2023 Ottawa-Carleton Student Northern Research Symposium

Program and Abstracts

March 3, 2023
Nicol Building 3040
Carleton University

Carleton University

uOttawa

Foreword

Each year, undergraduate and graduate students from the University of Ottawa and Carleton University participate in high-quality research studies related to polar regions in a wide range of disciplines. As a platform to showcase our excellence, common interests, and passion, Carleton University is pleased to host the 2023 Ottawa-Carleton Northern Research Symposium (OCSNRS). This one-day symposium is a great opportunity to foster discussions on many pressing northern issues and strengthen ties between students and researchers from the two universities.

Light lunch and refreshments will be provided throughout the day.

We recognize that we are fortunate to live and work in traditional never-ceded Algonquin Anishinaabe territory and we acknowledge our responsibilities to the Algonquin people. We also acknowledge that the national capital region of Ottawa-Gatineau – and by extension Carleton University and the University of Ottawa – profit from Algonquin stewardship over millennia of the broader landscape of the Kitchissippi watershed. We also recognize the diverse Indigenous lands on which research presented at this symposium takes place, and encourage everyone to reacquaint themselves with the status of the Truth and Reconciliation Commission of Canada's 94 Calls to Action, only 13 of which have been completed in the eight years since it was issued.

The organizers would like to thank the Department of Geography and Environmental Studies at Carleton University for providing logistical and financial support for the Symposium, Dr. Derek Mueller for organizational and website support and for aiding with communication at Carleton University, and Drs. Luke Copland and Audrey Giles for aiding with communications at University of Ottawa. We thank Dr. Katherine Minich (Carleton University) for providing our keynote address.

OCSNRS 2023 Organizational Committee

Ada Loewen (PhD Candidate, Dept. of Geography and Environmental Studies, ada.loewen@carleton.ca)
Reyd Smith (PhD Candidate, Dept. of Biology, reyd.smith@carleton.ca)
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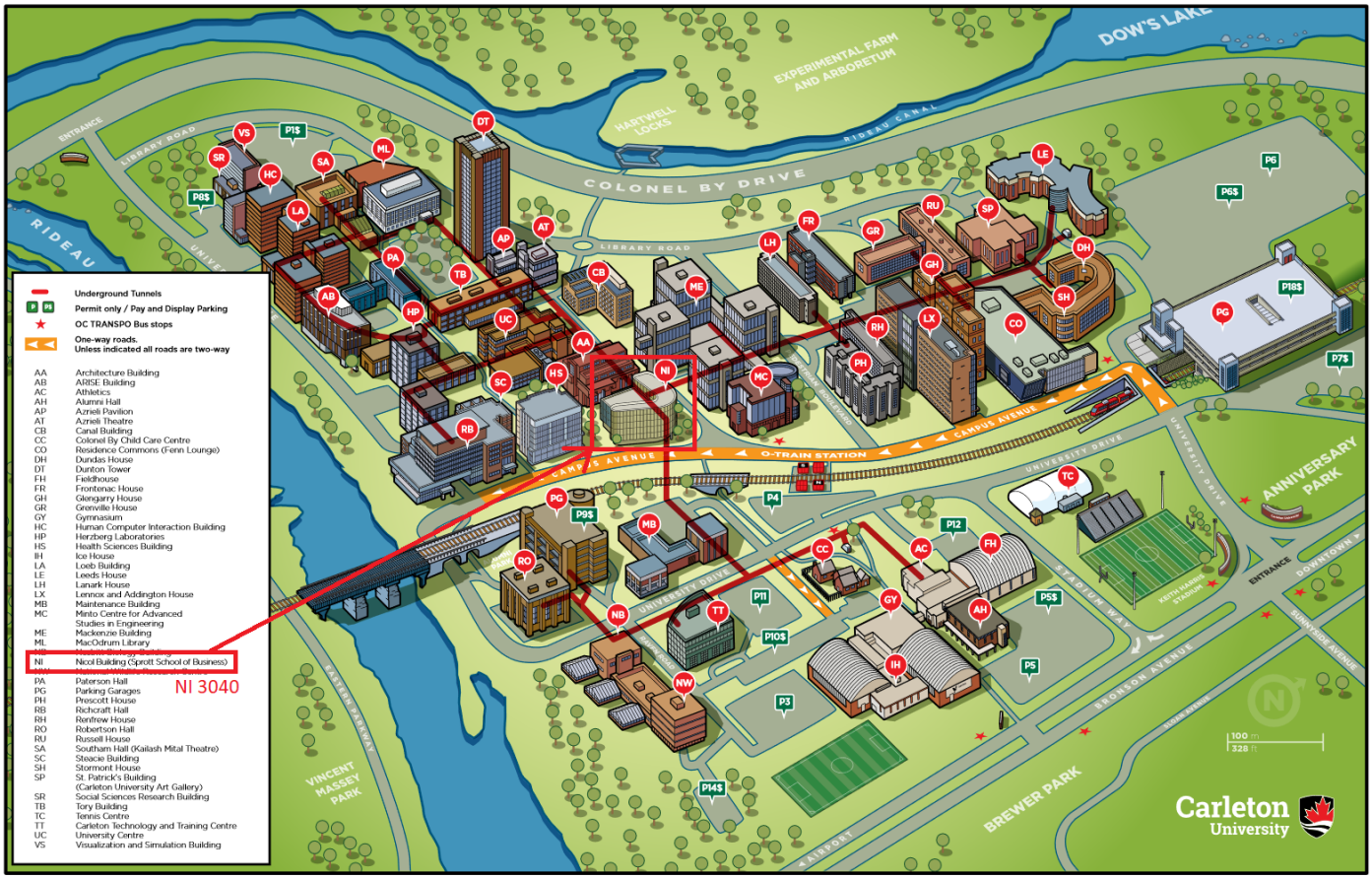
Further details are available at: http://carleton.ca/northernresearch/ocsnrs/

