2013 Ottawa-Carleton Student Northern Research Symposium

Each year, undergraduate and graduate students from Carleton University and the University of Ottawa participate in high-quality northern research studies, both in natural and social sciences.

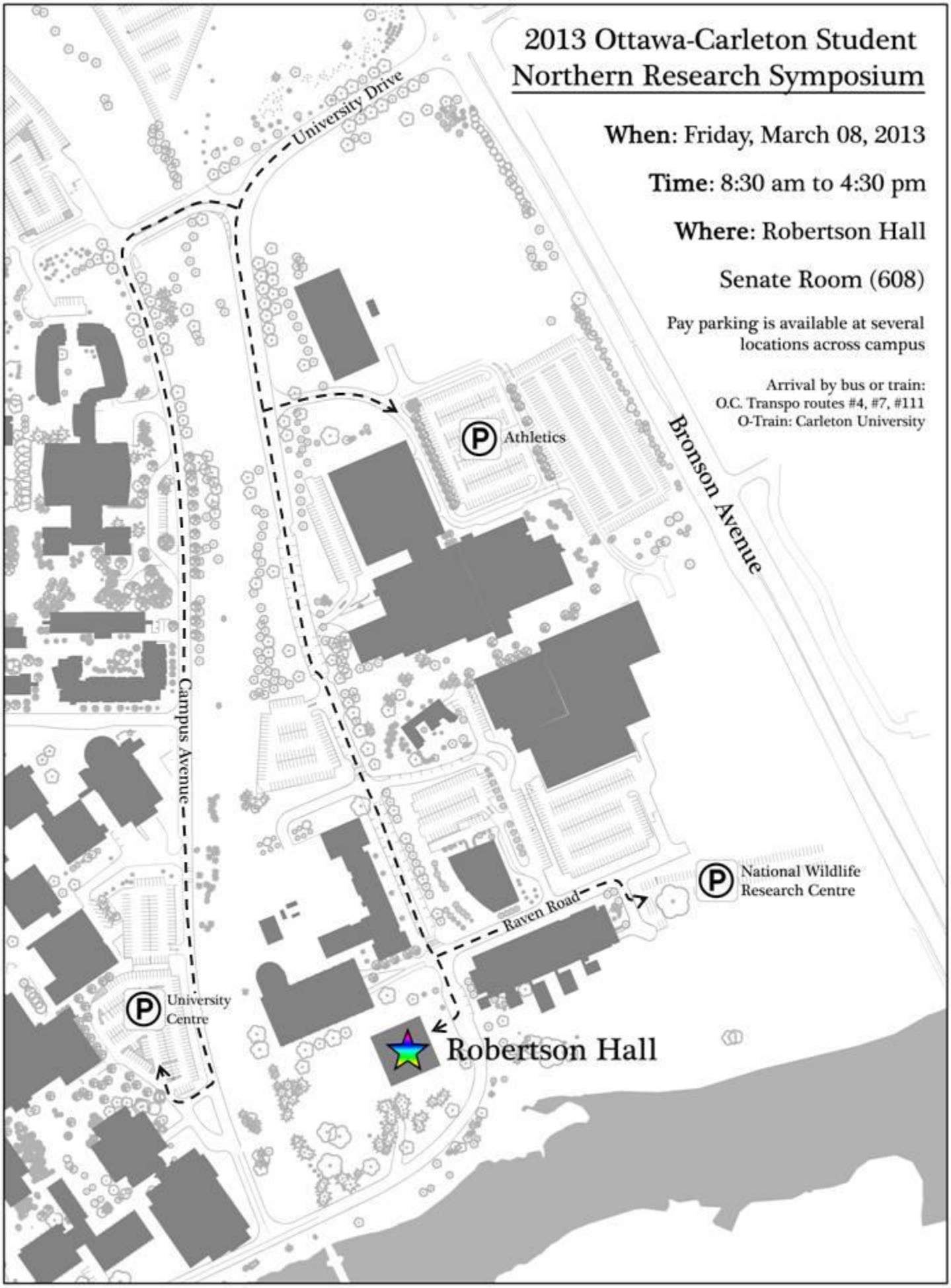
As a platform to showcase our excellence and common interests in northern research, Carleton University is pleased to host the 2013 Ottawa-Carleton Student Northern Research Symposium (OCSNRS).

RSVP is required.

Details at:
http://www3.carleton.ca/northernresearch/OCSNRS.html

8:30 a.m. - 4:30 p.m., Friday, March 8, 2013
Senate Room, 608 Robertson Hall

Carleton UNIVERSITY


2013 Ottawa-Carleton Student
Northern Research Symposium
When: Friday, March 08, 2013
Time: 8:30 am to 4:30 pm
Where: Robertson Hall
Senate Room (608)
Pay parking is available at several locations across campus
Arrival by bus or train:
O.C. Transpo routes #4, #7, #111
O-Train: Carleton University
University Drive
Campus Avenue
Bronson Avenue
Athletics
Raven Road
National Wildlife Research Centre
University Centre
Robertson Hall

The 2013 Ottawa-Carleton Northern Research Symposium (OCSNRS) is taking place at Carleton University, in the Senate Room (608 Robertson Hall), from 8:30am - 4:30pm on Friday, March 8th.

