

# *Ottawa Carleton Student Northern Research Symposium 2022*

## *Conference Proceedings*



**Fri., March 25<sup>th</sup>, 2022**

**9:30 – 3:00**

Join Zoom Meeting

<https://uottawa-ca.zoom.us/j/91795675465?pwd=YVRKYmliTW52WE5OK3Rpdm9rSIFxZz09>

Meeting ID: 917 9567 5465

Passcode: 0eVRNs

<b>Conference Schedule</b>	
----------------------------	--

9:30-9:50	<b>Conference meeting opens</b>
9:50-9:55	<b>Opening remarks</b>
10:00-10:40	<b>Keynote address:</b> <i>Dr. Jean Holloway- Risks, opportunities, and management needs for increased ship traffic in the Canadian Arctic</i>
10:40-10:50	<b>Break</b>
10:55-11:40	<b>Session 1</b> <ol style="list-style-type: none"> <li>1. Michelle Landry - Determining the Source and Age of CO2 Emissions from Warming Permafrost in the North Ogilvie Mountains, Central Yukon.</li> <li>2. Pat Jardine - Investigating Snowbank Compaction as a Method of Improving the Stability of Infrastructure Built in Permafrost Terrain</li> <li>3. Kethra Campbell-Heaton - Ice wedges as a winter paleotemperature proxy: limitations and local noise in their <math>\delta</math> 18O record.</li> </ol>
11:45-12:40	<b>Lunch</b>
12:45-13:45	<b>Session 2</b> <ol style="list-style-type: none"> <li>1. Lena Dedyukina - Community food security and wellbeing: Evaluation of the Nutrition North Canada cooking circle program in Paulatuk, NWT</li> <li>2. Brandon Pludwinski - A CBPAR photovoice approach to understanding the lived realities of environmental and climate change adaptation in Tł̨ets'éd̨éł First Nation</li> <li>3. Hussein Samhat - The Outdoors: An Indigenous Perspective</li> <li>4. Stephanie Woodworth &amp; Beth Hudson - "It's not being on the land, it's like we are a part of the land.": Youth stories from on-the-land camps in the Northwest Territories</li> </ol>
13:50-14:00	<b>Break</b>
14:05-14:50	<b>Session 3</b> <ol style="list-style-type: none"> <li>1. Trevor Andersen – Synoptic conditions leading to storm force winds in Hurricane Alley, km 450-465, Dempster Highway, Yukon</li> <li>2. Erik Wagenaar – Modelling freshwater contribution to Milne Fiord, Ellesmere Island, NU</li> <li>3. Benoît Lauzon – Glacier surge dynamics on western Axel Heiberg Island, Nunavut</li> </ol>
14:55-15:00	<b>Closing Remarks</b>

\*Five-minute transition allocated for technical difficulties and/or set up timing.

**Keynote speaker:****Dr. Jean Holloway*****Risks, opportunities, and management needs for increased ship traffic in the Canadian Arctic***

*Dr. Jean Holloway is a Postdoctoral Fellow co-affiliated at the University of Ottawa and Université Laval. Her research interests are focused, broadly, around determining how climate change is impacting various elements of the cryosphere in the Canadian Arctic and subarctic. After receiving degrees in Environmental Science (B.Sc.) and Geography (M.Sc.) at Queen's University, Dr. Holloway completed a Ph.D. in the Department of Geography, Environment and Geomatics at the University of Ottawa, focused on determining the impacts of forest fires on permafrost in the boreal forest of Canada. Following her Ph.D., she joined the Environment, Society, and Policy Group (ESPG) at the University of Ottawa where she currently holds an AN-MEOPAR Fellowship for her project looking at changes in Arctic shipping activity and the subsequent human and environmental impacts, with the goal of producing research that is useable by policy makers. Dr. Holloway remains part-time with the ESGP, but has begun a project with Dr. Pascale Roy-Léveillé through PermafrostNet related to permafrost hazards. Dr. Holloway currently sits on the Board of Directors of ArcticNet, as well as the Association of Polar Early Career Scientists (APECS).*



## Session I

Michelle Landry

**Determining the Source and Age of CO<sub>2</sub> Emissions from Warming Permafrost in the North Ogilvie Mountains, Central Yukon.****Key Words: Permafrost; Radiocarbon; CO<sub>2</sub>**

