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Polar Continental Shelf Program

SCIENCE REPORT

2012 & 2013

Logistical support for leading-edge scientific research in the Canadian Arctic

Canada

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Cover Photograph: Using GPS to conduct shoreline survey on Lowther Island
Table of Contents photograph: Camp at Cape Bounty, Melville Island

Acknowledgements

This report was written by Norah Foy with assistance from Kathleen Lysyshyn, Sue Sim-Nadeau, Chris Evans, Lori Wilkinson and Katlin Fagan from the Polar Continental Shelf Program with Natural Resource Canada (PCSP/NRCan) and the PCSP-supported scientists whose work is highlighted.

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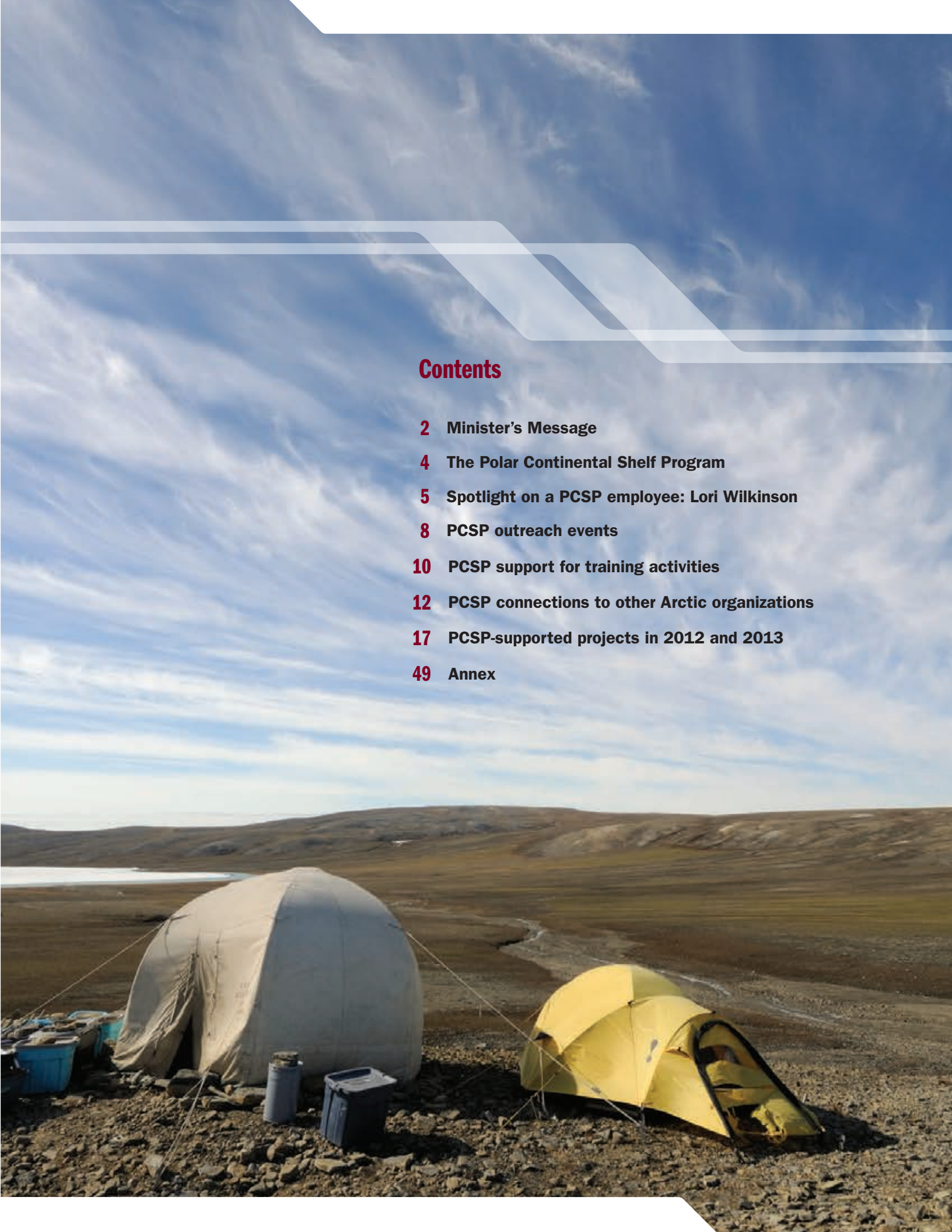
Cat. No. M78-1/1-2013 (Print)
ISSN 1925-8623

Cat. No. M78-1/1-2013E-PDF (Online)
ISSN 1925-8631



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Arctic glacier

Minister's Message

In 1958, Prime Minister John Diefenbaker proclaimed a dream. "I see a new Canada," he said, "A Canada of the North. This is the vision."

Diefenbaker's dream never died. The Government of Canada has made the North a top priority, with a vision John Diefenbaker would be proud of: a vision for a prosperous North within a strong and sovereign Canada. The Polar Continental Shelf Program (PCSP) plays a key role in this effort.

Established in 1958, the PCSP helps scientists from around the world to better understand Canada's final frontier: the Arctic. The Arctic can be a dangerous place to conduct research. With the help of the PCSP, scientists can do their jobs safely and securely.

That is why I am pleased to introduce the Polar Continental Shelf Program science report for 2012 & 2013. This report highlights the PCSP's important scientific work and demonstrates the program's continuing contributions to our pursuit of science and Canada's sovereignty in the North.

The past two years have been marked by accomplishment. In 2013 alone, the program supported 109 Arctic science projects and three military training activities. The logistical support necessary for these projects was tremendous: over 8 000 hours flown and 3 355 nights worth of accommodation for scientists at the PCSP's Resolute facility.

A major expansion of the PCSP facility in Resolute was completed in 2013 in order to house the Canadian Armed Forces Arctic Training Centre. This expansion is a core accomplishment. It allows the PCSP not only to better support the training of armed forces personnel but also to extend its operational field season and provide greater access to scientists to the facility in Resolute.

The PCSP has opened a door to the North for Canadian and world science with the help of an extensive network of partners. Theses include ArcticNet, a network of centres of excellence specializing in academic Arctic science; the Canadian High Arctic Research Station; the Canadian Space Agency; and Defence Research and Development Canada. The PCSP also supports the work of scientists from NRCan's own Geo-Mapping for Energy and Minerals (GEM) program as the primary logistical service provider for GEM scientists.

The PCSP is recognized as the Centre of Excellence for logistics support over Canada's North. This report demonstrates the program's continuing success in delivering on its mission of providing safe, efficient and cost-effective logistical services in support of science and government priorities in the North.

Sincerely,

The Honourable Greg Rickford, P.C., M.P.

Canada's Minister of Natural Resources and Minister for the Federal Economic Development Initiative for Northern Ontario

ᒥᓂᔅᑕᐅᑉ ᑐᓴᕐᑎᑦᑎᔾᔪᑖ

ᑕᐃᑲᓂ 1958, ᑲᓇᑕᐅᑉ ᒥᓂᔅᑕᖓ ᔩᓐ ᑏᕝᕙᓐᐸᐃᑯ ᐅᖃᓚᐅᖅᓯᒪᔪᖅ ᐱᔪᒪᔭᒥᓂᒃ, “ᑕᑯᕗᖓ ᓄᑖᖅ ᑲᓇᑕ,” ᐅᖃᖅᖢᓂ, “ᐅᓇ ᑲᓇᑕᖓ ᐅᑭᐅᖅᑕᖅᑐᖅ. ᐅᓇ ᑕᕝᕙ ᑕᐅᑦᑐᕆᓂᐊᖅᑕᕗᑦ.”

ᑏᕝᕙᓐᐸᐃᑯ ᐊᑐᕈᒪᔭᖓ ᑐᖁᓚᐅᖅᓯᒪᓐᖏᑦᑐᖅ. ᑲᓇᑕᐅᑉ ᒐᕙᒪᒃᑯᖏᑦ ᓴᓇᓯᒪᕙᖓ ᐅᑭᐅᖅᑕᖅᑐᖅ ᓯᕗᓪᓕᖅᐹᐅᑏᓐᓇᖅᑐᒍ, ᑕᐅᑦᑐᐊᓄᑦ ᔩᓐ ᑏᕝᕙᓐᐸᐃᑯ ᐅᐱᒋᓇᔭᖅᑕᖓᓂᒃ: ᑕᐅᑦᑐᖓᑦ ᐊᔾᔭᒃᓴᓐᖏᑦᑎᐊᖅᑐᑦ ᐅᑭᐅᖅᑕᕐᒥ ᐃᓗᐊ ᓴᙱᑎᑦᑎᔪᖅ ᐊᒻᒪᓗ ᓄᓇᖃᕈᑕᐅᔪᖅ ᑲᓇᑕᒥᒃ. ᐅᓇ ᐊᐅᓚᓐᓇᖏᑦᑐᖅ ᓄᓇ ᐱᓕᕆᑎᑦᑎᔾᔪᑕᐅᔪᖅ ᐃᓂᖃᖅᑐᖅ ᑕᒪᑐᒥᖓ ᐱᓕᕆᐊᖑᔪᒧᑦ.

ᓴᕿᑕᐅᓯᒪᔪᖅ 1958, ᐅᓇ ᓇᑎᕐᓇᐃᑦ ᓯᑯᐊᓗ ᐊᐅᒍᓐᓇᖕᖏᑦᑐᖅ ᐱᓕᕆᐊᖑᔪᖅ ᐃᑲᔫᑎᔪᖅ ᖃᐅᔨᓴᖅᑎᒪᕆᖕᓂᒃ ᓇᑭᑐᐃᓐᓇᖅ ᓄᓇᕐᔪᐊᒥ ᑐᑭᓯᑎᐊᑲᓐᓂᕈᑎᒋᓪᓗᒍ ᑲᓇᑕᒥᒃ ᑭᙳᓪᓕᖅᐹᖓᓂ ᓄᓇᓕᐊᖅᓯᒪᔪᑦ: ᐅᓇ ᐅᑭᐅᖅᑕᖅᑐᖅ. ᐅᓇ ᐅᑭᐅᖅᑕᖅᑐᖅ ᐅᓗᕆᐊᓇᖅᑐᑏᑎᑦᑎᔪᓐᓇᖅᑐᖅ ᖃᐅᔨᓴᖅᓯᓇᓱᒻᒪᓂ. ᐃᑲᔪᖅᑕᐅᓪᓗᑎᒃ ᐅᓇ ᓇᑎᕐᓇᐃᑦ ᓯᑯᐊᓗ ᐊᐅᒍᓐᓇᖕᖏᑦᑐᖅ ᐱᓕᕆᐊᖑᔪᖅ, ᖃᐅᔨᓴᖅᑎᒪᕆᖕᓂᑦ ᓴᓇᔪᓐᓇᖅᑲᑦᑕᖅᑐᑦ ᐱᕈᓗᐊᕿᑦᑕᐃᓕᒪᑎᓪᓗᒋᑦ ᐊᒻᒪᓗ ᑲᐸᐊᓇᖅᑐᑰᓕᖅᑕᐃᓕᒪᑎᓪᓗᒋᑦ.

ᑕᐃᒪᐃᒻᒪᑦ ᖁᕚᐊᓱᒃᑐᖓ ᐱᒋᐊᖅᑎᑦᑎᒐᑦᑕ ᐅᓇ ᓇᑎᕐᓇᐃᑦ ᓯᑯᐊᓗ ᐊᐅᒍᓐᓇᖕᖏᑦᑐᖅ ᐱᓕᕆᐊᖑᔪᖅ ᖃᐅᔨᓴᖅᑏᑦ ᐅᓂᒃᑳᖓᓂ 2012-ᒥᑦ 2013-ᒧᑦ. ᐅᓇ ᐅᓂᒃᑳᖓ ᓴᕿᑎᑦᑎᓯᒪᔪᖅ ᐅᓇ ᓇᑎᕐᓇᐃᑦ ᓯᑯᐊᓗ ᐊᐅᒍᓐᓇᖕᖏᑦᑐᖅ ᐱᓕᕆᑎᑦᑎᔾᔪᑕᐅᔪᖅ ᐱᒻᒪᕆᐅᔪᑦ ᖃᐅᔨᓴᖅᑎᒪᓈᑦ ᓴᓇᔭᖅᑐᑦ ᐊᒻᒪᓗ ᓴᕿᑎᓪᓗᒋᑦ ᐱᓕᕆᑎᑦᑎᔾᔪᑕᐅᔪᖅ ᑲᔪᓯᔪᒥᒃ ᐃᑲᔪᖅᑲᑦᑕᖅᑐᖅ ᖃᐅᔨᓴᖅᑎᒪᕆᖕᓂᒃ ᐊᒻᒪᓗ ᓇᑕᐅᑉ ᓄᓇᖅᑲᖅᕕᒋᖓᒍ ᐅᑭᐅᖅᑕᖅᑐᒥ.

ᑕᐃᒪᖓᓂᑦ ᐊᕐᕌᒍᓂᑦ ᒪᕐᕉᖕᓂᑦ ᓇᓗᓇᐃᖅᑕᐅᓯᒪᕗᖅ ᑲᔪᓯᑎᐊᕐᑎᑦᑎᓯᒪᓂᖓ. ᑕᐃᑲᓂ 2013 ᑐᐊᒥ, ᐱᓕᕆᑎᑦᑎᔾᔪᑕᐅᔪᖅ ᐃᑲᔪᓚᐅᖅᑐᖅ 109 ᐅᑭᐅᖅᑕᖅᑐᒥ ᖃᐅᔨᓴᖅᑕᐅᔪᓂᒃ ᐊᒻᒪᓗ ᐱᖓᓱᓂᒃ ᐅᓇᑕᖅᑐᒃᓴᐃᑦ ᐱᔭᓇᐅᖅᓴᑎᑕᐅᓪᓗᑎᒃ ᖃᓄᐃᓕᐅᕐᑎᑦᑎᔫᓚᐅᖅᑐᖅ. ᐅᑯᐊ ᖃᓄᐃᓕᐅᕆᐊᖅᑲᖅᑐᓄᑦ ᐃᑲᔪᕆᐊᖅᑲᖅᑐᑦ ᐅᑯᐊ ᐱᓕᕆᐊᖑᔪᑦ ᐊᖏᓂᖅᐸᐅᖕᒪᑕ: ᐅᖓᑖᓂ 8,000 ᐃᑲᕐᕋᓄᑦ ᖃᖓᑕᕝᕕᐅᓯᒪᕗᖅ ᐊᒻᒪᓗ 3,355 ᐅᓐᓄᐊᑦ ᓯᓂᒃᑕᕐᕕᐅᓯᒪᕗᖅ ᖃᐅᔨᓴᖅᑎᒪᕆᖕᓂᒃ ᑕᐃᑲᒥ ᐅᓇ ᓇᑎᕐᓇᐃᑦ ᓯᑯᐊᓗ ᐊᐅᒍᓐᓇᖕᖏᑦᑐᖅ ᐱᓕᕆᐊᖑᔪᖅ ᖃᐅᓯᐃᑦᑐᖅ ᐃᒡᓗᕐᑯᑖᑦ.