All faculty and students who are conducting northern research at Carleton University and the University of Ottawa are invited to attend this annual student-run conference. While those engaged in northern research are given preference, additional seating may available for those with a general interest in northern research if space permits.

Award-winning photographer Michelle Valberg (http://www.michellevalberg.com/) will be delivering the keynote address. Michelle has traveled to Canada's Arctic more than 25 times and will share some of her work and stories.

The keynote address will be followed by presentations from students in wide-ranging disciplines including anthropology, biology, earth science, geography, and public policy. See the complete schedule of events and abstracts of presenters below. Awards for the best oral presentation and best poster will be presented at the end of the day.

Breakfast snacks, hot and cold beverages, a light lunch, and afternoon snacks will be served:

Breakfast:
Croissants, danishes, cinnamon crunches
Coffee, tea, fruit juices and water

Lunch:
Traditional tea sandwiches (ham, cheddar, egg salad, turkey, tuna salad)
Carrot cake, butter tart bars, Nanaimo bars, brownies, pecan streusel
Coffee, tea, fruit juices, soft drinks, water

Afternoon snacks:
Cheese platter
Fruit and vegetable platters

The 2013 OCSNRS organising committee would like to kindly thank the following bodies for their contributions to the symposium: *the Carleton Faculty of Graduate and Postdoctoral Affairs, the Carleton Department of Biology, and the Carleton Department of Geography and Environmental Studies.*

The committee would also like to thank Dr. Gita Ljubicic for her help facilitating the organization of the symposium, and Michelle Valberg for delivering the keynote address.

Sincerely,
The 2013 OCSNRS organising committee:
Marcus Phillips – Coordinator, Geography
April Dalton – Earth Sciences
Blair Kennedy – Geography
Brendan O'Neill – Geography
Zoe Panchen - Biology

2013 Ottawa-Carleton Student Northern Research Symposium Schedule
March 8th 2013 - Senate Room, 608 Robertson Hall, Carleton University

Morning		
8:30 – 9:05	*Registration, snacks and coffee*	
9:05 – 9:10	Opening remarks	
9:10 – 9:55	Keynote speaker – Michelle Valberg	
9:55 – 10:15	*Coffee break*	
Session 1 – Chair: Zoe Panchen		
	Title	***Presenter***
10:15 – 10:30	Considerations in measuring soil moisture remotely	Koreen Millard
10:30 – 10:45	The history of government-assisted housing in Yukon, 1950-2000	Nick Falvo
10:45 – 11:00	Geochemistry and runoff process in Wolf Creek Research Basin, Whitehorse, Yukon	Tianjiao Li
11:00 – 11:15	Dendroclimatic analysis of *Pinus banksiana* radial growth in Yellowknife, Northwest Territories, Canada	Sarah L. Quann
11:15 – 11:30	Towards a TTOP model of permafrost for the yukon	Alexandre Bevington
11:15 – 11:30	Origins and applied implications of ice-rich clay ridges within the Boundary Creek watershed outside Yellowknife, NWT	Adrian Gaanderse
11:45 – 12:45	**Lunch**	
Session 2 – Chair: Blair Kennedy		
12:45 – 13:00	At the corner of Inuit Street and Kugluktuk Drive: Tracing time and place through the streets of an arctic hamlet	Erin Cummings
13:00 – 13:15	Cascading ecological impacts of climate change: temporal advances in summer sea ice break-up are correlated with increased depredation of colonial-nesting bird eggs by polar bears	Samuel Iverson
13:15 – 13:30	A comparison of Dwarf Birch (*Betula glandulosa*) photosynthetic capacity among low-arctic tundra habitats	Lee Hawkings
13:30 – 13:45	Multi-decadal differences in ground temperatures and permafrost characteristics along the Alaska Highway Corridor	Max Duguay
13:45 – 14:00	Near-surface permafrost in the alluvial fan at Pauline Cove, Herschel Island	Alexandra Zemskova
14:00 – 14:15	*Coffee Break*	
Session 3 – Chair: Brendan O'Neill		
14:15 – 14:30	Adaptation to rapid northern resource development: A case study from Pond Inlet, Nunavut	Roger Ritsema
14:30 – 14:45	Parasites and pollution; why both matter in northern marine bird conservation	Jennifer Provencher
14:45 – 15:00	The High Arctic Large Igneous Province: geochemical, isotopic and tectonic significance of the Walker basalts of the Isachsen Formation, Axel Heiberg Island, Nunavut Canada.	Cole G. Kingsbury
15:00 – 15:15	Eastern versus Western Canadian Arctic ice islands: Deterioration modes and sea ice concentrations	Anna Crawford

