



2020 Annual Report Cooperative Freshwater Ecology Unit “Clean Water Now and Forever”

A Message from the Director of the Vale Living With Lakes Centre
“Dealing with a Double Whammy”



The first thing that strikes me about this 2020 annual report is the Zoom gallery screen shot on the cover. Usually this would be a group picture of our staff and students, kids and dogs gathered at the Lake Centre along the shores of Ramsey Lake. Jeff would be taking

the photo. Karen would be directing the traffic. Bill and I would be in our regular anchor spots.

The switch to Zoom images symbolizes the tragedy of the pandemic that rages on, having killed millions worldwide and thrown Ontario into emergency measures today. Most of us did not get sick, but sadly I did lose a brother-in-law who was on vacation in Europe. A few of our students were also infected, but thankfully recovered. Many of us are now getting our vaccines, but no one escaped the impact of the pandemic-- the emotional, physical and financial toll is huge.

The screen shot also reminds me of the adaptability of the Co-op Unit crew. Look how we pivoted our teaching and research activity, and how we put our trust in the now exhausted local public health officials and in the amazing biotech industries trying to bring closure to this global challenge.

The pandemic came to Sudbury in early March 2020 with first cases associated with travelers to the international mining conference in Toronto. Laurentian University shortly afterwards became the first university in Canada to end in-person teaching. Regular access to the Vale

Living with Lakes Centre came to an end on May 24, almost a year ago, but access for critical research work continues.

The Lake Centre team responded magnificently to this crisis, showing amazing ability to adapt. We all did pretty well at on-line teaching, but there were stars among us, like Michelle and Gretchen who taught “old dogs new tricks”. This experience showed how fortunate we are to share “our little boat” with an elite Science Communication team. They proved to be excellent rowers in the turbulent waters we face.

Not only did we continue to do our jobs, teach our courses, and regain our role in the world by delivering superb on-line workshops (L-CARE), symposium, seminars and webinars (Troubled Waters forum), we used our morning Zoom call to keep everyone connected. People took the opportunity to illustrate, often with old pictures from family albums, stories of their life and career paths, or their hobbies and secret talents. We also had amazing opportunities to reconnect with former students and colleagues at distant location and time zones.

Looking back on our pandemic coping skills now gives me considerable comfort that we can survive the current financial crisis that insolvency of the University has created.

This financial crisis was not of our making. As a research centre team we don’t just study environmental sustainability, we walk the talk. Our award winning LEED Platinum green building with its one-of-a kind specialized labs (e.g. Ramsey water flowing through fish egg

rearing facilities) as well as geothermal and green roof systems, minimizes our environmental footprint. Our structural wood design stores 180 tons of atmospheric carbon. We have also been incredibly fiscally responsible (thank you Liz and Karen) and never in debt. We raised the \$22M ourselves (3 way split: Federal/Provincial/Vale, City and many local donors) for our building and labs and still to this day had some capital funds remaining. We established a rental agreement with our government partners (MECP, OMNRF) to share the operating and administrative costs of the facility, and created our own student scholarship programs (Drysdale family, Seaway). Along with substantial overhead and indirect funds from research grants and a focus on graduate student training, we were super efficient and certainly not a “revenue drain”. Instead as a “knowledge discovery centre” we were, and still are, one of the principal purposes of a modern university.

Going into 2021 we had approximately \$1M in tri-council research grants and a substantial cash reserve (saved carefully over decades) ready to deal with rainy day problems. What came instead was a flood - with our life raft swept away on Feb 1, 2021. Who knew we were vulnerable – that our research funds could be seized in a CCAA insolvency process, a process never before applied to a university? What a blow, and the attack may not be over! – as creditors eye our buildings, carbon-offset forest, equipment, and our irreplaceable student research labs - all the hard-earned things our local community donors provided. However, no matter how hard the financial hit has been, my message today is that like our acid damaged lakes and forests, we must recover to resume our essential research, teaching and training work. Yes, we need help to rebuild our war chest to be able to protect our domestic and international graduate students.

Tough as the financial damage has been, no words can explain the personal loss we feel after the shocking layoffs of so many young research stars. Brilliant role models for women in science were particularly impacted. Cruel too was the forced retirement of many still-active senior scientists. These body blows were heavy and they hurt and we need “all hands on deck” to reverse them, and restart our essential succession, EDI (equity, diversity, inclusion) and growth plans.

As we enter the UN Decade of Ecosystem Restoration (2021-2030) our mission of “Clean Water Now and Forever” remains as important as ever. New watershed reclamation techniques and mine waste biotechnologies are still needed - after all, tailing piles and the 5000 abandoned mine sites in Ontario have not gone away. Climate change and biodiversity loss have not stopped. Communities across Ontario still have big concerns about contaminants in wild caught fish and how climate change and development will affect them in the future. Fundamental discoveries of how nature works and how she heals herself also await us.

If the pandemic has taught us anything, it is that good research is essential, that data matters, and that skilled science communication is needed. Broad and strong partnerships are the only way forward. After these 31 years of existence, the Co-op Unit can still offer all these.

Be safe and let’s keep rowing. Maybe pick up the pace and find a friend to help.

Dr. John Gunn
Canada Research Chair in Stressed Aquatic
Systems
April 16, 2021

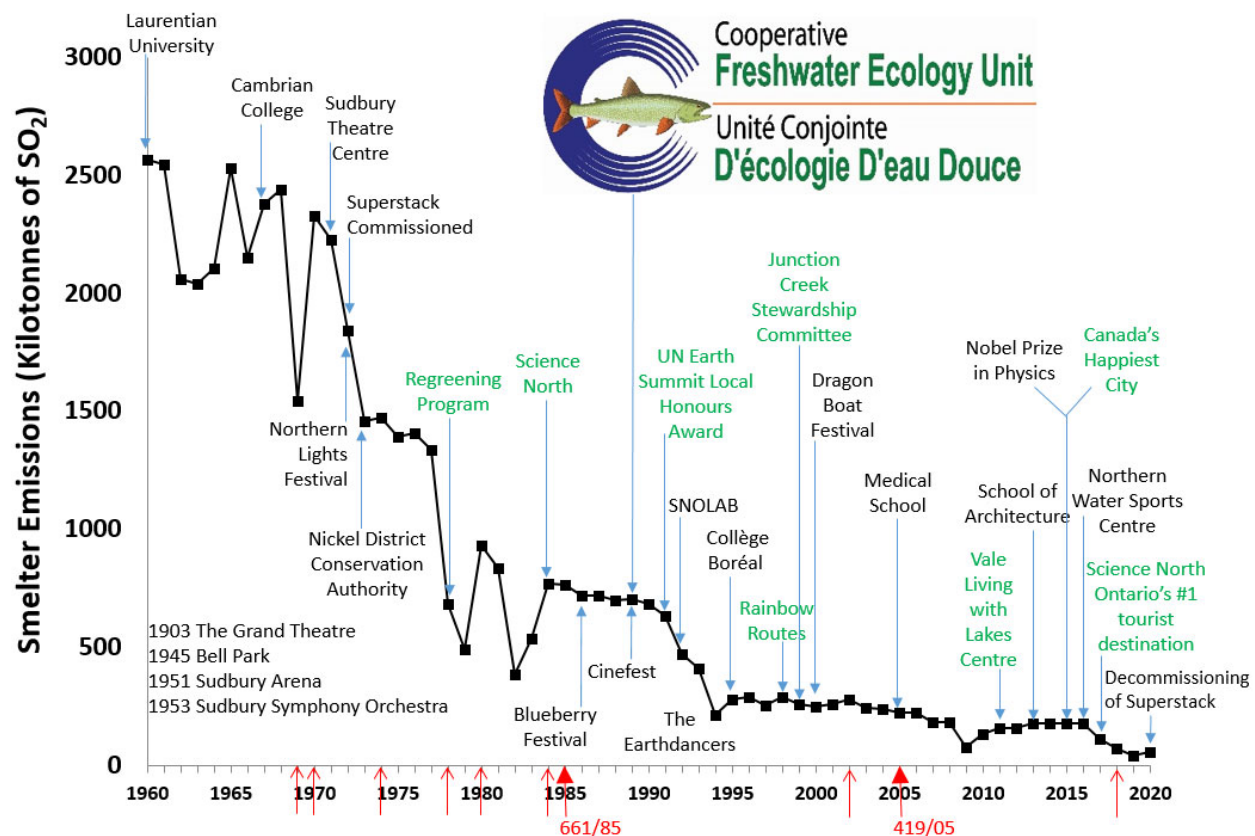


Fig. Creation of significant community assets with cleaner air in Sudbury. Timing of some of the government pollution control orders (↑) and regulations (▲) indicated.

Awards and Recognition

- Congratulations to Dr. Pascale Roy-Léveillé who was awarded the position of Research Chair in Permafrost Geomorphology at the Université Laval. Dr. Roy-Léveillé officially began this exciting new position in Sept. 2020 and remains a member of the CFEU and an adjunct at Laurentian.
- We welcome Dr. Alessandro Ielpi, Assistant Professor of Sedimentology in the Harquail School of Earth Sciences as a new member of the CFEU. Dr. Ielpi will have his office in the Lake Centre in 2021 and retain his lab space on campus.
- Congratulations to Dr. Heidi Swanson, who won the Outstanding Performance Award at the University of Waterloo.
- On Jan. 16, 2020 Laurentian University officially named the small forest located near the university's West Residence 'Beppi's Forest Therapy Trail' after Giuseppe "Beppi" Curridor, the university's grounds foreman for over 30yrs and was responsible for the regreening of

the LU campus through tree planting. Dr. John Gunn and Dr. Peter Beckett celebrated the announcement after having brought the project to university administration.

- The CFEU partnered with NRCan Canadian Forest Services on Feb. 27 to host a Symposium entitled “Canadian Forest Ecosystems in a Changing Climate” as part of Laurentian University’s Research Week in 2020. The symposium featured speakers from Laurentian, the Great Lakes Forestry Centre (NRCan), the Ontario Forest Research Institute (MNRF), University of Toronto, the Invasive Species Centre, Algoma University and Collège Boréal.



Speakers at the Forestry Symposium Feb. 27, 2020

- Dr. John Gunn and Dr. Nadia Mykytczuk hosted a visiting Peruvian delegation at the Lake Centre March 4-6, the last in person delegation of 2020. This visit follows their trip to a number of Peruvian universities on May 5-10, 2019 with a final presentation describing the Sudbury recovery story at the Canadian embassy in Lima.

Student Scholarships, Fellowships, Bursaries

- Tara Boag, MSc Student, Waterloo (Swanson) was awarded a Northern Scientific Training Program grant.
- Kelly Chan Yam, PhD Candidate Laurentian (Basiliko), won a QEII Science and Technology Graduate Fellowship.
- Jade Dawson, MSc Candidate Laurentian (Edwards/Gunn) won the Ruffed Grouse Society, Wildlife Conservation Bursary and a NSERC, Canadian Graduate Scholarship. Jade was also Runner-up for best presentation for the Faculty of Science, Engineering, and Architecture during Laurentian University Research Week 2020 and took home the Eagle Award for best science communication presentation, Graduate Biology Seminars at Laurentian University.
- Carrie Ewins, MSc Candidate Queen’s (Arnott), received a NSERC CGS-M Scholarship, a Queen’s University Graduate Research Fellowship and at convocation from York University

in May 2020 Carrie received the Biology Department C.D. Fowle and B. Rozario Award for the most outstanding graduating student in Honours Biology.

- Kunali Gohil, MSc Candidate Laurentian (Gunn/Edwards), received the DFO- Fisheries and Ocean Canada's Habitat and Restoration Bursary
- Isabel Hilgendag, MSc Student, Waterloo (Swanson) was awarded a NSERC CGS-M Scholarship as well as a Northern Scientific Training Program grant.
- Adam Kirkwood, PhD Candidate Laurentian (Roy-Léveillé/Basiliko) won an NSERC OGS scholarship and a W. Garfield Weston Award in Northern Research.
- Jonathan Lavigne, PhD Candidate Laurentian (Basiliko), was the recipient of the CLRA Tom Peters Memorial Fellowship.
- Jasmine Louste-Fillion, MSc Candidate Laurentian (Gunn/Edwards), received the DFO- Fisheries and Ocean Canada's Habitat and Restoration Scholarship and a Wildlife Conservation Society (WCSS) Canada, W. Garfield Weston Fellowship Award.
- Eric Massa, PhD Candidate Queen's (Arnott) received an International Tuition Award.
- Shrisha Mohit, MSc Candidate Queen's (Arnott) received a James Craigie Fellowship and the Senator Frank Carrel Fellowship.
- Mehdi Moslemi-Aqdam, PhD Student, Waterloo (Swanson) was awarded the University of Waterloo Noel Hynes Scholarship
- Robyn Rumney, MSc Candidate Laurentian (Gunn/Basiliko), won the Tom Peters Memorial Mine Reclamation Award for Student Oral Presentation
- Xinyu Sun, PhD Candidate Queen's (Arnott), received a Craigie Fellowship for Aquatic Research and International Tuition Award.
- Spencer Weinstein, PhD Student, Waterloo (Swanson) was awarded a NSERC Vanier Scholarship
- Undergraduate student Sarah Zucconi won an NSERC USRA Laurentian (Basiliko)

Annual Pineapple Awards

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

Covid Pandemic Quiz Award

Jocelyne Heneberry



Mikkealla Hurley



2020 Young Leaders Award

Saskia Hart Robyn Rumney



Global Soil Science Award

Dr. Graeme Spiers



Community College Partnership Award

Dr. Nadia Mykytczuk



Dr. Nathan Basiliko



Indigenous Youth Educational Award

Chantal Sarrazin-Delay



Community Outreach

- Dr. Nathan Basiliko serves on the Regreening Advisory Committee (VETAC) for the City of Greater Sudbury. In 2020 he was also an ally in the Circles Canada (Sudbury) chapter and was a member of the Board of Directors for the Laurentian Child and Family Centre.
- Dr. Peter Beckett is the Outreach Coordinator with the VLWLC. He served in the following Capacities in 2020:
 - ~ VETAC: Chair
 - ~ Canadian Land Reclamation Association (Ontario Chapter): Director
 - ~ American Society of Mining and Reclamation: Chief Student Presentations 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 FrameworkDr. Beckett also participated in the following activities:
 - ~ Gave presentation on Healing the Sudbury Landscape to 35 students from Cambrian College's Environmental Monitoring and Impact Assessment Program and Environmental Technician Programs 9 Mar 2020
 - ~ Along with G Spiers, gave a tour of Kelly Lake Hill Regreening site (and adjacent areas) to and was interviewed by Sara Miller Liana of the Christian Science Monitor for the article The Sudbury model: How one of the world's major polluters went green 9 Aug. Article published 24 Sept 2020. <https://www.csmonitor.com/Environment/2020/0924/The-Sudbury-model-How-one-of-the-world-s-major-polluters-went-green>
 - ~ Led a seminar entitled Regreening Science Transforms the Sudbury Landscape for Community Benefits 25 Sept 2020 (60+ participants including from Peru and Moscow)
 - ~ Interviewed for 'How well is Sudbury's re-greening effort working? Scientists crunching the numbers' on CBC Morning North, 19 July 2020
 - ~ Interviewed for 'Un chercheur estime la quantité de carbone capturée par les arbres à Sudbury depuis 40 ans', on Radio-Canada L'heure du monde, 20 Jul 2020
 - ~ Interviewed for 'Success of the Sudbury Regreening Program', on Radio-Canada L'heure du monde, 14 Dec 2020
- Dr. Brie Edwards and Jocelyne Heneberry participated in a workshop for the Indigenous Environmental Keepers (IEK) Program, "Monitoring Freshwater Health" in Jan. 2020.
- 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 in 2020.

