TRENT UNIVERSITY
ENVIRONMENTAL & LIFE SCIENCES GRADUATE PROGRAM

ENVIRONMENTAL & LIFE SCIENCES SOCIETY

Environmental & Life Sciences Graduate Student Conference

Abstract Booklet & Schedule

Saturday, March 7, 2026

Trent University Student Centre

TSC 1.22

trentu.ca/els

ITINERARY

8:30AM-9:00AM
MORNING REGISTRATION & REFRESHMENTS

9:00AM-9:30AM
WELCOME & OPENING TALK

9:30AM-10:45AM
SESSION 1: ORAL PRESENTATIONS

10:45AM-11:15AM
BREAK & POSTER JUDGING

11:15AM-12:30PM
SESSION 2: ORAL PRESENTATIONS

12:30PM-1:30PM
LUNCH BREAK & POSTER VIEWING

1:30PM-2:45PM
SESSION 3: ORAL PRESENTATIONS

2:45PM-3:15PM
BREAK & POSTER JUDGING

3:15PM-4:30PM
SESSION 4: ORAL PRESENTATIONS

4:30PM-7:00PM
CLOSING REMARKS, POSTER VIEWING, AWARDS CEREMONY (5:00PM) & SOCIAL

A message from the Director

We are very pleased to be hosting the 2nd Environmental & Life Sciences Graduate Program Conference, showcasing several of our outstanding students. Today, as a Program, we can further foster collaboration and celebrate the phenomenal research conducted by our students and faculty. We hope that this conference spurs more research ideas and partnerships.
Regards,

Invited Speaker

Dr. Mary-Claire Buell
Assistant Professor, Trent School of the Environment and Department of Forensic Science
Trent University Environmental and Life Sciences Program Alumnus

Dr. Mary-Claire Buell is an Assistant Professor, cross-appointed with the School of Environment and Department of Forensic Science at Trent University. Dr. Buell's research interests include investigating the source, fate, transport, and impacts of legacy and contemporary contaminants, examining the connections between contaminants and environmental justice; her research is transdisciplinary as it brings together environmental toxicology, chemistry, and community knowledges. Her research has been internationally recognized by the International Association of Great Lakes Research and was the 2025 recipient of the Large Lake Champion Award. This award recognized her significant contributions to sharing the social, economic, and ecological understanding of large lakes of the world. Prior to her academic career, Dr. Buell was the CEO and founder of consulting and research firm Collective Environmental.

Opening Speaker

Dr. Sarah West
Trent University Dean of Science

Thank you, Sponsors

We extend or sincere gratitude to the Trent University School of Graduate Studies, and the Trent University Dean of Science, for their gracious contributions towards the second annual Environmental and Life Sciences Graduate Student Conference. Your dedication to student collaboration and success has played a pivotal role in bringing this event to fruition. We are deeply grateful.

TRENT UNIVERSITY

TRENT UNIVERSITY
SCHOOL OF GRADUATE STUDIES

Land Acknowledgement

Galair Prevost

PhD Student EnLS

Galair Prevost is a 2nd year PhD student in the Environmental and Life Sciences program. Currently, Galair is the Genes, Cells, and Physiological Systems Stream Representative of the EnLS Graduate Student Society. Galair is co-supervised by Drs Craig Brunetti and Neil Emery. Her project focuses on how the mechanisms of action behind cytokinin inhibition of large double stranded DNA viruses

Environmental & Life Sciences Graduate Student Society

The EnLS Society is a student-led society for graduate students in the Environmental and Life Sciences graduate program. Our goal is to provide students with opportunities to engage in fun activities while fostering a sense of community. In addition, the Society organizes events which promote the dissemination of graduate student research and provide opportunities to network with the larger community.

All photos in this booklet were taken during the first annual Environmental and Life Sciences conference held on May 1, 2025.

Schedule

Registration: 8:30 AM – 9:00 AM; Refreshments served in TSC 1.07
TSC 1.22

	Presenter	
Welcome 9:00 AM - 9:10 AM	**Galair Prevost** **Dr. Sarah West**	PhD Candidate EnLS program EnLS Society Stream Rep – Genes, Cells, and Physiological Systems Dean of Science Professor in Kinesiology and Biology
Opening Talk 9:10 AM - 9:30 AM	**Dr. Mary-Claire Buell**	Title: Strengths, Serendipity, and the Post-Grad Pathway Assistant Professor, School of the Environment and Department of Forensic Science, Trent University

Session 1: Mixed Oral Presentations

Session Chair: Galair Prevost
TSC 1.22

Schedule for Session 1: 9:30 AM – 10:45 AM

Time	Presenter	Title
9:30 AM - 9:45 AM	**Bradley Howell** PhD Student *Ecology, Evolution, and Conservation*	Physiological variation as a driver of behaviour and ecological outcomes in fishes
9:45 AM - 10:00 AM	**Jennifer Routledge** PhD Student *Ecology, Evolution, and Conservation*	Variation in marine mammal sulfur stable isotope compositions (δ34S) is driven by sources of primary production not trophic position
10:00 AM - 10:15 AM	**Kaileigh Wright** MSc Student *Earth Sciences, Natural Resources, and Agriculture*	Feeding crops, not the atmosphere: Novel nature-based fertilizers to reduce GHG emissions and support nutrient uptake
10:15 AM - 10:30 AM	**Shawn Yip** MSc Student *Genes, Cells, and Physiological Systems*	Central Ontario's drug toxicity crisis: Supporting reductions in harm in two Ontario municipalities
10:30 AM- 10:45 AM	**Pratik Poudel** MSc Student *Ecology, Evolution, and Conservation*	Does flowering time influence hybrid formation rate in the North American Cattail (Typha) hybrid zone?

Break: 10:45 AM – 11:15AM | Refreshments in TSC 1.07

Session 2: Mixed Oral Presentations

Session Chair: Larissa Wallisch

TSC 1.22

Schedule for Session 2: 11:15 AM – 12:30 PM

Time	Presenter	Title
11:15 AM - 11:30 AM	**Carling Serran** MSc Student *Earth Sciences, Natural Resources, and Agriculture*	Growing food for growing cities: Quantifying greenhouse gas emissions from peri-urban farmland transitioning to horticulture
11:30 AM - 11:45 AM	**Jean-Paul Lanoue** MSc Student *Ecosystem Biogeochemistry and Trace Contaminants*	Rare earth elements in wood ash
11:45 AM - 12:00 PM	**Connor Maltby** MSc Student *Genes, Cells, and Physiological Systems*	Synthesis of a Glycomimetic for galectin-1 Inhibition
12:00 PM - 12:15 PM	**Jamie Burnett** MSc Student *Earth Sciences, Natural Resources, and Agriculture*	Improving periclase and brucite carbonation for scalable MgO looping: Implications for direct air capture
12:15 PM - 12:30 PM	**Laura Maskell** MSc Student *Ecology, Evolution, and Conservation*	Breeding ground foraging behaviour of the Lesser Yellowlegs (Tringa flavipes) in Churchill, Manitoba

LUNCH 12:30 PM – 1:30 PM

Lunch served in TSC 1.07

Poster Viewing in TSC Atrium

Session 3: Mixed Oral Presentations

Session Chair: Hazel McMillan

TSC 1.22

Schedule for Session 3: 1:30 PM – 2:45 PM

Time	Presenter	Title
1:30 PM - 1:45 PM	**Gianna Saarenvirta** PhD Student *Earth Sciences, Natural Resources and Agriculture*	Effect of Changing Landscapes on Stream Morphology, Nutrient Transport, and Particulate Losses
1:45 PM - 2:00 PM	**Stacy James** PhD Student *Earth Sciences, Natural Resources, and Agriculture*	Enhancing the Cosmetic and Pharmaceutical Value of Crabwood Oil: A Comprehensive Study of Its Antimicrobial Properties and Applications
2:00 PM - 2:15 PM	**Leah Howitt** MSc Student *Ecology, Evolution, and Conservation*	Effects of artificial light at night on the behaviour of wild fishes: a whole-lake experiment
2:15 PM - 2:30 PM	**Minh Thao Nguyen Duong** PhD Student *Ecosystem Biogeochemistry and Trace Contaminants*	Potential Health Risks Associated with Rare Earth Elements in Daily Diets
2:30 PM - 2:45 PM	**Irina Badell Garcia** PhD Student *Genes, Cells, and Physiological Systems*	Post-Mortem DNA Methylation Analysis in Human Cadavers

