Compendium of Research in the Northwest Territories

2016

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This publication is a collaboration between the Aurora Research Institute, the Department of Environment and Natural Resources, the Government of the Northwest Territories and the Prince of Wales Northern Heritage Centre and the Department of Fisheries and Oceans. Thank you to all who submitted a summary of research or photographs, and helped make this publication possible.

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Fisheries and Oceans Canada Pêches et Océans Canada

Northwest Territories Environment and Natural Resources

Northwest Territories Education, Culture and Employment

Forward

Welcome to the 2016 Compendium of Research in the Northwest Territories. I am pleased to present you with this annual publication which includes plain language summaries of all the licensed research that has taken place in the Northwest Territories. The Aurora Research Institute, the Prince of Wales Northern Heritage Centre, the Department of Environment and Natural Resources and the Department of Fisheries and Oceans have been collaborating to produce this compendium series since 1984.

In addition to the compendium summaries, please check out the ARI's NWT research database for more information about research happening in the Northwest Territories. The NWT Research Database is a publically-available, map-based online resource that can be accessed at data.nwtresearch.com. The Database is continuously updated with new records, and was designed to make information about NWT research more accessible to the people and stakeholders of our territory.

As you look through this Compendium, I encourage you to contact the researchers if there is a project that is of interest to you. The summaries in this publication are only a brief outline of the rich findings and scientific advancements that have been made over the past year.

Pippa Seccombe-Hett
Vice President, Research
Aurora Research Institute

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2016 Licenced Research Projects

Introduction

This compendium offers a summary of research licences/permits that were issued in the Northwest Territories during 2016. The information contained in this book is a product of collaboration between the Aurora Research Institute (ARI), the Prince of Wales Northern Heritage Centre (PWNHC), the Department of Environment and Natural Resources (ENR) and the Department of Fisheries and Oceans (DFO). The Compendium series began in 1984.

Licensing in the NWT

Under territorial legislation, all research in the NWT requires a licence/permit from one of four agencies, depending on the type of research being conducted:

- *Prince of Wales Northern Heritage Centre* - Archaeology;
- *Department of Environment and Natural Resources, Government of the Northwest Territories* - Wildlife;
- *Department of Fisheries and Oceans* - Fisheries; or
- *Aurora Research Institute* - all other research in the NWT.

Through the licensing process, researchers are informed of appropriate organizations, communities and other licensing/permitting agencies that should be contacted prior to conducting studies. Licensing ensures research activities are communicated to interested parties and provides opportunities for the exchange of information.

The Compendium provides a summary of all licences/permits issued in the NWT by all four licensing/permitting bodies. As each research project is represented by a short abstract, the reader is encouraged to contact the researcher for additional information and results.

How to Use This Book

This book has four main sections. Each of these sections reflects a specific licensing agency and type of licence/permit issued. Within each section, research descriptions have been grouped by subject and listed alphanumerically by the principal researcher's last name. Refer to the Table of Contents for the specific page on which each section and/or subject begins. An index is included at the end of the compendium listing all researchers in each section.

1. File Number

The file numbers shown in each of the Aurora Research Institute's subject areas refer to the file number issued to a particular researcher. It allows cross referencing with research material that may be available on file or in the ARI library. The reference numbers of the other three agencies refer directly to the permit numbers given to each researcher. When requesting information from any of these agencies on specific research outlined in the compendium, please refer to the reference number in your correspondence.

2. Regional Abbreviations

Throughout the book, reference is given to the specific land claim region(s) in which the research took place. The regions are shown on the following page. Some of the land claim regions are still under negotiation and the boundaries shown are only approximations. The abbreviations shown for each region are as follows:

DC	Dehcho	**SS**	South Slave
NS	North Slave	**SA**	Sahtú Settlement Area
IN	Inuvialuit Settlement Region	**GW**	Gwich'in Settlement Area

3. Glossary

A glossary of terms has been added to the Compendium. The intent of the glossary is to allow the reader to better appreciate the research descriptions.

Available in Print or Free Download

This compendium is available as a printed publication or can be downloaded from the Aurora Research Institute's website (nwtresearch.com). Copies can also be requested by contacting the Aurora Research Institute.

Send Us Your Comments

Whether you are a researcher or an interested member of the public, the Aurora Research Institute welcomes your comments and suggestions concerning this publication. Contact us by mail, email or telephone (see address on page viii).

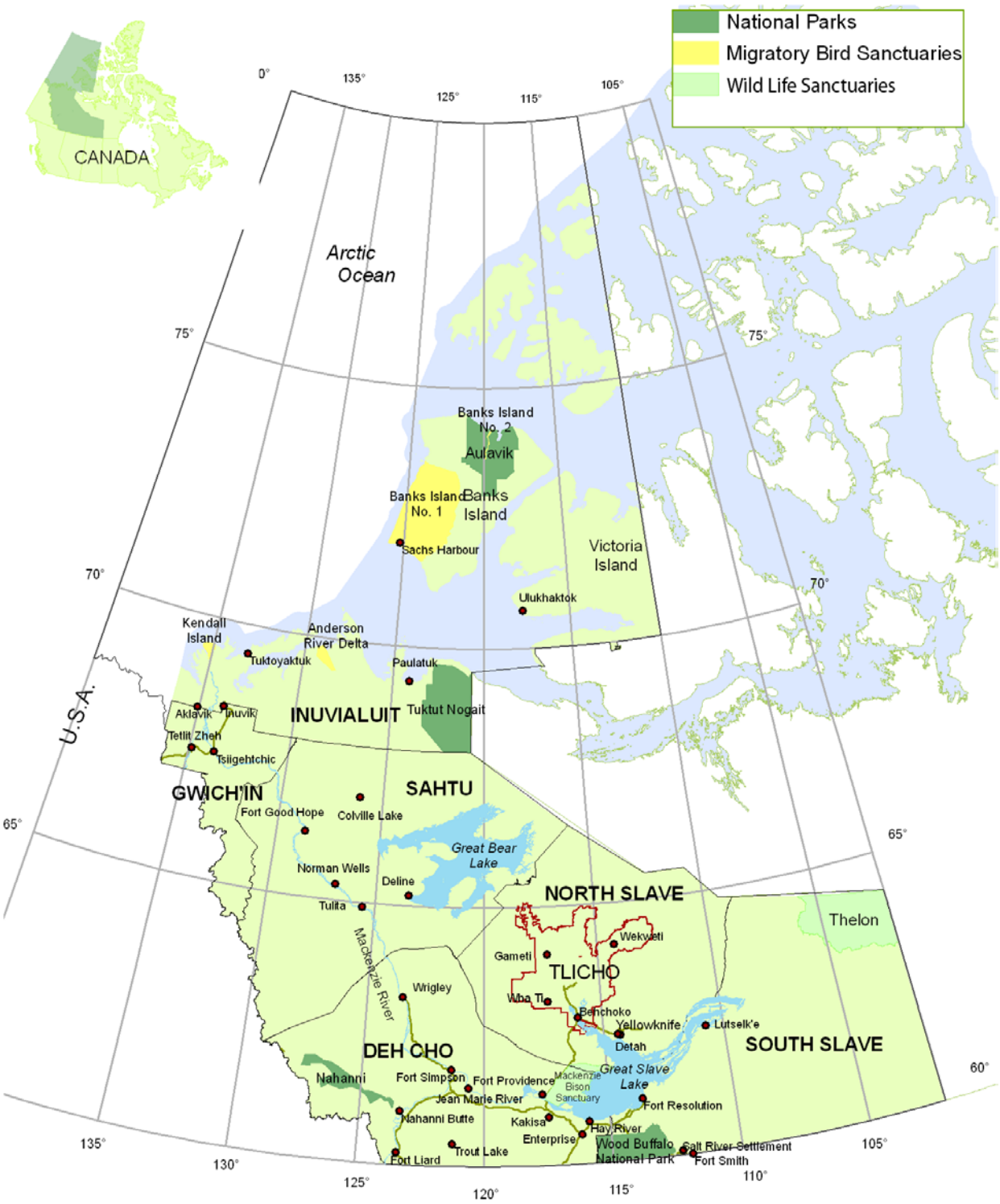


Figure 1. *Land claim regions in the Northwest Territories*

Aurora Research Institute

The Aurora Research Institute's mandate is to improve the quality of life for NWT residents by applying scientific, technological and indigenous knowledge to solve northern problems and advance social and economic goals.

ARI is responsible for:

- licencing and coordinating research in accordance with the NWT Scientists Act: this covers all disciplines including the physical, social, biological sciences and traditional knowledge;
- promoting communication between researchers and the people of the communities in which they work;
- promoting public awareness of the importance of science, technology and indigenous knowledge;
- fostering a scientific community within the NWT which recognizes and uses the traditional knowledge of northern aboriginal people;
- making scientific and indigenous knowledge available to the people of the NWT;
- supporting or conducting research and technological developments which contribute to the social, cultural and economic prosperity of the people of the NWT.

For more information, contact ARI at:

Aurora Research Institute
PO Box 1450
Inuvik, NT, X0E 0T0
Tel: (867) 777-3298
Fax: (867) 777-4264
E-mail: licence@nwtresearch.com
Website: nwtresearch.com

Department of Environment & Natural Resources

The Government of the Northwest Territories' Department of Environment and Natural Resources (ENR) has a mandate to promote sustainable development through the management and protection of the quality, diversity and abundance of natural resources and the integrity of the environment.

With respect to permitting for research and monitoring, ENR is responsible for issuing Wildlife Research Permits under the Wildlife Act (Section 84) for all studies on wildlife or wildlife habitat in the Northwest Territories. Wildlife includes all vertebrates and invertibrates, except fish and marine mammals.

For more information, contact ENR at:

Wildlife Division
Environment and Natural Resources
Government of the Northwest Territories
PO Box 1320
Yellowknife, NT, X1A 2L9
Fax: (867) 873-0293
Website: enr.gov.nt.ca

Northwest Territories Environment and Natural Resources

Department of Fisheries and Oceans

The Department of Fisheries and Oceans Canada (DFO) is responsible for developing and implementing policies and programs in support of Canada's scientific, ecological, social and economic interests in oceans and fresh waters. Some Fisheries management responsibilities have been delegated or transferred to other federal agencies (e.g. Parks Canada), provinces/territories and co-management groups under Land Claim agreements.

DFO Fisheries Management is responsible for issuing Commercial, Domestic, Licence to Fish for Scientific Purposes (LFSP), Exploratory, Public Display and Educational licences in the NWT. Subject to Land Claim agreements, a Commercial licence is required to sell or barter fish

All individuals fishing for scientific purposes or participating in the acts described below are required to obtain a Licence to Fish for Scientific Purposes (LFSP):

- activities involving fishing, catching or attempting to catch fish;
- activities where the potential exists for the incidental capture of fish;
- sampling or possessing fish caught in a subsistence fishery.

For further information about licensing, contact DFO at:

Licensing Officer
Central & Arctic Region
Government of Canada
Fisheries and Oceans Canada
PO Box 358
Iqaluit, NU, X0A 0H0
Tel: (867) 979-8005
Fax: (867) 979-8039
Email: XCNA-NT-NUpermit@dfo-mpo.gc.ca
Website: dfo-mpo.gc.ca

Fisheries and Oceans Canada | Pêches et Océans Canada

Prince of Wales Northern Heritage Centre

The Prince of Wales Northern Heritage Centre (PWNHC), a division of the Department of Education, Culture and Employment, Government of the Northwest Territories, is responsible for managing and protecting the archaeological resources of the NWT. Representing a continuous human occupation stretching back over 7000 years, archaeological sites are fragile and non-renewable and are protected from disturbance by legislation, regulation and policy in the NWT. There are currently about 6000 archaeological sites recorded in the NWT, though this number represents only a fraction of the existing sites as large areas remain unexplored for archaeological resources. A large part of the work done at the PWNHC involves reviewing land use and development permit applications. On average, 300 permits are reviewed per year, with recommendations being proffered to nine land management authorities.

With respect to permitting for research and monitoring, PWNHC is responsible for issuing NWT Archaeology Research Permits.

For more information, contact the Prince of Wales Northern Heritage Centre at:

NWT Cultural Places Program
Prince of Wales Northern Heritage Centre
4750 48th Street
PO Box 1320
Yellowknife, NT, X1A 2L9
Phone: (867) 873-7688
Fax: (867) 873-0205
Email: archaeology@gov.nt.ca
Website: pwnhc.ca

Northwest Territories Education, Culture and Employment

Biology

Photos clockwise from top left: 1) ARI bee project (ARI photo); 2) Mourning Cloak (butterfly) (credit: Rogers, B); 3) Fireweed (ARI photo); 4) Mountinous Landscape (credit: Michel, J.); 5) Raindrops on Arctic Lupine leaves (credit: Hurst, W).

Corrin, Natasha
Stantec Consulting Ltd.
Ottawa, ON
Natasha.Corrin@stantec.com

File No: 12 402 909
Region: NS

Licence No: 15918
Location: Tundra Mine: Control Lake; Hambone Lake Inlet; Hambone Lake Outlet; Powder Mag Lake; Powder Mag Lake Outflow; Sandy Lake; Sandy Lake Outflow

Tundra Mine remediation risk assessment
The goal of this study was to see if there are any health risks for people who use the Tundra Mine site for traditional activities. The Tundra Mine was a gold mine that closed in the mid-1980s. The site was polluted from mining activities and is currently being cleaned up. The researchers conducted fieldwork in July 2016 to collect information and samples from both contaminated and uncontaminated areas, to see how much pollution might be present in the plants, water, and animals. Using this information, they determined whether there are any health risks for a First Nations person using the site for traditional activities. They assumed that someone might use the site two weeks per year, every year, and would eat fish, berries, and small game on site and drink water from the lakes. The researchers also assumed that Labrador tea would be collected and dried for use year round, and that caribou meat hunted from the site would be eaten twice per week, year round. These assumptions allowed the researchers to add up the amount of pollution that would be consumed. The researchers wrote a draft report which was reviewed by Health Canada, Environment and Climate Change Canada, and Fisheries and Oceans Canada. The study is not finished yet, however, and the researchers will go back to the site next summer to collect more information and samples. At that time, the report and findings will be finalized.

Insley, Stephen J.
Wildlife Conservation Society Canada
Whitehorse, YT
sinsley@wcs.org

File No: 12 402 894
Region: IN

Licence No: 15872
Location: Darnley Bay

Darnley Bay seal monitoring
The goal of this ongoing project is to monitor harvested ringed seals and bearded seals in the Inuvialuit Settlement Region using a locally-based approach. The monitoring began in September 2014, when a small number of seals were sampled in Darnley Bay, which is just north of Paulatuk. In the next two years (2015 and 2016), seal samples came from two sources. The first source is seals sampled directly from Darnley Bay between August and October. The second source is seals collected for Environment Canada at Sachs Harbour. In addition to taking seal samples and studying them, the researchers also spent time with various organizations within and outside the Inuvialuit Settlement Area, ensuring the project was running well and meeting the community's needs. They met with the Paulatuk Hunters and Trappers Committee, the Sachs Harbour Hunters and Trappers Committee, and the Ulukhaktok Hunters and Trappers Committee. The researchers also attended the September 2016 Inuvialuit Game Council meeting in Whitehorse and the October 2016 Beaufort Sea Partnership meeting in Inuvik. The 2015 samples from both Sachs Harbour and Darnley Bay (Paulatuk) were analyzed by North-South Consultants in Winnipeg. The researchers found out something very interesting from these samples: The 2015 samples from

both Sachs Harbour and Darnley Bay (Paulatuk) were analyzed by North-South Consultants in Winnipeg. The researchers found that in 2015, the majority of the seals' diet was fish, most of which was capelin. The samples from 2016 will be sent to the same lab and results are expected in early 2017.

Insley, Stephen J.
Wildlife Conservation Society Canada
Whitehorse, YT
sinsley@wcs.org

File No: 12 402 894
Region: IN

Licence No: 15873
Location: Cape Kellett, Johnson Point, Prince of Wales Strait

Acoustic monitoring of marine mammals and ship traffic in the Amundsen Gulf

The main goal of this ongoing study is to see if increased shipping and the loss of sea-ice is having any effects on the marine mammals in the eastern Beaufort Sea. The researchers are studying how the traffic and changes to sea ice are affecting sea life using special devices that record the sounds of passing whales and other marine mammals. The project began in 2014, and over the years the research locations have spread from Sachs Harbour to the Amundson Gulf. In 2016, the researchers put recorders at the western entrance to the North-West Passage shipping route, in areas of the Amundsen Gulf and near Banks Island. The equipment for the project includes two new submersible sound recorders that are specially-made to record sounds in the ocean. The equipment also includes mooring supplies, batteries, and secure digital memory chips to store the recordings. The researchers went on three deployment/recovery trips during the summer and fall of 2016. In early July, they picked up a recording device that had been deployed about 10 km southwest of Sachs Harbour the previous August (2015) to record over the winter. A new recording device was then deployed in the same location to record for the next year. In late August, two attempts were made to deploy a recorder near Johnson Point in the Prince of Wales Strait. Both attempts were unfortunately shut down by weather. During mid-October, one recorder was deployed roughly 3 km west of Ulukhaktok to record over the winter. The research team also had discussions with local and regional organizations to ensure the project was running well and meeting community needs, including the Sachs Harbour Hunters and Trappers Committee, the Paulatuk Hunters and Trappers Committee, and the Ulukhaktok Hunters and Trappers Committee. Information from the 2015-16 research was also presented to the Inuvialuit Game Council during their September meeting in Whitehorse.

Low, George
Dehcho First Nations
Hay River, NT
jmichaellow@gmail.com

File No: 12 402 857
Region: DC

Licence No: 15900
Location: Providence Creek

Enhancement and monitoring of arctic grayling spawning habitat at Providence Creek, NWT

This project was completed in 2015, with no research conducted in 2016.

Maier, Kris
Gwich'in Renewable Resources Board
Inuvik, NT

kmaier@grrb.nt.ca

File No: 12 402 851
Region: GW
Licence No: 15939
Location: Arctic Red River and tributaries

Arctic Red River Headwaters (ARRH) fisheries assessment year 2
This project was cancelled due to time conflicts with the Rat River project, and will hopefully be continued in 2017.