Canada's arctic regions have been experiencing enhanced surface warming at three times the global rate. This study focuses on determining the source and age of carbon emissions from permafrost soils experiencing warming and furthering our understanding of the carbon cycle and sub-arctic carbon sources in northern climates. Using Accelerator Mass Spectrometry (AMS), the radiocarbon (<sup>14</sup>C) content of organic matter in permafrost cores was determined for three sites in Tombstone Territorial Park, Yukon, Canada. Through microcosm studies, %CO<sub>2</sub> produced by heterotrophic microbes through respiration was determined and measured for <sup>14</sup>C. The <sup>14</sup>C content of these cores was measured by AMS to determine the age of the total carbon at each depth interval. Results from twelve microcosm studies show sequestered carbon from soils of 0-11cm demonstrate ages from average calendar years between 1995-2017 as evident via the fraction modern carbon (F14C) signatures of active layer samples. F14C values consistently decrease from the upper to lower extent of each core, indicating carbon becomes older with increasing depth below the ground surface. Comparing relative thermonuclear radiocarbon signals of these analyses shows whether accelerated surficial warming of permafrost is causing the emission of old or modern carbon from these thawing cryotic reserves into the atmosphere.



Pat Jardine

**Investigating Snowbank Compaction as a Method of Improving the Stability of Infrastructure Built in Permafrost Terrain**

**Key Words: Permafrost; Snow; Infrastructure; Roads**

In Central Yukon, air temperatures are warming rapidly due to climate change. As a result, permafrost degradation is becoming more widespread, increasing the risk of infrastructure damage due to thaw subsidence. For roads, this risk is exacerbated by snowbanks which accumulate alongside their embankment. When the snow is sufficiently deep, it causes a warming influence by creating an insulative layer which limits the flow of heat out of the ground. The thermal conductivity of snow has a positive relation with density, and a negative relation with depth. therefore, compression of the snowpack will theoretically increase its thermal conductivity, resulting in lower ground temperatures. This presentation discusses the results of field experiments which took place to test this hypothesis during the winter of 2020. Roadside plots were set up near Mayo and at km 96 of the Dempster Highway to see how the efficacy of compaction changed under varying conditions. Compaction was carried out by workers from the Na-Cho Nyak Dun First Nation using snow machines. Ground temperatures were monitored using loggers placed at the bottom of the snowpack, and snow conditions were surveyed monthly. Average temperatures were between 1-3°C lower at all compacted plots when compared to those left undisturbed.



Kethra Campbell-Heaton

**Ice wedges as a winter paleotemperature proxy: limitations and local noise in their  $\delta^{18}\text{O}$  record.**

**Key words: Ice wedge, Permafrost, Paleoclimate, Holocene, Radiocarbon Dating, Fosheim Peninsula, Agassiz ice cap**

In the last two decades, ice wedge research has shifted towards the use of ice wedges as paleoclimate proxies. Scientists use the  $\text{D-}^{18}\text{O}$  signature recorded in the wedge ice to reconstruct past winter climates in the Arctic. The purpose of this research is to investigate the validity of the ice wedge stable isotope signature as a valid proxy for winter climate. Ice wedges in Eureka, Nunavut, were analyzed for  $\text{DOC }^{14}\text{C}$  and  $\text{D-}^{18}\text{O}$ . Radiocarbon ages extracted from eight ice wedges show peripheral cracking in one quarter of the sampled wedges. Comparison of sampled ice wedges ages to the MacKay (1974) Gaussian distribution suggests that ice wedges of medium widths (1-2 m) are more reliable for paleoclimate dating because of a higher probability of cracking. Cracking irregularity and peripheral cracking suggest that ice wedge  $\text{D-}^{18}\text{O}$  should rely on veinlets' direct dating to establish a proper chronology. Symmetry analysis of the ice wedge  $\text{D-}^{18}\text{O}$  showed a statistically different average  $\delta^{18}\text{O}$  at depth within three of the four sampled ice wedges. Additionally, the  $\delta^{18}\text{O}$  signature within the sampled ice wedges shows an increasing trend from the center to the wedge's edge. This change can be attributed to increased moisture and mixing near the intersection between ice wedge and icy-permafrost. Consequently, against ice cap Agassiz  $\delta^{18}\text{O}$ , the ice wedge isotopes show a high degree of variability throughout the Quaternary and are attributed to the random timing of meltwater fractionation infiltrating the ice wedge crack. Finally, it is proposed that a smoothing spline be used with multiple ice wedge  $\delta^{18}\text{O}$  records to create a robust and reliable chronology.