- Dr. John Gunn participated in the following public outreach initiatives in 2020:
 - ~ Served as an expert member for the City of Greater Sudbury Watershed Advisory Panel
 - ~ Interviewed for the article 'The Sudbury model: How one of the world's major polluters went green' by Sara Miller Liana of the Christian Science Monitor, 10 Aug 2020. Article published 24 Sept 2020 <https://www.csmonitor.com/Environment/2020/0924/The-Sudbury-model-How-one-of-the-world-s-major-polluters-went-green>
 - ~ Featured in article 'Sudbury is a city primed for change', J Moodie, The Sudbury Star, 10 Feb 2021
- Dr. Nadia Mykytczuk participated in the following outreach initiatives in 2020:
 - ~ Invited MC for 'She and Her: UN International Day of Women and Girls in STEM', 11 Feb 2020 (150 participants)
 - ~ Invited Speaker at the Sudbury Women in Science and Engineering (WISE) 2020 kick-off event. 30 Jan 2020.
 - ~ Participated in the Science North Skills Catalyst Consultation 9 Sept 2020
 - ~ Participated in Webinar with UNIFEI (Brazil) seminar 22 Jul 2020 (45 in attendees)
- Dr. David Pearson participated in the following public outreach initiatives in 2020:
 - ~ Interviewed by CBC Morning North [Addressing climate change in indigenous communities in northern Ontario](#)
- Dr. Charles Ramcharan participated in the following outreach initiatives in 2020:
 - ~ Served as a member of the City of Greater Sudbury Watershed Advisory Panel
 - ~ Served as a member of the Ramsey Lake Stewardship Committee
 - ~ Served as a voting member of the Greater Sudbury Food Policy Council.
 - ~ Served as a member of the Greater Sudbury Community Garden Network
 - ~ Served as a member of the Greater Sudbury Foodshed Network
 - ~ Member of the Laurentian University Environmental Sustainability Committee
 - ~ Coordinator of the Laurentian Community Garden.
- Dr. Bjorn Rosseland, Senior Fellow, participated in the following outreach activities in 2020:
 - ~ Gave talk UN Sustainable Development Goals No 14: Life below Water. Conserve and use the marine resources in a polluted environment in a sustainable way. Local mercury challenges in Lake Kolbotnvann to Gjersjoen Rotary Club, Kolben Kulturhus, Kolbotn, Norway. 20/1-2020. 25 participants. (In Norwegian).
 - ~ Gave talk UN Sustainable Development Goals No 14: Life below Water – In a Polluted Environment. Local challenges in Lake Oyeren to Kloefta Rotary Club, Kloefta, Norway. 27 Jan 2020. 25 participants. (In Norwegian)
 - ~ Gave talk UN Sustainable Development Goals No 14: Life below Water – In a Polluted Environment. Local challenges in Lake Vannsjo to Raade Rotary Club, Kihl Gaard, Raade, Norway. 24 Feb 2020. 15 participants. (In Norwegian)

- ~ Gave talk UN Sustainable Development Goals No 14: Life below Water – In a Polluted Environment. Local challenges in Lake Oyeren to Lillestroem Rotary Club, Thon Hotel Arena, Lillestroem, Norway. 3 Mar 2020. 30 participants. (In Norwegian).
 - ~ Gave talk UN Sustainable Development Goals No 14: Life below Water – In a Polluted Environment. CERAD Western Norway Project to Karmoy West Rotary Club, Aakra Kulturhus, Karmoy, Norway. 1 Sept 2020. 30 participants. (In Norwegian)
 - ~ Gave talk UN Sustainable Development Goals No 14: Life below Water – In a Polluted Environment. CERAD Western Norway Project at Oppegaard Senior Academy, Kolben, Kolbotn, Norway 21 Oct 2020. 200 participants. (In Norwegian).
 - ~ Gave talk UN Sustainable Development Goals No 14: Life below Water – In a Polluted Environment. CERAD Western Norway Project to Nesodden Rotary Club, Eklund, Nesodden, Norway. 26 Oct 2020. 20 participants. (In Norwegian).
- Dr. Pascale Roy- Léveillé participated in the following outreach initiatives in 2020:
 - ~ Participated in ‘Discovering Permafrost’, a youth workshop for the opening of the exhibit ‘Under the Arctic’ at Dynamic Earth, Sudbury on 11 Feb 2020 with students A Kirkwood and C Guilfoyle.
 - ~ Participated in and was filmed for a video for the Canadian component of the Permafrost Exhibit, as well as a short video for the new Climate Change Show at Science North
 - ~ Featured in ‘Exploratrice des sols gelés’. D Grapton. Les Explorateurs, No. 189, Oct 2020.
 - ~ Featured on the cover of ‘The Key’ and in ‘Unearthing the Secrets of a Thawing North’, by M Homayed, The Key, vol. 9, March 2020.
 - ~ Interviewed for ‘Entrevue avec la spécialiste du pergélisol’ with Sophie-Andrée Blondin on Radio-Canada’s Les années lumières, 28 Jun 2020.
 - ~ Interviewed for ‘Visite guidée de l’exposition sur le pergélisol’ with Eric Robitaille on Radio-Canada’s Jonction 11-17, 20 Feb 2020.
- Chantal Sarrazin-Delay participated in the following outreach initiatives in 2020:
 - ~ Led an online, hands-on, workshop during Camp Chikepak, a week-long summer camp for children 9-14 from Mushkegowuk Council communities, August 2020.
 - ~ Interviewed by Radio-Canada Jonction 11-17 Aider les Premières Nations à faire face aux changements climatiques
 - ~ Actively posted climate change awareness material on the UpNorthOnClimate Facebook page with support from the Up North on Climate team.
- Dr. Graeme Spiers served as a member of VETAC and gave a number of virtual talks to students and the general public in 2020.
- Dr. Heidi Swanson participated in the following outreach activities in 2020:
 - ~ Worked with Kugluktuk Hunters and Trappers Organization to retrieve and re-deploy an array of acoustic telemetry receivers in Coronation Gulf – because of COVID, community workers performed this work independently

- ~ Presentations on results at two communities in NT February 2020
 - ~ Swanson served as a research mentor to youth from Kluane First Nation and Champagne and Aishihik First Nation as part of the Ikaarvik program – 2 day workshop in Haines Junction, YT
 - ~ Rosie Smith (MSc student) - Ikaarvik Coppermine River Health Monitoring Project. Five day workshop for Inuit youth to review and analyze data from monitoring project in Kugluktuk, Nunavut.
- Dr. Andrew Tanentzap had his Sudbury-based research featured in the Permafrost episode in a documentary series on climate feedback loops narrated by Richard Gere. The film series was launched by His Holiness the Dalai Lama and Greta Thunberg and available to view at <https://feedbackloopsclimate.com/>.
- Dr. Shaun Watmough participated in the following outreach activities in 2020:
 - ~ Gave a TV interview with Global Television on the Environmental issues associated with COVID masks
 - ~ Was interviewed for the Peterborough Examiner on the effect of COVID on air pollution
 - ~ Hosted Ed Burtynsky for the Sheperd Family Lecture Series at Trent
- Dr. Norman Yan participated in the following outreach activities in 2020:
 - ~ Gave a lecture on the Wood Ash Project via Zoom at the Lake Vernon AGM, 12 Jun 2020
 - ~ Gave a lecture on the Wood Ash Project via Zoom to the members of the Active Jewish Adults of Ottawa group, 11 Jun 2020
 - ~ Gave a lecture entitled “Calcium decline and road salt” to 40 people at the Bracebridge Rotary Club, 24 Jan 2020
 - ~ Gave a lecture entitled “Calcium decline and its treatment with wood ash” to approx. 50 people at Bracebridge Probus Club, 8 Jan 2020

2020 Watershed Lecture with Dr. Heidi Swanson

THE VALE LIVING WITH LAKES CENTRE PROUDLY PRESENTS THE
2020 Watershed Lecture

**How are northern ecosystems connected to each other?
Ask the fish!**

Heidi and her graduate students research the ecology of subarctic and Arctic aquatic ecosystems, and they are most often focused on questions from Indigenous communities, government agencies, and industry. Heidi is deeply committed to forging lasting relationships with northern research partners, and has learned a lot about the strengths and challenges of maintaining these partnerships during COVID-19.

October 30, 2020 • 12-1 p.m. • via Zoom

 Vale LIVING WITH LAKES CENTRE
CENTRE POUR LA VITALITÉ DES LACS Vale



Dr. Heidi Swanson
Associate Professor and
University Research Chair,
University of Waterloo

 **Laurentian University**
Université Laurentienne

livingwithlakes.ca

Dr. Heidi Swanson from the University of Waterloo gave the annual Watershed Lecture on Friday, October 30, 2020 entitled: How are northern ecosystems connected to each other? Ask the fish!

Heidi Swanson is an Associate Professor and University Research Chair at the University of Waterloo. Heidi and her graduate students research the ecology of subarctic and Arctic aquatic ecosystems, and they are most often focused on questions from Indigenous communities, government agencies, and industry. Heidi is deeply committed to forging lasting relationships with northern research partners, and has learned a lot about the strengths and challenges of maintaining these partnerships during COVID-19.

On the same day, Dr. Swanson hosted the annual Watershed Symposium with our graduate students. Lake Centre students presented their research projects and Dr. Swanson provided feedback and guidance.

Dr. Swanson's lecture, along with previous Watershed Lectures, can be found on our website at: <https://www3.laurentian.ca/livingwithlakes/research/instructional-videos/>

NSERC OCE Program L-CARE 2017-2020

Landscape Carbon Accumulation through Reduction in Emissions L-CARE is 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 is 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 processes of primary production, mineralization of C and energy transfer through ecosystems and interrelated GHG fluxes.



L-CARE was officially launched during research week at Laurentian University on March 26, 2018.

The project is led by Nathan Basiliko and John Gunn with Co-PI's at:
 Laurentian: P. Beckett, B. Edwards (OMECP), N. Mykytczuk and G. Spiers
 Trent: S. Watmough. Emily Smenderovac served as project manager.
 Sherbrooke: J-P Bellenger
 UQAM: P. del Giorgio and Y. Prairie
 Cambridge: A. Tanentzap
 Queen's: J. Smol, A. Paterson (OMECP)
 McMaster: M. Waddington

Collaborators are 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).

The 5 Themes of L-CARE are:

- I New C sequestration trial in uplands and tailings
- II C and GHG dynamics in existing reclaimed upland
- III C and GHG dynamics in peatland
- IV Aquatic C stocks, GHG dynamics and aquatic food web processes
- V Scaling-Up, Integrative and Future Projections



LCARE AGM June 27, 2019

Sudbury Environmental Study (SES) Lakes

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 Sudbury Environmental Study (SES): SES Intensive and SES Extensive.

The SES Intensive programme is a set of lakes sampled monthly or twice-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 SES Extensive programme includes a set of 44 lakes, located within a 100 km zone around Sudbury. These lakes were all acidified to below pH 5.5 in the early 80s 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 Extensive lakes are a set of 24 reference lakes, all of which were 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 SES Extensive and reference lakes, sampling for water chemistry occurs on every visit, and sampling for other parameters (physical and biological) occurs periodically.

Regular SES monitoring was put on hold in 2020 due to the pandemic, however MECP partnered with CFEU colleagues and researchers from numerous academic and government institutions under the L-CARE umbrella, to conduct research-related sampling. Several Intensive and Extensive lakes were sampled monthly by students and technicians for traditional biological indicators (zooplankton, phytoplankton, chlorophyll), and physico-limnological characteristics (temperature/oxygen profiles, clarity, etc.).

MECP also provided information and analytical support for several pilot whole-lake community surveys, in collaboration with CFEU colleagues Tom Johnston (MNRF) and John Gunn, in support of the Conservation and Restoration of Aquatic Diversity in the face of Legacy and Emerging Stressors lakes (CRADLES) project.

Lynne Witty (as Identazoop) continued to process zooplankton samples for MECP, including those collected for the regular SES Lake Monitoring programmes, and the L-CARE and CRADLES projects.

SES Database management during 2020 was lead by database managers Jerry Warmbold and Sara Lehman, as well as program coordinator Jocelyne Heneberry. Major activities included: 1. Updating and cleaning the Intensive and Extensive data sets, and preparation of the Extensive chemistry record for posting to the Province's open data portal, data.ontario.ca, 2. Updates to the Zooplankton database for both the Sudbury and DESC groups under ILNSU and preparation

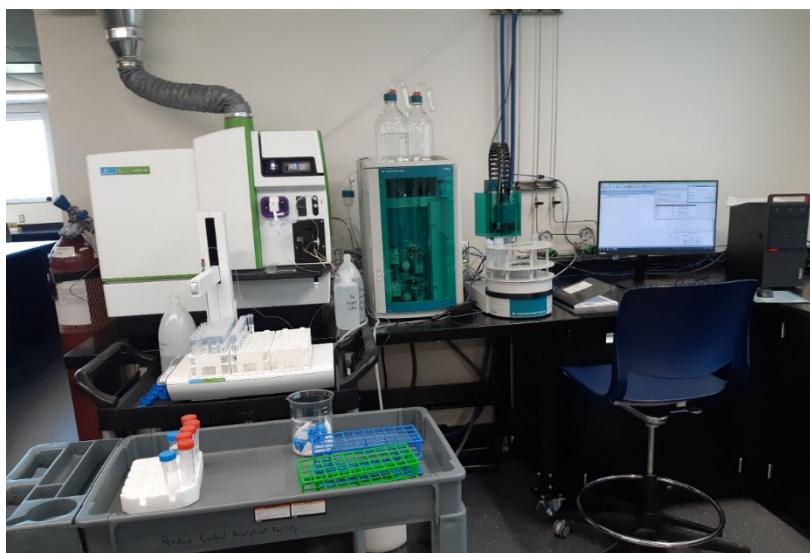
of the Intensive zooplankton records for posting to the open data portal, data.ontario.ca. 3. In addition, several data requests were addressed from partners and collaborators. Support for other projects, including graduate student projects was also provided (data, expertise and logistics).

