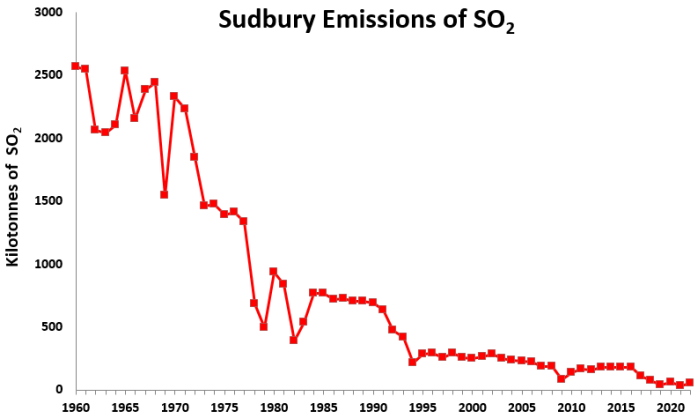


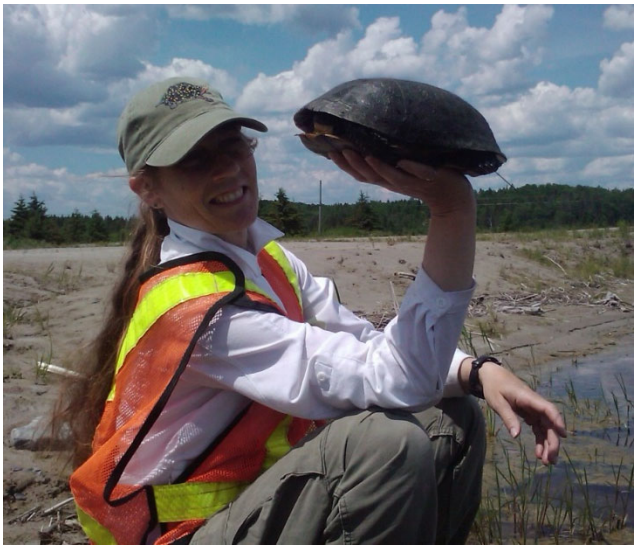
Cooperative Freshwater Ecology Unit
Unité Conjointe D'écologie D'eau Douce

2022 Annual Report Cooperative Freshwater Ecology Unit

"Clean Water Now and Forever"

A Message from the New Director
March 2023

Hello Co-op Unit friends and partners,



This 2022 CFEU Annual Report is starting a little differently than those you have read in the past… the rudder that steers this boat was passed from John to me in January 2023, so rather than recap what happened in 2022, I will focus more on what I hope to achieve going forward. I will do my best to stay the course, and even work on cresting a few new waves, all with the intent to fill the boat with people who have common goals and innovative ideas for reaching new horizons. But I have such big boots to fill! Thankfully, Karen and John have been instrumental in teaching me the ropes, and I know there is still much to learn.

During the 3 months that I have been in my new role of Director of the Lake Centre, I've had the opportunity to meet with members of the CFEU housed in the building, to learn about their projects and research programs. I sat down with Tom, Brie, and their teams over a cup of tea to learn about their respective government research programs. The long-term monitoring of lake and stream fish communities, food webs and water conditions undertaken by MNRF and MECP are the backbone of the Co-op; these are the data that tell the Sudbury Story of recovery in the aquatic landscape. I am inspired by David and Chantal S-D's Up North climate change project, and the true on-the-ground relevance and impact it has for First Nation communities in Northern Ontario. I met with Chantal B and Michelle to talk about the Science Communication program, its incredible reach supported by all three of the Canadian Tri-Council agencies (NSERC, CIHR and SSHRC), its unique training structure, and its pressing need for more permanent human resources. Next on my agenda is to meet with the Co-op partners outside the building; our supporters from industry and collaborators from other universities and government agencies.

For those of you who I have not yet had the pleasure to meet, let me introduce myself; I hail from Southern Ontario, am an alumnus of the University of Guelph (BSc, MSc), and obtained my PhD even further south, from the University of South Carolina, USA. I've been a professor in the Biology programs at Laurentian University since 2004. My research program focuses on the life history, ecology and conservation of at-risk reptiles (mostly turtles, some snakes), with an occasional foray into amphibian ecology and herpetological community ecology. I have extensive

experience working with government, industry, and First Nations, and my active research program is currently training 10 graduate students. My former students are now biologists with MNRF, Parks, Ducks Unlimited, Toronto Zoo, First Nation Lands Departments, consultants, and some are professors or are in other academic roles.

Looking to the future, Laurentian has emerged from CCAA, we have new leadership, tenure-track faculty positions are posted, and we have an opportunity to build something awesome, something that includes the CFEU as a significant contributor to the research mandate of the university. We can chart a course for a future that establishes the LWLC as an environmental research hub of the north. Of course, we have some work to do to get us there.

I have three main messages about that work that I want to share:

1. The CFEU is fundamentally grounded in partnerships among government, industry, First Nations, and academia. Each partner is integral, like a spoke in a wheel, all connected and centered, working together to move environmental and ecological research forward in a good way. We need to continue to solidify those partnerships with respect and reciprocity, but there is room to add more partners and to include succession planning, which brings me to my second message.
2. Building our research capacity. We need to build the LU faculty complement in research and teaching related to the environment. One effective avenue for doing this is a focus on cluster hires in the Canada Research Chair (CRC) program, once that door has been reopened to us, and to develop other supported research positions. And this second message leads naturally to my third message.
3. Building graduate programs. Graduate students are the foundation of research programs. On a personal note, mentoring graduate students has always been my greatest joy as a professor; I am inspired by these young scientists who eventually become family to me. I'd like us to work towards rebuilding a big family of young researchers who will eventually be leaders in environmental and ecological research.

I look forward to hearing your ideas about the work ahead.

Dr. Jackie Litzgus
Director, Vale Living with Lakes Centre

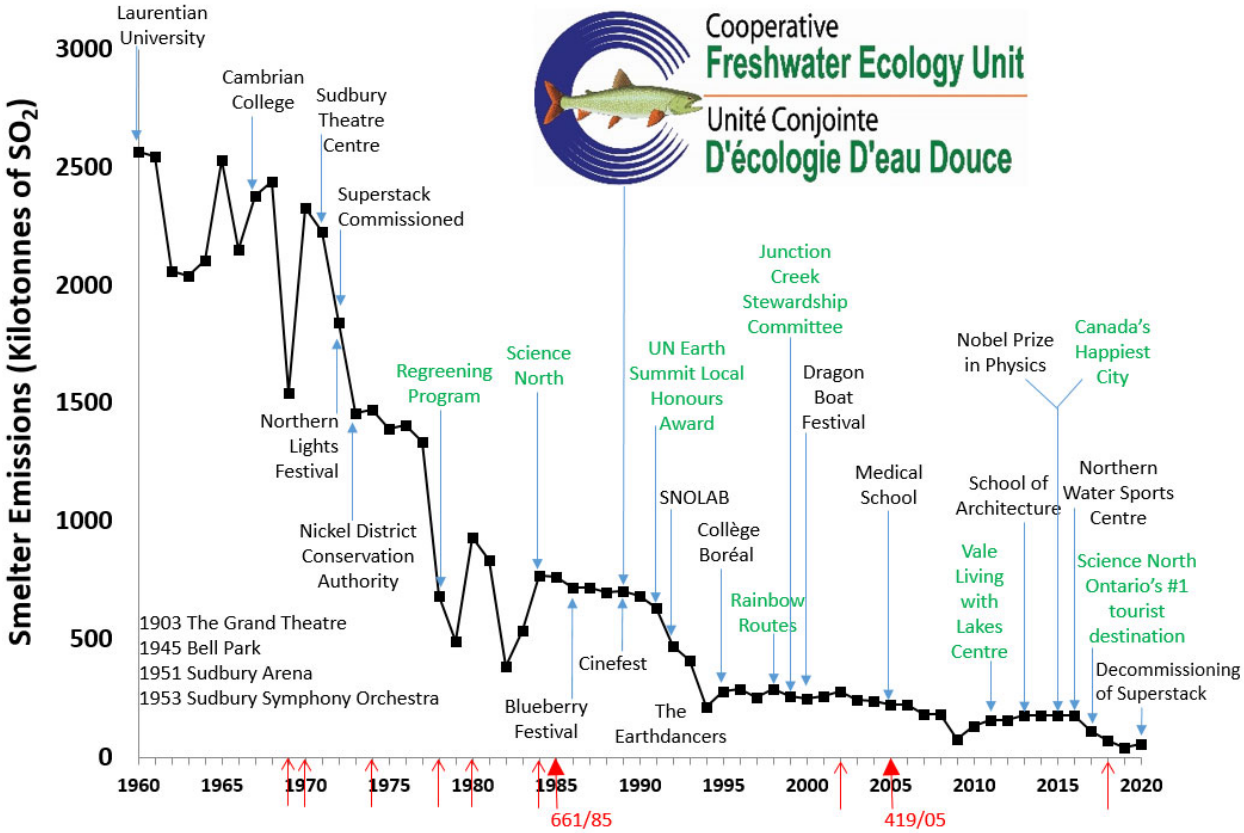


Fig. Creation of significant community assets with cleaner air in Sudbury. Timing of some of the government pollution control orders (↑) and regulations (▲) indicated.

Awards and Recognition

- Congratulations to Dr. Nadia Mykytczuk, who was awarded a five year NOHFC Industrial Research Chair in Biomining and Bioremediation through MIRARCO with industrial support from Vale Global on March 7, 2023! Co-applicants on the project include Cambrian College, BacTech Mining, Canmet Mining, the University of Toronto and Teck Resources. This award is on the heels of a Northern Ontario Business Award for Innovation which she was awarded in 2022. These awards are well-deserved recognition for Dr. Mykytczuk, who has been working tirelessly in her positions as Interim Executive Director of the Goodman School of Mines and President and CEO of MIRARCO since 2021. We will continue to support her in her work in any way we can and encourage others to do the same.

- Congratulations to Dr. Heidi Swanson who was appointed as the Inaugural Jarislowsky Chair in Sustainable Water Futures at Wilfrid Laurier University in July 2022! This endowed research chair was established through a transformational $2-million gift from the Jarislowsky Foundation (matched by Laurier with $2M) and will focus on sustainable resource management and adaptation to climate change. In her role, Dr. Swanson will work between Laurier's Waterloo campus and Yellowknife, where Laurier maintains a research office and a research partnership with the Government of the Northwest Territories.

- Dr. Andrew Tanentzap was awarded a Canada Research Chair in Climate Change and Northern Ecosystems at Trent University where he is now an Associate Professor. In addition, he was nominated for the Blavatnik Award for Young Scientists in the UK, administered by the New York Academy of Sciences and ranked in the top-10 in the entire Life Sciences category. Finally, his paper on plastic pollution (Sheridan et al. 2022 Nature Communications) was Selected as a Research Highlight by Nature Reviews Microbiology. Andrew has much to be proud of and we look forward to seeing more of him now that he is back in Canada!

- Dr. Shelley Arnott was named an Association for the Sciences of Limnology (ASLO) Sustaining Fellow in 2022. ASLO Sustaining Fellows are recognized as having sustained excellence in their contributions to ASLO and the aquatic sciences. Congratulations Dr. Arnott!

- Congratulations to Dr. Jackie Litzgus, who was presented with the Ontario Nature Conservation Leadership Award by Ontario Nature on June 11, 2022. Dr. Litzgus was honoured for her major contributions to our knowledge of species at risk biology and conservation planning.

- Michelle Reid, a Sessional Instructor, Technical Advisor, and Adjunct Professor with the Science Communication Program, received the Laurentian University Teaching Excellence Award for Part-Time Faculty at the Fall 2022 convocation. Michelle was described as "a champion of innovative teaching methods, especially in using educational technologies and in her application of active learning techniques to engage students to maximize participation and experiential learning." In her teaching philosophy, she states that she tries "to establish a learning environment where students feel supported to take creative risks, stretch their comfort zone by communicating through new media formats, and openly share the challenges they are facing in their research and practice, so that we can approach them together." Bravo Michelle!

- Congratulations to Dr. Shaun Watmough for being nominated for both the Trent Symons Teaching Award and the Decanal Teaching Award. The Decanal is a Trent School of Graduate Studies award for Outstanding Graduate Mentorship.

- Congratulations to Science Communication Program Alumnus Anthony Morgan, who is a new co-host of The Nature of Things! Anthony joined Chantal Barriault and David Pearson on CBC Morning North on December 14, 2022 to discuss how the Science Communication program set him up for success in this new role. https://www.cbc.ca/news/canada/sudbury/nature-of-things-co-host-anthony-morgan-1.6684102

Student Scholarships, Fellowships, Bursaries

- Dr. Lucas Braga, PDF Cambridge (Tanentzap), won a Marie Skłodowska-Curie Fellowship for work on ancient viruses in thawing permafrost.

- Brooke Carroll, MSc Candidate Laurentian (Litzgus), received an NSERC Canadian Graduate Scholarship and a WCS Canada Weston Family Boreal Research Fellowship.

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

- Nicole Corbiere, MSc Candidate Laurentian (Roy-Léveillée/Basiliko), won an Indspire's BBF - Proctor and Gamble Indigenous Student Bursary 2022, a WCS Canada Weston Family Boreal Research Fellowship, a Royal Canadian Geographical Society Graduate Research Grant, an Indspire's BBF –Individual Giving Indigenous Student Bursary and received the 3rd place poster award at the North Yukon Permafrost Conference.

- Jenna Kentel, MSc Candidate Laurentian (Litzgus), won an OGS Scholarship. Jenna also won best 5-minute talk at the Canadian Herpetological Society meeting in September 2022.

- Adam Kirkwood, PhD Candidate Laurentian (Roy-Léveillée/Basiliko), held a Weston Northern Research award (2021-2022, $50,000) and NSERC CGS-D (2021-2024), and was awarded a WCS Canada Weston Fellowship for 2022. Adam also won the best poster presentation at the Sentinel North conference (prize $1000) for his poster entitled, "Estimates of mercury storage in the Hudson Bay Lowlands decrease by a factor of 10 when calibrated with field data".

- Danai Kontou, PhD Candidate Cambridge (Tanentzap), was awarded an R.C. Lewontin Early Award from the Society for the Study of Evolution for their work on Daphnia evolution in Muskoka lakes.

- Adam Lepage, MSc Candidate Laurentian (Lescord/Gunn), was awarded a NSERC CGS-M Scholarship and also won 2nd place for his presentation at the SETAC Laurentian & Prairie Northern chapter joint virtual conference and AGM.

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

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

- Corbin Montminy, BSc Student Queen's (Arnott), won the Wes and Dorletta Curran Memorial Award for research in aquatic ecology.

- Haley Moskal, MSc Candidate Laurentian (Edwards/Gunn), was awarded Weston Family Fellowship Funding through WCS and also received a NSERC CGS-M Scholarship.

- Taylor Nicholls, MSc Candidate Laurentian (Lecord/Gunn) won the Sudbury Game and Fish Protective Association Scholarship, a Kurt Grinnell Aquaculture Inaugural Scholarship for Indigenous students, and a Glencore WFN scholarship

- Heather Patterson MSc, MSCom Candidate Laurentian (Barriault) won an OGS scholarship.

- Dr. Asun Rodríguez-Uña, PDF Cambridge (Tanentzap), won a Royal Society Newton Fellowship to study forest restoration.

- Dr. Thomas Scheurel, PDF Cambridge (Tanentzap), won a Marie Skłodowska-Curie Fellowship to study how microbial consortia degraded brown water.

- Xinyu Sun, PhD Candidate Queen's (Arnott), won an Ecological Dissertations in the Aquatic Sciences (Eco-DAS) Award to participate in the Eco-DAS meeting in 2023.

- Stephane Thibeault, MSc Candidate Laurentian (Litzgus), won an OGS Scholarship.

Annual Pineapple Awards

Pineapple awards are presented at the end of each year to recognize staff who have gone above and beyond.

Community Outreach

- Dr. Shelley Arnott participated in the following public outreach initiatives:
  - ~ Gave the Royal Legacy Society Tea Talk entitled 'Freshwater salinization: why we need to use less salt.' Jun 2022
  - ~ Featured in article 'Use less salt! High levels of chloride from road salt are threatening Ontario's aquatic ecosystems', Skeleton Park Press. Fall 2022.

  Dr. Arnott also gave the following media interviews:
  - ~ La Presse, interview with Philippe Robitaile-Grou, 20 Apr 2022.
  - ~ The Pointer.com, interview with Joel Wittnebel, 12 Apr 2022.
  - ~ Queen's Gazette, Human-induced salt pollution a major threat to biodiversity in lakes. 22 Mar 2022. https://www.queensu.ca/gazette/stories/human-induced-salt-pollution-major-threat-biodiversity-lakes?utm_source=Gazette+Newsletter&utm_campaign=22daaeda42-2022-ur-qgt&utm_medium=email&utm_term=0_a59e82e8e1-22daaeda42-522027514
  - ~ News 8, Rochester, NY interview about road salt. 17 Mar 2022.
  - ~ CBC Fresh Air interview about road salt, 13 Mar 2022. https://www.cbc.ca/listen/live-radio/1-193-fresh-air/clip/15900339-new-study-queens-highlights-damage-salt-runoff-roads

- ~ CBC Ontario Morning interview about road salt. 8 Mar 2022. https://www.cbc.ca/listen/live-radio/1-112-ontario-morning-from-cbc-radio/clip/15899216-ontario-morning-march-8-2022-pt-2
- ~ Kingston Whig Standard, Life-saving road salt an environmental concern by Ian MacAlpine, 19 Jan 2022.