Maier, Kris
Gwich'in Renewable Resources Board
Inuvik, NT
kmaier@grrb.nt.ca

File No: 12 402 851
Region: GW
Licence No: 15940
Location: Fish Creek and tributaries (67°45'24.11"N, 136°17'50.71"W)

Examination of distribution and density of juvenile Dolly Varden char in Fish Creek (Rat River)
The goal of this project was to find out which areas of Fish Creek are used by young Dolly Varden char, and to see if the areas that are vital to the survival of these fish are being damaged or changed in any way ("habitat monitoring"). The researchers fished for young Dolly Varden using electrofishing in order to map out where young char are found. Habitat monitoring included recording measurements about the river itself, testing the water for certain chemicals, and checking for tiny animals that live in the water when the water system is healthy. The research team also installed remote cameras to photograph different areas of the river every hour to document change. The research team documented very clearly when young Dolly Varden are found in different places along their migration route. The researchers gained a much better understanding of the life history and spawning site selection of the fish who move between fresh water and salt water in the ocean. They also found out more about the Dolly Varden that do not migrate, known as "residents". Long-term habitat monitoring equipment was installed during the project, and is now recording information about Rat River Dolly Varden habitat and how things are changing over time. Published materials will be available in 2017-18, and the research team will also update all their co-management partners at that time.

Pellissey, Jody
Wek'eezhii Renewable Resources Board
Yellowknife, NT
jpellissey@wrrb.ca

File No: 12 402 903
Region: NS
Licence No: 15822
Location: Tłı̨chǫ region

When do caribou return? Impacts of wildfires on tǫdzi (boreal caribou)
The goal of this multi-year project is to learn more about boreal caribou returning to an area after a forest fire. There were two main components of this project: meetings and interviews, and field work. Eight elders and three youth met with the research team to talk about how to best conduct fieldwork. In addition, individual interviews were conducted with elders over 80 years of age to discuss the intensity and severity of forest fires. The field work was conducted from 14 to 26 August, 2016 by the community researchers and the elders. Elders observed and catalogued evidence of tǫdzi and noted changes to the plant communities at ten monitoring sites. The

community researchers documented this information on maps, with photos, and field notes, as well as through plant collection. The community researcher revisited the monitoring sites in September 2016 to observe them in a different season (fall vs. summer). In the future, elders will be asked to share information and narratives about the photos and collections. The research team is working to analyze the information collected to date, and expect to have a verification meeting with elders in Whatì during February 2017.

Ruben, Diane
Paulatuk Hunters and Trappers Committee
Paulatuk, NT
phtc@live.ca

File No: 12 404 907
Region: IN
Licence No: 15883
Location: Billy's Creek and Hornaday River

Paulatuk whitefish assessment

In the Inuvialuit Settlement Region, whitefish are an ecologically and culturally important species that plays a large part in people's diet. The Paulatuk Hunters and Trappers Committee found that there is a lack of recorded information about this species, especially considering the designation of the Anguniaqvia niqiqyuam Marine Protected Area. The Paulatuk Hunters and Trappers Committee therefore started a whitefish monitoring program to better understand the biology of whitefish harvested by the community. This monitoring program will focus on what the fish eat and their health, including contaminants. Four monitors were hired, with two monitors harvesting 75 broad whitefish at Billy's Creek during the second week of June, and two monitors collecting an additional 75 whitefish at the upper Hornaday River. From each fish, the monitors took a sample of muscle, collected the ear bones, weighed and measured the fish, and collected its stomach contents. The stomach contents of 22 of the fish harvested at Billy's Creek had sand, bivalves and bivalve shells, flies, snails, water bugs, many types of tiny water-dwelling animals, beetles, and wasps. Monitoring will continue at Billy's Creek and the upper Hornaday River in the summer of 2017.

Simmons, Deborah L.
Sahtú Renewable Resources Board
Tulít'a, NT
director@srrb.nt.ca

File No: 12 402 882
Region: SA
Licence No: 15830
Location: Sahtú Settlement Area

Sahtú region caribou and moose study

The goal of this multi-year project is to study how caribou are similar and different to each other across the landscape, how people understand these differences, and why they exist. The Sahtú communities developed and ran this project in collaboration with the researchers as a team. Through a process of legha´gots'eneteʔ, "learning together", the research team studied caribou DNA under the guidance of traditional knowledge, indigenous language, and visual approaches. In 2016, presentations were held in the Sahtú to explain the results to the communities and this communication is ongoing. The research team has published three reports that will help managers and the ʔehdzo Got'ıę (Renewable Resources Councils) better understand caribou populations in the region and make better decisions about caribou in the future. This project is therefore providing good information for the region, but is also showing how this type of research can be very useful. The collaborative community research process was strengthened by the knowledge and experience that all the partners brought to the table. The information will help wildlife

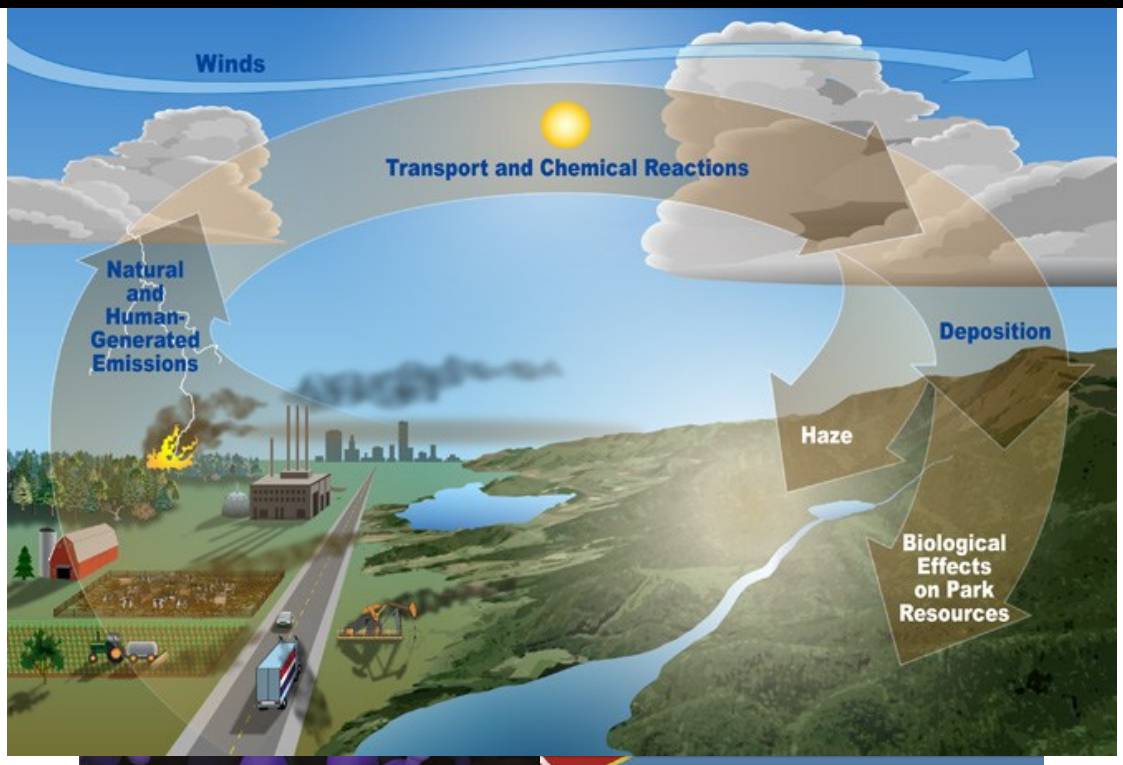
managers see that there might be new ways of doing things. For example, because the DNA samples were collected from caribou dung, the project has shown that cost-effective and non-invasive ways of studying animal DNA can be used to separate out different caribou types. Across Canada, these results are showing other research teams how using indigenous languages can improve how traditional knowledge is included in species at risk reports and plans.

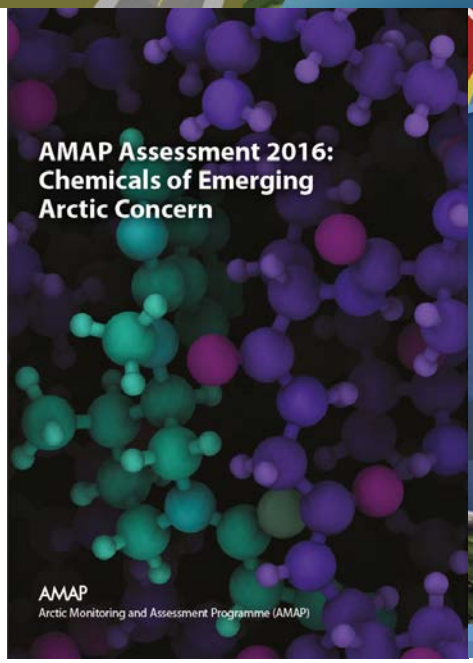
Trimble, Annika
Aurora Research Institute
Inuvik, NT
atrimble@auroracollege.nt.ca

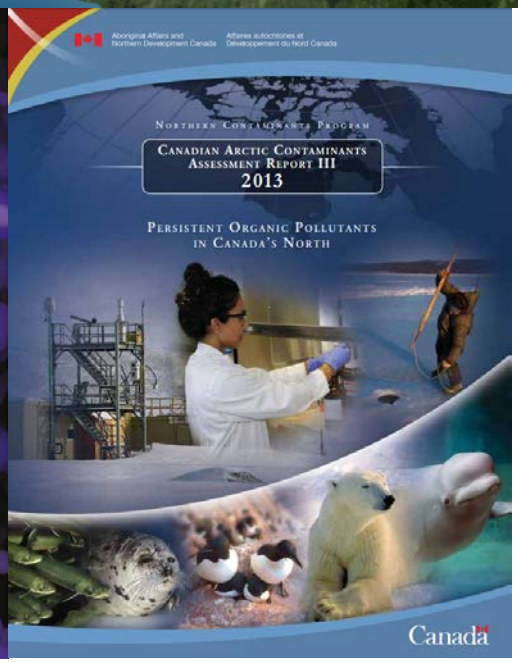
File No: 12 402 733 **Licence No:** 15718
Region: IN, GW **Location:** Inuvik

Northern native seed development field trials
The goal of this ongoing project is to have seeds from northern plants available for planting in damaged or disturbed areas. Generally, when developers re-plant disturbed areas they use plants or seeds from the south. Using local northern plants instead is considered a better way to help damaged areas heal. The researchers collected seeds from northern plants, grew them in a greenhouse, and planted them in areas that have been disturbed to see how they grow. In 2016, the researchers went back to three of the planted areas to see how well the plants are growing. They took notes about the plants and will have results at a later date.

Contaminants







Photos clockwise from top: 1) Sources, tranportation and deposition of contaminants. US National Parks Service. Jan 3, 2017. Web; 19 Jan 2018. 2) Canadian Arctic Contaminants Assessment Report 3 – 2013 cover, Northern Contaminants Program, Government of Canada; 3) Assessment Report 2016 cover for the Arctic Monitoring and Assessment Program (AMAP), Arctic Council.

Amuno, Solomon A.
University of Saskatchewan
Saskatoon, SK
solomon.amuno@gmail.com

File No: 12 402 910
Region: NS
Licence No: 15924
Location: 62°29'58.14"N, 114°21'21.57"W

Oxidative stress, DNA damage, and bone metabolism disruption in small mammal populations exposed to arsenic and heavy metals in Yellowknife, NWT: a preliminary study

The goal of this study was to check if and how snowshoe hares that live near the Giant Mine site are affected by arsenic pollution. The researchers checked for arsenic in three ways: first, they checked to see how much arsenic could be found in the hares' bodies and how their bodies were reacting to it; second, they looked at how the hares' skeletons grew; and third, they looked at thin slices of the hares' bodies under a microscope to see if the arsenic was changing how their bodies grow on a microscopic level. They looked at hares from near the mine, as well as hares from further away, so they could compare them to make sure it was the arsenic pollution that was causing any issues. The researchers found that arsenic concentrations were about 20 to 70 times higher in the stomach contents of hares near Giant Mine. In other words, what they were eating had more arsenic in it. They also found high arsenic levels in the nail clippings, organs, and intestines of the Giant Mine site hares. These hares had some expected organ disease from arsenic, and their bones were weak and had odd, unnatural growths. This research seems to show that snowshoe hares breeding near Yellowknife are exposed to higher levels of arsenic, and it's affecting their bodies and, in particular, their bones.

Bailey, Alexandra
Queen's University
Kingston, ON
a.bailey@queensu.ca

File No: 12 402 908
Region: NS
Licence No: 15844
Location: Giant Mine, Yellowknife

Characterization of arsenic-hosting solid phases in Giant Mine tailings and tailings dust

There are different types of arsenic found in Giant Mine waste, and they are not all equally dangerous to people. The first, known as "arsenopyrite", is the form that arsenic is in naturally in the ore. However, when the ore went through the roaster, a few other forms of arsenic were made, in particular a form called "arsenic trioxide". Arsenopyrite (the natural form) is pretty stable and won't dissolve, but arsenic trioxide (made in the roaster) is highly soluble in body fluids and therefore poses more of a health risk to humans. The goal of this research is to see how much of each type of arsenic can be found in the dust from the surface tailings at Giant Mine. The researchers collected dust from two locations. In 2015, they took dust from the sediments of the tailings ponds at Giant Mine. Then in 2016, they set up dust collectors at the south end of the southern-most tailings pond at Giant Mine to collect airborne dust. These samples are being analyzed by the researchers using a variety of specialized techniques. Analyses have shown that the natural form, arsenopyrite, and other less dangerous forms are the main types of arsenic found in the surface tailings and tailings dust. No arsenic trioxide has been found in the samples examined to date.

Blais, Dr. Jules M.
University of Ottawa
Ottawa, ON
jules.blais@uottawa.ca

File No: 12 402 847
Region: NS

Licence No: 15803
Location: Yellowknife area

Developing new tools for assessing legacy pollutants and their ecological consequences in lakes near Northwest Territories mines

The goal of this project is to find good ways to measure arsenic and mercury pollution levels in lakes around Yellowknife. The arsenic and mercury originally came from gold mines that are now closed, but that contaminated the area close to the mines as well as the broader region. The researchers set out to investigate the history of arsenic and mercury contamination in the Yellowknife area by measuring these contaminants in lake water and lake bottom sediments. This work has shown that lakes within 15 km (approximately 10 miles) of the mine have higher arsenic levels than lakes further away. This work has also shown that lake sediments became contaminated with arsenic during the years when the mine was actively releasing arsenic through its roaster stack, especially in the 1940s and 1950s. Some important algae species and crustacean species (small animals that live in lakes) were eliminated from one lake near the mines, Pocket Lake, during the time that the mine was active. These small animals have not yet recovered 12 years after the mine stopped its operations. Ongoing research will check other lakes to see if they show the same loss of species. This research was featured in many news reports in 2016.

Bond, Matthew J.
Canadian Nuclear Laboratories
Chalk River, ON
matthew.bond@cnl.ca

File No: 12 402 911
Region: DC, NS, SS

Licence No: 15928
Location: Hwy #1: 60.606950, -116.382205; Hwy #1: 61.178762, -120.545864; Hwy #3: 62.014668, -116.327114; Hwy #6: 60.741785, -114.760949

Permafrost thaw and implications for the cycling of radionuclides in the Canadian north

When permafrost thaws, contaminants that have been frozen into the ground for a long period of time can be released with the melt-water and end up in lakes and rivers. The goal of this research is to see if higher levels of radioactiveity are being released from thawing permafrost and accumulating in these lakes and rivers. Knowing more about what is released from thawing permafrost will help scientists understand how contaminants (including radioactive elements) move through the sub-Arctic environment. In September 2016, the researchers took samples from lake water, ground water, and lake sediments from 12 different lakes. These lakes are all in areas where the permafrost is thawing, near Yellowknife, Ft. Providence, and Jean Marie River. This study is looking for broad patterns across northern regions where the permafrost is thawing, and the research in the Northwest Territories is only one part. Samples were also collected in northern Labrador in 2016, and in northern Manitoba in 2017. The levels of radioactivity present in the samples will be measured in a laboratory. So far, it seems that there is no risk to human health or the environment. When results are available, they will be included in a report that will be distributed to communities in regions where sampling took place, and to the Aurora Research Institute.

Budziak, Jerry
Spirit Resource Management Ltd.
Calgary, AB
jbudziak@spiritrml.com

File No: 12 402 475
Region: SA
Licence No: 15806
Location: Nota Creek C-17 wellsite

Phytoremediation study on the CDN sorest et al Nota Creek C-17 wellsite
Phytoremediation means using plants to remove contaminants from the soil. In theory, plants take in the contaminants from the soil, and the contaminants then move into the plant's leaves and stalks as it grows. The plants are then harvested and removed from the site. This process is repeated until the impacted soil is no longer contaminated. Phytoremediation has been used at a contaminated wellsite known as Nota Creek C-17 for more than ten years. The site is contaminated with petroleum hydrocarbons like gas and diesel. After testing to see if phytoremediation worked at this site, the whole wellsite was planted for the first time in 2009. Each spring, the soil is prepared for planting, fertilized to help the plants grow, and seeded. Each fall, the plants are harvested and removed. The plants have been so good at removing contamination that the site managers decided to excavate contaminated soil that had been buried on the site, and use phytoremediation on it too. This excavated soil was spread on the site in 2011 and again in late 2013. The site manager kept testing the soil, and when any portion was found to be uncomtaminated it was removed and new, contaminated soil was brought in and planted. Continued phytoremediation of newly excavated soil will continue in 2017.

Chetelat, John
Carleton University
Ottawa, ON
john.chetelat@canada.ca

File No: 12 402 886
Region: NS
Licence No: 15894
Location: Ingraham Trail, Hwy #5, Russell Lake, North Arm of Great Slave Lake

The influence of forest fires on metal deposition to lakes and peatlands in the North Slave Region, NWT
Some metals, like mercury, can be found in tiny amounts in the air, soil, plants, and animals. Metals in this form are always around, but are usually at low levels. The goal of this multi-year project is to see how recent forest fires might cause mercury and other metals, released from burning trees, to accumulate to higher levels in lakes and peatlands. The research team collected lake sediment cores and peat cores, which have many years' worth of information in them, from the North Slave Region of the NWT. Study sites were selected in areas with recent fires, close to recent fires, and also sites farther away from recent fires. Sediment cores were collected from 10 lake sites: three sites on Great Slave Lake, three lakes along the Ingraham Trail, three lakes off Highway 3 (west of Behchokǫ̀), and Russel Lake (north of Behchokǫ̀). Peat cores were collected from eight sites in the vicinity of the study lakes. The research team also measured the levels of certain chemicals that are dissolved in the water of nine of the lakes where sediment cores were collected. Lake sediment was collected from the larger lakes (Russel Lake and Great Slave Lake) with the assistance of local guides from Behchokǫ̀ or Ndilo. The researchers are conducting special analyses of the cores in a laboratory.