ᐊᕐᕿᓛᖅ ᐊᕐᕿᒡᓕᕆᐋᓚᐅᖅᑐᖅ ᐅᓇ ᓇᑎᕐᓇᐃᑦ ᓯᑯᐊᓗ ᐊᐅᒍᓐᓇᖕᖏᑦᑐᖅ ᐱᓕᕆᐊᖑᔪᖅ ᐃᒡᓗᕐᑯᑖᑦ ᖃᐅᓯᐃᑦᑐᒥ ᐱᔭᓈᓚᐅᖅᑐᖅ 2013 ᐃᒡᓗᖅᑲᖅᑎᑦᑎᓪᓗᓂ ᑲᓇᑕᐅᑉ ᐅᓇᑕᖅᑐᒃᓴᖏᓐᓂᒃ ᐅᑭᐅᖅᑕᖅᑐᒥ ᐱᔭᓇᐅᖅᓴᕚᕆᓪᓗᒍ. ᐅᓇ ᐊᕐᕿᒡᓕᕆᐊᕐᓂᖓ ᑕᒪᐃᓐᓄᑦ ᐱᕗᓪᓕᕈᑕᐅᔪᖅ. ᐊᔾᔨᐅᓐᖏᖅᑎᑦᑎᓯᒪᕗᖅ ᐅᓇ ᓇᑎᕐᓇᐃᑦ ᓯᑯᐊᓗ ᐊᐅᒍᓐᓇᖕᖏᑦᑐᖅ ᐱᓕᕆᐊᖑᔪᖅ ᐃᑲᔪᖅᓯᑎᐊᒃᑲᓐᓂᓕᖅᓱᓂ ᐱᔭᓇᐅᖅᓴᔪᓂ ᐅᓇᑕᖅᑐᒃᓴᓂ ᑭᓯᐊᓂᓕ ᐊᐅᓚᓐᓂᐊᕐᒥᔪᖅ ᐊᕐᕌᒍᑦ ᐃᓚᖓᓂ ᐊᑐᖅᑕᐅᔪᓐᓇᖃᓐᓂᕐᓗᓂᓗ ᖃᐅᔨᓴᖅᑎᒪᕆᖕᓄᑦ ᐃᒡᓗᕆᔭᐅᓗᓂ ᖃᐅᓯᐃᑦᑐᒥ.

ᐅᓇ ᓇᑎᕐᓇᐃᑦ ᓯᑯᐊᓗ ᐊᐅᒍᓐᓇᖕᖏᑦᑐᖅ ᐱᓕᕆᐊᖑᔪᖅ ᒪᑐᐃᓚᐅᖅᑐᖅ ᐅᑭᐅᖅᑕᖅᑐᒧᑦ ᑲᓇᑕᒥᐅᓄᑦ ᐊᒻᒪᓗ ᓄᓇᕐᔪᐊᒥ ᖃᐅᔨᓴᕈᑕᐅᔪᓄᑦ ᐃᑲᔪᖅᑕᐅᓗᓂ ᐊᖏᔪᒥᒃ ᑐᑭᓯᓇᓱᐊᖃᑎᒌᒃᐸᒃᑐᑦ ᐱᓇᓱᐊᖃᑎᒌᑦ. ᐅᑯᐊ ᐱᓚᕆᔭᐅᔪᑦ ᐅᑭᐅᖅᑕᖅᑐᒥ ᑐᑭᓯᓐᓂᐊᖃᑎᒌᑦ, ᐅᑯᐊ ᑐᑭᓯᓇᓱᐊᖃᑎᒌᑦ ᐱᐅᓛᒥᒃ ᐱᓕᕆᔪᑦ ᐃᓕᓐᓂᐊᕐᑎᑦᑎᕙᒃᑐᑦ ᐅᑭᐅᖅᑕᖅᑐᒥ ᖃᐅᔨᓴᖅᓯᒪᔪᓂᒃ; ᑲᓇᑕᒥᐅᑦ ᖁᕕᒃᑐᕐᒥᐅᓂ ᖃᐅᔨᓴᕐᕕᖓᑦ; ᑲᓇᑕᒥ ᓄᓇᕐᔪᐊ ᓯᓚᑖᓂ ᐊᓂᕐᓂᖅᑲᓐᓂᖅᑐᒥ ᑎᒥᖁᑎᖏᑦ; ᐊᒻᒪᓗ ᐅᓇᑕᖅᑐᒃᓴᐃᑦ ᖃᐅᔨᓴᕐᓂᖓ ᐊᒻᒪᓗ ᐱᕙᓪᓕᐊᑎᑕᐅᔪᑦ ᑲᓇᑕᒥ. ᐅᑯᐊ ᐅᓇ ᓇᑎᕐᓇᐃᑦ ᓯᑯᐊᓗ ᐊᐅᒍᓐᓇᖕᖏᑦᑐᖅ ᐱᓕᕆᐊᖑᔪᖅ ᐃᑲᔪᖅᓯᕙᖕᒥᔪᑦ ᓴᓇᔭᖕᖏᓐᓂᒃ ᖃᐅᔨᓴᖅᑎᒪᓈᑦ ᑖᒃᑯᓇᖓ ᓄᓇᒥᐅᑕᓕᕆᓂᒃᑯᓂᑦ ᑲᓇᑕᒥ ᓄᓇᖑᐊᓕᐅᖅᑎᖓ ᐆᒪᔅᑯᑎᓕᕆᓂᒃᑯᓄᑦ ᐊᒻᒪᓗ ᐅᔭᕋᖕᓂᐊᖅᑕᕝᕕᒻᒪᓄᑦ ᐱᓕᕆᑎᑦᑎᔾᔪᑕᐅᔪᖅ ᐅᓇ ᐱᒋᐊᖅᓯᔾᔪᑕᐅᓪᓗᓂ ᖃᓄᐃᓕᐅᕆᐊᖅᑲᖅᑐᓂᒃ ᐱᕚᓪᓕᐊᑎᑦᑎᓪᓗᒋᑦ ᑖᑉᑯᐊ ᖃᐅᔨᓴᖅᑎᒪᕆᖕᓄᑦ.

ᐅᓇ ᓇᑎᕐᓇᐃᑦ ᓯᑯᐊᓗ ᐊᐅᒍᓐᓇᖕᖏᑦᑐᖅ ᐱᓕᕆᐊᖑᔪᖅ ᒪᑐᐃᓕᑕᓴᐅᓯᒪᕗᖅ ᐊᔪᕐᓂᖑᔪᓂᑦ ᖃᓄᐃᓕᐅᕆᐊᖅᑲᖅᑐᓂᒃ ᐃᑲᔪᖅᑎᐅᓪᓗᑎᒃ ᑲᓇᑕᐅᑉ ᐅᑭᐅᖅᑕᖅᑐᐊᓂ. ᐅᓇ ᐅᓂᒃᑳᖅ ᑕᑯᑎᑦᑎᔪᖅ ᐱᓕᕆᑎᑦᑎᔾᔪᑕᐅᔪᖅ ᑲᔪᓯᔪᒥᒃ ᑲᔪᓯᑎᐊᕐᓂᖅᑐᖅ ᑐᓂᓯᑎᐊᖅᑲᑦᑕᖅᑐᖅ ᐱᓕᕆᐊᒃᓴᖏᓐᓄᑦ ᑐᓂᓯᓯᒪᓪᓗᑎᒃ ᐊᑦᑕᕐᓇᖅᑐᖅᑲᖏᓐᓂᒃ, ᐱᐊᓚᔪᓂᒃ ᐊᒻᒪᓗ ᐊᑭᑐᓗᐊᖏᑦᑐᓂᒃ ᖃᓄᐃᓕᐅᕆᐊᖅᑲᖅᑐᓄᑦ ᐱᔾᔪᑎᖃᖅᖢᑎᒃ ᐃᑲᔪᖅᖢᑎᒃ ᖃᐅᔨᓴᕐᓂᕐᒥᒃ ᐊᒻᒪᓗ ᒐᕙᒪᒃᑯᑦ ᓯᕗᓪᓕᖅᐹᐅᑎᑦᑎᔪᖏᓐᓂᒃ ᐅᑭᐅᖅᑕᖅᑐᒥ.

ᑕᕝᕙᐅᕙᑎᑦ

ᒥᓂᔅᑕ ᒍᓚᒃ ᐅᓕᒃᕗᑦ, ᐱᓯ, ᒥᓂᔅᑕ

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The Honourable Greg Rickford, P.C., M.P.
Canada's Minister of Natural Resources and Minister for the Federal Economic Development Initiative for Northern Ontario

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The Polar Continental Shelf Program

People are drawn to work in the North for many reasons: to learn more about the world in which we live; to preserve the Arctic heritage; to study the still intact wilderness; to harness the potential of the vast territories; and to guard and protect the Canadian landmass. With 56 years of experience operating in the Canadian Arctic, Natural Resources Canada's Polar Continental Shelf Program (PCSP) helps these researchers to safely and efficiently access the North.

The PCSP's suite of logistical services includes air transportation to and from remote field sites in Canada's North. The PCSP supplies, transports and positions fuel across the Canadian Arctic for use in field camps and by aircraft. As well, the PCSP's Technical Field Support Services (TFSS) rent field equipment to scientists working across Canada, including tents, ATVs, GPS units and other specialized equipment.

The recently expanded PCSP research facility in Resolute, Nunavut, now boasts sleeping accommodations for up to 237 people and services that include three cooked meals per day, working space, laboratory space and storage on site. PCSP-supported researchers also benefit from advice on licensing and permitting in the North. The PCSP maintains a communications network that is a lifeline for flight crews and PCSP-supported researchers in fly camps stationed across the Canadian Arctic.

Filling a field equipment order for a scientist from the Technical Field Support Services warehouse

A twin otter aircraft rests at Alexandra Fiord, Ellesmere Island

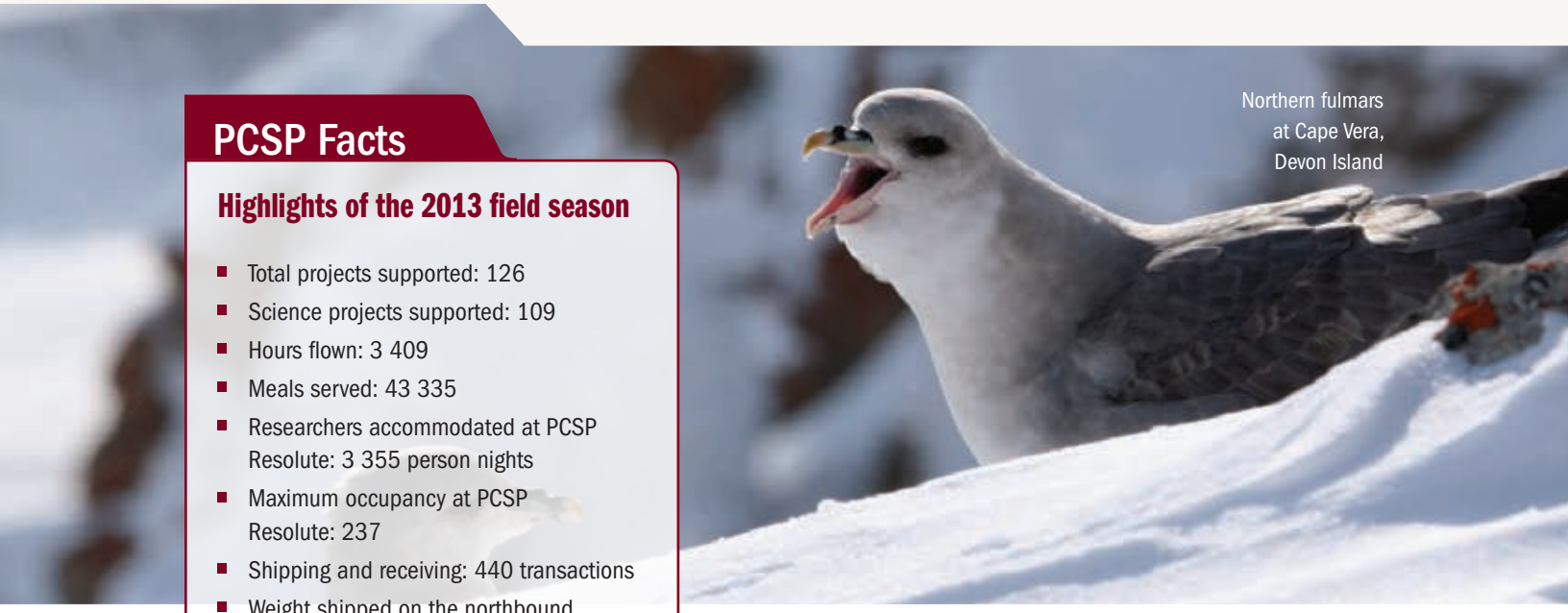
Spotlight on a PCSP employee: Lori Wilkinson

Lori exploring collaboration ideas (and the terrain) at Canadian Forces Station Alert

Since 2010, Lori Wilkinson has been the Chief of the Science and Logistics Coordination Centre (SLCC) at the PCSP. The SLCC handles policy and program development, client relations, communications, outreach, licensing and permitting, and corporate reporting on behalf of the PCSP. Lori excels at confronting unique challenges as diverse as negotiating territorial land leases, overseeing the annual logistics request process, and researching and purchasing wheel loaders. At the core of these varied responsibilities is the obligation to protect and enhance the ability of the PCSP to deliver on its mandate of coordinating field logistics in support of advancing scientific knowledge and management of Canada's lands and natural resources.

Lori's enduring dedication to her work links to a conversation she had with Marty Bergmann, former director of the PCSP, while they were returning from the High Arctic during her first winter with the PCSP. Although she wanted to unwind during the flight, Marty insisted on discussing the importance of Arctic science during the trip. Lori was struck by Marty's intense passion for the North; a passion that she sees enduring within the PCSP team, PCSP-supported researchers and arctic operators to this day.

Though much of Lori's work occurs behind the scenes, she has become a cornerstone of the PCSP over the past three years through her work with the entire PCSP team, partner organizations, scientists and other government departments. The uniqueness and diversity of Lori's work and the opportunity to experience the Arctic and meet new people are what fuel her drive to continue to be a leader within the PCSP.



Northern fulmars at Cape Vera, Devon Island

PCSP Facts

Highlights of the 2013 field season

- Total projects supported: 126
- Science projects supported: 109
- Hours flown: 3 409
- Meals served: 43 335
- Researchers accommodated at PCSP Resolute: 3 355 person nights
- Maximum occupancy at PCSP Resolute: 237
- Shipping and receiving: 440 transactions
- Weight shipped on the northbound sealift: 242 tonnes (t)
- Weight shipped on the southbound sealift: 23 t

The PCSP facility in 1986

Construction materials arrive in Resolute via sealift.

Evolution of the PCSP facility in Resolute

The PCSP has evolved and grown dramatically over the last 50+ years, while continuing to support national interests in the North. Another major expansion to the facility in Resolute was completed in 2013.

1950s: Research in Resolute was based out of a wood shack.

1970s: To accommodate increasing demand, 14 trailers were installed to replace the wood shack. Some of these trailers are still onsite, now used as storage containers.

1980s: Modern living and working accommodations were constructed, including sleeping accommodations, a kitchen and dining area, a lounge and office space. Today these areas are referred to as the "old PCSP facility." The PCSP Operations Centre was also built in this era, which has office space, storage space and a garage for maintaining field equipment.

2011: The PCSP completed a major expansion to the facility, funded by the Arctic Research Infrastructure Fund (ARIF), which effectively doubled the PCSP's capacity to support researchers in Resolute. The expansion included a new accommodations wing (known as the ARIF wing), a new kitchen and dining room, a fitness room, lounge areas, office space, and the Dr. Roy M. "Fritz" Koerner Laboratory.

Scientist at work in the Dr. Roy M. "Frtiz" Koerner Laboratory.

Scientists prepare to ship equipment from the PCSP warehouse in Resolute.

The Dr. Roy M. "Fritz" Koerner Laboratory is a stand-alone modern facility, equipped to prepare and process a variety of scientific samples.

The "old facility PCSP", built in the 1980s, is home to many PCSP-supported scientists during their field season.