[Link to paper](#)



## Session 2

Lena Dedyukina

**Community food security and wellbeing: Evaluation of the Nutrition North Canada cooking circle program in Paulatuk, NWT****Key Words: Arctic; Inuvialuit; Food Security; Country Food; Evaluation; Nutrition; North Canada**

Minimal research exists on the role of local food programs, such as cooking circles, in supporting food security and overall wellbeing in Canadian Arctic communities. While the literature on community cooking programs tends to be limited to urban centres, such programs show many positive benefits, including supporting food security and nutrition education regarding healthy eating, cooking, and shopping. They also provide space for social interaction and contribute to the mental wellbeing of participants. Concurrently, Indigenous community cooking programs often incorporate cultural elements and traditional food practices.

This research investigates the cooking circle program in the Inuvialuit hamlet of Paulatuk, NWT. The objectives are: to collaboratively evaluate the cooking circle regarding its impact on participants' intake of healthy food, awareness, and knowledge accumulation regarding healthy eating and healthier cooking/meal preparation techniques; to assess the cooking circle in terms of its intangible (e.g., social, cultural, and mental health) benefits to the wellbeing of its participants and the community; to analyze the potential for consistent country food integration into the cooking circle. This research will provide insight into the role of sustainable local-scale initiatives in supporting food security, overall wellbeing, and possible integration of country food in program activities in remote, Arctic communities.



**Brandon Pludwinski**

**A CBPAR photovoice approach to understanding the lived realities of environmental and climate change adaptation in Tthets'éhk'édélí First Nation**

**Key Words: Climate Change Adaptation; Indigenous Community; Relationally; CBPAR; Photovoice**

*On May 7<sup>th</sup>, 2021, the Mackenzie River annual spring break-up reached unprecedented levels, destroying, and displacing the residents of Tthets'éhk'édélí First Nation, NWT. The flooding had devastating impacts on Tthets'éhk'édélí First Nation's social, cultural, political, and economic wellbeing. This presentation will focus on the community-based, bottom-up collaboration co-designed with residents of Tthets'éhk'édélí First Nation to shed light on the social, cultural, political, and economic dimensions of environmental and climate change adaptation. It brings an innovative, culturally sensitive, and creative approach to climate-adaptation studies while addressing the social, political, economic, cultural, and colonial realities that shape present-day adaptation processes. The presentation will explore the conceptual framework of my dissertation as well as the methods of data collection and analysis I intended on using.*



---

**Hussein Samhat**

---

**The Outdoors: An Indigenous Perspective**

---

**Key Words: Indigenous; Outdoors; Holistic; Reconciliation; Land-dependent**

---

*Literature shows that connection to the land and outdoors has tremendous psychological and physiological benefits. However, the question of whether the “outdoors as therapy” concept is sustainable remains to be answered. The purpose of this research is to understand the outdoors through Indigenous knowledge and land-based pedagogies. After reviewing the work of Indigenous scholars that explain how connection with the land is at the heart of knowledge production and wellbeing, this research project presents a case study of a youth initiative. Through secondary data analysis, this study shows how youth learn the way of the land that helps them reconnect with their traditions. The overall reflection in this research also highlights Indigenous postcolonial struggles and shows how resurgence through a land-based pedagogy is key in re-establishing a sense of community. Furthermore, this work suggests new principles guiding research on outdoor/green therapy. Settlers could learn about holistic visions of wellbeing where the health of the land and a commitment to protecting and respecting it are at the core of a collective therapy.*



Stephanie Woodworth & Beth Hudson

**"It's not being on the land, it's like we are a part of the land.": Youth stories from on-the-land camps in the Northwest Territories**

**Key Words: Land-based Education; Photovoice; Community-based Research; Northern Youth**

Through ongoing collaboration with research partners at Dehcho First Nations (Beth Hudson), Ka'a'gee Tu First Nation, and Ecology North, Stephanie Woodworth's doctoral research identifies community-based solutions for land-based education (LBE) in the Northwest Territories (NWT). In this paper, Woodworth and Hudson examine photovoice data from 2019 and 2021 on-the-land camps to show the impacts of LBE on northern youth. During the day at the camps, youth captured photographs of their experiences and shared reflections in the evening. Following the camps, we developed photobooks and hosted photo exhibits in their communities to share their photographs and stories. We have adapted traditional photovoice to be an immersive experience of co-learning between the researcher and participants, and we centre the youth's stories of, and relationships with, the Land, using digital technologies and creative arts. This work will lead to improved dialogue between the researchers and community partners to make informed decisions about programs, practices, behaviours, and policies related to LBE. Additionally, it will expand the understanding of youth's experiences and priorities for the Land within their communities, region, and territory. Finally, it will contribute to the development of educational policies that embrace land-based pedagogies, learning, and education in the NWT.