Evans, Marlene
Environment and Climate Change Canada
Saskatoon, SK
marlene.evans@canada.ca

File No: 12 402 681
Region: SA
Licence No: 15947
Location: Délı̨nę, Great Bear Lake

Monitoring of mercury, flame retardants and other chemicals in lake trout and cisco from Great Bear Lake

Mercury and other hazardous chemicals such as flame retardants (chemicals that make clothing and furniture less flammable) can accumulate in the fish that people eat. High levels of these contaminants can be unsafe for the people who eat the fish. The goal of this ongoing monitoring project is to measure mercury and flame retardants in fish over time. Lake trout and cisco (lake herring) from Great Bear Lake were provided by community members from Délı̨nę. Fish have been collected about once a year since 2008, and there is also information available from earlier research. Mercury concentrations are very low in these fish, especially cisco. The lake trout being caught were old, with an average age of 22 years with some reaching 30-44 years old. Normally older fish have higher concentrations of mercury, but the cold waters of Great Bear Lake and its very large size result in low mercury concentrations in lake trout despite the fish being quite old. Mercury concentrations have changed little over the years. Where mercury levels are high, like for some small lakes in the NWT, the GNWT Department of Health and Social Services warns people to avoid eating fish, or avoid to eating too much fish caught there. However, they have seen the mercury data from this research and have issued no such warnings about fish from Great Bear Lake.

Evans, Marlene
Environment and Climate Change Canada
Saskatoon, SK
marlene.evans@canada.ca

File No: 12 404 292
Region: SS
Licence No: 15948
Location: Great Slave Lake

Spatial and long-term trends in persistent organic contaminants and metals in lake trout and burbot from Great Slave Lake

The Great Slave Lake Northern Contaminants Program is an on-going monitoring project with a few separate components. The goal of one component is to measure mercury, other metals, and other hazardous pollutants known as ‘persistent organic contaminants’ in lake trout and burbot from two regions of Great Slave Lake, and to see if those levels are changing over time. The researchers got lake trout from Łutsel K’e (East Arm Region) and from the commercial fishery at Hay River (West Basin Region), and burbot from Ft. Resolution (West Basin Region). In another project component, the research team is monitoring mercury levels in burbot at Łutsel K’e, and in northern pike at Ft. Resolution. Mercury concentrations remain relatively low in these fish. A few years ago it seemed like mercury levels were increasing, but now it is not clear that this is the case. In addition, the hazardous ‘persistent organic contaminants’ are declining in concentration. The research team continued to work with the communities of Ft. Resolution and Łutsel K’e on two other studies, and contributed to related studies that were conducted by other researchers, including measuring mercury in fish from Dehcho lakes and Great Bear Lake. Finally, the team worked on a series of posters to present the mercury findings in a clearer and more understandable way.

Laird, Brian
University of Waterloo
Waterloo, ON
brian.laird@uwaterloo.ca

File No: 12 402 900
Region: SA, DC, SS

Licence No: 15966
Location: Coleville Lake, Délı̨nę, Ft. Good Hope, Norman Wells, Tulít'a, Ft. Liard, Ft. Providence, Ft. Simpson, Jean Marie River, Nahanni Butte, Trout Lake, Wrigley, Hay River, West Point, Kakisa

Contaminant biomonitoring in the Northwest Territories Mackenzie Valley: investigating the links between contaminant exposure, nutritional status, and country food use
The overall goal of this project is to promote country (or traditional) foods in the Mackenzie Valley in a way that balances health risks from contaminants on the one hand, and nutritional benefits on the other. That is, the researchers hope to show how to maximize eating healthy, nutrient-rich country foods while minimizing the amount of mercury consumed. Mercury is a dangerous pollutant that is found in higher levels in some traditional foods than others. The research team will monitor what kinds of traditional foods people are eating, in what amounts, and how much mercury contamination is present in all of these foods. They will also monitor mercury levels in community participants. In the end, the research team hopes to have a new, and better, way to figure out whether someone is at risk for mercury-related illness based on what they are eating.

Laird, Brian D.
University of Waterloo
Waterloo, ON
brian.laird@uwaterloo.ca

File No: 12 402 900
Region: DC, SA

Licence No: 15977
Location: Jean Marie River First Nation

Contaminant biomonitoring in the Dehcho Region: investigating the links between contaminant exposure, nutritional status, and country food use
Country (or traditional) foods are healthy; however, these foods can also pose risks due to contamination. The government has warned people to eat less walleye, northern pike, and lake trout from some lakes in the Northwest Territories due to higher levels of mercury. Also, the government has warned people about eating the kidneys and liver of moose from some areas. It is not known how much contaminated fish or how many moose organs people in the Dehcho, Sahtú and Hay River regions actually eat, nor how contaminated these foods actually are. For this reason, the researchers have started a three-year project to find out—the project is currently in year two of three. The end goal of this project is to create a strategy to promote the use of country foods, because they provide important nutrition benefits, while reducing contaminant exposure.The research team is taking samples of human hair, urine, and blood to test for metals (mercury, cadmium, uranium, etc.), organic pollutants (pesticides, flame retardants, etc.), as well as nutrients (selenium, omega-3). The project participants are also filling out a food survey. Every community in these regions was consulted separately about the project. In communities that chose to participate, community members were allowed to choose which types of sampling they were interested in. The research team will be back within one year to report the results.

Low, George
Dehcho First Nations
Hay River, NT
geobarbgeo@hotmail.com

File No: 12 402 857
Region: DC, SS Reserve
Licence No: 15899
Location: Ft. Simpson, Wrigley, Kakisa, Hay River

Updating data on mercury levels in food fish species in lakes used by Dehcho communities
No fish were collected for this project in 2016. The results from this project have been presented several times to the communities of the Dehcho.

McGeer, Jim
Wilfrid Laurier University
Waterloo, ON
jmcgeer@wlu.ca

File No: 12 402 912
Region: SS
Licence No: 15962
Location: Ft. Smith

Understanding community based monitoring exceedances through site assessments
No research was conducted under this licence in 2016.

Naeth, M. Anne
University of Alberta
Edmonton, AB
anne.naeth@ualberta.ca

File No: 12 402 409
Region: NS
Licence No: 15829
Location: Diavik Diamond Mine, East Island, Lac de Gras

Reclamation of disturbed sites research at Diavik Diamond Mine, NWT
Reclamation means returning the land to the state it was in before it was disturbed or changed by development, or to a state that is desired by local land users. Reclamation research in the north over the past 30 years has focused on oil and gas developments and transportation corridors. Different industries — mining, oil and gas, etc. — create different disturbances to the land, although some aspects are similar. Each industry may have a different type of waste product and a different degree of soil removal that determines which reclamation methods will work the best. The purpose of this research program is to find ways to make plants grow more quickly on disturbed sites at diamond mines in the north. The researchers will also study how to build soil surfaces on the ground in places where the soil has been stripped. This new soil will be made of salvaged soil and commercially purchased materials that are available on the site, and it will help native plants return more quickly to these bare areas. In 2013 and 2014, research plots were established to see how small changes in the land surface, the addition of natural materials to the soil, and preventing erosion would help grass and other plants grow. The research team also tried to plant mosses and lichens. They have been visiting the plots every year to check on the plants' growth. They are finding that adding sludge from the sewage treatment process is particularly

beneficial due to its fertilizer properties. Making the land uneven instead of smooth is also an important technique. Controlling erosion continues to be a challenge in this ongoing program.

Oliver, Jonathon
Queen's University
Kingston, ON
jamieson@queensu.ca

File No: 12 402 904
Region: NS
Licence No: 15932
Location: 30 km radius of Yellowknife

Understanding regional variability in soil geochemistry in an area impacted by legacy industrial activity

Arsenic is a dangerous pollutant that came from old gold mines. Researchers know that arsenic can be found in the soil around these old gold mines, but they don't know how the arsenic has spread out across the land. For example, is it spread out evenly? Or is it patchy? If it is patchy, what makes the arsenic levels higher in some places than others? To answer these questions, the researcher tested for arsenic levels in many places within 30 kilometers of Yellowknife. Samples were collected from three different types of soils: soils from rocky outcrops, forest canopy soils, and forest canopy outcrop soils. To see if arsenic might vary a lot in a small area, the researcher also took many samples from a small, defined area. The samples will be analyzed in a lab using specialized techniques, and after that point, more fieldwork may be conducted.

Sandlos, John
Memorial University of Newfoundland
St. John's, NL
jsandlos@mun.ca

File No: 12 402 891
Region: NS
Licence No: 15834
Location: Yellowknife

Toxic legacies: community perspectives on arsenic pollution at Yellowknife's Giant Mine

This project, which is ending in 2017, studied arsenic contamination from the Giant Mine. In particular, it studied how people understand the pollution, and how to educate future generations about it. A Yellowknife-based committee called the "Communicating With Future Generations" committee was created to discuss how to educate future generations about the arsenic hazards at Giant Mine. In addition to the committee, fieldwork for two student projects started in 2016. In the first, the elders of the Yellowknives Dene First Nation mapped places they know were historically contaminated with arsenic in their territory. In the second project, interviews were conducted with a variety of people who work with the Giant Mine Remediation Project to see how the remediation project changes over its lifetime, and how community concerns are affecting the remediation. Finally, the research team held a workshop in Detah to discuss how to educate future generations about the dangers of arsenic pollution, and to commemorate the people and places affected by arsenic pollution. The workshop was attended by Yellowknives Dene elders and a broad selection of other people interested in the Giant Mine Remediation Project. The research team will produce reports, and have hosted screenings of their film, Guardians of Eternity, across Canada and the north.

Somers, Gila
ENR Water Resources Division
Yellowknife, NT
gila_somers@gov.nt.ca

File No: 12 402 908
Region: GW, NS

Licence No: 15841
Location: Martin Lake; Kam Lake; Grace Lake; Long Lake; 67°27'19.29”N, 134°53'16.43”W; Mackenzie River (between 67°25'40.08”N, 133°32'52.97”W and 68°44'19.96”N, 134°29'33.94”W); 67°26'12.08”N, 133°45'49.19”W; 67°40'16.61”N, 134°51'41.47”W; 68°14'53.28”N, 133°48'32.16”W

Metal levels in large-bodied fishes near communities along the Mackenzie River compared to impacted lakes near Yellowknife, NWT
The goal of this project was to see if the fish that people harvest to eat have become contaminated with mercury. Mercury is a dangerous pollutant that can be found in fish, and that can make people sick if they eat too much of it. The project team took fish from four sites within the Gwich’in region, and also from a few lakes near Yellowknife. The Yellowknife locations were near urban development or mining operations (e.g., the Giant and Con mines). The researchers took up to 30 fish from each species. Although the target for the research team was large-bodied fish that are traditionally harvested for food, they also caught other species. Samples from these other species were saved but not analyzed. Fish were collected using scientific gillnets in the Yellowknife area by community fishers and project team members, and domestic gillnets by community fishers in the Gwich’in region. All fish were sent to the University of Alberta, where the researchers found out how old each fish was, and tested for mercury and other types of contaminants. A report about what they found will be available in 2017.

Somers, Gila
GNWT ENR Water Resources
Yellowknife, NT
Gila_Somers@gov.nt.ca

File No: 12 404 922
Region: NS

Licence No: 15950
Location: Martin Lake; Grace Lake; Long Lake

Metal levels in large-bodied fishes near impacted lakes near Yellowknife, NWT
This project was a supplementary project to licence 15841 (the previous entry). The researchers were measuring the levels of mercury in fish that people eat. In order to be sure that their results were correct, the researchers needed to obtain more fish to test. This licence was for the researchers to capture and test more fish from the impacted lakes near Yellowknife.The researchers took up to 30 fish from each species. Although the target for the research team was large-bodied fish that are traditionally harvested for food, they also caught other species. Samples from these other species were saved but not analyzed. Fish were collected using scientific gillnets in the Yellowknife area by community fishers and project team members, and domestic gillnets by community fishers in the Gwich’in region. All fish were sent to the University of Alberta where the researchers found out how old each fish was, and tested for mercury and other types of contaminants. A report about what they found will be available in 2017.

Swanson, Heidi
University of Waterloo
Waterloo, ON
hswanson@ualberta.ca

File No: 12 402 889

Licence No: 15870

Region: DC

Location: Ekali Lake, Sanguez Lake, Gargan Lake, McGill Lake, and Deep Lake in the Jean Marie area. Trout Lake in the Sambaa K'e area. Tathlina Lake and Kakisa Lake in the Kakisa area. Big Island and Mustard Lake in the Ft. Simpson area.

The bio-magnification of mercury within fish species of the Dehcho and their varying levels among lakes

This research project began in 2013, with the goal of checking mercury levels in the animals found in lakes across the Dehcho region to see if fish from these lakes are safe to eat. Mercury is a hazardous pollutant. When it gets into a lake, a dangerous thing happens. The smallest creatures and plants absorb some mercury. Then, they are eaten by slightly bigger creatures, and the mercury gathers in their flesh. Small fish might then eat a lot of these creatures, so the small fish end up with more mercury concentrated in their flesh. Finally, large fish eat the small fish, and because they eat so many small fish, and because they live for so long, mercury can accumulate to dangerous levels in these large fish. For the final year of this research project, Mustard and Kakisa Lakes were studied through partnerships with the Liidlii Kue (Ft. Simpson) and Ka'a'gee Tu (Kakisa) First Nations. Community members were hired as field assistants, cooks, and camp maintainers. The research team harvested five burbot, 49 lake trout, one longnose sucker, two nine spine stickleback, and six northern pike from Mustard Lake. They also harvested 19 cisco, 28 lake whitefish, seven longnose sucker, 18 northern pike, 11 walleye, and eight white suckers from Kakisa Lake. Plankton and invertebrates (the tiny animals that live in the water) were also collected. The researchers have already made presentations to Dehcho audiences and community members, and will publish their results as well.

Swanson, Heidi
University of Waterloo
Waterloo, ON
heidi.swanson@uwaterloo.ca

File No: 12 402 889

Licence No: 15970

Region: DC

Location: Ekali Lake; Sanguez Lake; WIllow Lake; Mustard Lake

Further examination of the bio-magnification of mercury within fish species of the Dehcho and their varying levels among lakes

The goal of this on-going research project is to check the mercury levels in fish from lakes in the Dehcho. The research team, which is a joint community-university research team, want to see if mercury levels differ among lakes and fish. In 2016, they sampled Willow and Sanguez lakes, and in 2017, they plan on sampling Big Island Lake and Ekali Lake. Along with fish samples, the researchers took samples of invertebrates and plankton (the tiny plants and animals that live in the water), the water itself, and the lake bottom sediments. The team also mapped out the lake depth of Willow, Sanguez, and Ekali Lakes. Early testing shows that lake whitefish from Willow Lake have mercury levels that are below Health Canada's mercury guideline—in other words, they are safe to eat. Northern pike larger than 24" had mercury levels above the guideline, because as fish get larger and older, they tend to have more mercury. Only three lake trout were captured in Willow Lake, so further fishing is necessary. The researchers held meetings in K'a'a Gee Tu, Deh Gah Got'ie', Jean Marie River First Nation, Samba'a K'e, and Liidlii Kue to discuss what they found. Posters will be provided to each community, and will be uploaded on the POLAR site once finalized.

Van Den Berghe, Martin
Queen's University
Kingston, ON
martin.vandenberghe@gmail.com

File No: 12 402 901 **Licence No:** 15788
Region: NS **Location:** Giant Mine Property

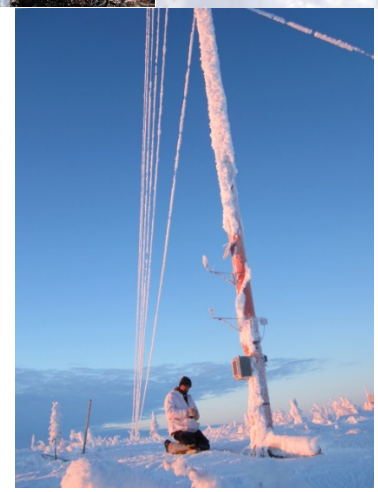
Characterization of arsenic species in lake sediments surrounding Giant Mine, NWT

The goal of this study was to learn how arsenic can move from lake sediments into the water of the lake, in lakes contaminated by gold mining activities. Sediments are found on the bottom of a lake – the mud, sand, and other natural materials. The arsenic in question can be found as a particularly dangerous form called “arsenic trioxide” which is produced during gold ore roasting. This arsenic gets into the lake sediments, transported by the air as dust from the roasting operations at the mine. The researchers first checked to see if this type of arsenic could be found in the soils and lake sediments near the Giant Mine site, and they did find it. The study also found that when this type of arsenic is in lake sediments, it dissolves into the water slowly. Some of the dissolved arsenic turns into new minerals and stay in the sediments, which are more stable and potentially safer. However, much of the dissolved arsenic just goes into the lake waters, and contributes significantly to the higher arsenic concentrations in these lakes. More studies about arsenic pollution in lakes would be helpful to understand how it moves from sediments into the water, and to help clean up contaminated areas.

Engineering







Photos clockwise from top left: 1) Ice Profiling (credit: Van Der Sanden, J.); 2) Solar Panel array at Westrern Arctic Research Centre (ARI photo); 3) Ice Profiling sample (credit: Van Der Sanden, J.); 4) ARI staff downloading data from wind monitoring tower (ARI photo); 5) ARI summer student downloading data from winde monitoring tower (ARI photo).