2013: Another major expansion to the facility doubled the size of the Operations Centre and added another accommodations wing with 140 beds. These new expansions are called the "Canadian Armed Forces Arctic Training Centre" (CAF ATC) and the "ATC accommodations wing," respectively, and were made possible with funding from the Department of National Defence (DND). The CAF ATC expansion will allow the PCSP to host more scientists and to accommodate DND personnel on training. The CAF ATC expansion included a high frequency (HF) radio farm, which increases the PCSP's communications capacity.

Also in 2013, the entire accommodations complex (including all sleeping quarters, lounge areas, office spaces and the kitchen/dining facilities) was named "The Martin Bergmann Complex" in honour of the late director of the PCSP.

2014: The PCSP operates a significant piece of Arctic infrastructure, with a footprint of 7 468 square metres and a maximun occupancy of 237 for guests, staff, pilots and aircraft engineers. The complex is multi-use and accommodates a range of research and training activities.

Following the ARIF expansion, the dining hall can now seat 100.

PCSP outreach events

As a member of the Arctic science community, the PCSP takes every opportunity to share its passion for the North and to communicate the important work accomplished by PCSP staff and the scientists supported by the PCSP. The PSCP attended and hosted several events during 2012 and 2013 with the aim of promoting arctic science, community-building and maintaining lines of communication.

Winterlude Cool Science Saturdays

Since 2011, *Cool Science Saturdays* have been an important element of Winterlude in Ottawa. The family-friendly event introduces the general public to northern science in action and aims to cultivate an appreciation for the challenges faced by scientists in the Arctic. Who better to demonstrate these challenges than the PCSP and its supported scientists? On February 16, 2013, the PSCP erected a northern field camp at the Canada Museum of Science and Technology. This free event allowed people of all ages to experience a typical northern field camp, complete with ATVs and snow machines.

Chris Evans and Jodi MacGregor from PCSP help out at the field camp set up outside the Canadian Museum of Science and Technology during Winterlude 2013.

Lori Wilkinson helps out during the Winterlude Cool Science Saturday at PCSP's Arctic Science Field Camp.

ArcticNet annual scientific meeting 2012 and 2013

ArcticNet (a member of the Networks of Excellence of Canada) aims to bridge the gap between Arctic science and policy and to educate the next generation of Northern professionals. The work of ArcticNet is highly intertwined with that of the PCSP, and consequently, the PCSP participates annually at the ArcticNet annual scientific meeting (ASM). Held in Vancouver in December 2012 and in Halifax in December 2013, the ASM typically brings together close to 500 members from the national and international Arctic science community.

A highlight of the 2012 meeting was the plenary panel on major federal government initiatives in support of Arctic science. During this session, the PCSP's director Michael Jordan highlighted new and innovative partnerships that enhance the PCSP's ability to support northern research. The PCSP hosted an information booth at both events for researchers and Arctic professionals. In 2012, PCSP staff also presented during the ASM Student Day, advising on logistics planning and licensing and permitting.

PSCP Open House 2013

The 2013 PCSP Open House was hosted in Resolute on July 25, 2013. The highly anticipated sixth annual community event featured a barbecue lunch, a craft table, presentations about the PCSP and the science it supports, and displays by PCSP collaborators from across the North, including the Nunavut Research Institute, the Canadian Polar Commission, Yukon College and First Air, to name just a few.

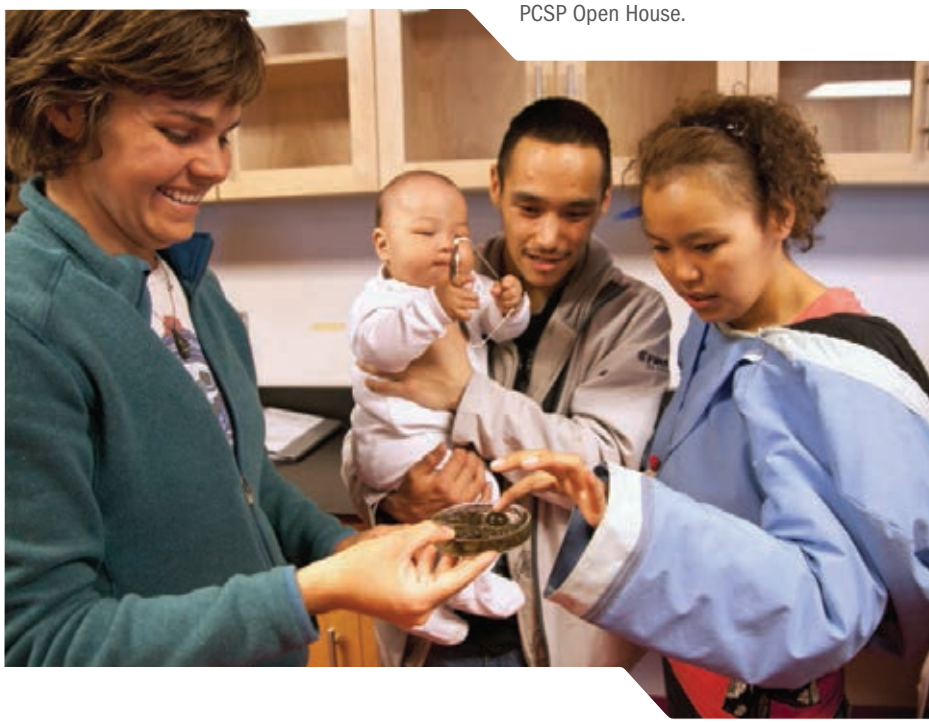
PCSP-supported scientists joined in the festivities using interactive displays of their work. Fish dissections were hosted in the Dr. Roy M. "Fritz" Koerner Laboratory, while in the warehouse, Open House revellers were treated to interactive glacier panoramas, a fossilized plants display, a rock collection from Yukon and demonstrations of equipment for monitoring carbon dioxide (CO_2) fluxes.

Resolute locals examine rock speciments from the Yukon during the PCSP Open House.

The community of Resolute got into the spirit as they displayed local art and shared locally made bannock. The highlight of the event was the finale, which featured a performance by four talented throatsingers and spectacular drum dancing performances.

Over the past six years, this tradition has helped to strengthen the PCSP's relationship with Resolute and has helped to solidify PCSP staff and PCSP-supported scientists as members of the community of Resolute.

Resolute locals take part in interactive science demonstrations during the 2013 PCSP Open House.



PCSP support for training activities

The PCSP supports a variety of training activities including educating the next generation of Arctic professionals. The PCSP can provide equipment and accommodations to groups such as Students on Ice and Inuit Tapiriit Kanatami, offering unique educational experiences in the Canadian Arctic.

CAF ATC grand opening

The Canadian Armed Forces Arctic Training Centre (CAF ATC) was officially launched on August 15, 2013. The PCSP has been supporting training activities with DND since 2008, including the Arctic Operations Advisor course, Operation NANOOK and Operation NUNALIVUT. The grand opening of the CAF ATC included a ceremonial ribbon cutting by Resolute Mayor, Tabitha Mullin, Major-General Stephen Bowes of the Canadian Armed Forces (CAF), and the chief of the PCSP's Arctic Logistics Support Centre, Mike Kristjanson. This event marked the beginning of a long-term partnership between the PCSP and the CAF that will see the training of hundreds of military personnel based out of the PCSP facility.

The grand opening of the Arctic Training Centre was marked by a ceremonial ribbon cutting involving (left to right) Chief Warrant Officer Jules Moreau, Mike Kristjanson, Mayor Tabitha Mullen and Major General Stephen Bowes.

The military training conducted within the CAF ATC program includes cold weather survival, search and rescue, and sovereignty operations. The facility will also be a staging site for training exercises in more remote regions of the Canadian Arctic for the Canadian Army, the Royal Canadian Air Force and the Royal Canadian Navy, including regular forces, reserve forces and the Canadian Rangers.

This will mean a strong and visible military presence at the PCSP facility during CAF training activities. For instance, during Operation NANOOK in August 2013, the PCSP facility experienced its highest occupancy to date, with 211 patrons onsite, of whom 174 were CAF personnel. CAF operations are concentrated in winter when demand from scientists to use the PCSP facility traditionally has been low, although DND personnel may be onsite throughout the scientific operating season.

These activities provide several benefits: training the next generation of highly skilled northern military professionals and reinforcing a strong Canadian presence in the High Arctic, thereby promoting Canadian Arctic sovereignty. This innovative partnership realizes economic efficiencies for both NRCan and the CAF and is a pioneer of the "whole of government" approach to addressing multiple priorities in the North.

Participants in the 2013 Action Canada northern tour pose with PCSP staff outside the Martin Bergmann Complex in Resolute, NU.

Did you know?

Organizations that train the next generation of northern professionals or help emerging Canadian leaders better understand northern Canada can request PCSP logistical support. For instance, in 2013, the PCSP provided accommodations at its Resolute facility to Action Canada, a national leadership development and public policy program that is building a network of future leaders. Action Canada's theme for 2013 *was Applying lessons from Canadian history in the development of public policy for northern Canada*. Program participants spent a week aboard the ice breaker CCGS *Louis S. St-Laurent* studying Canadian Coast Guard operations and objectives. The group visited the PCSP facility to learn about NRCan's important role in the Canadian Arctic.

PCSP connections to other Arctic organizations

Canadian Polar Commission

The Canadian Polar Commission (the Commission) is the federal government agency responsible for assembling and distributing information about the Canadian Arctic to the general public, policy-makers and northern organizations. As Canada's primary polar knowledge agency, the Commission is a linchpin in the national and international polar research communities, spearheading a variety of initiatives that promote collaboration and co-operation in polar research. As a prominent member of the Arctic research community, the PCSP partners with the Commission on many of its activities.

For instance, the Commission acts as the secretariat for the Canadian Network of Northern Research Operators (CNNRO), of which the PCSP is a founding member. The CNNRO provides a forum for sharing information across research facilities throughout the Canadian Arctic and subarctic. The CNNRO meets annually to discuss common challenges and to share best practices. The Commission also maintains an interactive on-line registry of all northern research facilities, which helps researchers find accommodations and services near their field location.

The Commission also maintains the Canadian Polar Information Network. This online resource is available to the public, providing a wide range of information about polar events, resources for research and a database of northern experts, complete with contact information, publications and research interests. This database is now available as an application for cell phones. The PCSP contributes to this database by sharing information with the Commission about its supported researchers. In fact, communications products are coordinated across the Commission and PCSP whenever possible, to maximize distribution and impact.

The Commission performs several other duties in the interest of northern science education and outreach, including

- administering the Northern Scientific Training Program (NSTP), which helps fund students performing northern field work
- awarding the Centenary Medal annually to deserving northern scientists whose contributions help advance our understanding of the natural world
- contributing to developing the Canadian High Arctic Research Station science program

The Commission also supported the 2013 PCSP Open House, disseminating information to scientists and the local community and partnering with the PCSP to ensure the prominent inclusion of Inuit cultural activities during the festivities.

The Centenary Medal was created to commemorate the 100th Anniversary of the International Polar Year, 1882-1883. The medal, together with a prize of $10,000, is presented as the Northern Science Award (NSA) annually by the Canadian Polar Commission to give prominence to the importance of scientific knowledge and its applications to Canada's North.

A Eurocopter Astar B2 rests by a camp in Cirque Valley, Labrador.

Did you know?

The Canadian Polar Commission supported a multimedia project called *Profiles from the Arctic*, which features the work of Canadian researchers studying a range of disciplines in the Arctic. Katriina O'Kane and Evan Hall produced posts for the blog and a documentary Web series focussed specifically on PCSP-supported researchers and staff working at the facility in Resolute.

PCSP-supported field camps in the Canadian Arctic (2012 and 2013)

Legend

- 2013 Field Site
- 2012 Field Site
- Community
- Resolute Polar Continental Shelf Program Facility
- National Park

Land Cover

- Ice and Snow
- Tundra
- Barren Land
- Transitional Forest
- Forest
- Farm Land

Air Distances in Kilometres

				Ottawa	Resolute
			Inuvik	4119	1502
		Iqaluit	2845	2100	1581
	Edmonton	2794	1971	2857	2527
Alert	3621	2100	2287	4172	1098

Kilometres 0 100 200 400 600

Scale: 1:6 750 000
Projection: Vertical Near Side Perspective, centred at 85°N 79.57°W, altitude 3 000 000 metres.

Sea Ice Information: The Canadian Ice Service, Environment Canada, Ottawa, Canada (*www.ice-glaces.ec.gc.ca*) with data from the National Snow and Ice Data Center, Boulder, CO, U.S.A. (*nsidc.org*) outside of Canadian waters.

Geographical Names: Canadian Geographical Names Data Base (CGNDB), Natural Resources Canada, 2013.

Land Cover Data: Advanced Very High Resolution Radiometer (AVHRR) from GeoGratis (*GeoGratis.gc.ca*), Natural Resources Canada,Canada Centre for Mapping and Earth Observation.

Produced by: Kramers, R E, Canada Centre for Mapping and Earth Observation, Natural Resources Canada.

In the foreground is an old Inuit tent ring of boulders that were used to hold down the edges of a skin tent, and in the background are PCSP-supplied tents used by students and researchers working at Alexandra Fiord on Ellesmere Island.

PCSP-supported projects in 2012 and 2013

The PCSP supports a range of studies in many disciplines in the natural sciences and humanities. Arctic researchers from the federal and provincial/territorial governments, Canadian universities, museums, foreign organizations and independent groups can apply for PCSP logistical support. Additionally, federal researchers doing field work in southern Canada can borrow PCSP equipment through TFSS.

In 2012, the PCSP supported 142 projects, while in 2013, 126 projects used PCSP logistical services. Some of the world-class science projects supported by the PCSP are highlighted in the following stories, which describe their contributions to the body of Arctic knowledge and the value of their research to society. These are followed by a list of all PCSP-supported projects in 2012 and 2013.

Mountain range and glaciers en route to Eureka weather station, Nunavut

Scientists from DRDC and International Submarine Engineering discussing Project Cornerstone plans in the PCSP lounge before deploying to the UNCLOS ice camp at Borden Island.

Arctic lemmings: keystone species in a changing environment

Douglas Morris (Lakehead University) and **Angélique Dupuch** (Université du Québec en Outaouais)

A brown lemming (Lemmus trimucronatus) near Walker Bay, Nunavut

Lemmings are keystone prey species in the North to predators such as Arctic foxes, snowy owls, weasels and jaegers. The legendary cyclical fluctuations in lemming populations affect their predators: as the lemming populations grow, predator populations increase because of the abundance of food (lemmings).

However, a large population of predators can then lead to overharvesting, which causes a huge decrease in the lemming population. This decrease makes the food supply insufficient for the predators, which causes their populations to decline in turn.

Recently, cycles in lemming populations have become less predictable in northern Europe and Greenland, coincident with an increase in temperature. It is crucial to gather and analyze comparable data on the population dynamics of lemmings in northern Canada. Understanding whether ongoing climate change will affect lemming population dynamics and their use of habitat in the Canadian Arctic is central to forecasting the future of arctic ecosystems. Consequently, Douglas Morris and Angélique Dupuch are examining lemming populations near Walker Bay on the Kent Peninsula, Nunavut, where two species of lemmings, brown and collared, coexist.

To understand the links among climate, habitat, lemmings and predators, the Morris-Dupuch team analyzed data from Walker Bay dating back to 1996. This is the longest joint record of lemming dynamics and habitat use in the central Canadian Arctic. Researchers have used motion-detecting cameras and live trapping to learn how lemmings interact with their habitat, and ultimately, to predict the future. The data yielded a wealth of information about current and future habitat choice among lemmings, including recent findings discussed here.