- Dr. Chantal Barriault participated in the following outreach initiatives:
  - ~ Delivered science communication skills training for graduate students as part of the NSERC-supported ReNewZoo initiative. 2 May 2022
  - ~ Delivered a science communication skills workshop for graduate students in Laurentian's Rural and Northern Health research program. The interactive workshop focused on designing engaging and accessible presentations. Mar 2022
  - ~ Delivered a science communication skills workshop for Forensics students at Laurentian University to encourage them to communicate their research findings with an audience-focused approach. Feb 2022

- Dr. Peter Beckett is the Outreach Coordinator with the VLWLC. He served in the following capacities in 2022:
  - ~ 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 SER Working group within the UN Decade on Ecological Restoration Framework
  - ~ Cambrian College Public Advisory Panel (Environmental Technician and Environmental Monitoring Programs)

  Dr. Beckett also participated in the following activities:
  - ~ Covered the history of smelting damage in the area and the Regreening Program itself at the Ontario Professional Foresters Association AGM which was held in Sudbury April 12 to 14. The conference was virtual with a series of meetings including a virtual tour of Sudbury's regreening efforts and update on progress made over the last decade. https://drive.google.com/file/d/1Hz90BduVxMuQ6vSPPKmlkJsh-_mChBB6/view?usp=sharing).
  - ~ Spent several weeks in summer of 2022 on-set at various locations and scouting for set locations (including working with Dr. Jane Goodall) for the 10 Millionth Tree event, Imax Jane Goodall's 'Reasons for Hope' and Dynamic Earth's 'The Sudbury Regreening Story' Gave a presentation at Cambrian College on Healing the Sudbury Landscape to 35 students from the College's Environmental Monitoring and Impact Assessment Program and Environmental Technician Programs. 21 Mar 2022

- ~ Gave virtual talk Abundance of Lichens and Mosses in the Restored Landscape around Base-Metal Smelters of Sudbury, Ontario, Canada to 140 delegates at the International Planning for Closure Conference in Santiago, Chile. 12 May 2022
- ~ Presented to 110 delegates at the 39th Annual Meeting of the American Society of Reclamation Sciences in Duluth, MN on 'Abundance of Lichens and Mosses on the Restored Landscape in the Nickel- Copper City of Greater Sudbury, ON, Canada'. 14 Jun 2022
- ~ With Dr. Graeme Spiers, hosted a day long field trip for over 20 participants of the Jesuits of Canada 'Reflections on Ecology Workshop' held by the Sudbury Jesuit Community. 25 Jun 2022
- ~ Provided a contextual tour of regreening history and efforts along the Kelly Lake Trail to the Honourable Steven Guilbeault, MP and Federal Minister of Environment and Climate Change with Dr. Stephen Monet, Dr. Graeme Spiers and Dr. David Pearson. 7 Jul 2022
- ~ With Dr. Spiers, attended meetings and talks with representatives from the Democratic Republic of the Congo's mining industry and government officials, along with City Economic Development staff, which focused on community and industry relationships, and government direction/guidance. As part of the information sharing exercise along with Dr. Spiers, a private tour was provided to Fr. Jacques Nzumbu from Kinshasa, Democratic Republic of the Congo. 17 Aug 2022
- ~ Gave presentation and tour for 10 third year students of the Natural Environment Technologist Field Camp from Sault College. 10 Sept 2022
- ~ With Dr. Graeme Spiers participated in a presentation on the status of Regreening to 50 attendees at the Hannah Lake Bible Camp. 16 Sept 2022
- ~ With Dr. Graeme Spiers gave an in-person talk to a class of 60 fourth year Environmental Science students at Trent University enrolled in the course ERSC 4530 Reclamation and Remediation of Sites. 5 Oct 2022
- ~ Led 70 participants on the Annual Minnow Lake Oak Forest and Restoration Walk. 10 Oct 2022
- ~ Led a tour at Kelly Lake Hill for 32 students of the Sir Sandford Fleming Restoration Program. 20 Oct 2022
- ~ Along with Dr. Spiers, gave a private regreening tour to Dr. Charles Driscoll on the occasion of Dr. Driscoll's having given the Annual Watershed Lecture. 28 Oct 2022
- ~ Gave talk about the Importance of Lichens and Mosses in Sudbury Restoration to 65 participants of the Canadian Land Reclamation Association (CLRA) ARC2002 Conference held in Truro, Nova Scotia. 8-10 Nov 2022
- ~ With Franco Mariotti, conducted a series of seasonal public nature walks; winter March 20, spring May 7 and autumn October 15, in the Laurentian University Greenspace that included the outcomes of past regreening efforts in the Bethel Lake watershed.

- Dr. Brie Edwards participated in the following public outreach initiatives in 2022:
  - ~ Was filmed performing water sampling procedures on Swan Lake as part of the IMAX/Goodall Science North film. Aug 2022

- ~ Participated in the School of Natural Sciences Seminar Series giving a presentation entitled, 'Monitoring Ontario's inland waters: Overview and recent insights from the Sudbury region'. March 2022

- Dr. Erik Emilson served on the City of Sault Ste. Marie Environmental Sustainability Committee and the Sault College School of the Natural Environment Advisory Committee.

- Kim Fram led 5 weekly Up North on Climate Adaptation Framework workshops (Virtual) 1-29 Jun 2022 and actively posted climate change awareness material on the UpNorthOnClimate Facebook page.

- Dr. John Gunn participated in the following public outreach initiatives in 2022:
  - ~ Was interviewed alongside Science Communication student and Environmental Sustainability Committee Co-Chair, Anastacia Chartrand, for an episode of CBC Morning, where they discussed their upcoming trip to the UN COP 15 in Montreal https://www.cbc.ca/listen/live-radio/1-41/clip/15952519
  - ~ Represented Canada at the COP 15 Biodiversity Conference with presentation entitled "Global Lessons from the Sudbury Story", Montreal, QC. 19 Dec 2022.
  - ~ 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
  - ~ Was interviewed alongside MSc student Haley Moskal, for a video on stewardship in Killarney Provincial Park https://www.ontarioparks.com/parksblog/revitalizing-killarney-lakes/
  - ~ Gave a presentation to the Honourable Steven Guilbeault, MP and Federal Minister of Environment and Climate Change while paddling Clearwater Lake in Sudbury. 8 Jul 2022

- Dr. Alessandro Ielpi and BSc Honours Candidate Carolyn Hatton, reached out to the Little Salmon Carmacks First Nation of Yukon to obtain permission to conduct fieldwork in their ancestral lands in 2022. This involved communications via email and an in-person meeting during which research activities and future engagement initiatives were discussed in collaboration with the Yukon Geological Survey

- Dr. Gretchen Lescord participated in the following public outreach initiatives in 2022:
  - ~ With MSc student Taylor Nicholls, Dr. Lescord co-planned/presented at a community engagement session at Wahnapitae First Nation speaking about contaminants and subsistence fishing, and their FNECP project
  - ~ Gave a community engagement presentation to AAFN, on the fish surveys, water chemistry, and contaminant sampling that was planned for July-Aug 2022

- Dr. Nadia Mykytczuk participated in the following outreach initiatives:
  - ~ Was featured in 'Sudbury's mine waste worth billions; new project to find ways of extracting valuable minerals', Sudbury Star, 8 Mar 2023

- ~ Was featured in 'NOBA 2022: Nadia Mykytczuk is the Innovation Award winner', Casey Stranges, Sudbury.com, 3 Jan 2023
- ~ Contributed Opinion column 'Laurentian must turn its legacy into a new vision for the future', Sudbury Star 29 Aug 2022

- Dr. David Pearson participated in the following public outreach initiatives in 2022:
  - ~ Featured in article 'New The Nature of Things co-host has a strong connection to northern Ontario', CBC News, 14 Dec 2022
  - ~ Featured in article 'A rare kiss, a visit underground: Sudbury's memories of Queen Elizabeth II', S. Juric, CBC News, 11 Sep 2022
  - ~ Guest on TVO's Agenda, 'How municipalities prepare for climate change.' 24 Aug 2022
  - ~ Featured in article " 'We've been lucky,' researcher says as fewer forest fires reported in northeastern Ontario'', CBC News, 15 Aug 2022
  - ~ Guest speaker for Matawa Four Rivers Webinar Series, 'Climate Change Adaptation Planning and Adaptation Options in First Nation Communities', 18 Mar 2022
  - ~ Guest interview 'First Nations Delivery for ENERVA Energy Solutions and Independent Energy Systems Operator', CBC Morning North, 3 Jan 2022
  - ~ Dr. Pearson also participated in the following Working Groups:
    - Climate Services Working Group – Training SubGroup (Env and Climate Change Canada)
    - Adaptation Skills Working Group (Natural Resources Canada)
    - National Adaptation Strategy Symposium re Public Engagement; Evaluation and Framework (Natural Resources Canada)
    - Award Panels – NSERC

- Dr. Charles Ramcharan participated in the following outreach initiatives in 2022:
  - ~ Served as a member of the City of Greater Sudbury Watershed Advisory Panel
  - ~ Served as a member of the Ramsey Lake Stewardship Committee
  - ~ Coordinator of the Laurentian Community Garden

- Michelle Reid participated in the following outreach initiatives in 2022:
  - ~ Supported communication strategy and asset development for UN COP15 delegation Dec 2022
  - ~ Supported a WCS Canada project led by Dr. Gretchen Lescord. Michelle reviewed and workshopped CFEU presentations with graduate students and staff to ensure they were tailored to engage the youth delegation from Moose Cree First Nation. 25 Aug 2022
  - ~ Michelle was a guest on Science North's 'Give Vaccines A Shot' podcast, where she discussed misinformation surrounding COVID-19, how to have challenging conversations about COVID-19 and vaccination with friends and family, and ways to encourage vaccine confidence. The podcast is part of a project funded through the Immunization Partnership Fund from the Public Health Agency of Canada. Episode: https://www.youtube.com/watch?v=R5OBybeezAE 25 May 2022

- ~ Led the event logistics and provided a press release and short interview to the Sudbury Star for the Northern MedTalks: Science North, HSN and Eastlink collaborate on northern MedTalks | Sudbury Star 21 Apr 2022

- Dr. Pascale Roy-Léveillée was part of an expert panel on Permafrost Carbon in the Context of Environment Impact Assessment at the North Yukon Permafrost Conference in Dawson City Canada. Other panel participants included S. Natali, D. McPhee and K. Bass and the audience was predominantly composed of knowledge users.

- Chantal Sarrazin-Delay participated in the following outreach initiatives in 2022:
  - ~ Led a 2-week workshop in Peawanuck to certify Weenusk First Nation community members in benthic invertebrate sampling and identification, 11-25 Oct 2022
  - ~ Led 2 outdoor, hands-on aquatic ecology workshops during Camp Chikepak, a week-long camp for children 9-14 from Mushkegowuk Council communities, 6-19 Aug 2022
  - ~ Actively posted climate change awareness and adaptation material on the UpNorthOnClimate Facebook page

- Dr. Graeme Spiers participated in the following outreach initiatives in 2022:
  - ~ Served as a member of VETAC
  - ~ Addressed ~ 200 Engineers at an annual training program in Tacna, Peru giving two talks entitled 'Developing a Peru-Canada Collaboration to Resolve Critical Environmental Questions', and 'Lessons Learned from The Experience of Sudbury, Ontario'. These talks were presented as part of the Colloquium of Technological Innovation for Accreditation, organized by the Professional School of Mining Engineering at the Jorge Basadre Grohmann National University. 16-17 Nov 2022
  - ~ Along with Dr. Peter Beckett, gave a private regreening tour to Dr. Charles Driscoll on the occasion of Dr. Driscoll's having given the Annual Watershed Lecture, 28 Oct 2022
  - ~ Gave an in-person talk to class of 60 fourth year Environmental Science students at Trent University enrolled in ERSC4530 Reclamation and Remediation of Sites, 5 Oct 2022
  - ~ Along with Dr. Peter Beckett, presented a talk entitled 'The Sudbury Protocol – Forty five years of Landscape Healing' to 50 guests at a special event at Hannah Lake Bible Camp, 16 Sept 2022
  - ~ With Dr. Beckett, attended meetings and talks with representatives from the Democratic Republic of the Congo's mining industry and government officials, along with City Economic Development staff, which focused on community and industry relationships, and government direction/guidance. As part of the information sharing exercise along with Dr. Beckett, a private tour was provided to Fr. Jacques Nzumbu from Kinshasa, Democratic Republic of the Congo, 17 Aug 2022
  - ~ Along with Dr. Peter Beckett, hosted a day long field trip for over 20 participants of the Jesuits of Canada 'Reflections on Ecology Workshop' held by the Sudbury Jesuit Community, 25 Jun 2022

- Dr. Heidi Swanson was featured in 'The Arctic community that chose conservation over Big Oil', by Edward Struzik, climatechnagenews.com, 07 Jan 2022

- Dr. Andrew Tanentzap participated in the following outreach activities in 2022:
  - ~ Gave many news and radio interviews on his plastic pollution work, including being featured on a science programme for RTE (Ireland's national broadcaster).
  - ~ Gave seminars at the Université du Québec en Abitibi-Témiscamingue and Novo Nordisk Fonden (Denmark)
  - ~ Hosted two visitors on sabbatical: Professor Ligia Tchaicka, from Universidade Estadual do Maranhão and Professor Yu (Frank) Yang, from University of Nevada, Reno

- Dr. Shaun Watmough participated in the following outreach activities:
  - ~ Ran two half-day experiential learning activities in the Trent Nature Areas for grade 7/8 students from two Peterborough Elementary High Schools: St. Paul's (5 Oct 2022) and St. Anne's (3 Nov 2022).
  - ~ Took part in a 1 week field course for Trent students in Barbados

- Dr. Norman Yan participated in the following engagement activities:
  - ~ Gave talk on the wide-reaching impact of road salt on the environment to the Muskoka Field Naturalists, 5 Jan 2023
  - ~ Was interviewed on the Chris O Show, Hunters Bay Radio (available on Sound Cloud), Dec 2022. https://soundcloud.com/hunters-bay-radio/chris-o-show-dr-norman-yan-dec-2022
  - ~ Was featured in 'What is being done with wood ash in Muskoka? Friend of the Muskoka Watershed continues collection, research', by Sarah Law, MuskokaRegion.com, 5 Apr 2022.
  - ~ Was featured in 'Hold the salt: Muskoka environmental group advocates for less road salt, more creative solutions', by Sarah Law, St. Catharines Standard, 31 Jan 2022
  - ~ Gave lecture entitled 'What might Hillel, Hiawatha and Hippocrates have thought about the practice of western ecological science: reflections on half a century of research on Ontario lakes', Episode 1 of The Best of Two Worlds Webinar Series hosted by the Muskoka Steamships & Discovery Centre and Friends of Muskoka Watershed, 28 Jan 2022

Anthony Morgan, a graduate of the Science Communication program housed in the LWLC, is one of the new co-hosts of the CBC's The Nature of Things.

Environmental Sustainability Committee

ESC YEAR IN REVIEW 2022

It was a very busy year for the Environmental Sustainability Committee led by Anastacia Chartrand. ESC meets regularly at VLWLC and reports to VPA Michel Piché with a mandate of:

1. Promoting environmental awareness and success on campus
2. Engaging with environmental advocates from the Sudbury area and beyond
3. Working towards carbon neutrality and campus restoration as part of the UN Decade on Restoration

Community Earth Day march, lake trout release and plaque unveiling at LU beach (April 22, 2022)	Unveiling of LU Logo sculpture at Climate Science Parkette. Announcement of MSoA design project for Restoration Forest supported by Margaret Atwood and Roger Nash (September 21, 2022)
Tree and wildflower giveaway to graduates at spring Convocation (May 30 - June 3, 2022)	Convocation video presentation and unveiling of Class of 2022 tree (October 29, 2022)
Assisted Land and Water Caring Committee with 1000 tree plantings (June 20, 2022)	Collaboration with MSoA Grad Studio during their development of the Climate Science Parkette Pavilion Design with Dr. Tammy Gaber and Bruce Mau (September - December 2022)
ESC/SGA leaders meet with Steven Guilbeault, Minister of Environment and Climate Change, to discuss regreening efforts (July 7, 2022)	Water quality testing with Nepahwin Lake Watershed Stewardship Group (April - October 2022)
SGA Welcome Week Participation (September 3-7, 2022)	Participation in UN COP 15 Biodiversity Conference in Montreal (Dec 19, 2022)
Construction of pollination garden at VLWLC (September 11, 2022)	*In 2023, we look forward to becoming a founding university of the **Nature Positive Universities Alliance**, co-led by the United Nations Environment Programme and the University of Oxford.*


2022 UN BIODIVERSITY CONFERENCE

2022 Watershed Lecture with Dr. Charles Driscoll

Dr. Charles Driscoll, Distinguished Professor from Syracuse University gave the annual Watershed Lecture on Friday, October 28, 2022 entitled: 'Long-Term Research at the Hubbard Brook Forest'.

Dr. Driscoll is a long-term investigator of the Hubbard Brook Long-Term Ecosystem Research study and his scholarly work addresses the effects of disturbance on forest, freshwater and marine ecosystems, including air pollution (acid and mercury deposition), land-use, and climate change. He has testified at US Congressional and state legislative committee hearings, and provided briefings to government agency and stakeholder groups on environmental issues. He has served on local, national and international committees pertaining to environmental management and policy. He is a member of the National Academy of Engineering and a fellow of the American Association for the Advancement of Science.

On the same day, Dr. Driscoll, along with Dr. Colin McCarter from Nipissing University, hosted our graduate students for the Watershed Student symposium. Lake Centre students presented their research projects and Dr. Driscoll provided feedback and guidance. While here, Dr. Driscoll also planted a tree along the United Nations Restoration Trail on campus contributing to Laurentian's Carbon Offset Forest.

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

L-CARE "Mining Atmospheric Carbon" 2017-2022

Landscape Carbon Accumulation through Reduction in Emissions (L-CARE) was a $2.0M project funded by NSERC and OCE through the Target GHG Program in partnership with Vale Canada Ltd., Glencore's Sudbury Integrated Nickel Operations and the City of Greater Sudbury. The objective was to qualify how massive sulphur and metal emissions reductions in Ontario's largest mining and smelting centre, coupled with novel ecosystem reclamation practices, can lead to long-term C sequestration and influence the underlying processed of primary production, mineralization of C and energy transfer through ecosystems and interrelated GHG fluxes.

The project included:

- N. Basiliko, J. Gunn, P. Beckett, B. Edwards (OMECP), N. Mykytczuk and G. Spiers from Laurentian with Emily Smenderovac serving as Project Manager.
- S. Watmough, Trent University
- J-P Bellenger, University of Sherbrooke
- P. del Giorgio and Y. Prairie, Université du Québec à Montréal
- A. Tanentzap, University of Cambridge
- J. Smol, A. Paterson (OMECP), Queen's University
- M. Waddington, McMaster University

Collaborators were located at Canadian Forest Service, NRCan (E. Emilson, T. Jones), Cornell University (J. Yavitt) the Northern Ontario School of Medicine (G. Ross), Collège Boréal (M. Hubert) and the City of Greater Sudbury (S. Monet, T. McCaffrey).

