used by her community for subsistence fishing. This project has attracted considerable media attention and is a collaborative project with Dr. Brian Laird at the University of Waterloo, who will be addressing any potential health implications of excessive consumption of particular size and species of fish.

MSc student Taylor Nicholls on Kukagami Lake>

You can read some of the news coverage here: (https://www.google.com/amp/s/beta.ctvnews.ca/local/northern-ontario/2023/1/13/1_6230121.amp.html)

The Watershed Ecology Team:
Federal partners at the Canadian Forest Service (Natural Resources Canada)

The Watershed Ecology Team generates science to inform best practices and policies for sustainable forest management in Canada, with a specific focus on a watershed-based approach to forest management.

The team, led by Dr. Erik Emilson, brings a watershed perspective to forest harvest, silviculture, afforestation, and reforestation. An industry-partnered project in New Brunswick is ongoing to investigate the role of forest structure as a 'press' disturbance (in response to harvest and silviculture), versus the effects of management events themselves as 'press' disturbances on water quality and aquatic ecosystem condition.

The team also brings a watershed perspective to the management of natural forest changes, including that brought on by insects and fire, and the interactions with climate change and carbon cycles. Dr. Emilson is currently leading a large-scale project in Gaspésie Q.C. with industry and provincial partnerships to understand the role of defoliation by spruce budworm on the structure and function of headwater streams. In addition, the group is exploring the impacts of fire and wood-ash amendment on headwaters.

The Watershed Ecology Team also operates a molecular ecology laboratory, with capacity in eDNA and RNA extraction, several molecular assays related to microbial functions and activities, radioisotope tracer analyses and assays, and greenhouse gas analyses. In addition, the group has analytical capacity for molecular water analyses, and has an ongoing equipment loan agreement with LWLC to share resources for spectral analyses of dissolved organic matter.

Ontario University Program in Field Biology (OUPFB)

The OUPFB Program offered both domestic and international field courses this year; however, Laurentian did not contribute a field module in 2023. Dr. Gunn continues to serve as the OUPFB Coordinator for Laurentian University with assistance from Karen Oman.

Laurentian's OUPFB Class of 2019 in Killarney Park, ON.

Science Communication at the Vale Living with Lakes Centre
www.sciencecommunication.ca
Master's and Graduate Diploma in Science Communication (MSCom, G.Dip)

The Science Communication Graduate Program continues to contribute to the projects, research, and education of graduate students at the Vale Living with Lakes Centre. We do this through partnering on research projects and communication products that highlight the work being done by CFEU researchers and VLWLC scientists.

A total of 12 students graduated with a Master's of Science Communication in the fall of 2023, while 4 part time students continued their education with us in the Master's Degree stream. In September 2023, we welcomed 11 new full-time students from across Canada, and 2 international students, one from India and one from Nigeria. We also continue to have 4 part-time students on track to complete their degrees in 2025.

While the pandemic comes to a slow end, the climate emergency and the biodiversity crisis continue to put a spotlight on the importance of effective and impactful science communication, making our program and our expertise in this field highly sought after by scientists, health professionals and potential students. The demand for professionally and academically trained science communicators ensures our program's sustainability. We are still uniquely positioned as the only Science Communication graduate program in Canada.

Grant-supported projects:
SCOM Program secured a $40,000 contract from the Canadian Institutes of Health Research to pilot the "Foundations of Science Communication" Workshop Series. CIHR approached SCOM Faculty to develop science communication training that equipped CIHR-supported researchers with the key theories and skills required to engage in effective communication with diverse audiences. Funding for this project came from the Centre for Research on Pandemic Preparedness and Health Emergencies. Based on the program's "Communicate With Intent" Framework, each interactive workshop spans 3 days (9 total hours), and reaches 75 researchers from across Canada over Zoom. For this pilot offering, CIHR opened registration for 4 sessions of this workshop, and all 300 seats were claimed in less than a week. In 2023, the SCOM program delivered two sessions, one in French and one in English, for which we received very positive feedback both from participants and from CIHR personnel.

SCOM Faculty awarded Knowledge Mobilization Activities and Initiatives Fund Grant from Laurentian University's internal SSHRC Exchange program. As part of an ongoing research project investigating the professionalization of science communication across Canada, the SCOM faculty was awarded funds to host a symposium titled "Science Communication in the Workplace Symposium: Creating Capacity for Canada's Current and Future Needs." This project brings together science communication professionals, employers, and academics to share our program's preliminary research on science communicator core competencies, and explore ways to align our curriculum and our professional development workshop content with the evolving

needs of the science communication employment field. We began collecting literature in May 2023 and are continuing to collect and share data with partners through 2024.

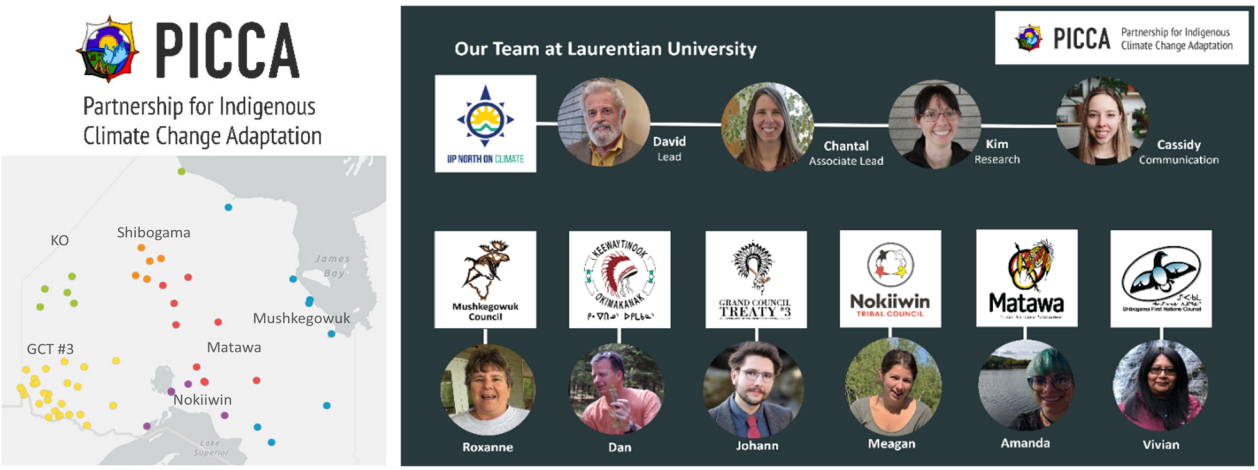
Student achievements:
The Science Communication graduate students continue to benefit from belonging to the Vale Living With Lakes Centre team. Collaborations between the Science Communication program and Lakes Centre's graduate students and researchers allows CFEU and VLWLC research to be the focus of SCOM student projects and assignments. The Science Communication students developed and produced short radio interviews in collaboration with the Master's in Biology students, developed infographics based on the online course Environmental Remediation: Global Lessons from the Sudbury Story, and wrote media releases based on the published work of Lake Centre researchers.

In collaboration with our partners at Science North, the students worked alongside researchers from Health Sciences North, the Northern Ontario School of Medicine, and Public Health Sudbury and Districts to produce an engaging public event called Northern MedTalks 2023. The combined viewership of the in-person and live-streamed audience exceeded 500 people, with many more individuals tuning in over Eastlink Community TV and watching the recorded event. The event will continue for its 4th offering in April 2024.

Up North on Climate - Northern climate change and adaptation
In 2023, the Up North on Climate team continued to promote climate change education and work towards Indigenous-led climate change adaptation in the north. We have been privileged to partner with many First Nation Councils and Indigenous communities in Ontario and beyond.

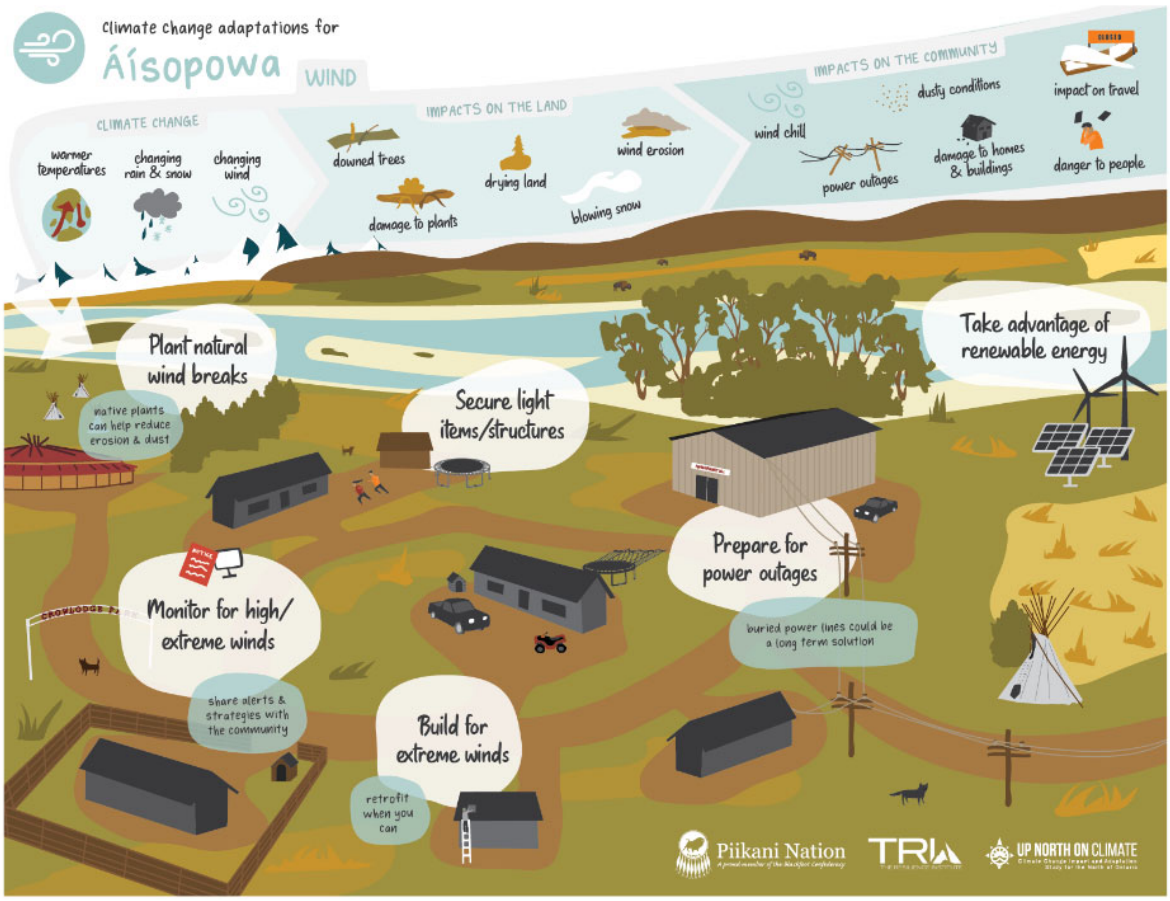
PICCA
The Up North on Climate team continues to collaborate with Grand Council Treaty 3 and five Tribal Councils across northern Ontario as part of the "Partnership for Indigenous Climate Change Adaptation" or PICCA. The objective of the project is to build climate change adaptation capacity in northern First Nations; to establish an interactive, regional, online adaptation knowledge network; to co-produce culturally appropriate adaptation resources, and to co-design an ArcGIS online GeoHub on key climate change topics including traditional Indigenous and western science knowledge.