Berg, Aaron A.
University of Guelph
Guelph, ON
aberg@uoguelph.ca

File No: 12 406 062 **Licence No:** 15902
Region: IN **Location:** Trail Valley Creek

Hydrological remote sensing
The goal of this project was to test a new way of measuring soil moisture (water in the soil) and frost depth. As the climate changes, it is important to know if and how soil moisture is changing. Usually when scientists need to know these things, they go to the spot and take measurements and samples, which is slow and only allows for a few locations to be sampled. The new technique that the research team was trying out is different, and allows researchers to measure soil moisture from satellites. This method allows for many more measurements to be taken. The researchers fine-tuned their satellite measurements of soil moisture using a special probe that measures cosmic rays close to the earth's surface. Cosmic rays are tiny particles from the solar system, and measuring them close to the earth's surface tells us how much moisture is in the ground. The research site was the Trail Valley Creek site north of Inuvik, where the probe was placed. A publication and thesis from the research are available.

Marsh, Philip
Wilfrid Laurier University
Waterloo, ON
pmarsh@wlu.ca

File No: 12 406 059 **Licence No:** 15855
Region: IN **Location:** Trail Valley Creek and Havikpak Creek

Hydrology of high latitude watersheds
The climate of the Inuvik region is changing rapidly, and will continue to change in the coming decades as a result of human-released greenhouse gases. For example, since Inuvik was formed in the late 1950s the number of winter days below -40°C has decreased. Over the last few years there have been very few days with such low temperatures. In the summer, the number of days over +20°C have increased dramatically. In addition, the amount of rain in the summer and snow in the winter has also been gradually changing. The result is that more shrubs are growing on the tundra north of Inuvik, the permafrost is thawing, and lake and river levels are changing. There are also examples of lakes rapidly draining due to thawing permafrost. Everyone is wondering – how will the snow, the lakes, and the rivers change in the coming decades, and what will they be like 50 years from now? In order to answer these questions, the research team is carrying out studies of the snow, lakes, and rivers at a location north of Inuvik. The water at this site has been observed since the 1970s. In 2016 there were researchers and students from around Canada and the world, studying the water at this site. This research used many types of new equipment, including drones, to map the snow and vegetation, and to measure snow, soil moisture, and runoff. The snow cover at the end of winter was among the lowest on record. The research team will use the information they gathered to try and figure out what the waters in this area will be like in the future.

Panayi, Damian
Golder Associates Ltd.
Yellowknife, NT

dpanayi@golder.com

File No: 12 406 050 **Licence No:** 15853
Region: NS **Location:** 5 km NE of the Gahcho Kué Mine

Kennady North diamond project
This research licence was for a winter water quality program and the spring hydrology program at the Kennady North Project. The purpose of the Winter Water Quality Program was to collect under-ice water samples and other measurements from a few different lakes. The lakes were carefully chosen: one lake has been impacted directly by the mine, two are downstream from the mine, and three are along a possible diversion channel route. Water quality and other measurements were taken from a depth of 4 to 8 m (around 12 to 25 feet). The purpose of the Spring Hydrology Field Program was to start the "hydrological monitoring" for the mine. Hydrological monitoring refers to monitoring the lakes, rivers, and streams around the mine. The research team measured such things as how the streams and rivers flow into and out of lakes. They used a special measuring device that records water levels, temperature, and other information. These devices were placed on the lakebed of each lake being monitored, at the location where the lake drains out into a river or creek. The instruments recorded water depth every 15 minutes. The research team also mapped out the different watersheds and lakes in the area by flying over them. The monitoring will continue next year.

Spence, Christopher
Environment and Climate Change Canada
Saskatoon, SK
chris.spence@canada.ca

File No: 12 406 061 **Licence No:** 15860
Region: NS **Location:** Upper Baker Creek watershed

Investigations of the water cycle and hydrological processes of the subarctic Canadian Shield
The goal of this ongoing research project is to find out more about how water moves through its whole cycle, from the snow into the groundwater and back into the air, and how this cycle is different in areas that have different types of vegetation and permafrost. The research is taking place in the Upper Baker Creek watershed near Yellowknife. In 2016, the researchers began with a spring snow survey, during which they also turned on some climate towers and water level stations. These climate towers measure and record information about the weather. Using other instruments, the researchers continued to measure weather conditions, how much water was evaporating from the surface of the earth, soil moisture, and other aspects of the water cycle. The researchers also measured the flow of various streams and at lake outlets along Baker Creek in April, June, and October, and took water samples as well. They tried to take water samples from wells but they were dry. They analyzed the stream water samples for water quality, pollution, and nutrient levels.

Trimble, Annika
Aurora Research Institute
Inuvik, NT
atrimble@auroracollege.nt.ca

File No: 12 406 058 **Licence No:** 15777

Region: GW

Location: 6 km NE of the Inuvik airport (68°21'24.12"N, 133°24'25.31"W)

Wind energy monitoring at Inuvik High Point (2015-2017)
The goal of this ongoing project is to see if it is possible to generate electricity for the town of Inuvik using wind power. A 60 m (200 foot) tall wind monitoring tower was installed at the High Point site, north of Inuvik. The tower uses sensors to measure how fast the wind is at 40, 50, and 60 m above ground level. In the past, ice has formed on the wind monitoring towers, impacting the readings. To overcome this challenge, a heated wind speed sensor was added to the tower to ensure accurate winter wind speeds would be recorded. The tower also records wind direction, air temperature, and relative humidity. The project will continue into 2017.

Trimble, Annika
Aurora Research Institute
Inuvik, NT
atrimble@auroracollege.nt.ca

File No: 12 406 058
Licence No: 15778
Region: NS
Location: CN Hill (63°24'15.5"N, 116°10'44.8"W)

Wind energy monitoring at Yellowknife (2015-2017)
The goal of this ongoing project is to see if it is possible to generate electricity for the city of Yellowknife using wind power. The project has been measuring wind speed along the Snare grid powerline. In December 2015, two heated wind sensors were installed on Northwestel's Snare tower at 25 and 53 m above ground level (about 75 and 160 feet). The sensors are heated, because the winter conditions can cause ice to form which prevents the sensors from working. An unheated sensor was also installed at 53 m, a wind vane at 25 m, and a temperature sensor at 2 m above ground level. This project will continue for at least two more years.

Wolfe, Brent B.
Wilfrid Laurier University
Waterloo, ON
bwolfe@wlu.ca

File No: 12 406 060
Licence No: 15857
Region: NS
Location: Marian Watershed

Hydrological and contaminant studies in the Marian Watershed, NWT, to enhance community-based cumulative effects monitoring
The Tłı̨chǫ Government Marian Watershed Stewardship Program is a community-based program aimed at monitoring ecosystem health in the Marian Watershed. Starting in 2016, the research team has worked in collaboration with this Program to study long-term changes to the lakes in the Marian Watershed. They are looking at changes in the environment caused by climate change. They are also trying to map out metal contaminants such as arsenic in the watershed. The arsenic might have come from natural erosion of bedrock or as pollution from past mining operations. In order to understand how conditions have changed, the researchers have taken sediment cores from several lakes throughout the watershed. The cores have lake bed sediments dating back many years, which will allow the research team to chart out changes over time. The researchers found that Nico Lake has higher levels of naturally-occurring arsenic and other metals from metals in the bedrock. There may also be higher arsenic levels from past mining pollution. Results were

presented to the Tłı̨chǫ community in January 2017 at the GNWT CIMP Results Workshop in Behchokǫ̀, and in March 2017 at the Tłı̨chǫ Government Elders Meeting in Yellowknife.

Health

Photos: HealthESteps project team practicing their measurments (ARI photos)

Affleck, Ewan
Yellowknife Health and Social Services Authority
Yellowknife, NT
ewan_affleck@gov.nt.ca

File No: 12 408 194
Region: NS
Licence No: 15771
Location: Yellowknife

Northwest Territory disease registry study
No research was conducted under this licence in 2016.

Estabrooks, Carole A.
University of Alberta
Edmonton, AB
carole.estabrooks@ualberta.ca

File No: 12 408 200
Region: IN, DC, NS, SS
Licence No: 15779
Location: Behchokǫ̀, Inuvik, Ft. Smith, Hay River, Ft. Simpson, Yellowknife

Translating research in elder care (TREC 2.0): advice-seeking networks in residential long term care
The goal of this multi-year project is to see where and to whom the staff in long-term care homes turn to get advice when they need help to care for elders. The research team has finished collecting all the information they need, from across the western and northern regions of Canada. They used both surveys and interviews. A total of 432 surveys were filled out by long-term care home directors. The survey results are being analyzed and will be published in academic papers – a first paper is already published and available for the public: Dearing, J.W., et al. (2017). Pathways for best practice diffusion: The structure of informal relationships in Canada's long-term care sector. Implementation Science, 12:11. In addition, 39 people who had completed the survey were also interviewed. Interviews were also conducted with the individuals who nursing home employees turn to for advice. These interviews are being analyzed, and initial results will be ready in 2018.

Fournier, Bonnie
University of Alberta
Edmonton, AB
bonnie.fournier@ualberta.ca

File No: 12 408 207
Region: IN, GW
Licence No: 15808
Location: Aklavik

Policy options to support healthy eating and active living
The overall goal of this research project was to promote healthy eating and active living in Aklavik, in particular through changes to government policy and education. In 2015 and 2016 the researchers conducted interviews and a wisdom circle with community members who work in health services. The interviews and wisdom circles focussed on understanding the current policies about healthy eating and active living, and creating better community-driven policies to encourage healthy lifestyles. The research team also met with the Mayor and Council to share their results and get feedback. During the interviews, participants discussed various policy options that would be possible in their community. As a result, five examples of changes that would support healthy

living were recommended by the researchers. These were 1) banning the sale of energy drinks in public buildings, 2) healthy catering, 3) free water in public buildings, 4) dropping sugar-sweetened beverages from public buildings, and 5) banning sports sponsorship by unhealthy food and beverage companies. As a result of this research, and demonstrating the success of the research method, the Hamlet chose to ban the sale of energy drinks in public buildings. The researchers used the example of the local school's ban on junk food, which has been in place for more than a decade, as a success story.

Goodman, Karen J.
University of Alberta
Edmonton, AB
karen.goodman@ualberta.ca

File No: 12 408 149
Region: IN, GW

Licence No: 15785
Location: Aklavik, Tuktoyaktuk, Ft. McPherson, Sachs Harbour

Addressing community concerns about health risks from H. pylori infection

The Canadian North Helicobacter pylori (CANHelp) Working Group conducts research in four communities in the Northwest Territories, and a few Yukon communities, to address concerns about Helicobacter pylori (H. pylori) infection. H. pylori is a bacteria that lives in many people's stomachs. It can cause stomach ulcers and more serious medical problems. In April 2016, community partners from Aklavik, Ft. McPherson, and Ulukhaktok joined academic partners on a university conference panel to talk about working together. Also in 2016, a new study recruited community project participants with H. pylori infection to investigate exposure to mercury in food and whether it is related to the severity of inflammation associated with H. pylori infection. Forty-five residents of Aklavik provided hair samples for measurement of mercury levels and details about their fish consumption, a major source of mercury exposure. This information will be linked to previously collected data on the severity of inflammation to describe any relationship between these factors. During the summer of 2016, a traditional medicines project requested by community partners collected traditional medicines in Aklavik. Throughout the year, the team carried out a variety of activities to share information with community project participants and obtain input from community partners and planning committees. They held community information sessions, planning workshops, and meetings to obtain community review of research results, and had booths at health fairs. The research team piloted new approaches to incorporating community perspectives in research. An illness narratives project collected illness histories from Aklavik participants. In a 'photovoice' workshop, Ft. McPherson youth learned photography skills and took photos to reflect their perspectives on H. pylori infection and health. In November, the youth will visit Edmonton to observe university researchers at work and present their photos at a conference.

Howard, Courtney G.
Canadian Association of Physicians for the Environment
Yellowknife, NT
courtghoward@gmail.com

File No: 12 408 205
Region: NS, SS

Licence No: 15801
Location: Ndilo, Detah, Yellowknife, Kakisa

SOS-Summer of Smoke: A mixed-methods research examination of the health effects of a record wildfire season in Canada's Northwest Territories.

The goal of the SOS project was to find out more about the effects of the bad forest fire year of 2014 on people's health and traditional activities. To do this, the researchers looked at how many people were seen with breathing problems, and what their breathing problems were, at Yellowknife clinics and at the hospital during 2014. The researchers also did interviews with community members in Yellowknife, Ndilo, Detah, and Kakisa to find out how the summer impacted people's wellbeing, including its impact on traditional summertime activities. The research team is almost finished analyzing their information and have begun writing up the study so they can submit it to medical journals.

Jenkins, Emily J.
University of Saskatchewan
Saskatoon, SK
emily.jenkins@usask.ca

File No: 12 408 204
Region: IN

Licence No: 15813
Location: Hendrickson Island (69°30'0"N, 133°35'10"W); East Whitefish (69°22'45"N, 133°37'10"W)

Beluga health and food borne parasites in the Inuvialuit Settlement Region

The purpose of this research is to assess the health of beluga harvested by hunters in the Inuvialuit Settlement Region, in collaboration with whale monitors, community youth, and elders. This is a joint project with the Fisheries Joint Management Committee, Department of Fisheries and Oceans, Université de Montréal, University of Saskatchewan, the Canadian Food Inspection Agency, and Health Canada. So far, the research team have taken samples from 22 beluga in 2014, 16 in 2015, and 10 in 2016. In 2015 and 2016, beluga were measured and weighed, and blood and organ samples were collected. Overall, beluga were in good health and body condition. Different parasites were found, including round worms (nematodes) in the lungs of five beluga, the stomach of three beluga, and the kidneys of four beluga. A flatworm (trematode) was found in the intestinal lymph nodes of three animals. It is normal for wildlife to have parasites, and these parasites are not thought to pose a risk to the people who harvest or eat beluga. Blood samples from animals harvested in 2014 and 2015 showed exposure to toxoplasma (a microscopic parasite that can be transmitted to people), but the team did not detect this parasite in the brain, heart, or muscles. Testing on 2016 animals, including examining tissues under a microscope, is ongoing. A final written report will be available by March 2017.

Logie, Carmen
University of Toronto
Toronto, ON
carmen.logie@utoronto.ca

File No: 12 404 900
Region: IN, NS, SS

Licence No: 15882
Location: Yellowknife, Inuvik, Hay River, Ft. Smith

Visual and performance art for HIV prevention with indigenous youth in the Northwest Territories and Nunavut: a mixed-methods multiple case study

Fostering Open eXpression among Youth (FOXY) is an on-going project which, in previous years, encouraged new ways of talking with young women about sexual health, sexuality, and relationships. The project held workshops and original,new ways of educating and communicating, such as through the arts and digital story telling. The researchers wanted to see if the same approach would work to educate young men about sexual health. To do this, they

used information from surveys that were filled out by 185 young women who participated in the FOXY program. In winter 2016, FOXY leaders held focus groups with the people who provide sexual health care services to young men in the NWT. In the focus groups they spoke about the development of a sexual health program catered to young men. The researchers took what they learned from the focus groups and used it to create a new program for young men that follows the structure of the FOXY program. They are hoping to have several hundred young men as participants, and also to include a new cohort of young women participants, starting in 2016-2017.

Logie, Carmen
University of Toronto
Toronto, ON
carmen.logie@utoronto.ca

File No: 12 408 199 **Licence No:** 15925
Region: IN, GW, SA, DC, NS, SS **Location:** All NWT Communities

Understanding syndemics and HIV/STI vulnerability among northern indigenous youth in Northwest Territories

Fostering Open eXpression among Youth (FOXY) is a project that encourages a new way of talking with young women about sexual health, sexuality, and relationships. The project has offered workshops for hundreds of young people, and uses new ways of communicating with young people, such as through the arts and digital story telling. During summer 2016, FOXY leaders facilitated four retreats at Blachford Lake where young women from all NWT communities acted as both the retreat leaders and participants. The FOXY leaders also conducted research with a total of 42 young women participants. Young women participants filled out surveys and participated in focus groups. The FOXY research team is analyzing the information they gained through the surveys and focus groups. The research team also held retreats with 19 young men, however, research was not conducted with these participants because community approval to conduct research with young men had not be granted yet.

Manca, Donna P.
University of Alberta
Edmonton, AB
dpmanca@ualberta.ca

File No: 12 408 196 **Licence No:** 15802
Region: NS **Location:** Yellowknife

Canadian primary care sentinel surveillance network (CPCSSN) project

The goal of this ongoing research is to gather information about health care and treatment for people with chronic diseases. The information gathered includes the medical treatments provided, and what happened after the treatments, over a long time-span. This information will be useful for doctors and nurses when they determine how to best treat chronic diseases. In 2014, research agreements and data sharing agreements were set-up with the Yellowknife Health and Social Services Authority. These agreements ensure that strict codes of confidentiality and privacy are followed during this project. The agreements were required before the project team could start collecting any medical information from patients. The medical records that are used have been stripped of any identifying information and are electronic only. Researchers started working with the electronic medical records in 2016, and will continue into 2017. Electronic medical records have been located for more than 25,000 patients from 26 primary care providers. The records

were stripped of any personal information. The researchers will report their findings back to the 26 health care providers.

Pepperell, Caitlin
University of Wisconsin-Madison
Madison, WI
cspepper@medicine.wisc.edu

File No: 12 408 210 **Licence No:** 15836
Region: IN, GW, SA, DC, NS, SS **Location:** All NWT Communities

Spatial and temporal distribution of tuberculosis in Northwest Territories
No research was conducted under this licence in 2016.

Petrella, Robert J.
Western University
London, ON
petrella@uwo.ca

File No: 12 408 201 **Licence No:** 15904
Region: NS, SS **Location:** Ft. Smith and Yellowknife

HealtheSteps: exercise and nutrition prescriptions to prevent diabetes in rural and remote communities
The aim of this study is to create healthier rural and remote Canadian communities by providing science-backed information about how to live a healthy life, and to attempt to slow or halt the growing epidemic of type 2 diabetes. The researchers used a program known as the HealtheSteps™ Program, which is an eight month program consisting of one-on-one healthy lifestyle coaching sessions every two months for people who are at risk for certain diseases. The program was offered in Yellowknife and Ft. Smith in 2015. Currently, the research team is checking to see whether program participants have maintained these healthy changes to their lifestyle. By checking back in with participants six months after they finished the program, the research team will be able to see if participants are keeping up with any healthy changes they made during the HealtheSteps program. It will also help the researchers understand the challenges and/or successes that participants experience after the program ends. With better information, the researchers hope to address the ever-growing epidemic of type 2 diabetes throughout Canada, and to work towards building healthier communities together.