LCARE AGM June 27, 2019

LCARE Final Recommendations:

1. Industrially degraded lands or lands held in public trust (e.g. conservation areas, parks) should be the main priority for restoration efforts to prevent later loss of treed sites to urban development, roads, easements or other land-use conflicts.

2. Soil amendments are needed to maximize carbon sequestration rates. Natural regeneration rates without soil amendments or without active tree planting are simply too low. However, additional research is needed to select optimal tree planting density to meet enhanced carbon accumulation goals.

3. Reapplication of fertilizer and lime should be conducted in restored areas if soil nutrients (e.g. P), alkalinity and base cations (Ca) start to decrease as the forest stands age. The additional treatments are needed to maintain optimal tree growth rates and to prevent mobilization of metals from the soil.

4. More research into soil C dynamics is needed to be able to assess the stabilities of both old and new carbon and to determine why soil C pools are not increasing and may actually be declining. Research should include studies of how various restoration techniques could stimulate microbial nutrient cycling to maximize carbon sequestration within the trees and in the soil organic pools.

5. Continued soil erosion on slopes appears to limit soil carbon storage and tree growth. Specialized treatment of exposed slopes are needed to reduce erosion (e.g. seeding with lichen particles, addition of coarse organic matters, etc.). Regreening of slopes will be key to limiting flooding in the future.

6. In preliminary trials on upland sites, agricultural addition rates of a locally sourced lime stabilized municipal biosolid or pulp and paper mill residuals significantly increased growth, soil moisture retention, ground cover, and biodiversity compared to the standard limestone + fertilizer treatment of the "Sudbury recipe". However, before being recommended as an upland soil amendment, various logistical and potential health and environmental concerns must be addressed. Similar materials are used as substrates for thick caps (~20x higher addition rates) on mine tailings locally, but for lower addition rates and where groundwater is not monitored, questions remain about material processing for aerial/broadcast application by aircraft, and nutrient leaching. A small, watershed scale trial is recommended.

7. Regreening with the standard limestone + fertilizer treatment has often resulted in sites with low plant species diversity. This may be improved by using low cost organic amendments (municipal biosolids, pulp and paper sludge and biosolids, etc.) as well as an increased variety of planted tree and shrub species. However, species-specific planting directives (sun/shade) (dry/moist) need to be followed with an overall plan of creating a forest mosaic of species. For example, to maximize upland species richness and reduce seedling mortality, only sun and drought tolerant deciduous species should be planted in sloped and/or exposed areas until a canopy is well established.

8. The shaded to semi-shaded upland areas with topographic depressions should be reserved for deciduous species or conifers with high moisture and shade requirements. Refrain from planting fast-growing stress tolerant conifers (i.e., birch/poplars, pine) within these limited shaded or depressed areas to avoid competition with the more sensitive species.

9. Consider using more browse resistant species (e.g. staghorn sumac, eastern hemlock, balsam fir) in locations where seedlings are being quickly lost to birds and mammals. Browsing rates can also be significantly decreased on particularly expensive seedlings or ecologically important species by planting in denser vegetation areas, rather than out in the open.

10. Peatland reclamation, including active Sphagnum moss regeneration, may represent an important new opportunity for landscape-level carbon capture in the Sudbury area. Experiments and "space-for-time" surveys

across Sudbury indicate improved potential for Sphagnum survival post-emissions-reductions, while 35 years ago this was not possible. However, large scale reclamation efforts should not proceed before long-term (peat core analyses) and current (eddy-covariance and flux chamber approaches) C balances and past ecological states are determined.

11. Concurrent with Recommendation #10, Establish greenhouse mesocosm trials to test Sphagnum growth and survival under different nutrient and metal exposures, drought duration etc.

12. Test the peat-block transplant technique (e.g. using material from highway 69 construction sites) in a highly contaminated peatland, and determine the geochemical processes controlling the fate of metals in Sphagnum moss/peat and implications for restoration success. Begin modelling study on the longer-term carbon storage resilience of transplant sites to climate change (drought, wildfire).

13. Expand on the gradient and resampling work by Gingac and Beckett in the mid-1980s and in the LCARE project to complete a peatland inventory across the damaged zone as well as the larger Sudbury deposition zone. Building on information in Recommendations #10-12, assess the role of peatlands in regional carbon accumulation and the C sequestration potential under future active reclamation. We will identify and map naturally recovering peatlands as reference sites for regional restoration strategies; particularly water table dynamics and metal concentration measurements at these sites will help identify current limits to Sphagnum regeneration at severely contaminated sites.

14. Reductions (>95%) in emissions of both acids and metals have greatly improved water quality throughout the historic Sudbury deposition zone, and DOC in lake water is now returning to near normal levels. However, acidity remains a problem at several distant lakes located on sensitive bedrock (Killarney, Lady Evelyn/Smoothwater) and residual metals in free ionic form potentially remain a toxicity problem in nearby lakes. Lake monitoring therefore needs to be maintained to detect whole lake effects under multiple stressors, while we also now need to develop new nearshore (littoral zone) protocols to assess recovery of the high productivity zone (e.g. sensitive indicator species, organic matter shredders, biodiversity).

15. Future restoration treatments should focus on creating and maintaining healthy ecosystem corridors and connectivity (watersheds, connected wetland complexes, dispersal routes) to assist with biodiversity recovery and adaptation to climate change.

16. More work is need to quantify the relative effects of DOC input from restored peatlands and forests vs the in-lake processes (pH-related) that lead to DOC rise in lakes and the detoxification of residual metals (i.e. Can restoration effort generate more DOC from the catchment areas?).

17. Additional research is needed to assess and model the effects of acidification recovery, restoration and climate change on C storage and GHG emissions at the scales of lakes to watersheds and across the larger deposition zone. Information gaps remain around the impacts that reclamation procedures, new soil amendments or planned wetland restoration work may have on GHG (CO_2, CH_4, N_2O) emissions from freshwater systems, and the fate of different watershed and aquatic carbon pools under different future conditions.

18. The regional extent of impacts to forest health and C sequestration related to historically large pollution sources such as Sudbury potentially extends well beyond the visible damage zones, requiring remote sensing technologies (LANDSAT, LiDAR, Hyperspectral, etc.) to assess both impacts and recovery. Additional work is needed to ground truth estimates of carbon pools and processes (e.g. soil respiration/decomposition) requiring more use of remotely sensed information (e.g. annual measures of soil temperature).

19. We need to develop new completion criteria (beyond the regional reference approach) to assess recovery state for novel aquatic ecosystems that now have permanent alterations such as the arrival of invasive species (e.g. milfoil, bass) or expanded urban development.

20. Complete necessary fisheries assessment to allow additional lake trout fish stocking in lakes with suitable pH (e.g. OSA, Norway, Killarney, Ruth-Roy, Frederick, Dougherty, Marjorie etc.) in support of government agency restoration goals.

21. Develop disease-free culture facilities (perhaps in partnership with community colleges) to repatriate species not available in hatchery program (e.g. perch, slimy sculpins) to rebuild food webs for both fish and wildlife (e.g. loons) communities in still damaged lakes.

22. Encourage continued collaboration and use of Provincial park sites (e.g. Killarney's Lumsden Lake hilltop chain; Daisy Park's experimental sub-catchments; waterway parks) to reduce various confounding effects at study sites.

Sudbury Long-Term Inland Lake Monitoring

The Ministry of the Environment, Conservation and Parks (MECP) at the Cooperative Freshwater Ecology Unit (CFEU) leads 2 main lake monitoring programmes as complementary components of the long-term Inland Lake Monitoring Program: Intensive Sentinel lake monitoring and Extensive Spatial lake monitoring.

The Intensive Sentinel programme is 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 provide a greater variety and intensity of data on a smaller group of lakes.

The Extensive Spatial programme is 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 2022, Both programmes conducted the second 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, 2022 field season achieved monthly sampling of 6 Sentinel lakes, and mid-summer sampling of 22 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 candidate Haley Moskal.

Database management activities during 2022 included: 1. Updating and cleaning the Reference and Sentinel data sets, and preparation of the chemistry records for posting to the Province's open data portal, data.ontario.ca, 2. Updates to the Zooplankton and Phytoplankton databases and preparation of the Sentinel lake timeseries for assessment in the next MECP reporting cycle 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. Publication highlights included an MECP led assessment (Sorichetti et al. 2022) of increasing chloride trends in Ontario's surface waters.

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 added both new and temporal repeat samples across the Attawapiskat River Basin and Upper Albany River Basin, distributed across both the Hudson Bay Lowlands and Boreal Ecozones. 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 2022, preliminary assessments of temporal trends in water chemistry and community metrics were completed for MECP's Inland Waters Unit annual reporting.

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 is 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 2022 was primarily directed at two fields of research:

- **i)** **Assessing fish biodiversity recovery at the drainage basin scale.** This work was supported in 2022 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 2022 by the MNRF Aquatic Research and Monitoring Section, and the Canada-Ontario Agreement (COA). We completed a controlled-breeding experiment to determine the influence of maternal traits on egg survival in a Lake Huron lake whitefish spawning stock.

Contaminants in Fish Studies

Dr. Gretchen Lescord, Environmental Scientist with the Wildlife Conservation Society 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 Bay 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 actually occur in various species of fish to determine if elevated values expressed as total arsenic actually contain the more toxic forms. This important study will 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 represents a collaborative project with Dr. Brian Laird at Waterloo, who will be addressing any potential health implications of excessive consumption of particular size and species of fish. 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.

Dr. Emilson provided a seminar to Laurentian's School of Natural Sciences, documenting the extensive partnership with LWLC, and outlining how his work influences forest management and policy in Canada, entitled "Science to Support Watershed-Based Management of Canada's Changing Forests".

Ontario University Program in Field Biology (OUPFB)

The OUPFB Program offered field courses within Canada this year; however, Laurentian did not contribute a field module in 2022. Two Laurentian students were able to participate in courses offered by other universities through Letter of Permission. 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.

Collaborative Project with Peru

MIRARCO and the National University of Moquegua (UNAM) officially announced the launch of the Coralaque River Hydrographic Basin Research and Restoration Project on Feb. 3, 2023. The project aims to better understand the mining and other anthropogenic impacts in the Coralaque River watershed and to develop treatment solutions and a remediation plan to improve the water quality throughout the watershed. A key objective of this project will be to apply the successful community-led research approach that has brought about the "Sudbury Story" of environmental restoration to the Coralaque River Basin. This region of Peru has centuries of pastoral and mining practices that have left an indelible impact on the environment and human health in sensitive settings from the highlands to the coastal regions. The MIRARCO-UNAM team will carry out a comprehensive study of the region, focusing on understanding the impacts of historic and modern land uses as well as the effects of climate change.

This work unofficially began in 2021, before the project had received funding, when a research team comprised of MIRARCO's President and CEO, Dr. Nadia Mykytczuk, Laurentian University Emeritus Professor and CFEU Senior Research Fellow in Freshwater Biology, Dr. Charles Ramcharan, and MSc. student Lianne Girard, travelled to Peru to initiate the first phase of the work. This devoted team successfully completed the initial investigation phase that included challenging fieldwork, working throughout the entire watershed of the Coralaque River, from the high altitude mine areas (4800 meters above sea level) to the lowlands where the Tambo River reaches the Pacific Ocean. A total of 17 sites were sampled overcoming treacherous roads and rapidly shifting weather conditions, from rain and snow to very dry conditions. Other project researchers include CFEU Senior Research Fellow in Pedology, Dr. Graeme Spiers and CFEU Senior Research Fellow in Ecosystem Restoration, Dr. Peter Beckett both of whom will be leading

different phases of this operation, as well as researchers and specialists from UNAM and the Core Foundation Corporation.

New collaboration opportunities with several Peruvian universities were first initiated by Laurentian University's Goodman School of Mines in 2019. This project is the first of several collaborative efforts in which both Laurentian University and MIRARCO will be participating. The successful commencement of this venture would not have been possible if not for the support of UNAM faculty and staff, Core Foundation, and several regional environmental research groups. Endeavors such as this one require support not only from partner universities but also regional and national entities in Peru. During their time in Peru, Dr. Mykytczuk and the team met with the governor of Moquegua to share information, request additional support, and build partnerships across sectors.

For more information on UNAM's Coralaque River Ecosystem Research and Restoration Project, contact Dr. Nadia Mykytczuk at nmykytczuk@mirarco.org.

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.

After starting 2022 with a return to remote lecturing, it was truly a pleasure to finish the rest of the year in person at the VLWLC with our cohort of graduate students. Despite the pandemic and insolvency, a total of 13 students (9 full time and 4 part time), graduated with a Master's of Science Communication in 2022. In September, we welcomed 12 full time and 6 new part time students to the Master's Degree stream.

The pandemic put a spotlight on the importance of effective and impactful science communication, making our program and our expertise highly sought after by scientists, health professionals and prospective 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. The following paragraphs highlight some of the many successes of our students and our faculty in 2022.

Grant-supported projects:

SCOM Program Secured $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. Three of the workshops were delivered in English, and one in French. In 2022, the SCOM program delivered two of the four sessions, receiving very positive feedback from participants and CIHR.

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 run a 1-day symposium titled "Science Communication in the Workplace Symposium: Creating Capacity for Canada's Current and Future Needs." This project will bring 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. Preparation for this event began in 2022, and the event will run in May 2023.

Science Communication Theory and Skills for Northern Ontario Researchers
This project, supported by a 2021 NSERC Science Communication Pilot Grant was completed in 2021 but revisited in 2022 when the English Workbook was translated into French.

- Access the English workbook and French workbook here.

Student achievements:
The Science Communication graduate students continue to benefit from belonging to the Vale Living with Lakes Centre. 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. In January 2021, SCOM students led an internal forum to identify shared audiences, common themes, and priority research areas for CFEU in 2022 following interviews with 10 Living with Lakes researchers. The Science Communication students developed and produced short research videos 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. The Science Communication students were judges for the graduate research presentations at the Graduate Research Symposium in 2022.

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 2022. The live event featured 10 speakers and was broadcast on Eastlink Community TV and live streamed on YouTube. The combined viewership of the in-person and live streamed audience exceeded 400 people, with many more individuals tuning in over Eastlink Community TV and watching the recorded event.

In 2022, students completed twelve Major Research Papers which were presented at our September symposium. Two recent alumni published work that was conducted in consultation with Dr. Chantal Barriault:

Richard, K., Pisani, K., & Barriault, C. L. (2022). Evaluating Changes in Experimentation, Critical Thinking, and Sense of Wonder in Participants of Science North's In-School Outreach Programs. *Frontiers in Education*, *7*. https://doi.org/10.3389/feduc.2022.675306

Lau, C., Barriault, C., & Krolik, J. (2022). Evaluating the Impact of a Comprehensive Canadian Science-Art Residency Program on the Participating Scientist, Artist and the Public. Frontiers in Education, 6. https://www.frontiersin.org/articles/10.3389/feduc.2021.690489

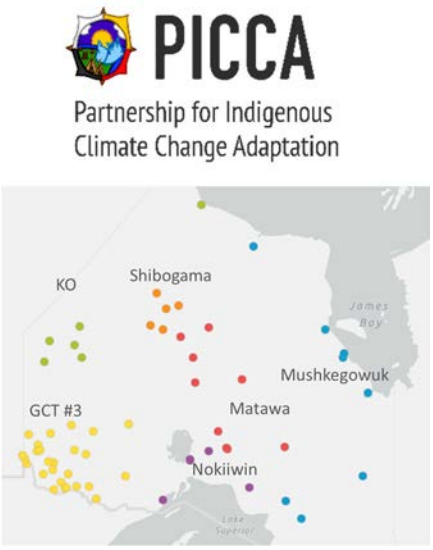
Up North on Climate - Northern climate change and adaptation

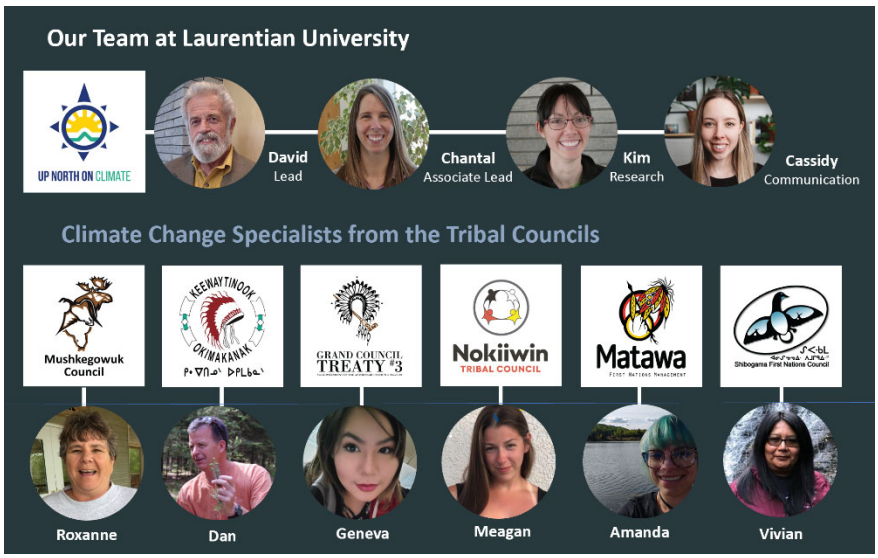
During 2022, our "Up North on Climate" team continued to collaborate with Grand Council Treaty 3 and five Tribal Councils across the north of the province in an NRCan supported project through the Building Regional Adaptation Capacity and Expertise (BRACE) program: "Building Climate Change Adaptation Capacity of First Nations in Far Northern Ontario Through Knowledge-Exchange and Collaboration". We have collaboratively come to a name for our group: "Partnership for Indigenous Climate Change Adaptation", 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 science knowledge.

