

Title: High Arctic permafrost landscape stability and water quality, Sabine Peninsula, Melville Island, Nunavut

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Site: Drake Point area (76 deg 27' N, 108 deg 33' W), northeastern Melville Island

Project Description

The aim of the research project is to develop knowledge to help predict what landscape controls affect water quality. In particular, we will study the impact of natural permafrost and vegetation disturbances. We will map permafrost disturbances (1954-present) with satellite images and aerial photographs, and develop a landscape model to predict future disturbances across different rock, slope and plant surfaces. We will also integrate water quality monitoring to create models to predict changes in water quality associated with permafrost disturbance. These models will be of primary value to effectively manage this region of the High Arctic in a changing climate and to support the development of natural gas resources in the region in the future.

The research project was initiated in 2010, and fieldwork was carried out primarily in 2011 and 2012. We will have only have one more field season in 2013, with a small possibility of another short site visit in 2014. Field activities in 2013 will focus on characterizing how river and pond water quality and biological activity varies with the depth of seasonal thaw, and input of water from the subsurface. We will resample some of the ponds examined in 2013 to better determine the processes and organisms responsible for nutrient production. We will sample stream water and measure flow volumes in order to better characterise the impact of sources of subsurface water on water quality in rivers. We will continue to collect satellite images and to survey disturbance features and map variations in surface soil moisture to refine our ability to monitor and map changes in soil moisture and permafrost disturbance. We will also record observation of vegetation communities types on the ground, to determine if the vegetation map that we have made from satellite images is accurate. We plan on having will have 2-4 people in camp for three weeks, from July 10th to August 1st, 2013, for a total of approximately 55 person days.

Methodology

Three rivers will be instrumented with electronic sensors to measure flow, level, temperature, and turbidity during the summers. Water sampling will be carried out at approximately 100 sites. Samples of approximately 1 litre or less that will be collected by hand from each stream and used for analysis. All river stations require temporary structures that are located on existing banks or shores. Sampling does not change the flow, dam or discharge hazardous materials. We will also collect mud samples from surface mud flow features to characterise the chemistry and microbiological communities in the mud and waters derived from deep within the active layer.

Ground travel will be by ATV. All driving will be done to have minimal or no impact on the local environment. All materials and waste are removed to Resolute at the end of the season.