Rich, Rebecca
University of Toronto
Toronto, ON
rebecca.rich@mail.utoronto.ca

File No: 12 408 208 **Licence No:** 15780
Region: IN, GW, NS **Location:** All NWT Communities

Performance measurement in a circumpolar context: developing indicators of health system responsiveness for maternity care
The goal of this multi-year project is to see if there is a good way to measure whether the health care system responds to the medical needs of pregnant woman, new mothers, and their newborn children in northern communities around the globe. To know if a health care system is actually meeting people's needs, it is important that the organizations that deliver health services create

goals, and then measure how close they come to achieving those goals. This is known as "performance measurement", and the particular goals that are used to measure how well they are doing are known as "indicators." In circumpolar countries, national indicators may fail to address the health priorities of northern, remote, or indigenous communities. The objective of this study was to find ways to select useful indicators to monitor northern maternity care . The researcher first checked existing academic and other research reports to see what indicators might work. Then, the researcher worked with an advisory panel of 14 circumpolar maternity care experts. The maternity care experts came up with 11 indicators that were the best options, and a further 29 that might also work. The researcher found that while most circumpolar health systems do use performance measurement for maternity care, the indicators used do not always reflect local priorities.

Scott, Shannon D.
University of Alberta
Edmonton, AB
ss14@ualberta.ca

File No: 12 408 186 **Licence No:** 15859
Region: NS **Location:** Yellowknife

Knowledge translation tools for parents with children with croup and gastroenteritis
The purpose of this study was to see what are the best ways to get important information about two childhood illnesses to parents. To do this, the researchers worked with parents to create and assess three educational options – two videos and one eBook – about childhood croup and gastroenteritis. Acute croup is a virus that affects breathing. Gastroenteritis is an infection that causes vomiting and diarrhea. The videos and eBook were created after interviewing parents in three emergency departments in hospitals in Alberta, Manitoba and the Northwest Territories. The research team carefully reviewed the interviews to understand the experience of going to the emergency department with a sick child, and the parents' information needs and preferences. In general, parents found the videos and eBooks to be useful and educational. The research team also conducted group interviews with 19 parents. They found out that parents preferred the videos over the eBook. This was because the videos were short and gave important information with checklists to help parents decide what to do next. The eBook was too long with too much extra information. By working with parents, the research team created three engaging and effective videos to share medical information with parents.

Sharma, Sangita
University of Alberta
Edmonton, AB
gitasharma.ualberta@gmail.com

File No: 12 408 141 **Licence No:** 15819
Region: IN, GW, SA **Location:** Inuvik and Ft. Good Hope

Attitudes towards cancer in indigenous communities & examining uptake of screening services: the ACCESS project
The goal of this project was to find out why people who could benefit from cancer screening services that are offered at medical centres and hospitals do not make use of these services. Testing for cancer can save people's lives, so the researchers wanted to see if they could get more people comfortable with taking these tests.The researchers were focussed on colorectal, breast, and cervical cancer screening services. The study team and trained community members

talked with 366 participants about family history of cancer, visits to the doctor's office, knowledge about cancer screening, and risk factors for cancer. Community members were asked why they didn't get screened, and what helped them to attend screening appointments. In the end, the researchers found that there were a lot of reasons why people don't use cancer screening services. There are communication problems and a lack of clarity about appointment times and locations, and people are sometimes referred to multiple doctors. Also, the results from the screening services can be confusing. Participants spoke about experiences with cancer in terms of family and community. The team heard that a patient's friends would not visit, and when a family member passed away from cancer others would not come to the funeral. Cancer patients also found that supports within the community were limited, as many do not understand the disease. The results are now being used by the team and communities to develop local cancer screening education materials as well as education for health professionals.

Tordiff, Robert
Department of Health and Social Services
Yellowknife, NT
RobertTordiff@hotmail.com

File No: 12 408 209
Region: NS, SS, IN, GW

Licence No: 15825
Location: Yellowknife, Inuvik, Ft. Smith, Hay River

A path to greater cultural safety in NWT physician practice: improving patient-physician interaction in the Northwest Territories

The goal of this project was to see if there are better, safer, and more culturally respectful ways for doctors to interact with patients, particularly indigenous patients, in the Northwest Territories. The researcher examined tools developed in other juridictions and the difference those tools made on patients. This is known as improving "cultural competence". Two study groups were formed, each with doctors from different areas and who practise different types of medicine. Everyone had the opportunity to take training. One group took part in a self-directed on-line program. The other group participated in a two-day in-person workshop. The researchers then asked the doctors about their training experiences. The doctors were asked what was the most useful part of their training, and what were the most challenging aspects. The researcher determined that how well doctors and patients get along depends on many things, including outside factors and personal factors. The outside factors can be broadly described as how the medical services are being provided. The project shows that all the factors that affect cultural competence need to be addressed for doctors and patients to have a better relationship, and that more research on how to address these issues must be carried out.

Wagner, Anne
Ryerson University
Toronto, ON
anne.wagner@psych.ryerson.ca

File No: 12 408 211
Region: NS

Licence No: 15930
Location: Yellowknife and Behchokǫ̀

Accessing sexually transmitted and blood-borne infection (STBBI) and sexual health services in Canada – perspectives of health and social service providers and service users

No research was conducted under this licence in 2016.

Walker, Jody Butler
Arctic Institute of Community-Based Research
Whitehorse, YT
jody@aicbr.ca

File No: 12 408 203 **Licence No:** 15871
Region: NS **Location:** Yellowknife

Working together to achieve healthier lifestyles in Yukon and Northwest Territories' communities

This project began in 2013 in communities in both the Yukon and Northwest Territories. The goal of the project was to make the relationship between different organizations stronger and more effective. The organizations being studied include both non-government and government agencies that help people live healthier and happier lives through healthy eating, active living, literacy, and food security. The research team wanted to see if helping these agencies work more closely with one another would improve everyone's shared goals. The research team were particularly interested in making sure that positive effects for people and the community last long into the future. The research team helped these agencies work together, and studied what helped the relationships between organizations stay strong over time. They also ensured that the relationships created were based on indigenous cultural values and practices where appropriate.

Young, Kue
Edmonton Clinic Health Academy
Edmonton, AB
kue.young@ualberta.ca

File No: 12 408 166 **Licence No:** 15772
Region: IN, GW, SA, DC, NS, SS **Location:** All NWT

Survey of primary care providers and managers in the NWT

The purpose of this project is to ask 'primary care providers' about how well the air ambulance system is working, how well they are supported in their work, and their thoughts on the health care system in the Northwest Territories. 'Primary care provider' refers to doctors, nurses, and nurse practitioners. The researchers had 44 nurses and 20 physicians from the NWT fill out surveys in 2015. The survey was repeated in 2016 in the NWT with nurses only, and nurses and physicians from Nunavut were added. With the assistance of the Registered Nurses Association of the Northwest Territories and Nunavut, the research team sent out questionnaires electronically to all registered nurses in the two territories. The team received responses from 248 nurses. The survey focused on three main topics. First, how nurses in the communities stay in touch with physicians in the regional hospitals. Second, what sort of support the nurses receive when doing their work. Third, how responsive the patient transportation system is. The research team found that most nurses were satisfied with their ability to communicate with physicians in a timely manner, their freedom to make clinical decisions, and their overall experience practicing in the NWT. The patient transportation system appears to work well from both the sender and receiver points of view.

Young, Kue
Edmonton Clinic Health Academy
Edmonton, AB
kue.young@ualberta.ca

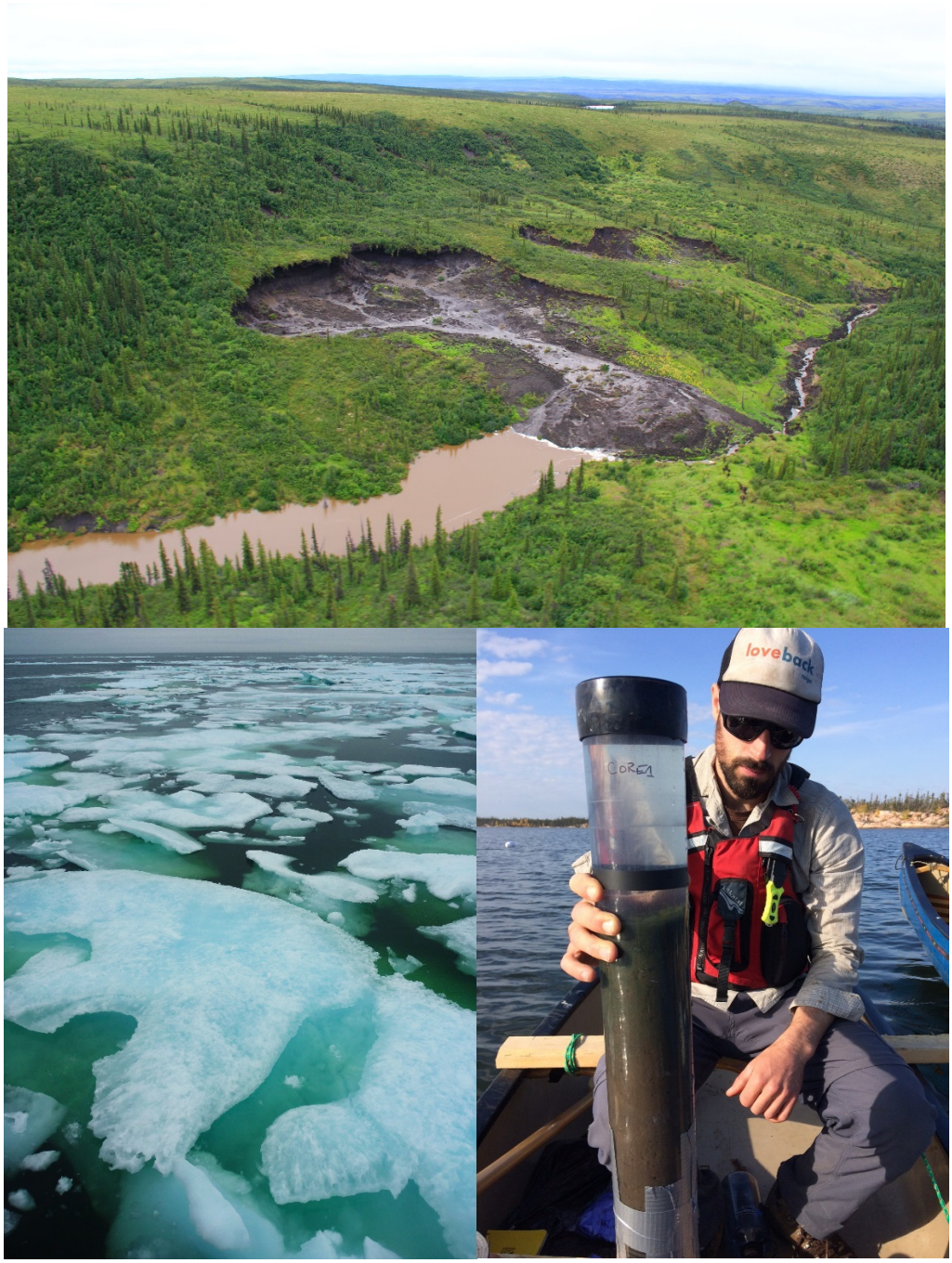
File No: 12 408 166
Region: NS

Licence No: 15773
Location: Yellowknife

Review of medical travel in Nunavut and the Northwest Territories

The goal of this project is to study medical travel in the NWT and Nunavut. The researchers looked at five years' worth of information about medical travel dating from 2011 to 2016. For every time someone traveled for medical reasons, the information included the type of travel (scheduled, medevac, charter), the community of origin, the destination, travel costs, and the medical reason for the travel. The research team is currently analyzing the patterns of use of medical travel; for example, are there some diseases, communities, or seasons that seem to have more or less medical travel than others? They are also looking at the associated costs, and any changes over time. The team is particularly interested in how people end up going to different types of regional health facilities, such as community health centres, hospitals in Inuvik and Yellowknife, and hospitals in the provinces. Since medical travel is very expensive and uses up a lot of the health budget in the territory, understanding why and how medical travel differs among communities would provide health care agencies with important information that can help them plan and improve services.

Physical Sciences



Photos clockwise from top left: 1) Peel Plateau – a stream dammed by the debris of a retrogressive thaw slump (credit: Shakil, S.); 2) Michael Gilday, collecting sediment sample from Lower Martin Lake (credit: Palmer, M.); 3) Beaufort Sea Ice (credit: Lighten, J)

Alkire, Matthew B.
University of Washington
Seattle, WA
malkire@apl.washington.edu

File No: 12 404 846
Region: IN
Licence No: 15787
Location: Kuujjua River and Thomsen River

Assessing the impact of small, Canadian Arctic river flows to the freshwater budget of the Canadian Archipelago

The purpose of this project is to collect water samples from small rivers throughout the Canadian Archipelago to determine whether their 'chemical signatures' differ from larger North American rivers such as the Mackenzie. The 'chemical signature' refers to the exact composition of the water – for example, water with a specific amount of a few different chemicals dissolved in it. During the final year of this three-year program, the researchers went back to river and estuary sites that they sampled in 2014 and 2015, including the Coppermine, Ellice, Back, Hayes, Kuujuua, Thomsen, Cunningham, Kangiqtugaapk, and Koogaaluk rivers. Both the rivers and their estuaries (the mouth of the river where they meet the ocean) were sampled. They took samples from 48 different spots in the estuaries at eight different depths, from about one foot to about 50 feet deep. In addition to taking all these samples, a small instrument that measures water temperature, depth, and other information about the water was lowered over the side of the boat to take measurements at different depths. A total of 253 places in the estuaries visited during the field program were studied in this way. In general, the natural chemistry of the rivers was found to differ based on the type of bedrock of the region. A second research article summarizing work in the estuaries is currently being prepared.

Audet, Pascal
University of Ottawa
Ottawa, ON
paudet.uottawa@gmail.com

File No: 12 404 815
Region: SA, DC
Licence No: 15797
Location: Ft. Liard, Wrigley, Tungsten Mine, Nahanni Butte

Yukon-Northwest seismic network: characterizing earthquakes and earth structures

Seven new seismograph stations were installed in northwestern Canada in the summer of 2013 to record earthquakes occurring locally, nationally, and worldwide. These stations have a very sensitive machine, a seismograph, which measures earthquakes – even those which are very soft or very far away. The information collected is being used to produce maps of the Earth's deep interior, and to help the researchers understand where earthquakes might occur in the future. The seismometers were buried inside a hole dug by hand. Information about any earthquakes that the seismometers detect is sent by satellite through a small station that's powered by the sun, a battery, or an outlet. The researchers are finding that the boundary between the mountain chain and the flat sedimentary basin at depths of 50-100 kmis more variable than they had thought. They are learning more about how the mountains were made by the movement of the earth's surface over many millions of years. The surface of the earth floats over the molten core, and this movement is what causes earthquakes. The researchers are developing a way to assess how much of a risk there is that any particular area might have earthquakes. In 2016, the research team fixed problems at five of the seven stations. In particular, the Ft. Liard station needed a re-alignment of the satellite antenna and the power cord to be changed. The Yukon stations at

Watson Lake, Hyland airport, Faro, and Mayo were also serviced. The research team is producing a lot of academic papers and publications from the information they have gathered.

Audet, Pascal
University of Ottawa
Ottawa, ON
paudet.uottawa@gmail.com

File No: 12 404 815
Region: IN

Licence No: 15798
Location: Bar Harbour E-76 (74.258, -123.901); Muskox 0-87 (73.602, -117.453); Victoria Island (72.901, -115.973); Nelson Head (71.39, -122.959); Uminmak H-07 (73.609, -123.011); Parker River (73.529, -115.876)

Teleseismic investigations of the crust and mantle structure beneath Banks Island, NWT
The goal of this project is to understand what is deep under Banks Island. There are two theories – one is that Banks Island was made from long-ago volcanoes under the ocean. If this were true, there may be oil and gas deposits. The other theory is that Banks Island is a part of the Canadian Shield like all of mainland Nunavut and the eastern half of the NWT. If this were true, there may be a potential for diamond mines. To figure this out, the researchers used special and very-sensitive machines that record distant earthquakes. The sensors are buried in the ground, are powered by solar power or a battery, and have a small transmission station. Earthquakes move through different types of ground in different ways, which will allow the researchers to have a better idea of what is deep under Banks Island. The three seismic stations at Bar Harbour, Johnson Point, and Nelson Head were serviced in 2016. While there, the researchers collected the data from the disks and carried out site maintenance. Two out of three sites were damaged by wind, and had only recorded information about earthquakes for 3-4 months each. The researchers will analyzed the information they collected, and preliminary results will be presented at the Northwest Territories Geoscience Forum in Yellowknife in November 2016, and at the American Geophysical Union Fall Meeting in San Francisco in December 2016. The research team will return to the area next year to collect more information from the stations.

Baltzer, Jennifer L.
Wilfrid Laurier University
Waterloo, ON
jbaltzer@wlu.ca

File No: 12 404 855
Region: DC, NS

Licence No: 15879
Location: The coordinates for the four corners of this region are: 60.714°N, 117.027°W; 63.206°N, 123.702°W; 64.175°N, 113.974°W; 62.322°N, 112.459°W

Impacts of wildfire extent and severity on caribou habitat
The goal of this project is to understand how taiga forests in the southern NWT grow back after severe wildfires. To study this, the researchers went out to certain locations across the landscape and took careful measurements of what is growing at that spot, what seeds are present, and how the permafrost and soil was affected by the fire. The number of seeds and how well they germinated was also measured. They call these research locations ‘plots’, and re-visit each plot year after year to see how the plants, lichen, shrubs, and trees are re-growing over time. They

chose plots within areas that burned during a particularly severe fire in 2014, but also in many other locations so they could compare these recently burned plots to ones that hadn't been burned, or that had burned a long time ago. They had close to 50 plots in areas that had never been burned, as well as plots in areas that had burned at various times in the past. The researchers set up 19 plots within forests that burned 35 to 45 years ago because they suspected they would find rapid changes in the amount of lichen, which is an important food for caribou. The researchers are also facilitating fire education to the communities, attending meetings, and writing reports about their findings.