Location



Carleton University campus can be reached by bus routes 2, 7, 10, and 111. These stop either near the Nicol Building (marked in red on the map above) when coming from the north, or near the Colonol By Child Care Centre (marked CC on the map) when coming from the south. If you're driving, there are several pay-parking lots on campus. Find an interactive version of the map above at: http://carleton.ca/campus/map/.

OCSNRS 2023 Program
Friday, March 3rd, 2023
Nicol Building 3040, Carleton University

8:15-9:00	Registration and Poster Installation
9:00-9:15	Welcome, Opening Remarks, and Land Acknowledgement
9:15-9:45	**Keynote address: Building yourself through research** *Dr. Katherine Minich*, Carleton University
9:45-10:00	**Break**

Oral Session 1: Human and Environmental Health
Chaired by Ada Loewen

10:00-10:15	**Mercury storage in the continuous and discontinuous permafrost zones of the Hudson Bay Lowlands** *Adam Kirkwood*, Carleton University
10:15-10:30	**Community food security and wellbeing: Evaluation of the Nutrition North Canada cooking circle program in Paulatuuq, NWT** *Lena Dedyukina*, University of Ottawa
10:30-10:45	**FISHES: Initial Findings and Community Atlas Coevolution in Deline, NWT** *Kahlea Wells*, Carleton University
10:45-11:00	**Effect of shrub height on year-round carbon dioxide emissions from the low Arctic tundra** *Rachel Mandryk*, Carleton University
11:00-11:15	**Break**

Oral Session 2: Identifying and Monitoring Trends
Chaired by Rachel Mandryk

11:15-11:30	**Exploring the relationships between proglacial lakes and glacier terminus dynamics: A case study from Kaskawulsh Glacier, Yukon, Canada** *Brittany Main*, University of Ottawa
11:30-11:45	**Employing Remote Sensing Technologies to Monitor Drought and Control the Vulnerability of Peatlands to Wildfire** *Yasaman Amini*, Carleton University
11:45-12:00	**Characteristics of the 18 year surge of Mittie Glacier, SE Ellesmere Island** *Benoît Lauzon*, University of Ottawa
12:00-12:15	**Emerging topics and perceptions surrounding Arctic shipping using natural language processing** *Connor Rettinger*, University of Ottawa

12:15-13:30	**Lunch and Poster Session**
Oral Session 3: Mapping: Near and Far Chaired by Reyd Smith	
13:30-13:45	**Mapping Small Peatland Water Bodies Using Sentinel-1** *Samantha Schultz*, Carleton University
13:45-14:00	**Mapping a Return** *Sonya Gray*, Carleton University
14:00-14:15	**Delineation of the Milne Glacier grounding line using in-situ and satellite observations over 5.5 decades** *Yulia Antropova*, Carleton University
14:15-14:30	**Break**
Oral Session 4: Cultural and Ecological Movements Chaired by Reyd Smith	
14:30-14:45	**Weather, water, ice, and climate (WWIC) information needs for different vessel types operating in the Canadian Arctic** *Nathaniel Holloway*, Carleton University
14:45-15:00	**Reconceptualizing Mobility** *Brandon Pludwinski*, University of Ottawa
15:00-15:15	**Ecosystem engineering of red foxes increases seed production and viability of white spruce trees** *Justin Benjamin*, University of Manitoba
15:15-15:30	**Photo Exhibition - Voting and Announcement of Winner**
15:30-15:45	**Closing Remarks**
15:45-17:30	**Social - Mike's Place (209 University Centre)**

Posters

Characterizing the Changing Surge Behaviors of Lowell Glacier
Erika Brummell, University of Ottawa

The Effects of Anthropogenic Land-Use and Land-Cover on the Small Streams of the First Nation of Na-Cho Nyak Dun's Traditional Territory
John Foster, Carleton University

Supraglacial Hydrological Changes Along the Latitudinal Gradient of Ellesmere Island, Canadian High Arctic
Pénélope Gervais, University of Ottawa

Community-developed research expectations in Kluane region, southwest Yukon: Exploring researcher perspectives
Savanah Müller, University of Ottawa