Because they are food for numerous predators, one might expect that lemmings would choose habitat that minimizes the predation risk. No particularly safe environment is available to lemmings, although both brown and collared lemmings prefer land patches with protective plant cover. Collared lemmings are more vigilant (standing on hind legs and observing the surroundings intermittently) than brown lemmings but neither species increases vigilance against predators in open environments. Interestingly, both the brown and collared lemmings are more vigilant in the presence of the other species than when they are alone.

The pattern in vigilance hints that an important determinant of habitat choice at Walker Bay is competition between the two species. This is relatively surprising because the two species do not

compete for food: brown lemmings prefer sedges and grasses (which can stunt growth in collared lemmings), while collared lemmings prefer herbs and small shrubs such as mountain avens and willow (which stunt growth in brown lemmings). For lemmings, competition more likely relates to interference and aggression between the two species.

Therefore, when populations are low, the two species rarely interact; collared lemmings tend to occupy relatively dry environments with low-lying shrubs, while avoiding the wetter sedge and grass habitats preferred by brown lemmings. Competition, like a ghost, lurks in the northern Canadian tundra when populations are low, ever present but invisible because the lemmings choose to live in different habitats. However, when populations increase, both species expand into each other's marginally "fit" environments, and this is when the competition between the two species occurs.

Since 1950, temperatures increased in the Walker Bay area on average by 2.1°C, which caused increased shrub growth in a "wetter" landscape. In response to this, over time, both lemming species have altered their habitat use. Researchers are using the climate-induced habitat change to build general models that predict how lemmings and other species will use future habitats. The value of general models is that they can be fine-tuned to fit the findings of future studies on population dynamics and habitat choice under different climate change scenarios.

Northern Canada's harsh, cold climates can be endured by only a few hardy species. Arctic ecosystems are thus less diverse than those in southern climates. Because northern climates are warming, there is great interest in understanding the impact on vegetation and animal species. Studying these ecosystems will give insight into how species dynamics may be affected elsewhere in the world.

"Canada, more than any other, is an Arctic nation. Canadians thus have more to gain from Arctic research, and more to lose if they ignore it, than any other people. We hope that our research in Arctic Canada will help to provide the insights Canadians and other people need in order to understand the vastness, fragility and global significance of Canada's North and the rapidity with which it is changing."

– Douglas Morris

Dr. Angélique Dupuch (left), MaryJane Moses (MSc., centre) and Spanish PhD student Rocío Tarjuelo celebrate Canada Day at Walker Bay.

Want to learn more?

Dupuch, A., Morris, D.W., Ale, S. B., Wilson, D. J. and **Moore, D.E. (2013).** "Landscapes of fear or competition? Predation did not alter habitat choice by Arctic rodents." *Oecologia:* DOI 10.1007/s00442-013-2792-7.

Morris, D.W., Dupuch, A. and **Halliday, W.D. (2012).** "Climate-induced habitat selection predicts future evolutionary strategies of lemmings." *Evolutionary Ecology Research 14:689–705*.

Morris, D.W. and **Dupuch, A. (2012).** "Habitat change and the scale of habitat selection: shifting gradients used by coexisting Arctic rodents." *Oikos* 121:975-984.

Multi-year ice and engineering safe structures

M.E. Johnston (National Research Council of Canada)

Richard Lanthier, Carl Fillion and Jeffrey Amarualik core through a multi-year ice hummock.

Multi-year sea ice (ice that has survived two or more melt seasons) is one of the most significant hazards to infrastructure and shipping in High Arctic waters, particularly when ice floes are thick, deformed and comprised of hills of broken ice (hummocks). Unfortunately, this kind of ice is a very real hazard in the Beaufort Sea, which is an area of high interest for resource exploration. Engineers are particularly interested in understanding the strength of this type of ice because it will help them to design structures for the Arctic offshore environment that can withstand impact from ice hazards. To date, understanding the properties of multi-year sea ice has been challenging because of the difficulty in accessing these floes and in accurately sampling ice at depth.

Through extensive analysis of the past 50 years of data, Michelle Johnston of the National Research Council of Canada noted that very little data exist on multi-year sea ice deeper than 6 metres (m), even though hummocked multi-year sea ice can far exceed this thickness. Johnston's work aims to get the information the engineers need and to provide new data about the properties of thick multi-year ice for calculating ice forces on structures. Using equipment specially designed by the National Research Council of Canada's Design and Fabrication Service (NRCC-DFS), in 2012 Johnston sampled ice properties on a floe near Resolute, Nunavut, to an unprecedented depth of 12 m.

To determine the strength of multi-year sea ice, scientists locate appropriate ice floes by using satellite imagery and select floes to visit based on accessibility (safety, travel distance and cost). On the ice, scientists establish transects and drill holes through the ice to measure snow thickness, ice thickness and ice freeboard (thickness of the ice floating above the water's surface). Scientists also establish boreholes from which they sample ice temperature, salinity and (most importantly) strength at various depths. Ice strength is measured in situ by using an apparatus that applies force to the surrounding ice. The amount of force that causes the failure gives the strength of the ice at that depth. The type of ice failure that occurs is often associated with the temperature of the ice, and to a lesser extent, the salinity.

The research has produced some surprising results. Because multi-year ice is composed of a variety of ice types (that may include cavities), it is difficult to predict the strength at various depths for a given ice floe. However, if the overall temperature of the floe has been measured, Johnston proposes that sampling strength at the midpoint of the floe provides a reasonable predictor of the overall effective strength of the multi-year sea ice.

"Probing the depths of multi-year ice has been a long, hard journey that has taken more than 50 years and has involved many people. The reward has been providing new information that the engineering community views as fundamentally important in designing well-engineered structures for the Arctic offshore."

– M.E. Johnston

Also, the study has shown that although the strength of first-year ice (ice that has yet to survive a melt season) degrades greatly as ice decays and melts in the spring, this is not true for older ice. The implication is that "weak" multi-year floes cannot be reliably differentiated from "strong" multi-year floes, and that observations from the bridge of a ship or the platform of a rig are insufficient for gauging the severity of a potential impact between the ice and the structure. This information can be used in decisions regarding transportation safety and in the design of safe and stable off-shore structures.

As this project continues, similar analyses conducted in the Beaufort Sea will verify if multi-year floes in that portion of the Arctic are comparable to multi-year floes in other parts of the Arctic. This work contributes to a larger project led by Aboriginal Affairs and Northern Development Canada called the Beaufort Regional Environmental Assessment (BREA). The BREA aims to prepare all parties, including the federal government and local communities, to respond to new investment opportunities in oil and gas in the Beaufort Sea.

Want to learn more?

Johnston, M.E., (2013).
"A Decade of Probing the Depths of Thick Multi-year Ice to Measure its Borehole Strength."
Submitted to the *Journal of Cold Regions Science and Technology*, accepted for publication, Nov. 2013.

Johnston, M.E., Masterson, D., Wright, B. (2009).
"Multi-year Ice: Knowns and Unknowns." Proc. 20th International Conference on Port and Ocean Engineering under Arctic Conditions (POAC'09), June 9–12, 2009, Luleå, Sweden, POAC09-120, 13 p.

Johnston, M.E. (2013).
Quantifying the Properties of Hummocked Multi-year Ice: Two Measurement Seasons. Technical report submitted by the National Research Council Canada to the Program of Energy Research and Development (PERD) and Aboriginal Affairs and Northern Development Canada (AANDC), Report OCRE-TR-2013-039.

Johnston, M. and **G. Timco (2008).**
Understanding and Identifying Old Ice in Summer. Technical report CHC-TR-055, December 2008, Ottawa, 236 p.

Johnston, M. and **C. Haas (2011).**
"Validating Helicopter-based EM (HEM) Thicknesses over Very Thick Multi-year Ice." Proc. Proceedings of the 21st International Conference on Port and Ocean Engineering under Arctic Conditions (POAC'11), July 10–14, 2011, Montréal, Canada, POAC11–132, 11 p.

Life inside an ice camp – DRDC scientific programmer Derek Clark rests in his accommodations tent at Borden Island ice camp.

Flora of the Canadian Arctic

Jeff Saarela and **Lynn Gillespie** (Canadian Museum of Nature)

The Canadian Museum of Nature's Arctic Botany team breaks for dinner on Victoria Island, Northwest Territories.

With over a century of experience in arctic botany, the Canadian Museum of Nature (CMN) is home to the world's largest herbarium (collection of preserved plant specimens) from the Canadian Arctic. This collection forms an important part of the active studies of CMN researchers Jeff Saarela and Lynn Gillespie, who are creating the first comprehensive Arctic Flora (an index of plant species) for the entire North American Arctic region.

Unfortunately, the plant life collection in the National Herbarium of Canada is incomplete; some areas of the Arctic have never been explored botanically, while studies of other areas are incomplete. Consequently, Saarela and Gillespie have gathered plant samples from across the Arctic, from northwestern Yukon to northern Newfoundland and Labrador, including the archipelago. New specimens are photographed and studied, and then stored in the herbarium.

In addition to updating the herbarium's collection, this project is building a comprehensive database of Arctic plant life by using DNA barcodes. This effort is part of a larger international initiative called the International Barcode of Life Project, which aims to create a reference library of each species on the planet by using the organism's DNA as the gateway. To populate the database, scientists examine short regions of DNA for all specimens (whether they are gathered in the field or sampled from the herbarium). Most species of plants (approximately 70 percent) can be distinguished from one another by using two loci (the specific location of a gene on a chromosome) on the plant's DNA. Scientists continue to collect data on other loci so that eventually all species can be distinguished from one another by DNA barcodes.

The database entry for a species includes information such as its scientific name, the collection location, the collectors and an image of the voucher specimen. Therefore, by using a DNA barcode, a non-specialist would be able to use a tiny sample of any organism's DNA to identify its species with great accuracy. This DNA identification is an important innovation because using traditional methods (detailed visual analysis) can distinguish only approximately 1 000 species.

So far, the CMN team has generated DNA barcodes for 490 species of vascular plants, which are estimated to represent almost half of the Canadian Arctic flora (the number of plant species in this region is estimated at 1 100 species). Within the Canadian Arctic Archipelago, 93 percent of flora species have been identified and barcoded, many of which are new discoveries in this area. Interestingly, the creation of barcodes from herbarium specimens revealed that some plants in the

"Canada's Arctic is currently a place of rapid change – development, social shifts and a warming climate combine to make this our nation's most dynamic region. As the Arctic changes, comprehensive knowledge of its biota is essential for research in the North now and in the future."

– Jeff Saarela

collection had originally been misclassified. Therefore, application of this modern taxonomic practice is improving the existing body of knowledge in taxonomy.

CMN scientists have also used the flora inventories to study change in the Arctic. Tuktut Nogait National Park, N.W.T., was last surveyed botanically in 1990 as part of the process to achieve National Park designation. Comparison of the 1990 survey with the 2009 inventory revealed 54 taxa that were not previously recorded as existing within the park and range extensions for several species. New stands of balsam poplar north of the treeline (known as extralimital stands) were discovered – a finding that considerably extends the known geographical range of this species.

The increasingly dynamic Arctic climate is expected to cause profound changes in vegetation, including increased plant productivity, shrub expansion, changes in species composition and abundance, and treeline advancement. Underpinning studies of all of these changes is the need for an accurate baseline inventory of plant species in the Arctic, as well as information on distribution of these species throughout northern Canada. The National Herbarium of Canada, the barcode database and the Canadian Arctic Flora will serve as excellent tools to facilitate this research.

Want to learn more?

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Dr. Jeff Saarela presses seabeach sandwort (*Honckenya peploides*) collected near Kimmirut on Baffin Island, Nunavut.

Studying the Arctic marine food web

Steven Kessel, **David Yurkowski**, **Nigel Hussey** and **Aaron Fisk** (University of Windsor), **Svein Vagle** and **Caitlin O'Neill** (Fisheries and Oceans Canada and University of Victoria), **Richard Crawford** (East Carolina University) and **Steve Ferguson** (Fisheries and Oceans Canada and University of Manitoba)

David Yurkowski, Amy Tanner (a student at the University of Windsor) and Randy Idlou (a local hunter in the hamlet of Resolute), traveling to shore in Resolute Bay, Nunavut

Management and conservation plans for marine species are dependent on a thorough understanding of the ecosystems in which these animals live. Despite the importance of understanding marine food webs, very little is known about the movement patterns of most marine organisms – this is particularly true in the Arctic.

To address this information need, the Ocean Tracking Network (OTN) traces the movements of marine animals and examines the ocean conditions that sustain marine wildlife. The OTN uses telemetry to measure data from remote sources (such as acoustics or satellite tracking). The OTN aims to fill a significant gap in our understanding of marine ecosystems and the effects of climate change on these global systems. The northern contingent of the OTN is based out of the PCSP facility in Resolute.

Arctic cod is a key species in the North; cod consume zooplankton and in turn are an abundant food source for seabirds, ringed seals, beluga whales and narwhal, linking energy flow from the lower to the upper trophic levels. Seals and whales are in turn hunted and consumed by the people of Resolute. Therefore, there is high local interest in understanding the movement patterns of cod. This is why cod is one of the main subjects of study for the northern OTN team.

Acoustic transmitters implanted in individual cod emit pulses that are collected by receivers placed around Resolute Bay. Information gathered indicates the location of tagged fish at a given time or their absence, if the fish have exited the bay and are out of range of the receivers. Using this technology, researchers can track individual fish continually for up to a year as they move in and out of Resolute Bay. Researchers have thus discovered that Arctic cod stay in the bay whether the water is open or iced over but do periodically depart the bay en masse.

Ringed seals and Greenland sharks have also been tagged with satellite telemetry transmitters. While some seals remained near the tagging location year-round, some of the younger ones travel much greater distances than previously thought (upwards of 2 500 kilometres (km) to southwest Greenland and Frobisher Bay, Nunavut). The movements of Greenland sharks and seals will be analysed

"We are just beginning to scratch the surface in terms of our understanding of these complex marine ecosystems ... the continuation of this project will greatly increase our understanding of these complex ecological interactions and help to predict the potential effects of the changing Arctic environment."

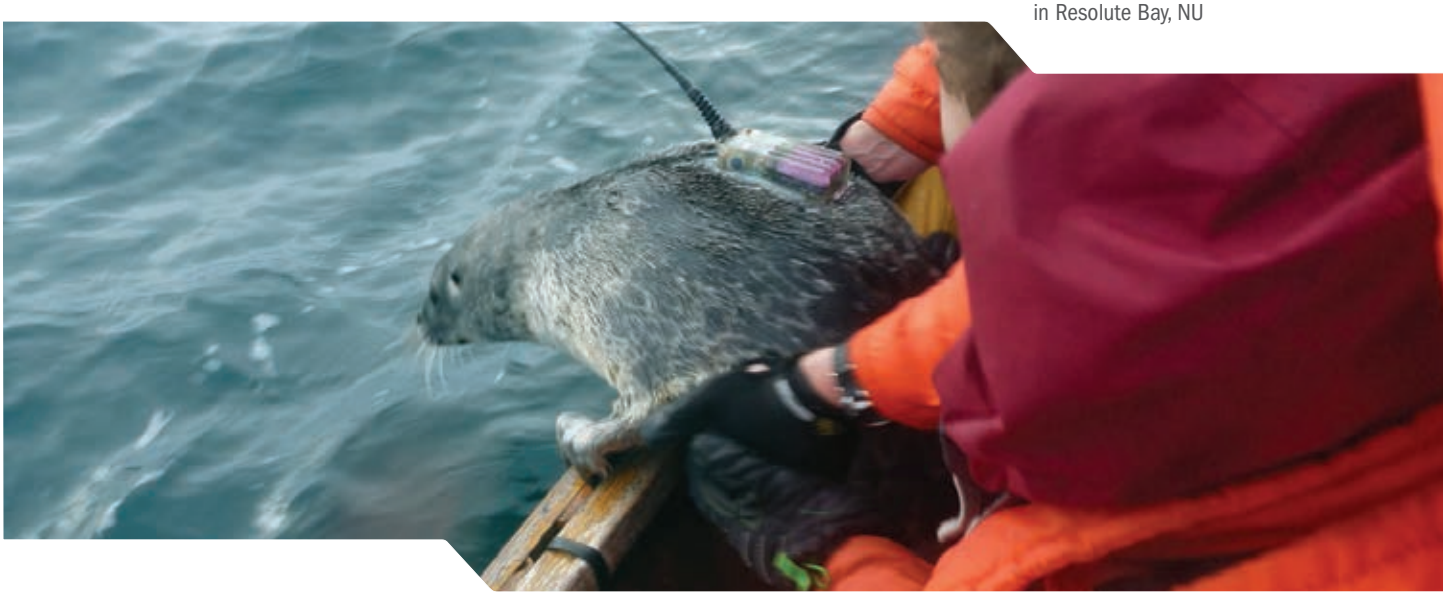
– Steve Kessel

against cod movements and against each other because ringed seals are important to the Arctic food web and Inuit culture and may be an important food source for Greenland sharks.