Session 4 – Posters

15:15 – 16:30	Poster session and snacks	
	Thaw Slump Initiation & Propagation in the Richardson Mountains, N.W.T., using a Remote Sensing Approach	Alex Brooker
	Spatio-temporal (1986 to 2012) mapping of aufeis in the Richardson Mountains, Northwest Territories and adjacent northern Yukon Territory	Phillippe Brasseur
	How spatially representative are meteorological station data in arctic and alpine environments?	Michelle Chaput
	Lake level fluctuations and its impact on bison habitat: a climate reconstruction of the Fort Providence region, NWT.	Peter deMontigny
15:15 – 16:30	A 40-year record (1970-2010) of air temperature variations reconstructed from stable water isotopes and melt layers measurements from Agassiz Ice Cap, Canadian high Arctic	Brittany Main
	Open Water Leads Along Northern Ellesmere Island, Nunavut, Canada.	Miriam Richer McCallum
	Recent lake expansion and influence on mercury concentration in lake sediments, Mackenzie Bison Sanctuary, Northwest Territories, Canada	Joelle Perreault
	Hydrological and Geochemical Impact of Retrogressive Thaw Slumps on Streams, in the Richardson Mountains, NWT, Canada (a thesis proposal)	Catherine Paquette
16:30	Awards reception and closing remarks	

2013 OCSNRS ABSTRACTS

Towards a TTOP Model of Permafrost for the Yukon

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Oral Presentation

Changes in the distribution and characteristics of permafrost are expected to become increasingly evident as the climate warms. Predicting these impacts across a spatially variable landscape is challenging, particularly in mountain environments which have a high degree of spatial heterogeneity. This research will create high-resolution spatial predictions for various climate scenarios using the "Temperature at the Top of Permafrost" (TTOP) model, a physically based equilibrium model. The TTOP model uses scaling factors between the air (Ta) and ground surface (Ts) temperatures (n-factors), and between Ts and ground temperature at the top of permafrost (if present) (Tg) (rk values). N-factors are influenced by vegetation in summer (nt) and snow cover (nf) in winter, and rk values (thermal diffusivity) are influenced by soil type and the amount of seasonally frozen and unfrozen moisture.

Ta for the Yukon will be modelled by spatially interpolating between measurements made at about 100 climate monitoring stations and at about 50 Environment Canada weather stations using topographic information derived from a high-resolution digital elevation model and surface temperature lapse rates. N-factors and rk values will be assigned to each pixel of the modelled air temperature surface using high resolution vegetation maps from the Land Cover Clasification-2000 dataset (http://geogratis.gc.ca/) and surficial geology maps at different resolutions from the Yukon Geological Survey. The predicted values of Tg will indicate the presence or absence of permafrost under current climate, and the climate field will then be perturbed to examine the impact of long-term warming. These predictions will be compared to statistical modelling of the probability of permafrost done previously for the region using the Basal Temperature of Snow method.

Spatio-temporal (1986 to 2012) mapping of aufeis in the Richardson Mountains, Northwest Territories and adjacent northern Yukon Territory

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Poster Presentation

From the year 1986 to 2012, aufeis in the Richardson Mountains and in northern Yukon Territory were mapped using Landsat images taken from the month of June. Only the years with the least amount of cloud cover were used to conduct this study. For every available year, the surface area of aufeis was traced and their surface area was calculated. In total nineteen aufeis were studied in this research, seven from northern Yukon and twelve from the Richardson Mountains. Climate data from three weather stations in the surrounding areas (Inuvik, Old Crow and Fort McPherson) was used to study the effects of the warming climates on aufeis. Key findings are the following. The period of study (1986 to 2012) is the warmest since the 1960. Mean summer air temperatures (MSAT) in the western Canadian Arctic remain stable and the station in Inuvik show a slight decrease in MSAT. In contrary, mean winter air temperatures are increasing in all three stations in western Canadian Arctic. As a climate index for warmth, the thaw degree days (TDD) of May and June were used for the research. The TDD of May-June show that spring is getting colder in Fort McPherson, warmer in Old Crow and remain constant in Inuvik. The size of the aufeis studied in this research show a strong correlation with the TDD of May-June. The results indicate that the aufeis are consistent in size through the period of 1986 to 2012.

Thaw Slump Initiation & Propagation in the Richardson Mountains, N.W.T., using a Remote Sensing Approach

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Poster Presentation

This thesis aims to better understand the precise processes through which thaw slumps initiate and propagate in the Richardson Mountains, Northwest Territories. This thesis will use a remote sensing approach, incorporating air photos, high-resolution satellite imagery, as well as a new method of Landsat change detection mapping, which calculates the vegetation indices change of each pixel from a stack of Landsat images. This map was created for the Cumulative Impacts Monitoring Program (CIMP) and is comprised of 151 Landsat scenes, which provides medium scale resolution (30m) of disturbance mapping over an area of 85,000km^2, in the Mackenzie valley region. This novel method provides an efficient way of locating slumps as well as determining whether the slump is active or re-vegetating. One hypothesis that will be examined in this thesis is whether debris flows of existing slumps can be responsible for the creation of new slumps upstream, due to local damming of stream water, as well as investigating the effect of topography on slump formation. Preliminary observations of high-resolution (Ikonos and Quickbird) satellite imagery, as well as the Landsat change detection map support this hypothesis.

How spatially representative are meteorological station data in arctic and alpine environments?