Country Foods in the Inuvialuit Settlement Region, NWT: Understanding Child and Youth Preferences
Alissa Sallans, University of Ottawa

Infrastructure Development and Community Food Security in the Inuvialuit Settlement Region: The Impact of the Inuvik-Tuktoyaktuk Highway
Camille Slack, University of Ottawa

Keynote Speaker

Building Yourself Through Research

Dr. Katherine Minich
School of Public Policy & Administration, Carleton University

Abstract
As students we are reminded by our teachers to use a methodology, to apply a theory and to use ethical guidelines. Some of the things I wanted to talk to you about today is about you and your work, whether its work within Inuit Nunangat, the Inuit homelands, or within the territorial north as per Canada's jurisdiction or within another Indigenous People's territory. Such political questions are important to the goals of research, as they relate to broader philosophical questions of what is knowledge? how we know? and what does it mean? This keynote will address the diversity of work in Northern Research and explore how research and evidence inform governance and policy, as well as your identity as a researcher.

Oral Presentations

Session 1: Human and Environmental Health

Chaired by Ada Loewen

Mercury storage in the continuous and discontinuous permafrost zones of the Hudson Bay Lowlands

Kirkwood, A.[1]*, Roy-Leveillee, P.[2], Basiliko, N.[3], Branfireun, B.[4], Richardson, M.[1]
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[2] Department of Geography and Forestry, Laval University
[3] Department of Natural Resources, Lakehead University
[4] Department of Biology, Western University

Organic soils in the Circumpolar North may store large amounts of total mercury (THg) that could be mobilized by permafrost thaw. The Hudson Bay Lowlands (HBL) is the World's second largest northern peatland, supports North America's lowest latitude continuous permafrost, and contains 81-150 mg/m^2 of THg in the top 300 cm of the soil profile according to published estimates. These estimates are speculative as there has been little research completed on the spatial patterns of THg in the HBL, and the size of the THg pool has not been verified by field sampling and analyses. To better understand the implications of permafrost thaw in the HBL on Hg cycling, cores of full peat profiles (ranging from 45 to 300 cm deep) were collected across the HBL at 35 sites representing a range of environments such as bogs, fens, permafrost plateaus, and thermokarst fens. These cores were sectioned into 4 cm increments, and analysed for THg and other elements (C, N, Ca, K, P). Preliminary analyses show that the pool of THg at our study sites is 9.5 mg/m^2, which is lower than published estimates. Mean THg concentrations in surface peat (top 50 cm) differs slightly between locations from continuous and discontinuous zones of permafrost (101.3 ng/g and 83.4 ng/g, respectively), where THg from the surface of permafrost plateaus in the continuous zone is considerably higher than any other environment (mean = 199.6 ng/g). However there are no statistically significant variations in mean THg concentrations along the entire profile between fens (56.1 ng/g), thermokarst fens (50.1 ng/g), bogs (43.9 ng/g) and plateaus (31.9 ng/g). These results advance our understanding on the spatial distribution of THg storage through this globally significant and rapidly changing permafrost wetland.

Community food security and wellbeing: Evaluation of the Nutrition North Canada cooking circle program in Paulatuuq, NWT

Dedyukina, L.[1]*, Wolki, C.[2], Wesche, S.[1], Skinner, K.[3]
[1] Department of Geography, Environment and Geomatics, University of Ottawa
[2] Inuvialuit Regional Corporation (IRC) Food Security Coordinator, Paulatuuq, NWT
[3] School of Public Health Sciences, University of Waterloo

Limited research exists on the role of community food programs, such as cooking circles, in Canadian Arctic communities. This research investigates the Nutrition North Canada cooking circle program in the Inuvialuit (Inuit) hamlet of Paulatuuq, NWT. The objectives are to 1) collaboratively evaluate program impacts on healthy food intake, and awareness/knowledge accumulation regarding healthier eating and meal preparation techniques; 2) assess the program's intangible (e.g., social, cultural, and mental health) benefits to participant and community wellbeing; and 3) analyze the potential for consistent country food integration.

This research applies a participatory research approach to collaborative program evaluation, with Covid-19 modifications. Methods include document analysis of NNC annual reports (n = 9) and proposals (n = 2), a series of iterative online conversations with the Paulatuuq cooking circle facilitator (n = 1), online semi-structured interview with a regional representative (n = 1), telephone semi-structured interviews with cooking circle coordinators from ISR communities (n = 4), and telephone (n = 1) and in-person (n = 11) semi-structured interviews with Paulatuuq cooking circle participants.

Cooking circle participants reported an increased intake of healthy food, improved awareness of healthy eating/cooking, and positive social and mental benefits from the program. Further integration of country food into program activities is challenging and requires considerable effort from local and regional stakeholders. This research provides insight into the role of local-scale initiatives in supporting food security, overall wellbeing, and integration of country food in remote, Arctic communities.