Although funding through NRCan's Building Regional Adaptation Capacity and Expertise (BRACE) program ended on March 31, 2022, a slimmed Up North on Climate team continued to meet weekly, via Zoom, with the Climate Change Specialists (CCSs) from the Councils in 2023. All CCSs were retained by their Councils despite the loss of funding support, tangible evidence of the value of the expertise built during the project.



New partnerships in Alberta – The Resilience Institute, Piikani Nation and Willow Lake Métis Nation

Funded and facilitated by The Resilience Institute, Up North on Climate worked with two Indigenous communities in Alberta, the Piikani Nation and the Willow Lake Métis Nation, to create climate change education and adaptation materials that were culturally appropriate and suited to the needs of each community. Modelled after our Ontario climate change science and adaptation "Quick Guides", and guided by community leaders, the materials used visuals from their community and plain language to highlight their particular climate change challenges and potential adaptations. Piikani Nation, being in the plains, was interested in climate change adaptations related to wildfire, drought, flooding, but especially wind. They also saw the need for a Quick Guide describing the difference between mitigation and adaptation. Willow Lake Métis Nation wanted to highlight, among other things, the importance of returning bison to their land. For both communities, we adapted our "What is Climate Change" and "Climate Projections" specifically to Alberta.



Four Rivers Environmental – *Blastomyces* in northern Ontario

In response to a blastomycosis outbreak in Constance Lake First Nation, Four Rivers Environmental Services Group of Matawa First Nations engaged Up North on Climate to perform a literature review of current knowledge of *Blastomyces,* the fungus that causes blastomycosis. A sampling protocol was also cooperatively created based on the literature review findings and local knowledge. In the fall of 2023, this protocol was successful in finding *Blastomyces* fungus in the community, the first successful detection of *Blastomyces* DNA in Ontario and only the second time it has ever been detected, the last time being in the 1980s. There are now plans to publish the literature review as well as the successful detection.

We were also asked by Four Rivers to create a plain language infographic about *Blastomyces* as a communication piece for members of Constance Lake First Nation, the other Matawa communities and all First Nations in Northern Ontario, the supposed endemic range of *Blastomyces*.

Nokiiwin Tribal Council – Collaborative Community Watershed Planning and Climate Change Adaptation

With funding from Ontario's Great Lakes Program, Up North on Climate and Nokiiwin Tribal Council are collaborating to increase the capacity of Nokiiwin communities to adapt to climate change related challenges in the Lake Superior and Lake Nipigon watersheds, such as extreme precipitation, changing water levels, and shoreline erosion. In 2023, Up North on Climate was involved in training Youth Ambassadors and community Climate Change Champions from each Nokiiwin community in water quality monitoring protocols such as water sampling and benthic invertebrate sampling. "Quick Guide" graphics illustrating the climate change impacts facing watersheds in Ontario as well as potential adaptation options were also created for future use as community engagement tools. The project will continue in 2024 with a series of workshops outlining the Up North on Climate Adaptation Framework and its use in adaptation planning for watershed related issues in the Nokiiwin communities.

Knowledge and Resource Sharing

All resources created by Up North on Climate are posted and freely available on our website, UpNorthOnClimate.ca. This includes our Quick Guide graphics, 2-page Infosheets, Adaptation Framework, Climate Change Word Guide, and more. We also continue to moderate ACClimateNow, a closed Facebook Group for the Climate Change Specialists and staff in Tribal Councils and communities with responsibilities touched by climate change in northern Ontario First Nations. The closed Facebook Group serves as a social learning and discussion platform. Additionally, we continue to maintain a public Up North on Climate Facebook page with weekly posts sharing our climate change and adaptation resources.

Upcoming in 2024

In 2022, we began to build the PICCA Climate Adaptation GeoHub for First Nations by First Nations; a one-stop culturally appropriate, plain language and graphically accessible source for climate change information and data (maps from open data, knowledge, both scientific and Traditional, monitoring data, adaptation case studies, adaptation planning tools, discussions of best practices and experiences on the land). All GeoHub resources are being presented in a

Storymap to guide the reader through the use of resources in developing community adaptation plans. These Storymaps will also form the basis for a series of micro credentials for First Nation professionals and beyond. The project's future goals are to complete the PICCA GeoHub and micro credentials. We also hope to visit communities and interview Elders and youth to include more indigenous voices.

A new funding proposal was submitted to NRCan's Climate Change Adaptation Program for the continuation of the PICCA group with funding for the CCSs and the completion of the PICCA GeoHub. A conditional approval was received, and work is slated to start in 2024.

A Letter of Interest has been approved by NRCan for a collaborative project with the Mushkegowuk Tribal Council in the "Climate Resilient Coastal Communities Program" for Hudson Bay and work is slated to start in 2024.

Killarney Park Lake Charr Repatriation Studies

In 2023, we continued to explore the remarkable adaptability of lake charr (this time living on an invertebrate only diet) as we continue to restore lake charr populations (*Salvelinus namaycush*) in the acid-damaged Killarney Provincial Park lakes. Our experiments tested both embryo stocking through the ice (see Figure below) as well as the release of hatchery-reared yearling trout in fishless lakes, well in advance of attempting to rebuild additional parts of the food web. In 2021, the Ruth-Roy embryos were from a single-family source of Killala charr, with the same genetic stock introduced to Lumsden Lake as 1+ fish in 2022. In 2023 both Lumsden and Ruth-Roy received a mixed pool of embryos from multiple stocks of ELA charr. The two study lakes Ruth-Roy and Lumsden had no prey fish present for many decades but had undergone significant pH recovery in the past 25 years. Ruth-Roy had increased in pH from 4.85 to 5.8 between 1996 and 2022, while Lumsden increased from 5.19 to 6.0 during this same period. DOC also rose in both lakes (RR from 0.5 to 3.7 mg/L; Lumsden from 1.5 to 3.7 mg/L), a change which has provided sunblock protection against damaging UV radiation and allowed *Chaoborus* to thrive in these clear fishless lakes. The large standing crops of *Chaoborus* also appeared to have been critical food items to support the rapid growth of lake trout in Ruth-Roy introduced as embryos through the ice in early March 2021. Rapid growth rate continued for these fish into 2023 (2+ fish = max size 1200 g) but stomach analysis and zooplankton sampling in the fall of 2023 suggested that the *Chaoborus* populations, particularly the vulnerable C. *americanus* species, may now have been largely decimated by the feeding trout. The second stocking of embryos in March 2023 also showed good growth as YOY fish but these small fish were feeding mainly on *Chironomidae* at the time of sampling. In Lumsden Lake, the patterns were somewhat different, with both the YOY from the Feb 2023 embryo stocking event and 2+ fish (introduced as stocked hatchery 1+ fish in 2022) growing well, while still feeding mainly on *Chaoborus*, which were also still present (including C. *americanus*) in the zooplankton hauls. The Lumsden results suggest that this lake may either have a lower overall population of feeding trout that protected the *Chaoborus* from rapid decimation or perhaps has other lake characteristics that support more persistent *Chaoborus* populations.

Ruth-Roy Lake (Amazing Growth While Feeding on *Chaoborus*)

March 2021 | September 2022 | Stomach contents 2022 | September 2023

Successful Introduction into Historic Lumsden Lake

February 2023 | February 2023 | September 2023 | September 2023

<u>Atikameksheng Anishnawbek Partnership Project</u>

Atikamekseng Anishnawbek is located within 20 km of the Copper Cliff smelter, with its once very dusty nearby associated tailing piles, and was the first location in Sudbury where federal scientists came to study pollution effects from the mining industry on local ecosystems (Beamish et al. 1975; DFO technical report). In 2022, we consulted with AAFN community leaders and agreed to conduct a reassessment of the status of water chemistry and fish communities within the reserve. The studies included standardized netting assessments (BsM), water testing at a local lab (Testmark), collection of fish tissues for contaminant analysis at Western University, and, in partnership with Dr. John Smol at Queens University, paleolimnological studies of past changes as recorded in the sediment records. The paleolimniological studies support the work of two graduate students (MSc candidate Julia Paton; PhD candidate Emma Graves). The contaminant studies contribute to the work of CFEU's Dr. Gretchen Lescord, Adam Lepage, and John Gunn. The studies received enthusiastic

support from the community and active involvement in all aspects of the sample collection efforts by AAFN staff of the Lands department. A community meeting and lovely dinner was held on March 6, 2023 where Dr. Gunn presented the findings to date and transferred data files and samples to AAFN for safe keeping as per our confidentiality agreement. The illustrated necklace was gifted to Dr. Gunn at that time. A second virtual community information session was held on November 8, 2023 to update the community on the results of the contaminant studies (Adam Lepage) and paleolimnological studies (Julia Paton).

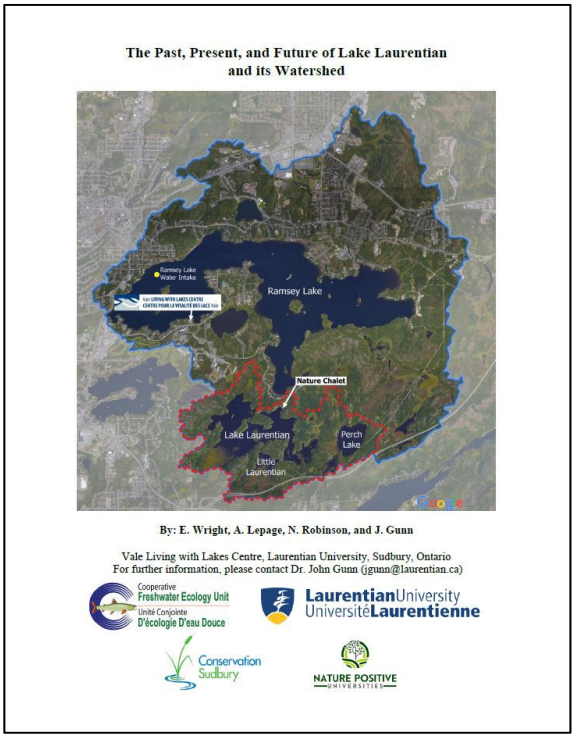
Conference presentations and publications are now proceeding, for example the co-authored presentation listed below:

Lepage AT, GL Lescord, R Paishegwon, L Richer, C Assance, TA Johnston, BA Branfireun and JM Gunn. Trace elements in fish from an industrial region near Sudbury, Ontario. Canadian Ecotoxicity Workshop, Ottawa, ON. 2-6 Oct 2023.

Nickel District Conservation Authority/ Laurentian University Partnership Program

CFEU has established a 3-year partnership program between Nickel District Conservation Authority and LU to share information from student and faculty research projects to assist with the management of conservation lands. In Year 1, we focused on aquatic biodiversity studies conducted within the Lake Laurentian Conservation Area (LLCA), an area with shared recreational trails and shared responsibility for the protection of the drinking water in downstream Ramsey Lake. Some key findings were:

1. Surface water cover has increased by nearly 4-fold since LLCA was established, mainly with the construction of an outlet dam in 1958 and because of extensive expansion of beaver dams in recent decades.
2. Significant improvements in water quality, particularly metal levels (Cu, Ni) have occurred and sensitive species such as amphipods have returned since 1990, as have 6 species of fish. However, we caution that past studies have shown that such improvements are rapidly reversible if water levels are not maintained, either through draining or after drought events.
3. The introduction of northern pike by CFEU staff in 1996 has been very successful, creating a valuable sport fishery in both Laurentian and Perch lakes; with measured contaminant levels suggesting the fish are safe to eat.