The process we have developed involves training and paying a Climate Change Specialist (CCS) recruited by each of the six co-lead councils. The role of the Climate Change Specialist is to promote climate change adaptation in their tribal council and member communities. The whole

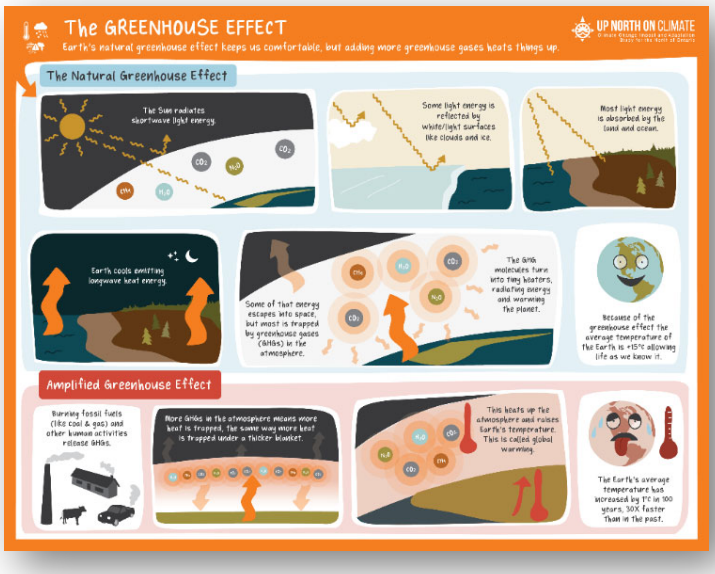
team of CCSs and the Laurentian group meet weekly. A Coordinating Panel of the Co-leads meets approximately every 6 weeks or as needed.





The project makes use of previously written community climate vulnerability reports produced as part of our earlier collaborative (2016 – 2018) "Climate Change Impact and Adaptation Study for the North", that weaved community-gathered Traditional Ecological Knowledge with climate science. CCSs are using gathered information that will help communities develop a climate change adaptation plan.

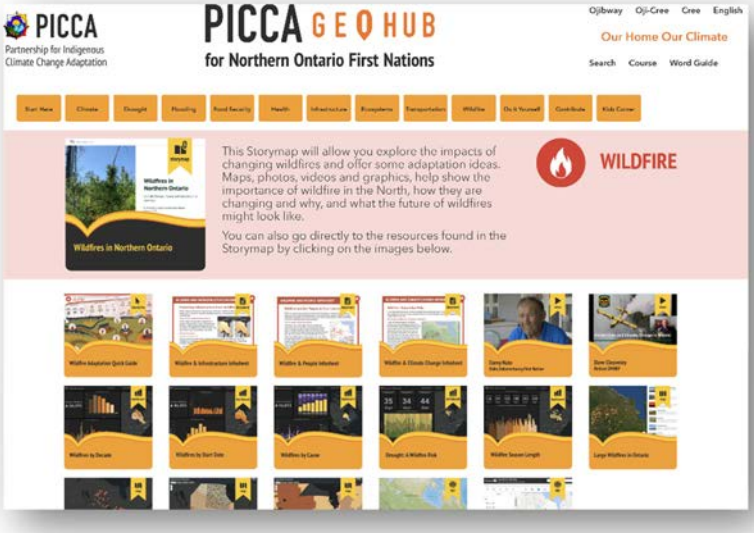
A previously developed 100-page adaptation document included in each community report as well as 36 detailed InfoSheets were the basis for an adaptation Quick Guide. With a series of 9 graphic 2-pagers, the Adaptation Quick Guide provides a visually appealing starting point to begin discussions about preparing for the climate of the future, as well as adapting to the climate of today. A Climate Change Quick Guide was also developed covering: What is climate change, the greenhouse effect, climate change then vs now, and climate projections.



A climate change glossary, "Climate Change Word Guide: 101 climate change words and their meaning" is in the translation stage. We have also created an Adaptation Framework to help

First Nation communities or Tribal Councils move towards climate change adaptation. Steps include learning about climate change and adaptations, gathering knowledge from the community, discussing adaptation options, implementing projects, and evaluating success.

All resources are posted on UpNorthOnClimate.ca. The website also showcases locally developed data visualizations, graphics, and GIFs on seasonal temperature. We 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. It serves as a social learning and discussion platform. Bi-weekly 100-word posts keep CCS engaged and stimulate conversations. Resources, as they become available are also being posted on ACClimateNow to allow for ease of access to printable resources for CCS to distribute to their communities. Similar 100-word posts are also being provided to the general public on our open FB page, Up North On Climate.



We continue to build the PICCA GeoHub https://picca-picca.hub.arcgis.com/ and micro credentials for First Nations by First Nations. We are collaboratively creating an online GeoHub, the Partnership for Indigenous Climate Change Adaptation, as a one-stop culturally appropriate, plain language and graphically accessible source for climate change information and data (maps from open data, knowledge, both western scientific and Traditional Knowledge, monitoring data, adaptation case studies, adaptation planning tools, discussions of best practices and experiences on the land), all relevant for First Nations considering the impacts of climate change in Northern Ontario. All GeoHub resources are being presented in a Storymap to guide the reader through how resources can be useful in developing adaptation plans in their community. These Storymaps will form the basis for the series of micro credentials.

The project's future goals are to complete the PICCA GeoHub and course. We also hope to visit communities and interview Elders and youth to include more Indigenous voices in the GeoHub. We are exploring how to host the course, perhaps on Laurentian University's D2L, as a micro credential for First Nations and others. We are also working to include near-north First Nations into the project.

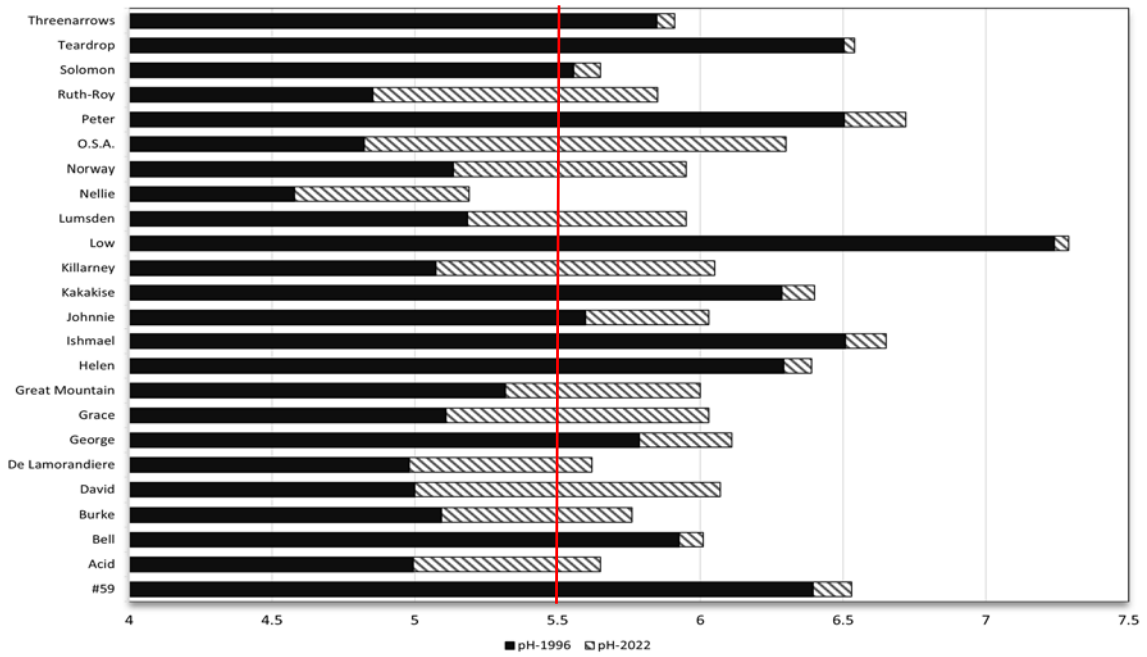
After NRCan BRACE funding terminated on March 31, 2022, a slimmed Up North on Climate team continued to meet weekly, via Zoom, with the Climate Change Specialists (CCSs) from the

Councils, all of whom were retained by their Councils despite the loss of funding support from the BRACE project. The continuation of the CCSs is tangible evidence of the value of the expertise they built during the project.

In the summer of 2022, we successfully jointly applied with the Nokiiwin Tribal Council for 2-year Canada-Ontario Agreement on Great Lakes Water Quality and Ecosystem Health funding. The goal is to build long-term adaptive capacity of Nokiiwin member communities to adapt to extreme weather events, especially stormwater and erosion. Knowledge sharing and training of youth related to extreme precipitation, water levels and use of benthic invertebrates as indicators of water quality will be the core of the work. The project will have co-benefits for the region of the Great Lakes watershed encompassing the communities. Starting in April 2023.

In the fall of 2022, we participated with both The Resilience Institute and the University of Guelph Rural Planning and Development in preparing research expressions of interest and proposals for OMAFRA, SSHRC and Global Affairs Canada.

Friends of Killarney Project- Remarkable Chemical Recovery



pH recovery of Lake Charr (*Salvelinus namaycush*) lakes in Killarney Park (1996-2022)

On March 14 and 15, 2022 with safe ice for a MNRF helicopter to land, and generous support from the Friends of Killarney, John Gunn, Michelle Giroux and MSc student Haley Moskal returned to assess chemical changes in 24 of the historic lake charr (also called lake trout) lakes in Killarney Park that were last sampled in 1996. What they found was very encouraging. All the lakes showed a significant pH rise; some to quite dramatic levels. Only one lake, Nellie Lake, was not yet at the pH 5.5 threshold where lake charr can reproduce. These findings are key to Haley's thesis project on littoral zone biodiversity recovery, but also allow MECP and OMNRF to begin planning programs to restock several new lakes with lake charr, and consider repatriating other lost species that were native to the lakes before the acid rain era began.

Michelle Giroux and MSc Candidate Haley Moskal collect water samples in Mar 2022

Learning from Lake Sturgeon

Dr. Gretchen Lescord, hosted youth from Moose Cree First Nation at the Lake Centre in Aug. 2022 for a youth science day! Dr. Lescord, Dr. Jackie Litzgus, Chantal Sarrazin-Delay, and Dr. Tom Johnston, spent the day with the students doing demonstrations of their work. A number of Lake Centre students also made presentations and shared their science. This initiative was part of the 'Learning from Lake Sturgeon' project and was made possible through support from WCS Canada, Moose Cree First Nation and the Kapuskasing Indian Friendship Centre. For more information, check out https://learningfromlakesturgeon.ca/

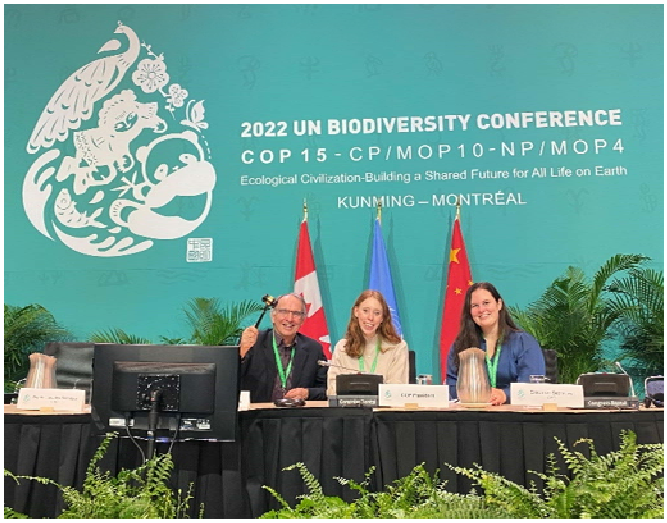
Participants in the Youth Science Day at the Lake Centre.

Atikameksheng Anishnawbek Partnership Project

The CFEU teamed up with the Land Office Staff of Atikameksheng Anishnawbek First Nation (AAFN) to conduct a broadscale fisheries assessment on five lakes within the reserve in the summer of 2022. This project was in response to a request by AAFN for a biodiversity assessment of lakes highly valued by the community, in order to establish a baseline for future monitoring.

The assessment was led by LWLC staff Ryan Coady, with able assistance of technicians Ben Schlosser, Chris Bisson and Alex Lieou. Water sampling, lake habitat mapping and submission of tissue samples for contaminant analysis were all part of the project. The CFEU crews and AAFN staff also assisted Queen's University students in the collection of sediment cores which will be used to reconstruct the history of these lakes, lakes that have very little background information. The data and findings from the fisheries assessment have been transferred to AAFN for their retention and use. The project began with a presentation by Dr. Gretchen Lescord to the community to describe the purpose and procedures of such studies. The follow up presentation of results occurred on March 6, 2023.

COP15 United Nations Biodiversity Conference Presentation



Dr. John Gunn and student leaders Avery Morin (President SGA) and Anastacia Chartrand, (Co-Chair Environmental Sustainability Committee, VP GSA, Science Communication graduate student) were honoured with an invite to represent Canada, Sudbury and Laurentian University to present the "Sudbury Story" at the COP15 UN Biodiversity Conference in Montréal, QC, on Dec. 19, 2022. The presentation entitled " Worst to Best: Global Lesson from the Sudbury Story" was featured as the final presentation at the Canada Pavilion on the day of the signing of revised Biodiversity Framework with approximately 190 countries pledging to protect 30% of land and waters by 2030. Interestingly, our Sudbury presentation occurred 30 years after Sudbury was first recognized with the Local Honours Award at the Earth Summit in Brazil in 1992, the meeting where the first biodiversity convention was signed.

Dr. Gunn's COP15 presentation can be found here:
https://www.youtube.com/watch?v=mR0XCV2TUfE

In addition to our presentation, with much assistance from Science Communication Program Technical Advisor Michelle Reid, a series of videos were produced for display on the monitors of the Canadian Pavilion. Included were an overview of the municipal VETAC regreening program; a regreening design project at the McEwen School of Architecture; a proposal submitted by Wahnapitae FN for an Indigenous-Led Conservation Area near Wolf Lake; and a high impact series of photos of the recovery results in Sudbury.

Science Communication Students Anastacia Chartrand and Caitlin Wittke collaborated with SCOM Instructor Michelle Reid to prepare 5 multimedia assets for the delegation:

- Global Lessons from the Sudbury Restoration Story - teaser video for exhibition space and social media promotion
- Connecting to Recovering Landscapes through Architecture - Video for exhibition pavilion
- 45 Years of Community-Led Landscape Restoration of Smelter-Impacted Ecosystems in Sudbury, Canada - Video for exhibition pavilion
- Global Applications of the Sudbury Story - subtitled existing video from Environmental Remediation - Global Lessons from the Sudbury Story online course to show in the exhibition pavilion
- Proposal: A First Nations Led Conservation Area - Video for exhibition pavilion

As part of the social engagement strategy to engage local audiences, Caitlin Wittke took over Laurentian University's Instagram account for a day to produce and host a series of interactive videos. The goal of the Instagram takeover project was to raise awareness of the CFEU contribution to the UN COP15 amongst the Laurentian student community.

- Videos were viewed by 2000+ individuals, with some of the highest engagement for student-led promotional campaigns, according to LU marketing.
- 209 people clicked the link to watch the full video for "Global Lessons of the Sudbury Story"
- All accounts that were tagged in the videos shared our content and messages with their audiences, including key stakeholders:
    - Greater Sudbury official account and Mayor of Greater Sudbury, Paul Lefebvre
    - MPP Nickel Belt, France Gelinas
    - MPP Sudbury, Jamie West
    - MP Nickel Belt, Marc Serré
    - MP Sudbury, Viviane Lapointe

On Twitter, Michelle Reid led a promotional campaign with a series of curated tweets. You can read the thread here. Key wins from this campaign:

- 539 views on our Global Applications promotional video
- 2733 people were served our content on the Sudbury delegation when they opened their app

Participation in The IMAX film with Dr. Jane Goodall

CFEU staff participated in the IMAX filming with Dr. Goodall in July 2022.

CFEU faculty, staff and students were prominent "actors" in assisting with the filming of an upcoming IMAX film by Science North (tentative title: Reasons for Hope) that features the world famous environmentalist and UN Ambassador of Peace, Dr. Jane Goodall. Our contributions during July 6-10 included Chantal Sarrazin-Delay assisting Dr. Goodall with the fish release (brook trout donated by Vale) with children from Wahnapitae First Nation and Dr. John Gunn, Chris Bisson, Ben Schlosser and Henni Laberge showing Dr. Goodall some of the fish now living in one of our long-term monitoring lakes. Dr. Peter Becket and former student Tina McCaffrey are featured in scenes with Dr. Goodall conducting land reclamation as well as at a tree planting event at Bell Park for the IMAX film. Peter and the land reclamation team are also featured in a second feature film about the regreening process to be released later this year for showing at Dynamic Earth. Drs. Gretchen Lescord and Brie Edwards may also appear in cameo appearances in that film.

Conference Organizing, Program Coordination and Editorial Activities

Arnott, S

- Served on Planning/Program committee for the Joint Aquatic Sciences Meeting, Grand Rapids, MI, May 2022

Basiliko, N

- Associate Editor, Soil Research
- Associate Editor, FEMS Microbiology Letters
- World Congress of Soil Science 2030 Bid Committee member (for the Canadian Society of Soil Science bidding to hold the meeting in Toronto in 2030); Bid was successful!

Beckett, P

- Served on the Technical Committee for the Planning for Closure International Conference, Santiago, Chile, May 2022
- Co-Chair of the Ontario Nature Annual Gathering and AGM held in Sudbury, Jun 2022
- Served as Reviewer for Science of the Total Environment, Environmental Pollution, Water Air and Soil Pollution, Environmental Science and Pollution Research, Remote Sensing and the International Journal of Environmental Research and Public Health
- Served on the Review Panel for CFI (Colleges)
- Served on the Environmental Technician/Technologist College Review Panel for the Ontario Ministry of Universities and Colleges

Belzile, N

- Associate Editor for the Journal of Geochemical Exploration
- Served on the Editorial Board of Critical Reviews in Environmental Science and Technology
- Served on the Editorial Board of Research Journal of Environmental Sciences
- Served on the Editorial Board of Green and Sustainable Chemistry
- Served on the Editorial Board of Environments

Emilson, E

- Associate Editor for the Canadian Journal of Forest Research

Gunn, J

- Director of the Vale Living with Lakes Centre, Laurentian University (2011-2022)
- Faculty Co-Chair for the Environmental Sustainability Committee

Lescord, G

- Provided reviews for the journals of Environmental Science and Technology, Science of the Total Environment, Environmental Toxicology and Chemistry, Environmental Pollution and Chemosphere.