## Session 3

Trevor Andersen

**Synoptic conditions leading to storm force winds in Hurricane Alley, km 450-465, Dempster Highway, Yukon****Key Words: Winds; Topography; Synoptic Conditions**

The final 15 kilometres of the Dempster Highway within the Yukon (YT kms 450-465) – known as Hurricane Alley – experience strong downslope windstorms. The winds follow the foehn mechanism and are topographically enhanced. For much of Hurricane Alley, the highway is oriented south-north with a parallel ridge to the east. Air layers pool east of the ridge before spilling over the ridgetop as easterly winds. These winds accelerate downslope and blow perpendicularly across the highway, causing hazardous conditions and frequent road closures. The ECCC Rock River meteorological station recorded 41 hours of sustained storm force winds (speeds above 88 km/h) during winter 2020/2. Through January 2022, there have been 46 hours of storm force winds in winter 2021/22. ECCC wind forecasts are often inaccurate since the forecast grid cells are much larger than the ridge; however, recent UBC modelling suggested using smaller grid cells increases forecast accuracy. In October 2021, seven additional anemometers were installed to record the winds. Due to the site remoteness, there is limited previous research on Hurricane Alley windstorm. The use of synoptic tools including ECCC analysis charts, and the NOAA HYSPLIT model can help explain the atmospheric conditions responsible for the windstorms.



**Erik Wagenaar**

### **Modelling freshwater contribution to Milne Fiord, Ellesmere Island, NU**

**Key Words: Ice Shelf; Epishelf Lake; Hydrological Modelling**

The breakup of the Milne Ice Shelf in the summer of 2020 was the most recent in an accelerated series of ice shelf collapses on the coast of Ellesmere Island in the last 100 years. It resulted in a loss of 79 km<sup>3</sup> of ice, and the probable drainage the Milne Epishelf Lake, the last known ecosystem of its kind in Canada. This poster will outline the progress of a hydrological modelling project to explore how terrestrial hydrological processes within the Milne Fiord watershed, including glacier melt, have responded to a changing climate, and the role of these processes in ice shelf breakup. The project is an effort to produce a first-order estimate of the Milne Fiord's seasonal freshwater output into the Arctic ocean over the past several decades, by synthesizing existing knowledge of Arctic watershed hydrology through the modelling framework RAVEN, alongside remotely-sensed and gridded reanalysis climate data (ERA5/ERA5L) supported by in-situ observations. This work aims to contribute to a better understanding of the hydrology of Ellesmere's glaciated ocean fiords, their role as transition zone between land- and marine- systems, and the inter-related response of both to climate change.

**Benoît Lauzon**

### **Glacier surge dynamics on western Axel Heiberg Island, Nunavut**

**Key Words: Glaciology; Surging; Remote Sensing**

Surge-type glaciers experience cyclical variations between long periods of slow flow, followed by shorter periods of rapid flow. This study provides the first comprehensive reconstruction of the surge history of Iceberg and Airdrop glaciers, located on western Axel Heiberg Island, since the 1950s. A variety of remotely sensed data were used to quantify changes in terminus position, ice velocities, and ice thickness.

Preliminary results suggest an active phase of ~20 years for Iceberg Glacier, with ice velocities reaching ~1500 m a<sup>-1</sup> in the glacier's lower half, and a > 7 km terminus advance from 1980 to 1997. In contrast, Airdrop Glacier has been continuously advancing since the 1950s, by a total of ~6 km. It has shown little change in ice velocity other than a relatively steady slowdown since the beginning of the 21<sup>st</sup> century. Glacier surface elevation change mapping reveals that ice that accumulates in Iceberg's upper reservoir zone during quiescence is transferred to the glacier's lower receiving zone during a surge. Conversely, Airdrop has encountered constant and significant thickening near the terminus resulting from its advance. These observations confirm that Iceberg is a surge-type glacier, but make it unclear whether Airdrop should also be classified as one.