Baltzer, Jennifer L.
Wilfrid Laurier University
Waterloo, ON
jbaltzer@wlu.ca

File No: 12 404 855
Region: IN

Licence No: 15898
Location: Trail Valley Creek (68°44.734"N, 133°30.003"W)

Drivers and consequences of shrub distribution on the tundra landscape

The goal of this multi-year project is to understand how shrubby areas and treed areas are changing both within a forested area near Inuvik (Havikpak Creek), and at a spot between Inuvik and Tuktoyaktuk called Trail Valley Creek. Trail Valley Creek is near the treeline, and there have been more shrubs growing there than in the past. Alder shrubs are becoming more common on the tundra, and researchers do not know what effects the shrubs might have in the future. During the summer of 2016 the research team visited the same ten locations they had studied in 2015, and made careful observations and measurements of the alder shrubs. This included how well the alders were re-growing, and how well their roots were growing into the soil. The researchers also studied the permafrost conditions, soil moisture, and the nutrients available in the soil to support the growing alders. In future, they will return to these same locations year after year to monitor how things change. The researchers also took tree core samples from spruce trees to check if they are growing more rapidly than they were in the past. They found that spruce are growing more rapidly in the last few decades. The research team is giving presentations to other scientists and the communities about their work, and writing reports and papers.

Beddoe, Ryley
York University
Toronto, ON
ryley.beddoe@lassonde.yorku.ca

File No: 12 404 901
Region: GW, SA

Licence No: 15895
Location: The Loon River outlet (66°28'10.1778"N, 128°58'30.6264"W) and along the Mackenzie River between (67°27'23.2992"N, 131°12'15.1806"W) and (67°27'23.2992"N, 130°51'58.9932"W)

Climate driven permafrost degradation and its impact on slope failures

No research was conducted under this license in 2016. One conference paper was presented at the 69th Canadian Geotechnical Conference in Vancouver, BC in October 2016. This conference paper was based on research conducted in 2015.

Belosevic, Mike
University of Alberta
Edmonton, AB
michael.belosevic@ualberta.ca

File No: 12 404 891
Region: NS

Licence No: 15781
Location: Acasta River Lake Region

Examining the Acasta Gneiss Complex: a broader scope

The goal of this research project is to study a well-known and very old outcropping of rock known as the Acasta Gseiss Complex, which is along the Acasta River. Extensive wildfires in the last twenty years cleared much of the brush and vegetation off the rock outcropping in the study area. This allowed the research team a clearer view of the Acasta Gneiss Complex than has ever been seen before. Because of this, accurate bedrock mapping of a large area was possible. Bedrock mapping is not the same as drawing a regular map. Instead, these maps show what kind of rock the bedrock is made up of, even if it is covered by soil, vegetation, or lakes. In addition, approximately 100 kg of rock samples were collected from the area using rock hammers and chisels. These samples will be analyzed in the geochemical laboratories at the University of Alberta over the winter of 2016, and through to the summer of 2017. Publications and results from this research will be made publicly available in the future.

Beveridge, Meghan
Environment and Natural Resources
Yellowknife, NT
Meghan_Beveridge@gov.nt.ca

File No: 12 404 838
Region: IN, GW, SA, DC, NS, SS

Licence No: 15814
Location: Aklavik, Inuvik, Ft. McPherson, Tsiigehtchic, Ft. Good Hope, Norman Wells, Tulít'a, Ft. Providence, Ft. Simpson, Trout Lake, Behchokǫ̀, Yellowknife, Ft. Resolution, Ft. Smith, Łutsel K'e, Hay River, Kakisa

Community-based water quality monitoring in the Northwest Territories

The goal of this research program is to address community concerns and questions about the health and quality of NWT water systems, and to build capacity at the community level to do this kind of project in the future. The Department of Environment and Natural Resources worked with 20 northern communities and other partners to monitor water quality and water system health at over 40 sites across the NWT. The research team trained community members to use specialized equipment. They were trained to place water quality loggers which sit in the water and automatically take measurements every two hours. They learned how to take water samples by hand for later analysis, such as for chemical composition and nutrients. Community members also learned to use two special measuring devices. The first is a device that measures oil and gas chemicals. These sit in the water for up to 30 days. The second device measures dissolved toxic metals, and sites in the water for only 2-5 days. The information collected by these sampling techniques will be analyzed in labs in Yellowknife and at Trent University in Ontario. When the analyses are complete, the research team will map the data to see if there are important changes across time and space, to see how healthy the Mackenzie River Basin is, and to see if any water quality guidelines are not being met. The research team will present their findings to the communities online and in other ways.

Bourgeau-Chavez, Laura L.
Michigan Tech Research Institute
Ann Arbor, MI
lchavez@mtu.edu

File No: 12 404 885 **Licence No:** 15805
Region: DC, NS, SS **Location:** Great Slave Lake area

Planning and collection of data on boreal wildfire effects: studies of broad-scale 2014 wildfires in NWT, Canada

The project goal is to collect information about the effects of the 2014 and 2015 NWT wildfires through fieldwork, satellite photos, and air photos. In summer 2016 the project team visited eight fire sites and collected information at 119 locations, mostly peatlands. Using the information they collected, the researchers are creating maps of what the land was like before the fires burned - for example, it peatland or was there other vegetation there? The maps and fieldwork will help the research team understand how severe a future wildfire is by checking satellite images and doing more fieldwork. At the burned sites, the researchers checked how severe the burn was, how well the moss is growing, the condition of the natural material that usually covers the ground, shrub condition, and whether trees had burned branches, needles, or leaves. They also noted how well the plants and trees had grown back after the fire, as well as how old the trees were. This information will be used to create burn severity maps from satellite imagery. In both burned and unburned sites the research team took measurements of soil moisture, soil temperature, depth to frozen ground, depth of peat, tree heights, and other measurements. The team have been studying a variety of different landscape types and burn severities to understand how recent changes in climate, including earlier springs, longer summers, and different rainfall amounts across the landscape, are affecting wildfire regimes in this region.

Burgess, David O.
Geological Survey of Canada
Ottawa, ON
david.burgess@nrcan.gc.ca

File No: 12 404 707 **Licence No:** 15790
Region: IN **Location:** The Melville South Ice Cap

Glacier mass balance of the Melville South Ice Cap

The purpose of this ongoing project is to measure how much the Melville South Ice Cap is melting, and to predict future sea level rise from melting glaciers. Every year in the winter, there is new snowfall on the ice cap. In the summer, in recent years, all this snow has melted off, and then some ice underneath the snow also melts – so the glacier is getting thinner and smaller. The research team took measurements of snow accumulation and ice melt at 17 locations on the Melville South Ice Cap in April, 2016. These measurements show that the Melville South Ice Cap did indeed get thinner between Sept 2014 and Sept 2015. The glacier has been thinning most years between 1963 and 2014, but the thinning is happening more and more quickly. The rate of thinning in 2015 was three time higher than the 1960-2015 average, but only sightly greater than the rate of ice loss over the last ten years. The researchers downloaded temperature data from an automatic weather station and found that the summer melt season of 2015 lasted from June 9 to September 6, with an average daily temperature over this time period of +1.22°C, and a summer maximum of +12.5°C on July 27. Due to the warm temperatures, the ice cap surface at the location of the automatic weather station lowered dramatically throughout the summer by a total of about 183 cm (six feet), where 30 cm (one foot) of this was the previous winter's snowpack

and the rest was due to melting of the 'old' ice surface. The teams' measurements are consistent with those from the other GSC glacier monitoring sites across the Canadian High Arctic and are important for estimating sea-level rise and documenting climate change across this region.

Burn, Chris
Carleton University
Ottawa, ON
christopher.burn@carleton.ca

File No: 12 404 235
Region: IN

Licence No: 15917
Location: Garry Island (69°29.94"N, 135°46.67"W); Illisarvik (69°28.78"N, 134°35.59"W); Dempster Hwy km 256 (68°19.00"N, 133°26.14"W); Paulatuk (69°19.84"N, 124°06.05"W)

Permafrost and climate change, western Arctic Canada
The objective of this ongoing long-term project is to understand how climate change is affecting permafrost in the western Arctic. In 2016 the research team spent a month at Illisarvik, a drained lake on Richards Island. The research team made a detailed survey of vegetation in the basin to study how the vegetation is changing at this site. This site is very useful for understanding change through time because scientists have been taking measurements there since 1978. The research team also measured the gases coming out of the soil at the drained lake site, to see how different vegetation types affect how leaves, roots, and other plant and animal matter in the soil slowly decompose. The researchers drilled into the ground in the dry lake bed to see how permafrost has been growing at the site since the water drained. The research team also visited Garry Island for a week to continue measuring how the permafrost there is changing due to climate change.

Campbell, Joseph W.
TerraX Minerals Inc.
Ottawa, ON
joe.campbell@geovector.ca

File No: 12 404 859
Region: NS

Licence No: 15869
Location: 10 km north of Yellowknife

City of Yellowknife gold Project
The goal of this project is to find out how metals like arsenic and lead might get into lake water. The researchers visited Daigle, Milner, and Walsh Lakes near Yellowknife to study the natural and man-made ways that these metals spread into the environment. The program included mapping the lake floor and taking samples from the lake bottom, and from nearby peat and soil. All samples will be tested for arsenic and many other elements to see how arsenic levels are different based on changing conditions in lakes. The research team also tested water quality and measured lake depth, water temperature, and dissolved oxygen before, during, and after the winter drilling season. Fish need dissolved oxygen to stay alive in lakes. They found that in all three lakes, the water quality exceeded guidelines for arsenic and total ammonia. The arsenic in these lakes comes from naturally occurring arsenic in the bedrock. The ammonia in the lakes is also natural. Water samples did not contain any fuel or oils from drilling. After drilling, fish were placed in the drilling waste water to see if it was toxic to them. All of the fish survived in Milner Lake and Walsh Lake. The researchers are working with universities and government to understand how metals like arsenic, which can be both natural and a pollutant, move through

water systems and into lake sediments and the soil. The research team also surveyed the area for archaeological sites, mapped out some lake systems, and installed temperature sensors in some drill holes.

Chamberland, Joseph
C-CORE
Ottawa, ON
joseph.chamberland@c-core.ca

File No: 12 404 888
Region: SS
Licence No: 15876
Location: Near Ft. Resolution and Ft. Smith

Water ecosystem monitoring using earth observations

The goal of this multi-year project was to figure out how to best use satellite photos to identify lake qualities, such as water temperature. To do this, the researchers worked with communities to first check the lake itself, and then compared it to the colour of the lake in satellite images. The colour of a lake is related to how much 'suspended sediment' there is in the lake. Suspended sediments are the small particles like silt that stay floating in water, and do not settle to the bottom unless water conditions change. The research team wants to be able to tell both the water temperature and the amount of suspended sediment in lakes from satellite photos. During this final field season, community members took water samples at both Ft. Smith and Ft. Resolution, and in the Slave River. These samples were analyzed by Taiga Labs in Yellowknife. The researchers achieved their goal—they were able to figure out how much suspended sediment was in these lakes from satellite images. The project team also made a web-based map of information about suspended sediments and water temperature along the Slave River and Delta spanning back five years. The research and community sampling efforts were a success, and this data is now available online. A new project will start soon that will increase the communities' capacity to do this research and record more information about water temperatures and suspended sediment in the Slave River and Delta area.

Charette, Matthew
Woods Hole Oceanographic Institution
Woods Hole, MA
mcharette@whoi.edu

File No: 12 404 909
Region: IN
Licence No: 15885
Location: Inuvik, Tuktoyaktuk, Kugmallit Bay

Permafrost, river, and groundwater inputs of trace elements and nutrients to the Mackenzie River estuary

The goal of this project is to see how the water chemistry of the Mackenzie River effects the water chemistry where it flows into the Arctic Ocean. Researchers from Woods Hole Oceanographic Institution collected water samples and suspended sediment samples from the Mackenzie River in Tsiigehtchic, Inuvik, and Kugmallit Bay. Suspended sediments are the small particles like silt that stay floating in water, and do not settle to the bottom. The researchers are checking these samples to see what nutrients can be found in the water, such as carbon, and what metals can be found, such as iron. The water from the river can change the chemistry of the ocean in many ways. For example, river water is not pure water. It has dissolved chemicals and substances in it, which then go into the ocean. Also, the salt water in the ocean can dissolve chemicals that are floating as solids in the river water. In addition to the river water samples, the researchers took samples of the soil and permafrost in Inuvik and Tuktoyaktuk to measure metals and salts in these

samples as well, to see if the chemistry of the Mackenzie River might change if permafrost thaws as a result of climate change. Results will be shared when analysis is complete, likely in Spring 2018.

Chin, Krista
Environment and Natural Resources
Yellowknife, NT
krista_chin@gov.nt.ca

File No: 12 404 827
Region: SA
Licence No: 15833
Location: 100 km radius of Norman Wells

Establishing a watershed framework for assessing cumulative impacts of development
No research was conducted under this licence in 2016.

Chisholm, Veronica
De Beers Group of Companies
Yellowknife, NT
Veronica.chisholm@debeersgroup.com

File No: 12 404 852
Region: NS
Licence No: 15847
Location: Kirk Lake Watershed and Kennady Lake Watershed

De Beers - Gahcho Kué 2014 environmental monitoring program
The purpose of this project is to check on the environment around the Gahcho Kué mine to make sure the mine is following all guidelines and meeting environmental targets. In 2016, the monitoring was focused on the construction and early operation of the mine. The research team monitored wildlife around the mine, and checked to see if the mine was changing any of the lakes or rivers nearby. They also checked whether the mine was affecting any of the creatures and plants that live in the lakes and rivers. The researchers also checked for any on-site spills, checked how the mine was managing waste, and checked for acid rock drainage. Acid rock drainage is a way that water can become dangerously polluted from mines, when water mixes with mine waste and becomes slightly acidic. All annual reports from this monitoring will be available in 2017.

Dallimore, Scott
Natural Resources Canada - Geological Survey of Canada
Sidney, BC
scott.dallimore@canada.ca

File No: 12 404 359
Region: IN
Licence No: 15912
Location: Beaufort Sea

Marine geohazard studies in the Beaufort Sea
The goal of this project was to find and map ‘geohazards’ in the Beaufort Sea. A geohazard is a geological state that could cause large-scale damage; for example, a hill that has been affected by drilling might slump, causing large-scale environmental or human damages. The Geological Survey of Canada, Fisheries and Oceans Canada, and the Monterey Bay Aquarium Research Institute worked together for ten days on the Canadian Coast Guard Vessel Sir Wilfrid Laurier. The offshore, underwater geohazards they were studying included degrading permafrost, landslides, and mud volcanos in the Beaufort Sea offshore of the Tuktoyaktuk Peninsula. The

research team used very sophisticated tools, such as a free-swimming remote-controlled underwater vehicle and another remotely-operated vehicle with a cable back to the ship. These both had numerous sensitive recording devices, as did the ship itself. The research team found evidence of active mud volcanos with temperatures above 20°C—very warm for being underwater in the Beaufort Sea. The researchers took cores from the seabed around a few old landslides. The cores will be studied in the laboratory to see how long ago the landslides happened. The researchers checked on a few landslides, and it appears they haven't slumped at all since 2013. This research forms part of an ongoing study of regional geohazards, and information gained from this study will be published in scientific papers. Project summaries are also available from Fisheries and Oceans Canada.

Danby, Ryan K.
Queen's University
Kingston, ON
ryan.danby@queensu.ca

File No: 12 404 913
Region: NS

Licence No: 15909
Location: Daring Lake Tundra Ecological Research Station to the community of Wekweètì

Contemporary dynamics of forest-tundra ecotones in central NWT

There were two main goals of this project. The first goal was to record on-the-ground observations about treeline 'plant communities'. Plant communities are all the kinds of plants that can be found in an area, including information about how many of each plant there is. The researcher wanted to record the plants found in specific locations at the treeline in order to compare them with satellite photos, which will improve how well we can use satellite photos to understand the forest-to-tundra transition in the central Northwest Territories. The researcher took plant and tree height measurements at regular intervals in 35 plots of different vegetation types. The researcher also measured how many trees, tall shrubs, dwarf shrubs, mosses, and other plants were there.The second goal was to collect tree cores from spruce trees in 12 different locations (plots) along the study route. Fifty trees were cored in each plot. Tree cores can tell us how old trees are and what growing conditions were like during the tree's life. The cores were studied to see how climate change has influenced tree growth over the last 200 years. The ages of these trees were counted out, and tree ring widths are being measured to see how spruce trees have responded to recent climate change. Both goals were met during a 30-day canoe trip from Big Lake to the community of Wekweètì. Following the trip the research team spent time in the community of Wekweètì and met with community members to discuss the project.

Dearden, Richard P.
Imperial College London
Ascot, Berkshire
r.dearden14@imperial.ac.uk

File No: 12 404 912
Region: DC

Licence No: 15905
Location: 60.843°N, 124.375°W; 60.842°N, 124.370°W

A novel, exceptionally preserved, shark fauna from the early carboniferous of the NWT

Researchers don't have a good understanding of the early evolution of sharks. This is because most shark fossils they find are just teeth and scales that aren't attached to a body. Because of this, fossils preserving all or a part of the animal are extremely valuable to researchers. In

particular, researchers want to find more shark fossils that preserve the whole body of sharks from the very earliest stages of their evolution (between 420-300 million years ago). Geologists working in 2012 found one such fossil – the 340 million year old skull of a shark - in a rock formation in the Liard River basin. The research team went back to this location in August 2016 to look for more well-preserved shark fossils. They searched the gully where the original fossil was found, and also nearby gullies where water had eroded down to rocks of the same age. They found a single fossil scattered in many pieces down a scree slope. It had eroded out of the rockface. Together these pieces form part of a shark's skull. The fossil is incomplete, and the researchers were not able to reassemble it into one piece. However, finding teeth and scales that the research team know are from the same animal is important. Casts are being taken from the fossils for more research.