4. Our chemical surveys of lakes and outlet streams in 2023 revealed an increasing effect of road salt inputs, largely originating from the construction of the bypass highway. This finding deserves follow-up attention.
5. Significant restoration activities continue, with an emphasis on restoring degraded peatlands to improve carbon sequestration.

Wetland Restoration Project – Nipissing NSERC Alliance Missions Grant

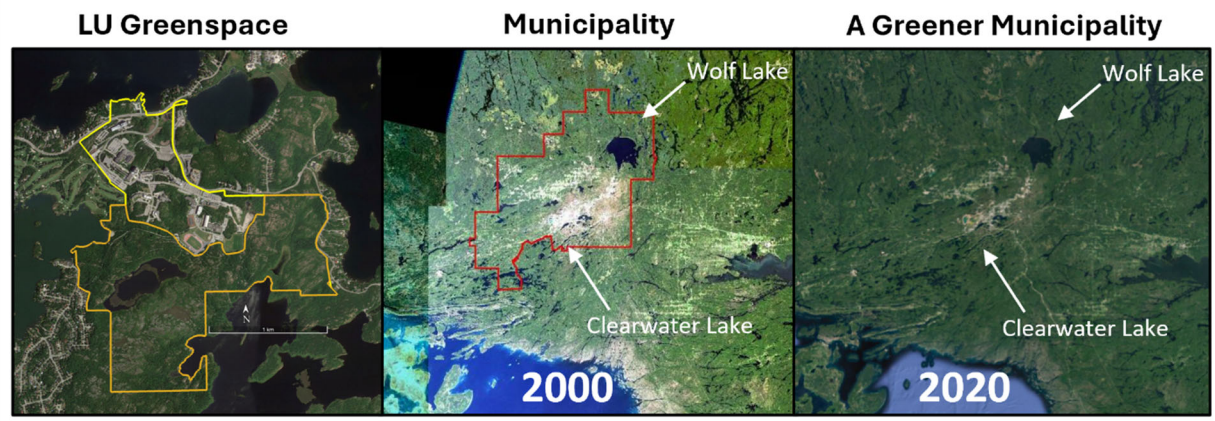
Dr. Colin McCarter, CFEU Member, SoNS adjunct professor, and Canada Research Chair (CRC) in Climate and Environmental Change at Nipissing University, was awarded a 3-year $1.7 M NSERC Alliance grant to lead a collaborative climate change and peatland restoration study in Sudbury, with the LU Greenspace experimental wetlands among the principal study sites. Partnering with the City of Greater Sudbury and Vale Base Metals, along with researchers Drs. Pete Whittington (Brandon University), Ellie Goud (St. Mary's University), Nathan Basiliko (Lakehead University), John Gunn and Peter Beckett (Laurentian University), the project will examine how metal and sulfur pollution from historical mining activities in Northeastern Ontario have impacted carbon storage, greenhouse gas emissions, as well as soil and water quality in wetlands. A key goal is also to determine whether traditional or new reclamation restoration techniques are needed to restore both the biodiversity and ecosystem services of severely polluted wetlands. The information gathered will be important to help us understand how to protect our environment and community from climate change.

30x30 Task Force and LU Greenspace

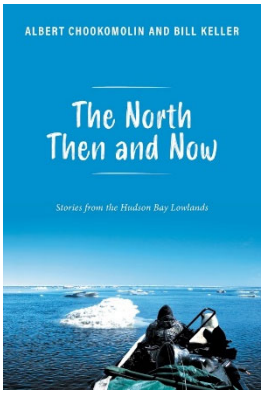
Mayor Paul Lefebvre has established a 30x30 Task Force to respond to Canada's commitment at the COP 15 Biodiversity meeting in Montreal (Dec 2022) that we protect 30% of our land and water by 2030 (i.e. 108,913 ha within a 363,064 ha municipality). He views this challenge as an opportunity to be the first in the country to achieve this goal within a municipal area itself. Drs. Gunn and Beckett serve on the committee and are promoting two action items:

1. The LU Greenspace to become the first approved protected area within a university campus in Canada, and continue to promote it as a central place for public recreational use, biodiversity assessment, education, and restoration ecology research, to show the value of protected areas. This initiative will also focus international attention on the Sudbury Regreening Program.
2. The native lake trout (charr) lakes within the municipality become the highest priority waters for protection, given their unique history of impacts and subsequent restoration efforts. The lake charr, a glacial relict species, is a rare species in Ontario occurring in only 2% of lakes.

The cold-water "old growth" lake trout represents an iconic species that historically occupied 38 lakes (>10%) within the municipality, with a combined surface area of 22,286 ha, a potential series of protected areas that represents as much as 20.5 % of our overall protection goal for the municipality. Included among these special lakes, whose basins retain crown ownership, are the two main drinking water surface sources in Sudbury (Wahnapitei Lake, Ramsey Lake). Remarkable recovery of naturally reproducing populations of trout has been achieved in many of these lakes in recent decades as pollution levels have declined, but continued monitoring and restoration efforts (e.g. hatchery stocking) are still needed in approximately 13 of the lakes, including Nepahwin Lake, a lake adjoining the LU Greenspace.



A Chronical of a Northern Life



Our Senior Fellow in Northern Studies, Bill Keller, produced a beautifully written book with his co-author Albert Chookomolin, describing Albert's life living in communities along the coast of the Hudson Bay Lowlands. This remarkable book tell what it has been like to live in that remote, vast land and experience the changes that have happened to it and its people over the last 70+ years.

Conference Organizing, Program Coordination and Editorial Activities

Arnott, S

- Served as Co-organizer of the Canadian Institute for Ecology and Evolution Workshop 'The regional extent of genetic adaptation in *Daphnia pulicaria* to freshwater salinization'. Nov 2023
- Served as a Session Co-Chair for the Society for Canadian Aquatic Sciences panel discussion 'A framework for inclusive science communication in science'. Feb 2023
- Served as a Session Co-Chair for 'Freshwater salinity' at the International Association for Great Lakes Research. May 2023

Basiliko, N

- Associate Editor, Soil Research
- Associate Editor, FEMS Microbiology Letters

Beckett, P

- Co-Chair of the Ontario Nature Annual Gathering and AGM held in Sudbury, 9-11 Jun 2023
- Served as Reviewer for Science of the Total Environment, Environmental Pollution, Environmental Science and Pollution Research, Remote Sensing and the International Journal of Environmental Research and Public Health

Emilson, E

- Associate Editor for the Canadian Journal of Forest Research

Gunn, J

- Faculty Co-Chair for the Environmental Sustainability Committee
- Faculty Advisor for the Nature Positive University Team at Laurentian
- Serves on Selection committees for Master Lecturer Science Communication, Vice President Academic and Provost.

Lescord, G

- Provided reviews for the journals of Science of the Total Environment, Environmental Toxicology and Chemistry, Environmental Pollution and Bioavailability, Hydrobiologia and Fisheries.
- Serves on the Environmental Steering Committee for the American Indian and Indigenous Studies Center at the University of Florida

Ramcharan, C

- Associate Editor, Frontiers in Environmental Science

Swanson, H

- Associate Editor, Arctic Science

Tanentzap, AJ

- Associate Editor of Nature Scientific Reports
- Associate Editor of Journal of Vegetation Science
- Associate Editor for PLoS Biology
- Dr. Tanentzap also coordinated an international meeting to synthesize data on dissolved organic matter as part of his ERC project.

Watmough, SA

- Director of the Environmental and Life Sciences Graduate Program, Trent University (Jan-Aug 2023) which underwent a program review in 2023.
- Editorial Board Member for The Science of the Total Environment
- Instructed a 1-week field course for Trent Students in Barbados
- Reviewed 37 journal articles

Partners and Collaborators

- Acadia University
- Appalachian State University
- Boniferro Millworks
- Blazing Star Environmental
- Brandon University
- Canadian Kraft Papers
- City of Greater Sudbury
- Clergue Forest Management
- Cornell University
- Dept. of Fisheries and Oceans Canada
- Domtar Inc.
- Dorset Environmental Science Centre
- Dryden Forest Management Company
- Environment and Climate Change Canada
- Experimental Lakes Area IISD
- Forest Protection Limited
- Friends of Killarney
- Georgian Bay Biosphere
- Glencore Sudbury INO
- Grand Council Treaty 3
- Great Lakes Forestry Centre, NRCAN-CFS
- IMDEA Agua, Spain

- Institute of Baltic Sea Research
- Irving Pulp and Paper
- Keewaytinook Okimakanak (Northern Chiefs) Tribal Council and member First Nations
- Laurentian University
- Magnetawan First Nation
- Manitoulin Streams Improvement Association
- Matawa First Nations Management, Four Rivers Environmental Services Group and member First Nations
- McGill University
- McMaster University
- Memorial University
- Mercer-Peace River
- Michigan Tech U
- Ministère des Forêts, de la Faune et des Parcs (MFFP)
- Mount Allison University
- Mushkegowuk Tribal Council and member First Nations
- Natural Resources Canada
- Nipissing University
- Nokiiwin Tribal Council and member First Nations
- OMECP
- OMNRF
- ONGEN
- Ontario Forest Research Institute (MNRF)
- Ontario Tech University
- Piikani Nation
- Queen's University
- Rayonier Advanced Materials
- Resolute Forest Products
- Ryerson University
- Scales Nature Park
- Science North
- Shawanaga First Nation
- Shibogama Tribal Council and member First Nations
- St. Mary's University
- The Resilience Institute (TRI)
- Thunder Bay Pulp and Paper
- Trent University
- UK Centre for Ecology and Hydrology
- University of Birmingham
- University of Cambridge
- University of Copenhagen
- University of Guelph
- University of New Brunswick
- Université Laval
- Université du Québec à Montréal
- University of Sherbrooke
- University of Toronto
- University of Uppsala
- University of Waterloo
- University of Windsor
- University of Winnipeg
- US Forest Service
- Vale Ltd.
- Wahnapitae First Nation
- Weenusk First Nation
- Western University
- Weyerhauser Canadian Timberlands
- Wildlife Conservation Society Canada
- Willow Lake Métis Nation
- York University

Book Chapters

Alarie Y and MC Michat. 2023. Larval chaetotaxy of the Dytiscidae (Coleoptera: Adephaga) and - comparison with other families of Hydradephaga, 17-53. In: Yee DA (Ed). Ecology,

Systematics, and the Natural History of Predaceous Diving Beetles (Coleoptera: Dytiscidae), 2nd edition. Springer, The Netherlands.

McMeans, BC, PA Cott, TA Johnston, PJ Blanchfield, MM Guzzo and RA Cunjak. 2023. Winter as a defining season for Canadian fishes, Chpt. 17. In: CT Hasler, JG Imhof, NE Mandrak and SJ Cooke (Eds.) Freshwater Fisheries in Canada, American Fisheries Society, Bethesda, MD, USA.

Barriault C and M Reid. 2023. The Communicating with Intent Framework. In: Rowland S and L Kuchel (Eds). Teaching Science Students to Communicate: A Practical Guide. SpringerLink. https://doi.org/10.1007/978-3-030-91628-2_46

Publications

Alarie Y, Z Mai, M Michat and J Hajek. 2023. Larval morphology and new records of the iconic diving beetle *Acilius sinensis* Peschet, 1915 (Coleoptera: Dytiscidae: Dytiscinae)-a species well established in western Yunnan, China. Zootaxa 5301(2):277-291.

Alarie Y, K Watanabe and MC Michat. 2023. The very rare Japanese endemic diving beetle *Japanolaccophilus niponensis* (Kamiya, 1939), (Coleoptera: Dytiscidae, Laccophilinae): larval morphology and phylogenetic comparison with other known Laccophilini. Zootaxa5285(1):116-132.