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Poster Presentation

There are few meteorological stations in the Canadian Arctic and it has been questioned whether these few sites can adequately characterize the temperature regime of arctic and alpine regions. This study is an analysis of hourly and daily temperatures from 16 HOBO data loggers along a 280 km transect from northern British Columbia to southwestern Yukon. Scatter plots, time series plots and seasonal-trend decompositions revealed very high correlations between all data series at these time-scales, suggesting local temperatures are predominantly determined by synoptic-scale weather patterns. Long-term trends between logger and standard meteorological station data were almost identical. Microclimate effects produced only slight changes in temperature trends across a latitudinal gradient, and the onset of synoptic-scale events occurred within hours of each other at the different sites. These results suggest temperatures can be estimated across the landscape in this region using the available meteorological records.

Eastern versus Western Canadian Arctic ice islands: Deterioration modes and sea ice concentrations

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Oral Presentation

The 2008 break-up of the Ward Hunt and Markham ice shelves (Northern Ellesmere Island) and the 2010 calving of the Petermann Glacier (Northwest Greenland) both resulted in over 200 km^2 of freely drifting ice islands (large, tabular icebergs). Climate change induced break-up of Arctic ice features has caused an increased occurrence of ice islands in Canadian waters and for offshore activity to intensify in areas overlapping with typical drift tracks. Ice islands are hazards to infrastructure and an operational, ice island deterioration model has yet to be developed. To aid in this process, the deterioration of seven ice islands between the Eastern and Western Canadian Arctic (ECA and WCA) was quantified with satellite imagery analysis (RADARSAT-2) (surface area) and radar measurements (volume). Three deterioration modes, utilized for Antarctic icebergs, were determined appropriate for Arctic ice islands. The deterioration mode (edge-wasting, break-up or disintegration) is related to the concentration of sea ice in contact with the ice island's perimeter (determined through spatial analysis with Canadian Ice Service ice concentration charts). Edge-wasting and break-up events, such as Petermann Ice Island-B's 20 km^2 (33% loss in extent) break-up event (ECA), occurred in light-ice conditions. Due to differences in time spent in open water conditions annually (up to 31% – ECA versus 0% – WCA), WCA ice islands exhibited fewer large deterioration events (edge-wasting or break-ups). This has implications for the risk assessment and management of ice hazards between the two regions and will contribute to the further development of ice island deterioration models.

At the Corner of Inuit Street and Kugluktuk Drive: Tracing Time and Place through the Streets of an Arctic Hamlet

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Oral Presentation

Contemporary social science research in the Canadian Arctic operates within a tradition of focusing on the knowledge of elders as the spokesperson's for Inuit knowledge and identity. It seems that our interest as academics, and as members of the public, remains firmly rooted in essential images of Inuit as peoples who live on the land and move with the seasons. When the hamlet is made the focal point of analysis, there is a strong tendency to construct permanent settlements in opposition to the land – as somehow bound by time and space as a place that is both uniquely 'modern' and removed from the surrounding Arctic landscape. Drawing from four months of field research in the hamlet of Kugluktuk Nunavut, I will enter into a discussion of the hamlet as part of wider Arctic environments and histories. By focusing on the narratives of young Inuinnait whose daily lives and movements are often limited to the hamlet, I hope challenge false dichotomies that depict tradition, modernity, settlement, and landscape as separate and oppositional. This work will contribute to dismantling essentialist images of 'authentic' Inuit identity by focusing on contemporary realities, aspirations, and priorities of young Inuinnait. I hope to create a narrative of daily life that moves down streets and rock strewn tundra, store aisles, sea ice and hallways – revealing the ways in which the hamlet is inextricably connected to wider landscapes of time and place, while reflecting the complex realities and connections that shape life in the Arctic settlement.

Lake level fluctuations and its impact on bison habitat: a climate reconstruction of the Fort Providence region, NWT.

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Poster Presentation

Lake area is dramatically increasing across the Great Slave Lowlands north of Fort Providence, NWT. Encroaching on wood bison (Bison bison athabascae) habitat, lake expansion is forcing bison to migrate out of the core region of the Mackenzie Bison Sanctuary (MBS). Until recently, the MBS population was one of the largest free-ranging and disease-free bison herds in Canada. To the southeast in Wood Buffalo National Park, bison populations are infected with bovine brucellosis (Brucella abortus) and tuberculosis (Mycobacterium bovis). Interaction between these herds could introduce widespread infection.

Lake level expansion is often driven by changes in climate, however climate data for this region are limited. Dendrochronology can be used to extend instrumental data records. We developed tree ring chronologies from seven white spruce (Picea glauca) sites. Correlations were highest between the tree ring chronologies and the Palmer Drought Severity Index, a climate indicator which incorporates aspects of both temperature and precipitation. Climate has gradually become wetter within the study area, with an overall increasing trend from 1915 to present.