Break: 2:45 PM – 3:15 PM

Refreshments in TSC 1.07

Poster Session in TSC Atrium

Session 4: Mixed Oral Presentations

Session Chair: Abbey Lewis

TSC 1.22

Schedule for Session 4: 3:15 PM – 4:30 PM

Time	Presenter	Title
3:15 PM - 3:30 PM	**Meagan Stager** MSc Student *Ecology, Evolution, and Conservation*	Tree Cavities and Tiny Gliders: Understanding Flying Squirrel Reproduction
3:30 PM - 3:45 PM	**Sarah Hill** PhD Student *Genes, Cells, and Physiological Systems*	Nitric oxide dioxygenase activity of Giardia intestinalis flavohemoglobins
3:45 PM - 4:00 PM	**Shivani Sachin Nadkarni** MSc Student *Ecosystem Biogeochemistry and Trace Contaminants*	Hormetic effects of rare earth elements on the green alga *Chlamydomonas Reinhardtii*
4:00 PM - 4:15 PM	**Samantha Howard** MSc Student *Ecology, Evolution, and Conservation*	Under Ice and On the Move: Winter Activity of Northern Map Turtles in a Dam-Influenced River
4:15 PM - 4:30 PM	**Victoria Hatten** MSc Student *Earth Sciences, Natural Resources, and Agriculture*	Heat Activation Effects on Carbon Sequestration in Brucite, Serpentine, and Hydrotalcites

Closing Remarks: 4:30 pm - 4:35 pm

TSC 1.22

Social with Bar: 4:35 PM
Awards Ceremony: 5:00 PM

EnLS Society Trivia: 5:30 PM - 6:30 PM

Refreshments and cash bar in TSC 1.07

***Poster Viewing** in TSC Atrium*

Poster Session: Undergraduate Mixed Poster

TSC Atrium

Poster Number	Judging Time	Presenter	Title
UG 1	10:45 AM - 11:15 AM	**Adrian Guaman Vargas** UG Student *Ecology, Evolution, and Conservation*	The Fungal Eye in Action: Wavelength-Specific Light and Cytokinin Control of Mycelial Growth
UG 2	10:45 AM - 11:15 AM	**Angelina Gordon** UG Student *Ecology, Evolution, and Conservation*	Moth Community Beta Diversity Over Space and Time Between Forest Interior and Forest Edge Habitats in Ontario's Carden Alvar Provincial Park
UG 3	10:45 AM - 11:15 AM	**Jax Nasimok** UG Student *Ecology, Evolution, and Conservation*	Plastics in Urban Bird Nests
UG 4	10:45 AM - 11:15 AM	**Shannon Learoyd** UG Student *Ecology, Evolution, and Conservation*	Just Keep Skimming: Pools as an Overlooked Cause of Mortality in Urban Wildlife
UG 5	2:45 PM - 3:15 PM	**Swati Banerjee** UG Student *Ecology, Evolution, and Conservation*	Human-Induced Reduction in the American Oystercatcher's (*Haematopus palliatus*) Pre-fledging Succees on Two of Virginia's Barrier Islands
UG 6	2:45 PM - 3:15 PM	**Lillian Hartley** UG Student *Ecosystem Biogeochemistry and Trace Contaminants*	Fate of Oxidised and Reduced Nitrogen in an Arctic Tundra.
UG 7	2:45 PM - 3:15 PM	**Eric St-Hilaire** UG Student *Genes, Cells, and Physiological Systems*	Effects of Early Developmental Cold Shocks on the Morphology of Painted Lady Butterflies
UG 8	2:45 PM - 3:15 PM	**Kaleb Martin** UG Student *Earth Sciences, Natural Resources, and Agriculture*	The Pulse of Forested Watersheds: Diel Changes in Stem Radius Reveal Hydrologic Coupling Between Transpiration and Streamflow

Poster Session: Graduate Mixed Poster

TSC Atrium

Poster Number	Judging Time	Presenter	Title
G 9	10:45 AM - 11:15 AM	**Abbey Lewis** MSc Student *Ecology, Evolution, and Conservation*	Nest-site selection by Hudsonian godwits (*Limosa haemastica*) in Polar Bear Provincial Park, Ontario
G 10	10:45 AM - 11:15 AM	**Ainsley Taggett** MSc Student *Ecology, Evolution, and Conservation*	The passive recovery of lichen and moss in mine-impacted landscapes
G 11	10:45 AM - 11:15 AM	**Shelby Cohen** MSc Student *Ecology, Evolution, and Conservation*	Comparing gut microbiome of sympatric North American flying squirrels
G 12	10:45 AM - 11:15 AM	**Sydney Dam** MSc Student *Ecology, Evolution, and Conservation*	Identifying ecological factors that influence the survival, reproduction, and establishment of *Culicoides spp*. post-dispersal: A scoping review
G 13	10:45 AM - 11:15 AM	**Mark Duchene** MSc Student *Ecology, Evolution, and Conservation*	Goose on the Loose: Do Cackling Geese Affect the Nesting Success of Arctic-breeding Shorebirds?
G14	10:45 AM - 11:15 AM	**Shrutika Kadam** MSc Student *Ecosystem Biogeochemistry and Trace Contaminants*	The contribution of tire-derived chemicals to oxidative potential in Toronto
G 15	2:45 PM - 3:15 PM	**Julia Delaire** MSc Student *Genes, Cells, and Physiological Systems*	A quantitative, time-resolved framework for equine herpesvirus 1 replication kinetics using herpes simplex virus 1 as a model system
G 16	2:45 PM - 3:15 PM	**Larissa Wallisch** MSc Student *Earth Sciences, Natural Resources, and Agriculture*	Enhanced weathering of wollastonite and diopside in forest soils for CO_2 removal and exchangeable calcium replenishment
G 17	2:45 PM - 3:15 PM	**Jordan Gilder** MSc Student *Earth Sciences, Natural Resources, and Agriculture*	Near-term ecosystem responses to wollastonite in a hardwood forest

G18 BEMA	2:45 PM - 3:15 PM	**Terry Topham** MSc Student *Ecology, Evolution, and Conservation*	Genome composition and ploidy drive morphological variation in a mixed-ploidy salamander complex
G19 BEMA	2:45 PM - 3:15 PM	**Alexander Robertson** MSc Student *Ecology, Evolution, and Conservation*	Genome composition but not ploidy drives microhabitat used by salamanders in a mixed-ploidy complex

ABSTRACTS
Session 1: Mixed Oral Presentations

Title: Physiological variation as a driver of behaviour and ecological outcomes in fishes
Authors: Bradley E. Howell, Mitchell B. Shorgan, Christian J. Bihun, Leah C. Howitt, Luc LaRochelle, William K. Grant, Aaron T. Fisk, Steven J. Cooke, Graham D. Raby
Abstract
The pace-of-life hypothesis predicts that intrinsic traits such as rates of metabolism and growth influence behaviour, with high-metabolism individuals expected to be bolder, more aggressive, and more exploratory. These behavioural tendencies may increase predation risk by driving individuals to forage in riskier habitats. We tested this hypothesis in a freshwater fish community by integrating metabolic assays, growth analysis, stable isotope analysis, and acoustic telemetry. Using lakeside intermittent flow respirometry, we measured routine metabolic rate (RMR) as a proxy for baseline energy expenditure. Using biopsy, we back-calculated individual rates of growth and quantified stable isotope ratios (δ13C and δ15N) to infer diet composition and trophic position. Fish were then implanted with predation-sensing acoustic transmitters to track movement, habitat use, and predation events in a whole-lake acoustic positioning system (Ontario, Canada). The lake was divided into habitat zones (e.g., open water, vegetated shallows, nearshore areas) to assess how individuals used risky versus safe habitats. We studied prey species (bluegill Lepomis macrochirus, pumpkinseed Lepomis gibbosus) and a predator (largemouth bass *Micropterus salmoides*) to characterize metabolic-behavioural syndromes and their links to diet, growth, movement, and survival. This research rigorously tests the pace-of-life hypothesis and may inform conservation efforts by identifying traits that increase vulnerability to predation and environmental change.

Title: Variation in marine mammal sulfur stable isotope compositions (δ34S) is driven by sources of primary production not trophic position
Authors: Jennifer Routledge, Paul Szpak
Abstract
The homogenous isotopic composition of marine sulfate (δ34S ≅ +21 ‰) leads to the expectation of an oceanic isoscape exhibiting little variation in δ34S values. Nevertheless, instances of variation in δ34S values have been identified in Arctic marine ecosystems that require clarification to explain the mechanisms driving unexpectedly low values. Walruses are frequently characterized by low δ34S values compared to other marine mammals, but it is unclear if these values are a function of the low trophic position of walruses or of a specialized foraging niche. This study examines the two potential drivers of differences in sulfur isotopes at the species level: trophic position and foraging ecology. By analysing archaeological samples of walrus, ringed seal and polar bear from archaeological sites at three discrete locations in the Canadian Arctic: Smith Sound (Ellesmere Island), Lancaster Sound (Devon Island), and northwest Hudson Bay, we have clarified and confirmed that in collagen-to-collagen comparisons, differences in δ34S values are not driven by trophic discrimination factors. Bacterial influences on the sulfur cycle, particularly symbiotic relationships between

chemosynthetic bacteria and invertebrates in the benthos may be a cause of the low δ34S values in walrus and likely represent an often-overlooked contribution of primary production to the shelf food web.