FISHES: Initial Findings and Community Atlas Coevolution in Deline, NWT

Wells, K.[1*]
[1] School of Public Policy and Administration, Carleton University

FISHES is an interdisciplinary research project that aims to integrate genomics and fisheries science with indigenous Knowledge through coevolution to the benefit of food security and diverse fishing arrangements in northern communities. The research conducted in Deline is specific to enhancing food security and socio-economic development through knowledge coevolution. Currently, the project is working on the development of a community atlas mapping areas of cultural significance as well as areas relating to the sustainable harvesting of fish. This has been achieved through community mapping workshops, interviews, and inputting data through atlas software. The findings will be established during fieldwork in Deline from February 19th-26th.

Effect of shrub height on year-round carbon dioxide emissions from the low Arctic tundra

Mandryk, R.[1*], Humphreys, E.[1]
[1] Department of Geography and Environmental Studies, Carleton University

The Canadian Arctic tundra is experiencing an increase in the height, size, and distribution of shrubs, which is affecting plant community productivity, ground temperatures, and soil carbon cycling. It has been hypothesized that increasing shrub cover and increased summer productivity may be associated with greater soil carbon dioxide (CO_2) emissions during the non-growing season because of higher amounts of plant litter and a deeper snowpack allowing soils to remain warmer longer into the winter. The objective of this research is to determine how shrub cover affects emissions of CO_2 from the soil by measuring plot-scale fluxes of CO_2 at three sites of varying shrub cover in Canada's Southern Arctic ecozone. The sites are located within 2 km of each other and experience similar weather conditions. Automated forced-diffusion chambers at each of these sites operated from the spring of 2021 through the winter of 2021/2022 until late August 2022, collecting measurements of CO_2 flux every half hour. Growing season CO_2 emissions were highly variable within the sites, with no definitive trends related to shrub cover alone. Once the ground thawed in spring, the average soil respiration was 0.55 +/- 0.22 μmol m^{-2} s^{-1}. During the winter, soil temperatures at the site with greater shrub cover and deeper snowpack remained warmer and took longer to freeze. CO_2 emissions at the shrubbiest site remained slightly higher, but eventually declined to near-zero emissions at all sites.

Session 2: Identifying and Monitoring Trends

Chaired by Rachel Mandryk

Exploring the relationships between proglacial lakes and glacier terminus dynamics: a case study from Kaskawulsh Glacier, Yukon, Canada

Main, B.[1,2*], Copland, L.[1], Smeda, B.[1], Kochtitzky, W.[1,3], Samsonov, S.[4], Dudley, J.[4], Skidmore, M.[5], Dow, C.[6], Van Wychen, W.[6], Medrzycka, D.[1], Higgs, E.[7], Mingo, L.[8]

[1] Department of Geography, Environment and Geomatics, University of Ottawa
[2] Canadian Centre for Mapping and Earth Observations, Natural Resources Canada
[3] School of Marine and Environmental Programs, University of New England
[4] Canadian Centre for Mapping and Earth Observations, Natural Resources Canada
[5] Department of Earth Sciences, Montana State University
[6] Department of Geography and Environmental Management, University of Waterloo
[7] School of Environmental Studies, University of Victoria
[8] Blue System Integration Ltd., Vancouver BC

While proglacial lakes are predicted to increase in both number and volume under a warmer, wetter climate, the connections between such features and glacier ice dynamics are poorly constrained. A local hydrological reorganization in 2016 provides the opportunity to examine the relative impact of proglacial lake size on glacier velocities. A ~120-year record of terminus retreat, thinning and surface velocities using both in-situ and remote sensing observations is presented from Kaskawulsh Glacier, Yukon. From 2000-12, terminus velocities increased at a rate of 3 m a^{-2}, while proglacial Slims Lake area similarly expanded. The rapid drainage of the lake in May 2016 considerably modified the velocity profile, decreasing annual velocities within 3 km of the terminus by 48% over a 6-year period, at an average rate of ~12.5 m a^{-2}. A key source of the abrupt decrease in glacier motion was a reduction in flotation of the lower part of the glacier terminus following lake drainage. This study provides one of the first evaluations of the impacts of a rapid proglacial lake drainage event on local terminus velocities, and has significant implications for glacier dynamics.

Employing Remote Sensing Technologies to Monitor Drought and Control the Vulnerability of Peatlands to Wildfire

Amini, Y.[1*], Millard, K.[1], Richardson, M.[1]
[1] Department of Geography and Environmental Studies, Carleton University

Peatlands are increasingly vulnerable to the impacts of climate change. The changing hydrological regimes, characterized by an increased frequency and intensity of droughts and wildfires, pose a significant threat to these ecosystems. Drought conditions result in decreased soil moisture and create ideal conditions for severe wildfires. Remote sensing techniques have significantly contributed to the global soil moisture information in the recent past. The most recent passive microwave sensor for monitoring soil moisture is Soil Moisture Active Passive (SMAP). However, SMAP soil moisture products have limitations in peatlands, due to the complex nature of these environments which typically feature a combination of dense canopy cover, variable vegetation characteristics, and standing water. Brightness Temperature (BT) data, another product generated through passive microwave missions, can help address the challenge of obtaining accurate soil moisture information in peatlands. Since BT is a key input for soil moisture estimation, the development of new methods can incorporate the accurate assumptions appropriate for peatlands.