Telemetry work in Nunavut uses a comprehensive approach in which the acoustic instruments are tested for operational efficiency while simultaneously gathering information about the ecosystem. Preliminary data suggest that the acoustic detection range does not always continually decrease as the distance between the transmitter and receiver increases, and that this should be considered when scientists select the power of the transmitter for a given study. Data from the Arctic are now being compared against data from temperate and subtropical sites to see how acoustic detection range differs in low noise environments (i.e. the Arctic Ocean) and high noise environments (i.e. the subtropical Atlantic Ocean). The results of this analysis may revolutionize the way telemetry studies are approached.

Additionally, to help to define the high Arctic food web structure, biological samples collected by scientists and local hunters from fish and mammals (including blubber, fin and muscle, to name a few) are being analyzed for genetic, mercury and chemical tracers. The OTN team also plans to use data from local hunters (including the number and date of animals caught) and data from C-PODs, which detect the presence of whales, narwhals and porpoises by tracking the clicking sounds these animals make.

Simultaneously, scientists are continually collecting information on oceanographic characteristics (salinity, temperature, dissolved oxygen and density) as well as sea ice dynamics. This information will not only help scientists to understand the reasons behind the migration patterns of species around the Canadian Arctic Archipelago but will also inform global models of ocean productivity, thus contributing to the overall understanding of the Earth's oceans.



The deployment of a sub-adult ringed seal after successful satellite transmitter attachment in Resolute Bay, NU

Chert toolstone and early Arctic peoples

S. Brooke Milne and **Mostafa Fayek** (University of Manitoba), **Robert W. Park** (University of Waterloo) and **Douglas R. Stenton** (Government of Nunavut)

Dense chert flaking scatter at the Hone River Quarry site, southern Baffin Island, NU

The Pre-Dorset people (who lived on Baffin Island 4 500 to 2 800 years ago) were the predecessors of the Dorset people who inhabited the eastern Arctic between 2 500 and 1 000 years ago. Although the Pre-Dorset people are known to have been seasonally nomadic, researchers have long speculated that the Dorset people travelled less and were more settled in their way of life.

Excavated Dorset sites are larger, have more permanent dwellings and exhibit evidence of meat storage technology, which enabled these peoples to harvest abundant sea mammal resources for consumption throughout the year. This evidence, coupled with an apparent lack of transportation technologies, suggests that Dorset people spent most of the year living in coastal regions.

The perceived changes in settlement, mobility and subsistence between the Pre-Dorset and Dorset periods suggest a cultural discontinuity – and some believe even a possible population replacement – 2 800 years ago. However, recent findings by S. Brooke Milne and her team have challenged the notion that Pre-Dorset and Dorset peoples lived very different ways of life.

In 2007, Milne and her team began investigating the distribution and availability of chert – the most widely used type of stone for tool making throughout human history – on southern Baffin Island. This research was recently expanded into a four-year project that included geological and archaeological fieldwork in the island's interior aimed at locating source areas where this stone was procured by Pre-Dorset and Dorset toolmakers. Using an archaeometric approach, which applies scientific technologies to archaeological analysis, Milne's team has been conducting geochemical analyses to determine the "fingerprints" of surface-collected chert samples from the island's interior.

Chert sources are fixed geologically, which means that people had to travel to them to get the stone for their tool-using needs. Therefore, if chert tools found in both Pre-Dorset and Dorset sites are fingerprinted and compared to known source areas, land use patterns can be reconstructed based on where people carried the stone during their seasonal travel. Results obtained so far indicate that some of the chert used by Pre-Dorset and Dorset people to make their tools was from the same source and therefore had come from the same place. The next step in the team's research was to find the source areas for these rocks because nearly a decade of searching had yet to identify them.

"The discovery of the Hone River quarry site and "Chert Island" sites further affirms local traditional knowledge that the island's deep interior region is the place chert comes from."

– S. Brooke Milne

Douglas Stenton had heard stories in the 1980s among Inuit on southern Baffin Island of a place called "Chert Island." These stories led the team in 2013 to the southern edge of Amadjuak Lake (which, loosely translated from Inuktitut, means "place where chert comes from"), which is about 180 km inland from Iqaluit. Here they found large limestone boulders and bedrock outcrops containing chert. Milne's team believes this is the location of "Chert Island," although it is no longer an island because lake levels have changed, leaving areas that were once submerged now exposed and connected to the main shoreline. The team also identified a second major chert quarry on the Hone River.

Near Mingo Lake, Milne and her team previously had discovered evidence that indicated the Dorset people (determined through carbon dating) intensively hunted caribou and made chert tools. These facts suggest that during the summers, the Dorset, like their Pre-Dorset predecessors, travelled inland for the same purposes. If the interior was the only reliable place to get chert toolstone on southern Baffin Island, both Pre-Dorset and Dorset toolmakers would have another important reason to travel inland.

The continuance of long distance seasonal mobility between inland and coastal areas for both Pre-Dorset and Dorset populations strongly suggests that these peoples' way of life was not drastically different in this region of the Arctic. Geochemically testing Pre-Dorset and Dorset chert artifacts from inland and coastal sites and matching these signatures to the inland source areas identified in 2013 will provide further insights on how these earliest Arctic populations lived so long ago on southern Baffin Island.

Want to learn more?

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Aquatic invasive species in the Canadian Arctic

Kimberly Howland and **Kristen Adair** (Fisheries and Oceans Canada),
Philippe Archambault and **Jésica Goldsmit** (Université du Québec à Rimouski)

Divers heading out to collect benthic samples

Over the past century, aquatic invasive species (AIS) have become a serious threat to biodiversity in North America as new species are introduced to ecosystems and begin competing for limited resources. Until recently, AIS have been limited in the Canadian Arctic because the harsh conditions, short shipping season and low levels of shipping placed this region at low risk for the introduction of species from other parts of the world. However the warming climate, increasing resource exploration and the resultant increase in shipping activities have increased the AIS risk in northern waters. As these continue to intensify, it is important to understand how the aquatic ecosystems could be affected.

As with many Arctic issues, historical sampling efforts in this relatively inaccessible part of the world have been low, and there is a paucity of information about current ecosystem composition. Therefore, the first step in assessing potential future changes to Arctic aquatic ecosystems is to understand the present composition of species in this environment.

A team of marine researchers from the Canadian Aquatic Invasive Species Network (CAISN), led by Kimberly Howland from Fisheries and Oceans Canada, has been compiling baseline data on what species exist in the Arctic. The focus was on coastal marine invertebrates, which compose an important part of the base for the arctic aquatic food chain. The team is concentrating its efforts in the ports at Churchill, Manitoba; Deception Bay, Quebec; and Iqaluit, Nunavut, which were among those identified as being at greatest risk in a recent shipping assessment. Steensby Inlet, Nunavut, is also being examined because it is expected to be at future risk because of proposed shipping activity associated with resource extraction in the area.

The team has used a variety of techniques, including sampling from boats, the shore and by diving to the ocean floor to maximize the diversity and numbers of organisms encountered. The team sampled benthic (bottom) organisms found along six transects established at each port. Each transect crossed the intertidal zone (the area covered by water at high tide and uncovered at low tide) and the subtidal zone (the area permanently covered by water) from shore to a depth of 10 m at low tide. The team collected organisms that were encountered at the surface of the ocean floor and also dug into the ocean floor to sample at depth in various places along the transects. Researchers also took samples of temperature, salinity, water clarity, dissolved oxygen, acidity and conductivity

"Since invasions have been limited by the harsh climate and limited shipping, the Canadian Arctic is one of the few remaining regions on the globe where we have a chance to be proactive with respect to invasive species."

– Kimberly Howland

to get an accurate depiction of the current environment at each port. Finally, zooplankton samples were collected from the water column at the deepest point along each transect, both in the ice-covered and open water seasons.

Other CAISN researchers from the universities of Windsor, Guelph and Prince Edward Island are also involved in the analysis. The organisms are being analyzed by using not only the traditional taxonomic practice of classifying organisms based on their appearance, but also by using modern molecular genetic analysis, including barcoding and pyrosequencing (which use markers and the sequence of nucleotides on an organism's DNA to determine the species) to determine which species were present, which species were native and which species were not indigenous to the port in which they were sampled.

The comparison of recent and historical surveys has uncovered several new species in these ports. None of the "new" species are known invasive species. It was determined that most of them had not been introduced but are native to the areas and had not been included in previous surveys of these poorly known Arctic coastal areas. However, at least six species found in these ports were new for Canada and classified as cryptogenic (meaning that scientists are uncertain if the species is native or if it is indeed introduced). The majority of species have been previously identified elsewhere in the Arctic or subarctic. These findings provide a baseline for comparison with future surveys conducted in these ports, as shipping and climate change continue to intensify.

A bowl of creatures gathered from the sea floor of Steensby Inlet, Nunavut, including sea stars, hermit crabs, sea urchins and anemones

Information on changes in the Arctic aquatic food chain is of great interest to Northerners because many local communities still depend on marine fish and mammals as part of their diet. Consequently, the research team has made every effort to incorporate local people in their work and to communicate their findings to the communities most affected. During sampling, members of the communities of Iqaluit, Hall Beach, Igloolik and Salluit were hired to collect data. Working with local people who had knowledge and skill on the land and on water enhanced the safety and effectiveness of the field campaigns. To ensure that interested community members have access to information about AIS in these ports, researchers made presentations at local community meetings, did interviews with local news media, including CBC North and *Nunatsiaq News*, and participated in the development of an AIS awareness brochure in English and Inuktitut.

Multi-disciplinary research in Old Crow permafrost

Duane Froese (University of Alberta)

Temporary camp along the Old Crow River at a site known as CRH 11a — one of the richest sites for Pleistocene fossils in Yukon. The site regularly produces fossils from mammoth, horse, bison, and occasionally more rare fossils such as giant beaver, camel and short-face bear.

The Old Crow Flats in northern Yukon are a vast network of tundra lakes and ponds. The flats have great ecological and social significance because they form an important wetland habitat for wildlife and are used by the Vuntut Gwitchin First Nation for hunting, trapping and fishing. The entire area is underlain by continuous permafrost and is one of the richest sources of ice age fossils in Canada. For all of these reasons, the Old Crow Flats are of great significance to researchers in a variety of disciplines including evolutionary biology, ancient DNA, geochronology, geophysical sciences, geochemistry, soil science and paleoecology. Duane Froese is a researcher from the University of Alberta whose work in Old Crow extends across many of these sciences.

The objective of Froese's research is to improve understanding of the ancient history of the Old Crow region as recorded by existing elements of the physical environment. Though particularly focused on permafrost (ground that remains below 0°C for one consecutive year), his team's approach to understanding environmental changes is multidisciplinary and collaborative. This approach has yielded a wealth of knowledge about the Old Crow region, as well as an improved understanding of the world in general.

Using sediment cores sampled from permafrost, scientists are able to glean an abundance of information about changes above ground in the Old Crow region. For instance, the formation of ice within the permafrost can yield information about the nature and intensity of local disturbances (including fire and changing hydrology) experienced at the surface of the permafrost.

When examining the frozen ground in this region, it is common to encounter ancient fossils deposited during the ice age (2.6 million to 10 000 years ago). During this era, the Old Crow region was not glaciated and sustained life that included mammoths, hyenas, camels, horses, bison and giant beavers, to name a few. The bones of all of these animals can still be found in the flats. The age of fossils and other paleoenvironmental records found in the permafrost can be dated approximately by using tephra layers (volcanic ash) found in the permafrost as a reference. A particular volcanic ash, the Old Crow tephra, is widespread through the Old Crow region and across Alaska and was deposited about 125 000 years ago at a time of dramatic warming across the Arctic.

Because the Old Crow region was not glaciated during the Quaternary, deposits formed during interglacial intervals (periods in the past as warm or warmer than today) are preserved within the sedimentary record. Froese, his research group and collaborators studied several of these intervals to look at plant and insect communities, the vertebrate record, and the impacts of this past warming on

"These projects may seem disparate, but the focus is on understanding the record and processes of environmental change in the north."

– Duane Froese

permafrost. What they found is that during these periods permafrost thaw was widespread, lakes expanded and taxa from more southerly regions extended their ranges.

A broad overview of the history of ancient history of Old Crow, authored by Grant Zazula and Duane Froese, was recently published in a book entitled *Ice Age Old Crow: Yukon's ancient history from north of the Arctic Circle*. This publication is available for download at **www.tc.gov.yk.ca/publications/ice_age_old_crow.pdf**.

Want to learn more?

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"Recalibrating equus evolution using the genome sequence of an early Middle Pleistocene horse."
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PCSP-supported projects in 2012 and 2013

Karrak Lake assessment of continental efforts at population reduction of Light Geese [2012 & 2013]

Principal investigator: Ray Alisauskas
(Science and Technology Branch/Wildlife Research Division, Environment Canada)
Locations: Karrak Lake and Perry River, NU

Survival in Arctic Geese (Perry River, Queen Maud Gulf Bird Sanctuary) [2012 & 2013]

Principal investigator: Ray Alisauskas
(Science and Technology Branch/Wildlife Research Division, Environment Canada)
Locations: Perry River and Atkinson Point River, NU

Gastro-intestinal bioaccessibility of contaminants in traditional food [2013]

Principal investigator: Marc Amyot
(Sciences biologiques, Université de Montréal)
Location: Resolute (Cornwallis Island), NU

Bathurst Island Peary Caribou and Muskoxen Population and Recruitment Survey [2013]

Principal investigator: Morgan Anderson
(Department of Environment, Government of Nunavut)
Location: Resolute (Cornwallis Island), NU

O'Grady Lake archaeology and ice patch monitoring project [2012 & 2013]

Principal investigator: Tom Andrews
(Prince of Wales Northern Heritage Centre/Cultural Places Program, Government of Northwest Territories)
Location: O'Grady Lake, N.W.T.

Assessing the adaptive capacity of zooplankton communities/populations in Sub-Arctic ponds: The role of dispersal and genetic variation [2012]

Principal investigator: Shelley Arnott
(Biology Department, Queen's University)
Location: Churchill, Man.