Title: Feeding crops, not the atmosphere: Novel nature-based fertilizers to reduce GHG emissions and support nutrient uptake

Authors: Kaileigh T. Wright, Karen A. Thompson, D. Huy Dang

Abstract

Nutrients are required by crops for growth and function, yet not all soils can supply sufficient nutrition for crop growth. Accordingly, fertilizers are commonly applied to agricultural fields to meet crop demand. While improving productivity, their excessive or improper application can result in environmental degradation. Novel strategies to reduce nutrient losses are critical to support global population growth. This study aims to quantify the capacity of novel nature-based fertilizers to reduce nitrogen (N) losses while supporting soil health and crop growth. A field trial was established as a randomized complete block design over one growing season using corn (*Zea mays*). Fertilizer treatments included urea (U), urea + inhibitor (U+I), novel fertilizers (G1 and G2), and a no-fertilizer control (n=3 per treatment). Nitrous oxide (N_2O) and ammonia (NH_3) emissions were quantified around fertilizer application and rainfall. Soils were collected for analysis of soil metrics and corn plants were harvested to assess tissue nutrient content. Reductions in N_2O and NH_3 emissions were observed when comparing G1 and G2 with U, consistent with previous mesocosm studies. Soil organic matter and soil NH_4^+ levels were significantly higher in soil treated with G2 compared to U+I and G1. No differences among fertilizer treatments were observed for additional soil metrics or corn biomass, however, labile carbon (POX-C) increased significantly over time in the G2 treatment. Increases in POX-C indicate potential increased substrate availability for soil microbes, supporting soil health. Grain phosphorus content in G2 and G1 were significantly higher than U, indicating potentially higher nutrient uptake from the novel formulation. Novel nature-based fertilizers have the potential capacity to reduce fertilizer emissions and reduce multiple fertilizer applications through increased uptake efficiency.

Title: Central Ontario's drug toxicity crisis: Supporting reductions in harm in two Ontario municipalities

Authors: Shawn S.Y. Yip, J. Chris Smith, Wesley S. Burr, Amy L. Greer

Abstract

The drug toxicity crisis remains a major public health crisis in Canada. Most studies exploring this crisis focus on federal or provincial trends. Existing municipal-level studies focus on large urban centres, leaving rural areas understudied. Additionally, researching drug-related interventions in isolation, resulting in a lack of research on how these services interact. We will address these research gaps by answering the following questions: (1) What is the state of the drug toxicity crisis in central Ontario? And (2) How has the COVID-19 pandemic impacted drug toxicity calls in central Ontario?

Data on drug-toxicity calls from Haliburton Paramedic Service (HPS) and Kawartha Lakes Paramedic Service (KLPS) are used to answer these questions. The dataset included drug-toxicity call counts over time, call date and time, patient age and sex, and paramedic pick-up and drop-off locations. Data trends were summarized and analyzed through an interrupted time series of call counts before and after the declaration of a

state of emergency on March 18, 2020. Our results identified that in both jurisdictions, most calls were picked up from private residences (houses/town houses) and dropped off at major hospitals (Haliburton and Ross Memorial Hospital). In KLPS calls, most patients were between 30-40 years old. There seems to be no significant differences in gender distributions. Results for the time series analyses will be forthcoming.
Our findings allow for a better understanding of the drug toxicity crisis in central Ontario to inform further action at a local level.

Title: Does flowering time influence hybrid formation rate in the North American Cattail (Typha) hybrid zone?

Authors: Pratik Poudel, Joanna Freeland, Marcel Dorken

Abstract

Interspecific hybridization is a prominent force in plant evolution and can have multiple outcomes. Hybridization rates can vary among plant lineages, and when it does occur, hybrid inviability and/or infertility can favour phenotypes with reduced propensities to hybridize. Wetlands in the Laurentian Great Lakes region in North America contain an extensive and expanding hybrid zone involving cattails (genus Typha), comprising native broadleaf cattail (T. latifolia), introduced narrowleaf cattail (T. angustifolia), and their invasive F1 hybrid (T. x glauca). The maintenance of the hybrid zone requires recurrent hybrid formation, and therefore the persistence of both parental species, including introduced T. angustifolia, the seed parent of F1 hybrids. Previous studies have indicated that temporal isolation via differences in flowering time might act as a reproductive barrier, with T. angustifolia flowering earlier than other Typha, but the data supporting this is limited. Here, we test the hypothesis that the degree of temporal overlap in flowering time between T. angustifolia and other Typha (T. latifolia and hybrids) affects hybrid formation. We found that while flowering time influenced the formation of non-F1 hybrids across 10 sites, temporal isolation is not the main cause of variation in hybrid formation. Critically, our data clearly contradict the claim that T. angustifolia flowers earlier than other Typha taxa.

Session 2: Mixed Oral Presentations

Title: Growing food for growing cities: Quantifying greenhouse gas emissions from peri-urban farmland transitioning to horticulture
Authors: Carling Serran, Marney E. Isaac, Kira A. Borden
Abstract
Sustainable local food systems are key to maintaining food security and sovereignty. Despite Ontario boasting prime farmland, it is not being used effectively to feed growing urban populations, causing reliance on imported produce. Peri-urban agriculture – farming in close proximity to urban areas – will become increasingly vital to supporting local food demand. This will likely necessitate transitioning farmland that is currently in grain production to horticultural crops for local consumption, however, there are few studies investigating the environmental impacts of this transition. Organic amendment strategies, which are more common in vegetable growing, are used to improve both crop outcomes and environmental impacts, but the greenhouse gas (GHG) emissions from these strategies are only beginning to be studied. Therefore, we aim to assess the GHG emissions from peri-urban farmland in transition from grain to horticulture using organic inputs. In June 2025, we established a field experiment at the Trent Research Farm in plots that represent a chronosequence of 1-year and 10-years of growing horticultural crops using organic inputs. Three organic input treatments were applied: a control (no inputs), a single compost application, and an improved split application strategy using compost and organic fertilizer. We collected detailed soil and crop ecophysiology data to evaluate the relationship between nutrient inputs, crop performance, and the resulting GHG emissions throughout the growing season. In this presentation, I will discuss preliminary data collected between June and October 2025.

Title: Rare earth elements in wood ash
Authors: Jean-Paul Lanoue, Shaun Watmough
Abstract
Increasing global electrification and demand for advanced technologies have amplified the need to identify alternative and sustainable sources of rare earth elements (REEs). Wood ash is an underutilized waste material generated in large volumes from the combustion of wood biomass in industrial, commercial, and residential settings. This study characterized and compared the REE content and variability of industrial wood ash (IWA) from Canadian pulp and paper mills and non-industrial wood ash (NIWA) collected from residential stoves in central Ontario. Additionally, species-specific soil and wood ash samples were collected and generated from branches of six treespecies (Acer saccharum, Betula papyrifera, Fagus grandifolia, Tsuga canadensis, Abies balsamea, and Pinus strobus) from locations on and off the Canadian Shield to assess interspecies and geographical variability. The mean concentration of all REEs was significantly higher in IWA compared to NIWA, with concentrations often four to five times greater ($p < 0.001$). Species-specific ash analyses revealed distinct REE profiles among tree species sampled from the same locations thus highlighting the importance of species and regional soil characteristics in governing REE variability in wood ash. Further research is necessary to better elucidate the influence of soil geochemistry and acidity on the REE content of ash produced from different tree species. This

research demonstrates the viability of using ash from trees as a bioindicator of REE rich soils and the potential to utilize wood ash as a secondary source of REEs.

Title: Synthesis of a Glycomimetic for galectin-1 Inhibition
Authors: Connor T. Maltby, Jenifer L. Hendel
Abstract
Lectins are a class of proteins that bind to carbohydrates with high specificity for certain sugar groups. These sugar-binding proteins play a major role in various biological functions. The most widely expressed group of lectins are the galectins, which bind to β-galactose-containing glycoconjugates. These proteins are divided into three different types: prototype, chimera type, and tandem repeat. Our research focuses on galectin-1 (prototype), which is frequently expressed in different cell types and its upregulation has been linked to tumor progression, making it a potential target for therapeutics. A recent advancement in the field involves the use of molecules that mimic the structure and function of native carbohydrates that bind to the carbohydrate recognition domain of galectins. These molecules, known as glycomimetics, have shown potential as therapeutics. For example, Thiodigalactoside (TDG) and TD139 have been shown to suppress tumor growth by inhibiting galectin-3. Our research focuses on the design and synthesis of glycomimetics to inhibit galectin-1. I will be presenting our synthetic strategy towards a disaccharide glycomimetic based on an N-acetyllactosamine scaffold.