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 a new product of the L-CARE aquatic theme, Carsten Meyer-Jacob et al.'s article (2020) using lake paleolimnological DOC reconstruction to describe the re-browning of Sudbury area lakes.

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 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 2020 was primarily directed at two fields of research:

- i) **Food web structure and contaminant bioaccumulation in northern fish populations.** This work was supported in 2020 by MNRF Aquatic Research and Monitoring Section, MECP Environmental Monitoring and Reporting Branch, and Vale Ltd. 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 2020 by the MNRF Aquatic Research and Monitoring Section, and the Canada-Ontario Agreement (COA). We initiated a controlled-breeding experiment to determine the influence of maternal traits on egg survival in a Lake Simcoe lake whitefish spawning stock.



Contaminant burdens and speciation profiles in freshwater fishes

A project related to the Northern Fisheries Research is the analysis of various metals in freshwater fish from across Ontario and beyond. This work is being led by post-doctoral fellow and recent CFEU PhD graduate Gretchen Lescord and John Gunn in collaboration with Alan Lock and others at the new Purdue Central Analytical Facility (PCAF) and several researchers with the Wildlife Conservation Society (WCS) Canada. A key component of the research, which began in February 2019, is to better understand which affects arsenic (As) and chromium (Cr) bioaccumulation and speciation in Ontario fish; recent reports from the provincial monitoring program suggest that subsistence consumers should lower their consumption of locally-harvested fish due to elevated As and Cr concentrations. This research is funded by an NSERC CRD partnership with DeBeers Canada (533736-18, Gunn and Branfireun, “Development of New Analytical Methods for Speciation of Chromium in Subsistence Fish from northern Ontario”), as well as a MITACS partnership with WCS Canada (IT13105, Lescord, “Metal concentrations and speciation in fish from the Far North of Ontario; implications for subsistence consumption and the Ring of Fire development”), 2019-2022. It also included a chromium/Ring of Fire session at the Mining and the Environment Conference held in June 2019 with participants from the US and Canada across research sectors.

The Ion Chromatography (IC) paired with Inductively Coupled Plasma Mass Spectrometry (ICP-MS) set-up at the Purdue Central Analytical Facility (PCAF). The equipment was installed in Spring 2019 and is being used to develop analytical methods for chromium speciation (i.e. differentiating between harmful Cr^6 and benign Cr^3) in fish tissue. These results will be used to refine fish consumption advisories.

Freshwater Invertebrate Research Network of Northern Ontario (FIRNNO)

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 CFEU.

The 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. Ongoing objectives of FIRNNO 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.

Since FIRNNO's establishment in 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, FIRNNO sampling was extended to include more than 200 additional sites as part of MECP's Ring of Fire (ROF) Baseline Environmental Data Collection Programme. 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 extraction activities, infrastructure and potential transportation corridors are expected to pass through.

In 2020, sampling was put on hold due to the pandemic, and so efforts were directed at QA/QC, database management, analysis and reporting. Jocelyne Heneberry and Jerry Warmbold conducted a comprehensive QA\QC of the most recent benthic invertebrate data, incorporating information provided by data audits performed on our behalf by Environment Canada.

A major initiative is under way to enhance collaboration and integration with the broader Ontario Benthic Biomonitoring Network (OBBN) of MECP. Brie Edwards has joined the OBBN Science Advisory Panel and is working with Chris Jones to advance OBBN research initiatives and provide province wide guidance on field and analytical best practices. In addition, all of the FIRNNO holdings have been integrated into the OBBN database and are being made available with regular updates on the Province's open data portal, data.ontario.ca.

Baseline monitoring information collected up to 2018 in the ROF was prepared for release to First Nation communities and was analyzed to support a draft MECP Ring of Fire Baseline Monitoring report which is currently being prepared for release. This draft report includes contributions from all MECP groups involved with research and monitoring in this area (groundwater, streams, air, and terrestrial). Peer reviewed publications will be prepared following the release of the report.

Ontario University Program in Field Biology (OUPFB)

The OUPFB Program did not run in 2020 due to the Covid-19 pandemic. We look forward to being able to safely offer this experience to students again soon. Dr. Gunn continues to serve as the OUPFB Coordinator for Laurentian University and Karen Oman provides administration assistance.



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

Science Communication at the Vale Living with Lakes Centre

www.sciencecommunication.ca

Master's and Graduate Diploma in Science Communication (MSc, G.Dip)

Despite having delivered the end of the 2020 winter semester, and the entire 2020 Fall semester, remotely, the Science Communication Graduate Program contributed to the projects, research and education of graduate students at the Vale Living with Lakes Centre. We did this through research projects and communication products that focus on the work being done by CFEU researchers and VLWL scientists. The following paragraphs will highlight some of the many successes our students and our faculty had in 2020.

This year, 14 full time students, and two part time students, graduated with a Master's in Science Communication in the fall of 2020. As word continues to spread about the Master's degree, our number of applicants remains over 35 for 15 spots! This demand ensures our program's sustainability, and is a testament to the growth of science communication as a field of study in our country. We are still uniquely positioned as the first and only graduate program of its kind in Canada since 2005.

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 VLWL research to be the focus of student projects and assignments. This year, the Science Communication students developed and produced comprehensive communication plans for Dr. Pascal Roy-Leveillé, Dr. Nathan Basiliko, and Dr. Nadia Mykytczuk. Working closely with the researchers to identify their target audiences and the goals of their future communications, the students produced focused and practical communications that each of these VLWL researchers can easily implement. Students produced 15 infographics detailing different aspects of Sudbury's environmental history, building off of the online course "Environmental Remediation: Global Lessons from the Sudbury Story."

MScCom student Cassieanna Krane successfully her Major Research Paper with Dr. Nadia Mykytczuk called "*Minding Microbes in the Mines; An Exploration of the perceptions of biomining by non-specialist adult audiences in Greater Sudbury, Ontario*". Our students also completed work placements with VLWL researchers and faculty in the spring of 2020. For example, Samantha Fowler worked with Dr. Nathan Basiliko, as the social media communications specialist for the Canadian Society of Soil Science.

As we have done for the past 8 years, the Science Communication students, Program Director and Program Technical Advisor, continued to be responsible for judging over 50 research presentations at the Graduate Research Symposium during LU Research Week 2020. Two of our students also competed in Laurentian's Three Minute Thesis (3MT) event, with Tess Dufour winning the People's Choice Award!

Program and Faculty Highlights:

Science Communication Professional Development and Workshops. Our profile as experts in the field of science communication continues to grow. In 2020, we led professional development training for graduate students, professors, researchers and scientists both internally and externally. For example, Dr. Chantal Barriault and Michelle Reid delivered professional development for 30 scientists at Fisheries and Oceans Canada in March, facilitated science communication workshops for faculty and graduate students at Laurentian. Michelle Reid was an invited speaker at the University of Toronto's Science Communication Club, The Royal Canadian Institute of Science's SciComm TO Conference and Butantan Institute, Sao Paulo, Brazil. In February, Dr. Chantal Barriault was invited by the Alan Alda Center for Science Communication as a contributing expert to the working group "Professionalizing Science Communication".

The highlight of 2020 for our program and faculty was being awarded one of 20 NSERC Science Communication Skills Training Pilot Grants in Canada. This \$20,000 grant will go towards the development, production and delivery of professional development materials and workshops for scientists, researchers and faculty across all of Northern Ontario.

Carbon Offset Forest

The City's recent celebration of 40 years of greening, under the leadership of many, including CFEU scientist Dr. Peter Beckett, has focused primarily on the beautification and increased biodiversity of the region, but increasingly we recognize the importance of reforestation of barren industrial landscapes in carbon sequestration as well. Our researchers have, for example recently estimated that more than 1 million tons of C have been captured through the greening efforts to date and through the return of a natural regenerating forest with cleaner air. That is the amount of carbon in wood needed to build over 550 Living with Lakes Centres. However, much more is needed in the battle to slow the rise in atmospheric CO₂. In 2019 CFEU contributed to the science needed to enhance carbon sequestration through its L-CARE research, but it also worked to encourage the University and partners to continue to cooperate on pollution reduction and remediation projects, and to promote a restored landscape through tree planting events. On Jan. 16, 2020 Laurentian University officially named the small forest located near the university's West Residence 'Beppi's Forest Therapy Trail' after Giuseppe "Beppi" Curridor, the university's grounds foreman for over 30yrs and was responsible for the greening of the LU campus through tree planting. Dr. John Gunn and Dr. Peter Beckett celebrated the announcement after having brought the project to university administration.



Dino Otranto, COO Vale Ltd., McGill Professor and Activist Dr. Cindy Blackstock and Peter Xavier, VP Sudbury Integrated Nickel Operations Glencore, all planted trees in 2019.

Up North on Climate - Northern Climate Change and Adaptation

During 2020 our "Up North on Climate" team collaborated 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".

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 and co-deliver in-person knowledge exchange workshops on key climate change topics that include traditional Indigenous and science knowledge.

The process we have developed involves recruiting, training and paying a Climate Change Specialist (CCS) in 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 Co-ordinating Panel of the Co-leads meets approximately every 6 weeks or as needed.

The project is capitalizing on 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 splice community-gathered Traditional Ecological Knowledge with climate science. CCSs are using gathered information that will help communities develop a climate change adaptation plan, using guides produced in consultation with the CCSs.

A previously developed 100-page adaptation document included in each community report covering drought, ecosystem shifts, fire, flooding, food security, human health, infrastructure and transportation is being used to create an adaptation Quick Guide. With a series of eight graphic 2-pagers, the 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. More detailed InfoSheets have been developed on various climate change and adaptation topics.

A 100-term climate change glossary with quadrilingual translation is in the final editing stage. We have also created an “Assess Prioritize Prepare” worksheet to begin to document and prioritize impacts and potential adaptations in communities. An Adaptation Framework for planning in communities is also almost completed.

All resources will be posted on our climate change website, UpNorthOnClimate.ca. Meant to facilitate interaction and knowledge transfer among communities, the currently unilingual (English) website is being translated into Ojibway, Cree, and Oji-Cree with the hope of a quadrilingual website being live soon. The website showcases locally-developed data visualizations and GIFs on the greenhouse effect, seasonal temperature and precipitation change, fire seasons, drought, all of which work equally well in print or as website content. Graphics and visualizations continue to be developed for climate change concepts and projections.

We also launched 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. InfoSheets 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.

In-person workshops were impossible in the last year because of Covid. Shifted online, engagements took the form of weekly discussion meetings with climate change specialists with periodic invited speakers covering climate change topics such as food production, health issues, forest fires, impacts on ungulates and fish, monitoring as well as weaving Indigenous and scientific knowledge, monitoring and funding sources.

Engagement of youth in understanding climate change remains a priority although Covid restrictions have prevented in-person delivery. We had the opportunity run a zoom-based outreach session with Mushkegowuk youth at Camp Chikepak in August 2020 where we provided materials for youth to follow along in a demonstration of lake stratification, lake acidification, the importance of riparian vegetation and even learn about tracking animals from scat which they happily molded using clay.

The project's future goals are to deliver an information GeoHub and a video course for First Nations by First Nations. We will be collaboratively creating an online Northern Ontario First Nation Climate Adaptation GeoHub as a one-stop culturally appropriate, plain language and graphically accessible source for climate change information and data (maps, knowledge, both 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. We will also be co-hosting with First Nation participants, a culturally appropriate climate change adaptation online video course that incorporates science and Traditional Knowledge, information, practitioner expertise and stories from the land. Course modules will be accessible on the GeoHub.

Conference Organizing, Program Coordination and Editorial Activities

Arnott, S

- Scientific Advisory Group member, Canadian Institute for Ecology and Evolution (CIEE) 2019-present
- Board member, Consortium of Aquatic Science Societies (CASS), representative for ASLO at monthly meetings
- Associate Director, Queen's University Biological Station
- Chair, Equity, Diversity, Inclusion, Indigeneity Committee (2019-present)
- Associate Editor for Ecology 2016-present
- Associate Editor for Ecological Monographs
- Served on organizing committee representing ASLO for the Joint Aquatic Sciences Meeting (JASM) 2022 to be held in Grand Rapids, MI

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)
- President of the Canadian Society of Soil Science in 2020
- Past President of the Canadian Society of Soil Science 2021

Belzile, N

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

Emilson, E

- Served as Science Advisor on the NRCan Science Integrity Policy Roundtable
- Served as Science Advisor on the Canadian Forest Service Water Working Group

Gunn, J

- Director of the Vale Living with Lakes Centre, Laurentian University (2011-present)
- Appointed Strategic Plan Lead for Outcome 18, Environmental Goals (2018-2023)
- Special Editor PNAS
- NSERC DG and CRD program reviewer

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)
- NSERC CRD program External reviewer (2017-present)
- MITACS external reviewer (~2/year 2017-present)
- Canada Research Chairs (CRC) Program External reviewer (2021)

Ramcharan, C

- Associate Editor, Canadian Journal of Fisheries and Aquatic Sciences

Swanson, H

- Associate Editor, Arctic Science
- Associate Editor, Canadian Journal of Fisheries and Aquatic Sciences
- Co-organized a session on effects of COVID on Arctic research during the ArcticNet Annual Meeting in December 2020

Tanentzap, AJ

- Associate Editor at the Journal Nature Scientific Reports

- Associate Editor at Journal of Vegetation Science
- Associate Editor for PLoS Biology

Watmough, SA

- Director of the Trent School of the Environment (appointed June 2016).
- Board Member, Canadian Colleges and University Environmental Network
- Editorial Board Member for The Science of the Total Environment
- Performed 3 grant reviews for Northeast States Research Cooperative
- Reviewed 30 journal articles