Genetic mark-recapture population assessment of polar bears in Baffin Bay and Kane Basin, Nunavut [2012 & 2013]

Principal investigator: Stephen Atkinson
(Department of Environment/Wildlife Management Division, Government of Nunavut)
Locations: Alexandra Fiord and Grise Fiord (Ellesmere Island), Pond Inlet, Clyde River, Qikiqtarjuak and Cape Dyer (Baffin Island), Cape Jameson, Cape Hooper and Bathurst Bay, NU

Tectonics and sedimentation in the High Arctic [2013]

Principal investigator: Benoit Beauchamp
(Department of Geoscience, University of Calgary)
Location: Otto Fiord, NU

Nunavut carvingstone deposit evaluation program [2012 & 2013]

Principal investigator: Mike Beauregard
(Department of Economic Development & Transportation/Mineral & Petroleum Resources, Government of Nunavut)
Locations: Clyde River, Iqaluit, Qikiqtarjuaq, Arctic Bay and Pond Inlet (Baffin Island), Cambridge Bay (Victoria Island), Gjoa Haven (King William Island), Sanikiluaq (Flaherty Island), Kugaaruk, Rankin Inlet, Baker Lake and Kugluktuk, NU

Ecology of arctic and red fox on Bylot Island [2012 & 2013]

Principal investigator: Dominique Berteaux
(Département de Biologie, Chimie et géographie, Université du Québec à Rimouski)
Location: Bylot Island, NU

Ecology of insectivorous birds on Bylot Island [2012 & 2013]

Principal investigator: Joël Bêty
(Département de Biologie, Chimie et géographie, Université du Québec à Rimouski)
Location: Bylot Island, NU

Freshwater and tundra baseline monitoring near Uyarsivik Lake in TuktutNogait National Park [2012]

Principal investigator: Jean-Francois Bisaillon
(Western Arctic Field Unit/Resource Conservation, Parks Canada)
Location: Uyarsivik Lake, N.W.T.

View from the cockpit of a Bell 206LR Helicopter as it flies over Hebron Fiord, Labrador

Hornaday River monitoring program [2012 & 2013]

Principal investigators: Jean-Francois Bisaillon [2012] and Herbert Allen [2013]
(Western Arctic Field Unit/Resource Conservation, Parks Canada)
Location: Hornaday River, N.W.T.

The Arctic in flux: How has recent climate change affected contaminant transport and uptake in aquatic arctic systems? [2012 & 2013]

Principal investigator: Jules Blais
(Department of Biology, University of Ottawa)
Locations: Tathlina Lake, Yellowknife and Inuvik, N.W.T.

Glacier mass balance across the Queen Elizabeth Islands, Canada [2012 & 2013]

Principal investigator: David Burgess
(Geological Survey of Canada, Natural Resources Canada)
Locations: Melville ice cap (Melville Island), N.W.T.; Meighen ice cap (Meighen Island), Agassiz ice field, Devon ice cap and Grise Fiord (Ellesmere Island), NU

Permafrost and climate change, Western Arctic Canada [2012 & 2013]

Principal investigator: Chris Burn
(Geography Department, Carleton University)
Locations: Garry Island and Illisarvik, N.W.T.

GEM - Multiple metals Melville Peninsula project: Wager Bay surficial geology activity [2012]

Principal investigator: Janet Campbell
(Geological Survey of Canada, Natural Resources Canada)
Locations: Hayes River camp and Repulse Bay, NU

A latitudinal investigation of ecosystem sensitivity to methylmercury bioaccumulation in Arctic fresh waters [2013]

Principal investigator: John Chételat
(Ecotoxicology and Wildlife Health Division/Wildlife and Landscape Science Directorate, Environment Canada)
Location: Iqaluit (Baffin Island), NU

The Royal Canadian Geographical Society Martin Bergmann Medal for Excellence in Arctic Leadership and Science.

Did you know?

In 2012, the Royal Canadian Geographical Society established the Martin Bergmann Medal for excellence in Arctic leadership and science. The medal is awarded to individuals who demonstrate significant contributions to Arctic science as well as outstanding contributions to Arctic leadership. The inaugural award was presented posthumously to Martin Bergmann, late director of the PCSP. Nominations for the award can be made by any Canadian through the Royal Canadian Geographical Society.

Mass balance, dynamics and recent changes of glaciers in Kluane National Park, Yukon [2012 & 2013]

Principal investigator: Luke Copland
(Department of Geography, University of Ottawa)
Location: Kaskawulsh Glacier, Y.T.

Northern Ellesmere ice shelves, epishelf lakes & climate impacts [2012 & 2013]

Principal investigator: Luke Copland
(Department of Geography, University of Ottawa)
Locations: Eureka (Ellesmere Island) and Expedition Fiord (Axel Heiberg Island), NU

Hydrocarbon remote sensing survey and seismic ground motion studies in Mackenzie Delta [2012]

Principal investigators: Michelle Côté and Scott Dallimore
(Geological Survey of Canada, Natural Resources Canada)
Location: Mackenzie Delta, N.W.T.

Peary caribou and muskoxen abundance and distribution on Melville Island, and Prince Patrick Island, Northwest Territories and Nunavut [2012]

Principal investigator: Tracy Davison
(Environment and Natural Resources, Government of Northwest Territories)
Locations: Mould Bay (Prince Patrick Island), N.W.T. and Cape Providence (Melville Island), N.W.T. and NU

Movement patterns and population structure of polar bears in a changing climate [2012 & 2013]

Principal investigator: Andrew Derocher
(Biological Sciences, University of Alberta)
Locations: Cape Parry, Browns Harbour, Norway Island, Banks Island and Prince Patrick Island, N.W.T.

The only means of survival: The ethnoarchaeology of Inuit sea-mammal hunting, northwest Foxe Basin, Nunavut [2012]

Principal investigator: Sean Desjardins
(Department of Anthropology, McGill University)
Location: Pingiqqalik, NU

Investigation of vegetation-snow-permafrost-climate interactions for improved predictions of the permafrost thermal regime [2013]

Principal investigator: Florent Domine
(Département de chimie, Université Laval)
Location: Bylot Island, NU

Climate warming in the Canadian High Arctic: Effects on lakes [2013]

Principal investigator: Paul Drevnick
(Centre Eau Terre Environnement, Institut national de la recherche scientifique)
Location: Resolute (Cornwallis Island), NU

The Polar Environment Atmospheric Research Laboratory (PEARL) [2012]

Principal investigator: James Drummond
(Department of Physics and Atmospheric Science, Dalhousie University)
Location: Eureka (Ellesmere Island), NU

Environmental change at Duck Hawk Bluffs, SW Banks Island: from a forested to glaciated Arctic [2012]

Principal investigator: John England
(Earth and Atmospheric Sciences, University of Alberta)
Location: Duck Hawk Bluffs (Banks Island), N.W.T.

Regional stream sediment and water geochemistry survey, Mackenzie Mountains, Northwest Territories [2012]

Principal investigator: Hendrik Falck
(Northwest Territories Geosciences Office, Aboriginal Affairs and Northern Development Canada)
Locations: Coates Lake, Lac de Gras and Lockhart, N.W.T.

GEM - Bedrock mapping and structural analysis of Mackenzie Plain and Franklin Mountains [2012]

Principal investigator: Karen Fallas
(Geological Survey of Canada, Natural Resources Canada)
Location: Norman Wells, N.W.T.

Eastern Arctic Narwhal Aerial Survey [2013]

Principal investigator: Steve Ferguson
(Arctic Aquatic Research Division, Environment Canada)
Locations: Resolute (Cornwallis Island), Clyde River (Baffin Island) and Jones Sound, NU

Bonnet Plume (106B) mapping project - Understanding the evolution of Lower Paleozoic basinal rocks in the northern Mackenzie Mountains [2012]

Principal investigator: Beth Fischer
(Northwest Territories Geosciences Office, Aboriginal Affairs and Northern Development Canada)
Location: Grinde Willow Camp, N.W.T.

Tracking the movement of arctic cod and Greenland shark in Lancaster Sound [2012]

Principal investigator: Aaron Fisk
(Great Lakes Institute for Environmental Research, University of Windsor)
Location: West of Allen Bay, NU

Trophic interactions and movements of Arctic fish and marine mammals in a changing Arctic [2013]

Principal investigator: Aaron Fisk
(Great Lakes Institute for Environmental Research, University of Windsor)
Locations: Resolute (Cornwallis Island), Little Cornwallis Island, Maxwell Bay and Stuart Bay, NU

Glacier mass balance variability in a small subarctic mountain range, southwest Yukon Territory [2012 & 2013]

Principal investigator: Gwenn Flowers
(Department of Earth Sciences, Simon Fraser University)
Locations: Kaskawulsh Glacier tributary, Kluane Glacier tributary, Y.T.

Coastal geoscience in support of BREA (Beaufort Regional Environmental Assessment) [2012 & 2013]

Principal investigators: Donald Forbes [2012] and Dustin Whalen [2013]
(Geological Survey of Canada, Natural Resources Canada)
Location: Inuvik, N.W.T.

GEO-NEIGE (Northern Ellesmere Island in the Global Environment – geosystems) [2013]

Principal investigator: Daniel Fortier
(Geography, University of Montreal)
Locations: Ward Hunt Island and Resolute (Cornwallis Island), NU

High Arctic periglacial ecosystem responses to climate change [2012 & 2013]

Principal investigator: Daniel Fortier
(Département de géographie, Université de Montréal)
Location: Bylot Island, NU

Past modes of Arctic climate variability from varved sediments [2012]

Principal investigator: Pierre Francus
(Centre Eau, Terre et Environnement, Institut National de la Recherche Scientifique)
Location: South Sawtooth Lake (Ellesmere Island), NU

Arctic cultural heritage at risk: Climate change impacts on the archaeological record in the western Canadian Arctic [2013]

Principal investigator: Max Friesen
(Department of Anthropology, University of Toronto)
Locations: Tuktoyaktuk and Inuvik, N.W.T.

Quaternary geology, permafrost and paleoenvironmental investigations of thermokarst lake basins in northern Yukon [2012]

Principal investigator: Duane Froese
(Department of Earth and Atmospheric Sciences, University of Alberta)
Locations: Bluefish basin and Old Crow basin, Y.T.

Water level changes in the Aishihik Region, Yukon Territory, Canada [2012]

Principal investigator: Konrad Gajewski
(Department of Geography, University of Ottawa)
Location: Aishihik Region, Y.T.

Evaluation of hydro-climatic drivers of contaminant transfer in aquatic food webs in the Husky Lakes Watershed (Inuvialuit Settlement Region, Northwest Territories) [2012 & 2013]

Principal investigator: Nikolaus Gantner
(Department of Geography, University of Victoria)
Locations: Inuvik, Noell Lake, Yaya Lake, Husky Lake and Tuktoyaktuk, N.W.T.

Seabird studies at Coats Island, Nunavut [2013]

Principal investigator: Tony Gaston
(Science and Technology/Wildlife Research, Environment Canada)
Location: Coats Island, NU

Biology of tundra birds: demographics, trophic interactions and climate change [2012 & 2013]

Principal investigator: Gilles Gauthier
(Centre d'études nordiques, Université Laval)
Location: Bylot Island, NU

Population studies of common and king eider Ducks breeding at East Bay, Southampton Island, Nunavut [2012 & 2013]

Principal investigator: Grant Gilchrist
(Science and Technology/Wildlife Research Division, Environment Canada)
Location: East Bay (Southampton Island), NU

East Bay Shorebirds (Arctic PRISM Tier 2 Site) [2012 & 2013]

Principal investigators: Grant Gilchrist and Jennie Rausch
(Canadian Wildlife Service/Northern Conservation Section, Environment Canada)
Location: East Bay (Southampton Island), NU

CASIMBO: Canadian Arctic Sea Ice Mass Balance Observatory [2012 & 2013]

Principal investigator: Christian Haas
(Department of Earth and Atmospheric Sciences, and Geophysics, University of Alberta [2012]; Earth Science and Engineering, York University [2013])
Locations: South Cape Fiord, Grise Fiord and Alert (Ellesmere Island), Sachs Harbour (Banks Island) and Resolute (Cornwallis Island), NU

GEM – Ellesmere Island teleseismic experiment [2012]

Principal investigator: James Haggart
(Geological Survey of Canada, Natural Resources Canada)
Location: Eureka (Ellesmere Island), NU

Late Proterozoic stratigraphy of the Yukon and its record of Earth system evolution [2012]

Principal investigator: Galen Halverson
(Department of Earth and Planetary Sciences, McGill University)
Locations: Mount Profeit and Snake River, Y.T.

Ecology of Ross's Gulls and Ivory Gulls in Penny Strait, NU [2012]

Principal investigator: Siu-Ling Han
(Environmental Stewardship Branch/Canadian Wildlife Service, Environment Canada)
Location: Tern Island, NU

Seabird and contaminant monitoring, Prince Leopold Island, NU [2012 & 2013]

Principal investigator: Siu-Ling Han
(Environmental Stewardship Branch/Canadian Wildlife Service, Environment Canada)
Location: Prince Leopold Island, NU

Petrology and geochemistry of the late Archaean banded iron formation and associated turbidites, western Slave Craton: constraints on palaeoenvironment [2012]

Principal investigator: Rasmus Haugaard
(Department of Earth and Atmospheric Sciences, University of Alberta)
Locations: Point Lake, Russell Lake and Damoti Lake, N.W.T.

Plant adaptation and ecosystem responses to climate change [2012]

Principal investigator: Greg Henry
(Geography Department, University of British Columbia)
Locations: Alexandra Fiord, Hot Weather Creek, Big Slide Creek, Princess Marie Bay lowland, Sverdrup Pass, Eastwind Lake and Eureka (Ellesmere Island), NU

Canadian Rangers preparing komatiks during Operation NUNALIVUT

Tundra ecosystems and climate change: effects of changes in precipitation regimes and permafrost disturbance [2013]

Principal investigator: Greg Henry
(Geography Department, University of British Columbia)
Locations: Alexandra Fiord, Hot Weather Creek, Princess Marie Bay, Sverdrup Pass, Eastwind Lake, Fosheim Peninsula and Eureka (Ellesmere Island), NU

Archaeological investigations of past hunting landscapes on Banks Island, N.W.T. [2013]

Principal investigator: Lisa Hodgetts
(Department of Anthropology, University of Western Ontario)
Location: Fish Lake (Banks Island), N.W.T.

Canadian Aquatic Invasive Species Network (CAISNII) Arctic sampling program: Baseline benthic invertebrate surveys and zooplankton collections in Steensby Inlet, Nunavut and Deception Bay, Nunavik [2012]

Principal investigator: Kimberly Howland
(Arctic Aquatic Division, Fisheries and Oceans Canada)
Locations: Steensby Inlet, NU and Deception Bay, Que.

Dolly Varden population assessment [2012 & 2013]

Principal investigator: Kimberly Howland
(Arctic Aquatic Division, Fisheries and Oceans Canada)
Locations: Big Fish River, Rat River and Babbage River, Y.T.

The ecological determinants of muskrat abundance at the northern edge of their range [2012]

Principal investigator: Murray Humphries
(Department of Natural Resource Sciences, McGill University)
Location: Old Crow, Y.T.

Distribution and abundance of barrenground caribou (Rangifertarandusgroenlandicus) on Baffin Island, Nunavut [2012]

Principal investigator: Debbie Jenkins
(Department of Environment/Wildlife Research Section, Government of Nunavut)
Locations: Nettilling Lake, Iqaluit, Cape Dorset, Pangnirtung, Longstaff Bluff and Dewar Lake (Baffin Island), NU

GEM field camp on Cumberland Peninsula, Baffin Island

Assessing risks of wildlife diseases in the Canadian North [2012 & 2013]

Principal investigator: Emily Jenkins
(Veterinary Microbiology, University of Saskatchewan)
Locations: Karrak Lake and Perry River, NU

Hummocked multi-year ice: The most severe, but least understood type of sea ice [2012]

Principal investigator: Michelle Johnston
(Canadian Hydraulics Centre, National Research Council)
Locations: Queen's Channel and Allen Bay, NU

Fishing Branch River Chum salmon habitat assessments [2013]

Principal investigator: William Josie
(Natural Resources Department, Vuntut Gwitch'in Government)
Location: Fishing Branch River, Y.T.