Arnott SE †, V Fugère†, CC Symons†, SJ Melles†, BE Beisner, M Cañedo-Argüelles, M-P Hébert, JA Brentrup, AL Downing, DK Gray, D Greco, W Hintz, A McClymont, RA Relyea, JA Rusak, CL Searle, L Astorg, HK Baker, Z Ersoy, C Espinosa, JM Franceschini, AT Giorgio, N Göbeler, E Hassal, M Huynh, S Hylander, KL Jonasen, A Kirkwood, S Langenheder, O Langvall, H Laudon, L Lind, M Lundgren, ER Moffett, L Proia, MS Schuler, JB Shurin, CF Steiner, M Striebel, S Thibodeau, P Urrutia Cordero, L Vendrell-Puigmitja, GA Weyhenmeyer, AM Derry†. 2023. Widespread variation in salt tolerance within freshwater zooplankton species reduces the predictability of community-level salt tolerance. Limnology and Oceanography Letters 8:8-18, DOI:10.1002/1012.10277. †Equal contributions.

Casas-Rui JP, P Bodmer, KA Bona, D Butman, M Couturier, EJS Emilson, K Finlay, H Genet, D Hayes, J Karlsson, D Pare, C Peng, R Streigl, J Webb, X Wei, SE Ziegler and PA del Giorgio. 2023. Integrating terrestrial and aquatic ecosystems to constrain estimates of land-atmosphere carbon exchange. Nature Communications 14(1):1571.

Choquette J, AI Mokdad, T Pitcher and JD Litzgus. 2024. Selection and validation of release sites for conservation translocations of temperate-zone snakes. Global Ecology and Conservation 49: e02765.

Choquette J, T Pitcher and J Litzgus. 2024. Occupancy and detection of a temperate-zone rattlesnake (*Sistrurus catenatus*): Implications for evaluating population recovery efforts. Herpetologica. In press.

Choquette J, J Litzgus, J Gui and T Pitcher. 2023. A systematic review of snake translocations to identify potential tactics for reducing post-release effects. Conservation Biology. 37(1): e14016.

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Dawson J, M Guzzo, JM Gunn, E Emilson, K McCann and B Edwards. 2024. Stable isotope analysis provides novel insights for measuring lake ecosystem recovery following acidification. Canadian Journal of Aquatic Sciences. Accepted.

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Diep P, H Shen, JA Wiesner, N Mykytczuk, V Papangelakis, AF Yakunin and R Mahadevan. 2023. Engineered nickel bioaccumulation in Escherichia coli by NikABCDE transporter and metallothionein overexpression. Engineering in Life Sciences DOI: 10.1002/elsc.202200133

Dopson M, C González-Rosales, DS Holmes and N Mykytczuk. 2023. Eurypsychrophilic acidophiles: From (meta)genomes to low-temperature biotechnologies Frontiers in Microbiology 14:1149903.

Dugan HA and SE Arnott. 2023. The ecosystem implications of salt as a pollutant of freshwaters. WIREs Water 10:e1629.

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Hajek J, Y Alarie, CJ Bennetti, M Springer, L Hendrich, A Villastrigo. RO Torres, MS Basantes and M Balke. 2023. Underestimated diversity and range size of diving beetles in tank bromeliads – bColeptera of "hygrofloric" lifestyle (Dytiscidae). Zoological Journal of the Linnean Society 200(3):720-735

Harrow-Lyle TJ, YL Lam, EJS Emilson, RW Mackereth, CPJ Mitchell and SJ Melles. 2023. Watershed characteristics and chemical properties govern methyl mercury concentrations within headwater streams of boreal forests in Ontario, Canada. Journal of Environmental Management 345:118526.

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Hébert MP[†], CS Symons[†], M Cañedo-Argüelles [†], SE Arnott, AM Derry, V Fugùre, WD Hintz, SJ Melles, L Astorg, HK Baker, JA Brentrup, AL Downing, Z Ersoy, C Espinosa, JM Franceschini, GF Fussmann, AT Giorgio, N Göbeler, DK Gray, D Greco, E Hassal, M Huynh, S Hylander, KL Jonasen, A Kirkwood, S Langenheder, O Langvall, H Lauden, L Lind, M Lundgren, A McClymont, L Proia, RA Relyea, J Rusak, MS Schuler, CL Searle, JB Shurin, CF Steiner, M Striebel, S Thibodeau, P Urrutia Cordero, L Vendrell-Puigmitja, GA Weyhenmeyer and BE Beisner[†]. 2023. Lake salinization drives consistent losses of zooplankton abundance and diversity across coordinated experiments. Limnology and Oceanography Letters. 8:19-29. DOI:10.1002/lol2.10239

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Kluke C, GL Lescord, TA Johnston, B Kielstra, A Lock, SP Bhavsar and JM Gunn. 2023. Spatial patterns and environmental factors related to arsenic bioaccumulation in boreal freshwater fish of Ontario, Canada. Can. J. Fish. Aquat. Sci. 80:628-641 00:1-14. DOI: 10.1139/cjfas-2022-0106.

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McDonough A and SA Watmough. 2023. Interactive effects of precipitation and above canopy nitrogen deposition on understory vascular plants in a jack pine (*Pinus banksiana*) forest in northern Alberta, Canada. Science of the Total Environment 855:158708.

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Tanentzap AJ and O Kolmakova. 2023. Global change ecology: Science to heal a damaged planet. PLoS Biology 21:e3002455.

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Thompson L, M Kuhn, J Winder, LLP Braga, R Hutchins, AJ Tanentzap, V St. Louis and D Olefeldt. 2023. Controls on methylmercury concentrations in lakes and streams of peatland-rich catchments along a 1700 km permafrost gradient. Limnology and Oceanography 68:583-597.

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Volponi SN, HL Wander, DC Richardson, CJ Williams, DA Bruesewitz, SE Arnott, J Brentrup, HL Edwards, H Ewing, K Holeck, L Johnson, B Kim, A Morales-Williams, N Nadkarni, B Norman, L Parmalee, A Shultis, A Tracy, N Ward, K Weathers, C Wigdahl-Perry and K Yokota. 2023. Nutrient function over form: Organic and inorganic nitrogen additions have similar effects on lake phytoplankton nutrient limitation. Limnology and Oceanography 68:307-321.

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Wijewardena T, NE Mandrak, JE Paterson, CM Davy, CB Edge, AM Lentini and JD Litzgus. 2023. Effects of release method on the survival, somatic growth, and body condition of headstarted turtles. Journal of Wildlife Management 88(1):e22505.

Winder JC, LPP Braga, MA Kuhn, LM Thompson, D Olefeldt and AJ Tanentzap AJ. 2023. Climate warming has direct and indirect effects on microbes associated with carbon cycling in northern lakes. Global Change Biology 29:3039-3053.

Reports

Sarrazin-Delay, C. and Fram, K., 2023. The Two Sides of *Blastomyces*: The fungus and the infection. Up North on Climate, Laurentian University, Sudbury, ON, 44pp. plus appendices.

Conference Presentations

Arnott SE, L Cicchetti, A Derry, V Fugère, C Symons, S Melles, X Sun. Intraspecific variation in salt tolerance. Association for the Science of Limnology and Oceanography, Palma de Mallocora, Spain. 4-9 Jun 2023.

Aubin I, É Deschenes, EJS Emilson and K Santala. How can trait-based ecology enhance the restoration of ecosystem functions and services? RE3 Conference, Québec, QC. 11-15 Jun 2023.

Auclair-Fournier E, M Garneau and P Roy-Léveillée. Vegetation succession and carbon accumulation following permafrost thaw in Nunavik, (Northern Québec, Canada). EUCOP23 the Sixth European Conference on Permafrost, Puigcerdà, Spain. 18-22 Jun 2023.

Baird DJ, A Bush, EJS Emilson, N Gagné, M Hajibabaei, B Levenstein, WA Monk, TM Porter and R Steeves. Connecting biodiversity to biomonitoring: applying environmental DNA metabarcoding in large-scale bioassessment programs. GeoBON Global Conference 2023. Montreal, QC. 10-13 Oct 2023.

Baird D, A Bush, EJS Emilson, N Gagne, M Hajibabaei, B Levenstein and W Monk. Biomonitoring 2.0: applying an environmental DNA approach to revolutionise bioassessment of Canadian river health. Society of Canadian Aquatic Sciences, Montreal, QC. 22-25 Feb 2023.

Beckett PJ. 2023. Blending mineral and organic residuals to aid restoration of industrially damaged lands in Sudbury, Ontario, Canada. Society for Ecological Restoration 2023 (SER2023) - 10th World Conference on Ecological Restoration, Darwin, Australia, (170 delegates). 26-30 Sept 2023.

Beckett PJ. Integrating Functional Ecology, Industrial Residuals, and Novel Earthworks in the Reclamation of Borrow Pits. CLRA Ontario Chapter Symposium, Sudbury, ON. 15 Sept 2023.

Beckett PJ, T Miller and S Wainio. The importance and abundance of lichens and mosses on the restored landscape in the nickel-copper city of Sudbury, ON. Life of Mine International Conference, Brisbane, Australia (140 delegates). 2-4 Aug 2023.

Bouffard M, M Bottini and J. Litzgus. Demographic analysis of a coastal population of Spotted Turtles (*Clemmys guttata*) on Long Island, New York. CHS, Ottawa, ON. 15-18 Sept 2023. Poster.

Britt M, M DiLeo, M Szenteczki, K Moxley, J Hathaway, JD Litzgus and SC Lougheed. Rattling on: Conservation genomics of Massasauga Rattlesnakes. CHS, Ottawa, ON. 15-18 Sept 2023. Lightning talk.

Cardinal RM, P Roy-Léveillée, S Gauthier, M Kwan and B Branfireun. Methyl mercury concentrations in a degrading palsa field near Kangiqsualujjuaq, Nunavik (Canada). EUCOP23 the Sixth European Conference on Permafrost, Puigcerdà, Spain. 18-22 Jun 2023.

Caron F, J Anderson, PJ Beckett and GA Spiers. Tracking metal aerosols and natural radioactivity in Northern Ontario, Canada: tales told by lichens. Goldschmidt Conference, Lyon, France. Jul 2023.

Carroll B, S Noganosh and J Litzgus. Ecology of species at-risk turtles within the footprint of a transmission line and a proposed highway expansion. CHS, Ottawa, ON. 15-18 Sept 2023. Lightning talk.

Chiasson D, P Roy-Léveillée and N Bhiry. Post-Drainage Evolution of Drained Lake Basins in Old Crow Flats, Yukon, Canada. EUCOP23 the Sixth European Conference on Permafrost, Puigcerdà, Spain. 18-22 Jun 2023.

Choquette J, A Mokdad, T Pitcher and J Litzgus. Selection and validation of release sites for conservation translocations of a temperate-zone snake. CHS, Ottawa, ON. 15-18 Sept 2023. Lightning talk.

Choquette J, L Savi, T Pitcher and J Litzgus. An inexpensive artificial snake hibernaculum built using readily available plumbing supplies. CHS, Ottawa, ON. 15-18 Sept 2023. Poster.

Cicchetti L, SE Arnott and P Sartori Manoel. Evolved tolerance to road salt among wild populations of *Daphnia*. IAGLR Annual Conference on Great Lakes Research. Toronto, ON. 8-12 May 2023.