Partners and Collaborators

- | | |
|--|---|
| • Agnico Eagle Mines Ltd. | • Nipissing University |
| • Algoma University | • Nookiwin Tribal Council and member First Nations |
| • Appalachian State University | • OMECP |
| • City of Greater Sudbury | • OMNRF |
| • Cornell University | • Ontario Forest Research Institute (MNRF) |
| • Dept. of Fisheries and Oceans Canada | • Queen's University |
| • Dorset Environmental Science Centre | • Ryerson University |
| • Environment and Climate Change Canada | • Shibogama Tribal Council and member First Nations |
| • Government of Northwest Territories | • Skidmore College |
| • Glencore Sudbury INO | • South West U. of Science & Technology |
| • Grand Council Treaty 3 | • Tianjin Univ. of Science & Technology |
| • Great Lakes Forestry Centre, NRCAN-CFS | • Trent University |
| • Great Lakes Fishery Commission | • Universidad de Santiago de Chile |
| • Keewatinook Okimakanak (Northern Chiefs) Tribal Council and member First Nations | • University of Cambridge |
| • Lakehead University | • University of Geneva, Switzerland |
| • Laurentian University | • University of Guelph |
| • Matawa First Nations Management, Four Rivers Environmental Services Group and member First Nations | • University of New Brunswick |
| • McGill University | • Université Laval |
| • McMaster University | • Université de Montréal |
| • Michigan Tech U | • Université du Québec à Montréal |
| • Mushkegowuk Tribal Council and member First Nations | • University of Sherbrooke |
| • Natural Resources Canada | • University of Toronto |
| | • University of Waterloo |
| | • University of Winnipeg |
| | • US Fish and Wildlife Service |
| | • US Forest Service |

- US Geological Survey
- Vale Ltd.
- Western University
- Wildlife Conservation Society Canada
- York University
- Yukon Geological Survey

Others

- Aboriginal Aquatic Resources and Oceans Management Program
- Anbaric LLC
- Boniferro Millworks
- Canadian Kraft Papers
- Clergue Forest Management
- Climate Risk Institute
- Dartmouth College, New Hampshire
- Dehcho First Nations
- Domtar Inc.
- DMI- Peace River
- Dryden Forest Management Company
- Forest Protection Limited
- Friends of Killarney
- Hunters and Trappers Organization, Kuglulik NU
- Irving Pulp and Paper
- Kivalliq Inuit Association
- Manitoulin Streams
- Ministère des Forêts, de la Faune et des Parcs
- National Research Council
- Rayonier Advanced Materials
- United States Forest Service
- Universität Konstanz
- University of Birmingham
- University of Northern British Columbia
- University of Toledo
- Weyerhaeuser Canadian Timberlands

Book Chapters

Alarie Y and MC Michat. 2021. Larval chaetotaxy of the Dytiscidae (Coleoptera: Adephaga) and comparison with other families of Hydradephaga, XX-XX. In: Yee DA (ed) Ecology, Systematics, and the Natural History of Predaceous Diving Beetles (Coleoptera: Dytiscidae), 2nd edition. Springer, The Netherlands. In press.

Basiliko N, K Dunfield and M Tenuta. 202X. Soil Biodiversity and Ecology. In Krizic M et. al. (ed) Chapter 6 in Introduction to Soil Science: A Canadian Perspective. To be published by BC Campus and the Canadian Society of Soil Science. In press.

Koptsik G, GA Spiers, S Koptsik and PJ Beckett. 2021. Use of organic amendments in phytoremediation of metal-contaminated soils: prospects and challenges. Pp 207 – 233. In: Prasad MNV (ed). Handbook of Assisted and Amendment-Enhanced Sustainable Remediation Technology. Elsevier, Oxford, United Kingdom.

Kumaragamage D, CJ Warren and GA Spiers. 2020. Soil Chemistry. In: Concepts in Soil Science – Text for Universities and Colleges. Canadian Soil Science Society. In press.

Laamanen CA and JA Scott. 2020. Microalgae biofuel bioreactors for mitigation of industrial CO₂ emissions. In: Singh Y and L Mahapatra (eds) Bioreactors for Bioenergy and Waste Abatement. Elsevier Pub. In press.

Muehlbauer JD, S Larsen, M Jonsson and EJS Emilson. 2020. Variables Affecting Resource Subsidies from Streams and Rivers to Land and their Susceptibility to Global Change Stressors. In: Kraus JM, DM Walters and MA Mills (eds) Contaminants and Ecological Subsidies. Springer, Cham.

Warren CJ and GA Spiers. 2020. Soil Mineralogy. In: Concepts in Soil Science – Text for Universities and Colleges. Canadian Soil Science Society. In press.

Publications

Co-op Unit Members authored or co-authored numerous publications in 2020:

Akerman T, GA Spiers, PJ Beckett, J Anderson and F Caron. 202X. Assessment of Airborne Lead Provenance in Northern Ontario, Canada, using isotopic ratios in snow and *Cladonia rangiferina* lichens. Water, Air, & Soil Pollution. Accepted.

Alarie Y. 2021. Hydradephaga (Coleoptera: Amphizoidae, Haliplidae, Gyrinidae, Dytiscidae) of the Alaska-Yukon region: new records, distributions and faunal composition. Aquatic Insects. In press.

Alarie Y, MC Michat and CHS Watts. 2021. Evolution of Sternopriscina larval forms (Coleoptera: Dytiscidae, Hydroporinae); descriptions of four species of *Sternopriscus* Sharp, 1880 and phylogenetic considerations. Aquatic Insects. In press.

Alarie Y. 2020. The Hydradephaga (Coleoptera, Haliplidae, Gyrinidae, Dytiscidae) fauna of Manitoulin Island, Ontario, Canada, the world largest freshwater island. The Coleopterists Bulletin 74:772-781.

Alarie Y and MC Michat. 2020. Larval morphology of Agabinae (Coleoptera: Dytiscidae): descriptions of three species of the subgenus *Agabus* s. str. Leach, 1817 with phylogenetic considerations. Aquatic Insects 41(3):197-226.

Alarie Y, MC Michat and CHS Watts. 2020. Larval morphology of *Megaporus* Brinck, 1943 (Coleoptera: Dytiscidae): description of *M. hamatus* (Clark, 1862) and *M. gardnerii* (Clark, 1862) and phylogenetic considerations. The Coleopterists Bulletin 74(1):139-160.

Arnott SE, MP Celis-Salgado, R Valleau, A DeSellas, A Paterson, N Yan, JP Smol and J Rusak. 2020. Road salt impacts freshwater zooplankton at concentrations below current water quality guidelines. Environmental Science and Technology 54:9398-9407.

Asemaninejad A, S Langley, T Mackinnon, GA Spiers, PJ Beckett, N Mykytczuk and N Basiliko. 2021. Blended municipal compost and biosolid materials for mine reclamation: long-term field studies to explore metal mobility, soil fertility and microbial communities. *Science of the Total Environment*. Mar 15; 760:143393

Asemaninejad A, K Munford, S Watmough, D Campbell, S Glasauer, N Basiliko and NCS Mykytczuk. 2020. Structure of microbial communities in amended and unamended acid-generating mine wastes along gradients of soil amelioration and revegetation. *Applied Soil Ecology* 155:103645.

Aždajić M, N Belzile, JM Gunn, JM Blais and AJ Poulain. 2020. Effects of a decade of selenium emission reductions on mercury accumulation in aquatic biota in the Sudbury region of Ontario. *Canadian Journal of Fisheries and Aquatic Sciences*. doi.org/10.1139/cjfas-2019-0196.

Barst BD, K Hudelson, GL Lescord, A Santa-Rios, N Basu, A Crémazy and PE Drevnick. 2020. Effects of non-native fish on lacustrine food web structure and mercury biomagnification along a dissolved organic carbon gradient. *Environmental Toxicology and Chemistry* 39:2196-2207.

Borgstrøm R, BO Rosseland and CM Sharma. 2021. Fjerning av store gjedder kan gje laagare kvikksølvkonsentrasjon hos individ i restbestanden. (Removal of large pike (*Esox lucius*) can result in lower mercury concentration in the remaining population of pike). *NATUREN* 1:36-41. (In Norwegian). <https://doi.org/10.18261/issn.1504-3118-2021-01-05>

Bräuer S, N Basiliko, HMP Siljanen and S Zinder. 2020. Methanogenic archaea in peatlands. *FEMS Microbiology Letters* 367(20), fnaa172.

Burke SM, CE Zimmerman, SM Laske, JC Koch, AM Derry, S Guernon, BA Branfireun and HK Swanson. 2020. Fish growth rates and lake sulphate explain variation in mercury levels in ninespine stickleback (*Pungitius pungitius*) on the Arctic Coastal Plain of Alaska. *Science of the Total Environment* <https://doi.org/10.1016/j.scitotenv.2020.140564>

Carson MA, S Watmough, G Spiers, SL Brauer, PJ Beckett and N Basiliko. 201X. Alerted methanogen communities and methane production in northern peatlands following long-term smelter deposition of Ni, C, and S. *Soil Biology and Biochemistry*. In revision.

Chavarie L, J Hoffmann, A Muir, C Krueger, C Bronte, K Howland, C Gallagher, S Sitar, M Hansen, M Vinson, L Baker, L Loseto, W Tonn and H Swanson. 2020. Dietary vs non-dietary fatty acid profiles of lake trout morphs from Lake Superior and Great Bear Lake: Are fish really what they eat? *Canadian Journal of Fisheries and Aquatic Sciences*. <https://doi.org/10.1139/cjfas-2019-0343>

Chen S, J Hu, Y Guo, N Belzile and T-L Deng. 2020. Enhanced kinetics and super selectivity toward Cs⁺ in multicomponent aqueous solutions: A robust Prussian blue analogue/polyvinyl

chloride composite membrane. *Environmental Research* 189 (2020) 109952
doi.org/10.1016/j.envres.2020.109952

Chen S, J Hu, S Han, Y Guo, N Belzile and T-L Deng. 2020. A review on emerging composite materials for cesium adsorption and environmental remediation on the last decades. *Separation and Purification Tech.* 251 (2020) 117340, doi.org/10.1016/j.seppur.2020.117340

Choy ES, C Giralod, B Rosenbuerg, JD Roth, AD Ehrman, A Majewski, H Swanson, M Power, JD Reist and LL Loseto. 2020. Variation in the diet of beluga whales in response to changes in prey availability: insights on changes in the Beaufort Sea ecosystem. *Marine Ecology Progress Series* 647:195-210.

Cosma M, A Finotello, A Ielpi, D Ventra, A D'Alpaos and M Ghinassi. 2020. Piracy-controlled geometry of tidal point bars revealed by ancient sedimentary successions and modern channel networks. *Geomorphology*, 370, 107402.

Cyples NN, A Ielpi and RW Dirszowsky. 2020. Planform and stratigraphic signature of proximal braided streams: Remote-sensing and ground-penetrating-radar analysis of the Kicking Horse River, Canadian Rocky Mountains. *Journal of Sedimentary Research* 90:131–149.

Deighton H and SA Watmough. 2020. Effects of non-industrial wood ash (NIWA) applications on soil chemistry and sugar maple (*Acer saccharum* Marsh.) seedlings grown in an acidic sugar bush in central Ontario. *Forests* 11:693.

Deighton H, SA Watmough, N Basiliko, PW Hazlett, CR Reid and A Gorgolewski. 2020. Trace metal biogeochemical responses following wood ash addition in a northern hardwood forest. *Canadian Journal of Forest Research*. <https://doi.org/10.1139/cjfr-2020-0320>

Deighton H, SA Watmough, C Reid, N Basiliko and PW Hazlett. 202X Soil water responses to wood ash addition to acidic upland soils: implications for combatting calcium decline in lakes. *Water, Air and Soil Pollution*. In review.

DeGasparro SD, Y Alarie and DV Beresford. 2021. Faunistic of Dytiscidae (Coleoptera: Adephaga) of Ontario's Far North, Canada. *The Coleopterists Bulletin*. In press.

Desjardins SM, CA Laamanen, N Basiliko and JA Scott. 2021. Selection and re-acclimation of bioprospected acid-tolerant green microalgae suitable for growth at low pH. *Extremophiles*, 25(2), 129–141. <https://doi.org/10.1007/s00792-021-01216-1>

Desjardins SM, CA Laamanen, N Basiliko and JA Scott. 2020. Utilization of lipid-extracted biomass (LEB) to improve the economic feasibility of biodiesel production from green microalgae. *Environmental Reviews*. 28(3):325-338.

Desjardins S, C Laamanen, N Basiliko and JA Scott. 202X. Dark stress as means to increase lipid content and improve fatty acid profiles of acid-tolerant microalgae exposed to gas containing 6% CO₂. *Applied and Environmental Microbiology*. In review.

Deslauriers C, M Allard and P Roy-Léveillé. 202X. Ground temperature responses to climatic trends in a range of surficial deposits near Kangiqsualujjuaq, Nunavik. *In* 2021 Regional Conference on Permafrost and 19th International Conference on Cold Regions Engineering, Boulder, CO, 11-16 Jul 2021, American Society of Civil Engineers: Reston, Virginia. Submitted.

Edge T, D Baird, G Bilodeau and 36 others, including EJS Emilson. 2020. The Ecobiomics Project: Advancing metagenomics assessment of soil health and freshwater quality in Canada. *Science of the Total Environment* 710, 135906.

Erdozain M, C Emilson, D Kreutzweiser, K Kidd, NCS Mykytczuk and P Sibley. 2020. Forest management influences the effects of streamside wet areas on stream ecosystems. *Ecological Applications*. DOI: 10.1002/eap.2077

Estop-Aragonés, C, D Olefeldt, BWAbbott, JP Chanton, CI Czimczik, JF Dean, JE Egan, L Gandois , MH Garnett, IP Hartley, A Hoyt, M Lupascu, SM Natali, JA O'Donnell, PA Raymond, AJ Tanentzap, SE Tank, EAG Schuur, M Turetsky, KW Anthony. 2020. Assessing the potential for mobilization of old soil carbon after permafrost thaw: A synthesis of 14C measurements from the northern permafrost region. *Global Biogeochemical Cycles* 34:e2020GB006672.

Gauthier MR, GNA Senhorinho and JA Scott. 2020. Microalgae under environmental stress as a source of antioxidants. *Algal Research*. In press.

Ghazouani S, Z Béjaoui, P Michael, G Spiers, P Beckett, M Gtari and K. Nkongolo. 2020. Effects of rhizobioaugmentation with N-fixing Frankia on metal mobility in *Casuarina glauca*-soil system irrigated with industrial wastewater: High level of metal exclusion of *C. glauca*. *Water, Air, & Soil Pollution*. 231(8):395

Ghazouani S, Z Béjaoui, P Michael, G Spiers, P Beckett, M Gtari and K Nkongolo. 2020. Rhizobioaugmentation of *Casuarina glauca* with N-fixing actinobacteria Frankia decreases enzymatic activities in wastewater-irrigated soil: effects of Frankia on *C. glauca* growth. *Ecotoxicology* 29:417–428. <https://doi.org/10.1007/s10646-020-02187-3>

Gorgolewski A, P Rudz, T Jones, N Basiliko and J Caspersen. 2020. Assessing coarse woody debris nutrient dynamics in managed northern hardwood forests using a matrix transition model. *Ecosystems* 23(3), 541–554. <https://doi.org/10.1007/s10021-019-00420-7>

Gupta V, J Courtemanche, JM Gunn and NCS Mykytczuk. 2020. Shallow floating treatment wetland capable of sulfate reduction in acid mine drainage impacted waters in a northern climate. *J. of Environmental Management*, doi: 10.1016/j.jenvman.2020.110351.