Miner River Chinook salmon aerial survey [2012 & 2013]

Principal investigator: William Josie
(Fish and Wildlife Management, Vuntut Gwitch'in Government)
Location: Old Crow, Y.T.

Did you know?

In August 2013, the Government of Canada announced $100 million in funding for Phase 2 of the Geo-mapping for Energy and Minerals (GEM) program (2013–2020). Following on the success of the PCSP-GEM collaboration for the delivery of GEM phase 1 (2008–2013), the PCSP will be the primary logistical service provider for GEM scientists for the duration of GEM-2. The GEM program will further develop geological maps, data sets and knowledge. The new knowledge and data will complete regional-scale coverage of Canada's North by 2020.

The second phase of the GEM program will build on the successes of the past five years and will improve public understanding of the resource potential in the North, helping northerners with economic and land-use decisions. New public geoscience knowledge generated by the GEM program will help to attract further investments in the North that will benefit northerners through enhanced economic opportunities and jobs.

GEM – Minerals diamond project [2012]

Principal investigator: Bruce Kjarsgaard
(Geological Survey of Canada, Natural Resources Canada)
Locations: Melville Peninsula and east of Chantrey Inlet, NU

GEM - Miscellaneous projects [2012]

Principal investigators: Bruce Kjarsgaard, Margot McMechan
(Geological Survey of Canada, Natural Resources Canada)
Locations: Tyrell Lake, Lynx Lake and Hoarfrost River, N.W.T.

Evaluating the impacts of mega-scale permafrost disturbances on northern streams [2013]

Principal investigator: Denis Lacelle
(Department of Geography, University of Ottawa)
Location: Fort McPherson, N.W.T.

Landscape and aquatic system processes and impacts due to changing permafrost [2012]

Principal investigator: Scott Lamoureux
(Department of Geography, Queen's University)
Locations: Cape Bounty and Cape Collingwood (Melville Island), Char Lake (Cornwallis Island), NU and Chevalier Bay, N.W.T.

Spatial dimensions and downstream impacts of permafrost perturbation on High Arctic terrestrial and aquatic systems [2013]

Principal investigator: Scott Lamoureux
(Department of Geography, Queen's University)
Locations: Cape Bounty and Cape Collingwood (Melville Island) and Char Lake (Cornwallis Island), NU

GEM - Yukon sedimentary basins project [2012]

Principal investigators: Larry Lane
(Geological Survey of Canada, Natural Resources Canada)
Location: Mile 229 of the Dempster Highway, Y.T.

Causes and consequences of Arctic environmental change: A multiscale approach [2012 & 2013]

Principal investigator: Trevor Lantz
(Environmental Studies, University of Victoria)
Locations: Jimmy Lake, Parsons Lake, Peninsula Point, Ellice Island, Zed Creek, Husky Lake and uplands between Inuvik and Tuktoyaktuk, N.W.T.

Using Inuvialuit observations to monitor environmental change in the Mackenzie Delta region [2012]

Principal investigator: Trevor Lantz
(Environmental Studies, University of Victoria)
Locations: Parsons Lake, Willow River, Husky Lake, Big Fish River, Akalavik, Tuktoyaktuk and Inuvik , N.W.T. and Blow River Y.T.

Arctic melt ponds: a hotspot for the production of greenhouse gas emissions and methylmercury [2013]

Principal investigator: Isabelle Laurion
(Centre Eau Terre Environnement, Institut national de la recherche scientifique)
Location: Bylot Island, NU

Arctic Goose Banding on Baffin Island, Nunavut [2012 & 2013]

Principal investigator: Jim Leafloor
(Canadian Wildlife Service, Environment Canada)
Location: Nikku Island on Nettilling Lake (Baffin Island), NU

Southampton Island goose banding [2012 & 2013]

Principal investigator: Jim Leafloor
(Canadian Wildlife Service, Environment Canada)
Location: Coral Harbour (Southampton Island), NU

The inuksuit project: Ancient and traditional Inuit navigational systems on northern Baffin Island [2012]

Principal investigator: Sylvie LeBlanc
(Carleton University)
Location: Steensby Inlet, NU

Population dynamics of Snow Geese in relation to habitat [2012 & 2013]

Principal investigator: Josée Lefebvre
(Environmental Stewardship Branch/Canadian Wildlife Service, Environment Canada)
Location: Bylot Island, NU

Stress-mediated mechanisms linking individual state, climatic variation and population health in Arctic-breeding birds [2012 & 2013]

Principal investigator: Oliver Love
(Biological Sciences, University of Windsor)
Location: East Bay (Southampton Island), NU

Determining key marine bird habitats and contaminant sources in Lancaster Sound [2012 & 2013]

Principal investigator: Mark Mallory
(Biology, Acadia University)
Location: Prince Leopold Island, NU

Tracking rare, high Arctic gulls [2012 & 2013]

Principal investigator: Mark Mallory
(Biology, Acadia University)
Locations: Tern Island, Hamilton Island and Resolute (Cornwallis Island), NU

Hydrological studies, Mackenzie Delta region [2012 & 2013]

Principal investigator: Philip Marsh
(Water Science & Technology/Hydrologic Processes and Modelling, Environment Canada)
Locations: Inuvik and Trail Valley Creek, N.W.T.

Energy balance and atmospheric boundary layer studies, Prince of Wales Icefield, Ellesmere Island [2012 & 2013]

Principal investigator: Shawn Marshall
(Department of Geography, University of Calgary)
Location: Vendom Glacier and Prince of Wales Icefield (Ellesmere Island), NU

Hall Peninsula integrated geoscience program [2012 & 2013]

Principal investigators: David Mate [2012] and Tommy Tremblay [2013]
(Canada-Nunavut Geoscience Office, Government of Nunavut and Natural Resources Canada)
Location: Hall Peninsula (Baffin Island), NU

Ecological integrity monitoring in Vuntut National Park [2012]

Principal investigator: Ian McDonald
(Yukon Field Unit/Vuntut National Park, Parks Canada)
Locations: Dog Creek and Old Crow, Y.T.

Hydrological and ecological monitoring in Old Crow Flats [2013]

Principal investigator: Ian McDonald
(Yukon Field Unit, Parks Canada)
Location: Old Crow, Y.T.

The Polar Sea [2013]

Principal investigator: Kevin McMahon
(Primitive Entertainment)
Locations: Resolute (Cornwallis Island), Penny Ice Cap and Pond Inlet (Baffin Island), NU

Hazardous sea ice in the Canadian archipelago [2012 & 2013]

Principal investigator: Humfrey Melling
(Science Sector Pacific Ocean Science Division, Fisheries and Oceans Canada)
Location: Resolute (Cornwallis Island), NU

Sea Ice BIOTA (Biological Impacts Of Trends in the Arctic) [2012 & 2013]

Principal investigator: Christine Michel
(Arctic Aquatic Research Division, Fisheries and Oceans Canada)
Locations: Resolute Passage, Barrow Strait, McDougall Sound and Wellington Channel, NU

Chert sourcing and palaeo-Eskimo lithic technology: An archaeometric approach to understanding technological organization [2012 & 2013]

Principal investigator: Brooke Milne
(Department of Anthropology, University of Manitoba)
Locations: Mingo River, Mingo Lake, Nuvungmiut River, Amadjuak Lake, Chert Island and Hone River (Baffin Island), NU

Disappearing ice caps [2013]

Principal investigator: Gifford Miller
(Institute of Arctic and Alpine Research, University of Colorado Boulder)
Locations: near Qikiqtarjuaq and Pangnirtung (Baffin Island), NU

Critical habitat of Bull Trout in the lower South Nahanni watershed, Northwest Territories [2012]

Principal Investigator: Neil Mochnacz
(Arctic Aquatic Research, Fisheries and Oceans Canada)
Location: Prairie Creek, N.W.T.

Juvenile occupancy and thermal regimes of sensitive stream salmonids in Nahanni National Park [2013]

Principal investigator: Neil Mochnacz
(Arctic Aquatic Research, Fisheries and Oceans Canada)
Location: Nahanni National Park, N.W.T.

Ecological thresholds of Dolly Varden in the Canadian Western Arctic [2013]

Principal investigator: Neil Mochnacz
(Arctic Aquatic Research, Fisheries and Oceans Canada)
Locations: Babbage River, Big Fish River and Rat River, Y.T.

In-stream flow needs of northern Dolly Varden in the Canadian Western Arctic [2012]

Principal investigator: Neil Mochnacz
(Arctic Aquatic Research, Fisheries and Oceans Canada)
Location: Inuvik, N.W.T.

Dynamics and habitat use by lemmings under climate change [2012 & 2013]

Principal investigator: Douglas Morris
(Science and Environmental Studies, Lakehead University)
Locations: Cambridge Bay (Victoria Island), Walker Bay and Kent Peninsula, NU

Ocean dynamics and meltwater input and the fate of Ellesmere Island's ice shelves, ice tongues and epishelf lakes [2012 & 2013]

Principal investigator: Derek Mueller
(Department of Geography and Environmental Studies, Carleton University)
Locations: Purple Valley and Milne Ice Shelf (Ellesmere Island), NU

Ice Service Specialist on duty at sunset at the PCSP facility in Resolute, Nunavut

Investigating potential regional effects of climate warming on mercury and other contaminants in landlocked Arctic char (Salvelinus alpinus) [2012 & 2013]

Principal investigator: Derek Muir
(Aquatic Ecosystem Protection Research Division, Environment Canada)
Locations: Resolute, Boomerang Lake and Amituk Lake (Cornwallis Island) and Cape Bounty (Melville Island),NU

Arctic - Ice Covered Ecosystem in a rapidly changing environment (Arctic-ICE) [2012]

Principal investigator: C.J. Mundy
(Centre for Earth Observation Science, University of Manitoba)
Location: Resolute Passage, NU

Ecological integrity monitoring of tundra and freshwater ecosystems in Aulavik National Park [2012 & 2013]

Principal investigators: Linh Nguyen [2012] and John Lucas Jr. [2013] (Western Arctic Field Unit/Resource Conservation, Parks Canada)
Locations: Green Cabin, Castel Bay and Southern boundary of Aulavik National Park (Banks Island), N.W.T.

Permafrost and coastal monitoring in Ivvavik National Park [2012]

Principal investigator: Linh Nguyen
(Western Arctic Field Unit/Resource Conservation, Parks Canada)
Location: Sheep Creek, Y.T.

Validating experimental and modeled rate constants for reduction and oxidation of mercury species in Arctic snow: Assessing the modeling error [2013]

Principal investigator: Nelson O'Driscoll
(Department of Earth and Environmental Science, Acadia University)
Location: Resolute (Cornwallis Island), NU

The geochemical ecology of cryptoendolithic microorganisms: Relationships between cyanobacteria and sandstone weathering in the Canadian High Arctic [2012]

Principal investigator: Christopher Omelon
(Geological Sciences, University of Texas)
Location: Eureka (Ellesmere Island), NU

Researchers conducted a genetic mark-recapture to estimate the abundance, trend, distribution and habitat use of polar bears in Baffin Bay and Kane Basin.

Metallogenic significance and volcanogenic massive sulphide potential of the ArcheanBanting Group, Slave Province, N.W.T., Canada [2012]

Principal investigator: Luke Ootes
(Northwest Territories Geoscience Office, Government of Northwest Territories)
Location: Sharrie Lake area and Snare River, N.W.T.

North Baffin Island narwhal study [2012]

Principal investigator: Jack Orr
(Arctic Aquatic Research Division, Fisheries and Oceans Canada)
Location: Tremblay Sound, NU

An analogue mission to discover the genesis of methane on Mars [2012]

Principal investigator: Gordon Osinski
(Department of Earth Sciences, University of Western Ontario)
Location: Lost Hammer spring (Axel Heiberg Island), NU

Investigation of a possible new meteorite impact structure on Victoria Island, Nunavut [2012]

Principal investigator: Gordon Osinski
(Department of Earth Sciences, University of Western Ontario)
Location: Collinson Crater (Victoria Island), NU

The Haughton impact structure, Devon Island, Nunavut: Geological, biological, and environmental effects [2013]

Principal investigator: Gordon Osinski
(Department of Earth Sciences, University of Western Ontario)
Location: Haughton River Valley (Devon Island), NU

Paleoclimatological assessment of the central Northwest Territories: Implications for the long term viability of the Tibbitt to Contwoyto Winter Road [2012]

Principal investigator: R. Timothy Patterson
(Department of Earth Sciences, Carleton University)
Location: Lac de Gras, N.W.T.

GEM - Operation GEM [2012]

Principal investigator: Sally Pehrsson
(Geological Survey of Canada, Natural Resources Canada)
Locations: Baker Lake and Devon Island, NU and Obre Lake lodge, N.W.T.

Long-term limnological and paleolimnological monitoring of Nettilling Lake, central Baffin Island, Nunavut, Canada [2012 & 2013]

Principal investigator: Reinhard Pienitz
(Centre for Northern Studies, Université Laval)
Locations: Nikko Island on Nettilling Lake and Iqaluit (Baffin Island), NU

Impacts of warming climatic conditions on northern ecosystems [2012 & 2013]

Principal investigator: Michael Pisaric
(Department of Geography and Environmental Studies, Carleton University [2012] and Department of Geography, Brock University [2013])
Locations: Yellowknife, Inuvik and Fort McPherson, N.W.T.

An integrated study of permafrost conditions on Herschel Island, Northern Yukon [2012]

Principal investigator: Wayne Pollard
(Geography Department, McGill University)
Location: Herschel Island, Y.T.

The vulnerability and resilience of high arctic permafrost to climate change [2012 & 2013]

Principal investigator: Wayne Pollard
(Geography Department, McGill University)
Locations: Expedition Fiord (Axel Heiberg Island) and Eureka (Ellesmere Island), NU

Viscount Melville Sound polar bear sub-population survey [2012]

Principal investigator: Jodie Pongracz
(Environment and Natural Resources/Wildlife Management, Government of the Northwest Territories)
Locations: Mould Bay (Prince Patrick Island), Polar Bear Cabin (Banks Island), Cape Providence and Nias Point (Melville Island) and Wynniatt Bay (Victoria Island), N.W.T.

Regional geoscience studies and petroleum potential of Mackenzie Plain area, central Northwest Territories [2012]

Principal investigator: Leanne Pyle
(Northwest Territories Geoscience Office/Petroleum Geosciences, Government of the Northwest Territories)
Location: Norman Wells, N.W.T.

Arctic shorebird monitoring program (Arctic PRISM) - Banks Island [2012 & 2013]

Principal investigator: Jennie Rausch
(Canadian Wildlife Service/Northern Conservation Section, Environment Canada)
Location: Kagloryuak River (Victoria Island), N.W.T.

Arctic shorebird monitoring program (Arctic PRISM) - Victoria Island [2012]

Principal investigator: Jennie Rausch
(Canadian Wildlife Service/Northern Conservation Section, Environment Canada)
Location: Bernard River (Banks Island), N.W.T.

Arctic shorebird monitoring program (Arctic PRISM) – Queen Elizabeth Islands [2013]

Principal investigator: Jennie Rausch
(Canadian Wildlife Service/Northern Conservation Section, Environment Canada)
Locations: Eureka (Ellesmere Island) and Polar Bear Pass (Bathurst Island), NU

Ecology and management of waterfowl populations from the western Canadian Arctic [2012]

Principal investigator: Myra Robertson
(Environmental Stewardship Branch/Northern Conservation Section, Environment Canada)
Location: Inuvik, N.W.T.