Title: Improving periclase and brucite carbonation for scalable MgO looping: Implications for direct air capture
Authors: Jamie Burnett, Ian M. Power, Anna Harrison, Shaheen Akhtar, and Baichan Li
Abstract
Magnesium oxide (MgO) looping is a carbon dioxide (CO_2) removal technology that uses abundant magnesium carbonates ($MgCO_3$). Upon heating, $MgCO_3$ decomposes to MgO, which hydrates to form brucite [$Mg(OH)_2$] and subsequently captures atmospheric CO_2 to reform $MgCO_3$, enabling repeated cycling. However, slow kinetics and passivation have limited large-scale deployment, and the performance of natural Mg-carbonates remains minimally researched. Here, we investigated (1) the role of liquid water in reducing MgO passivation and (2) carbonation rates and extents of natural and synthetic MgO and $Mg(OH)_2$ films. Films were either dry, hydrated with deionized water, or hydrated with water equilibrated with 100% CO_2 (i.e. carbonated water; pH ~3.9), then exposed to atmospheric CO_2 concentrations (~420 ppm) at 100% relative humidity and 28 °C for 130 days. Passivation was greatest in dry MgO films (~51% carbonation) and lowest in films hydrated with carbonated water (~92%), despite similar initial carbonation rates (0.23 %C/day and 0.20 %C/day, respectively). Films hydrated with deionized water exhibited distinct behaviour, with slow initial carbonation that plateaued between days 8–14 (13% carbonation), followed by semi-linear carbonation (0.04 %C/day) to ~69% by day 130. In initially hydrated films, additional wetting (with deionized or carbonated water) did not reduce passivation, whereas wetting initially dry films increased carbonation extent by 7–12%. These results demonstrate that reacting MgO with carbonated water, which can be recycled from captured CO_2, significantly reduces passivation. Faster and more extensive reactions minimize the amount of unutilized material, thereby lowering costs and energy demands of MgO looping technology.

Title: Breeding ground foraging behaviour of the Lesser Yellowlegs (Tringa flavipes) in Churchill, Manitoba

Authors: Laura Maskell, Erica Nol, Paul A. Smith, Glen Brown

Abstract

Lesser Yellowlegs (Tringa flavipes) are a threatened, long-distance migrant shorebird that breeds in Northern Canada and Alaska and spends the non-breeding season in Central and South America. These wetland-dependent shorebirds rely on access to foraging areas throughout their range, yet little research has examined the foraging behaviour of Lesser Yellowlegs, especially in their breeding grounds. Many predators of Lesser Yellowlegs have one hunting strategy in common; they fly low to the ground and use cover to surprise attack foraging shorebirds. My research aimed to observe Lesser Yellowlegs in foraging areas to assess how their behaviour differs between closed wetlands with abundant vegetative shoreline cover and open wetlands characterized by high visibility of the surroundings. We observed Lesser Yellowlegs in both open and closed wetlands and tracked the duration of various behaviours performed over two minutes. We additionally quantified the frequency of pecking, vigilance and vocalization within these behaviours and recorded whether there were any human-caused disturbances during each observation. We found that Lesser Yellowlegs in both wetland types spent the most time actively foraging and the least time resting or engaging in territorial and breeding behaviours. Additionally, behaviour did not differ significantly between open and closed wetlands; however, Lesser Yellowlegs were 83% more likely to be disturbed by humans in closed wetlands. This suggests that, while Lesser Yellowlegs do not alter the time spent on various behaviours between open and closed wetlands, they seem to be more alert to their surroundings in areas with low visibility and abundant shoreline cover.

Session 3: Mixed Oral Presentations

Title: Effect of Changing Landscapes on Stream Morphology, Nutrient Transport, and Particulate Losses

Authors: Gianna Saarenvirta, Catherine Eimers

Abstract

This project investigates the impacts of changing landscapes—specifically agricultural intensification through increased row cropping and tile-drained agriculture—on nutrient loading (phosphorus [P] and nitrogen [N]) and sediment fluxes in a paired watershed study comparing east-central and northwestern Ontario. These processes have important implications for eutrophication and harmful algal blooms in the Great Lakes and other freshwater systems. Despite this, few studies examine the differential effects of tile drainage on particulate versus dissolved nutrient losses across contrasting landscapes. Tile drainage systems typically reduce surface runoff and soil erosion, resulting in lower losses of particulate phosphorus (PP). However, tile effluent is often enriched in dissolved forms of P and N, which are more bioavailable and readily transported to surface waters. The kinetic energy of tile outflows can also enhance streambank and bed erosion, mobilizing particulate-bound or "legacy" P stored in channel sediments. In addition, piped discharge may increase local flow velocities, particularly in artificially straightened channels, thereby increasing bank instability and erosional losses. This study addresses this gap through a two-part approach. First, we quantify long-term changes in stream morphology and climate in regions that have experienced substantial landscape modification. Second, intensive in situ sampling of water and sediment following the BACI approach is used to quantify nutrient and sediment losses. Preliminary results indicate tile drainage increases total phosphorus (TP) and total suspended sediment (TSS) in rivers downstream of the outlets, whereas NO_3-N is high in the tile outlets but remains relatively the same upstream and downstream.

Title: Enhancing the Cosmetic and Pharmaceutical Value of Crabwood Oil: A Comprehensive Study of Its Antimicrobial Properties and Applications

Authors: Stacy James, Suresh Narine, Neil Emery

Abstract

Carapa guianensis (Crabwood/Andiroba) oil is valued in traditional medicine and cosmeceutical applications due to its bioactive limonoids and phenolic compounds; however, its antimicrobial mechanisms and therapeutic efficacy against clinically relevant pathogens remain inconsistently characterized. This knowledge gap is particularly significant given the escalating threat of antimicrobial resistance (AMR), which in 2019 was estimated to cause 4.95 million deaths, and the need to discover effective, sustainable antimicrobial agents. This research systematically characterizes the bioactive properties of Crabwood oil, with emphasis on its antifungal and antioxidant activities relevant to medicinal and cosmetic applications. With plans to evaluate how potential synergistic relationships, when combined with complementary agents, may influence efficacy. For this stage of the research, Crabwood oil's antifungal activity was evaluated in vitro against Candida albicans, with ongoing assays for Candida tropicalis and Candida glabrata using broth macro-dilution assays.

Results demonstrate significant fungistatic activity of Crabwood oil at 5 mg/mL, resulting

in a 37.8% reduction in Candida albicans growth at 72 hours ($p < 0.001$). By addressing current knowledge gaps in antimicrobial mechanisms and optimizing formulation strategies, this project advances the evidence-based development of natural, value-added products for cosmeceutical and pharmaceutical use, contributing to sustainable public health solutions.

Title: Effects of artificial light at night on the behaviour of wild fishes: a whole-lake experiment
Authors: Leah C. Howitt, Bradley E. Howell, Steven J. Cooke, Aaron T. Fisk, Graham D. Raby
Abstract
As the human population continues to grow, artificial light at night (ALAN) is steadily increasing in both urban and rural areas. ALAN disrupts the natural day-night cycles that wildlife depends on to regulate their daily and seasonal activities like feeding, growth, and reproduction. While there is growing research on how ALAN affects terrestrial species, much less is known about its impact on fishes, particularly in the wild. This study investigated how Northern pike (*Esox lucius*), Largemouth bass (*Micropterus nigricans*), Pumpkinseed (*Lepomis gibbosus*), and Bluegill (*Lepomis macrochirus*) responded to ALAN by monitoring their behaviour in a small, private lake equipped with a whole-lake fish positioning system (acoustic telemetry). Large LED lights were installed around the lake on a one-night-on, two-nights-off schedule and positioning of tagged fish was used to assess changes in activity levels and habitat use under ALAN. The results reveal how fish behaviour varies across lit and unlit areas of the lake and species-specific responses to light pollution, while highlighting patterns in activity and space use on nights with the lights on compared to those where the lights were off. These patterns provide insight into potential behavioural responses to ALAN and factors influencing how different species may adjust to artificial lighting.