Gustafson G, KB Miller, MC Michat, Y Alarie, S Bacca and A Short. 2021. The enduring value of reciprocal illumination in the era of insect phylogenomics: a response to Cai *et al.* 2020. *Systematic Entomology* 1;263:110351. DOI: 10.1111/syen.12471

Hall L, EJS Emilson, B Edwards and SA Watmough. 2020. Patterns and trends in lake concentrations of dissolved organic carbon in a landscape recovering from environmental degradation and widespread acidification. *Science of the Total Environment* 765, 142679.

Hargan KE, SA Finkelstein, KM Rühland, MS Packalen, AS Dalton, AM Paterson, W Keller and JP Smol. 2020. Post-glacial lake development and paleoclimate in central Hudson Bay Lowlands inferred from sediment records. *Journal of Paleolimnology* 64: 25-46. DOI: 10.1007/s10933-020-00119-x.

Harris LN, HK Swanson, MJH Gilbert, BK Malley, AT Fisk and JS Moore. 2020. Anadromy and marine habitat use of Lake Trout (*Salvelinus namaycush*) from the central Canadian Arctic. *Journal of Fish Biology*. <https://doi.org/10.1111/jfb.14305>

Hart S, T Porter, N Basilko, L Venier, M Hajibabaei and D Morris. 202X. Fungal community dynamics and C mineralization in coarse woody debris across decay stage, tree species, and stand development stage in northern boreal forests. *Forest Ecology and Management*. In review.

Ielpi A, MGA Lapôtre, A Finotello and M Ghinassi. 2021. Planform-asymmetry and backwater effects on river-cutoff kinematics and clustering. *Earth Surface Processes and Landforms* 46:357–370.

Ielpi A and MGA Lapôtre. 2020. A tenfold slowdown in river meander migration driven by plant life. *Nature Geoscience* 13:82–86.

Ielpi A, MGA Lapôtre, A Finotello, M Ghinassi and D’Alpaos. 2020. Channel mobility drives a diverse stratigraphic architecture in the dryland Mojave River (California, USA). *Earth Surface Processes and Landforms* 45:1717–1731.

Isanta-Navarro J. SE Arnott, T Klauschies and D Martin-Creuzburg. 2021. Dietary lipid quality mediates salt tolerance of a freshwater keystone herbivore. *Science of the Total Environment*. May 15;769:144657.

Jiao Y, N Basiliko, AT Kovala, J Shepherd, H Shang and JA Scott. 2020. TiO₂ based nanopowder coatings over stainless steel plates for UV-C photocatalytic degradation of methylene blue. *Canadian Journal of Chemical Engineering*. 98(3):728-729

Johnston TA, MD Wiegand, RL Szmydala, LR Porteous, JM Casselman and WC Leggett. 2020. Sex-based differences in fatty acid composition of adult walleye. *Ecology of Freshwater Fish* 29:654-664.

Kirkwood A, P Roy-Léveillé, B Branfireun, M Pakalen, J McLaughlin and N Basiliko. 202X. Mercury, methylmercury, and microbial communities in a degrading palsa of the Hudson Bay Lowlands, Far North Ontario. Full conference paper for the 2021 Conference on Permafrost, Boulder CO Oct 2021; paper will then be published in Cold Regions Engineering. Accepted.

Kirkwood A, P Roy-Léveillé, N Mykytczuk, M Packalen, J McLaughlin, A Laframboise and N Basiliko. 202X. Soil microbial community response to permafrost degradation in palsa fields of the Hudson Bay Lowlands: implications for greenhouse gas production in a warming climate. Revisions submitted to Global Biogeochemical Cycles. In review.

Kornis M, D Bunnell, H Swanson and C Bronte. 2020. Spatiotemporal patterns in trophic niche overlap among five salmonines in Lake Michigan, USA. Canadian Journal of Fisheries and Aquatic Sciences 77(6):1059-1075.

Laamanen CA and JA Scott. 2020. Microalgae biofuel bioreactors for mitigation of industrial CO₂ emissions. In Bioreactors. Eds. L Singh, Y Yousuf and M Mahapatra. Elsevier Pub. 1-16

Lapôtre MGA and A Ielpi. 2020. The pace of fluvial meanders on Mars and implications for the western delta deposits of Jezero crater. AGU Advances 1, e2019AV000141.

Lento J, S Laske, I Lavoie, D Bogan, B Brua, S Campau, K Chin, JN Culp, B Levenstein, M Power, E Saulnir-Talbot, R Shaftel, H Swanson, M Whitman and CE Zimmerman. 2020. Diversity of diatoms, benthic macroinvertebrates, and fish varies in response to different environmental drivers in Arctic Rivers across North America. Freshwater Biology <https://doi.org/10.1111/fwb.13600>

Lescord GL, TA Johnston, M Heerschap, W Keller, M Southee, C O'Connor, R Dyer, B Branfireun, and J Gunn. 2020. Arsenic, chromium, and other elements of concern in fish from remote boreal lakes and rivers: Drivers of variation and implications for subsistence consumption. Environmental Pollution 259:113878.

Levasseur P, SA Watmough, J Aherne, CJ Whitfield, and MC Eimers. 2020. Estimating mineral surface area and base cation weathering rates of forest Spodosols in Kitimat, British Columbia. Geoderma Regional 20(2020) e00247.

Lind L, E Maher Hasselquist, W Lidberg, A Leinonen, J Jyvasjarvi, EJS Emilson, B Kielstra and L Kuglerova. 2020. Hur hanteras små vattendrag vid skogsavverkning i nordliga områden? SLU's Fakta Skog 5, 2020. [Translated: "How to handle small streams in northern forested areas" – SLU's Forest Facts 5, 2020]

Little SM, GNA Senhorinho, M Saleh, N Basiliko and JA Scott. 2021. Antibacterial compounds in green microalgae from extreme environments: A review. ALGAE 36(1):61–72. <https://doi.org/10.4490/algae.2021.36.3.6>

Magnuson E, NCS Mykytczuk, A Pellerin, J Goordial, SM Twine, B Wing, SJ Foote, K Fulton, and LG Whyte. 2020. *Thiomicrothabodus* streamers and sulfur cycling in perennial hypersaline cold springs in the Canadian high Arctic. Environmental Microbiology J. doi:10.1111/1462-2920.14916.

McLean SH, J Chenier, S Muinonen, CA Laamanen and JA Scott. 2020. Recovery and repurposing of thermal resources in the mining and mineral processing industry. Journal of Sustainable Mining. 19:115-125.

McLean SH, J Chenier, S Muinonen, CA Laamanen and JA Scott. 2020. Low-grade waste heat recovery and repurposing to reduce the load on cooling towers. Advances in Energy Research. 7(2):147-166.

McTavish MJ, A Gorgolewski, SD Murphy and N Basiliko. 2020. Field and laboratory responses of earthworms to use of wood ash as a forest soil amendment. Forest Ecology and Management 474, 118376.

McTavish M, A Gorgolewski, S Murphy and N Basiliko. 2020. Anecic earthworms (*Lumbricus terrestris*) facilitate the burial of surface-applied wood ash. Biology and Fertility of Soils 56(2):195-203.

Meyer-Jacob C, AL Labaj, AM Paterson, B Edwards, W Keller, B Cumming and JP Smol. 2020. Re-browning of Sudbury (Ontario, Canada) lakes now approaches pre-acidification lake-water dissolved organic carbon levels. Science of the Total Environment 725: 138347. doi.org/10.1016/scitotenv.2020.138347.

Michat MC, M Archangelsky and Y Alarie. 2020. Morphology and chaetotaxy of Neotropical *Halipilus* larvae (Coleoptera: Haliplidae). Revista Mexicana de Biodiversidad 91:1-12.

Mohit S, TB Johnson, SE Arnott. 2021. Recreational watercraft decontamination: can current recommendations reduce aquatic invasive species spread? Management of Biological Invasions 12:148-164.

Moreau K, CA Laamanen, R Bose, H Shang and JA Scott. 2020. Life cycle assessment to demonstrate how automation improves the sustainability performance of an underground mining operation. Journal of Sustainable Mining. 19:182-194

Mozzon CM, GL Lescord, P-L Savage and TA Johnston. 2020. The trophic niche of sculpins (*Cottus spp.*) in forage fish assemblages of boreal lakes. Journal of Fish Biology 96:92-101.

Munford KE, M Casamatta, N Basiliko, S Glasauer, NCS Mykytczuk and SA Watmough. 2021. Paper birch (*Betula papyrifera*) nutrient resorption rates on nutrient-poor metal-contaminated soils and mine tailings. Water, Air and Soil Pollution 232:1-15.

Munford K, SA Watmough, M Rivest, A Poulain, N Basiliko and N Mykytczuk. 2020. Edaphic factors influencing vegetation colonization and encroachment on arsenical gold mine tailings near Sudbury, Ontario. *Environmental Pollution*. 264(2020)114680.

Munford KE, A Asemaninejad, N Basiliko, NCS Mykytczuk, S Glasauer and S Watmough. 202X. Pioneer plants provide ecosystem benefits on legacy Ni-Cu mine tailings with variable treatment regimes. *International Journal of Phytoremediation*. In press.

Okada R and Y Alarie. 2020. Description of the immature stages of the endangered Japanese endemic *Oreodytes kanoi* (Kamiya, 1938) (Coleoptera, Dytiscidae, Hydroporinae) and comparison with the known larvae of *Oreodytes* Seidlitz, 1887. *Zootaxa* 4820(1): 001-018.

O'Neil B, P Roy-Léveillé, L Slebedeva and F Ling. 2020. Recent advances (2010–2019) in the study of taliks. *Permafrost and Periglacial Processes* 31:346-357, doi:10.1002/ppp.2050.

Orland C, KM Yakimovich, NCS Mykytczuk, N Basiliko, and AJ Tanentzap. 2020. Think global, act local: The small-scale environment mainly influences microbial community development and function in lake sediment. *Limnology and Oceanography* 65:88-100. doi:10.1002/lno.11370 (Special Issue: Linking Metagenomics to Aquatic Microbial Ecology and Biogeochemical Cycles)

Pilla R, W(B) Keller et al. (58 authors). 2020. Deeper waters are changing less consistently than surface waters in a global analysis of 102 lakes. *Nature Scientific Reports* 10:20514.

Preston MD, M Brummell, E Smenderovac, B Rantala-Sykes, R Rumney, G Sherman, N Basiliko, P Beckett and M Hebert. 2020. Tree restoration and ecosystem carbon storage in an acid and metal impacted landscape: Chronosequence and resampling approaches. *Forest Ecology and Management* 463, 118012.

Robinson C, P Roy-Léveillé, K Turner and N Basiliko. 202X. Impacts of shrubification on ground temperatures and carbon cycling in a sub-arctic fen near Churchill, MB. Full conference paper for the 2021 Conference on Permafrost, Boulder CO Oct 2021; paper will then be published in *Cold Regions Engineering*.

Rosseland BO. 2021. The legacy from the 50 years of acid rain research, forming present and future research and monitoring of ecosystem impact. This article belongs to *Ambio's 50th Anniversary Collection*. Theme: Acidification. 50:273–277. <https://doi.org/10.1007/s13280-020-01408-7>

Rumney RH, MD Preston, T Jones, N Basiliko and J Gunn. 2021. Soil amendment improves carbon sequestration by trees on severely damaged acid and metal impacted landscape, but total storage remains low. *Forest Ecology and Management* 483, 118896.

Senhorinho GNA, C Lanner and JA Scott. 2020. The importance of harvesting time on the screening of *Chlamydomonas* spp. extracts for antibacterial activity. *International Journal on Algae*. 22(3):269-278.

Seward J, MA Carson, LI Lamit, N Basiliko, JB Yavitt, E Lilleskov, CW Schadt, D Solance Smith, J McLaughlin, NCS Mykytczuk, S Williams-Johnson, R Roulet, TR Moore, L Harris and S Bräuer. 2020. Peatland microbial community composition is driven by a natural climate gradient. *Microbial Ecology*. 80(3), 593–602. <https://doi.org/10.1007/s00248-020-01510-z>

Sinclair JS, SE Arnott, WA Nelson and KB Brougham. 202X. Consistent and transient drivers of freshwater zooplankton communities. *Journal of Biogeography*. Accepted.

Sinclair JS, JL Lockwood, S Hasnain, P Cassey and SE Arnott. 2020. A framework for predicting with non-native individuals and species will enter, survive, and exit human-mediated transport. *Biological Invasions* 22:217-231.

Smith AL, SSE Azan and ND Yan. 201X. Does newspaper coverage of invasive alien species in Canada accurately reflect their threat? *Biol. Inv.* Under review.

Sumner AW, TA Johnston, GL Lescord, BA Branfireun and JM Gunn. 2020. Mercury bioaccumulation in lacustrine fish populations along a climatic gradient in northern Ontario, Canada. *Ecosystems* 23:1206–1226.

Tanentzap AJ, G Morabito, P Volta, M Rogora, ND Yan and M Manca. 2020. Climate warming restructures an aquatic food web over 28 years. *Global Change Biology* 26:6852-6866.

Thomas S, S Melles, R Mackereth, T Tunney, C Chu, C Oswald, S Bhavsar and TA Johnston. 2020. Climate and landscape conditions indirectly affect fish mercury levels by altering lake water chemistry and fish size. *Environmental Research* 188:109750.

Tipping E, S Lofts and W Keller. 2021. The use of WHAM- F_{TOX} , parameterized with laboratory data, to simulate zooplankton species richness in acid- and metal-contaminated lakes. *Aquatic Toxicology*. 231(2021)105708 doi.org/10.1016/j.aquatox.2020.105700.

Tregubova P, G Koptsik, A Stepanov, S Koptsik and GA Spiers. 2021. Organic amendments potentially stabilize metals in smelter contaminated Arctic soils: an incubation study. *Heliyon* 7(1) e06022. DOI:<https://doi.org/10.1016/j.heliyon.2021.e06022>

Tsyrlin E, M Carew and Y Alarie. 2020. Redescription of larvae of *Chostonectes nebulosus* (MacLeay, 1871) (Coleoptera: Dytiscidae: Hydroporinae: Hydroporini: Sternopriscina) with a key of identification of the known larvae of *Chostonectes* Sharp 1882. *Zootaxa* 4718(3): 436-446.

Urcola JI, Y Alarie, CJ Benetti and MC Michat. 2020. Description of the larval stages of *Hydrocanthus socius* Sahlberg, 1844 (Coleoptera: Noteridae) with chaetotaxy analysis. *Annales Zoologici* 70: 687-695.