Mykytczuk, N

- Editor, Canadian Journal of Microbiology (2017-present)
- Associate Editor, Water, Air, and Soil Pollution (2016-present)
- Served on the Editorial Board for the Journal of Microbiological Methods (2014-present)
- Review Editor: Frontiers, Terrestrial Microbiology, Biogeochemical Dynamics (2018-Present)
- NSERC DG program external reviewer (2013-present)
- MITACS external reviewer (~2/year 2017-present)

Ramcharan, C

- Associate Editor, Frontiers in Environmental Science
- Associate Editor, Canadian Journal of Fisheries and Aquatic Sciences

Roy-Léveillée, P

- Served as a session convener at the American Geophysical Union for C52D: Drained Lake Basins in Permafrost

Swanson, H

- Associate Editor, Arctic Science
- Associate Editor, Canadian Journal of Fisheries and Aquatic Sciences

Tanentzap, AJ

- Associate Editor of Nature Scientific Reports
- Associate Editor of Journal of Vegetation Science
- Associate Editor for PLoS Biology
- Dr. Tanentzap has also been coordinating a global network of >100 individuals from 70 sites worldwide that are sampling water as part of the GLEON DOM seasons project (https://gleon.org/research/projects/domseasons-tracking-seasonality-dissolved-organic-matter)

Watmough, SA

- Director of the Trent School of the Environment (June 2016 – June 30, 2022)
- Board Member, Canadian Colleges and University Environmental Network
- Editorial Board Member for The Science of the Total Environment
- Oversaw site visit for Geography and Environmental Geoscience Cyclical Review
- Reviewed 22 journal articles

Partners and Collaborators

- Acadia University
- Appalachian State University
- Boniferro Millworks
- Canadian Kraft Papers
- City of Greater Sudbury
- Clergue Forest Management
- Cornell University
- Dehcho First Nations
- Dept. of Fisheries and Oceans Canada
- DMI- Peace River
- Domtar Inc.
- Dorset Environmental Science Centre
- Dryden Forest Management Company
- Environment and Climate Change Canada
- Forest Protection Limited
- Friends of Killarney
- Government of Northwest Territories
- Glencore Sudbury INO
- Grand Council Treaty 3
- Great Lakes Forestry Centre, NRCAN-CFS
- Irving Pulp and Paper
- Keewaytinook Okimakanak (Northern Chiefs) Tribal Council and member First Nations
- Laurentian University
- Manitoulin Streams Improvement Association
- Matawa First Nations Management, Four Rivers Environmental Services Group and member First Nations

- McGill University
- McMaster University
- Memorial University
- Metrohm USA
- Michigan Tech U
- Ministère des Forêts, de la Faune et des Parcs (MFFP)
- Moose Cree First Nation
- Mushkegowuk Tribal Council and member First Nations
- Natural Resources Canada
- Nipissing University
- Nokiiwin Tribal Council and member First Nations
- Northwest Territories Geological Survey
- OMECP
- OMNRF
- Ontario Forest Research Institute (MNRF)
- Ontario Tech University
- Queen's University
- Rayonier Advanced Materials
- Ryerson University
- Shibogama Tribal Council and member First Nations
- Skidmore College
- The Resilience Institute (TRI)
- Tianjin Univ. of Science &Technology
- Trent University
- University of Alaska
- University of Birmingham
- University of Cambridge
- University of Guelph
- University of New Brunswick
- University of Northern British Columbia
- Université Laval
- Université de Montréal
- Université du Québec à Montréal
- University of Sherbrooke
- University of Toronto
- University of Waterloo
- University of Winnipeg
- US Forest Service
- Vale Ltd.
- Wahnapitae First Nation
- Weenusk First Nation
- Western University
- Weyerhauser Canadian Timberlands
- Wildlife Conservation Society Canada
- York University
- Yukon Geological Survey

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. 202X. Winter as a defining season for Canadian fishes, pp. xxx-xxx In Cooke, SJ (ed.) Freshwater Fisheries in Canada, American Fisheries Society, Bethesda, MD, USA. In press.

Reid M and C Barriault. 202X. The Communicating with Intent Framework. In: Rowland S and L Kuchel (Eds). Teaching Science Students to Communicate: A Practical Guide. SpringerLink. ISBN 978-3-030-91627-5, ISBN 978-3-030-91628-2(e-book). DOI:10.1007/978-3-030-91628-2

Publications

Co-op Unit Members authored or co-authored numerous publications in 2022:

Abdullahi M, X Li, MA-E Abdallah, W Stubbings, ND Yan, M Barnard, L-G Guo, JK Colbourne and L Orsini. 2022. *Daphnia* as sentinel species for environmental health protection: a perspective on biomonitoring and bioremediation of chemical pollution. Env. Sci. Technol. 56,20:14237-14248.

Alarie Y and J Hajek. 202X. The iconic diving beetle Acilius sinensis Peschet, 1915 (Coleoptera: Dytiscidae: Dytiscinae): larval morphology and new mention from the southern Gaoligong Mountains, China. Zootaxa. In press.

Alarie Y, K Watanabe and MC Michat. 202X. *Japanolaccophilus niponensis* (Kamya, 1939), a very rare Japanese endemic diving beetle (Coleoptera: Dytiscidae): larval morphology and phylogenetic comparison with other known Laccophilini. Zootaxa. In press.

Alarie Y. 2022. Inventory of the aquatic Adephaga (Coleoptera: Amphizoidae, Haliplidae, Gyrinidae and Dytiscidae) fauna of Yukon Territory, Canada and Alaska, USA: new records, distributions and faunal composition. Aquatic Insects 43:130-166.

Alarie Y and MC Michat. 2022. Larval morphology of Ilybiosoma Crotch, 1873 (Coleoptera: Dytiscidae: Agabinae): descriptions of five species with phylogenetic considerations. Aquatic Insects 43:99-129.

Alarie Y, MC Michat, T Ranarilalatiana and J Bergsten. 2022. Larval morphology of the Madagascan diving beetle genus Hovahydrus Biström, 1982 (Coleoptera: Dytiscidae) and comparison with other known Hyphydrini. Zootaxa 5319:227-246.

Alarie Y, MC Michat, K Watanabe, H Shaverdo, L-J Wang and CHS Watts. 2022. An outlook on larval morphology of Copelatinae diving beetles with phylogenetic considerations (Coleoptera: Adephaga, Dytiscidae). Zootaxa 5175:151-205.

Anderson J, N Lévesque, F Caron, P Beckett and GA Spiers. 2022. A review on the use of Lichens as a biomonitoring tool for environmental radioactivity. Journal of Environmental Radioactivity. 243:106797. https://doi.org/10.1016/j.jenvrad.2021.106797

Anderson J, F Caron, P Beckett, GA Spiers, N Lévesque, GM Charbonneau, B Halvorson, H Dufour and A Lock. 2022. Distribution of metals and radionuclides in the lichens *Cladonia*

rangiferina and *C. mitis* in the past uranium mining region of Elliot Lake, Ontario, Canada. Helyion 8(12):e11863. https://doi.org/10.1016/j.heliyon.2022.e11863

Angers D, R Ouimet, P Roy-Léveillée and M Garneau. 2022. Priorities for protection and management of Quebec soils. Geoderma Regional. 29:e00523.

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. Broad scale intraspecific variation in freshwater zooplankton salt tolerance. Limnology and Oceanography Letters 8:8-18, DOI:10.1002/1012.10277. [†]Equal contributions.

Borton MA, SM Collins, EB Graham, VA Garayburu-Caruso, AE Goldman, ML de Melo, L Renteria, JC Stegen, WHONDRS crowdsourced consortium (including AJ Tanentzap). 2022. It takes a village: using a crowdsourced approach to investigate organic matter composition in global rivers through the lens of ecological theory. Frontiers in Water 4:2022. DOI: 10.3389/frwa.2022.870453.

Braga LPP, C Orland, EJS Emilson, AA Fitch, H Osterholz, T Dittmar, N Basiliko, NCS Mykytczuk and AJ Tanentzap. 2022. Viruses direct carbon cycling in lake sediments under global change. PNAS. Proceedings of the National Academy of Sciences 119:e2202261119.

Chalmandrier L, DB Stouffer, AST Purcell, WG Lee, AJ Tanentzap and DC Laughlin. 2022. Predictions of biodiversity are improved by integrating trait-based competition with abiotic filtering. Ecology Letters 25:1277-1289.

Charbonneau KL, KA Kidd, DP Kreutzweiser, PK Sibley, EJS Emilson, NJ O'Driscoll and MA Gray. 2022. Are there longitudinal effects of forest harvesting on carbon quality and flow and methylmercury bioaccumulation in primary consumers of temperate stream networks? Environmental Toxicology and Chemistry 41:1490-1507.

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. https://doi.org/10.1111/cobi.14016

Courchesne B, M Schindler, AJ Lussier and N Mykytczuk. 2022. Macro-to-nano-scale mineral relationships in surficial cobalt-arsenic-bearing mine tailings of the Cobalt Mining Camp, Northeastern Ontario, Canada. The Canadian Minerologist 60(2):309-329.

Couturier M, YT Prairie, AM Paterson, EJS Emilson and PA del Giorgio. 2022. Long-term trends in pCO2 in lake surface water following rebrowning. Geophysical Research Letters 49:e2022GL097973.

Cunillera-Montcusi DM, M Beklioğlu, M Cañedo-Argüelles, E Jeppesen, R Ptacnik, C Alves, S Arnott, S Berger, S Brucet, H Dugan, M Gerhard, Z Horvath, S Langenheder, J Nejstgaard, M Reinikainen, M Striebel, P Urrutia-Cordero, C Vad, E Zadereev and M Matias. 2022. A global increase in salinity. Trends in Ecology and Evolution 37:440-453.

Delay SJ and JD Litzgus. 2022. *Clemmys guttata* (Spotted Turtle). Nest predation. Herpetological Review 53(3):484-485.

Desjardins S, C Laamanen, N Basiliko and JA Scott. 2022. Dark stress to improve lipid quantity and quality in acid-tolerant microalgae. FEMS- Microbiology Letters 369:fnac057.

Dugan HA and SE Arnott. 2022. The ecosystem implications of salt as a pollutant of freshwaters. WIREs Water (Early Access). DOI:10.1002/wat2.1629

Edge C, L Baker, E Smenderovac, S Heartz and EJS Emilson. 2022. Tebufenozide has limited direct effects on simulated aquatic communities. Ecotoxicology 21:1231-1240.

Ehrman AD, H Swanson, S MacPhee and AR Majewski. 2022. Isotopic and traits-based trophic diversity of Canadian Beaufort Sea benthic communities in relation to food supply. Arctic Science https://doi.org/10.1139/as-2021-004

Eimers MC, AM Paterson, SA Watmough, AJ Williams and WJ Greenwood. 202X. Phosphorus and nitrogen deposition within a large transboundary watershed: implications for nutrient stoichiometry and lake vs. watershed budgets. Journal of Great Lakes Research. In press.

Ellenor JR, PA Cott and HK Swanson. 2022. Occupancy of young-of-year Arctic grayling (*Thymallus arcticus*) in Barrenland streams. Hydrobiologia 849:725-745.

Erdozain M, KA Kidd, L Negrazis, S Capell, DP Kreutzweiser, MA Gray and EJS Emilson. 2022. Understanding the effects of forest management on streams and rivers: a synthesis of research conducted in New Brunswick (Canada) 2014-2018. The Forestry Chronicle 98:77- 88.

Gauthier M, JA Scott, G Senhorinho, N Basiliko and S Desjardins. 2022. Green photosynthetic-microalgae from low pH environments as a potential source of antioxidants. Industrial Biotechnology 18:168-175.

Greco D, SE Arnott, I Fornier and B Schamp. 2023. Nutrient level does not alter response to salinization in freshwater zooplankton communities. Limnology and Oceanography Letters 8:48-55. DOI: 10.1002/lol2.10202

Gunn JM and J Louste-Fillion. 2022. Adaptability of lake charr (*Salvelinus namaycush*) in a changing world: Newly colonized landscapes reveal the significance of traits shaped during the Pleistocene. Env. Biol. Fish. https://doi.org/10.1007/s10641-022-01311-y

Hajek J, Y Alarie, CJ Bennetti, M Springer, L Hendrich, A Villastrigo and M Balke. 202X. Underestimated diversity and range size of *Copelatus* diving beetles in tank bromeliads - beetles of "hygrofloric" lifestyle (Coleoptera: Dytiscidae). Zoological Journal of the Linnean Society. In press.

Hart S, T Porter, N Basilko, L Venier, M Hajibabaei and D Morris. 2022. Fungal community dynamics and C mineralization in coarse woody debris across decay stage, tree species, and stand development stage in northern boreal forests. bioRxiv https://doi.org/10.1101/2022.01.31.478531

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

Hilgendag IR, HK Swanson, CW Lewis and AD Ehrman. 2022. Mercury biomagnification in benthic, pelagic and benthopelagic food webs in an Arctic marine ecosystem. Science of the Total Environment 841(1)156242.

Hintz WD[†], SE Arnott[†], CC Symons, DA Greco, A McClymont, JA Brentrup, M Cañedo-Argüelles, AM Derry, AL Downing, DK Gray, SJ Melles, RA Relyea, JA Rusak, CL Searle, L Astorg, HK Baker, BE Beisner, KL Cottingham, Z Ersoy, C Espinosa, J Franceschini, AT Giorgio, N Göbeler, E Hassal, M-P Hébert, M Huynh, S Hylander, KL Jonasen, AE Kirkwood, S Langenheder, O Langvall, H Laudon, L Lind, M Lundgren, L Proia, MS Schuler, JB Shurin, CF Steiner, M Striebel, S Thibodeau, P Urrutia-Cordero, L Vendrell-Puigmitja and GA Weyhenmeyer. 2022. Current water quality guidelines across North America and Europe do not protect lakes from salinization. Proceedings of the National Academy of Sciences of the United States of America 119:e2115033119, 10.1073/pnas.2115033119. Co-led[†]

Houde M and 35 others including H Swanson. 2022. Contribution and perspectives of Indigenous Peoples to the study of mercury in the Arctic. Science of the Total Environment. 841:156566.

Hu A, KS Jang, F Meng, J Stegen, AJ Tanentzap, M Choi, JT Lennon, J Soininen and J Wang. 2022. Microbial and environmental processes shape the link between organic matter functional traits and composition. Environmental Science & Technology 56:10504-10516. (Featured on cover)

Hu A, M Choi, AJ Tanentzap, J Liu, KS Jang, JT Lennon, Y Liu, J Soininen, X Lu, Y Zhang, J Shen and J Wang. 2022. Ecological networks of dissolved organic matter and microorganisms under global change. Nature Communications 13:3600.

Ielpi A, MGA Lapôtre, A Finotello and P Roy-Léveillée. 2023. Large sinuous rivers are slowing down in a warming Arctic. Nature Climate Change DOI:10.1038/s41558-023-01620-9

Ielpi A and MGA Lapôtre. 2022. Linking sediment flux to river migration in arid landscapes through mass balance. Journal of Sedimentary Research 92:695-703.

Ielpi A, MGA Lapôtre, MR Gibling and CK Boyce. 2022. The impact of vegetation on meandering rivers. Invited review. Nature Reviews Earth & Environment 3:165-178.

Johnston, TA, GL Lescord, M Quesnel, P-L Savage, JM Gunn and KA Kidd. 2022. Age, body size, growth and dietary habits: what are the key factors driving individual variability in mercury of lacustrine fishes in northern temperate lakes? Environmental Research 213:113740.

Jones BM, G Grosse, LM Farquharson, P Roy-Léveillée, A Veremeeva, MZ Kanevskiy, BV Gaglioti, AL Breen, AD Parsekian, M Ulrich and KM Hinkel. 2022. Lake and drained lake basin systems in lowland permafrost regions. Nature Reviews Earth & Environment 3(1):85-98. https://doi.org/10.1038/s43017-021-00238-9

Jonsson S, M Nerentorp Mastro-monaco, F Wang, AG Bravo, WRL Cairns, J Chételat, TA Douglas, GL Lescord, L Ukonmaanaho and LE Heimbürger-Boavida. 2022. Arctic methylmercury cycling. Sci. Total. Environ. 157445, DOI:10.1016/j.scitotenv.2022.157445

Joseph R, A Diochon, P Hazlett, L Venier, C Emilson, N Basiliko, N Bélanger, J Markham, D Morris, PM Rutherford, E Smenderovac and K van Rees. 2022. Limited effect of wood ash application on soil quality as indicated by a multi-site assessment of soil organic matter attributes. Global Change Biology-Bioenergy. DOI:10.1111/gcbb.12928

Keevil MG, N Noble, S Boyle, D Lesbarreres and J Litzgus. 202X. Lost reproductive value reveals a high burden of juvenile road mortality in a long-lived species. Ecological Applications. In press.

Kell SJ, N Rollinson, RJ Brooks and JD Litzgus. 2022. Nesting in close quarters: Causes and benefits of high-density nesting behaviour in Painted Turtles. Canadian Journal of Zoology 100: 208-218 (https://cdnsciencepub.com/doi/full/10.1139/cjz-2021-0159).

Kellaway E, MC Eimers and SA Watmough. 2022. Liming legacy effects associated with the world's largest soil liming and regreening program in Sudbury, Ontario, Canada. Science of the Total Environment 805:150321.

Kim N, SA Watmough and ND Yan. 2022. Wood ash amendments as a potential solution to widespread calcium decline in eastern Canadian forests. Environmental Reviews 30:485-500.

Kluke, C, GL Lescord, B Kielstra, A Lock, TA Johnston, S 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. 00:1-14. DOI: 10.1139/cjfas-2022-0106.

Lapôtre MGA, JL Bishop, A Ielpi, DR Lowe, KL Siebach, NH Sleep and SM Tikoo. 2022. Mars as a time machine to Precambrian Earth. Journal of the Geological Society 179:jgs2022-047.