Multi-decadal differences in ground temperatures and permafrost characteristics along the Alaska Highway Corridor

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Oral Presentation

Permafrost temperatures were measured in 1977-1981 at boreholes along a proposed pipeline route in the southern Yukon. Since then, mean annual air temperatures in the region have risen by 0.5-1.0˚C. Renewed interest in the pipeline has meant that information on permafrost and geotechnical conditions must be updated. To accomplish this goal, a total of eight boreholes ranging in depths of 5-9 m were located, unblocked of ice and instrumented with thermistor cables and RBR data-loggers to permit renewed ground temperature monitoring. Manual temperature measurements were also taken at four other shallow boreholes. Thermal monitoring from August 2011 to August 2012 shows an average increase of 0.5-1.0˚C when compared to the original1978-1981 ground temperatures. ERT surveys conducted at most borehole site show observable thawed ground where the cleared cut-line used for geophysical work in the 1970s is crossed. These results indicate the impacts of climate change and environmental change in the study area over the past three decades. They appear to match the relatively slow rates of ground warming observed elsewhere in northern Canada where permafrost temperatures are close to 0˚C and where warming also requires changes in latent heat due to internal thaw (Smith et al., 2010).

The History of Government-Assisted Housing in Yukon, 1950-2000

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Oral Presentation

Relative to southern Canada, a lack of affordable housing and high rates of homelessness are very common in Canada's North. This is especially the case outside of regional centres, and this affects Aboriginal persons at much higher rates than non-Aboriginal persons.

This research (still in its early stages) will provide a broad overview of key historical developments pertaining to the provision of government-assisted housing in Yukon. Methodologically, the research will consist of a literature review as well as semi-structured interviews with Elders and retired public servants. This research will complement a similar article being written by the same authors on the history of government-assisted housing in the Northwest Territories (with a focus on the western part of that territory).

Both of these articles form a historical backdrop to other research carried out by Mr. Falvo which can be found here:
www.homelesshub.ca/NWT.

Origins and applied implications of ice-rich clay ridges within the Boundary Creek watershed outside Yellowknife, NWT

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Oral Presentation

Newly discovered features within the Baker Creek watershed outside Yellowknife, NWT are ice-rich clay ridges. The ridges' raised topography in relation to its surroundings may be attributed to the formation of deep-seated ground ice within the clay subsurface. One ridge adjacent to Highway 3 was studied intensely. Evidence of sediment heave at this site was found from multiple lines of evidence including borehole cryostratigraphy to 8 metres and preliminary results from geochemical analysis. The origin of the ridge appears to stem from sediment deposition after glacial retreat, followed by the ice segregation process. The build-up of underground ice created an ice-based core and heaved the fine-grained glaciolacustrine sediments deposited by Glacial Lake McConnell to produce the raised formation currently seen at the study area.

Evidence of the ridges' incipient nature includes unfrozen clays between ice layers in the ice-based core, suggesting the free movement of unfrozen water toward the ice-based core via cryosuction may still be occurring. The ridge is adjacent to a peat land interpreted to have developed in a pond basin, as well as a current pond, thus enabling a water source for cryosuction to occur.

Due to the proximity of these ridges to highway infrastructure in the area and the known problems of highway subsidence in the area, the results of this study can provide important information to engineers and road builders when planning future routing of roads in the region.

A comparison of Dwarf Birch (Betula glandulosa) photosynthetic capacity among low-arctic tundra habitats

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Shrub encroachment has been documented in many arctic regions and is predicted to continue as the climate warms. Dwarf Birch (Betula glandulosa) is a dominant shrub in Canadian low Arctic tundra regions and may become increasingly abundant. With increasing shrub cover, total leaf area of the tundra is expected to increase and may be associated with an increase in Gross Ecosystem Production (GEP). Here we examine the photosynthetic capacity and respiration of Dwarf Birch to examine if there is any variation in GEP among low Arctic habitat types. This will help us evaluate if habitat is a confounding factor in the relationship between leaf area and GEP for these shrubs. Data was collected at the Daring Lake Tundra Ecosystem Research Station, NWT in Summer 2013 on replicated plots within four habitats including esker slope, heath, birch tussock, and fen. Branch level chamber techniques and leaf area data were used to quantify CO_2 exchange and derive GEP regularly during the growing season with concurrent measurements of soil temperature, soil moisture, active layer depth, and vegetation characteristics. Soil samples were collected for characterization of grain size, organic matter content and nutrient availability. We found that shrubs growing in birch tussock habitat had significantly higher GEP than the other three habitats. This is likely due to the deep organic soils and high soil moisture content. These findings will aid in interpreting variations in ecosystem-scale CO_2 exchange as shrub abundance changes.

Cascading ecological impacts of climate change: temporal advances in summer sea ice break-up are correlated with increased depredation of colonial-nesting bird eggs by polar bears

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Oral Presentation

Polar bears (Ursus maritimus) are adapted to use sea ice as a platform to hunt seals and other marine mammals. In some Arctic regions advances in the seasonal break-up of sea ice have reduced the amount of time available to bears to capture seals and amass the fat reserves they require to sustain themselves on shore during the ice-free season. Longer periods on shore could lead to an increased use of alternative food resources by bears. In this study, we examine polar bear predation of common eider (Somateria mollissima) and thick-billed murre (Uria lomvia) nests in the Canadian Arctic. Observations from two long-term research stations indicate that bear sightings during birds' nest incubation period have become more numerous and that the presence of bears is negatively correlated with early summer sea ice coverage. We supplemented these observations with data collected at >200 eider colonies in Hudson Strait, which were visited during the summers of 2010 through 2012. These years had among the lowest early summer sea ice coverage estimates on record in our stud area. Bear sign was observed on more than a third of eider colonies and documented a significant reduction in nesting success when bears are present. Nest depredation by polar bears is an emerging conservation concern for colonial nesting birds in a rapidly warming Arctic.