Flora of the Canadian Arctic [2012]

Principal investigator: Jeffery Saarela
(Research Division, Canadian Museum of Nature)
Locations: Mount Joy, Barrier Inlet and Kimmirut (Baffin Island), NU

Alaska Highway earthquake hazard assessment [2012]

Principal investigator: Michael Schmidt
(Natural Resources Canada)
Location: Haines Junction, Y.T.

Observational constraints on glacier sliding and subglacial hydrology [2012 & 2013]

Principal investigator: Christian Schoof
(Department of Earth and Ocean Sciences, University of British Columbia)
Location: Kaskawulsh Glacier, Y.T.

Profiles from the Arctic [2013]

Principal investigator: David Scott
(Canadian Polar Commission)
Location: Resolute (Cornwallis Island), NU

Dynamics and Change of the Devon Ice Cap [2012 & 2013]

Principal investigator: Martin Sharp
(Earth and Atmospheric Sciences, University of Alberta)
Locations: Summit camp and Big Rock camp, Belcher Glacier and Truelove Lowlands (Devon Island), NU

Paleozoic vertebrates and arthropods of Ellesmere Island: Scientific communication and discovery [2013]

Principal investigator: Neil Shubin
(Department of Organismal Biology and Anatomy, University of Chicago)
Locations: Bird Fiord and Judge Daly Promontory (Ellesmere Island), NU

The soil ecology of polar deserts: what are the critical soil processes sustaining polar deserts in Canada's Archipelago? [2012 & 2013]

Principal investigator: Steven Siciliano
(Department of Soil Science, University of Saskatchewan)
Locations: Alexandra Fiord (Ellesmere Island) and Truelove Lowland (Devon Island), NU

Permafrost in the Mackenzie Valley [2012 & 2013]

Principal investigator: Sharon Smith
(Geological Survey of Canada, Natural Resources Canada)
Locations: Inuvik and Norman Wells, N.W.T.

Van Tat Gwich'in navigation systems project [2012 & 2013]

Principal investigator: Shirleen Smith
(Heritage Branch, Vuntut Gwitch'in Government)
Locations: Timber Creek and Rampart House, Y.T.

Provenance of clastic sediments in the Sverdrup Basin, Canadian Arctic islands [2013]

Principal investigator: Helen Smyth
(CASP, University of Cambridge)
Locations: Slidre Fiord, Fosheim Peninsula and Eureka (Ellesmere Island), NU

GEM - Tele-seismic stations: Decommissioning and demobilization [2012]

Principal investigator: David Snyder
(Geological Survey of Canada, Natural Resources Canada)
Locations: Chesterfield Inlet, Kugaaruk and Nunuq exploration camp, NU

Net ecosystem exchange of the greenhouse gases CO_2 and CH_4 and water quality in the Canadian high Arctic [2012 & 2013]

Principal investigator: Vincent St.Louis
(Department of Biological Sciences, University of Alberta)
Location: Lake Hazen (Ellesmere Island), NU

Pan-Arctic Measurements and Arctic Regional Climate Model Simulations (PAM-ARCMIP) [2012]

Principal investigator: Ralf Staebler
(Science and Technology Branch/Meteorological Research Division, Environment Canada)
Location: Eureka (Ellesmere Island), NU

Astronomical site testing on Ellesmere Island [2012]

Principal investigator: Eric Steinbring
(Herzberg Institute of Astrophysics/Canadian Gemini Office, National Research Council)
Locations: Phillips Inlet and Eureka (Ellesmere Island), NU

Relationship of climate change to mercury contamination in fish [2012]

Principal investigator: Gary Stern
(Freshwater Institute, Fisheries and Oceans Canada)
Locations: Norman Wells and Kelly Lake, N.W.T.

Walrus survey - Foxe Basin [2012]

Principal investigator: Robert Stewart
(Arctic Aquatic Research, Fisheries and Oceans Canada)
Location: Hall Beach, NU

Solar degradation of dissolved organic carbon to CO_2 in lakes and river channels of the Mackenzie River Delta, N.W.T., Canada [2012]

Principal investigator: Suzanne Tank
(Department of Geography, York University)
Location: Inuvik, N.W.T.

The fate of terrestrial carbon and nutrients within lakes and river channels of the Mackenzie Delta region, N.W.T., Canada [2013]

Principal investigator: Suzanne Tank
(Department of Geography, York University)
Location: Inuvik, N.W.T.

The ultra-warm Arctic ca. 90 million years ago [2012]

Principal investigator: John Tarduno
(Department of Earth and Environmental Sciences, University of Rochester)
Locations: Bunde Fiord, Expedition Fiord (Axel Heiberg Island) and Hansen Point (Ellesmere Island), NU

Sailing towards Resolute Bay, the CCGS Louis S. St-Laurent provides a platform for science in the Arctic.

Mass-balance and ice-dynamics assessments on White Glacier and the Muller Ice Cap, Axel Heiberg Island, Nunavut [2012]

Principal investigator: Laura Thomson
(Department of Geography, University of Ottawa)
Location: Expedition Fiord
(Axel Heiberg Island), NU

The Canadian Arctic buoy program [2012 & 2013]

Principal investigator: Bruno Tremblay
(Department of Atmospheric and Oceanic Sciences, McGill University)
Location: Viscount Melville Sound, N.W.T.

Mesoproterozoic Bylot basins, Nunavut [2012]

Principal investigator: Elizabeth Turner
(Department of Earth Sciences, Laurentian University)
Locations: Navy Board Inlet, Tay Bay, Elwin Inlet, Charles Yorke River, Elwin Ice Cap, Red Rock Valley, K Mesa and Arctic Bay (Baffin Island), NU

Wild Canada [2013]

Principal investigator: Jeff Turner
(Wild Canada Productions)
Location: Pond Inlet (Baffin Island), NU

The winter role of tidal mixing in straits on ecologically and biologically significant areas in the Canadian Arctic [2012]

Principal investigator: Svein Vagle
(Institute of Ocean Sciences, Fisheries and Oceans Canada)
Location: Resolute (Cornwallis Island), NU

RADARSAT-2 in support of winter road management [2012]

Principal investigator: Joost van der Sanden
(Canada Centre for Remote Sensing, Natural Resources Canada)
Location: Yellowknife, N.W.T.

Making notes on an ice core extracted at a sample point in the Mackenzie Delta, NWT

Palaeontology of the Summit Creek formation, western Northwest Territories, Canada [2012 & 2013]

Principal investigators: Matthew Vavrek and David Evans (Department of Natural History, Royal Ontario Museum and Department of Ecology and Evolutionary Biology, University of Toronto)

Location: East Little Bear River and Fish River, N.W.T.

UNCLOS (United Nations Convention on the Law of the Sea) support [2012]

Principal investigator: Jacob Verhoef (UNCLOS, Natural Resources Canada)

Location: Alert (Ellesmere Island), NU

Northern Ellesmere Island in the Global Environment (NEIGE) [2012 & 2013]

Principal investigator: Warwick Vincent (Centre d'études Nordiques, Université Laval)

Locations: Ward Hunt Island and Resolute (Cornwallis Island), NU

Microbial investigations of permafrost and cold saline springs in the high Arctic [2012 & 2013]

Principal investigator: Lyle Whyte (Department of Natural Resource Sciences, McGill University)

Location: Expedition Fiord (Axel Heiberg Island), NU

Environmental mineralogy and geochemistry, South Fiord, Axel Heiberg Island, Nunavut [2013]

Principal investigator: Marie-Claude Williamson (Geological Survey of Canada, Natural Resources Canada)

Locations: Expedition Fiord, South Fiord (Axel Heiberg Island) and Coral Harbour (Southampton Island), NU

Hydrology, limnology and biogeochemistry of lakes in Wapusk National Park [2012]

Principal investigator: Brent Wolfe (Geography and Environmental Studies, Wilfrid Laurier University)

Location: Churchill, Man.

Lake biogeochemistry and paleolimnology in Wapusk National Park [2013]

Principal investigator: Brent Wolfe
(Geography and Environmental Studies, Wilfrid Laurier University)
Location: Churchill, Man.

Great Slave TRACS [2012 & 2013]

Principal investigator: Stephen Wolfe
(Geological Survey of Canada – Northern, Natural Resources Canada)
Location: Yellowknife, N.W.T.

Change in the alpine: researching methods to monitor shrubs in Kluane National Park and Reserve, Yukon [2012 & 2013]

Principal investigator: Carmen Wong
(Yukon Field Unit, Parks Canada)
Locations: Mt. Steele Meadows, Hoge Pass, Vulcan Mountain, Sheep Bullion and Mount Logan Glacier, Y.T.

Hydro-ecological responses of arctic tundra lakes to climate change and landscape perturbation [2012 & 2013]

Principal investigator: Frederick Wrona
(Water & Climate Impacts Research Centre, Environment Canada)
Locations: Noell Lake, Upland Lake and Inuvik, N.W.T.

Microwave backscatter measurement of snow thickness on first-year sea ice [2012]

Principal investigator: John Yackel
(Geological Survey of Canada, Natural Resources Canada)
Locations: Allen Bay and Resolute Passage, NU

Hydrology and resiliency of High Arctic wetlands [2012 & 2013]

Principal investigator: Kathy Young
(Department of Geography, York University)
Locations: Polar Bear Pass (Bathurst Island) and Resolute (Cornwallis Island), NU

Glacier mass balance monitoring, Auyuittuq National Park, Nunavut [2012 & 2013]

Principal investigators: Christian Zdanowicz [2012] and Alexander Chichagov [2013]
(Geological Survey of Canada, Natural Resources Canada)
Location: Penny Ice Cap (Baffin Island), NU

Industrial minerals, limestone (carbonate) resources, Southampton Island [2013]

Principal investigator: Shunxin Zhang
(Canada-Nunavut Geoscience Office, Government of Nunavut, Natural Resources Canada)
Location: Coral Harbour (Southampton Island), NU

Ecosystem inventories, mapping and monitoring of Ukkusiksalik National Park [2013]

Principal investigator: Paul Zorn
(Monitoring and Ecological Information Division/National Office, Parks Canada)
Location: Sila Lodge, NU

OPERATIONS PROJECTS

Eastern Kitikmeot quarrying [2013]

Principal investigator: Joseph Aglukkaq
(Community Economic Development)
Location: Murchison River, NU

Weather station maintenance [2012 & 2013]

Principal investigator: Rich DeVall
(Meteorological Service of Canada, Environment Canada)
Locations: Grise Fiord and Eureka (Ellesmere Island), Resolute (Cornwallis Island), Rea Point (Melville Island), Isachsen (Ellef Ringnes Island), Fort Ross (Somerset Island), Svartevaeg Cliffs (Axel Heiberg Island), Stefansson Island, Cape Liverpool and Gateshead Island, NU; Nangmagvik Lake (Banks Island), Cape Providence (Melville Island) and Mould Bay (Prince Patrick Island), N.W.T.

Field Enforcement Tour [2013]

Principal investigator: Curtis Didham
(Yellowknife Enforcement Office, Environment Canada)
Location: Resolute (Cornwallis Island), NU

Monitoring of FOX-C site [2013]

Principal investigator: Allison Dunn
(Aboriginal Affairs and Northern Development Canada)
Location: Ekalugad Fiord (Ellesmere Island) and Resolution Island, NU

Sirmilik National Park operations [2012 & 2013]

Principal investigators: Carey Elverum [2012] and Tyler Harbidge [2013]
(Nunavut Field Unit/Sirmilik National Park, Parks Canada)
Locations: Aktineq Glacier, Qaersut and Button Point (Bylot Island), Elwin Inlet, Mala River (Baffin Island), Oliver Sound and Devon Island, NU

Thermin II solar power controller system removal at Yankee and Grant microwave sites on Ellesmere Island [2012]

Principal investigator: Yves Gauthier
(Director, Information Management Technology, Products, & Services 3-6-6, Department of National Defence)
Locations: Eureka, Yankee and Grant (Ellesmere Island), NU

Northern Watch [2012 & 2013]

Principal investigator: Bruce Grychowski
(Defence Research and Development Canada – Atlantic)
Location: Gascoyne Inlet (Devon Island), NU

Site inspection tour [2013]

Principal investigator: Andrew Keim
(Water Resource Field Operations Unit, Aboriginal Affairs and Northern Development Canada)
Locations: Resolute (Cornwallis Island) and Cambridge Bay (Victoria Island), NU

Banks Island field work [2013]

Principal investigator: Clayton Kennedy
(Collection Services, Canadian Museum of Nature)
Locations: Sachs Harbour (Banks Island) and Inuvik, N.W.T.

Pond Inlet HTO Radio Repeater Installation [2013]

Principal investigator: Brian Koonoo
(Mittimatalik Hunters and Trappers Organization)
Locations: Bylot Island, Milne Inlet, Emmerson Island and Baffin Bay, NU

Canadian Ranger Ocean Watch (CROW) [2013]

Principal investigator: Donald McLennan
(Aboriginal Affairs and Northern Development Canada)
Location: Cambridge Bay (Victoria Island), NU

Quttinirpaaq National Park operations [2012 & 2013]

Principal investigator: Alexander Stubbing
(Quttinirpaaq National Park, Parks Canada)
Locations: Tanquary Fiord, Lake Hazen, Grant Ice Cap and Fort Conger (Ellesmere Island) and Ward Hunt Island, NU

Auyuittuq National Park operations and research [2012]

Principal investigator: Monty Yank
(Auyuittuq National Park/Nunavut Field Unit, Parks Canada)
Locations: Owl River, June Valley, Windy Lake and Maktak (Baffin Island), NU

Annex

PCSP Advisory Board

The PCSP Advisory Board provides to the Director General of the Strategic Policy and Operations Branch within Natural Resources Canada recommendations and advice on the PCSP's services and operations. The board consists of northern experts from the federal science agencies, academia, Aboriginal peoples' organizations and territorial governments.

PCSP Advisory Board Members 2013

Elizabeth Boston
Director, Mathematical, Environmental and Physical Sciences Research Grant Directorate
Natural Sciences and Engineering Research Council of Canada

Marianne Douglas
Professor, Department of Earth and Atmospheric Sciences Director, Canadian Circumpolar Institute
University of Alberta

Martin Fortier (Chair)
Executive Director, ArcticNet
Université Laval

Peter Hale
Manager, Wildlife Research
Department of Environment
Government of Nunavut

Siu-Ling Han
Head, Eastern Arctic Unit
Environment Canada

David Hik
Professor and Canada Research Chair in Northern Ecology, Tier 2 Department of Biological Sciences
University of Alberta

Donna Kirkwood
Director General, Geological Survey of Canada, Central and Northern Branch
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Scot Nickels
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Inuit Tapiriit Kanatami

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McGill University

Clint Sawicki
Coordinator, Northern Research Institute
Yukon College

Mary-Ellen Thomas
Senior Research Officer
Nunavut Research Institute

Robert J. Young
Division Manager, Arctic Aquatic Research Division
Fisheries and Oceans Canada

PCSP Project Review Committee

The PCSP Project Review Committee (PRC) sets priorities for the allocation of direct, in-kind support for university-based projects. The PRC evaluates logistics requests on the basis of feasibility; assurance of scientific excellence; performance of previous field projects and publication records; quality of application; and involvement of students and local people.

PCSP Project Review Committee Members 2013

David Corrigan
Section Head, Geological Survey of Canada, Regional Geology
Natural Resources Canada

Peter Dawson (Chair)
Associate Professor, Archaeology Department
University of Calgary

Michael Kristjanson
Chief, Arctic Logistics Support Centre
Polar Continental Shelf Program
Natural Resources Canada

Mark Mallory
Associate Professor and Canada Research Chair, Biology Department
Acadia University

Marc Meloche
Policy Advisor
Canadian Polar Commission

Kathy Young
Professor, Liberal Arts and Professional Studies
York University