Doucet, Michael
Stantec Consulting Ltd.
Dartmouth, NS
michael.doucet@stantec.com

File No: 12 404 889
Region: NS

Licence No: 15931
Location: Camlaren Mine (62°59'05"N, 113°12'15"W); Burnt Island (63°03'52"N, 113°09'46"W); West Bay Mine (62°55'01"N, 113°13'57"W); Goodrock Mine (63°01'53"N, 113°08'06"W); Kidney Pond (62°57'26"N, 113°20'22"W); Treacy (62°56'28"N, 113°20'13"W); Storm Property (63°00'21"N, 113°07'29"W); Try Me (63°04'09"N, 113°28'20"W); Murray Lake (63°00'45"N, 113°24'30"W)

Continuation of the Gordon Lake assessment project
The purpose of this project is to clean up nine mine and advanced exploration sites: Burnt Island, Camlaren, Goodrock, Kidney Pond, Murray Lake, Storm Property, Treacy, Try Me, and West Bay. These sites are located about 110 km northeast of Yellowknife in the Gordon Lake area. Two federal government agencies that work with contaminated sites (Indigenous and Northern Affairs Canada and Public Works and Government Services Canada) are working together to to completely 'remediate' these sites. Remediation refers to cleaning up a contaminated or damaged area and returning it to its natural state. Before remediation can begin, the research team needed to check on the environmental and physical conditions at the sites. They did this in 2015 and 2016, when they mapped out each site carefully and took samples and measurements from the groundwater, sediments, surface water, drinking water, soil, rock, and more. Samples of the tiny animals living in the water were also taken. They also checked ground conditions and stability around old mine openings to see if it was safe to work there. The samples they took and maps they made during the field program were used to prepare for the remediation work. A remediation plan for each site has now been finalized using the information collected during this field work.

English, Michael C.
Wilfrid Laurier University
Waterloo, ON
menglish@wlu.ca

File No: 12 404 555
Region: NS

Licence No: 15890
Location: South of Wekweètì

Relating changes in snowpack water equivalent and structure to migratory behaviour of the Bathurst caribou herd

Over the last 20 years the Bathurst caribou herd's population has declined significantly. The herd had approximately 400,000 caribou in 1996. However, a recent 2015 population study counted only 15,000 caribou left in this herd—a decline of around 385,000 animals, or about 96% of the herd. The cause of this decline is not fully understood because it is a complicated issue involving food availability, predation, and over-harvesting. In order to help figure out the reason for the decine, the researchers wanted to study how the snow conditions affect caribou. The amount and type of snow on the ground can impact caribou movements and how much effort the caribou need to put into digging for lichen, which comprise most of their diet. Using satellite photos the researchers can tell the location of the caribou and their lichen food source, and how much snow is on the ground during the winter. By carefully mapping out how caribou move through their environment based on the amount and type of snow on the ground, the researchers will be able to see how snow determines caribou migratory patterns. The researchers have already found that the caribou are moving further above the tree line than expected, and therefore into deeper snow than they typically prefer. This project will support Bathurst caribou herd conservation efforts to help population numbers return to previous levels.

Fallas, Karen M.
Geological Survey of Canada
Calgary, AB
karen.fallas@canada.ca

File No: 12 404 880 **Licence No:** 15845
Region: GW, SA **Location:** Colville Hills

Colville Hills bedrock mapping and stratigraphic studies

The goal of this multi-year project is to map out the types and ages of rocks found in the northern Mackenzie Mountains. A team of seven scientists from the Geological Survey of Canada did geological field work based out of Arctic Mountain House for three weeks in July and August 2016. Two Wildlife Monitors, one from Ft. Good Hope and one from Tsiigehtchic, worked with the geologists. Helicopter support was provided by Sahtú Helicopters out of Norman Wells, and logistical support was provided by Arctic Red River Outfitters. Over 120 sites with bedrock exposure were studied on mountain ridges or stream banks in the Canyon Ranges of the northern Mackenzie Mountains, ten of which were studied in detail. The geologists flew to the sites by helicopter or hiked overland to get to them. The geologists recorded the locations and rock descriptions, took photographs, and measured rock thickness and orientation. They collected approximately 400 rock samples, varying from fist-size to slightly larger than a loaf of bread. Samples were shipped to labs at the Geological Survey of Canada in Calgary. Here, the research team will check the rocks for the remains of long-dead creatures and plants and assess the chemical composition of the rocks. This information will be used to produce new reports and maps of bedrock geology for the northern Mackenzie Mountains region (National Topographic System map areas 106G and 106H). These reports will be made publicly available on the NRCan GeoGratis website when completed.

Fiess, Kathryn
Northwest Territories Geological Survey
Yellowknife, NT
kathryn_fiess@gov.nt.ca

File No: 12 404 807 **Licence No:** 15908

Region: GW, SA

Location: Flyaway Creek (65°27.42”N, 132°2.3”W); Arctic Red River East (65°26.42”N, 130°46”W); Mountain River Tributary (65°14.21”N, 128°35.40”W); Flyaway Creek Cretaceous (65°26.20”N, 132°2.39”W); Hume River Cretaceous (65°28.40”N, 129°57.40”W)

Shale basin evolution in the central Northwest Territories project

The Northwest Territories Geological Survey Petroleum Group started this research project in 2014. The purpose of this project is to create better maps of where oil and gas reserves are, and to study how processes in the earth created oil and gas reserves. This work is done in three areas of the Horn River Group, which is a large deposit of shale that has gas in it. The three areas are the Mackenzie Plain (in the central Mackenzie Valley), the Peel Plain, and the Peel Plateau. The research team visited two Horn River Group outcrops in the Peel Plateau in July and August 2016. The outcrops were selected because there is currently no information about these areas in existing geoscience maps. The sites that the researchers visited were Arctic Red River east and Flyaway Creek. At the Arctic Red River east site, the researchers carefully plotted out a 70 m section of the outcrop. They plotted out 52 m at Flyaway Creek. The outcrop sections were photographed and careful notes were taken about what the researchers found, with a focus on the layers of the rocks. A special instrument called a spectrometer was used to measure the exact chemical composition of the rocks. They also took rock chip samples, which are being studied in the lab to find out where the rocks originated from, how old they are, and what the environment was like in the past. The researchers have presented the results of their work at a petroleum conference in Calgary, Alberta, in April 2017.

Froese, Duane G.
University of Alberta
Edmonton, AB
duane@ualberta.ca

File No: 12 404 744
Region: SA, DC

Licence No: 15956
Location: Liard (61.7”N, 121.3”W), Willowlake (62.7”N, 123.0”W), Wrigley (63.2”N, 123.6”W), Blackwater (63.9”N, 124.1”W), Redstone (64.2”N, 124.6”W), Keele (64.4”N, 124.8”W), Little Bear (64.9”N, 125.9”W), and Great Bear (65.0”N, 124.7”W) rivers

Glacial lakes McConnell and Mackenzie reconstructed from pleistocene deltas of the Mackenzie River tributaries

No research was carried out in 2016. The field research was delayed until 2017 because of a scheduling conflict.

Galloway, Jennifer
Geological Survey of Canada
Calgary, AB
Jennifer.Galloway@canada.ca

File No: 12 404 704
Region: NS

Licence No: 15858
Location: Yellowknife and Courageous Lake

Geoscience tools for supporting environmental risk assessment of metal mining
The goal of this multi-year project is to map the amount and type of arsenic pollution and other contaminants in and around lakes in two areas. Some of the lakes are in the Tundra/Salmita Mine area in the central Northwest Territories, and the other lakes are near the City of Yellowknife. Fieldwork started in 2015. In 2016, the researchers carefully studied the lake sediments, tailings, soils, and peats collected the previous year. First, the researchers examined four lakebed sediment cores from the Tundra/Salmita Mine area. They measured the amount and type of arsenic and other elements in the cores, measured the size of the sediments (whether the sediment is the size of sand, silt, or clay), and checked for decaying plant and animal matter. Second, the research team examined two 7000 year old peatlands near the City of Yellowknife. They measured the amount of arsenic and other elements in the peatlands, studied the plant fossils and pollen, and measured the amount of decaying plant matter. Third, the researchers sent diatoms from water samples taken from 11 lakes and ponds around the City of Yellowknife for DNA analysis. Diatoms are a type of algae and they can be used to understand if and how the environment is changing. The project team is in the process of interpreting their results to better understand how climate change might affect arsenic contamination in northern lake and river environments.

Gosse, John
Dalhousie University
Halifax, NS
john.gosse@dal.ca

File No: 12 404 812
Region: IN

Licence No: 15933
Location: Prince Patrick Island (76.451”N, 119.588”W)

Pliocene environmental change on Prince Patrick Island
Due to poor weather conditions in 2016, the team was unable to travel to Prince Patrick Island to conduct the study. The team will travel to Prince Patrick Island in the summer of 2017 to conduct the research project.

Grogan, Paul
Queen's University
Kingston, ON
groganp@queensu.ca

File No: 12 404 687
Region: NS

Licence No: 15792
Location: Daring Lake

Biogeochemical controls on the structure and functioning of low arctic ecosystems
The goal of this long-term project is to understand what effect increases in snowfall and in summer temperature will have on the tundra in the Daring Lake region. An increase in snowfall is predicted to result from climate change during the winter. The research team had two main goals in 2016. The first goal was to study plants. In particular, the researchers were looking at whether the various plant species in the Daring Lake region differ in their growth rates when there are different levels of food (nitrogen and phosphorus) available in the soil. The reason for this research focus is that soil nutrient availability to plants is expected to increase as the climate changes in both winter and summer. The researchers will use to the results of this study to predict how arctic vegetation will change with the changing climate. The second goal was to continue a study on birch shrubs. Ten years ago, researchers from the same project measured the height of the birch

shrubs at various locations in the study area, and also how much ground area was occupied by selected individual birch shrubs. In 2016, these measurements were repeated to see how much growth and ground cover expansion had occurred, and whether the birch shrubs grow at different rates in different habitat types in the Daring Lake region. The team also collected shrub stems and studied cross-sections of them in the lab to see if they grow faster or slower in different locations, and the variation across years corresponded with the variation in weather in those same years. The research team also participated in the Daring Lake Science camp involving about 20 northern high school students and several elders. This experience greatly enhanced the team's understanding and appreciation of the north, and the people and culture for which it is home.

Gruber, Stephan
Carleton University
Ottawa, ON
stephan.gruber@carleton.ca

File No: 12 404 878
Region: NS

Licence No: 15791
Location: Yellowknife, Lac de Gras, Ingraham Trail, and the Tibbitt to Contwoyto Winter Road

Quantifying permafrost thaw

The goal of this multi-year study is to measure and understand how permafrost is thawing. Between July and September 2016, team members worked around Yellowknife and near Lac de Gras. They collaborated with the NWT Geological Survey in Yellowknife and with Ekati Dominion Diamond Corporation near Lac de Gras. In the Lac de Gras area, the research team visited 43 sites where small instruments for measuring ground temperature and permafrost temperature were installed in 2015. They collected measurements and serviced the instruments. The measurements were read wirelessly without disturbing the soil. The team will now analyse the measurements to find out how permafrost in different places might thaw and freeze differently. Soil samples taken in 2015 were sent to the Taiga Laboratory in Yellowknife, where soil scientists found that the ice in the permafrost often does not contain more nutrients than the water in the active layer (the active layer is the part of the ground that thaws in the summer). This is different from what was previously seen in the Mackenzie Delta. This may mean that different ecosystems will react to permafrost thaw in unexpected ways. The research team measured the elevation of roads and other surfaces around Yellowknife that were previously measured in 2015. Using these elevation measurements, the team can figure out where permafrost is thawing faster and where infrastructure may need repair. Finally, sites were set up for measuring permafrost temperature, similar to those installed near Lac de Gras in 2015.

Guêné-Nanchen, Mélina
Université Laval
Québec, QC
melina.guene-nanchen.1@ulaval.ca

File No: 12 404 902
Region: DC, NS, SS

Licence No: 15827
Location: Between Ft. Providence and Edzo, and between Kakisa and Enterprise

Bryophyte regeneration in burned peatlands in Northwest Territories

The goal of this project is to better understand how mosses grow back in peatland areas after a forest fire. The researchers visited 46 sites between Ft. Providence and Chan Lake in the summer of 2016. These sites were peatlands that had burned during fires in 2011, 2014, and 2015. The

researchers carefully observed the plants at each location and took measurements and samples. The recovery of plant species following a fire was measured by counting the plants, and measuring how much they had grown Back. The researchers also measured other conditions, such as the water table level and the chemical make-up of the peat. A lot of information and observations were taken. The next step is to analyze the information. In the field, the researchers noticed that a moss known as *Ceratodon purpureus* and a liverwort known as *Marchantia polymorpha* seems to grow back first after a fire These plants were found frequently in the first and second years after a fire, but after that other plants dominated the peatland. Which plants dominate depends on the surface water table conditions and their reproductive strategy (perennial vs colonist plant). Further study will confirm whether or not this is really the case.

Hadlari, Thomas
Geological Survey of Canada
Calgary, AB
thomas.hadlari@canada.ca

File No: 12 404 916
Region: GW, SA

Licence No: 15927
Location: From 67°0'0 to 68°13'0"N and 135°0'0" to 136°27'0"W, and 64°52'47.38"N, 125°13'6.58"W

Devonian to cretaceous tectonostratigraphy
The goal of this project was to study how the mountains around Treeless Creek were made. These mountains formed over an extremely long time-span, and the geological processes that made them were very large in scale. The research team were studying how the layers of rock were originally formed by sediments that gathered on the bed of an ancient ocean. Over time the sediments formed into rocks, and these were pushed high up to make mountains by the forces of the moving tectonic plates of the surface of the earth. The research team visited sites in the study area to observe and take samples of bedrock. Samples were sent to geology laboratories for testing. The researchers are also studying the fossil pollen that is preserved the in samples collected at Treeless Creek. The pollen will be used to document the boundary between two different geological periods: the Jurassic and the Cretaceous. This boundary happened approximately 150 million years before present. The Jurassic was a time with lush rainforests when the landscape was dominated by large reptiles. The Cretaceous was warm and although dinosaurs still ruled the earth, mammals and birds became more common and flowering plants appeared. Research team members were from the Geological Survey of Canada and the University of Calgary, and a wildlife monitor from Ft. McPherson.

Hansen, Ken
Husky Oil Operations Limited
Calgary, AB
Ken.Hansen@huskyenergy.com

File No: 12 404 797
Region: SA

Licence No: 15934
Location: 65.3"N, 126.9"W (NW corner); 64.6"N, 125.6"W (SE corner)

EL494 surface water monitoring program 2016-2018
The goal of this ongoing monitoring project is to check whether there are changes to, or contamination in, the lakes, river, creeks, streams, and groundwater around exploration block EL494. To do this, the researchers collect surface water samples from a number of locations near areas where exploration activities occurred. The water samples are used to check the water

quality of rivers and creeks flowing to and from EL 494. The 2016 program included two components. First, the research team collected water quality samples from 27 locations. They went to 16 watercourses (rivers, streams, or creeks) and 11 waterbodies (lakes, ponds, or sloughs). Two watercourse locations were dry at the time, so no samples were taken there. Second, the researchers collected information that was recorded by eight special instruments that monitor the permafrost. The researchers were not able to take samples of groundwater wells because they were frozen. The team is currently finishing their report. Upon completion, the report will be submitted to the Sahtú Land and Water Board as well as to the Aurora Research Institute to be made available on their public registries.

Hartmann, Jörg
Alfred Wegener Instute
Bremerhaven, Bremen
Jorg.Hartmann@awi.de

File No: 12 404 922
Region: IN, GW

Licence No: 15959
Location: Mackenzie Delta wetland

AirMeth

The goal of this multi-year project was to monitor methane emissions from the Mackenzie Delta. Planes were used to fly over the Delta in the NWT and Yukon and take measurements of methane. Wetlands naturally release a lot of methane, which is a greenhouse gas, so understanding methane release is important when studying climate change. The research team found that more methane was released from the ground at the boundary between deep- to shallow-permafrost in the northern part of the Delta. This is due to geological reasons. The researchers also used a special instrument to map out the land surface of the Trail Valley Creek area. This instrument is called LIDAR, and is attached to the plane. It directs lasers to the earth and then measures them as they return. This information can be used to create a very detailed map of the area being studied. The purpose for making this map was to study if and how the landscape has changed since it was last mapped this way eight years ago. The two maps will help the researchers understand changes in vegetation and permafrost, and how snowfall has changed. The researchers took a LIDAR scan of a section of the new road to Tuktoyaktuk that may help to monitor changes in the landscape, if the mapping is repeated some time in the future.

Hickey, Kenneth A.
University of British Columbia
Vancouver, BC
khickey@eos.ubc.ca

File No: 12 404 906
Region: DC

Licence No: 15880
Location: Cantung, Flat Lakes, and Mac Creek areas

Geological mapping of the March Fault

A fault line is like a large crack between two areas of the earth's surface that are moving in different directions. The March Fault is a large (but not active) crack that extends for around 60 km, from south of the Howards Pass District to the upper Hyland Valley. This fault is thought to have been active (in other words, the different sides were moving) about 100 million years ago, when what is now Alaska and central Yukon collided with western North America. Before this time, these areas were separated by a sea, but were moving very slowly towards each other. The goal of the 2016 fieldwork was to map out the rocks found on part of the March Fault to see when the fault

formed, how it formed, and how much each side has moved. The study area was southwest of the Howard's Pass Access Road. The research team hiked around on foot for most of July and August, and made detailed geological maps from areas near and across the March Fault. Supply barrels containing food rations and survival essentials were flown into a series of campsites for the research team to use. The supply barrels were picked up by helicopter after the fieldwork was done. Based on the maps that were made, the researchers found that the northwest segment of the March Fault has not seen as much movement as they thought before. Instead, the researchers think that when the two landmasses hit each other, they caused the surface to fold over on itself rather than causing a slippage along the fault line. Understanding the movement of different landmasses on either side of the March Fault helps the researchers understand where to find gold and lead-zinc mineral deposits in the Nahanni region.

Höfle, Bernhard
Heidelberg University
Heidelberg, Baden-Wuerttemberg
hoefle@uni-heidelberg.de

File No: 12 404 883 **Licence No:** 15914
Region: IN **Location:** Trail Valley Creek (68°45"N, 133°30"W)

PermaSAR: development of a method to detect subsidence by means of DInSAR in permafrost regions

Remote sensing means using air photos or satellite photos to understand the earth. It allows the research team to carefully map out the earth's surface from an overhead perspective without touching it. For this project, the researchers are using a pair of satellites called TanDEM-E and TerraSAR-X that uses radar to map out the earth's vegitation and elevation changes. The researchers will detect vertical movements of the ground surface caused by the thawing and freezing of the permafrost. Having good information about where the earth's surface is moving up and down can help local authorities avoid severe damage when they are constructing roads or buildings, for example. The goal of the 2016 field season was to check if the satellite information was true on the ground – in other words, is the information from the satellite telling us what is really happening on the ground? For this reason, they went to Trail Valley Creek about 50 km northeast of Inuvik and measured if the ground was moving up and down using very sensitive and specialized instruments. These same measurements were collected in previous years, so could be compared to each other to see how the land has changed over the years. The researchers also collected information from instruments placed in the ground that measure soil temperature and ground movement due to melting permafrost every hour. Having this very specific information about the ground temperature and movement will allow the research team to fine-tune the satellite readings.