Corbiere N, P Roy-Léveillée, BA Branfireun, D Chiasson and N Basiliko. Assessing mercury and methylmercury concentrations in drained basins complexes in Old Crow Flats, Yukon, Canada. EUCOP23 the Sixth European Conference on Permafrost, Puigcerdà, Spain. 18-22 Jun 2023.

Crisias H and P Roy-Léveillée. Geotechnical properties of Tyrrell Sea deposits: data gaps and research needs. EUCOP23 the Sixth European Conference on Permafrost, Puigcerdà, Spain. 18-22 Jun 2023.

Delay S, O Urquhart and J Litzgus. Windfarm and wildfire: Spatial ecology of an endangered freshwater turtle in a recovering landscape. CHS, Ottawa, ON. 15-18 Sept 2023. Poster.

Deslauriers C, P Roy-Léveillée and M Allard. The thermal regime and thermokarst rates of palsas and lithalsas near Kangiqsualujjuaq, Nunavik, Canada. EUCOP23 the Sixth European Conference on Permafrost, Puigcerdà, Spain. 18-22 Jun 2023.

Emilson EJS. The Watershed Ecology Team at GLFC: Generating science to support a watershed-based approach to the management of Canada's changing forests. ASCO Symposium, Algoma University, Sault Ste. Marie, ON. 2023.

Emilson EJS, K Kidd, KS Ju, R Maranger, M McCaig, C McCarter, S Ouimet, HK Sidhu, E Smenderovac, M Stastny and L Venier, L. Impacts of defoliation by spruce budworm on freshwater ecosystems in Canada. GLFC Seminar Series. 2023. Virtual.

Fee A, SE Arnott, T Martin and L Cicchetti. Assessing the toxicity of a beet-juice brine de-icing product to *Daphnia pulicaria*. IAGLR Annual Conference on Great Lakes Research. Toronto, ON. 8-12 May 2023.

Forneste CJ. A Unique Family Dynamic: Children as Brokers of Their Immigrant Families' Health-Literacy in Canada. Science Writers and Communicators of Canada Conference, Ottawa. 4-6 Jun 2023. Poster.

Gagnon S and P Roy-Léveillée. Contemporary formation of ice-wedge pseudomorphs during the expansion of a thermokarst lake followed by lake drainage in Old Crow Flats, Yukon, Canada. EUCOP23 the Sixth European Conference on Permafrost, Puigcerdà, Spain. 18-22 Jun 2023.

Gigeroff A, JL Riley, J Baxter-Gilbert and J Litzgus. Investigating the presence of non-native Gartersnakes (*Thamnophis sirtalis*) on the island of Newfoundland. CHS, Ottawa, ON. 15-18 Sept 2023. Poster.

Jones S, J Litzgus, P Rutherford, S Leelakumari, S Correard, M Murray, J Lee-Yaw, A Chabot, H Yueh, S Scherer, I Ragoussis and S Jones. The Canadian BioGenome Project. CHS, Ottawa, ON. 15-18 Sept 2023.

Ju KS, KA Kidd, C Mitchell and EJS Emilson. Impacts of forest defoliation from spruce budworm on consumer allochthony and mercury bioaccumulation and biomagnification in stream food webs. SETAC North America Annual Meeting. Louisville, KT. 12-16 Nov 2023.

Ju S, KA Kidd, CPJ Mitchell and EJS Emilson. Spruce budworm defoliation contributes to elevated consumer allochthony and lower brook trout mercury in stream food webs. Society of Canadian Aquatic Sciences, Montreal, QC. 22-25 Feb 2023.

Kirkwood A, P Roy-Leveillee, N Basiliko, B Branfireun and M Richardson. Mass-wasting and mercury along the Churchill River in the continuous permafrost zone of Far North Manitoba, Canada. EUCOP23 the Sixth European Conference on Permafrost, Puigcerdà, Spain. 18-22 Jun 2023.

Kirkwood A, Roy-Léveillée P, Richardson M, McLaughlin J, Packalen M, Branfireun B, Basiliko N. Mercury storage in the Hudson Bay Lowlands. Canadian Geophysical Union. Banff, Canada. May 2023. **Won Best Student Presentation*

Kirkwood A, Roy-Léveillée P, Richardson M, Branfireun B, Basiliko N. From landscape to microbes: how permafrost thaw influences mercury biogeochemistry. Canadian Geophysical Union, Banff, Canada. May 2023

Lajoie C, C Dawson, K Kidd, S Capell, EJS Emilson and R Mackereth. The effects of forestry and beaver dams on mercury dynamics in Ontarios' Boreal stream food webs. IAGLR Annual Conference on Great Lakes Research. Toronto, ON. 8-12 May 2023.

Lakenan M, J Anderson, PJ Beckett, F Caron and GA Spiers. 2023. Are lichen an effective tool to reliably monitor emission reductions from Sudbury smelters? RE3 Conference, Québec, QC. 11-15 Jun 2023.

Lakenan M, J Anderson, PJ Beckett and GA Spiers. 2023. What lichen can tell us about the Sudbury smelter emissions – a story of reductions with a new focus on critical minerals. The Joint Annual Meeting of the Geological Association of Canada, Mineralogical Association of Canada, and Society for Geology Applied to Mineral Deposits (GAC-MAC-SGA), Sudbury, ON. 24-27 May 2023.

Lavigne J, PJ Beckett, M Hebert, I Aubin, E Emilson and N Basiliko. Integrating mineral and organic residuals to reclaim industrially damaged lands. RE3 Conference, Québec, QC. 11-15 Jun 2023. **Won the CLRA Student Presentation Award*

Lepage A, GL Lescord and JM Gunn. Contaminants in subsistence fish. An oral presentation given to Atikameksheng Anishnawbek First Nation on environmental contaminant data in fish collected from lakes within their traditional territory. 8 Nov 2023.

Lepage A, GL Lescord, B Laird, K Skinner and JM Gunn. Arsenic speciation in freshwater fish: A systematic review with implications for monitoring and research. Canadian Ecotoxicity Workshop, Ottawa Ontario. 2-5 Oct 2023.

Lepage AT, GL Lescord, R Paishegwon, L Richer, C Assance, TA Johnston and JM Gunn. 2023. Trace elements in fish from an industrial region located within the Traditional Territory of two First Nations near Sudbury, Ontario. 49th Canadian Ecotoxicity Workshop, Ottawa, ON. 2-5 Oct 2023. Poster.

Lepage A, GL Lescord, A Lock, TA Johnston, J Gandhi and JM Gunn. 2023. Biodilution of organic species of arsenic in freshwater food webs. Annual meeting of the Society of Canadian Aquatic Sciences, Montréal, QC. 22-25 Feb 2023.

Lescord GL, J Simard, TA Johnston, J Seguin, C Farrell, N O'Driscoll and C O'Connor. 2023. Learning from Lake Sturgeon: how hydropower affects fish mercury and trophic ecology. Annual meeting of the Society of Canadian Aquatic Sciences, Montréal, QC. 22-25 Feb 2023.

Lewkowicz A, S Wolfe, A Rudy, P Roy-Léveillée, V Roujanski, B O'Neill, C Koenig, E Hoeve, S Gruber and N Brown. Progress in the development of an illustrated plain-language version of the Glossary of Permafrost and Related Ground-Ice Terms. EUCOP23 the Sixth European Conference on Permafrost, Puigcerdà, Spain. 18-22 Jun 2023.

L'Hérault E, M Lemay, M Allard, F Calmels and P Roy-Léveillée. Toward large-scale implementation of near real-time ground temperature monitoring LoRaWAN networks in northern Quebec and Yukon: challenges and opportunities. EUCOP23 the Sixth European Conference on Permafrost, Puigcerdà, Spain. 18-22 Jun 2023.

Lounsbury S, T Burke and J Litzgus. Measuring the success of an innovative fence design for mitigating road mortality of Eastern Foxsnakes (*Pantherophis gloydi*) and other at-risk reptiles in eastern Georgian Bay, Ontario. CHS, Ottawa, ON. 15-18 Sept 2023. Poster.

Maloney A, O Urquhart and J Litzgus. Investigating the impacts of wildfire and windfarm construction on squamate community ecology in central Ontario. CHS, Ottawa, ON. 15-18 Sept 2023.

Maloney A, O Urquhart and J Litzgus. Investigating the impacts of wildfire and windfarm construction on anuran bioacoustics in central Ontario. CHS, Ottawa, ON. 15-18 Sept 2023.Poster.

Martin T and SE Arnott. Effects of "eco-friendly" road de-icer alternatives on freshwater ecosystems: a mesocosm study. Association for the Science of Limnology and Oceanography, Palma de Mallocora, Spain. 4-9 Jun 2023. Poster.

Martin T and SE Arnott. Evaluating "Eco-friendly" road de-icer effects on aquatic communities. IAGLR Annual Conference on Great Lakes Research. Toronto, ON. 8-12 May 2023.

Martins D, G Vieira, P Roy-Léveillée, P Freitas and J Canário. Identification and Recent Dynamics of Geoecological Mosaics in the Tundra of Kangiqsualujjuaq (Subarctic Canada). EUCOP23 the Sixth European Conference on Permafrost, Puigcerdà, Spain. 18-22 Jun 2023.

McCaig M, E Smenderovac, KA Kidd and EJS Emilson. Response of stream microbial communities to spruce budworm defoliation in forested watersheds. Society of Canadian Aquatic Sciences, Montreal, QC. 22-25 Feb 2023. Poster.

Moskal H, B Edwards and JM Gunn. Re-establishment of littoral zone food webs in lake charr lakes affected by multiple stressors. Killarney Sessions Workshop, Killarney Provincial Park. Jul 2023.

Munford K, W Humphry, P Levasseur and S Watmough. Understory plan communities from the world's largest regreening program approach that of healthy sites. RE3 Conference, Québec, QC. 11-15 Jun 2023.

Mykytczuk, N. Panel 3F: Onboarding the Next Generations: New Paradigms for Educators, Industry and Government. LIAM Forum. 3-6 Oct 2023. Invited panelist. Virtual.

Mykytczuk, N. Reprocessing Pyrrhotite Tailings in Sudbury: Addressing the Legacy with a Battery-Coloured Lining. Sudbury, ON. 14 Sept 2023.

Mykytczuk, N. Untapping Critical Minerals Value from Mine Waste. BEV Mines to Mobility Conference, Sudbury, ON. 31 May 2023. Invited.

Mykytczuk, N. Bioleaching of mine wastes: scaling up "new" tools for critical mineral recovery. Geological Assoc. of Canada, Mineralogical Assoc. of Canada (GAC-MAC) Joint Annual Meeting. Sudbury, ON. 24-27 May 2023.

Nicholls T, S Lehman, GL Lescord and B Laird. Community update and food frequency survey. Presentation given to the members of Wahnapitae First Nation, to provide an update on the FNECP project progression and conduct a survey study. This presentation was co-delivered by Nicholls, Lehman, and Laird. 22 Nov 2023.

Pearson D. Climate Change in the Communities. Northern Ontario First Nations Environmental Conference. Thunder Bay. 26-27 Sept 2023. Invited.

Pearson D. Community Energy Champions can contribute to developing ways of adapting and preparing for climate change in their community. First Nations Net Zero Communities Workshop. Taykwa Tagamou First Nation, Cochrane. 9-11 Aug 2023. Invited.

Pearson D and M Hindman. Up North on Climate: university collaboration with Indigenous Councils in a "Partnership for Indigenous Climate Change Adaptation". Adaptation Futures. Montreal. 4-6 Oct 2023. Invited.