To this end, a time series analysis of BT trends is conducted to identify drought patterns leading to ideal fire conditions. The SMAP Level 1C product has been evaluated for its potential in predicting wildfires in Canada's Boreal peatlands between the years 2019 and 2021. The results reveal that a consistent decrease in SMAP BT trends occurs several months prior to peatland fires, and this trend pattern can be used to identify pre-fire conditions. Another objective of this research is to estimate soil moisture from SMAP BT and this can be achieved through the implementation of regression methods. The results of the Random Forest Regression indicate a strong performance in terms of accuracy and consistency during validation period.

Characteristics of the 18 year surge of Mittie Glacier, SE Ellesmere Island

Copland, L.[1], Hallé, D.[2], Van Wychen, W.[2], Schellenberger, T.[3], Dowdeswell, J.[4], **Lauzon, B.[1]***
[1] Department of Geography, Environment and Geomatics, University of Ottawa
[2] Department of Geography and Environmental Management, University of Waterloo
[3] Department of Geosciences, University of Oslo
[4] Scott Polar Research Institute, University of Cambridge

During a surge, a glacier's velocity typically increases by an order of magnitude or more above background levels. This study aims to describe the dynamics of Mittie Glacier during its most recent surge and provide insights into the controls on glacier surging in the Canadian Arctic. We use remote sensing to analyse changes in glacier terminus position and surface characteristics, variations in surface velocity, and temporal trends in backscatter values in synthetic aperture radar imagery to describe its surge.

Mittie Glacier surged from the late 1980s to 2007 and reached a maximum velocity of ~4.8 km m yr^{-1} near the glacier terminus, constituting the highest glacier velocity ever recorded in the Canadian Arctic. By 1999, this had resulted in a maximum terminus advance of 7.3 km on the west side of the glacier. The early 2000s then saw a slowdown of ice velocities, a rapid terminus retreat, and glacier thinning over most of the glacier length. Since 2005, Mittie Glacier has continued to thin over its lower part, but its upper part has thickened, with rates exceeding 3 m yr^{-1} in 2010–2014. We suggest that sustained thinning of the lower part of the glacier during quiescence eventually causes the near-terminus region to become buoyant, resulting in a slow increase in velocities. This acceleration then establishes new pathways for water to reach the glacier bed, allowing increasingly large amounts of water to access the subglacial drainage network and facilitate faster ice motion.

Emerging topics and perceptions surrounding Arctic shipping using natural language processing

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[1] Department of Geography, Environment and Geomatics, University of Ottawa

Social media has become a prominent way of obtaining access to information, specifically regarding world events and issues such as climate change. Twitter has been a social media platform of interest within the academic community, providing easy access to download and analyze datasets for scholarly publications. There has been no previous study observing sentiment regarding the arctic along with comparing conversations between the realm of academia and social media. The objective of this study is to recognize the formal and informal dialogue occurring between each other regarding arctic shipping. This analysis will highlight the key terms that influence polarity, topic comparison between the realms, along with common interests regarding Arctic Shipping. Using natural language processing techniques- 150 academic journal articles were extracted along with five queried searches from Twitter from the years 2010 to 2022. User emotions and perceptions were analyzed by using pre-determined sentiment and emotion lexicons, highlighting the trends in user polarity regarding each search. Word frequency, word association, and topic modelling will be used as a secondary form of analysis to identify subtopics of interest within significantly shifting groups regarding user sentiment. Preliminary results have found a decline in sentiment regarding the query “northwest passage” since 2018 and increased sentiment scores regarding “arctic council” observations.

Session 3: Mapping: Near and Far

Chaired by Reyd Smith

Mapping Small Peatland Water Bodies Using Sentinel-1

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[2] Water Survey of Canada, Environment and Climate Change Canada
[3] Canadian Hydrographic Service, Fisheries and Oceans Canada

Peatlands provide vital ecosystem and carbon services, and Canada is home to the world's largest peatland carbon stock. Climate warming trends are expected to lead to increased carbon release from peatlands as a consequence of drought and wildfire. Monitoring hydrologic regimes is key in understanding the impacts of warming, including the small water bodies in peatlands. Global surface water maps have been tested, but the spatial and temporal scale of the resulting data products prevent effective monitoring of peatland water bodies, which are small and experience rapid hydrologic changes. Capturing these water bodies is one hurdle to improving global surface water maps. This research investigates the reasons for small peatland water body omission as a preparatory step for surface water mapping using Sentinel-1 SAR data and image classification methods. Sentinel-1 backscatter signatures for small peatland water bodies differ from large water bodies, due in part to differing physical characteristics such as depth and emergent vegetation, and limitations on detectable water feature sizes as a result of land-water mixed pixels. Characterization of small peatland water body backscatter provides the theoretical basis for development of SAR-based surface water maps with high accuracy. The classification will be used in combination with large-scale soil moisture data products and a comprehensive peatland map to contribute to a peatland fire risk model for Canada.

