

Non-Technical Project Summary – 2011

Project Title: NEIGE (Northern Ellesmere Island in the Global Environment).

Research Team:

The principal investigator of this research is the Prof. Warwick Vincent from the Université Laval, Centre d'Études Nordiques (CEN) and NSERC Network of Centres of Excellence ArcticNet. The research team is composed of the additional participants: Denis Sarrazin, Marie Lionard, Sébastien Bourget, Professor Daniel Fortier (CEN at University of Montréal) and Michel Paquette. Professors Connie Lovejoy (CEN at UlaVal) and Esther Lévesque (CEN, at UQTR) are collaborators and codirectors of NEIGE students/postdocs at ULaval, and Professor Derek Mueller (Carleton University), Professor Bran Lanoil (U Alberta) and Dr. Cheryl Kuske (Los Alamos National Laboratory) are also potential collaborators.

Project Objectives:

-There is no significant change in this project from our work in previous years.

-We will determine the diversity of microbial life in ice shelf and other shallow pond communities using state of the art molecular techniques.

-We will characterize the physical characteristics and processes within northern Ellesmere Island's meromictic lakes.

-We will inventory the diversity of bacteria, eubacteria, Archaea, and viruses in the lakes of Quttinirpaaq National Park using DNA analysis.

-We will define the structure and function of food webs within Lake A using stable isotope, photosynthetic pigment and flow cytometry analyses.

-We will identify aquatic ecosystem indicators in Quttinirpaaq National Park and to evaluate their utility as sentinels of long- and short-term global environmental change.

-Our climate stations will provide long-term air and soil monitoring data for this globally important site.

-We will develop archives of remote sensing and satellite data.

-We will continue our research on the landforms and their origins at Ward Hunt Island and vicinity.

Project Timing

This Monitoring and Research Project was initiated in 2000 and we expect to complete it in 2020. We are thus applying for a multi-year project from 2011 to 2013. In 2011, we planned on a 3 week field season that we will undertake during the summer (July). The exact dates of all planned fieldwork are dependent on PCSP logical support.

Location

Our work takes place in Quttinirpaaq National Park (QNP), at Canada's strategically and scientifically important northernmost coastline, with comparative research on lakes in the Resolute Bay region. The following stations will be sampled: Lake A climate station (83°00.10'N 77°23.09'W), Lake A (83°00.10'N 77°23.09'W), Disraeli Fjord (82°54.350'N 73°40.630'W), Ward Hunt Ice Shelf (83°04.99'N 74°25.28'W), Ward Hunt island 1 (83°05.30'N 74°08.09'W), Ward Hunt island 2 (83°05.00'N 74°21.00'W), Markham Ice Shelf (83°05'N 71°15'W), Markham Ice Shelf (83°05'N 71°15'W) and Lake Hazen (81°48'N 70°56'W).

Methods

Methods will be as in the previous seasons (see Parks Canada permit Permit Number: **QUT-2009-2514 and Nunavut Research Institute license NRI 02 061 10R-M**). In brief, we will sample water in the lakes and fiords using a Kemmerer water sampler, CTD profiler for temperature and salinity, and a Hydrolab profiler for oxygen and pH. We will filter water samples for pigments, DNA and water chemistry variables. Microbial mats will also be sampled for pigments, DNA and oxygen profiles. Small sediment samples will be taken from the shorelines of lakes for the analysis of modern communities of biological indicators. Sediment cores will be taken from lake, catchment and fiord bottoms. Subsamples from these cores will be analyzed for fossil algal pigment concentrations, fossil diatom abundance and community composition, for DNA and for geochemical markers. We will continue the downloading and servicing of all our automated stations (Ward Hunt Island, Lake A and Lake C1), and this year will upgrade these systems with automated cameras and additional ground and lake thermistors for improved environmental monitoring. The imagery from these cameras may be of special interest to Park managers and visitors. We will characterize the periglacial landforms of the Ward Hunt Lake watershed using a differential GPS and collect small samples from different soil horizons for chemical and granulometric analysis.

Aircraft Access

We will be accessing our field sites by air using the logistical support and co-ordination of the Polar Continental Shelf Project.

Benefit of Research

Our results will be published in international peer-reviewed journals. Publications will be produced on the following topics: the diversity of microbial life colonizing the ice shelves and lakes of northwestern Ellesmere Island; the structure of food webs in the lakes of Quttinirpaaq National Park; the impacts of climate change on the structure and integrity of northern lake and ice shelves; a reconstruction of the environmental history of Ward Hunt Lake; The historical changes in climate, glacial dynamics, and epishelf lake fluctuations of the fiords of northwestern Ellesmere Island. Our publications concerning the rare and often poorly described ecosystem types found in Quttinirpaaq National Park will make significant contributions to the scientific understanding of their structure, function and vulnerability to changes in climate. These data will also be valuable to future managers making decisions regarding environmental impacts and conservation in the park. As we have done in the past, all the outputs will be transferred to Parks Canada. We are also preparing a well-illustrated synthesis article on Ward Hunt Island and vicinity which could be of broad interest for QNP Park management and Nunavut residents.