The Arctic Institute of North America presents the 2015–2016

Arctic Speaker Series

NSTP Student Symposium Abstracts

Wednesday, September 23, 2015

Colleen Hughes

***Nunami* ("on the Land"): Learning and Living Place Names in South Kivalliq, Nunavut.**

Place names are a valuable resource to understanding how people have interacted and experienced the land. The names can be descriptive, signify important events, provide direction, and so on. The learning aspect of the project relates to the experiences of working with Arviat Elders and community members. This included meeting with the local Hunters and Trappers Organization to introduce them to a new project using photospheres to capture the landscape. It also included spending time on the land with different Elders. The living aspect of the presentation discusses the relationships between named places, archaeology and being *nunami*

Sarah St. Germain

The Evolution of Supraglacial Stream Canyons

Supraglacial streams are a significant part of the glacial hydrological system and important for understanding the connection between glacial hydrology and glacier dynamics. A supraglacial stream channel incises when the streambed erosion is greater than the ablation rate of the surrounding glacier. Typically, supraglacial streams vary in size from a few centimeters to several meters in depth. However, on Bylot Island, Nunavut, two supraglacial streams have eroded canyons up to 25 m deep and 90 m wide into Fountain Glacier.

The aim of this research project is to understand the evolution of these unique canyons. During the summer of 2015, canyon metrics were collected and orthophotos were created. Results show that within 750 m of the Fountain Glacier terminus the two canyons have an average depth of 20 m and 15 m. Interestingly, a comparison between an orthophoto from 2011 shows that unlike terrestrial river canyons, these supraglacial canyons have the ability to

change position and alter in shape very rapidly. This can include forming englacial conduits, abandoning their channel on the surface and leaving behind isolated oxbows and supraglacial lakes.

Megan D. Goulding

Changing resource allocation: White spruce of the southwest Yukon and their interactions with spruce beetles, *Dendroctonus rufipennis*

Conifers primarily defend themselves against herbivory with carbon-based defenses such as terpenes. These defenses may be costly for the host tree with respect to the amount of carbon that is allocated towards them, and because there is a finite amount of carbon available there is expected to be trade-offs between what is allocated to defense, growth, and reproduction. Spruce trees also exhibit masting behavior, meaning that seed production in some years can be very high and low in others. This system provides an excellent opportunity to examine the effects of masting-caused alterations of carbon availability on plant defense. A key herbivore of spruce is the spruce beetle (*Dendroctonus rufipennis*), best known for a major outbreak that occurred in the southwest Yukon between 1990 and 2007. Through retrospective analysis of growth and resin ducts in tree cores, we will examine how white spruce (*Picea glauca*) allocation of carbon to growth, reproduction, and defense affected spruce beetle attack and the subsequent survival of trees. These analyses will provide novel information in terms of both basic and applied ecology, and provide new insight on tree survivorship and bark beetle-host interactions.

Sarah Cole

Developing Remote Sensing Tools for Mapping Linear Disturbances in the Sahtu Region of the Northwest Territories

Background and Relevance: Boreal forest regions across Canada are under increasing pressure from human development related to natural resource extraction. Roads, seismic lines, well sites, cut blocks, pipelines, and other elements of human disturbance exert cumulative environmental effects that can harm biodiversity, water quality, and the habitat of threatened species such as woodland caribou. The Sahtu region of the Northwest Territories has significant untapped opportunities for natural resource development, including shale oil and the proposed Mackenzie Gas Project. Territorial officials contemplating these scenarios require a comprehensive understanding of the environmental impacts of current and proposed future development. However, there is currently a lack of detailed information on the location, identity and vegetative state of human disturbance features related to petroleum

development in the region. This in turn hinders the capacity to adequately assess the effects of these disturbances on woodland caribou, and make informed regulatory decisions on future resource development. Modern remote sensing tools have been shown to provide an effective foundation for mapping and characterizing linear disturbances, but have never been applied systematically in the Sahtu region.

Research Objectives: The primary goal of this research is to develop remote sensing tools and protocols for mapping linear disturbance features in a northern Boreal environment. In order to achieve this goal, three objectives have been identified: (i) compare the capacity of various remote sensing data sources to characterize linear disturbances, (ii) develop remote sensing protocols for mapping the occurrence and characterizing the attributes of linear disturbances that are suitable for use across large areas of Boreal forest, and (iii) produce map layers that accurately portray the location and physical attributes of linear disturbances in the Sahtu.

Methods: In order to analyze the capacity of the different remote sensing sources for characterizing linear features, a variety of image-based metrics will be developed. Spectral metrics (e.g., NDVI, texture transformations) will be extracted from high-resolution Quickbird, mid-resolution SPOT and low-resolution Landsat to provide visual patterns and structural metrics (e.g., average height of vegetation) will be extracted from high-density airborne LiDAR data. Field data on the location, type, physical dimensions (i.e., seismic line width), and various vegetative characteristics (i.e. successional stage) will be collected from UAV aerial imagery in order to calibrate and validate the remotely sensed data. Samples will be collected across gradients of land cover (forest type, upland, and wetland) and disturbance age to ensure that the sample features represent the maximum range of variability. A series of empirical models will be built using vegetation characteristics as dependent variables, and the various remote sensing metrics as the independent variables to determine which dataset provides the best foundation for mapping linear human disturbance features in this northern boreal environment.

Anticipated Contributions: The approaches developed here will enhance our capacity to map human disturbances in the Sahtu region, and support ongoing efforts to understand the environmental effects of resource extraction in Canada's north.

Laura Kaupas

Roosting behaviour of reproductive northern long-eared bats in northern Canada

There are few studies on tree-roosting bats above 55°N latitude. At northern latitudes, bats experience cool temperatures and limited foraging time due to short summer nights. The purpose of this study was to examine roost and site selection in the endangered northern long-eared bat (*Myotis septentrionalis*) at the northern extent of its range, to determine if they exhibit roosting behaviours that minimize the impacts of cool temperatures and limited foraging time. Reproductive females may be living in larger colonies, and in trees that allow for high solar exposure, to decrease thermoregulatory costs. I captured and radio-tracked reproductive females in summer 2015 in the southern Northwest Territories, Canada. I compared roost and site characteristics between roost and random available trees. Reproductive females roosted in one tree species (*Populus tremuloides*) in relatively large colonies, despite small tree diameters compared to those at southern sites. Roost trees had larger diameters and were less decayed than random trees. Roost trees had moderately high canopy closure, suggesting that larger colony size may be more important for decreasing thermoregulatory costs than solar exposure. Understanding the roost characteristics necessary for reproductive northern long-eared bats can allow us to inform industry and attempt to minimize impacts of forestry on bat populations.