Mapping a Return

Gray, S.[1]
[1] Department of Sociology and Anthropology, Carleton University

Glacier Bay National Park and Preserve in Alaska is undergoing the largest transformation since the Little Ice Age when a young Tlingit girl, Kasteen, beckoned to a quiescing glacier and called into existence a relationship between the US National Park Service and the Xunaa Tlingit. The massive glacier that subsequently galloped down a valley displacing the Tlingit, also enticed scientific inquiry to follow the wake of its eventual retreat and would become the basis for the establishment of a National Park. However, with the park came policies and regulations that kept the Tlingit from returning while welcoming glacier-based tourism into the marine park. Not surprising, science and conservation needed an environmental story. One, to explain the creation of the dynamic landscape and two, to interpret the value of glaciers to visitors. The Xunaa Tlingit had such a story; the story of Kasteen. As much as the story explained the dynamic force of a surging glacier, it also placed the Tlingit in direct relationship with the glacier and the place. You couldn't have one without the other. In 2016, billed as a collaborative project, a Tribal House, Xunaa Shuka Hit, was built and dedicated within the park. The Xunaa Tlingit were back. Today, the biggest threat to Glacier Bay National Park and Preserve with over 1000 glaciers and 500,000 ice-seekers aboard cruise-ships, is due to climate change. As a Tlingit woman from this region, my research and this paper focuses on new and emerging stories arising from this collaboration and my time spent employed with the US National Park Service. As mapping coordinates, stories have the potential to (re)define both place and thought, geographically as well as socially, and inform not only how to live in relation to glaciers, but perhaps how to live without them.

Delineation of the Milne Glacier grounding line using in-situ and satellite observations over 5.5 decades

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Milne Glacier is a marine-terminating glacier located on the northern coast of Ellesmere Island, a region that has been experiencing extensive ice mass loss in the last two decades. The Milne Glacier flows into Milne Fiord where it transitions from grounded to floating at its grounding line. The glacier rests on a retrograde slope and is vulnerable to enhanced basal melt via the marine ice sheet instability process. In this study, we quantify changes in the Milne Glacier grounding line position from 1966 to 2021 using in-situ and satellite observations. Pairs of Synthetic Aperture Radar (SAR) images acquired between 1992 and 2021 were combined into interferograms to delineate the grounding line over this period. Airborne radar surveys in 1966 and 2014 were compared against our SAR-derived positions to investigate changes in the grounding line over 5.5 decades. The grounding line retreated up to 3.8 km along the glacier centerline between 1966 and 2021. We also used ice penetrating radar data collected between 2016 and 2019 to calculate the bed-reflection power (BRP) coefficient to distinguish between basal returns caused by water versus sediment. This alternate way of delineating the grounding line were in broad agreement with our satellite-based SAR interferometric results. This analysis of grounding line retreat over the last half century will serve as a baseline from, which to compare future cryospheric change as the Arctic climate warms.

Session 4: Cultural and Ecological Movements

Chaired by Reyd Smith

Weather, water, ice, and climate (WWIC) information needs for different vessel types operating in the Canadian Arctic

Holloway, J.[1], Dawson, J.[1], **Holloway, N.[1,2*]**, Stensland, A.[1], Jeuring J.[3], Lamers, M.[4], Else, B.[5]
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Attention has been drawn to the urgent need to address data and service gaps in the availability of weather, water, ice, and climate (WWIC) information to support safe maritime navigation. WWIC services in the Arctic are marginal compared to other regions, creating a significant gap in reliable information that ship operators can utilize to ensure safe and sustainable operations. To better understand ship operator needs, a mixed-methods survey was disseminated to target individuals who have experience travelling on board a variety of vessel types in the Canadian Arctic. Results show that 61% of respondents felt that their needs were met “frequently” by current WWIC services, but 63% said that their voyages would benefit from additional information. Sea ice concentration was identified as the most important information need, and that more frequent updating of ice charts, ideally daily or in real-time, was crucial. However, not all vessels require the same type of information, nor at the same temporal and spatial scales. Notably, for pleasure craft operators, the Northwest Passage was identified as an area where WWIC information is regularly inaccurate and where improvement is needed, while there was much more geographic spread in information deficiencies reported for other vessel types. Pleasure craft operators also stated that access to information was commonly constrained by limited onboard technology. This distinction between vessel types highlights the necessity to tailor WWIC services to specific user needs. WWIC information providers were identified from the survey responses and their contact information noted. Personalized reports are in the process of being created and will be disseminated to each WWIC service provider to help stimulate the co-production of meaningful WWIC products and aid safer navigation through the Canadian Arctic.

Reconceptualizing Mobility

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Indigenous communities have histories of mobility (including immobility) that predate discussions of mobility as (adaptation) responses to environmental change (Whyte et al., 2019). Indigenous communities, including Tthets'éhk'édélı First Nation (Jean Marie River First Nation, JMRFN of the Dene Nation), have moved throughout their traditional territory for thousands of years, all of which has been in response to a changing environment, cultural continuity, and traditional knowledges (JMRFN, 2011).