Urcola JI, CJ Benetti, Y Alarie, G Rodriguez and MC Michat. 2020. The unknown larva of the burrowing water beetle genus *Liocanthyrus* Guignot, 1957 (Coleoptera: Noteridae). *Journal of Natural History* 54:2285-2296.

Urcola JI, CJ Benetti, Y Alarie, G Rodriguez and MC Michat. 2020. Characterization and mapping of sensilla on the head appendages of noterid larvae (Coleoptera: Noteridae), and development of a preliminary biometric method for taxa delimitation. *Journal of morphology* 281:1210-1222.

Van Leeuwen P, NCS Mykytczuk, G Mastromonaco and A Schulte-Hostedde. 2020. Effects of captivity, diet and relocation on the gut bacterial communities of white-footed mice. *Ecology and Evolution*. <https://doi.org/10.1002/ece3.6221>

Van Leeuwen P, NCS Mykytczuk, G Mastromonaco and A Schulte-Hostedde. Effects of diet on the gut bacteria of captive and released wild white-footed mice – implications for zoo conservation. MEC-19-0969 - *Molecular Ecology*. Under review.

Vinson MR, JM Hoffmann, AM Muir, CL Rosinski, CC Kreger, CR Bronte, MJ Hansen, SP Sitar, WE Allen, LF Baker and HK Swanson. 2020. Gut contents from multiple morphs of lake trout (*Salvelinus namaycush*) at two offshore shoals in Lake Superior. *Journal of Great Lakes Research*. <https://doi.org/10.1016/j.jglr.2020.06.020>

Watmough SA and MC Eimers. 2020. Recent rapid recovery from acidic deposition in central Ontario lakes. *Soil Systems* 4(1):10

Watmough S, J Aherne and D Marmorek. 202X. Letter to the Editor: Impacts of industrial atmospheric emissions on watershed export of dissolved ions in coastal streams: a Bayesian modeling approach. *Environmental Monitoring and Assessment*. In press.

Watmough SA, S Gilbert-Parkes, N Basiliko, LJ Lamit, E Lilleskov (core author group) and 47 others including B Robinson, M Carson, G Guo and S Johnson. 202X. Evaluating carbon and nitrogen concentrations in peatland soils at the global scale. *Global Change Biology*. In review.

Wang B, Y Huang, W Liu, S Chen, J Zhu, N Belzile, Y-W Chen, M Liu and C Liu. 2021. Returning excrements from livestock, poultry and human to farmlands as nutrient resources for crop growth: Assessment of in rural China. *Process Safety and Environmental Protection* 146:412-423. doi.org/10.1016/j.psep.2020.09.001

Wang B, S Chen, Y-W Chen, N Belzile, R Zheng, Y Yang, K Fu, Y Chen, B Lin, Z Liu and J Sun. 2021. The geochemical behavior of trace metals and nutrients in submerged sediments of the Three

Gorges Reservoir and a critical review of risk assessment methods. Environmental Science and Pollution Research. doi.org/10.1007/s11356-021-12827-8

Wang B, M Li, X Wen, Y Yang, J Zhu, N Belzile, Y-W Chen, M Liu and S Chen. 2020. Distribution characteristics, potential contribution, and management strategy of crop straw and livestock-poultry manure in multi-ethnic regions of China: A critical evaluation. Journal of Cleaner Production 274 (2020) 123174, doi.org/10.1016/j.clepro.2020.123174

Wong C, K Ballegooyen, L Ignace, G Johnson and H Swanson. 2020. Towards Reconciliation: 10 calls to action for natural scientists working in Canada. FACETS. <https://doi.org/10.1139/facets-2020-0005>

Yakimovich KY, C Orland, EJS Emilson, AJ Tanentzap, N Basiliko, NCS Mykytczuk. 2020. Lake characteristics influence how methanogens in littoral sediments respond to terrestrial litter inputs. The ISME Journal 14(8):2153-2163.

Yao H, AM Paterson, AL James, C McConnell, T Field, R Ingram, D Zhang, SE Arnott and SN Higgins. 2020. Contrasting long-term trends of chloride levels in remote and human-disturbed lakes in South-Central Ontario, Canada. Lake and Reservoir Management 37:19-33.

Yin MX, DC Martineau, D Demers, ND Basiliko and NJ Fenton. 2021. The potential environmental risks associated with the development of rare earth element production in Canada. Environmental Reviews <https://doi.org/10.1139/er-2020-0115>

Ytrestøyl T, HR Takle, J Kolarevic, S Calabrese, G Timmerhaus, BO Rosseland, H-C Teien, TO Nilsen, SO Handeland, S Stefansson, L Ebbesson and BF Terjesen. 2020. Performance and welfare of Atlantic salmon, *Salmo salar* L. post-smolts in recirculating aquaculture systems: Importance of salinity and water velocity. Journal of the World Aquaculture Society 51(2):373-392.

Zuykov M, G Kolyuchkin, GA Spiers, M Gosselin, P Archambault and M Schindler. 2021. Pre-exposure to Cu²⁺ and CuO NPs leads to infection of caged blue mussels, *Mytilus edulis* L., by pathogenic microalga: Pilot study in the Lower St. Lawrence Estuary (Québec, Canada). Mar Pollut Bull. 10;166:112180. doi: 10.1016/j.marpolbul.2021.112180.

Zuykov M, B Allam, M Gosselin, P Archambault, GA Spiers and M Schindler M. 2020. First report of signs of infection by Coccomyxa-like algae in wild blue mussels, *Mytilus* spp., in the Gulf of Maine (USA, Maine). Journal of Fish Diseases 00: 1–4. <https://doi.org/10.1111/jfd.13172>

Zuykov M, SW Fowler, P Archambault, G Spiers and M Schindler. 2020. Practical advice on monitoring of U and Pu with marine bivalve mollusks near the Fukushima Daiichi Nuclear Power Plant. Marine Pollution Bulletin. 151(2020)110860.

Reports

ESSA Technologies, J. Laurence, Risk Sciences International, Trent University, and Trinity Consultants. 2020. 2019 Comprehensive Review of Sulphur Dioxide Environmental Effects Monitoring for the Kitimat Modernization Project – Volume 3: Technical Appendices (Appendices 4, 5 and 6), Draft, V.1. Prepared for Rio Tinto, B.C. Works, Kitimat, British Columbia.

Beckett PJ, M Preston, NBasiliko and Marc Hebert. 2020. Ecosystem Carbon Storage in the Mining and Smelter Impacted Landscape of Sudbury, Ontario. Canada. Planning for Closure 3, Chile. 8 p.

Johnston TA, KA Patterson, LC Haslam, SJ Scholten, JM Gunn and CD Wren. 2020. Limnological and fish community surveys of Tadenac Lake and Tadenac Bay (Georgian Bay, Lake Huron), 2011–2014. Ontario Ministry of Natural Resources and Forestry, Science and Research Branch, Peterborough, ON. Science and Research Technical Report TR-39. 39 p. + appendix.

Patterson KA, TA Johnston, LC Haslam, W Keller, GL Lescord, MJ Heerschap, RA DeJong, HK Swanson, PA Lennox, C-LB Chetkiewicz, CM O'Connor, JW Warmbold, JL Bailey, BA Edwards, MT Arts, CJ Chenier, AW Sumner, RWK Tang, BA Branfireun, NE Jones, SP Bhavsar and JM Gunn. 2020. Fish and aquatic sampling activities in the Hudson Bay Lowlands Ecozone of the Far North of Ontario: 2008-2018. Ontario Ministry of Natural Resources and Forestry, Science and Research Branch, Peterborough, ON. Science and Research Technical Report TR-41. 54 p. + appendices.

Conference Presentations

(Presentations delivered after March 2020 were delivered virtually due to Covid-19)

Basiliko N. The regreening of the Sudbury landscape and landscape carbon accumulation following reductions in smelter emissions. Trent School of the Environment, Dec 2020. Invited.

Basiliko N. Mill residual utilization 32nd Annual Pulp and Paper Research Consortium, University of Toronto, Nov 2020.

Basiliko N. The regreening of the Sudbury landscape and landscape carbon accumulation following reductions in smelter emissions. Université du Québec en Abitibi-Témiscamingue. Jan 2020. Invited.

Basiliko N and K Chan-Yam. Challenges and prospects of methane management in ecosystems: a case study of enhancing methane and energy recovery from organic waste streams in the forestry sector. First Annual International Methane Workshop, University of Waterloo, Mar 2021.

Beckett PJ and GA Spiers 2020. Sudbury, Canada – 40+ Years of Healing and Creating Novel

Functional Ecosystems on a Smelter-Impacted Landscape. Presentation to Canada-Peru Chamber of Commerce Delegation Visit to Laurentian University (14 delegates from Universities, Industry and 2 Governors of Peruvian Provinces), 4-6 Mar 2020.

Beckett PJ et al. Ecosystem Carbon Storage in the Mine and Smelter Impacted Landscape of Sudbury, Ontario, Canada. 3rd International Congress on Planning for Mine Closure, Santiago, Chile. 7-11 Sept 2020.

Byun E, F Rezanezhad, L Fairbairn, N Basiliko, J Price, W Quinton, P Roy-Léveillé, K Webster, P Van Cappellen. Temperature and moisture controls on non-growing season CO₂ emissions in laboratory incubations with soils from northern peatlands. European Geophysical Union general Assembly 9-13 Apr 2021.

Champagne J and N Mykytczuk. Genomics and Life in the Mine. CIM Academy Live Webinar, 15 Jul 2020. Invited.

Champagne J and N Mykytczuk. Genomics and Life in the Mine. CIM conference 2020 Vancouver Abstract accepted not presented due to COVID19.

Chan-Yam K, T Meyer and N Basiliko. Controls on methane production from pulp mill sludges. 32nd Annual Pulp and Paper Research Consortium at the University of Toronto, Nov 2020.

Corbière N, Roy-Léveillé P, Turner K, Basiliko N, Branfireun B. Permafrost degradation and mercury mobilization to waterways and water bodies in Old Crow Flats, Yukon. Arctic Change 2020, ArcticNet Conference. 7-10 Dec 2020.

Courchesne B, N Mykytczuk and M Schindler. Bioleaching potential of Co from alkaline tailings in Northeastern Ontario. Prospectors and Developers Association of Canada AGM. Toronto Ontario. 2-5 Mar 2020. Poster.

Dawson JC, BA Edwards and JM Gunn. Lake recovery and restoration effects on biodiversity and community structure. Bite-Sized biology seminars, Sudbury, ON. Dec. 2020.

Dawson JC, BA Edwards and JM Gunn. Freshwater food web recovery responses. Oral presentation, Laurentian University Graduate Research Symposium, Sudbury, ON. Feb 2020.

Deslauriers C, M Allard and P Roy-Léveillé. Changes in the permafrost thermal regime of a lithalsa, a glaciofluvial delta and bedrock near Kangiqsualujjuaq, Nunavik. Arctic Change 2020, ArcticNet Conference. 7-10 Dec 2020.

Dixon HJ, J Whitehouse, M Low, G Low and HK Swanson. Reducing mercury concentration in Northern Pike in a small Subarctic lake using intensive fishing. Canadian Conference for Fisheries Research, Halifax, NS, Canada. 2-5 Jan 2020.

Emilson EJS and L Venier. 2020. Cumulative effects in Ontario's managed forests and beyond. NRCan Cumulative Effects Knowledge Sharing Session, Virtual Meeting.

Gunn JM, BA Edwards, TA Johnston and WB Keller. Recovery dynamics of industrially damaged systems (Sudbury): Interface of restoration ecology and invasion biology. Canadian Conference for Fisheries Research, Halifax, NS, Canada, 2-5 Jan 2020.

Hilgendag I, Z Martin, A Ehrman, M Power and H Swanson. Intrapopulation variation of mercury in anadromous Arctic char (*Salvelinus alpinus*). ArcticNet Science Meeting. 7-10 Dec 2020.

Ielpi A and MGA Lapôtre. The case for barren meanders in Earth's modern endorheic basins as analogues to early Mars' Rivers. American Geophysical Union Fall Meeting, San Francisco, CA. 1-17 Dec 2020. Invited.

Ielpi A, MGA Lapôtre, A Finotello, M Ghinassi and A D'Alpaos. Predictions of stratigraphic architecture in relation to channel mobility of dryland rivers: Insight from the Mojave River of California (USA). Geological Society of America Connects Online, Montréal, QC. 26-30 Oct 2020.

Ielpi A. A Mars connection: Using Earth's rivers to search for ancient extraterrestrial life. Vale Living with Lakes Centre, Sudbury, ON. 27 Jul 2020. Invited.

Ielpi A. 2020. Forests as macro-engineers of river landscapes: Results of a worldwide time-lapse analysis of watershed photogrammetry. Canadian Forest Ecosystems in a Changing Climate, Laurentian University Research Week Symposium, Sudbury, ON. 27 Feb 2020. Invited.

Johnston TA, SP Lehman, MD Wiegand, MT Arts and JM Gunn. Combined maternal and environmental effects on embryo development and survival in walleye. 150th Annual Meeting of the American Fisheries Society. 14-25 Sept 2020.

Kirkwood A, P Roy-Léveillé, K Turner and N Basiliko. Landscape change in a warming north - observations of thawing permafrost in the Far North Ontario portion of the Hudson Bay Lowlands from remote sensing. Arctic Change 2020, ArcticNet Conference. 7-10 Dec 2020.

Kluke C, GL Lescord, TA Johnston, AS Lock, SP Bhavsar and JM Gunn. Factors controlling arsenic and chromium bioaccumulation in freshwater fish of Ontario, Canada. 41st Annual Meeting (Virtual) of the Society of Environmental Toxicology and Chemistry. 15-19 Nov 2020. Poster.

Lavigne J, G Spiers, P Beckett, M Hebert and N Basiliko. Pulp and paper mills residuals for land reclamation. 32nd Annual Pulp and Paper Research Consortium, University of Toronto, Nov 2020.

Lehman SP, TA Johnston and JM Gunn. Combined effects of maternal traits and spring warming patterns on spawning success of walleye. Canadian Conference for Fisheries Research, Halifax, NS, Canada. 2-5 Jan 2020.

Lescord GL, C Chetkiewicz, D Pearson, C Sarrazin-Delay, TA Johnston and JM Gunn. Food for thought: subsistence fishing in northern Ontario and future needs from environmental monitoring programs. Association of Polar Early Career Scientists (APECS) 6th Annual International Conference. 20 May 2020. Awarded 2nd place for Arctic oral presentations.