Rahman T and P Roy-Léveillée. The distribution and morphometry of wedge ice in the Barrens of northern Manitoba, Canada. EUCOP23 the Sixth European Conference on Permafrost, Puigcerdà, Spain. 18-22 Jun 2023.

Rennie MD, L James, SE Arnott, J Casselman, DO Evans and WG Sprules. Species invasion reduces fish mercury biomagnification. Society of Canadian Aquatic Sciences, Montreal, QC. 22-25 Feb 2023.

Roy-Léveillée P, K Turner, F Calmels, C Duguay, M Shaposhnikova, AB St-Amour and M Kay. Catastrophic drainages and landscape evolution in Old Crow Flats, Yukon, Old Crow Flats, Yukon. EUCOP23 the Sixth European Conference on Permafrost, Puigcerdà, Spain. 18-22 Jun 2023.

Seward J, PJ Beckett, S Bräuer, N Basiliko, P Roy-Léveillée, S Watmough and E Emilson. 2023. Sphagnum Re-establishment in Smelter-Impacted Peatlands in Sudbury. CLRA Ontario Chapter Symposium, Sudbury, ON. 15 Sept 2023.

Seward J, P Beckett, S Bräuer, P Roy-Léveillée, EJS Emilson, S Watmough, L Harris and N Basiliko. Sphagnum Re-establishment in Smelter-Impacted Peatlands in Sudbury, Ontario, Canada. RE3 Conference, Québec, QC. 11-15 Jun 2023.

Simmons N, K Dejora, CE Farrell, GL Lescord, CM O'Connor, J Seguin and J Simard. An academic's perspectives on science communication and teamwork when working with

Moose Cree First Nation and Wildlife Conservation Society Canada. 49th Canadian Ecotoxicity Workshop, Ottawa, ON. 2-5 Oct 2023. Poster.

Spoel P, E Cooke, C Copley and M Reid. Communicating COVID-19: Characterizing risk as personal property and responsibility. Public Communication of Science and Technology 2023 Conference, Rotterdam, The Netherlands. 12-14 Apr 2023.

Therrien C, S Garner, TA Johnston, K Edwards, H Swanson and B Neff. 2023. Invasive species mediate thiamine deficiency in lake trout (*Salvelinus namaycush*) in the Sudbury Basin. Annual meeting of the Society of Canadian Aquatic Sciences, Montréal, QC. 22-25 Feb 2023.

Thibeault S, K Moxley and J Litzgus. Investigating sexual dichromatism in a central Ontario population of Spotted Turtles (*Clemmys guttata*). CHS, Ottawa, ON. 15-18 Sept 2023. Lightning talk.

Thibeault S, K Moxley and JD Litzgus. Investigating sexual colour dimorphism in an Ontario population of Spotted Turtles (*Clemmys guttata*). Emydine Conservation Symposium, Huntingdon, PA, USA. 10-12 Jul 2023. 10-12 Jul 2023. Poster.

Watmough SA. Wood ash recycling to restore forest soil health. AGM for the Ontario Maple Syrup Producers Association, Algonquin College, Perth. 24 Jul 2023.

Watmough SA. Restoring soil nutrients through soil amendments: benefits and challenges. Haliburton Forest Research Day, Haliburton Forest. 13 May 2023.

Watmough SA and P Levasseur. Carbon cycling in restored upland forest sites in Sudbury Ontario. RE3 Conference, Québec, QC. 11-15 Jun 2023.

Webster KL, KA Bona, EJS Emilson, DK Thompson, O Hararuk and WA Kurz. 2023. What's new in the CaMP-ground? CaMP-Per and CaMP-DOC will add permafrost and dissolved organic carbon dynamics to national peatland carbon accounting. CGU Annual Meeting. Banff, AB. 7-10 May 2023.

Wijewardena T, N Mandrak, A Lentini and J Litzgus. Demographic assessment of a freshwater turtle assemblage in an urban protected area in the context of ongoing threats and mass mortality events. CHS, Ottawa, ON. 15-18 Sept 2023.

Wijewardena T, NE Mandrak, JE Paterson, CM Davy, CB Edge, AM Lentini and JD Litzgus. Evaluation of release techniques of headstarted Blanding's Turtles (*Emydoidea blandingii*) in an urban landscape. Emydine Conservation Symposium, Huntingdon, PA, USA. 10-12 Jul 2023.

Wijewardena T, C Drader, D Gasbarrini (presenter), J Litzgus and NE Mandrak. Mass mortality of multiple species of freshwater turtles in a protected urban wetland complex in Ontario, Canada. Emydine Conservation Symposium, Huntingdon, PA, USA. 10-12 Jul 2023.

Wolter J, H Bergstedt, B Jones, M Kanevskiy, P Roy-Leveillee, A Veremeeva and G Grosse. A synthesis of drained lake basin ages for northern permafrost regions. EUCOP23 the Sixth European Conference on Permafrost, Puigcerdà, Spain. 18-22 Jun 2023.

Research Grants

Arnott, S

- NSERC Discovery. A multi-scale approach to identifying the ecological impact of co-occurring environmental stressors (2019-2024)
- Canadian Institute of Ecology and Evolution. The regional extent of genetic adaptation in *Daphnia pulicaria* to freshwater salinization - working group (2023)
- OMECP. Quantifying the chloride-water hardness relationship for *Daphnia* and mussels (2021-2023)
- Science Communication Skills Grant (Pilot). Development of inclusive science communication training through an anti-racist lens. PI Orihel (2021-2023).
- ArcticNet. Ensuring water security in the High Arctic: understanding the impacts of changing permafrost, hydrology, and water quality on aquatic ecosystems. Lafreniere (PI) (2019-2024)
- Matariki Queen's-Dartmouth Fund. Assessing zooplankton response and resilience to chloride contamination (2019-2023)
- Aquacosm Plus. Plankton responsiveness to exposure of salinity under varying rates (PRESUR) with 10 other team members (Summer 2023)
- i-LINK. A global analysis of the impacts of freshwater salinization on aquatic biodiversity (GLOBALSALT). PI M. Cañedo-Argüelles and 6 others (2023-2024)
- CFI. Environmental and climate change observatory of Ontario (ECCO-Ontario): Infrastructure for research into biotic responses to climate change and other stressors. Co-applicant with PI S. Lougheed and 6 others (2024-2029)
- NSERC Alliance. New genomics and aerial drone tools for monitoring, managing and mitigating threats in aquatic ecosystems. Co-applicant with PI S. Lougheed and 2 others. (2023-2025)

Barriault, C

- Knowledge Mobilization Activities and Initiatives Fund Grant from Laurentian University's internal SSHRC Exchange for "Science Communication in the Workplace Symposium: Creating Capacity for Canada's Current and Future Needs" (2022-2023)

Basiliko, N

- CFI, John Evans Leaders Fund and ORF - Small Infrastructure. Research infrastructure for multitrophic studies of boreal forest landscapes. Basiliko (PI) with A Thomson and S-I Lee (Lakehead). (2023-2028)
- NSERC Alliance Missions Grant. Mining atmospheric CO_2: Assessing the efficacy of novel carbon sequestration strategies in smelter damaged ecosystems to achieve net zero GHG emissions. C McCarter PI with E Gould, P Whittington and Basiliko
- NSERC-SSHRC, Sustainable Agriculture Initiative Project development funding. Clearing the way for agricultural expansion in the North: evaluating alternative land conversion practices. A Diochon PI with C Levkoe and Basiliko.

- Mitacs Accelerate (and SAPPI North America). Managing the greenhouse gas burden of pulp and paper wastes at Sappi North America. N DeMartini and Basiliko co-PIs. 2023-2026
- Mitacs Accelerate (and Canadian Kraft Paper Industries). Novel treatments and end uses for kraft mill residuals: on-mill-site post-doctoral research for improved dewatering and energy recovery and developing targeted soil amendments for agriculture, silviculture, and land reclamation. DeMartini and Basiliko co-PIs. (2022-2024)
- Canada Research Chairs. Tier II CRC in Environmental Microbiology renewal. (2013-2023)
- NSERC Discovery. The tiny majority: how microbes mediate ecosystem functioning under anthropogenic stressors in boreal environments (2019-2025)
- NSERC Innovation Links Grant. Constraints on northern aggregate mine reclamation and novel reclamation strategies for enhancing biodiversity and ecosystem functioning with M Hebert, M Nellis, R Rochon, S Bouchard, R Craig (Collège Boréal), G Spiers, and P Beckett (Laurentian) (2021-2025)
- Polar Knowledge Canada. How shrubification influences hydrology, permafrost, and mercury mobilization: a cross-disciplinary approach to landscape change to support community resilience in Old Crow Flats, YT. P Roy-Léveillée PI, with Turner, Branfireun and Calmels (2020-2023)

Beckett, P

- NSERC Innovation Links Grant. Constraints on northern aggregate mine reclamation and novel reclamation strategies for enhancing biodiversity and ecosystem functioning with M Hebert, M Nellis, R Rochon, S Bouchard, R Craig (Collège Boréal), and G Spiers and Basiliko (Laurentian U) (2021-2025)

Belzile, N

- NSERC Discovery. Study of factors to improve the removal of trace metals/elements from mine effluents using low cost adsorbents. (2019-2025)

Edwards, B

- CFEU funded summer research assistant

Emilson, E

- Genomics Research Development Initiative. Genomic Adaptation and Resilience to Climate Change (the GenARCC Project) (2022-2025)
- Healthy Forest Partnership. Spruce budworm pest management as a conservation tool for critical habitats and ecological integrity of forest watersheds. Co-Lead with M. Statsny (2018-2025)

Gunn, J

- NSERC Canada Research Chair Tier 1 in Stressed Aquatic Systems (2003-2024)
- NSERC Discovery, Terrestrial ecosystem services and recovery of damaged aquatic systems (2016-2024)

- Conservation Sudbury. LU/NDCA Parternship Program (2023-2025)

Ielpi, A

- NSERC Discovery. Precambrian rivers and potential analogs with modern terrestrial and extra-terrestrial fluvial landscapes (2016-2023)
- Yukon Geological Survey. Impact of permafrost degradation on streams and nearby infrastructures: Thematic work near the community of Carmacks (2022-2023)

Johnston, T

- NSERC Discovery Development Grant Program. The trophic niche in boreal lake food webs. (2020-2023)
- Ontario Ministry of Natural Resources and Forestry, Aquatic Research and Monitoring Section. Northern fisheries research (2004 – present, renewed annually)

Lescord, G

- National Research Council Canada, Northern Challenge Program Grant. Real-time monitoring of contaminants in food fish and water. A. Tanentzap Co-I. (2023-2026)
- Dept. of Fisheries and Oceans (DFO) Ecosystems Oceans Science Contribution Framework. Impacts of land-use change on lake sturgeon habitat use, feeding ecology, contaminant exposure, and health in the James Bay Lowlands. Partners: Moose Cree First Nation, WCS Canada, Laurentian, MNRF, Ontario Tech University (2021-2023)
- First Nations Environmental Contaminant Program (FNECP). Understanding contaminants of potential concern in fish from traditionally-important water bodies around Wahnapitae First Nation. Granted to Wahnapitae First Nation with G. Lescord and B Laird as scientific partners (2022-2024)