On May 7th, 2021, when the annual Mackenzie River break-up in the Northwest Territories reached unprecedented levels, JMRFN was submerged. Within minutes, community members dispersed.

This research will explore Indigenous mobility through the voices and experiences of those from JMRFN. In doing so, it will shed light onto the social, cultural, political, economic, and colonial dimensions of Indigenous mobility by addressing the social and structural realities that shape present-day lived experiences in spaces (imaginatively and geographically) removed from national media, political support, and social attention. It uses photo-based relational methods to offer an alternative approach to living and moving with climate change.

Ecosystem engineering of red foxes increases seed production and viability of white spruce trees

Benjamin, J.[1]*, Markham, J.[1]
[1] Department of Biology, University of Manitoba

Ecosystem engineers can indirectly physically alter their physical environment through non-trophic interactions. Red foxes are ecosystem engineers in the nutrient-poor boreal woodlands by concentrating soil nutrients through their denning activities. These dens support different plant assemblages and increase plant growth creating ecologically significant hotspots. We measured the reproductive output of permanently tagged white spruce trees during a non-mast year at den sites and paired control sites at the northern tree line near Churchill, Manitoba. We estimated the number of new cones per tree and collected cones to measure cone size and estimate the number of total seeds, filled seeds, and viable seeds per cone, per tree, and per hectare. We measured tree height and tree density using modified methods with improved accuracy to explore how these factors influence reproductive output. There is a strong relationship between the number of cones per tree and the number of total seeds and filled seeds per tree, but a weak relationship between the number of cones per tree and the number of viable seeds tree. This demonstrates that cone counts alone are a good indicator of the number of filled seeds available as a food source for animals like squirrels and birds but it is a weaker indicator of the true reproductive potential of white spruce in this region. Foxes are influencing spruce tree reproductive potential but other variables could also explain the reproductive output by influencing growth rates or nutrient uptake.

Poster Presentations

Characterizing the Changing Surge Behaviors of Lowell Glacier

Brummell, E.[1]*, Copland, L.[1], Dow, C.[2], Van Wychen, W.[2], Medrzycka, D.[1], Garbo, A.[1]
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[2] Department of Geography and Environmental Management, University of Waterloo

The St. Elias Mountains contains a significant number of surge-type glaciers, of which Lowell Glacier is one of the largest. There is evidence to suggest that Lowell Glacier has repeatedly surged over time, with historical air photos and satellite images indicating that the glacier previously surged around 1948-50, 1968-70, 1983-84, 1997-98 and 2009-10. In this study we report the ongoing surge of Lowell Glacier, which appears to have started in 2021. The current surge follows a pattern of general reduction in quiescent phase length, as quiescent phases on Lowell glacier have gradually reduced from ~18 years in 1948, to only ~11 years since the last surge. Additionally, a pattern of general reduction in the maximum terminus extent has been recorded, with satellite imagery indicating that the terminus advanced by ~1.36km between summer 2021 and summer 2022, reaching a peak position in July 2022. Using a combination of satellite images and high-resolution air photos the surge initiation can be identified near the terminus, while further observation indicates that the surge propagated upglacier over time. Glacier velocity mapping from the ITS_LIVE dataset, pairs of Radarsat Constellation Mission images, and in situ GNSS receivers indicate that velocities reached >10 m/day in the lower ablation area and >4 m/day in the upper ablation area in summer 2022. This research provides new insights on surge dynamics of Lowell glacier while developing previous research on surge history.

The Effects of Anthropogenic Land-Use and Land-Cover on the Small Streams of the First Nation of Na-Cho Nyak Dun's Traditional Territory

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Accounting for almost 30% of Yukon's area, the Traditional Territory (TT) of the First Nation of Na Cho Nyak Dun (FNNND) is composed of many landscapes impacted by placer gold mining and transportation networks. What are the effects of these anthropogenic disturbances on the suspended sediment concentrations of streams and rivers, and how can these impacts be mapped and assessed across such a large and difficult-to-access area? Using methods from remote sensing, hydrology, and GIS, a spatially explicit empirical modelling approach is being developed that offers the ability to associate observed water quality with upstream land cover.During the summer of 2022, suspended sediment measurements were collected along a gradient of placer mining-impacted streams in the region. A detailed land cover map was then created from surface disturbance GIS data and satellite imagery acquired at approximately the same time as the water quality data. Afterwards, a flow accumulation technique was used to propagate the land cover classes downslope through a digital elevation model, allowing the upslope land cover class proportions to be queried at any point on the stream network or adjacent hill slopes. Finally, the observed suspended sediment concentrations were related to back the calculated land cover class proportions upstream of the sampling sites. This approach allows for novel visualizations of the impact of anthropogenic disturbances on stream networks and can act as a tool for the prediction of suspended sediment concentrations. This work can make important contributions for cumulative effects assessments in the FNNND TT and help to inform decision making during the upcoming Northern Tutchone regional land use planning process.