Title: Potential Health Risks Associated with Rare Earth Elements in Daily Diets
Authors: Minh Duong, Karen A. Thompson, D. Huy Dang
Abstract
In agriculture, rare earth elements (REEs) are used to enhance both the quality and quantity of crops. Several studies have demonstrated the beneficial effects of REEs at low concentrations; REE-based fertilizers are reported to have positive effects on plant development, and some studies report that REEs are safe. However, there is a lack of research on REE environmental geochemistry, and the chemical speciation of REEs has a direct effect on their toxicity, in which the free ion concentration is a good indicator of toxicity. Therefore, it is important to investigate existing REE concentrations in food sources and calculate the REE consumption in the average daily intake (ADI). Further, a hazard quotient (HQ) can be deduced from the reference dose values provided by the U.S. Environmental Protection Agency. The objective of this chapter is to average and compare the REE concentration in rice grains that were amended with lanthanum, with the REE concentration in a variety of food samples collected from grocery outlets in Southern Ontario, Canada. A total number of approximately 200 food samples including green vegetables, root vegetables, fruits, nuts and grains, meat, and seafood were collected, digested, and analyzed using Inductively Coupled Plasma Mass Spectrometry. The average daily intake of REEs is calculated, followed by an examination of the hazard

quotient to determine whether REEs, as trace elements that act as a source of fertilizers, could be toxic to humans when consumed.

Title: Post-Mortem DNA Methylation Analysis in Human Cadavers
Authors: Irina Badell, Shari Forbes, Aaron Shafer
Abstract
Understanding the dynamics of DNA methylation (DNAm) post-mortem is crucial for advancing forensic applications, particularly in estimating the Post-Mortem Interval (PMI), age, and sex of remains. After having successfully monitored the changes in DNAm patterns in pigs, this study focused on 15 human cadavers donated to the human taphonomic facility in Québec, Canada. Decomposition was monitored with photos, weather data was collected, and DNA methylation was quantified from soft tissue samples in 930k CpG sites with the MethylationEPIC microarray.
We established how long after death, age and sex can be accurately estimated, and whether there are predictable post-mortem changes.

Session 4: Mixed Oral Presentations

Title: Tree Cavities and Tiny Gliders: Understanding Flying Squirrel Reproduction
Authors: Meagan Stager, Jeff Bowman
Abstract
Understanding reproduction of wildlife is essential for population recruitment and persistence; however, for many species, this stage of life remains poorly understood. This knowledge gap is especially pronounced for the northern flying squirrel (*Glaucomys sabrinus*) and the southern flying squirrel (*G. volans*), for which birth site selection and litter size are largely unexplored. Therefore, we aimed to determine the litter size for both flying squirrel species in the Kawartha Highlands, Ontario, Canada, using radio collars, telemetry, and camera nest inspections. Concurrently, in a complementary study, we evaluated characteristics of nest trees used by reproductive females including tree species, type (coniferous or deciduous), size, decay stage, and nest type. We found that the nest trees used as birth sites were smaller in size than other available trees in the study area and nest cavities were considerably lower in height during the birth period relative to pre- and post-birth stages for both species. Furthermore, our results reveal an average minimum litter size of 2 ± 0.39 (n = 10) for southern flying squirrels, representing the smallest litter size reported for the species. Together, our findings provide valuable insight to the reproductive output of southern flying squirrels at the northern extent of their range and offer novel information on birth site selection for both species, with implications for forest management practices and conservation.

Title: Nitric oxide dioxygenase activity of Giardia intestinalis flavohemoglobins
Authors: Sarah Hill, Steven Rafferty
Abstract
Giardia intestinalis is a parasite that causes giardiasis. While unable to synthesize heme, Giardia still possesses five heme proteins, including one flavohemoglobin. Giardia flavohemoglobin (gFlHb) has nitric oxide dioxygenase (NOD) activity, oxidizing host-derived nitric oxide (NO) to nitrate at its heme cofactor. Of the eight Giardia subspecies (assemblages A-H), only the human-infecting assemblages (A, B, and E) encode flavohemoglobin. While gFlHb has been suggested as a novel drug target, prior research focuses on gFlHb-A, despite sequence divergence of 12-29% relative to the B and E variants. To determine if there were biochemical differences between the gFlHb variants, all three were recombinantly expressed and their NOD activities were measured using a free radical analyzer equipped with a NO-sensitive electrode. Rates of NOD activity did not significantly differ between the variants (A, 54 s-1; B, 35 s-1; E, 62 s-1), nor did their sensitivities to the substrates NO (Km: A, 0.77 μM; B, 0.62 μM; E, 0.89 μM) and NADH (Km: A, 18 μM; B, 19 μM; E, 15 μM), and the cofactor FAD. Inhibition of NOD activity by miconazole, cyanide, and nitrate was comparable. Inhibition by nitrite differed, however, optical titrations determined that nitrite ligand affinity did not. Rather, structural and sequential comparisons revealed residue differences in substrate entry and product exit pathways connecting the active site. Therefore, nitrite may be entering these pathways to interfere with access to the heme active site and elicit NOD inhibition, which may offer an alternative drug target route to using heme ligands as inhibitors.

Title: Hormetic effects of rare earth elements on the green alga *Chlamydomonas Reinhardtii*

Authors: Shivani Nadkarni, Dr. Huy Dang, Dr. Claude Fortin, Dr. Neil Emery

Abstract

Rare earth elements (REEs) have intrinsic physical and chemical properties that make them crucial for several industrial and high-tech applications (e.g. renewable energy, electronics). Terrestrial and aquatic environments are, therefore, increasingly exposed to REEs due to anthropogenic activities. At low concentrations, REEs demonstrate stimulating effects for terrestrial plants, such as increased biomass, while high concentrations result in toxicity; this dose-response behaviour is commonly referred to as hormesis. Currently, we do not know what the impacts of REEs like lanthanum are on algae. Additionally, with an increase in REE usage, we do not have set environmental safety guidelines for algae, which are the first and most affected trophic level. This study investigated the potential hormetic effects of REEs on *Chlamydomonas reinhardtii*. The algae were exposed to 12 concentrations of lanthanum for three days, where cell counts, photosynthetic capacity, chlorophyll content and stress biomarkers like reactive oxygen species were evaluated. Additionally, the concentrations of essential nutrients present in the algal cells during the exposure period were measured using ICP-MS.

The initial results showed a hormetic pattern for the cell growth, where stimulatory and inhibitory doses can be observed. With the global rise in REE consumption, it is crucial to understand the impacts of REE exposure on algae and aid in the development of environmental safety guidelines.

Title: Under Ice and On the Move: Winter Activity of Northern Map Turtles in a Dam-Influenced River

Authors: Samantha Howard, Valerie Von Zuben, Christina Davy, Michelle DiLeo

Abstract

Northern map turtles (*Graptemys geographica)* are a freshwater species that aggregate at communal overwintering sites. They often remain active beneath the ice, moving along the substrate throughout the winter. In regulated rivers, dam operations can alter water velocity, ice formation and dissolved oxygen - factors that may affect overwintering conditions. However, the behavioural response of Northern map turtles to changes in flow during the winter remains unclear. Using accelerometers, temperature and depth loggers, we quantified overwintering activity of female turtles at four sites in the Trent-Severn Waterway, a highly managed river system in Ontario. Using dam discharge rates, we tested whether variation in water velocity affected the probability of turtle activity. Turtles exhibited measurable activity throughout the winter, but activity did not differ significantly across water velocities. Although based on a small sample size, these results indicate that changes in water velocity may not strongly influence northern map turtle activity during the winter.

Title: Heat Activation Effects on Carbon Sequestration in Brucite, Serpentine, and Hydrotalcites

Authors: Victoria Hatten, Ian M. Power

Abstract

Carbon dioxide sequestration using mine tailings has gained increasing attention as a strategy to reduce the carbon footprint of mining operations. The mineralogical composition of mine wastes has a strong control on CO_2 sequestration capacities and rates. Heat activation, which can break down the crystal structure and cause calcination and dehydroxylation, may have significant influence on the reactivity of minerals with potential for CO_2 sequestration. In this study, heat activation was applied to minerals with varying CO_2 sequestration reactivities: brucite ($Mg[OH]_2$; high reactivity), hydrotalcites ($Mg_6[Al,Cr,Fe]_2[OH]_{16}[CO_3]\cdot 4H_2O$; moderate reactivity), and serpentine minerals ($Mg_3Si_2O_5[OH]_4$; low reactivity). Pure brucite, hydrotalcite, and serpentine samples were heated to various temperatures and times to determine the optimal method of dehydroxylation and calcination for these minerals. Ore containing these minerals, sourced from the Decar Nickel District in British Columbia, were heated to 600°C for 1 hr, the temperature and time which brucite transforms to periclase (MgO). Untreated and heat-activated sample were exposed to 10% CO_2 (1 atm) for 3 weeks to monitor CO_2 uptake by measuring total inorganic carbon. Both untreated and heat-activated brucite samples had reached their full sequestration potential at 601 kg CO_2/t. In contrast, the hydrotalcite minerals increased sequestration from 153 to 304 kg CO_2/t after heat activation, and the serpentine minerals increased from 11 to 24 kg CO_2/t. These results demonstrate that heat activation can improve CO_2 sequestration efficiency in less reactive minerals, highlighting its potential as a viable strategy for enhancing carbon capture in mine tailings.