The High Arctic Large Igneous Province: geochemical, isotopic and tectonic significance of the Walker basalts of the Isachsen Formation, Axel Heiberg Island, Nunavut Canada.

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Oral Presentation

Regionally extensive volcanic rocks and associated upper-level intrusive igneous rocks of Cretaceous age (130 – 80 million years) occur on Axel Heiberg Island and Ellesmere Island, Canada as well as Greenland, Svalbard, Franz Josef Land and Bennett Island, Russia. The present day distribution of these rocks is thought to be the result of intervening tectonic activity that dismembered a once contiguous High Arctic Large Igneous Province (LIP). In Canada, the High Arctic LIP is associated with the development of the Mesozoic Sverdrup Basin sedimentary sucession. Owing to its remote circum-Arctic location, the High Arctic LIP is poorly understood relative to other Mesozoic LIPs globally (e.g. Parana – Etendeka LIP, Ontong – Java oceanic plateau, Central Atlantic Magmatic Province).

The present study aims to expand the very small number of highly precise age determinations together with field and geochemical studies that will (1) help constrain the timing of Canada Basin opening, (2) characterize the geochemistry and volcanology of the Walker Basalts, and (3) assess potential for nickel – copper –platinum group element prospectivity.

Geochemistry and Runoff Process in Wolf Creek Research Basin, Whitehorse, Yukon

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Oral Presentation

Hydrometric and hydrogeochemical data, including isotopic data, were used to study runoff process in the Wolf Creek Research Basin located ~15km away from Whitehorse, Yukon. Surface water, groundwater and precipitation samples were collected from April to October 2012. δ18O, δ2H and geochemistry of Wolf Creek indicated a mixing trend among groundwater, soil water and precipitation. Weathering ions showed a similar relationship versus time, which may be due to variations in discharge during the melting season. This preliminary conclusion can be verified once the discharge data from this past summer become available. The discharge data can also be used for hydrograph separation to determine the contribution of groundwater quantitatively to the stream during the melting season. There are also samples of noble gases collected in springs and wells waiting for analyzing to help determine the recharge temperature of groundwater. Experiments on 14C may be conducted as well to study the carbon flux within the watershed combining δ13C, DIC and DOC values.

A 40-year record (1970-2010) of air temperature variations reconstructed from stable water isotopes and melt layers measurements from Agassiz Ice Cap, Canadian high Arctic

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Poster Presentation

Since the late 1970s, e core drilling campaigns have been undertaken at the Agassiz Ice Cap (Ellesmere Island, NU; 1977, 1978, 1987 and 1988) These studies measured melt layers, solid conductivity (ECM), stable water isotopes and pollens in the ice cores in effort to provide valuable information about climatic and environmental change over the last 15,000 years (e.g. Koerner and Fisher, 1982, 1990; Koerner et al., 1988; Fisher et al., 1983; Bourgeois, 1986; Fisher and Koerner, 1988; 1994). The objective of this study is to update the d18O and melt layer record from Agassiz Ice Cap using a shallow 16 m ice core drilled in 2010 by James Zheng and the Glaciology Program of Geological Survey of Canada as part of an IPY project. The sampled core includes a section of overlap with previous records, which correspond to the 1950-70's period. The analysis of melt layers and d18O, proxies for air temperature, will help to understand the rates and trends at which air temperature has changed over the past 40 years on northern Ellesmere Island, NU. The measurements of 18O (and D) will be performed using a LGR liquid water isotope analyzed coupled with an LC-PAL autosampler; while the presence and thickness of melt layers in the ice-core was determined in the field by J. Zheng and the dataset will be analyzed as part of this project. The results will be directly compared to previous cores obtained from Agassiz Ice Cap, which will allow us to assess the magnitude of the recent climate change relative to the last 15,000 years. Comparisons of the results will also be made with other high Arctic ice cores, the Prince of Wales ice sheet and Devon ice caps, to depict a regional picture of recent changes in air temperature.

Open Water Leads Along Northern Ellesmere Island, Nunavut, Canada.

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Poster Presentation

Observed open water leads along the northern coast of Ellesmere Island have been observed during the past decade and have been subject of great interest in relation to recent ice shelf calving events. The purpose of this study is the observation of the occurrence of these leads and the factors that have been contributing to these events. Weekly Canadian Ice Service Digital Archive (CISDA) and MODIS satellite images of northern Ellesmere Island since 1997 were analyzed to quantify the temporal and spatial occurrence of open water leads. The CISDA classify sea ice concentration in tenths, although only the sea ice concentrations that comprise open water were considered. For the purpose of this study, three types of sea ice concentration were identified: (1) Open Water, consisting of open water and bergy water with concentrations <1/10, (2) Very Open Drift, consisting of concentrations from 1/10 to 3/10, and (3) Open Drift, consisting of sea ice concentration of 4/ to 6/10.