Supraglacial Hydrological Changes Along the Latitudinal Gradient of Ellesmere Island, Canadian High Arctic

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Glacier mass losses in the Canadian Arctic Archipelago have more than doubled since the late 1990s due to an increase in surface melting. Although this has contributed to the development of supraglacial hydrological networks, no previous research has investigated their temporal evolution or variability. This study therefore examines spatial and temporal changes of these networks across the ~800 km latitudinal gradient of Ellesmere Island, by evaluating the utility of various semi-automated methodological frameworks for supraglacial stream mapping using different spatial resolutions like Planet, Sentinel-2 and Landsat-8. Such methodologies rely on the calculation of the Normalized Difference Water Index to enhance spectral contrast for linear feature enhancement or use a digital terrain model to identify potential flow routes. Future work will determine the best methodology and spatial resolution to quantify changes in supraglacial hydrology across Ellesmere Island since the 1950s, which will be made possible by making comparison with historical ASTER, SPOT and Landsat satellite imagery as well as with historical air photos. Initial results indicate that there have been significant changes in the number, length, width, incision, and sinuosity of supraglacial streams over the past ~60 years, with an acceleration in the rate of change over the last decade. Changes also seem to follow a spatial gradient where greater relative changes in incision are found in far northern areas.

Community-developed research expectations in Kluane region, southwest Yukon: Exploring researcher perspectives

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In the Kluane region of southwest Yukon, the Traditional Territory of Kluane First Nation (KFN), the diverse geography of the region, recent rapid environmental changes, and the presence of southern-operated research stations have generated significant research activity. However, research processes and outputs have been mainly externally driven and remain largely inaccessible to the local communities. Through a collaborative and community-driven project, KFN is in the process of developing a draft (unpublished) set of research expectations, aimed at guiding research activities within their Traditional Territory.

Although previous research has explored how to conduct ethical research with Indigenous communities, less research is available that explores researchers' perspectives on conducting such research. This research aims to fill an important gap in the existing BRH project by engaging with Kluane-based researchers and employing a series of to (O1) characterize current research practises in the Kluane region, (O2) identify how researchers are engaging with established ethical research principles for northern research, and (O3) explore how researchers would engage with emerging community-developed research protocols.

Early data collection highlights potential challenges for full ethical engagement in research protocols, including institutional barriers, lack of cultural competency and issues with accessibility. Findings from this research will help inform the development of tools emerging from the broader community-based project and explore how research processes can be culturally relevant, locally driven, and supportive of community-capacity building.

Country Foods in the Inuvialuit Settlement Region, NWT: Understanding Child and Youth Preferences

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It is well recognized that country foods are a fundamental part of Inuit livelihoods; however, there has been limited focus on Inuit child and youth perspectives on country foods. To address this gap and respond to stated community interests, this study aims to capture the perspectives of children and youth across the Inuvialuit Settlement Region (ISR) regarding their relationship with country foods and related procurement activities. Working collaboratively, we developed an image-based survey with community research coordinators in Paulatuk and Tuktoyaktuk, NWT, and received input from both school administrators and the regional Beaufort Delta Divisional Education Council. These surveys are being administered to K–12 students across the six ISR communities in 2022 and 2023, where students will respond to questions in four categories related to country foods: the types of foods they would like to eat, the related activities they would like to participate in, who they would like to learn from, and the harvesting and preparation skills they would like to learn. Through a quantitative cross-tabulation of responses, a summary report will be created for each community, and regional trends will be analyzed and further investigated through semi-structured interviews. This research can help to build an intergenerationally inclusive understanding of how children and youth can be better engaged in food sovereignty initiatives in the ISR. Moreover, we hope that this research can be used as a tool to inform decision making around how best to incorporate country food–related activities into existing community programs, including on-the-land camps, cultural calendars, and school breakfast and lunch programs.

Infrastructure Development and Community Food Security in the Inuvialuit Settlement Region: The Impact of the Inuvik-Tuktoyaktuk Highway

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While some research exists on rural road development impacts within the global Indigenous context, the impact of new roads on Indigenous communities in the Arctic remains largely unknown. This research addresses this gap through a collaborative case study of Tuktoyaktuk, a hamlet in the Inuvialuit Settlement Region that gained all-season road access with the 2017 opening of the Inuvik-Tuktoyaktuk Highway. Drawing on transcripts from community focus groups held in 2018 and a series of seven interviews conducted with community members in 2020, we examine perspectives on the impacts of the ITH alongside key trends connected to food access, harvesting, travel and community wellbeing. Prior to ITH completion, anticipated benefits were communicated by the Government of the Northwest Territories and verbalized by community members. These included reduced costs of living, food and travel; and increased access to external services and employment opportunities. Our preliminary results indicate that these benefits have not all been realized at the local scale. Our data highlights both direct and indirect impacts of the ITH on market and country food access, connectivity to external services, cost of living, substance use and tourism. Key trends also reflect highway benefits being experienced differently between demographics such as those in single parent households or those without regular vehicle access. Taking a collaborative, community-based approach, we are building on these results to better understand these key dynamics; contribute to improved decision-making around community needs; and better understand the connections between rural road development and impacts on food availability, quality, and access.