Poster Session: Undergraduate Mixed Poster

Title: The Fungal Eye in Action: Wavelength-Specific Light and Cytokinin Control of Mycelial Growth
Authors: Adrian Guaman Vargas, Neil Emery
Abstract
Light is a critical environmental signal that shapes fungal growth, development, and metabolism, yet the mechanisms by which fungi translate wavelength-specific light cues into coordinated physiological responses remain poorly understood. Although fungal photoreceptors have been well characterized at the molecular level, comparatively little attention has been given to how light perception integrates with internal hormonal signaling to drive colony-level morphology and development across diverse taxa. This project investigates the interaction between photoreceptor signaling and cytokinin metabolism in fungi exposed to distinct light environments. Multiple fungal species representing diverse phylogenetic lineages and growth strategies were cultured under twelve controlled light treatments spanning ultraviolet, visible, infrared, and dark conditions. Daily imaging combined with quantitative image analysis revealed that light wavelength significantly influenced colony expansion rates, hyphal network architecture, branching frequency, and optical density, with blue and white light generally promoting faster growth and increased network complexity relative to red, purple, and dark treatments. Pigmentation responses varied by species and wavelength but were treated as a secondary phenotypic outcome rather than a primary driver of morphological change. Targeted cytokinin profiling using LC–MS/MS demonstrated that fungi produced distinct cytokinin signatures that varied across light treatments and between mycelial biomass and agar substrates. Isopentenyladenine- and cis-zeatin–type cytokinins were consistently detected, with preliminary results indicating correlations between cytokinin abundance and image-derived metrics of growth and branching. These findings suggest that cytokinins may function as internal signaling intermediates linking photoreceptor activation to adaptive developmental responses. By integrating controlled photobiological experiments with quantitative phenotyping and hormone analysis, this study provides evidence that light–cytokinin co-signaling contributes to fungal morphological plasticity. This work advances understanding of fungal environmental sensing and has implications for ecology, conservation, fungal disease, and applied fungal cultivation.

Title: Moth Community Beta Diversity Over Space and Time Between Forest Interior and Forest Edge Habitats in Ontario's Carden Alvar Provincial Park
Authors: Angelina Gordon, Richard Feldman, Maggie MacPherson
Abstract
Insects – including moths (order Lepidoptera) – are experiencing global decline. Understanding the processes underlying moth biodiversity is necessary for their conservation. These processes are becoming increasingly impacted by anthropogenic forest fragmentation, which increases the prevalence of forest edge habitats at a landscape scale. As edge habitats become more prevalent over landscapes, so do edge effects, which can alter community structures through changes in microclimate and vegetation structure. Moth communities are both highly seasonal and influenced by vegetation structure, yet the seasonal dynamics of moth communities in forest edge

habitats are largely understudied. For my undergraduate thesis project, I aim to explore the seasonal differences in moth community structure between forest interior and forest edge habitats in Ontario's Carden Alvar Provincial Park. From May-September 2024, moths were caught using light traps every two weeks at four points throughout the park. Using photographs taken of all the moths caught, I identified over 4,500 individuals to taxonomic family. To examine the patterns of seasonal change between interior and edge habitats, I will calculate pairwise differences in moth community structure between sampling dates, which I will then model over time. With my results, I hope to contribute to the understanding of moth biodiversity patterns, and how spatial and temporal processes interact to drive moth community dynamics.

Title: Plastics in Urban Bird Nests
Authors: Jax Nasimok, Sarah Jamieson
Abstract
Plastic pollution is a threat to wildlife. While it is well established that plastic is a frequent component of birds nesting in urban areas, the range of plastics that are used is poorly understood. This study investigates the use of plastics in 15 species of birds nesting in urban and urban adjacent areas. The prevalence and intensity of various plastic shapes and colours was determined per species, as well as for the various lengths of plastic strands, and the area of plastic sheets. These two shapes raise two possible risk factors for nesting birds. Plastic stands can lead to entanglement of both chicks and adults, and plastic sheeting can trap additional moisture within the nest. A more comprehensive look at what plastics are being used by urban birds is important for understanding how plastic pollution may be compounding the negative effects of other anthropogenic changes to the environment.

Title: Just Keep Skimming: Pools as an Overlooked Cause of Mortality in Urban Wildlife
Authors: Shannon Learoyd, Sarah Jamieson
Abstract
Studies on urban wildlife mortality provide insight into anthropogenic impacts on wildlife populations. Most studies focus on wildlife within large urban centers. Impacts unique to suburban areas remain understudied. With suburban areas being the frontline of urban sprawl, the rapid development of new anthropogenic structures provides a novel challenge for wildlife previously unfamiliar with these risks. Inground swimming pools are a common feature of suburban landscapes and likely pose a significant risk of mortality to wildlife, yet this topic remains largely unexamined. This study is the first to document inground pools as a mechanism of urban wildlife mortality. We collected data from inground pool owners across southern Ontario and documented 405 incidents of animals in pools of which 16.5% were rescued. We found that higher maximum daily temperatures were associated with increased wildlife occurrences in pools and that frequent pool cover use is correlated with a lower proportion of these occurrences resulting in a mortality. This study establishes the importance of investigating this aspect of urban wildlife mortality through the initial exploration of mechanisms behind the frequent presence of wildlife in inground pools and the proposal of frequent pool cover use as a candidate for risk mitigation.

Title: Human-Induced Reduction in the American Oystercatcher's (Haematopus palliatus) Pre-fledging Succees on Two of Virginia's Barrier Islands
Authors: Swati Banerjee, Thomas Hossie, Lyn Brown
Abstract
Anthropogenic disturbances are a significant threat to biodiversity. With human populations growing and on-going recreational uses of many of our coastal shores, the world's migratory shorebirds are at risk. One of these birds is the American Oystercatcher (*Haematopus palliatus*). We asked the question, does human disturbance affect the pre-fledging success and long-term population viability of the American Oystercatcher on barrier islands in Virginia USA and how does predator abundance play a role in this decline? To answer this, we collected demographic measurements over the course of the breeding season (April to August) by surveying different parts of two islands in particular, Assateague Island and Assawoman Island. To test the relationships between predator abundance to disturbance, pre-fledging success to disturbance, and predator abundance to pre-fledging success we conducted logistic regressions in the format of a hurdle model using binary responses to each nest that had fledged and a catch per unit effort of the predators. To test whether human induced reduction in pre-fledging success will be enough to impact the long-term population viability, we created a staged structured matrix testing the population and forecasting the future through both deterministic and stochastic approaches. The results of this research presents a unique PVA that has not yet been tested at the Chincoteague National Wildlife Refuge and provides much insight into understanding declines in American Oystercatcher populations and maintaining healthy, functional coastal ecosystems. This work will also aid in future refuge management strategies and further rationalize their parking lot moving project for 2027.

Title: Fate of Oxidised and Reduced Nitrogen in an Arctic Tundra
Authors: Lillian Hartley, Julian Aherne
Abstract
Climate change is predicted to lead to increased shipping and human presence in the Canadian Arctic. Associated emissions may lead to new sources and elevated inputs of nitrogen (N) to Canadian Arctic ecosystems. The Arctic receives limited N, and as such, Arctic plant communities are especially vulnerable to N deposition. Additions are projected to consist primarily of oxidised N with select activities contributing reduced N. Tundra ecosystems adjacent to shipping routes and ports are at high risk, and presently, there is great uncertainty in how these systems will respond. The relationship between N load, form, and its retention across vegetation, soil, and leachate is critically understudied in a Canadian Arctic context. This study examines the fate of N (oxidised, reduced and combined) deposition to tundra ecosystem through a controlled addition experiment to *R. lanuginosum* vegetated soil cores. While simulating average diurnal temperatures and daylight hours for August in Iqaluit, Nunavut, treatments of oxidised N (NO_3^-; 20 kg, n = 5), reduced N (NH_4^+; 20 kg, n = 5), ammonium nitrate (NH_4NO_3; 20 and 10 kg, each with n = 5) and a water control (n = 4) were applied over four months. At the end of the study period, N content was measured in each vegetation, organic soil, mineral soil, and leachate exports. Results are expected by the end of February 2026. It is expected that NO_3^- will predominantly export in leachate, NH_4^+

will predominantly accumulate in *R. lanuginosum* biomass, and NH_4NO_3 more greatly in leachate and biomass at the higher loading.