Lescord GL, TA Johnston, M Quesnel, P-L Savage, KA Kidd and JM Gunn. Comparing the influence of growth rate and food web position on inter-individual variation in fish mercury (Hg) concentrations in lakes of northern Ontario, Canada. 41st Annual Meeting of the Society of Environmental Toxicology and Chemistry. 15-19 Nov 2020. Poster.

Lescord GL, TA Johnston, AS Lock, DE Ponton JM Gunn and M Amyot. Arsenic speciation in boreal freshwater fish: preliminary findings. 41st Annual Meeting of the Society of Environmental Toxicology and Chemistry. 15-19 Nov 2020. Poster.

McPhedran BE, ML Hanson and HK Swanson. Increased somatic growth and decreased tissue metals in Arctic grayling (*Thymallus arcticus*) from a wastewater wetland compared to a reference lake. ArcticNet Science Meeting. 7-10 Dec 2020. Poster.

McPhedran BE, ML Hanson and HK Swanson. Life history characteristics of ninespine stickleback (*Pungitius pungitius*) in an Arctic wastewater treatment wetland. Young Environmental Scientist Conference, Waco, TX, USA. 9-11 Mar 2020. Poster.

Pearson D. Climate change impacts in the North, Sioux Lookout Health Authority, 15-16 Jan 2020.

Pearson D. Climate change health impacts, Meeting of Northern Health Units, 10-11 Mar 2020.

Rosseland BO. UN Sustainable Development Goals No 14: Life below Water. Conserve and use the marine resources in a polluted environment in a sustainable way. (FNs BÆREKRAFTMÅL 14: LIVET UNDER VANN i et «forurensset miljø». Bevare og bruke hav- og marine ressurser på en bærekraftig måte). Talk at the Climate Festival § 112 Haugalandet – a festival for climate, environment and solidarity – a festival for the future. (Klimafestival 112 Haugalandet - en festival for klima, miljø og solidaritet - en festival for framtida. Haugesund Library, Norway. 29 Jan 2020. 100 participants. (In Norwegian)

Seward J, P Roy-Léveillé, F Reza Nezhad and N Basiliko. Physical Dynamics Regulating Microbial Community Structure and Respiration in Thawing Permafrost Peatlands. Arctic Change 2020, ArcticNet Conference. 7-10 Dec 2020.

Spiers GA 2020. Sudbury - Emissions Impacts on the City of Lakes. Presented at School of Environmental Engineering, Universidad Nacional de Moquegua, Ilo Campus, Peru. Presentation to a class of ~ 30 students and academics from UNAM, Ilo Campus. 11 Dec 2020. Invited.

Spiers GA. Evaluacion De Los Impactos Ambientales, Sociales Y Economicos En El River Coralaque, Generado Por El Drenaje Acido En La Parte Superior Del Sub-Basin - Un Proyecto Conjunto de Investigación por UNAM y LU. Presentation to Canada-Peru Chamber of Commerce Delegation Visit to Laurentian University (14 delegates from Universities, Industry and 2 Governors of Peruvian Provinces), 4-6 Mar 2020.

Spiers GA and PJ Beckett. 2020. Manufacture of Technosols on Mining Lands – Canadian Examples Presented to III CONGRESO MINEROSUR 2020, Universidad Nacional Jorge Basadre Grohmann, Tacna, Peru. 27 Nov 2020. Invited.

Spiers GA, N Mykytczuk, C Ramcharan, A Ilepi, P Beckett and N Tardif. 2020. Research Needs in Peru - UNAM and UNJBG and LU Collaborate. Presented at School of Environmental Engineering, Universidad Nacional de Moquegua, Moquegua, Peru and at Faculty of Engineering, Universidad Nacional Jorge Basadre Grohmann, Tacna, Peru. Via Zoom 8 Jun 2020. Invited.

Swanson HK and K Ballegooyen. Ten Calls to Action for Natural Scientists. Queen's University School of Environmental Studies Seminar Series, 7 Dec 2020. Invited.

Swanson HK. How are northern ecosystems connected to each other? Ask the fish! 2020 Annual Living with Lakes Watershed Lecture, Laurentian University, Sudbury, ON. 31 Oct 2020. Invited Keynote.

Swanson HK. Measuring contaminant levels in country foods: lessons learned from two case studies in northern Canada. Health Canada Country Food Forum. Ottawa, ON. 11-12 Feb 2020. Invited.

Weinstein SY, MC Hale, TN Loewen and HK Swanson. Diversity of chars (*Salvelinus spp.*) in the Coppermine River near Kugluktuk, Nunavut. American Fisheries Society Annual Meeting, 14-15 Sept 2020.

Weinstein SY, MC Hale, TN Loewen and HK Swanson. Diversity of chars (*Salvelinus spp.*) in the Coppermine River near Kugluktuk, Nunavut. Anadromous Salmonid Workshop., Laugarvatn, Iceland. 2-7 Mar 2020.

Wong C, L Ignace, K Ballegooyen, MJ Johnson and H Swanson. Ten Calls to Action for Natural Scientists. Indigenous-STEM in the Canadian Federal Service, 16 Nov 2020. Invited.

Research Grants

Arnott, S

- NSERC Discovery Grant, A multi-scale approach to identifying the ecological impact of co-occurring environmental stressors (2019-2024)
- ArcticNet, Ensuring water security in the High Arctic: understanding the impacts of changing permafrost, hydrology, and water quality on aquatic ecosystems (2019-2024) Lafreniere (PI)
- Matariki Queen's-Dartmouth Fund, Assessing zooplankton response and resilience to chloride contamination (2019-2021)
- OMNRF, Testing the efficacy of decontamination methods for preventing the spread of invasive species (2017-2020)
- OMECP, Drivers of food web change in Lake Simcoe (2017-2020)
- OMECP, Best in Science, Linking road salt application, lake chloride concentration, and biotic thresholds in Canadian Shield lakes (2017-2020)
- OMECP, Development of phytoplankton counting and measuring software (2017-2020)
- OMECP, Assessing the cumulative impacts of calcium decline and the non-native predator, *Bythotrephes longimanus*, in Ontario's inland lakes: a multi-scale approach (2015-2020)

Basiliko, N

- NSERC Canada Research Chair Tier II in Environmental Microbiology (2013-2023)
- NSERC Discovery (DG) The tiny majority: how microbes mediate ecosystem functioning under anthropogenic stressors in boreal environments (2019-2024)
- NSERC/Environment Canada Advancing Climate Change Science in Canada program: Winter carbon losses in wetland ecosystems under current and future climates. With F Rezanezhad PI et al. at (U Waterloo), P Roy-Léveillé (Laval) (2019-2022)
- MITACS Accelerate. Capture and repurposing of waste industrial emissions for improved economic and environmental sustainability. With Scott (PI) and Laamanen (2019-2021)
- SSHRC Partnership Development Grant. Reassembling Ontario's "Near North": Reparation through university-museum-Indigenous research partnerships. With Greer (PI) Peltier and Helmsworth (Nipissing U) (2019-2021)
- Ontario Centres of Excellence (OCE) VIP-II Prospecting for non-ore resources in Ontario's mining sector. With Scott (PI), Laamanen (Laurentian) (2018-2020)
- 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 (2018-2021).

- Environment Canada, Environmental Damages Fund. Microbial consortia in mining waste rock: understanding microbial dynamics to optimize metal recovery, minimize metal migration and facilitate revegetation in cold environments with Susan Glasauer (PI, Guelph), S Watmough (Trent), N Mykytczuk, T Merritt and N Basiliko (LU) (2016-2020)
- 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 (2017-2020)
- 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. Awarded April 2020
- CFI- John Evans Leaders Fund (JELF) Environmental geophysical infrastructure for understanding permafrost change and biogeochemical feedbacks. Nathan Basiliko (PI) with P Roy-Léveillé and N Mykytczuk. Awarded Fall 2020; matching ORF funding pending.
- 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-Léveillé PI

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)

Belzile, N

- NSERC Discovery Grant: Study of factors to improve the removal of trace metals/elements from mine effluents using low cost adsorbents. (2019-2025)
- Sichuan International Science Technology Research Grant. Geochemical study of the Three Gorges Reservoir on the Yangtze River. (2016-2020)
- Southwest University of Science and Technology, Mianyang, China. Travel Grant (2019-2020)

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)
- Community Restoration of Acid Damaged Lakes (CRADL), Funding through Vale Ltd., Co-PI with Gunn and Johnston

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)
- 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 (2018-2021)
- 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)
- Genomics Research Development Initiative. Ecobiomics: Metagenomics Based Ecosystem Biomonitoring (2018-2022)

Gunn, J

- NSERC Canada Research Chair Tier 1 in Stressed Aquatic Systems
- NSERC Discovery, Terrestrial ecosystem services and recovery of damaged aquatic systems (2016-2021)
- 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)
- MITACS/WCS – for PDF support of Dr. Gretchen Lescord
- Laurentian University Research Fund, Effects of Permafrost Thawing on Aquatic Ecosystems in the Far North of Ontario PI with Roy-Léveillé (2020)
- Community Restoration of Acid Damaged Lakes (CRADL), Funding through Vale Ltd., Co-PI with Edwards and Johnston

Ielpi, A

- NSERC Discovery Program. Precambrian rivers and potential analogs with modern terrestrial and extra-terrestrial fluvial landscapes (2016-2021)
- Other grants unrelated to Lake Centre work (bedrock)

Johnston, T

- NSERC Discovery Program. Individual specialization and the trophic niche of aquatic consumers (2015-2020)
- 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, Policy Division. Potential effects of climate warming on walleye spawning success (2018-2020)
- 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)
- Community Restoration of Acid Damaged Lakes (CRADL), Funding through Vale Ltd., Co-PI with Gunn and Edwards

Mykytczuk, N

- NOHFC IRC in Biomining, Bioremediation and Science Communication
- Sudbury GSDC: Community Economic Development Grant in support of a Feasibility study for the Centre for Mine Waste Biotechnology. (2020-2021) Role Principal Investigator
- NSERC Discovery- Understanding variability in microbial biomining and bioremediation consortia; adaptation mechanisms for multiple extremes. (2019-2024)
- CFI/ORF John R Evan Leader's Fund: A field and laboratory analysis facility for advancing biomining and bioremediation of mine wastes. PI (2017-2021)
- MRI Early Researcher Award. Application of acid mine drainage microbial communities to remediation of mining wastes in northern environments. PI (2017-2021)
- 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 (2016-2020)
- Environment Canada Environmental Damages Fund (Guelph U, Laurentian): Microbial consortia in mining waste rock: understanding microbial dynamics to optimize re-mining and metal recovery, minimize AMD, and facilitate re-vegetation in cold environments. Co-Investigator (2016-2020)
- 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

- Building Regional Adaptation Capacity and Expertise (BRACE), NRCan, January 23, 2019-March 31, 2021
- National Climate Change Impacts and Adaptation Assessment, NRCan, Co-lead Ontario Chapter with Al Douglas (Climate Risk Institute, formerly OCCIAR) 2018-2021

Roy-Léveillé, P

- Research chair in permafrost geomorphology in Nunavik, 2020-2023, Ministère de l'Environnement et de la Lutte aux Changements Climatiques
- Chaire de recherche Sentinelle Nord sur le pergélisol, 2020-2025, Sentinelle Nord
- NSERC, Strategic Partnership Grants for Networks, Permafrost Partnership Network for Canada. Co-PI (2019-2024)

- ArcticNet, Supporting Humans in a Thawing Landscape. Co-PI(2019-2021)
- Kivalliq Inuit Association, Compiling Polar Gas Pipeline data within the Proposed Kivalliq Hydro-Fibre Link Corridor. PI (2020)
- 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)
- Laurentian University Research Fund, Effects of Permafrost Thawing on Aquatic Ecosystems in the Far North of Ontario PI with Gunn (2020)

Scott, JA

- NSERC Discovery, Bioprospected microalgae and CO₂ in industrial emission utilization (2020-2025)
- CFI John Evans Leadership Fund, Bioprospecting in Canada for health beneficial compounds (2020-2021)
- Mitacs, Capture and repurposing of waste industrial emissions for improved economic and environmental sustainability (2019-2022)
- Mitacs, Mitigation of CO₂ in the emissions of stand-alone electricity generators (2019-2020)
- Mitacs Accelerate, Automated Deep Mining (2018-2020)
- OCE VIP II, Prospecting for non-ore resources in Ontario's mining sector (2018-2020)

Spiers, G

- Glencore's Sudbury Integrated Nickel Operations, Environment, Health and Safety: Organic residual cover materials on tailings create technosols for biomass production (2014-2021)
- 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

- Agnico Eagle Mines Ltd. Effects of flooding on productivity and mercury accumulation in tundra lakes
- Agnico Eagle Mines Ltd. Occupancy of Arctic Grayling in barrenland streams
- Cumulative Impacts Monitoring Program (CIMP), Gov't Northwest Territories. Understanding and predicting spatial variability in fish mercury levels in the Dehcho region
- Northern Contaminants Program. Understanding fish mercury levels in Dehcho lakes
- Early Researcher Award, Province of Ontario. Understanding ecology, life history, and mercury levels in fish
- DFO, Coastal Restoration Program. Restoration of anadromous Arctic Char and Dolly Varden near Kugluktuk, NU
- Parks Canada. Investigating declines of kokanee in Kluane National Park

- Canada First Research Excellence Fund. Northern Water Futures

Tanentzap, AJ

- 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)
- 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 (2019-2024)

Watmough, SA

- NSERC Discovery, Calcium in the environment: the highs and the lows (2016-2021)
- 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)

Yan, N

- Ontario Trillium Foundation, Hauling Ash To Save Our Forest's Future. (2019-2021) with Trent University, University of Victoria, Laurentian University, District Municipality of Muskoka, Dorset Environmental Science Centre, Learning for a Sustainable Future, the Ontario Maple Syrup Producers Association, and Westwind Forest Stewardship Inc.