Laske SM, SM Burke, MP Carey and HK Swanson. Investigation effects of climate-induced changes in water temperature and diet on mercury concentrations in an Arctic freshwater forage fish. Environmental Research 218(3):114851.

Lau C, C Barriault and J Krolik, J. 2022. Evaluating the impact of a comprehensive Canadian Science-Art Residency Program on the participating scientist, artist and the public. Frontiers in Education 6. https://www.frontiersin.org/articles/10.3389/feduc.2021.690489

Lembrechts J, J van den Hoogen, J Aalto, M Ashcroft, P De Frenne, J Kemppinen, M Kopecký, M Luoto, IMD Maclean, TW Crowther, JJ Bailey, S Haesen, DH Klinges, P Niittynen, B Scheffers, K Van Meerbeek plus 390 authors including EC Freeman and AJ Tanentzap. 2022. Global maps of soil temperature. Global Change Biology 28:3110-3144.

Lescord, GL, TA Johnston, DE Ponton, M Amyot, A Lock and JM Gunn. 2022. The speciation of arsenic in the muscle tissue of inland and coastal freshwater fish from a remote boreal region. Chemosphere 308:136140.

Levasseur P, J Galarza and SA Watmough. 2022. One of the world's largest regreening programs promotes healthy tree growth and nutrient accumulation up to 40-years post restoration. Forest Ecology and Management 507:120014.

Lievesley JA, EG Nancekivell, RJ Brooks, JD Litzgus and N Rollinson. 2022. Long-term resilience of primary sex ratios in a species with temperature-dependent sex determination after decades of climate warming. American Naturalist 200(4):532-543.

Liu F, B Lockett, R Sorichetti, SA Watmough and MC Eimers. 2022. Agricultural intensification leads to higher nitrate levels in Lake Ontario tributaries. Science of the Total Environment 830:154534.

MacGillivray KA, JW Greenwood, AM Paterson, SA Watmough, AJ Williams and MC Eimers. 202X. Complex patterns of phosphorus delivery in the Lake of the Woods watershed. Journal of Great Lakes Research. In press.

Mangal V, WY Lam, H Huang, EJS Emilson, RW Mackereth and CPJ Mitchell. 2022. Molecular correlations of dissolved organic matter with inorganic mercury and methylmercury in Canadian boreal streams. Biogeochemistry 160:127-144.

McClymont AM, SE Arnott and JA Rusak. 2023. The effects of increasing chloride concentrations and temperatures on freshwater zooplankton communities. Limnology and Oceanography Letters 8:56-64. DOI:10.1002/1012.10278

McCuaig S, R McKillop, C McGregor, P Roy-Léveillée and A St-Amour. 2022. Mapping surficial deposits and investigating permafrost along the proposed Kivalliq Hydro-fibre link, Manitoba to Nunavut. Proceedings of GeoCalgary 2022, Calgary, AB. 2-5 Oct 2022. https://geocalgary2022.ca/wp-content/uploads/papers/311.pdf

McDonough A and SA Watmough. 202X. 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. In press.

McDonough AW, SA Watmough, and AW Bird. 202X. Biogeochemical responses to multi-year above-canopy applications of nitrogen at a jack pine (*Pinus banksiana* Lamb.) forest in northern Alberta, Canada. Canadian Journal of Forest Research. In press.

Michat MC, Y Alarie and CJ Benetti. 2022. Larval morphology of the Neotropical diving beetle genus *Hemibidessus* Zimmermann, 1921 (Coleoptera:Dytiscidae: Bidessini). Zootaxa 5168:388-400.

Morison MQ, SN Higgins, KL Webster, EJS Emilson, H Yao and NJ Casson. Spring coherence in dissolved organic carbon export dominates total coherence in Boreal Shield forested catchments. Environmental Research Letters 17:014048.

Moslemi-Aqdam M, G Low, M Low, BD Laird, BA Branfireun and H Swanson. 2022. Estimates, spatial variability and environmental drivers of mercury biomagnification rates through lake food webs in the Canadian subarctic. Environmental Research 217:114835.

Moslemi-Aqdam M, LF Baker, JL Baltzer, BA Branfireun, MS Evans, BD Laird, G Low, M Low and HK Swanson. 2022. Understanding among-lake variability of mercury concentrations in Northern Pike (*Esox Lucius*): A whole-ecosystem study in subarctic lakes. Science of the Total Environment 822:153430.

Mullin DI, RC White, JL Mullen, AM Lentini, RJ Brooks and JD Litzgus. 202X. Headstarting turtles to larger body sizes for multiple years increases survivorship but with diminishing returns. Journal of Wildlife Management. Accepted.

Munford KE, S Gilbert-Parkes, NCS Mykytczuk, N Basiliko, KM Yakimovich, A Poulain and SA Watmough. 202X. How arsenic contamination influences downslope wetland plant and microbial community structure and function. Science of the Total Environment. Accepted.

Munford KE, A Asemaninejad, N Basiliko, NCS Mykytczuk, S Glasauer, S McGarry and SA Watmough. 2022. Native plants facilitate vegetation succession on amended and un-amended mine tailings. International Journal of Phytoremediation 24:963-974

Naeth MA, LA Leskiw, JA Brierley, CJ Warren, K Keys, K Dlusskiy, R Wu, GA Spiers, J Laskosky, M Krzic, G Patterson and A Bedard-Haughn. 2022. Revised proposed classification for human modified soils in Canada: Anthroposolic order. Canadian Journal of Soil Science 103(1). https://doi.org/10.1139/cjss-2022-0033

Negrazis L, KA Kidd, M Erdozain, EJS Emilson, CPJ Mitchell and MA Gray. 2022. Effects of forest management on mercury bioaccumulation and biomagnification along the river continuum. Environmental Pollution 310:119810.

Newman J, PA Levasseur, P Beckett and SA Watmough. 202X. The impact of severe pollution from smelter emissions on carbon and metal accumulation in peatlands. Environmental Pollution. In press.

Nkongolo K, G Spiers, P Beckett and R Narendrula-Kotha. 202X. Levels of metals and microbial biomass in Cobalt-Coleman mine tailings (Northern Ontario, Canada) three decades after land reclamation. Bulletin of Environmental Contamination and Toxicology. In Press.

Nkongolo K, G Spiers, P Beckett and R Narendrula-Kotha. 2022. Inside old, reclaimed mine tailings in Northern Ontario, Canada: a microbial perspective. Ecological Genetics and Genomics 23:100118. https://doi.org/10.1016/j.egg.2022.100118.

Nkongolo K, G Spiers, P Beckett and R Narendrula-Kotha. 2022. Effects of phytoremediation on microbial biomass, composition, and function in a sulphide-rich tailing from a metal-contaminated region. Frontiers in Environmental Science (section Conservation and Restoration Ecology) 10-2022. https://doi.org/10.3389/fenvs.2022.908633

Ott NFJ and SA Watmough. 2022. Does forest species composition impact modelled soil recovery from acidic deposition? Canadian Journal of Forest Research 52(3):372-384.

Packull-McCormick S, M Ratelle, C Lam, J Napenas, M Bouchard, H Swanson and BD Laird. 2022. Hair to blood mercury concentration ratios and a retrospective hair segmental mercury analysis

in the northwest Territories, Canada. Environmental Research 203: 111800. doi.org/10.1016/j.envres.2021.111800

Ponton, DE, J Ruelas-Inzunza, R Lavoie, GL Lescord, TA Johnston, J Graydon, M Reichert, C Donadt, M Poesch, JM Gunn and M Amyot. 2022. Mercury, selenium and arsenic concentrations in Canadian freshwater fish and a perspective on human consumption intake and risk. J. Hazard. Mat. Adv. 6: 100060.

Povoroznyuk O, WF Vincent, P Schweitzer, R Laptander, M Bennett, F Calmels, D Sergeev, C Arp, B Forbes, P Roy-Léveillée and DA Walker. 2022. Arctic roads and railways: Social and environmental and consequences of transport infrastructure in the circumpolar North. Arctic Science. https://doi.org/10.1139/as-2021-0033

Richard K, K Pisani and CL Barriault. 2022. Evaluating changes in experimentation, critical thinking, and sense of wonder in participants of Science North's in-school outreach programs. Frontiers in Education *7*. https://doi.org/10.3389/feduc.2022.675306

Ross AJ and SE Arnott. 2022. Similar zooplankton responses to low pH and calcium may impair long-term recovery from acidification. Ecological Applications 32. DOI:10.1002/eap.2512

Shaposhnikova M, CR Duguay and P Roy-Léveillée. 2022. Bedfast and floating ice dynamics of thermokarst lakes using a temporal deep learning mapping approach: Case study of the Old Crow Flats, Yukon, Canada. The Cryosphere. https://doi.org/10.5194/egusphere-2022-388

Sheridan EA, J Fonvielle, S Cottingham, Y Zhang, T Dittmar, DC Aldridge and AJ Tanentzap. 2022. Plastic pollution fosters more microbial growth in lakes than natural organic matter. Nature Communications 13:4175. *Reported on by The Independent, The Telegraph, New Scientist, etc; radio interview with The Times; TV coverage by RT´E; Selected as Research Highlight by Nature Reviews Microbiology

Smenderovac E, J Hoage, TM Porter, C Emilson, R Fleming, N Basiliko, M Hajibabei, D Morris and L Venier. 2023. Boreal forest soil biotic communities are affected by harvesting, site preparation with no additional effects of higher biomass removal 5 years post-harvest. Forest Ecology and Management 528:120636.

Smenderovac E, C Emilson, T Porter, D Morris, P Hazlett, A Diochon, N Basiliko, N Bélanger, K Markham, PM Rutherford, K van Rees, T Jones and L Venier. 2022. Forest soil biotic communities show few responses to wood ash applications at multiple sites across Canada. Scientific Reports 12:1-13.

Smith R, E Hitkolok, T Loewen, A Dumond, K Kristensen and H Swanson. 2022. Overwintering ecology and movement of anadromous Arctic char (*Salvelinus alpinus*) in a large, ice-covered river in the Canadian Arctic. Journal of Fish Biology 100(6):1432-1446.

Sorichetti RJ, M Raby, C Holeton, N Benoit, L Carson, A DeSellas, N Diep, BA Edwards, T Howell, G Kaltenecker, C McConnell, C Nelligan, AM Paterson, V Rogojin, N Tamana, H Yao and JD Young. 2022. Chloride trends in Ontario's surface and groundwaters. J. Great Lakes Res. 48:512-525.

Sun X and SE Arnott. 2022. Interactive effects of increased salinity and heatwave on freshwater zooplankton communities in synchronous and sequential treatments. Freshwater Biology 67:1604-1617.

Sun X and SE Arnott. 2022. Evolved tolerance to NaCl does not alter *Daphnia* response to acute heat stress. Evolutionary Ecology. DOI:10.1007/s10682-022-10220-6

Tafvizi A, AL James, H Yao, T Stadnyk and C Ramcharan. 2022. Investigating hydrologic controls on 26 Precambrian Shield catchments using landscape, isotope tracer and flow metrics. Hydrological Processes 36(3):e14528.

Timmerman S, JR Reimink, A Vezinet, F Nestola, K Kublik, A Banas, T Stachel, RA Stern, Y Luo, C Sarkar, A Ielpi, CA Currie, C Mircea, V Jackson and DG Pearson. 2022. Mesoarchean diamonds formed in thickened lithosphere, caused by slab-stacking. Earth and Planetary Science Letters 592:117633.

Trowbridge CM and JD Litzgus. 2022. Windfarms alter amphibian community diversity and chorusing behavior. Herpetologica 78(2):75-85.

Urcola JI, Y Alarie, CJ Benetti, PLM Torres and MC Michat. 2022. Description and chaetotaxy analysis of the larval instars of *Hydrocanthus debilis,* Sharp, 1882 (Coleoptera: Noteridae). Zootaxa 5196: 135-144.

Valleau RE, MP Celis-Salgado, SE Arnott, AM Paterson and JP Smol. 2022. Assessing the effect of salinization (NaCl) on the survival and reproduction of two ubiquitous Cladocera species (*Bosmina longirostris* and *Chydorus brevilabris*). Water Air and Soil Pollution 233:135. DOI:10.1007/s11270-021-05482-9

Verbeke B, LJ Lamit, E Lilleskov, J Chanton, S Hodgkins, N Basiliko, E Kane and 55 co-authors subsequently listed alphabetically including S Johnson and M Carson. 2022. Latitude, elevation, and mean annual temperature predict peat organic matter chemistry at a global scale. Global Biogeochemical Cycles 36:e2021GB007057.

Vincent KD, J Popp, SJ Kell, A Belleau and JD Litzgus. 2022. Chrysemys picta marginata (Midland Painted Turtle) Novel railway mortality. Herpetological Review 53(2):308-309.

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. 2022. Nutrient function over form: Organic and inorganic nitrogen additions have similar effects on lake phytoplankton nutrient limitation. Limnology and Oceanography. https://doi.org/10.1002/lno.12270

Watkinson A, M Juckers, LD Andrea, P Beckett and G Spiers. 2022. Ecosystem recovery of the Sudbury technogenic barrens 30 years post-restoration. Eurasian Journal of Soil Science 55(5):663-672.

Watmough SA, S Gilbert-Parkes, N Basiliko, LJ Lamit, E Lilleskov (core author group) and 58 others including N Mykytczuk, G Spiers, M Carson, P Levasseur. 202X. Variation in carbon and nitrogen concentrations among peatland categories at the global scale. PLoS-One e0275149.

Webster KL, JA Leach, PW Hazlett, JM Buttle, EJS Emilson and IF Creed. 2022. Long-term stream chemistry response to harvesting in a northern hardwood forest watershed experiencing environmental change. Forest Ecology and Management 519:120345.

Wijewardena T, MG Keevil, NE Mandrak, A Lentini and JD Litzgus. 2022. Evaluation of headstarting as a conservation tool to recover Blanding's Turtles (*Emydoidea blandingii*) in a highly fragmented urban landscape. PLoS One. Accepted.

Zuykov M, L Hayhurstb, N Murakami-Sugiharac, K Shiraic, G Spiers, M Schindler. 2021. Periostracum of bivalve mollusk shells for sampling engineered metal nanoparticles: a novel case study of silver-based nanoparticles in Canada's experimental lake. Chemosphere 303(1):134912. https://doi.org/10.1016/j.chemosphere.2022.134912

Reports

Douglas AG and D Pearson. 2022. Ontario; Chapter 3 *in* Canada in a Changing Climate: Regional Perspectives Report. FJ Warren, N Lulham, DL Dupuis and DS Lemmen (eds.) Government of Canada, Ottawa, Ontario. https://changingclimate.ca/regional-perspectives/

Sarrazin-Delay C and K Fram. 2022. Benthic Macroinvertebrate Community after Rehabilitation at Manitou River Site M49, Cooperative Freshwater Ecology Unit report, Sudbury, ON, 25pp.

Conference Presentations

Arnott SE, MP Celis-Salgado and S Buren. Water hardness influences zooplankton response to salinity. Joint Aquatic Sciences Meeting, Grand Rapids, MI. May 2022.

Arnott SE, B Hintz, C Symons, A Derry, S Melles, M Cañedo-Argüelles, J Brentrup, A Downing, D Gray, D Greco, A McClymont, R Relyea, J Rusak, C Searle, C Steiner, M-P Hébert, S Langenheder, O Langvall, S Hylander, L Lind, L Astorg, B Beisner, H Baker, Z Ersoy, C Espinosa, J Franceschini, A Giorgio, N Göbeler, E Hassal, M Huynh, K Jonasen, A Kirkwood, H Laudon, M Lundgren, E Moffett, L Proia, M Schuler, J Shurin, M Striebel, S Thibodeau, P Urrutia Cordero, L Vendrell-Puigmitja, G Weyhenmeyer. Current water quality guidelines for chloride do not adequately protect aquatic ecosystems. Society of Canadian Limnologists, Vancouver, BC. Feb 2022.

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

Belzile N. Biogeochemistry of trace elements in aquatic systems and mine sites. Instituto de Investigaciones Oceanológicas, Universidad Autónoma de Baja California. Ensenada, Mexico.

Cardinal RM, P Roy-Léveillée, S Gauthier, M Kwan and B Branfireun. Degrading palsa field and methylmercury concentrations near Kangiqsualujjuaq, Nunavik(QC). ArcticNet Annual Scientific Meeting, Toronto, ON. Dec 2022.

Carroll B, S Noganosh and JD Litzgus. Ecology of species at risk turtles within the footprint of a proposed highway expansion and transmission line. Canadian Herpetological Society conference, Fredericton, NB. 16-19 Sept 2022.

Choquette J, JD Litzgus, JXY Gui and T Pitcher. A systematic review of snake translocations to identify potential tactics for reducing post-release effects. Canadian Herpetological Society conference, Fredericton, NB. 16-19 Sept 2022.

Corbiere N, P Roy-Léveillée, B Branfireun, A Kirkwood, D Chiasson and N Basiliko. Assessing Net Methylmercury Potential in Recently Drained Basins in Old Crow Flats, Yukon, Canada. American Geophysical Union Fall Meeting Chicago, IL. (C52D-0389). 12-16 Dec 2022.

Corbiere N, P Roy-Léveillée, B Branfireun, A Kirkwood, D Chiasson and N Basiliko. Assessing net methylmercury production in changing permafrost environments in Old Crow Flats, Yukon. North Yukon Permafrost Conference Program. North Yukon Permafrost Conference, Dawson City, YT. Aug 2022. Poster.

Delay S, J Urquhart and JD Litzgus. Impacts of a windfarm and wildfire on the spatial ecology and habitat selection of an endangered freshwater turtle. Canadian Herpetological Society conference, Fredericton, NB. 16-19 Sept 2022. Virtual.

Deslauriers C, P Roy-Léveillée and M Allard. Permafrost thermal regime and thermokarst rates over decades in palsas and lithalsas near Kangiqsualujjuaq, Nunavik. ArcticNet Annual Scientific Meeting, Toronto, ON. Dec 2022.

Emilson EJS, E Smenderovac, M Erdozain, M Gray, K Kidd and D Kreutzweiser. Response of stream ecosystems to forest management is influenced by post-harvest silvicultural activities and spatial and temporal context. North American Forest Ecology Workshop. 20-24 Jun 2022. Virtual.