Open water leads were first observed during the summer of 1999 and were detected every summer until 2011, with the exception of 2006. These leads have been observed in higher concentration along Nansen Sound up past Ayles fjord however, numerous observation have been made as high as Alert. These observations were made during the summer melt season and the 13 year record of open water leads shows an interannual variability in the sea ice concentration along the shore line. The majority of the leads were observed during the month of August and September. Although, the data shows that these events are occurring earlier in the summer melt in June and July.

These open water leads have been observed in result of record low Arctic sea ice extent and generally during periods of strong positive Arctic Oscillation phase during the winter freeze-up and strong negative phase during the summer melt season. Factors that have been associated with the occurrence of these leads are rising surface air temperatures and persistent winds offshore and parallel to the coast-line. Open water leads have been associated with late summer ice shelf calving events which occurred in 2002, 2005, 2007, 2008, 2010, and 2011.

Considerations in Measuring Soil Moisture Remotely

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Oral Presentation

Soil moisture is temporally and spatially variable, both vertically and laterally, due to the heterogeneous properties of soil, topography, land cover and the spatial variability of rainfall and evapotranspiration. Accurate modeling of many hydrological and climatological processes depends on accurate spatial characterization of soil moisture and quantifying its spatial variability is crucial to understanding the climate and global carbon cycle. Synthetic Aperature Radar (SAR) remote sensing has shown great promise in the measurement of soil moisture from space due to the sensitivity of these sensors to the dielectric constant of its targets (Anderson & Croft, 2009). SAR is an active remote sensing technique, meaning it does not require illumination from the sun, and is not affected by clouds and is therefore particularly useful in northern locations. However, no method to measure soil moisture remotely has yet been operationalized due to the complexity involved in differentiating the effects of surface roughness and vegetation from soil moisture on SAR backscatter, issues of scale and a lack of spatially variable field validation data. This presentation discusses an assessment of SAR imagery and field data from the summer of 2012 in the sub-arctic peatlands surrounding the Victor Debeers Mine (northern Ontario) and highlights some important considerations to be made in field data sampling for soil moisture investigations from remotely sensed data.

Hydrological and Geochemical Impact of Retrogressive Thaw Slumps on Streams, in the Richardson Mountains, NWT, Canada (a thesis proposal)

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Poster Presentation

Retrogressive thaw slumps are landslides occurring following the degradation of permafrost. The growth of these features results in an increase of organic and inorganic matter in fluvial systems. The changes in the geochemical composition of the water have immense effects on the hydrology of the watershed as well as on aquatic ecosystems.

The objective of this poster will be twofold. Firstly, it will include a GIS aspect where locations of active and stabilised slumps will be shown, based on analysis of aerial imagery. I will show, at a regional scale, the effects of slumps on streams in the Richardson Mnts, NWT. This will be done by using an existing database on stream geochemistry across the Richardson Mnts. The analysis should allow the identification of streams having been impacted by slumps in the past through the use of a geochemical tracer (sulfate to chlorine ratio) whose presence indicates streams having been affected by slumps.

Secondly, as the project is a master's thesis proposal, the poster will highlight future studies planned. This includes updating the previously mentioned stream geochemistry database by sampling and analyzing streams in this region in summer 2013 and adding a more hydrological angle to this study by attempting to quantify the annual flux of ions and dissolved sediments travelling in streams impacted by slumping. It will be then possible to infer the total amount of matter transported by such streams in the entire region and eventually reaching the Mackenzie Delta"

Recent lake expansion and influence on mercury concentration in lake sediments, Mackenzie Bison Sanctuary, Northwest Territories, Canada

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Observational evidence suggests that the extent of many lakes in the Mackenzie Bison Sanctuary (MBS) have increased during the last few decades, flooding large tracts of forest. Previous research in other locations has shown that flooding of vegetative terrestrial material can lead to mobilization of mercury (Hg) in aquatic environments. Cores from the central basin of five lakes in the MBS were recovered in the spring of 2012 to test the hypothesis that lake expansion and flooding of terrestrial vegetation will cause Hg concentrations to increase in these lakes. Select intervals within these sediment cores have been analyzed for changes in total Hg concentrations, as well as determining organic carbon and total nitrogen in sediments, as the ratio of C:N can provide an indication of the source of organic matter to lake sediments. Sediment cores from two expanding lakes (Falaise and 'Jackie') have been dated using ^{210}Pb techniques, allowing us to estimate sediment accumulation over time.
Mercury concentrations in Falaise Lake were relatively stable from 1970 to ~2000, and then increased until 2012 (30 to 33 ng g^{-1}). 'Jackie' lake concentrations have increased sharply since ~1990 (25 to 45 ng g^{-1}), which coincide with increased sedimentation over that time period. The C:N ratio for both Falaise and Jackie lakes have decreased over time, suggesting an increase in the importance of algae in the origin of organic matter. Similar changes in the source of organic matter were not inferred in the lakes which have not undergone expansion, suggesting C:N ratio may be an important tool for tracking previous water level fluctuations.