Litzgus, J

- NSERC Discovery. Integrating life history variation into conservation of reptiles (2017-2024)
- HIW, Pattern Energy. Demography and spatial ecology of spotted turtles in inland and coastal populations in Parry Sound District (2022-2024)
- MITACS Accelerate. Impacts of wildfire and windfarm construction on herpetological community of eastern Georgian Bay (2022-2024)
- MITACS Business Strategy Internship for Bachelor of Environmental Solutions program development (2024) with Greater City of Sudbury
- Georgian Bay Biosphere. Road mortality mitigation for SAR turtles in eastern Georgian Bay (2021-2025)
- Pattern Energy and Henvey Inlet Wind (2022-2024)
- Vale Ltd. Cooperative Freshwater Ecology Unit project support including the CRADLES project (2024-2027)
- Glencore Sudbury Integrated Nickel Operations. CRADLES program support (2024-2027)

Mykytczuk, N

- NOHFC (through MIRARCO with support from Vale Global). Industrial Research Chair in Biomining and Bioremediation (2023-2028)
- Mining Innovation Commercialization Accelerator (2023-2025)
- NSERC Discovery. Understanding variability in microbial biomining and bioremediation consortia; adaptation mechanisms for multiple extremes (2019-2024)

Pearson, D

- The Resilience Institute. Climate change and adaptation resource production. Co-applicant with C. Sarrazin-Delay (2022- 2023)
- Matawa First Nations Management. Blastomyces literature review and resource production. Co-applicant with C. Sarrazin-Delay (2022-2023)

Roy-Léveillée, P

- Research Chair in permafrost geomorphology in Nunavik, Ministère de l'Environnement et de la Lutte aux Changements Climatiques (2020-2025)
- Chaire de recherche Sentinelle Nord sur le pergélisol, Sentinelle Nord (2020-2023)
- NSERC Discovery. Permafrost aggradation and degradation in relation to disturbance in isostatically uplifted (2022-2027)
- CFI Equipment. Dynamiques géomorphologiques des plaines pergélisolées en dégradation et rétroactions environnementales (2022-2025)
- NTCF Northern Arctic Funding. PermaRail: A Transdisciplinary Approach to Increasing Railway Resilience to Permafrost Terrain Changes in a Warming Climate Co-applicant with J Hayley (2021-2028)
- Société du plan Nord Fonds d'initiatives Nordiques. Acquisition et développement de nouvelles connaissances géoscientifiques en support à l'implantation d'infrastructures de transport linéaire terrestre au Nunavik (2021-2023)
- Polar Knowledge Canada. Shrubification, hydrology, permafrost, and mercury mobilization: a cross-disciplinary approach to landscape change to support community resilience in Old Crow Flats, YT (2020-2023)
- NSERC Strategic Partnership Grants for Networks. Permafrost Partnership Network for Canada. Co-PI (2019-2024)
- NSERC Advancing Climate Change Science in Canada. Winter Carbon Losses in Wetland Ecosystems under Current and Future Climates (2019-2023)

Sarrazin-Delay, C

- Manitoulin Stream Improvement Association: Benthic macroinvertebrate monitoring (2023)
- Ministry of Environment, Conservation and Parks: Benthic macroinvertebrate processing (2023)
- The Resilience Institute. Climate change and adaptation resource production. Co-applicant with D. Pearson (2022- 2023)

- Matawa First Nations Management. Blastomyces literature review and resource production. Co-applicant with D. Pearson (2022-2024)

Scott, JA

- NSERC Discovery. Bioprospected microalgae and CO_2 in industrial emission utilization (2020-2025)
- NSERC Alliance. Innovative carbon capture technology for Canada's SME breweries and wineries that turns wastes into valuable natural health and environment beneficial products with Grape Growers of ON, Malivoire Wine Co. Ltd. ON Craft Brewers Assoc. Niagara Custom Crush Studio and Bench Brewing Co. (2023-2026)
- NSERC Alliance. A Brazil/Canada initiative to bioprospect for novel sources for natural disease fighting compounds
- Mitacs. Use of non-ore resources to enhance the economic, social and environmental sustainability of the mining industry with Glencore (2022-2026)
- Global Affairs Canada. Visiting international research student (2023-2024)
- Brazilian National Council for Scientific and Technological Development. Prospecting antimicrobial activity of microalgae and cyanobacteria extracts, effects of pH stress during growth and cyclodextrin use on the effectiveness of extracts (2022-2023)
- CFI, John Evans Leadership Fund. Bioprospecting in Canada for health beneficial compounds (2020-2025).

Spiers, G

- NSERC Innovation Links Grant. Constraints on northern aggregate mine reclamation and novel reclamation strategies for enhancing biodiversity and ecosystem functioning with M Hebert, M Nellis, R Rochon, S Bouchard, R Craig (Collège Boréal), and P Beckett and N Basiliko (Laurentian U) (2021-2025)
- MITACS-Testmark, MITACS Accelerate Grant. Development of passive sampling devices for natural and artificial radionuclides in the context of pre- and post-deployment of small nuclear reactors in remote areas. Spiers (PI, LU) with Caron (CoI, RMC), Chabonneau (Testmark Project Lead). (2022 – 2024)

Swanson, H

- Saugeen Shores and Nuclear Innovation Institute. Pre-feasibility assessment for restoration of an urban lake, Fairy Lake, in Southampton, ON. Rooney and Swanson (2021-2023)

Tanentzap, AJ

- NSERC Disovery and Northern Research Supplement. Ecological importance of organic matter in a warming world (2023-2028)
- National Research Council Canada, Northern Challenge Program Grant. Real-time monitoring of contaminants in food fish and water. G Lescord Co-I. (2023-2026)
- National Research Council Canada. Real-time monitoring of contaminants in food fish and water. (2023-2026)

- CFI John R. Evans Leaders Fund Partnership grant. Environmental Microbiology culturing and sequencing facility (2022-2027)
- NERC Canada-Inuit Nunangat-United Kingdom grant. Community-led wildlife health monitoring for a resilient and healthy Nunavik (2022-2025)
- NERC National Environmental Isotope Facility grant. When did the spiny water flea invade North America? (2022-2023)
- NERC Changing the Environment grant. Landscape regeneration solutions to the interlinked extinction and climate crises (2022-2027)
- European Research Council. Ecological and evolutionary importance of molecular diversity in dissolved organic matter. 5-year programme to study the biological relevance of chemical diversity in dissolved organic matter (2019-2025)

Watmough, SA

- NSERC Discovery. Climate change and forest carbon capture (2022-2026)

Theses Completed

PhD

Chan-Yam, Kelly. PhD. Seasonal variations of the bacterial biome in wastewater treatment. Laurentian University (Basiliko/Scott)

Freeman, Erika. PhD. Logging impacts the ecology of molecules in headwater streams. University of Cambridge (Tanentzap/Emilson)

Keevil, Matthew. PhD. Demographic processes and behaviour of Snapping Turtles in the context of past catastrophes and ongoing threats. Laurentian University (Litzgus)

Levasseur, Patrick. PhD. The biogeochemistry of regreened forests on a mining and smelting degraded landscape. Trent University (Watmough)

Seward, James. PhD. Winter soil microbial ecology in northern Canadian peatlands. Laurentian University (Basiliko/Beckett/Roy-Léveillée)

Sun, Xinyu. PhD. Interactive Effects of Elevated Salinity and Heatwaves on Freshwater Zooplankton: From Community Ecology to Individual Physiology. Queen's University (Arnott/Rusak)

Tafvizi, Arghavan. PhD. Using Stable Water Isotopes and Isotope-enabled Hydrologic Modelling to Quantify Water in Central and Northeastern Ontario. Laurentian University (Ramcharan/James)

Wijewardena, Tharusha. PhD. Evaluation of the Blanding's Turtle reintroduction program into the Rouge National Park. Laurentian University (Litzgus/Mandrak)

MSc

Cicchetti, Lisa. MSc. Genetic variation, but no evidence of evolved tolerance, for *Daphnia* in road salt polluted lakes in Ontario. Queen's University (Arnott)

Clark, Thomas, MSc. An Evaluation of Droplet Digital Polymerase Chain Reaction as an Effective Tool for Biomass Quantification of Mixed Bioleaching Consortia from Stirred Tank Bioreactors. Laurentian University (Mykytczuk)

Comley, Jacob. MASc. Capture of industrial CO2-rich off-gas through optimized cultivation of microalgae. Laurentian University (Scott/Laamanen)

Conquer, Shelby. MSc. Biogeochemical Responses to a Non-Industrial Wood Ash Addition in a South-Central Ontario Forest. Trent University (Watmough)

Dawson, Jade. MSc. Modeling trophic recovery, interactions, and food web dynamics across smelter-damaged lakes. Laurentian University (Edwards/Gunn).

Ewins, Carrie. MSc. Effects of increased turbidity and nutrients on freshwater zooplankton and phytoplankton communities. Queen's University (Arnott/Lamoureux)

Girard, Lianne. MSc. Determining the relative impacts of natural and anthropogenic contamination in the Tambo River Basin, Peru. Laurentian University (Mykytczuk/Ramcharan)

Kentel, Jenna. MSc. A rocky solution: Evaluating the use of common construction materials as road-effect mitigation for turtle communities in a rock barren landscape. Laurentian University (Litzgus)

Lepage, Adam. MSc. Speciation of Arsenic in Freshwater Biota. Laurentian University (Lescord/Gunn)

Martin, Troy. MSc. Assessing the toxic effects of "eco-friendly" road de-icer alternatives on freshwater plankton communities. Queen's University (Arnott)

McCaig, Madison. MSc. The influence of spruce budworm defoliation on stream microbiome structure and function. McMaster University (Kidd/Emilson)

Moskal, Haley. MSc. Assessment of the Recovery of Littoral Zone Food-webs in Lake Charr Lakes in Killarney Provincial Park Affected by Acidification and Contemporary Stressors. Laurentian University (Edwards/Gunn)

Smith, Ed. MSc. Short-term biogeochemical response of hardwood forest soils to wood ash additions in central Ontario. Trent University (Watmough)

MSCom Major Research Papers/Projects, Laurentian University

Bennett, Jamie. MSCom. The Frequency of Aggressive, Contemptuous, Nonviolent, and Neutral Communication Within and Between Climate Scientists' Twitter Profiles.

Chartrand, Anastacia. MSCom. Harmonizing Voices: Culturally Respectful Interviewing Methods for Understanding Climate Change in First Nation Communities.

Cooke, Emily. MSCom. Digesting Ozempic: How information sources on the type 2 diabetes drug Ozempic can affect patient understanding and decision making.

Copley, Catherine. MSCom. The Alienation of Pain: A Rhetorical Critique of How People with Fibromyalgia are Characterized in Research-Focused, Clinically-Focused, and Patient-Focused Writing.

Forneste, CJ. MSCom. A Unique Family Dynamic: Children as Brokers of Their Immigrant Families' Health-Literacy in Canada.

Matheson, Alyssa. MSCom. Accessibility of Canadian Science Festivals as presented on their websites.

Moreau, Andrea. MSCom. Mitigation Through Education: Identifying communication strategies employed by informal learning experiences that are predictive of climate action.

Patterson, Heather. MSCom. A science and an art: Developing a framework for assessing quantitative and qualitative attributes of public facing websites for the purpose of promoting pro-conservation behaviours.

Raguraman, Aishwarya. MSCom. Discovering which Physical Characteristics of Science YouTube Video: Maximize Learning and Engagement for Viewers.

Taskar, Mitaali. MSCom. Formal Science Education, Informal Science Learning, and the Impact on Students.

Tippin, Amy. MSCom. Learning Impact of Youth Science Camps on Guardians as a Secondary Audience.

Wittke, Cait. MSCom. The Mental Health Epidemic of Post-Secondary Student Athletes Victoria Camp**:** 'Mining' the comments: Exploring public opinion of mine tailings management through Facebook comments and associated news.