Theses Completed

PhD

Desjardins, Sabrina. PhD Natural Resources Engineering. Adaptation of microalgae bioprospected from stressed environments in Northern Ontario for the production of lipids. Laurentian University (Scott/Basiliko)

Gupta, Varun. PhD. A systematic study of interaction effects between plants, microbes, and metals in a model constructed wetland system treating acid mine drainage impacted waters. Laurentian University (Gunn/Mykytczuk)

Jiao, Yongmei. PhD. UV/Photocatalyst based photoreactor design for water treatment for remote communities Laurentian University (Scott)

McDonough, Andrew. PhD. Ecosystem response to above canopy nitrogen addition in a jack pine (*Pinus banksiana*) forest in the Athabasca Bituminous Sands Region of northeastern Alberta, Canada. Trent University (Watmough)

McLean, Shannon. PhD. Recovery and repurposing of low-grade thermal resources in the mining and mineral processing industry. Laurentian University (Scott)

Moreau, Kyle. PhD. The effects of automation on the environmental impact of underground metal ore mining operations Laurentian University (Scott)

MSc

Boag, Tara. MSc. Variation in fish fatty acid concentrations among lakes in the Dehcho region of the Northwest Territories. University of Waterloo (Swanson)

Courchesne, Brittaney. MSc. The mineralogy, geochemistry & microbiology of Cobalt-bearing mine tailings from the Cobalt mining camp in Northeastern Ontario, Canada. Laurentian University (Mykytczuk/Schindler)

Ellenor, Jared. MSc. Habitat use of young-of-year Arctic Grayling (*Thymallus arcticus*) in Barrenland streams of central Nunavut, Canada. University of Waterloo (Swanson)

Gauthier, Miranda. MASc. Microalgae growing in stressed environments and their antioxidant potential from production of secondary metabolites. Laurentian University (Scott/Senhorinho)

Gilbert Parkes, Spencer. MSc. Trace metal geochemistry of peatlands. Trent University (Watmough)

Greco, Danielle. MSc. The interactive effects of road salt and nutrients on zooplankton communities. Queen's University (Arnott/Schamp)

Kennedy, Merritt. MASc. An investigation into the feasibility of improving the sustainability of a landfill biogas fueled electricity generator by capturing CO₂ exhaust emissions using photosynthetic green microalgae. Laurentian University (Scott/Basiliko)

Lavigne, Jonathan, MSc. Enhancing species richness in a smelter-impacted semi-barren upland (Sudbury, ON): microsite linkages to planted seedling dynamics. Laurentian University (Basiliko/Beckett)

Lehman, Sara, MSc. Combined effects of maternal traits and spring warming patterns on spawning success of walleye. Laurentian University (Gunn/Johnston)

Little, Shannon, MSc. Antibacterial activity of bioprospected microalgae from stressed environmental conditions. Laurentian University (Scott)

McClymont, Alexandra. MSc. Effects of NaCl and temperature on zooplankton communities. Queen's University (Arnott)

Mitchell, Katlyn. MSc. An evaluation of silica-Bacillus microencapsulation for reducing acid mine drainage from sulfur-bearing waste rock. Laurentian University (Mykytczuk)

Mukerji, Aparna. MSc. Effects of land reclamation on organic matter decomposition and carbon-dioxide, methane and nitrous oxide fluxes in a smelter impacted landscape, 37 years after application of dolomite limestone and tree planting. Laurentian University (Gunn)

Smith, Rosie. MSc. Migration timing and overwintering habitat of anadromous Arctic Char (*Salvelinus alpinus*) near Kugluktuk, Nunavut. University of Waterloo (Swanson)

Yamaguchi, Ari. MSc. January 2020. Abiotic conditions, algal biomass, and fish growth rates affect fish mercury concentrations in two subarctic lakes. University of Waterloo (Swanson)

MScCom, Laurentian University

Banderbob, Victoria. MScCom. News frame analysis of human papillomavirus vaccine coverage in Canadian news articles from 2015-2019

Buruga, Haseena Banu. MScCom. Brief study on framing of visual images used in FASD awareness campaigns in Canada (2010-2020)

Cohen-Krichevsky, Bailey. MScCom. #actuallivingscientist: What do scientists include in tweets?

Corral, Maria MacHado (Soledad). MScCom. The impact of staff interaction in the learning experience of visitors to a science centre: an initial framework for facilitation

Dufour, Tess. MScCom. Properties of youth science games and their impact on science-related attitudes

Fowler, Samantha. MScCom. Vaccine hesitancy during a global pandemic: a case study of vaccination hesitant Facebook pages during the 2020 COVID-19 Pandemic

Krane, Cassieanna. MScCom. Minding microbes in the mines; an exploration of the perceptions of biomining by non-specialist adult audiences in Greater Sudbury, Ontario

Li, Timmie. MScCom. Examining the landscape of informal science communication training for scientists in Canada

MacIsaac, Erin. MScCom. Investigating the inclusion of science communication training in Canadian BSc degrees

Mathialagan, Aarani. MScCom. Appeals to ethos in crisis communication: a case study of public health briefings about COVID-19 in Canada

Neseth, Nina. MScCom. A framework for understanding the nature of questions asked by audience participants at Science Cafés

Shi, Guangjie. MScCom. Media representation of the biodiversity in Canada and China

Siddiqi, Hafsa. MScCom. Communicating a culture of health equity in the health sector and beyond: a qualitative data analysis of public-facing health equity communications from local Public Health Units in Ontario

Ulmer, Joseph. MScCom. Neutrinos for non-specialists: an analysis of how physics institutions discuss oscillation with non-experts in the digital age

Velikova, Ivelina. MScCom. Science communication training for Canadian graduate students: a preliminary study

Yardley, Rebecca. MScCom. Instagram and Canadian science centres: how the COVID-19 pandemic has impacted the landscape

Undergraduate

Hall, Laura. BSc Thesis. Mechanisms driving DOC increases in Sudbury regional lakes. Trent University (Watmough)

Silverthorn, Megan. BSc Thesis. Toxicities of road salt alternatives utilizing organic additives on freshwater zooplankton (*Daphnia pulicaria*). Queen's University (Arnott)

HQP Supervised

Anderson, Hannah. BSc Thesis in progress, University of Waterloo (Swanson)
Buren, Shakira. BSc Thesis in progress, Queen's University (Arnott)
Graham, Alec. BSc Thesis in progress, Laurentian University (Ielpi)
Lepage, Adam. BSc Thesis in progress, Laurentian University (Gunn/Lescord)
Shi, Shuhong. BSc Thesis in progress, Queen's University (Arnott)
Smith, Ed. BSc Thesis in progress, Trent University (Watmough)
Zucconi, Sarah. BSc Thesis in progress, Laurentian University (Basiliko/Edwards/Preston)

Beckett, Anna. MSc Thesis Student, Queen's University (Arnott/Young)
Batool, Syeda. MSc Thesis Student, Trent University (Watmough)
Clarke, Thomas. MSc Thesis Student, Laurentian University (Mykytczuk)
Comley, Jacob. MASc Thesis Student, Laurentian University (Scott)
Conquer, Shelby. MSc Thesis Student, Trent University (Watmough)
Corbière, Nicole. MSc Thesis Student, Laurentian University (Roy-Léveillé/Basiliko)
Dasne, Anne Sylvie. MSc Thesis Student, Trent University (Watmough)
Dawson, Jade. MSc Thesis Student, Laurentian University (Gunn/Edwards)
Deslauriers, Catherine. MSc Thesis Student, Université Laval (Roy-Léveillé)
Ewin, Carrie. MSc Thesis Student, Queen's University (Arnott/Lamoureux)
Girard, Lianne. MSc Thesis Student, Laurentian University (Mykytczuk/Ramcharan)
Gohil, Kunali. MSc Thesis Student, Laurentian University (Gunn/Edwards)
Hilgendag, Isabel. MSc Thesis Student, University of Waterloo (Swanson Co-sup)
Humphrey, William. MSc Thesis Student, Trent University (Watmough)
Johnston, Caelan. MSc Thesis Student, Queen's University (Arnott/Rusak)
Kellaway, Ed. MSc Thesis Student, Trent University (Watmough)
Kluke, Calvin. MSc Thesis Student, Laurentian University (Gunn/Lescord)
Louste-Fillion. MSc Thesis Student, Laurentian University (Gunn/Edwards)
Luu, Taylor. MSc Thesis Student, University of Waterloo (Swanson Co-sup)
McPhedran, Bronte. MSc Thesis Student, University of Waterloo (Swanson Co-sup)
Méthé, Alexandra. MSc Thesis Student, Laurentian University (Mykytczuk/Merritt)
Mohit, Shrisha. MSc Thesis Student, Queen's University (Arnott/Johnson)
O'Neil, Kayla. MA Thesis Student, Trent University (Watmough)
Ott, Neil. MSc Thesis Student, Trent University (Watmough)
Prater, Madeleine. MSc Thesis Student, University of Waterloo (Swanson Co-sup)
Robinson, Chantae. MSc Thesis Student, Laurentian University (Roy-Léveillé/Basiliko)
Russell, MacKenzie. MSc Thesis Student, Laurentian University (Gunn/Rickwood)
Snyder, Tom. P/T MSc Thesis Student, Laurentian University (Basiliko)
Tremblay, Nathalie. MSc Thesis Student, Laurentian (Mykytczuk)
Whitney, Jenna MSc Thesis Student, Laurentian University (Ielpi)

Yavari, Nasim. MSc Thesis Student, Laurentian University (Scott)
Zhu, Kexin. MEng Thesis Student, Laurentian University (Scott)

Chan-Yam, Kelly. PhD Thesis Student, Laurentian University (Basiliko/Scott)
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)
Kirkwood, Adam. PhD Thesis Student, Laurentian University (Basiliko/ Roy-Léveillé)
Kontou, Danaï. PhD Thesis Student, University of Cambridge (Tanentzap)
Lavender, Mike. PhD Thesis Student, Queen's University (Arnott/Schamp/Rusak)
Lavigne, Jonathan. PhD Thesis Student, Laurentian University (Basiliko/Beckett)
Levasseur, Patrick. PhD Thesis Student, Trent University (Watmough)
Massa, Eric. PhD Thesis Student, Queen's University (Arnott/Rusak)
Moslemi-Aqdam, Mehdi. PhD Thesis Student, University of Waterloo (Swanson)
Munford, Kimber. PhD Thesis Student, University of Guelph (Glasauer/Mykytczuk)
Ngoma, Emmanuel. PhD Thesis Student, Laurentian University (Mykytczuk)
Sandor, Sarah. PhD Thesis Student, University of Cambridge (Tanentzap)
Seward, James. PhD Thesis Student, Laurentian University (Basiliko/ Roy-Léveillé)
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)
Van Leeuwen, Pauline. PhD Thesis Student, Laurentian (Mykytczuk/Schulte-Hostedde)
Weinstein, Spencer. PhD Thesis Student, University of Waterloo (Swanson)
Woodman, Samuel. PhD Thesis Student, Cambridge University (Tanentzap)

Braga, Lucas, PDF, Cambridge (Tanentzap)
Celis-Salgado, Martha, PDF, FLAMES lab, Dorset (Arnott)
Fonvielle, Jérémy, PDF, Cambridge (Tanentzap)
Kalamandeen, Michelle, PDF, Laurentian (Basiliko/Tanentzap/Gunn)
Khan, Madiha, PDF, Laurentian (Mykytczuk)
Kielstra, Brian, PDF, Great Lake Forestry Centre, NRCan (Emilson)
Preston, Michael, PDF, Laurentian (Basiliko/Edwards/Gunn) (dep. Sept. 15/20)
Scheurel, Thomas, PDF, Cambridge (Tanentzap)
Senhorinho, Gerusa, PDF, Laurentian (Scott/Basiliko)

Adkinson, Kevin. Research Technician, Trent University (Watmough)
Baker, Leanne, PhD. Research Associate (Swanson)
Campbell, Holly. Field Technician. Atlantic Forestry Centre, NRCan (Stastny/Emilson)
Capell, Scott. Field Technician. Great Lakes Forestry Centre, NRCan (Emilson)
Chartrand, Derek. Lab Technician. Great Lakes Forestry Centre, NRCan (Emilson)
Gow, Jonathon. St. Lawrence College Intern (Arnott)
Krane, Cassieanna. Science Communication Specialist, Université Laval (Roy-Léveillé)
Lemieux, Chantal. Research Coordinator, Université Laval (Roy-Léveillé)

Nguyen, Amy. Lab Technician, University of Waterloo (Swanson)
O'Halloran, Andrea. Summer Student, Queen's University (Arnott)
Sanders, Quentin. Summer Student, Queen's University (Arnott)
Schadenberg, Joe. Field Technician. Great Lakes Forestry Centre, NRCan (Emilson)

Staff

Laurentian University Main Campus

Alarie, Yves – Biosystematics
Belzile, Nelson - Environmental Chemistry
Ielpi, Alessandro - Sedimentology
Ramcharan, Charles - Aquatic Ecologist
Spiers, Graeme – Chemistry, Science and Engineering

External

Arnott, Shelley, Queen's University
Emilson, Erik, Canadian Forest Service, NRCan, Sault Ste. Marie
McGeer, Jim, Wilfrid Laurier University
Roy-Léveillé, Pascale, Université Laval (Adjunct LU)
Swanson, Heidi, University of Waterloo (Visiting Scholar in Residence 2020/2021)
Tanentzap, Andrew, University of Cambridge, UK
Watmough, Shaun A., Trent University

Living with Lakes Centre

Bamberger, Elizabeth - Business Manager, LU
Barriault, Chantal – Director, Science Communication Program, LU
Basiliko, Nathan – Canada Research Chair in Environmental Microbiology, LU
Beckett, Peter - Education and Outreach, Faculty LU
Edwards, Brie - MECP Research Scientist/ LU Adjunct
Fram, Kim - Taxonomist and Research Assistant, LU
Gunn, John - Canada Research Chair in Stressed Aquatic Systems, LU
Haslam, Lee - Senior Fisheries Technician, MNRF
Heneberry, Jocelyne - Monitoring Coordinator, MECP
Hurley, Mikkealla, Research Assistant, LU
Johnston, Tom - MNRF Senior Research Scientist/LU Adjunct
Lehman, Sara –Freshwater Biologist and Data Manager (MECP/LU)
McAuliffe, Cassidy – Communication Specialist, LU
McCourt, Jason - Environmental Officer, MECP
Mykytczuk, Nadia - NOHFC IRC in Biomining, Bioremediation and Science Communication, LU
Oman, Karen – Operations and Business Manager, LU
Patterson, Kristen – Research Biologist, MNRF (dep. Mar/20)
Pearson, David - Climate Change Impact Project Lead, Science Communication, LU
Reid, Michelle, Science Communication (Mykytczuk)
Sarrazin-Delay, Chantal - Associate Project Lead, Climate Change and Ecology, LU

Smenderovac, Emily – Research Project Manager LCARE, LU (dep. Feb. 28/20)
Warmbold, Jerry – Freshwater Biologist and Data Manager (MECP/LU) (dep. Jun. 26/20)

Senior Research Fellows (SRF)

Keller, Bill - SRF in Northern Studies, Vale Living with Lakes Centre (VLWLC)
Rosseland, Bjorn - SRF in Ecotoxicology, VLWLC (Emeritus Norwegian University of Life Sciences)
Yan, Norm - SRF in Aquatic Ecology, VLWLC (Emeritus York University)

Field Technicians and Research Assistants

Barrette, Rachelle, Climate data processing (Pearson)
Budgell, Alexandria, Summer Workstudy Student, LU (Roy-Léveillé)
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