Erdozain M, K Kidd, EJS Emilson, M Gray, L Negrazis and D Kreutzweiser. Forest management impacts of stream integrity: do they accumulate spatially? North American Forest Ecology Workshop. 20-24 Jun 2022. Virtual.

Ewins C, SE Arnott and S Lamoureux. Effects of turbidity and nutrients on zooplankton community structure: a mesocosm study. ESA/CSEE, Montreal, QC. Aug 2022.

Gauthier S, M Allard and P Roy-Léveillée. Knowledge transfer from applied permafrost research: Bridging the gap between technical scientific communications and easily accessible information. ArcticNet Annual Scientific Meeting 2022, Toronto, ON. Dec 2022.

Hintz WD and SE Arnott. Current water quality guidelines across North America and Europe do not protect lakes from salinization. Joint Aquatic Sciences Meeting, Grand Rapids, MI. May 2022.

Ielpi A. Can modern meander belts inform fluvial biogeochemical fluxes in deep time? A geomorphological perspective on merits and pitfalls. American Geophysical Union Fall Meeting Chicago, IL. (C52D-0389). 12-16 Dec 2022. *Invited.

Ielpi A and MGA Lapôtre. Stream widening and accelerated lateral migration from wildfire-induced watershed-wide perturbations in sediment flux. American Geophysical Union Fall Meeting Chicago, IL. (C52D-0389). 12-16 Dec 2022.

Ielpi A. Watershed controls on river mobility: Key to address human stresses on waterways. Invited talk, Department of Earth, Environmental and Geographic Sciences, University of British Columbia-Okanagan, Kelowna, BC. 10 May 2022.

Ielpi A. How do rivers respond to environmental stresses? Insight into channel mobility. Stanford Geological Sciences Virtual Seminar, University of Stanford, Stanford, CA. 18 Jan 2022. Invited.

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.

Ju S, KA Kidd, EJS Emilson and C Mitchell. Effects of spruce budworm defoliation on stream food webs and mercury cycling. Joint Aquatic Sciences Meeting, Grand Rapids, MI. 14-20 May 2022. Virtual.

Keevil MG, PD Moldowan, RJ Brooks and JD Litzgus. Challenges and potential costs of overwintering for Snapping Turtles (*Chelydra serpentina*). Canadian Herpetological Society conference, Fredericton, NB. 16-19 Sept 2022.

Keevil MG, DP Armstrong, RJ Brooks and JD Litzgus. A model of seasonal variation in somatic growth rates applied to two temperate turtle species. Joint Aquatic Sciences Meeting. Grand Rapids, MI. 14-20 May 2022. Virtual.

Kentel J, T Burke, S Kell and JD Litzgus. A rocky solution: Evaluating the use of common construction materials as road effect mitigation for turtle communities in a rock barren landscape. Canadian Herpetological Society conference, Fredericton, NB. 16-19 Sept 2022. *Winner best student lightning talk.

Kirkwood A, N Basiliko, BA Branfireun and P Roy-Léveillée. Mercury methylation and microbial community structure in degrading permafrost features of the Hudson Bay Lowlands, Canada. American Geophysical Union Fall Meeting Chicago, IL. (C52D-0389). 12-16 Dec 2022.

Kirkwood A, P Roy-Léveillée, B Branfireun, M Packalen, J McLaughlin and N Basiliko. Assessing mercury storage in the Hudson Bay Lowlands, Central Canada. Réunion scientifique annuelle Sentinelle Nord, Quebec City, QC. 25-27 Oct 2022.

Lajoie C, KA Kidd, SS Capell and EJS Emilson. Food web structure and function in headwater streams across wetland, forest, and transitional habitats in Canada's boreal. Joint Aquatic Sciences Meeting, Grand Rapids, MI. 14-20 May 2022. Virtual.

Lavigne J, K Chan-Yam, M Hebert, O Baudet, P Beckett, G Spiers and N Basiliko. Restoration strategies for enhancing biodiversity and ecosystem functioning on legacy aggregate pits. Meetings of the Peatland Ecology and Research Group and the Eastern Region of the Society for Ecological Restoration. Quebec, QC. Apr 2022

L'Hérault E, M Allard, M Lemay, F Calmels and P Roy-Léveillée. Towards large-scale implementation of near-real-time ground temperature monitoring LoRaWAN networks in northern Quebec and Yukon: challenges and opportunities. Réunion scientifique annuelle Sentinelle Nord, Quebec City, QC. 25-27 Oct 2022.

Lepage AT, GL Lescord, A Lock, TA Johnston and JM Gunn. Bioaccumulation and speciation of arsenic in freshwater organisms near historical mining operations. Laurentian and Prairie Northern SETAC joint AGM and Conference, June 2022. Virtual Poster.

Levasseur P, J Newman and SA Watmough. The impact of severe pollution from smelter emissions on carbon and metal accumulation in peatland. NADP Fall Meeting and Scientific Symposium: Monitoring for a sustainable future. Knoxville, TN. 16-18 Nov 2022.

Levasseur P and SA Watmough. Estimating mineral surface area and acid sensitivity of forest soils in Kitimat, British Columbia. Effective Energy and Chemical Recovery in Pulp and Paper Mills. Toronto, ON. 8-10 Nov 2022.

Litzgus JD. Chasing catastrophes slowly: Changes in turtle population patterns over time. MWPARC meeting, John Ball Zoo, Grand Rapids, MI. 9-11 Sept 2022. Invited Keynote.

Maloney A, J Urquhart and JD Litzgus. Understanding the impacts of wildfire and windfarm construction on squamate community ecology in central Ontario. Canadian Herpetological Society conference, Fredericton, NB. 16-19 Sept 2022.

Mangal V, H Huang, EJS Emilson and CPJ Mitchell. Forest harvesting impacts on the chemical composition of dissolved organic matter in boreal streams. CMOS-CGU Joint Congress, Saskatoon, SK. 1-3 & 6-8 Jun 2022. Virtual.

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.

McCaig ML, EJS Emilson, KA Kidd and E Smenderovac. Impacts of spruce budworm defoliation on the structure and function of microbial communities in streams. Joint Aquatic Sciences Meeting, Grand Rapids, MI. 14-20 May 2022. Virtual.

McGarry S, GA Spiers, PJ Beckett and MD Preston. The feasibility of using municipal compost cover over Cu-Ni tailings as a growth medium for biofuel crops. Canadian Soil Science Society Annual Conference, Edmonton, AB. 23-27 May 2022.

Mitchell CPJ, V Mangal, H Huang, WY Lam, EJS Emilson and R Mackereth. Stream sediment methylmercury as a dominant source to stream water loading in small, boreal forest catchments. American Geophysical Union Fall Meeting Chicago, IL. (C52D-0389). 12-16 Dec 2022.

Pearson D. Adapting to climate change. Grand Council Treaty #3, Climate Change Youth Summit, Winnipeg, MB. 29 Mar 2022.

Pearson D. Climate leadership in First Nation communities deciding on adaptation priorities using a five-step adaptation framework. Assembly of First Nations Climate Gathering, workshop and booth, Fredericton, NB. 27-29 Sep 2022.

Rahman T and P Roy-Léveillée. Volume, morphology, and development of ice wedges in the barrens of the Hudson Bay Lowlands, northern Manitoba. ArcticNet Annual Scientific Meeting, Toronto, ON. Dec 2022

Roy-Léveillée P. Suivi des systèmes pergélisolés: présentation des enjeux. Réunion scientifique annuelle Sentinelle Nord, Quebec City, QC. 25-27 Oct 2022. Invited.

Roy-Léveillée P. The initiation of permafrost aggradation in drained lake basins near Old Crow, Yukon. ArcticNet Annual Scientific Meeting, Toronto, ON. Dec 2022.

Roy-Léveillée P, F Calmels, F Amyot and L-P Roy. The initiation of permafrost aggradation in drained lake basins near Old Crow, Yukon. ArcticNet Annual Scientific Meeting, Toronto, ON. Dec 2022.

Sarrazin-Delay C. PICCA GeoHub. National Forum on Earth Observation. 4-6 Oct 2022. Virtual.

Sarrazin-Delay C. PICCA GeoHub. ESRI Canada's GIS Day in Canada. 14 Nov 2022. Virtual.

Seward J, PJ Beckett, S Bräuer, P Roy-Léveillée, N Basiliko, E Emilson and SA Watmough. Recovery and biogeochemical assessment of smelter impacted peatlands in Sudbury, Ontario, Canada. American Geophysical Union Fall Meeting Chicago, IL. (C52D-0389). 12-16 Dec 2022.

Seward J, P Beckett, S Bräuer, P Roy-Léveillée, N Basiliko, EJS Emilson and S Watmough. Recovery of smelter impacted peatlands in Sudbury, Ontario. PERG / SER-EN Science Symposium, Quebec, QC. 6-7 Apr 2022.

Sidhu H, KA Kidd, EJS Emilson, B Kielstra and C McCarter. The effects of spruce budworm on catchment hydrology in hilly spruce and fir-dominated forests in Gaspé, Quebec. Joint Aquatic Sciences Meeting, Grand Rapids, MI. 14-20 May 2022. Virtual.

Sun X and SE Arnott. Timing of salinity treatment and heatwave determines interactive effects on freshwater zooplankton. Joint Aquatic Sciences Meeting, Grand Rapids, MI. May 2022.

Thibeault S, J Hathaway, K Moxley and JD Litzgus. Population Demography and Spatial Ecology of Spotted Turtles (*Clemmys guttata*) in central Ontario. Canadian Herpetological Society conference, Fredericton, NB. 16-19 Sept 2022.

Turner K, M Pearce, M Tessier, P Roy-Léveillée, I MacDonald, C Charlie, B Wolfe and S Gagnon. Monitoring surface water biogeochemistry and ground conditions in drained lake basins in Old Crow Flats, Yukon, Canada. ArcticNet Annual Scientific Meeting, Toronto, ON. Dec 2022

Vincent K, J Litzgus and J Popp. The influence of landscape variables on turtle and frog railway interactions. Canadian Herpetological Society conference, Fredericton, NB. 16-19 Sept 2022.

Vincent K, J Litzgus, C Kozmik, S Kell and J Popp. Weaving Indigenous knowledge and western science to investigate the impacts of railways on wildlife. Laurentian University GSA Discovery and Dissemination Graduate Research Symposium. 30 Mar 2022. Winner of best talk in Faculty of Science, Engineering and Architecture and best talk with Indigenous content.

Vincent K, J Litzgus, C Kozmik, S Kell and J Popp. Weaving Indigenous knowledge and western science to investigate the impacts of railways on wildlife. Ontario Chapter of the Wildlife Society Conference. 26 Mar 2022. Virtual.

Warren CJ, D Saurette, GA Spiers and A Gillespie. Application of Radiometric Data to Predictive Digital Soil Mapping in Ontario. Canadian Soil Science Society Annual Conference, Edmonton, AB. 23-27 May 2022.

Watmough SA. A community led wood ash recycling program to restore forest nutrition in Muskoka, Ontario. Forest Ecosystem Monitoring Cooperative Conference. Burlington, VT. 15 Dec 2022.

Watmough SA and A McDonough. The response of vascular plants in xeric Boreal forests to atmospheric nitrogen deposition depends on precipitation. NADP Fall Meeting and Scientific Symposium: Monitoring for a sustainable future. Knoxville, TN. 16-18 Nov 2022.

Webster K, PW Hazlett, A Leach, EJS Emilson, JM Buttle and IF Creed. Long-term stream chemistry response to forest harvesting in a temperate deciduous forest watershed experiencing environmental change. North American Forest Ecology Workshop. 20-24 Jun 2022. Virtual.

Wijewardena T, NE Mandrak, JE Paterson, CM Davy, CB Edge and JD Litzgus. Soft release does not improve reintroduction outcomes for an endangered freshwater turtle in an urban landscape. Canadian Herpetological Society conference, Fredericton, NB. 16-19 Sept 2022.

Wijewardena T, MG Keevil, NE Mandrak and JD Litzgus. Demography and survival of headstarted Blanding's turtles in an urban wetland complex. Joint Aquatic Science Meeting. 14-20 May 2022. Virtual.

Wijewardena T, MG Keevil, NE Mandrak and JD Litzgus. Demography and survival of headstarted Blanding's turtles in the Rouge National Urban Park. ReNewZoo Student Symposium, Toronto Zoo, ON.

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 an anti-racist science communication training program. PI Orihel (2021-2023).
- South Frontenac Ecosystem grant. Effects of road salt runoff on South Frontenac Lake Ecosystems. PIs MSc Students Cicchetti and Martin (2021-2022)
- 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)

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)
- SSHRC Insight Development Grant. Collaboration project with the Huron Wendat Nation (HWN) to examine Wendat history through pottery in the Lower Great Lakes and St. Lawrence Valley. Funding for SCOM students to develop and deliver an archeological pottery exhibit for Science North and the Huron Wendat Museum. PI: Dr. Alicia Hawkins. (2020-2022)
- NSERC Encouraging Vaccine Confidence in Canada fund. Collaborator (Jul 2021 to Jan 2022)

Basiliko, N

- 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.
- NSERC Discovery. The tiny majority: how microbes mediate ecosystem functioning under anthropogenic stressors in boreal environments (2019-2024)
- 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) (2021-2024)

- NSERC Canada Research Chair Tier II in Environmental Microbiology (2018-2023)
- NSERC Advancing Climate Change Science in Canada (ACCS) program. Winter carbon losses in wetland ecosystems under current and future climates. With F Rezanezhad PI et al. at (U Waterloo), Bill Quinton (Wilfrid Laurier), P Roy-Léveillée (Laval) (2019-2023)
- NSERC Collaborative Research and Development Grant (CRD). Enhancing dewatering, drying, combustion and utilization of pulp and paper mill biosludge with G Allen (PI) and 7 others (2017-2022)
- NSERC Research Tools and Infrastructure (RTI) Grant. A macronutrient (C and N) analysis system for studies of natural and stressed soils and waters. Nathan Basiliko (PI), and J Gunn.
- 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)
- NSERC Collaborative Research and Development Grant- Ontario Centres of Excellence TargetGHG program. Landscape Carbon Accumulation through Reductions in Emissions (L-CARE): developing brownfield management protocols for carbon sequestration and habitat use. N Basiliko (PI) with J Gunn (co-PI), N Mykytczuk, G Spiers, P Beckett (Laurentian), J Smol, A Paterson (Queens University), JM Waddington (McMaster University), S Watmough (Trent University), P del Giorgio, Y Prairie (UQAM), JP Bellenger (University of Sherbrooke). $2,000,000 from NSERC, OCE, and industrial partners Vale Ltd. and Glencore's Sudbury Integrated Nickel Operations (2018-2022).

Beckett, P

- NSERC Collaborative Research and Development Grant- Ontario Centres of Excellence TargetGHG program. Landscape Carbon Accumulation through Reductions in Emissions (L-CARE): developing brownfield management protocols for carbon sequestration and habitat use (see Basiliko)
- 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) (2021-2024)

Belzile, N

- NSERC Discovery. Study of factors to improve the removal of trace metals/elements from mine effluents using low cost adsorbents. (2019-2025)
- NSERC Equipment. Powder XRD diffractometer. A. McDonald P.I. and others (2021-2022)

Edwards, B

- NSERC Collaborative Research and Development Grant- Ontario Centres of Excellence TargetGHG program. Landscape Carbon Accumulation through Reductions in Emissions (L-CARE): developing brownfield management protocols for carbon sequestration and habitat use (see Basiliko)

Emilson, E

- NSERC Collaborative Research and Development Grant- Ontario Centres of Excellence TargetGHG program. Landscape Carbon Accumulation through Reductions in Emissions (L-CARE): developing brownfield management protocols for carbon sequestration and habitat use (see Basiliko)
- Genomics Research Development Initiative. Genomic Adaptation and Resilience to Climate Change (the GenARCC Project) (2022-2025)
- Atlantic Canada Opportunities Agency. Spruce budworm pest management as a conservation tool for critical habitats and ecological integrity of forest watersheds. Co-Lead with Statsny (2018-2025)
- NSERC Strategic Partnership Grant. Identifying and evaluating the effectiveness of best management practices to mitigate mercury contamination in managed forests. Collaborator with Mitchell, Kidd and Melles (2019-2022)

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 (2016-2023)
- NSERC Collaborative Research and Development Grant- Ontario Centres of Excellence TargetGHG program. Landscape Carbon Accumulation through Reductions in Emissions (L-CARE): developing brownfield management protocols for carbon sequestration and habitat use (see Basiliko)
- NSERC CRD – Chromium in Fish study in partnership with DeBeers, with Gretchen Lescord, Brian Branfireun (Western), Al lock (PCAF)
- Glencore's Sudbury Integrated Nickel Operations. Restoration ecology studies in Greater Sudbury area including the airport kettle lakes (2021-2022)

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)
- Northwest Territories Geological Survey. Nonacho Lake Mapping Project (2021-2022)
- Northern Scientific Training Program from Polar Knowledge Canada (2021-2022)

Johnston, T

- NSERC Discovery Development Grant Program. The trophic niche in boreal lake food webs. (2020-2022)
- Ontario Ministry of Natural Resources and Forestry, Aquatic Research and Monitoring Section. Northern fisheries research (2004 – present, renewed annually)
- Ontario Ministry of Natural Resources and Forestry, Canada-Ontario Agreement (COA) on Great Lakes Water Quality and Ecosystem Health, The influence of female spawner characteristics on the early life survival and recruitment of lake whitefish (2020-2022)

Lescord, G

- 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

- 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)
- Georgian Bay Biosphere. Road mortality mitigation for SAR turtles in eastern Georgian Bay (2021-2025)
- NSERC Discovery. Integrating life history variation into conservation of reptiles (2017-2023)

Mykytczuk, N

- NSERC Discovery. Understanding variability in microbial biomining and bioremediation consortia; adaptation mechanisms for multiple extremes (2019-2024)
- Ontario Research Fund. Research Excellence Round 8: Elements of Bio-Mining (EBM): Genomics-Driven Improvements in Bioleaching, Sulfur and Selenium Stabilization in Mine Operations. Co-Lead (2016-2022)
- NSERC Collaborative Research and Development Grant- Ontario Centres of Excellence TargetGHG program. Landscape Carbon Accumulation through Reductions in Emissions (L-CARE): developing brownfield management protocols for carbon sequestration and habitat use (see Basiliko)

Pearson, D

- NRCan. Building Regional Adaptation Capacity and Expertise (BRACE) (Jan 2019-Mar 2022)
- The Resilience Institute. Adaptation resource production project (Jul 2022-Mar 2023)
- Matawa First Nations Management. Blastomyces resource production project (Dec 2022-Mar 2023)

Ramcharan, C

- TD Friends of the Environment Foundation, Climate Change Adaptation for Northern Community Gardens.