Parasites and Pollution; why both matter in northern marine bird conservation

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Both derived traits and environmental factors can shape the schedules of survivorship and reproduction of wild organisms. In migratory animals these traits can be especially important as they balance the costs and benefits of undertaking long range migrations to breeding areas to take advantage of seasonal resources. In ecosystems that are undergoing rapid change, such as the Canadian Arctic, it is increasingly important to understand how external factors influence reproduction; particularly in terms of how environmental changes might impact populations. Contaminants such as mercury are of growing concern in the Arctic because they are known to affect animal health, and levels are increasing in some Arctic regions. Concurrently, changing climatic conditions are predicted to increase the number and diversity of parasites found in wildlife within northern ecosystems. In addition to changes in both mercury and parasites, these two factors may interact in complex ways. For example, parasites are known to mitigate the effects of some contaminants in wildlife, while exacerbating them in others. Thus, understanding how contaminants and parasites may influence reproduction is important to conserving and managing arctic wildlife species. My PhD research investigates questions regarding how both mercury and parasites, separately and together, influence adult body condition and reproduction in an arctic seabird (the northern common eider duck; Somateria molissima).

Dendroclimatic analysis of Pinus banksiana radial growth in Yellowknife, Northwest Territories, Canada

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Knowledge of climate-growth relations is critical to understanding the responses of boreal forests to climate variability. Jack pine (Pinus banksiana Lamb.) is one of the most widely distributed conifer species in the high northern latitudes of North America, making it ideal for research involving regional climate analysis. Analyses of annual ring width are often used to evaluate the relationship between climate and tree growth, however, separating the annual ring into its component earlywood and latewood widths allows for detailed intra-annual analysis of this relationship. Jack pine samples retrieved from 12 sites near Yellowknife, Northwest Territories were used to develop earlywood, latewood, and total ring-width chronologies in order to determine which climate parameters are associated with the formation of each component. Statistical analysis of the relationship between these chronologies and temperature, precipitation, and PDSI was undertaken to improve understanding of the relationship between tree growth and climate. The total ring-width chronologies correlated significantly with June and cumulative June-July precipitation. All earlywood chronologies exhibited strong positive correlations with June precipitation and 75% had negative correlations with August temperatures of the previous growing season. The latewood chronologies were most strongly correlated with combined June-July precipitation, followed closely by July precipitation. Temperature and PDSI were more weakly correlated with growth than precipitation for all chronologies at all sites, indicating that moisture may be the limiting factor for tree growth in this region. These results indicate that analysis of the earlywood and latewood components of annual tree rings allows for detailed inferences concerning climate trends.

Adaptation to Rapid Northern Resource Development: A case study from Pond Inlet, Nunavut

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Oral Presentation

With climate change influencing increased access to remote Arctic resources, there has been a substantial increase in development activity. One such case is the Mary River Project, an open pit iron ore mine currently in construction and slated to be in operation for over 20 years. Due to the mine's proximity to Pond Inlet (160kms) the community will likely see significant economic opportunities. Established land claim agreements and Impact Benefit Agreements mean that local people are well positioned to benefit from development in ways that are culturally compatible and locally desirable. However, exactly how these benefits will manifest at the local scale remains unclear. Drawing on climate change adaptation literature and on indicators of successful economic development such as the Harvard Project on American Indian Development, the Berger Inquiry, and others, my thesis research uses a case study of Pond Inlet with the objectives to:

1. Assess the community vision for prosperity.
2. Examine challenges and barriers to desired opportunities.
3. Identify adaptation strategies to overcome constraints.

Qualitative research methods will be used to conduct approximately 25 semi-structured interviews with key informants in Pond Inlet and Iqaluit in June 2013. Results from the project will be the basis for an article for at least one journal publication and will also be communicated to Pond Inlet residents through a town hall meeting in the community and a community report. I am currently in the proposal phase of my thesis project and am seeking input and feedback prior to proposal defense."

Near-surface permafrost in the alluvial fan at Pauline Cove, Herschel Island

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This research studied characteristics of and detected differences between syngenetic aggradational permafrost in an alluvial fan and epigenetic permafrost in the adjacent upland terrain at Pauline Cove, Herschel Island (69^{o} 35' 20" N and 139^{o} 05' 20" W), which is nearly entirely underlain by permafrost. The main differences between the two permafrost types are in the amount of ice (excess ice) and sediment composition (particle size and amount of organic content).

Field work in summer 2012 included drilling of 33 boreholes in an alluvial fan with syngenetic permafrost and two upland sites with epigenetic permafrost, as well as a geological survey of the area. Collected samples were analyzed to determine the gravimetric moisture content and excess ice content. Some of the samples will also be processed to determine organic matter content and grain-size distribution. The obtained data supported previous research on Herschel Island permafrost by Burn and Zhang (2009), who stated that mean excess ice content of the uppermost permafrost of nearby Collinson Head was 47%, and described an ice-rich zone directly below the base of the contemporary active layer with a moisture content of up to 100% at depths of up to 60 cm below the base of the active layer.