Title: Effects of Early Developmental Cold Shocks on the Morphology of Painted Lady Butterflies

Authors: Eric St-Hilaire, Gary Burness, Sarah Jamieson

Abstract

Environmental stressors during development can have profound and stage-specific impacts on butterfly morphology and physiology. This study investigated short-term cold-shock effects at three larval instar stages (1, 3, and 5) on adult morphology and thermal recovery in the Painted Lady butterfly (*Vanessa cardui*). Results reveal instar-specific sensitivity to cold-shocks, with early-stage exposure (instar 1) increasing adult body mass and shifting wing colouration (a*; red-green) towards red, while later instars produced minimal morphological effects. These findings suggest early developmental windows are critical for physiological plasticity, likely driven by hormonally mediated growth and pigmentation pathways. Wing area displayed treatment effects irrespective of instar, indicating certain traits remain plastic across developmental stages. This is potentially due to modular growth in butterflies, where different developmental processes can be independently affected by treatment. Despite consistent asymmetry between left and right wings, these differences did not vary across treatment or instar, supporting the interpretation that bilateral asymmetry reflects intrinsic developmental noise rather than cold-stress induced instability. In contrast, thermal recovery times following adult cold exposure were unaffected by larval cold-shocks, suggesting that developmental stress alters morphology but not adult resilience to cold. Collectively, our findings support the Temperature-Size Rule and emphasize that cold-shock responses are both trait- and stage- specific. These results highlight the importance of developmental timing in shaping adult phenotypes, as well as the role of endocrine regulation during critical early life stages. Understanding the mechanisms underlying these plastic responses offers insight regarding how short-term temperature stressors influence life-history trajectories under fluctuating environmental conditions.

Title: The Pulse of Forested Watersheds: Diel Changes in Stem Radius Reveal Hydrologic Coupling Between Transpiration and Streamflow

Authors: Kaleb Martin, Magali Nehemy, Jason Leach, Brianna Townsend, Danielle Hudson

Abstract

Subsurface water storage feeds both transpiration and streamflow. However, subsurface processes that mediate the coupling between transpiration and streamflow within a forested hillslope remain poorly understood. Observing diel cycles (24-hour cyclic fluctuations in water storage and movement) during the summer reveals the processes that mediate the influence of transpiration on streamflow. While many studies have observed diel cycles to understand transpiration-streamflow coupling, few have considered changes in tree water storage. Changes in tree water storage reveal tree water use and reflect the balance between root water uptake and transpiration. To understand the relationship between transpiration and streamflow, I compared diel cycles in stem radius (i.e., changes in tree water storage) and streamflow during the summer for 2023 and 2024 across two hillslopes in a forested headwater catchment in the Turkey Lakes Watershed, located in central Ontario. My objectives were to

1) observe relationships between diel stem radius and streamflow, 2) determine when diel stem radius is most coupled with streamflow, and 3) understand the factors mediating diel stem radius and streamflow relationships. Overall, I found more frequent strong-positive correlations between diel stem radius and streamflow during dry periods. Additionally, I found that lower soil moisture and greater tree water stress correspond with stronger correlations between diel stem radius and streamflow. My findings suggest that transpiration has a greater impact on summer streamflow when tree water uptake and streamflow generation share the same subsurface water storage during dry periods, underscoring the importance of using direct measures of tree water storage.

Poster Session: Graduate Mixed Poster

Title: Nest-site selection by Hudsonian godwits (*Limosa haemastica*) in Polar Bear Provincial Park, Ontario
Authors: Abbey Lewis, Glen Brown
Abstract
Climate change is altering the landscape of the Hudson Bay Lowlands (HBL) in subarctic Ontario. These changes hold important consequences for wildlife; namely, reducing habitat and increasing predation. Hudsonian godwits (*Limosa haemastica*), a Threatened shorebird species, are particularly vulnerable in the HBL where they breed at the southernmost extent of their range. Godwits have declined in abundance by 94% since 1980, but not enough is known about their breeding ecology to inform recovery in Ontario. My research aims to fill critical knowledge gaps surrounding nesting requirements and habitat use, providing insight on how landscape features that influence resource availability and predation risk affect nest-site selection. Data comes from breeding godwits in Polar Bear Provincial Park, Ontario. We collected high-resolution drone imagery covering a 150m x 150m area centered on eighteen Godwit nests from 2023 – 2025. I generated habitat classification maps for each nest and will test differences between habitat present at used (nest) and available sites to investigate nest-site selection. Preliminary findings show that as a cryptic species, godwits prefer nest sites with greater concealment. Nesting requirements for godwits also seem to differ from findings in Manitoba and Alaska; in Ontario, birds nest farther from water in less shrubby areas. This reinforces the importance of studying Hudsonian godwits in their unique Ontario habitat. Cumulatively, my research will provide novel insight into nest-site selection and habitat use by Hudsonian godwits in Ontario to support conservation efforts.

Title: The passive recovery of lichen and moss in mine-impacted landscapes
Authors: Ainsley Taggett, Shaun Watmough, Eric Sager
Abstract
Peatlands in the Greater Sudbury region were heavily impacted by historic mining and smelting, which reduced *Sphagnum* moss cover and disrupted ecosystem function. This study revisits 10 peatlands surveyed in 2014 to assess whether passive recovery is occurring in the absence of active restoration, and, if so, to what extent. During the 2025 growing season, vegetation surveys were conducted along replicated transects to measure *Sphagnum* cover, diversity, and plant community structure. Peatland biogeochemical characteristics, such as water levels, peat decomposition state, porewater chemistry, and peat chemistry, were also monitored to understand how environmental conditions influence recovery. Compared to 2014, most sites now show increased *Sphagnum* abundance and diversity, including one peatland where none was previously recorded. *Sphagnum fallax* and *Sphagnum squarrosum* were the most common recovering species. These findings suggest that natural recolonization is underway in several peatlands, providing important insight into whether restoration intervention is still required.

Title: Comparing gut microbiome of sympatric North American flying squirrels
Authors: Shelby Cohen, Jeff Bowman
Abstract
Northern and southern flying squirrels are sympatric in the Kawartha Highlands of Ontario. These species typically live in parapatry; however, novel secondary contact is disrupting the northern flying squirrel populations, risking species turnover. There is concern because northern flying squirrels are keystone species due to their mycophagous diet, and losing this ecosystem service can disturb regular forest processes. Consequently, we are interested in learning more about how these species extract nutrients from the environment, specifically in areas of sympatry. We compared the gut microbiome of both species, across two seasons using 16s rRNA sequencing to identify bacteria taxa core diversity metrics. We have found no significant difference in alpha diversity, but significance in beta diversity between species (Jaccard Index $p<0.05$; Bray-Curtis Dissimilarity $p<0.05$), and across seasons (Jaccard Index $p<0.05$; Bray-Curtis Dissimilarity $p<0.05$). These results suggest that diet has the most influence over bacterial communities, but more work needs to be done to determine if the benefits of mycophagy can persist if only southern flying squirrels remain.

Title: Identifying ecological factors that influence the survival, reproduction, and establishment of Culicoides spp. post-dispersal: A scoping review
Authors: Sydney L. Dam, Julia N. Delaire, David Beresford, Maggie MacPherson, Amy L. Greer
Abstract
Climate change may enable the geographic range of pathogen-transmitting insect vectors to expand northward across North America, resulting in a greater risk of associated disease outbreaks in livestock and wildlife. Culicoides biting midges have been implicated in transmitting vector-borne disease such as epizootic hemorrhagic disease virus and bluetongue virus, which cause severe disease in livestock and wildlife. This project's objective was to assess the ecological factors that influence the survival, reproduction, and establishment of Culicoides species following dispersal to a new location. A formal scoping review – following Arksey and O'Malley's (2005) framework – was conducted, where we extracted peer-reviewed primary research articles from two databases. We de-duplicated and screened manuscripts, with 81 of the initial 261 being included for final data analysis. *Culicoides imicola* was the most-studied species of 146 described Culicoides species. Seasonality, temperature, and habitat were the most identified ecological factors. Biting midge abundance was used as a metric for 69% of included studies, which represented species activity and seasonal patterns. While there is a general understanding of some key ecological requirements such as seasonality, temperature, and some habitat features, these results are highly informative for predicting present and future Culicoides spp. distribution and thus predict the risk of Culicoides-transmitted diseases into new geographic regions.