Roy-Léveillée, P

- Research Chair in permafrost geomorphology in Nunavik, Ministère de l'Environnement et de la Lutte aux Changements Climatiques (2020-2023)
- 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)
- Aboriginal Affairs and Northern Development Canada. Climate change adaptation and clean energy. Une approche pour la construction durable au Nunavik. (2021-2022)
- 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)

Scott, JA

- NSERC Discovery. Bioprospected microalgae and CO_2 in industrial emission utilization (2020-2025)
- Mitacs. Capture and repurposing of waste industrial emissions for improved economic and environmental sustainability (2019-2022)

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) (2021-2024)
- 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)
- NSERC Collaborative Research and Development Grant- Ontario Centres of Excellence TargetGHG program. Landscape Carbon Accumulation through Reductions in Emissions (L-CARE): developing brownfield management protocols for carbon sequestration and habitat use (see Basiliko)

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)
- Great Lakes Fishery Commission Pilot Program. Seeing through a fish's eye: Using stable isotopes of fish eye lenses to understand life history. Fetzer, Swanson, Muir and Vinson (2021-2022)
- Northern Contaminants Program. Understanding fish mercury concentrations in Dehcho Lakes, with M Low (2021-2022)

Tanentzap, AJ

- 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)
- NSERC Collaborative Research and Development Grant- Ontario Centres of Excellence TargetGHG program. Landscape Carbon Accumulation through Reductions in Emissions (L-CARE): developing brownfield management protocols for carbon sequestration and habitat use (see Basiliko)

Watmough, SA

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

- NSERC Collaborative Research and Development Grant- Ontario Centres of Excellence TargetGHG program. Landscape Carbon Accumulation through Reductions in Emissions (L-CARE): developing brownfield management protocols for carbon sequestration and habitat use (see Basiliko)

Theses Completed

PhD

Moslemi-Aqdam, Mehdi. PhD. Controls of fish mercury concentrations in Subarctic lakes of Canada. University of Waterloo (Swanson)

Patzke, Mollie. PhD. Sedimentology and detrital-zircon provenance of the Fury and Hecla Basin, Nunavut, Arctic Canada. Laurentian University (Ielpi)

Zuykov, Mikhail. PhD. Material Sciences. Optimisation and use of bivalve mollusk shells as monitors and indicators for chemical and biotic stress detection. Laurentian University (Spiers)

MSc

Delay, Stephanie. MSc. Impacts of a windfarm and wildfire on the spatial ecology and habitat selection of an endangered freshwater turtle (*Clemmys guttata*). Laurentian University (Litzgus)

Gallon, Alexandria. MSc. Spatial ecology and potential variables influencing fitness of a snake species inhabiting an anthropogenic landscape. Laurentian University (Litzgus)

Gohil, Kunali. MSc. Novel zooplankton community compositions in lakes that have recovered from acidification in Sudbury, Ontario. Laurentian University (Edwards/Gunn)

Hilgendag, Isabel. MSc. Mercury dynamics in the anadromous Arctic char (*Salvelinus alpinus*) and food webs of inner Frobisher Bay, Nunavut. University of Waterloo (Swanson Co-sup)

Kluke, Calvin. MSc. Patterns and Drivers of Arsenic Bioaccumulation in Boreal Freshwater Fish of Ontario, Canada. Laurentian University (Lescord/Gunn)

Louste-Fillion, Jasmine. MSc. Set for Success: Ecological Factors Facilitating Restoration of Self-Sustaining Lake Trout (*Salvelinus namaycush*) Populations in Acid-Damaged Lakes. Laurentian University (Edwards/Gunn)

McPhedran, Bronte. MSc. The natural tundra wastewater system in Baker Lake, Nunavut. University of Waterloo (Swanson/Hanson)

Montgomery, Jamie. MSc. Trophic ecologies of double-crested cormorants and native piscivorous fishes in Lake Nipissing, Ontario. Laurentian University (Johnston/Gunn).

O'Neil, Kayla. MA. Nutrient Management in Forest Nutrient Planning. Trent University (Watmough)

Phathutshedzo, Molly Nethavhani. MSc. Geology. Geostatistical analysis and integration of soil chemistry data with remote sensing information in the Sudbury area, Ontario. Laurentian University (Spiers).

Syeda, Batool. MSc. Non-industrial wood ash chemistry and its biogeochemical effects on sugar maple (*Acer Saccharum*, Marsh.) in three central Ontario sugar-bushes. Trent University (Watmough)

Vincent, Kyle. MSc. Weaving Indigenous knowledge and western science to investigate the impacts of railways on wildlife. Laurentian University (Litzgus/Popp)

Whitney, Jenna. MSc. Sediment and carbon fluxes in a permafrost floodplain, Blackstone River, Yukon, Arctic Canada. Laurentian University (Ielpi)

MSCom Major Research Papers/projects, Laurentian University

Chartrand, David. MSCom. A systematic review: the science communication literature on biological evolution and informal learning.

de Faria, Ana. MSCom. The portrayal of wildfire in the Canadian media in the 1970s and early 1980s: How emotions and not science dictate the "good" or "bad" image.

Jiang, Gigi. MSCom. Skills, knowledge, and competencies prioritized by Canadian employers of science communication graduates.

Maitland, Mercedes. MSCom. Who's talking about the evolutionary mismatch hypothesis? Investigating differences between the public health profession and popular media.

Mathioudakis, Yiorgio. MSCom. Narrative structure in sci-comm: How classical narrative structure provides insights into how we think and learn.

Reimer, Victoria. MSCom. The production of "Us vs. Them" dynamics in COVID-19 vaccine critical memes on Instagram.

Sheppard, Tabetha. MSCom. Know your audience: A preliminary assessment of Sudbury youth perception of the mining industry and its career potential.

Szucki, Lauren. MSCom. What constitutes trust? Measuring trust in Science North's vaccine communication.

Wright, Zoë. MSCom. Indigenizing virtual reality.

Undergraduate

Buren, Shakira. ConEd. The effect of calcium on acute chloride toxicity in *Daphnia pulex*. Queen's University (Arnott)

Gillen, Samantha. BSc Thesis. Intraspecific variation to chloride toxicity among D. Pulicaira populations. Queen's University (Arnott)

Mezciems, Gustavs. BSc Thesis. The application of ecological theory to communities of dissolved organic molecules. University of Cambridge (Tanentzap)

Miller, Tori. BSc Thesis. 40 years of ground lichen recolonization in reclaimed areas of Northern Ontario. Laurentian University (Beckett)

Neuman, Jodi. BSc Thesis. The impact of smelter emissions on metal and C accumulation in Sudbury peatlands. Trent University (Watmough)

Nguyen, Hang. BSc Thesis. Comparing the relative contribution of atmospheric Ca to sugar maples at sites located on and off the Precambrian Shield using Sr isotopes and elemental ratios Trent University (Watmough)

Peck, Genevieve. BSc Thesis. Role of groundwater in protecting kettle lake biota from smelter emissions. Laurentian University (Gunn)

Portelance, Mackenzie. BSc Thesis. Not all sperm are the same: how does sperm quality change with age in two species of trout? Laurentian University (Johnston/Martinez)

Rinaldi, Kathryn L. BSc Thesis. Maturation and effluent changes of n'rich-compost based technosols under controlled conditions. Earth Science, Laurentian University (Spiers)

Smith, Luke. BSc Thesis. Sedimentology of a meander-cutoff plug bar, Vermilion River, Ontario. Laurentian University (Ielpi)

HQP Supervised

Bateman, Dillon. BSc Thesis in progress, Laurentian University (Johnston)
Cochrane, Marissa. BSc Thesis in progress, Queen's University (Arnott)
Fee, Abigail. BSc Thesis in progress, Queen's University (Arnott)
Foley, Kaylen. BSc Thesis in progress, Trent University (Watmough)
Hatton, Carolyn. BSc Thesis in progress, Laurentian University (Ielpi)
Galvani, Zachary. BSc Thesis in progress, Queen's University (Arnott)
Miller, Sydney. BSc Thesis in progress, Laurentian University (Johnston)
O'Meara, Adam. BSc Thesis in progress, Laurentian University (Gunn)
Orr, Rachel. BSc Thesis in progress, Queen's University (Arnott)
Wainman, Dawson. BSc Thesis in progress, Trent University (Watmough)

Barrera Mosquera, Melissa. MSc Thesis Student, Laurentian University (Ielpi)
Bewsh, Victor. MSc Thesis Student, Trent University (Watmough)
Cardinal, Rose-Marie. MSc Thesis Student, Université Laval (Roy-Léveillée)
Carroll, Brooke. MSc Thesis Student, Laurentian University (Litzgus)
Chiasson, Danielle. MSc Thesis Student, Université Laval (Roy-Léveillée)
Cicchetti, Lisa. MSc Thesis Student, Queen's University (Arnott)
Clark, Thomas, MSc Thesis Student, Laurentian University (Mykytczuk)
Conquer, Shelby. MSc Thesis Student, Trent University (Watmough)
Corbière, Nicole. MSc Thesis Student, Laurentian University (Roy-Léveillée/Basiliko)
Dasne, Anne Sylvie. MSc Thesis Student, Trent University (Watmough)
Dawson, Jade. MSc Thesis Student, Laurentian University (Edwards/Gunn)
Deslauriers, Catherine. MSc Thesis Student, Université Laval (Roy-Léveillée)
Ewins, Carrie. MSc Thesis Student, Queen's University (Arnott/Lamoureux)
Girard, Lianne. MSc Thesis Student, Laurentian University (Mykytczuk/Ramcharan)
Kental, Jenna. MSc Thesis Student, Laurentian University (Litzgus)
Lepage, Adam. MSc Thesis Student, Laurentian University (Lescord/Gunn)
Lounsbury, Sabrina. MSc Thesis Student, Laurentian University (Litzgus)
Maloney, Aidan. MSc Thesis Student, Laurentian University (Litzgus)
Martin, Troy. MSc Thesis Student, Queen's University (Arnott)
Matula, Erin. MSc Thesis Student, Trent University (Tanentzap/Emilson)
McCaig, Madison. MSc Thesis Student, McMaster University (Kidd/Emilson)
Michel, Sophie. MSc Thesis Student, Laurentian University (Ielpi)
Moskal, Haley. MSc Thesis Student, Laurentian University (Edwards/Gunn)
Nicholls, Taylor. MSc Thesis Student, Laurentian University (Lescord/Gunn)
Smith, Ed. MSc Thesis Student, Trent University (Watmough)
Soogrim, Noel. MSc Thesis Student, University of Waterloo (Swanson)
Thibeault, Stephane. MSc Thesis Student, Laurentian University (Litzgus)
VanDenDiepstraten, Heather. P/T MSc Thesis Student, Laurentian University (Litzgus)
Yavari, Nasim. MASc Thesis Student, Laurentian University (Scott)

Ayoub, Natasha. PhD Thesis Student, University of Waterloo (Swanson)
Britt, Meg. PhD Thesis Student, Laurentian University (Litzgus/Lougheed)
Chan-Yam, Kelly. PhD Thesis Student, Laurentian University (Basiliko/Scott)
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)
Freeman, Erika. PhD Thesis Student, University of Cambridge (Tanentzap/Emilson)
Gauthier, Miranda. PhD Thesis Student, Laurentian University (Scott)
Johnston, Caelan. PhD Thesis Student, Queen's University (Arnott/Rusak)
Keevil, Matt. P/T PhD Thesis Student. Laurentian University (Litzgus)
Kirkwood, Adam. PhD Thesis Student, Laurentian University (Roy-Léveillée/Basiliko)
Kontou, Danai. PhD Thesis Student, University of Cambridge (Tanentzap)
Lavigne, Jonathan. PhD Thesis Student, Laurentian University (Basiliko/Beckett/Emilson)
Levasseur, Patrick. PhD Thesis Student, Trent University (Watmough)
Lockie, Jade. PhD Thesis Student, Laurentian University (Ielpi)
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)
Rahman, Tabatha. PhD Thesis Student, Université Laval (Roy-Léveillée)
Sandor, Sarah. PhD Thesis Student, University of Cambridge (Tanentzap)
Seward, James. PhD Thesis Student, Laurentian University (Basiliko/Beckett/Roy-Léveillée)
Smith, Rosie. PhD Thesis Student, University of Waterloo (Swanson)
Sun, Xinyu. PhD Thesis Student, Queen's University (Arnott/Rusak)
Tafvizi, Arghavan. PhD Thesis Student, Laurentian University (Ramcharan/James)
Therrien, Christian. PhD Thesis Student, University of Waterloo (Swanson Co-sup)
Van Leeuwen, Pauline. PhD Thesis Student, Laurentian (Mykytczuk/Schulte-Hostedde)
Weinstein, Spencer. PhD Thesis Student, University of Waterloo (Swanson)
Wijewardena, Tharusha. PhD Thesis Student, Laurentian University (Litzgus/Mandrak)
Woodman, Samuel. PhD Thesis Student, Cambridge University (Tanentzap)

Braga, Lucas, PDF, Cambridge (Tanentzap)
Fonvielle, Jérémy, PDF, Cambridge (Tanentzap)
Gagnon, Samuel, PDF, Université Laval (Roy-Léveillée)
Mwafulirwa, Lumbani, PDF, Cambridge (Tanentzap)
Rodríguez-Uña, Asun, PDF, Cambridge (Tanentzap)
Santori Manoel, Pedro PDF, Queen's (Arnott)
Scheurel, Thomas, PDF, Cambridge (Tanentzap)
Senhorinho, Gerusa, PDF, Laurentian (Scott/Basiliko)

Adkinson, Kevin. Research Technician, Trent University (Watmough)
Archer, Victoria. Summer 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)
Clark, Alexandra. FSWEP Student. Great Lakes Forestry Centre, NRCan (Emilson)
Greco, Danielle. Forest Ecologist. Great Lakes Forestry Centre, NRCan (Emilson/Venier)
Huang, Iris. Summer Research Assistant, University of Cambridge (Tanentzap)
Kemp, Caroline. Senior Lab Technician, Cambridge (Tanentzap)
Lemieux, Chantal. Research Coordinator, Université Laval (Roy-Léveillée)
Montminy, Corbin. Summer Student, Queen's University (Arnott)
Rodrigo, Judit. Intern from Universitat Autonoma de Barcelona, Queen's University (Arnott)
Schadenberg, Joe. Field Technician. Great Lakes Forestry Centre, NRCan (Emilson)
Smenderovac, Emily. Watershed Ecologist. Great Lakes Forestry Centre, NRCan (Emilson/Venier)
Smuk, Jessica. Summer Student, Queen's University (Arnott)
Webb, James. Summer Research Assistant, University of Cambridge (Tanentzap)

Staff

Laurentian University Main Campus
Alarie, Yves – Biosystematics
Belzile, Nelson - Environmental Chemistry

External
Arnott, Shelley, Queen's University
Emilson, Erik, Canadian Forest Service, NRCan, Sault Ste. Marie, Cross-appointed LU
Roy-Léveillée, Pascale, Université Laval (Adjunct LU)
Swanson, Heidi, Wilfrid Laurier University
Tanentzap, Andrew, University of Cambridge, UK
Watmough, Shaun A., Trent University

Living with Lakes Centre
Barriault, Chantal – Director, Science Communication Program, LU
Basiliko, Nathan – Canada Research Chair in Environmental Microbiology, LU
Coady, Ryan - Fisheries and Restoration Ecology Project Biologist, LU (Gunn)
Edwards, Brie - MECP Research Scientist/Cross-appointed LU
Favot, Elizabeth –Research Biologist, MNRF
Fram, Kim - Research Assistant and Taxonomist, LU
Giroux, Michelle – Research Technician MNRF
Gunn, John - Canada Research Chair in Stressed Aquatic Systems, LU
Haslam, Lee - Senior Fisheries Technician, MNRF
Heneberry, Jocelyne - Monitoring Coordinator, MECP
Hurley, Mikkealla, Research Project Manager, LU (dep. Apr. 2022)
Ielpi, Alessandro – Sedimentology, LU
Johnston, Tom - MNRF Senior Research Scientist/Cross-appointed LU
Ki, Ki-Youn. Technical Support - Science Communication Training, Laurentian (Barriault)

McAuliffe, Cassidy – Communication Specialist, LU
McCourt, Jason - Environmental Officer, MECP
Mykytczuk, Nadia – Exec. Dir. Goodman School of Mines, CEO and President MIRARCO
Oman, Karen - Business Manager, LU
Reid, Michelle, Science Communication Part-Time Technical Advisor
Sarrazin-Delay, Chantal - Associate Project Lead, Climate Change and Ecology, LU
Tremblay, Nathalie – Senior Lab Technologist, LU

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
Bisson, Christopher, Summer Field Assistant (Gunn)
Boodhoo, Roxanne, Summer Research Assistant, MECP/LU
Chartrand, Anastacia, P/T Summer Science Communication Assistant (Gunn)
Cook, Descanon, Summer Workstudy Stud. & Fall Climate Change Res. Assist. (Pearson)
Coutu, Dominique, Student Research Assistant (Pearson)
Fields, Emily, MNRF SEO student (Johnston)
Khalilzadeh, Parinaz, Laboratory Technician, LU/MNRF (Johnston)
Leclair, Charly, MNRF SEO student (Johnston) & Workstudy Benthic Res. Assist. (Sarrazin-Delay)
Lieou, Alex, NSERC USRA Student (Gunn)
McAuley, Hailey, Summer Field Assistant (Gunn)
Mohan, Nirushi, Winter Workstudy Climate Change Research Assistant (Sarrazin-Delay)
Paradis, Michaela, PICCA Hub Developer, (Sarrazin-Delay)
Schlosser, Benjamin, Summer Field Assistant (Gunn)