Undergraduate

Bateman, Dillon. BSc Thesis. Walleye and northern pike: apex predators cohabiting through niche differentiation. Laurentian University (Johnston)

Campbell, Katrina. BSc Thesis. Is maternal body condition correlated with clutch variables in turtles? (Litzgus)

Cochrane, Marissa. BSc Thesis. Water hardness: Do varying Ca:Mg ratios influence acute chloride toxicity in *Daphnia pulicaria*? Queen's University (Arnott)

Drektraan, Laura. BSc Thesis. Behaviour of turtle hatchlings when maneuvering rip-rap materials. (Litzgus)

Fee, Abigail. BSc Thesis. "Eco-friendly" road de-icers may not be so friendly: Assessing the toxicity of a beet-juice brine de-icing product and KCl to *Daphnia pulicaria*. Queen's University (Arnott)

Galvani, Zachary. BSc Thesis. Dawn of the Undead *Daphnia*: Insights into Rapid Evolution to Salinization from Contemporary and Resurrected *Daphnia spp.* in an Impacted Suburban Lake Queen's University (Arnott)

Leclair, Charly. BSc Thesis. Trophic ecologies of fishes in small stream ecosystems of the Far North of Ontario. Laurentian University (Johnston)

Miller, Sydney. BSc Thesis. The brimstone factor: muscle Sulphur compositions and mercury concentrations in freshwater fishes. Laurentian University (Johnston)

O'Meara, Adam. BSc Thesis. Recovery of fish populations in a highly degraded stream in response to improving water quality, in Sudbury Ontario. Laurentian University (Gunn)

Orr, Rachel. BSc Thesis. Effect of turbidity on zooplankton community structure in Canadian high Arctic ponds. Queen's University (Arnott)

HQP Supervised

Beckwith, Neil. BSc Thesis in progress, Trent University (Watmough)
Bouffard, Michaela. BSc Thesis in progress, Laurentian University (Litzgus)
Conway, Devon, BSc-F Thesis in progress, Lakehead University (Basiliko)
Desaulniers, Jessica. BSc Thesis in progress, Laurentian University (Litzgus)
Duan, Xinran, BSc-F Thesis in progress, Lakehead University (Basiliko)
Gross, Justin. BSc Thesis in progress, Queen's University (Arnott)
Rodriguez, Macy. BSc Thesis in progress, Laurentian University (Litzgus)
Socransky, Liam. BSc Thesis in progress, Laurentian University (Johnston/Martinez)
Song, Yifan, BSc-F Thesis in progress, Lakehead University (Basiliko)
Stewart, Ella. BSc Thesis in progress, Queen's University (Arnott)

Bewsh, Victor. MSc Thesis Student, Trent University (Watmough)
Carroll, Brooke. MSc Thesis Student, Laurentian University (Litzgus)
Corbière, Nicole. MSc Thesis Student, Laurentian University (Roy-Léveillée/Basiliko)
Dasne, Anne Sylvie. MSc Thesis Student, Trent University (Watmough)
Fields, Emily. MSc Thesis Student, Laurentian University (Johnston)
Foley, Kaylen. MSc Thesis Student, Trent University (Watmough)
Ford, Erin. MSc Thesis Student, Queen's University (Arnott)
Grew, Ashley. MSc Thesis Student, Queen's University (Arnott)
Huth, Adelaide. MSc-F Thesis Student, Lakehead University (Basiliko)
LaFlamme, April. MSc Thesis Student, Queen's University (Arnott)
Lau, Vincent. MSc Thesis Student, Trent University (Tanentzap)
Lounsbury, Sabrina. MSc Thesis Student, Laurentian University (Litzgus)
Maloney, Aidan. MSc Thesis Student, Laurentian University (Litzgus)
Matula, Erin. MSc Thesis Student, Trent University (Tanentzap/Emilson)
McGrath, Samantha. MASC Thesis Student, Laurentian University (Scott)
Mitchell, Samantha. MSc-F Thesis Student, Lakehead University (Basiliko/Pendea)
Nicholls, Taylor. MSc Thesis Student, Laurentian University (Lescord/Gunn)
Rinaldi, Kathryn. MASC Thesis Student, Laurentian University (Scott)
Siket, Katherine. MSc Thesis Student, Trent University (Tanentzap)
Thibeault, Stephane. MSc Thesis Student, Laurentian University (Litzgus)
VanDenDiepstraten, Heather. P/T MSc Thesis Student, Laurentian University (Litzgus)

Britt, Meg. PhD Thesis Student, Laurentian University (Litzgus/Lougheed)
Choquette, Jonathan. P/T PhD Thesis Student, Laurentian University (Litzgus/Pitcher)
Corcoran, Jason. PhD Thesis Student, Laurentian University (Scott)
Fawcett, Claire. PhD Thesis Student, Laurentian University (Scott)
Gauthier, Miranda. PhD Thesis Student, Laurentian University (Scott)
Gigeroff, Andrea. PhD Thesis Student, Laurentian University (Litzgus/Riley)
Johnston, Caelan. PhD Thesis Student, Queen's University (Arnott/Rusak)
Kapoor, Dhruv. PhD Thesis Student, University of Cambridge (Tanentzap)

Kirkwood, Adam. PhD Thesis Student, Carleton University (Roy-Léveillée/Richardson)
Kontou, Danai. PhD Thesis Student, University of Cambridge (Tanentzap)
Lavigne, Jonathan. PhD Thesis Student, Lakehead University (Basiliko/Beckett)
Milli, Celeste. PhD Thesis Student, University of Cambridge (Tanentzap/Emilson)
Munford, Kimber. PhD Thesis Student, University of Guelph (Glasauer/Mykytczuk)
Ngoma, Emmanuel. PhD Thesis Student, Laurentian University (Mykytczuk)
Osborne, Chetwynd. PhD Thesis Student, Trent University (Watmough)
Ramirez, Karla. PhD Thesis Student, Lakehead University (Co-sup. Basiliko)
Sandor, Sarah. PhD Thesis Student, University of Cambridge (Tanentzap)
Therrien, Christian. PhD Thesis Student, University of Waterloo (Swanson Co-sup)

Badewa, Emmanuel, PDF, University of Toronto (Oelbermann/Basiliko)
Braga, Lucas, PDF, Cambridge (Tanentzap)
Chan-Yam, Kelly, PDF, University of Toronto (Co-sup. Basiliko)
Fonvielle, Jérémy, PDF, Cambridge (Tanentzap)
Kolmakova, Olyesya. PDF, Cambridge (Tanentzap)
Levasseur, Patrick. PDF. Lakehead University (Basiliko)
Rodríguez-Uña, Asun, PDF, Cambridge (Tanentzap)
Senhorinho, Gerusa, PDF, Laurentian (Scott)

Adkinson, Kevin. Research Technician, Trent University (Watmough)
Berman, Ben. Summer Work Experience Student, Queen's University (Arnott)
Capell, Scott. Field Technician. Great Lakes Forestry Centre, NRCan (Emilson)
Celis-Salgado, Martha, PhD Research Associate, Queen's (Arnott)
Chartrand, Derek. Lab Technician. Great Lakes Forestry Centre, NRCan (Emilson)
Greco, Danielle. Forest Ecologist. Great Lakes Forestry Centre, NRCan (Emilson/Venier)
Humbert, Bastien. Biosciences internship for INSA Lyon at Trent (Tanentzap)
Laavanya, Joshi. Summer Work Experience Student, Queen's University (Arnott)
McCaig, Madison. Watershed Analyst. Great Lakes Forestry Centre, NRCan (Emilson)
Sartori Manoel, Pedro, PhD Research Associate, Queen's (Arnott)
Smenderovac, Emily. Watershed Ecologist. Great Lakes Forestry Centre, NRCan (Emilson/Venier)

Staff and Faculty

External
Arnott, Shelley, Queen's University
Basiliko, Nathan, Lakehead University
Emilson, Erik, Canadian Forest Service, NRCan, Sault Ste. Marie, Cross-appointed LU
Ielpi, Alessandro, University of British Columbia (Okanagan)
Roy-Léveillée, Pascale, Université Laval
Swanson, Heidi, Wilfrid Laurier University
Tanentzap, Andrew, Trent University
Watmough, Shaun A., Trent University

Living with Lakes Centre

Barriault, Chantal – Director, Science Communication Program, LU
Chartrand, Anastacia, P/T NPU Coordinator (Gunn) and P/T Bachelor of Environmental Solutions Program Development Assistant (Litzgus)
Coady, Ryan - Fisheries and Restoration Ecology Project Biologist, LU (Gunn) (dep. Feb 2023)
Edwards, Brie - MECP Research Scientist/Cross-appointed LU
Fram, Kim - Research Assistant and Taxonomist, LU
Giroux, Michelle – Research Technician, MNRF
Gunn, John - Canada Research Chair in Stressed Aquatic Systems, LU; CFEU Director Emeritus
Haslam, Lee - Senior Fisheries Technician, MNRF
Heneberry, Jocelyne - Monitoring Coordinator, MECP
Johnston, Tom - MNRF Senior Research Scientist/Cross-appointed LU
Ki, Ki-Youn. Technical Support - Science Communication Training, Laurentian (Barriault)
McAuliffe, Cassidy – Communication Specialist, LU
Morin, Avery, P/T NPU Coordinator (Gunn)
Mykytczuk, Nadia – Exec. Dir. Goodman School of Mines, CEO and President MIRARCO
Oman, Karen - Business Manager, LU
Khalilzadeh, Parinaz, Research Technician, MNRF
Reid, Michelle, Science Communication Part-Time Technical Advisor (Barriault) (Jan-Sept 2023)
Reid, Michelle, Master Lecturer, Science Communication Program, SONS (Sept-Dec 2023)
Sarrazin-Delay, Chantal - Associate Project Lead, Climate Change and Ecology, LU
Tremblay, Nathalie – Senior Lab Technologist, LU (Jan-Sept 2023)

Senior Research Fellows (SRF)

Beckett, Peter -SRF in Ecosystem Restoration, VLWLC (Emeritus Laurentian University)
Keller, Bill - SRF in Northern Studies, Vale Living with Lakes Centre (VLWLC)
Pearson, David – Climate Change Impact Project Lead, Science Communication and SRF in Climate Adaptation, VLWLC (Emeritus Laurentian University)
Ramcharan, Charles - SRF in Freshwater Biology, VLWLC (Emeritus Laurentian University)
Rosseland, Bjorn - SRF in Ecotoxicology, VLWLC (Emeritus Norwegian University of Life Sciences)
Spiers, Graeme - SRF in Pedology, VLWLC (Emeritus Laurentian University)
Yan, Norm - SRF in Aquatic Ecology, VLWLC (Emeritus York University)

Field Technicians and Research Assistants

Bronson, Joanna, MNRF SEO student (Johnston)
Cook, Descanon, Workstudy Climate Change Research Assist. Winter-Summer (Sarrazin-Delay)
Elliott, Quinn, NPU Summer Field Assistant (Gunn)
Keating, Justine, Summer Field Assistant (Litzgus)
Lafleur, Natalie, MNRF SEO student (Johnston)
Leclair, Charly, Workstudy Benthic Research Assistant Winter-Summer (Sarrazin-Delay)
Moskal, Haley, Summer Research Assistant (Edwards)
Robinson, Naomi, NPU Summer Field Assistant (Gunn)

Rodriguez, Macy, Summer NSERC USRA Student (Litzgus)
Warner, Douglas, Summer Field Assistant (Litzgus)
Wildschut, Miah, Summer Field Assistant (Litzgus)
Wright, Emma, NPU Field Assistant (Gunn)