Title: The contribution of tire-derived chemicals to oxidative potential in Toronto
Authors: Shrutika Kadam, Pourya Shahpoury, Mark Parnis
Abstract
Urban traffic emissions are a major contributor to air quality degradation and associated health risks. While exhaust emissions have been extensively studied, non-exhaust sources such as tire wear remain underexplored despite their growing significance. Tire-derived emissions release a complex mixture of trace metals and organic compounds, among which substituted para-phenylenediamine (PPD) antioxidants and their transformation products, PPD-quinones (PPD-Qs), have emerged as toxicologically relevant contaminants. PPD-Qs, such as 6PPD-quinone, exhibit strong redox activity comparable to that of known toxic quinones and contribute notably to the oxidative potential (OP) of particulate matter (PM). Recent studies have detected PPD-Qs and related compounds in ambient air, road dust, and across urban regions including the Greater Toronto Area, with elevated concentrations near traffic-dense areas. The confirmed acute aquatic toxicity and detection of PPD-Qs in humans highlight their potential public health implications. The specific objectives of the present work are - (a) to quantify the intrinsic OP of individual PPD-Qs and binary mixtures of these with trace metals using chemical OP assays; and (b) to estimate the contribution of PPD-Qs to the OP of fine and coarse PM collected from multiple near-road sites across Toronto through concentration-response modeling. The results will provide critical insights into how particle size and proximity to roadways influence the OP of PPD-Qs, enhancing the understanding of population exposure to non-exhaust traffic pollutants. Ultimately, these findings will support policy development to improve air quality in Canada.

Title: A quantitative, time-resolved framework for equine herpesvirus 1 replication kinetics using herpes simplex virus 1 as a model system
Authors: Julia Delaire, Craig Brunetti, Amy Greer
Abstract
Equine herpesvirus 1 (EHV-1) is highly prevalent in horse populations globally, posing a significant threat to equine health and management. There are no effective antiviral treatments for EHV-1. Existing vaccines are ineffective at preventing disease, which can sometimes be severe or even fatal. While antivirals against related herpes viruses like herpes simplex virus 1 (HSV-1) target viral DNA polymerase, they do not address upstream and downstream processes such as viral entry, gene expression, protein accumulation, assembly, or egress. The kinetics of these events remain poorly defined for EHV-1. To address this, we propose a proof-of-concept study to develop a quantitative workflow for replication kinetics analysis using HSV-1, which is a well-characterized alphaherpesvirus with close similarity to EHV-1. We will quantify HSV-1 infection in Buffalo green monkey kidney cells at a defined multiplicity of infection. Samples will be collected across the early, mid, and late stages of viral replication. Viral DNA will be quantified via quantitative polymerase chain reaction. Infectious virus production will be quantified using plaque assays to determine plaque-forming units, which are a direct measure of productive infection and infectious particle output. These data will be integrated into a within-host mathematical model of viral replication, in which HSV-1 will serve as a surrogate for EHV-1 during model development. The model will define key kinetic phases and identify potential rate-limiting steps during replication. This approach will establish a mechanistic and adaptable framework for investigating

EHV-1 replication dynamics in cells, with broad applicability to virology, antiviral research, vaccine development, and animal health.

Title: Enhanced weathering of wollastonite and diopside in forest soils for CO_2 removal and exchangeable calcium replenishment

Authors: Larissa Wallisch, Minger Guo, Ian M. Power, Shaun Watmough

Abstract

Enhanced rock weathering (ERW) is an emerging carbon dioxide removal (CDR) strategy that accelerates silicate mineral dissolution to sequester atmospheric CO_2. Beyond CDR, ERW can mitigate soil acidification and replenish base cations in forest soils impacted by historic acid deposition, including Haliburton Forest & Wild Life Reserve, Ontario, Canada. ERW effectiveness depends on the dissolution kinetics of individual minerals within applied rock powders, yet mineral-specific weathering rates in soils remain poorly constrained. Wollastonite ($CaSiO_3$) and diopside ($CaMgSi_2O_6$), the dominant minerals in the wollastonite skarn used in this study (30 and 32 wt.%, respectively), exhibit laboratory dissolution rate differences of approximately two orders of magnitude. However, their relative contributions to CDR under field-relevant conditions remain uncertain. This study uses laboratory column experiments to quantify mineral-specific weathering rates and associated changes in pore water and soil geochemistry. Soil horizons from Haliburton Forest were reconstructed in 50 mL columns and amended with wollastonite skarn, pure wollastonite, and diopside at application rates of 2, 20, and 50 t/ha. The lowest rate approximates calcium losses from acid deposition, while higher rates target CDR optimization. Over 16 weeks, columns underwent wetting–drying cycles with periodic measurements of pore water pH, dissolved inorganic carbon, and major cations. Changes in soil chemistry and cation exchange processes were evaluated to determine whether released Ca^{2+} and Mg^{2+} are retained within the soil matrix or transported through the soil profile. This study aims to refine mineral dissolution kinetics under soil conditions, improve CDR estimates, and inform models linking laboratory experiments with in situ ERW processes.

Title: Near-term ecosystem responses to wollastonite in a hardwood forest

Authors: Jordan Gilder, Shaun Watmough

Abstract

Wollastonite ($CaSiO_3$) is a calcium-rich silicate mineral with potential to improve forest soil chemistry and enhance carbon sequestration. However, few studies have assessed its early ecological effects following field application. This study evaluates short-term ecosystem responses to wollastonite in Haliburton Forest, Ontario, using a replicated, plot-based experiment with four application rates (0, 5, 10, and 20 Mg ha-1). Measurements were conducted before application, shortly after application, and soon after winter ended to capture overwintering effects. The project integrates three ecological indicators: (1) soil properties and carbon cycling, assessed through pH, organic matter content, and CO_2 flux; (2) moss condition and nutrient uptake, evaluated through shoot height, percent cover, sporophyte production, and tissue chemistry (Ca, Mg, K, Na); and (3) ground-dwelling arthropod community structure, assessed via pitfall trapping and analyzed for abundance, diversity, and taxonomic composition (focusing on Acari, Collembola, and Coleoptera). Preliminary analyses suggest that soil responses varied by horizon and treatment, with some evidence of increased pH and altered organic matter content, but no clear treatment effect on cumulative CO_2 flux. Mosses

showed stronger seasonal and treatment-related differences, particularly in calcium and magnesium uptake. Arthropod communities were primarily influenced by seasonal variation, although treatment-level effects on diversity and taxonomic composition were also observed. This integrated approach provides early insight into how wollastonite amendments may influence forest floor systems. Results highlight variation in sensitivity across ecological components and the value of multi-indicator monitoring in evaluating short-term ecosystem responses.

Title: Genome composition and ploidy drive morphological variation in a mixed-ploidy salamander complex

Authors: Terry Topham, Dennis Murray, Thomas Hossie

Abstract

Understanding how morphological phenotypes are shaped by genetics is a central goal of evolutionary biology. The reproductive biology of unisexual Ambystoma salamanders produces individuals that range in ploidy (2N-5N), and that have hybrid nuclear genomes with variable contributions from multiple host species. The phenotypic consequences of polyploidy are poorly understood in vertebrates, and hybrid nuclear genomes can have a range of possible outcomes on organismal phenotype. We therefore leverage this unique system to disentangle the roles of genome composition and ploidy on body shape by quantifying the morphology of salamanders from Pelee Island, Ontario using traditional measurements and geometric morphometrics. We found that genome composition was the primary driver of morphological variation, with ploidy influencing some aspects of face shape. A cluster analysis could broadly differentiate hosts from unisexuals, however significant phenotypic overlap renders it difficult to reliably classify individuals based solely on morphology. Our results provide new insight into the consequences of hybridization and polyploidy on vertebrate phenotypes, as well as a proximate mechanism for the wide morphological variation characteristic of this salamander complex.

Title: Genome composition but not ploidy drives microhabitat used by salamanders in a mixed-ploidy complex

Authors: Alexander Robertson, Dennis Murray, Thomas Hossie

Abstract

Hybridization and polyploidy can have dramatic impacts on phenotypes, including patterns of habitat use, yet these are poorly understood in vertebrates. On Pelee Island, Ontario, Small-mouthed and Blue-spotted salamanders live alongside unisexual salamanders that are reproductively dependent on these hosts, vary in ploidy, and possess a variable hybrid nuclear genome. The host species differ in microhabitat preference, with Small-mouthed salamanders residing under cover objects sitting against moister soil. Given their hybrid nuclear genome, unisexuals may occupy microhabitat conditions intermediate to their hosts. Moreover, polyploidy is associated with multiple anatomical and physiological changes that reduce evaporative water loss, possibly improving tolerance to dry conditions. Leveraging eight years of ecological data across 10 sites and <500 genotyped samples of adult salamanders, we test for differences in microhabitat use according to genome composition and ploidy. While genetic composition of a salamander's nuclear genome significantly influenced their microhabitat use, we found no evidence that microhabitat use was influenced by ploidy.

Unisexual microhabitat niche is therefore intermediate to their hosts and driven by their hybrid nuclear genome.

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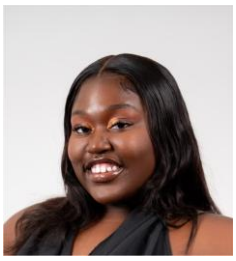

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