Holmes, R. Max
Woods Hole Research Center
Falmouth, MA
rmholmes@whrc.org

File No: 12 404 713 **Licence No:** 15799
Region: IN, GW **Location:** Mackenzie River near Tsiigehtchic at 67°27'21"N, 133°45'11"W

The Arctic great rivers observatory

The research team are measuring the concentration of naturally occurring chemicals, such as carbon, nitrogen, and phosphorus, in the six largest rivers that flow into the Arctic Ocean. These rivers are the the Mackenzie and Yukon in North America, and the Ob', Yenisey, Lena, and Kolyma in Russia. The aim is to obtain current information about the flow of these chemicals to the ocean to help understand how climate change is impacting Arctic rivers. This was originally a five year project, and 2016 was supposed to be the last year of sampling. However, funding for the project has been renewed for another three years, so samples will be collected from 2017 through 2019. The rivers are sampled every second month. During the summer, sampling is conducted from a motorized boat, just upstream of the Tsiigehtchic ferry crossing. During the winter, sampling is conducted at the same location using an ice auger to take a water sample from the mid-point of the river. For each sampling trip, the team takes eight litres of water (about two gallons), which is transported back to Inuvik for further processing in the lab. The research team also used a hand-held water meter to measure water temperature, acidity, and to take measurements of some other chemicals in the water.

Hood, Alexandra E.
De Beers Canada Inc.
Yellowknife, NT
Alexandra.Hood@debeersgroup.com

File No: 12 404 808
Region: NS

Licence No: 15784
Location: Snap Lake Mine

De Beers Canada Snap Lake Mine environmental monitoring

The goal of this ongoing project is to monitor the environmental effects of the Snap Lake Mine. DeBeers has been collecting wildlife, fish, and water information for the Snap Lake area since 1999. There was a change in the program in 2016, however, because the Snap Lake Mine entered into a new phase called "care and maintenance" in December 2015. Site activities were scaled back in 2016, and no wildlife research was completed at the Snap Lake Mine site aside from collecting wildlife observations from maintenance staff. The research team instead focussed their active research on monitoring the waterways to check for any effects caused by the mine. This included checking the water quality and taking samples of several things. The samples included the tiny plants and animals that live in the water, the sediment that floats in the water, and fish. Results from this research will be available in May 2017 as a part of the mine's Annual Aquatic Effects Monitoring Program.

Hulse, Peter
CASP
Cambridge, Cambridgeshire
clive@polarsphere.co.uk

File No: 12 404 884
Region: IN

Licence No: 15793
Location: Banks Island (73°14'11.20"N, 129°39'04.49"W) and Smoking Hills (69°48'49.42"N, 126°48'10.72"W)

Canadian Arctic islands project

The goal of this long-term research project is to study the geology of the Canadian Arctic islands. In 2016, the research team studied the potential oil and gas reserves of rocks found onshore, because it tells them about possible reserves offshore in the Beaufort-Mackenzie area and on the north slope of Alaska that could be drilled in the future. They took samples of organic-rich

mudstones from several different geological formations. 'Organic-rich' means that the rocks contain the decomposing bodies of ancient plants and animals, which is what oil and gas deposits are made of. The rocks they were sampling were from the late Cretaceous Period (between 66 and 100 million years ago) in formations known as the Horton River, Smoking Hills, and Mason River formations. Fieldwork was carried out at a meander in the Horton River. The research team was flown in and set up a small field camp. They conducted fieldwork on foot, using a small boat for river crossings. A total of 75 mudstone samples, about the size of two fists held together, were collected using a small hammer. The mudstone samples will be tested to see if they have decaying organic matter, which might mean that there are oil and gas reserves in the area. Nine bentonite samples of similar size were collected because they can be dated using special tests. The sampling did not disturb the land any more than natural erosion. Samples have arrived at CASP (formerly known as Cambridge Arctic Shelf Programme) in Cambridge (England) but have not yet been analysed. Results of analyses will be published in scientific journals, and sent to the communities as well as to the Aurora Research Institute.

Jakiela, Kevin
University of Toronto
Toronto, ON
kevin.jakiela@mail.utoronto.ca

File No: 12 404 910
Region: SS

Licence No: 15892
Location: Hay River

Sustainability and food security through geodesic greenhouses in the Canadian Arctic

Food security refers to people's ability to get their own healthy and nutritious food now and into the future. Food security in indigenous and non-indigenous communities of the Canadian north is an ongoing challenge, because food is not as readily available or abundant when compared to southern cities and towns. Geodesic greenhouses (circular, well insulated greenhouses) in remote regions of the Canadian north could allow for longer growing seasons and more sustainable food producing systems. These greenhouses have already been successful in places where they have been built, because food grown in the greenhouse is healthier and more abundant than what can be bought in the store. The goal of this project is to study how to make a greenhouse in Hay River as useful as possible for growing crops, and for growing plants to transplant outside. The researchers measured the temperature and humidity outside and inside the greenhouse, and compared these measurements to the ideal growing conditions for various plants. They found that that within the growing season, which lasted from May 23 until September 19, 2016, the geodesic dome greenhouse allowed for 3.5 staggered tomato harvests. Only 1.75 tomato harvests were possible outside on regular farm land. The researchers hope to conduct more research and help the community use the greenhouses to grow more vegetables.

Knox, Bernadette
Northwest Territories Geological Survey
Yellowknife, NT
bernadette_knox@gov.nt.ca

File No: 12 404 918
Region: NS

Licence No: 15936
Location: Beaulieu River (112°23'10.462"W, 62°54'15.494"N to 112°21'5.256"W, 62°50'19.035"N)

Beaulieu River Belt collaborative VMS project

The goal of this project was to see if there might be valuable metals or minerals that could be mined along part of the Beaulieu River near Sunset Lake. There were two main parts of the study. First, the researchers studied and mapped out the geological history of the ancient volcanic rocks in the area. They took rock samples and made observations in the field. They recorded what type of rocks were there, but also recorded the temperatures and pressures the rocks were likely exposed to during their long history in the earth's crust, and whether the temperature or pressure had changed the rocks at all. Both extreme temperatures and extreme pressure can actually change a rock from one type to another. The researchers also checked the rocks to see if they are the type that have copper, zinc, lead, gold, or silver ores in them.The second part of the study focussed on the glacial history of the Sunset Lake area. The researchers mapped out the direction of glacial ice flow, as well as the shape and orientation of rock outcrops that were affected by ice movement. They collected samples of glacial till, which are the rocky deposits left by ancient glaciers when they melt, in order to test them for certain minerals or metal ores. The information they collected will be summarized and presented in a talk at the Yellowknife Geoscience Forum in November 2016, as well as a preliminary bedrock map that will be published by the Northwest Territories Geological Survey.

Kokelj, Steve V.
NWT Geological Survey
Yellowknife, NT
steve_kokelj@gov.nt.ca

File No: 12 404 545
Region: IN, GW

Licence No: 15867
Location: Ft. McPherson area (67°27.293”N, 134°48.081”W; (67°15.142”N, 135°13.847”W; 67°10.850”N, 135°43.421”W; 67°16.300”N, 135°3.526”W); drained lake (67°31.265”N; 135°18.543”W)

Permafrost in the western Arctic

The goal of this ongoing project is to study the thawing permafrost on the Peel Plateau where large slumps and other changes in the ground are being seen. There were three main project components in 2016. First, the researchers continued studying the geology, terrain, and permafrost of the area. They used unmanned aerial vehicles (drones) to survey large thaw slumps from the air. Thaw slumps occur when permafrost is exposed to the sun and thaws, causing a slump, which exposes more permafrost that in turn thaws and slumps. Using the drones, the research team found that individual slumps can displace up to 500,000 m^3 (or about 200 Olympic sized swimming pools) of material every year. The impacts of the slumping on the environment downstream are significant. The research team took all the information they have gathered to date on permafrost in the Peel Plateau and summarized it in a book chapter titled “The Peel Plateau of Northwestern Canada: An ice-rich hummocky moraine landscape in transition”. The second project component was the creation of a map showing that the thawing of ice-rich permafrost has sped up across the western Arctic. The research team found that the long-ago retreat of the Laurentide Ice Sheet, a glacier that covered the whole land, left lots of relict ground ice in the permafrost of the western Arctic. Third, the research team measured the temperature of the permafrost across the tree line between Inuvik and the Beaufort Sea coast. The measurements confirmed that the minimum ground temperatures in the uppermost 10 m of the permafrost have increased by about 2°C since the 1970s.

Krizan, Julia
IMG-Golder Corporation
Inuvik, NT
jkrizan@golder.com

File No: 12 404 803
Region: IN

Licence No: 15961
Location: Panarctic Satellite F-68 wellsite at Satellite Bay on Prince Patrick Island (77°17'27"N, 116°55'10"W)

Remediation of the abandoned panarctic satellite F-68 wellsite at Satellite Bay, Prince Patrick Island, Northwest Territories

Panarctic Satellite F-68 is an abandoned wellsite located near Satellite Bay at the northern end of Prince Patrick Island, NWT. The well was drilled in 1971 by BP Exploration Canada Limited, and abandoned shortly afterwards without much clean-up. The site is contaminated; this includes soil polluted by fuel, and metals and solid wastes such as used drums, scrap metal, and other garbage. Repsol Oil and Gas Canada Inc. (formerly Talisman Energy Inc.) plans to clean up the site in 2017. They will leave most of the contaminated materials at the site in a containment structure, and will remove barrels, large pieces of metal, and other garbage. Work on cleaning up this site started in 2008, and continued during 2016. There were six inspections at the site, including 1) the inspection of alternative landing and refueling sites between Inuvik and Mould Bay, 2) the inspection of the Mould Bay and Satellite Bay airstrips, 3) testing of the Mould Bay airstrip to see if it is safe for the larger aircraft that are needed for the clean-up to land on, 4) inspection of the contaminated and work areas for potential issues, 5) inspection and maintenance of a temperature sensor installed in 2015, and 6) inspection of the equipment and tools that were stored onsite in 2015. Finally, the research team tried to install a remote camera at the Mould Bay airstrip, but could not.

Lafleur, Peter
Trent University
Peterborough, ON
plafleur@trentu.ca

File No: 12 404 621
Region: NS

Licence No: 15821
Location: Daring Lake Tundra Ecological Research Station

Toward predicting future tundra carbon balance

The overall goal of this project is to study how carbon gas moves between the soil, water, air, and living things in the tundra. Carbon gas can be released from the tundra into the air, which contributes to climate change. In May 2016, the researchers went back to four semi-permanent research sites they had set up in previous years that are located in various tundra types near Daring Lake. At each site there are special instruments to monitor the weather and carbon gas, and a spot near the instruments that is used to check how the vegetation is growing. The researchers measured and recorded the snow and snow melt conditions at each site, and took samples from special bags left at the site in 2015 to collect decaying leaves. These bags are part of a decomposition experiment studying how quickly vegetation decays on the tundra. The group returned to the field in July to maintain some instruments and take summer measurements, which included plant growth, thaw depth, and soil water. They returned once more to collect samples of dead leaves in mid-August. A new component of this ongoing monitoring project started in 2016: a study of the tussock tundra in the Daring Lake area. This is part of an international study on

carbon in Arctic tussock tundra. Tussocks are small bunches of grass that stick out of the tundra. The researchers measured how tall and dense the tussocks were around Daring Lake. Members of the research team also participated in the Tundra Science Camp for NWT high school students.

Lantz, Trevor
University of Victoria
Victoria, BC
tlantz@uvic.ca

File No: 12 402 712
Region: IN, GW

Licence No: 15849
Location: Mackenzie Delta

A multi-scale assessment of cumulative impacts in the northern Mackenzie basin
The northern Mackenzie Basin is an area of enormous ecological and cultural significance that is changing in response to warming temperatures and more frequent disturbances, both natural and human-caused. The disturbances and warming temperatures are causing changes everywhere, but scientists do not know what the effect may be of multiple disturbances working together (this is known as 'cumulative effects'). In this project the research team used air photos and in-person observations to map out how much the land has changed and why. In 2016, the researchers were studying white spruce in the Tuktoyaktuk coastlands using this method. They wanted to see how spruce woodlands have changed in recent decades.They used high quality air photos taken between 1980 and 2016 to track the changes in tree stands and growth. The researchers then double-checked their findings by going out in the field. The research team also returned to several field sites where instruments were set up to measure ground temperature, snow, and thaw depth. In a final, separate component, the research team are studying the reasons behind the decline of muskrat populations in the Mackenzie Delta. To do this, they are using spring-time aerial surveys of muskrat push-ups with research partners from the Gwich'in Renewable Resources Board and McGill University. They will continue to study muskrat push-ups in future years.

Lantz, Trevor C.
University of Victoria
Victoria, BC
tlantz@uvic.ca

File No: 12 404 758
Region: IN

Licence No: 15877
Location: Near Sachs Harbour (72.0196°N, 125.2154°W); Sand Hills Moraine (71.774°N, 124.283°W); Johnston Point (72.7374°N, 119.0246°W)

Landscape change on Banks Island
Arctic landscapes that are rich in ground ice are highly sensitive to climate change, which can kick off disturbances with significant impacts to the land, plants, and animals. Recent mapping shows that the ice-rich deposits on Banks Island have the highest amount of permafrost disturbances in the Canadian Arctic. There are two objectives of this project. First, the researchers will use air and satellite photos, along with field sampling, to study how fast the landscape on Banks Island is changing, and where the changes are happening. Second, they have set up permanent monitoring sites to track changes in vegetation and permafrost conditions. The Sachs Harbour Hunters and Trappers Committee helped the researchers identify and set up five community monitoring sites near town. The sites are all different: some are in areas where the permafrost has made polygons, others are in grassy areas, uplands, or near water. In 2015, the

research team took careful measurements and observations of the plants, permafrost, air and ground temperature, and soil conditions at these sites. A ground temperature sensor was also installed under an Environment and Natural Resources building at Sachs Harbour. Ground and air temperature have been logged every two hours by this instrument since 2015. In 2016, the research team tried to return to Banks Island twice, but both times the flights were cancelled. They will return in 2017, when they will check on the the research sites, the temperature sensor, and start a new study on the causes of vegetation dieback in low lying areas on the west coast of the island.

Layden, Ronald E.
Aurora Research Institute
Yellowknife, NT
rlayden@auroracollege.nt.ca

File No: 12 404 917 **Licence No:** 15929
Region: IN, GW **Location:** Inuvik, Tsiigehtchic, Fort McPherson

Development and testing of climate change monitoring equipment in the Arctic
The goals of this project were to test out instruments that measure carbon gas that is released from the soil, and to find out more about where carbon gas is released in greater amounts. Carbon gas is naturally released from the soil when plants and animals in the soil decay. However, when the climate warms, more carbon gas is released. Then, the carbon gas itself causes even warmer temperatures through the greenhouse effect. The researchers measured carbon gas that is released from the soil in two areas, one with shrubby vegetation and one with more grass. They found that more carbon gas was released at the shrubby tundra site, compared to the site with with mostly mixed grasses and dwarf shrub tundra. Both areas are in the continuous permafrost zone of northern Canada. Other studies seem to show that warming temperatures cause more shrubs to grow in northern locations. The increase in shrubs growing in northern areas could therefore cause even more release of carbon gas, and even more warming.

Lee, Claudine
Dominion Diamond Ekati Corporation
Yellowknife, NT X1A 3T1
Claudine.Lee@Ekati.DDCORP.CA

File No: 12 404 839 **Licence No:** 15812
Region: NS **Location:** Ekati claim block

EKATI engineering and environmental monitoring programs
There are several components to this ongoing monitoring project. First, the researchers are trying to determine if the Ekati Diamond Mine is having an effect on the surrounding lakes, rivers, land or air quality. For this goal, the researchers used three monitoring programs to check for changes in the water and to test air quality. These programs were designed to detect potential changes in the way water moves through the water system, as well as changes to the quality of the air, plants, soil, water, and lakebed sediments. They also looked for any changes to the small plants and animals that live in the water and keep it healthy. Second, the researchers are gathering information about areas where the mine may expand in the future. For this goal, the researchers studied current conditions at Lac du Sauvage, at lakes and streams near a part of the mine known as the Sable development, and the outlet of Lac de Gras. They recorded information about the whole water system including lakes, rivers, rain or snow. They also collected information about the climate and weather, water quality, sediment quality, the small plants and animals that live in

the water (including those that live close to the bottom), fish habitat, and fish communities in the surrounding area. Results have already been published, or will be made publically available through Dominion Diamond Ekati Corporation.

Lesack, Lance
Simon Fraser University
Burnaby, BC
LLesack@sfu.ca

File No: 12 404 485 **Licence No:** 15846
Region: IN, GW **Location:** Mackenzie Delta

Biogeochemistry of lakes in the Mackenzie Delta
The goal of this long-term project is to study the lakes in the Mackenzie Delta as a whole 'ecosystem' to see how climate change might impact the delta, and other arctic deltas. 'Ecosystem' refers to how all the living beings and non-living elements (the weather, soil, etc.) form a functioning system. The research team studied a couple of special types of bacteria in the delta lakes during 2016, both when the lakes were ice-covered during the spring, and later during the open water period. One type of bacteria produces methane from carbon, and the other type consumes (or "eats") methane to stay alive. Methane is an important greenhouse gas, but it usually stays below the surface of the earth. The researchers took water samples from under the ice in 22 lakes near Inuvik in May 2016 for analyses of to look for the methane-producing bacteria. Later in the summer, they took water samples each week from six lakes near Inuvik to look for both methane-producing and methane-consuming bacteria. The researchers also measured the amount of methane and carbon was in the water samples. They are studying the DNA of the bacteria to see what kinds of bacteria are in the water. They have found that the bacteria in these lakes are not as diverse as they had thought, although they are not finished their assessment yet.

Levesque, Keith R.
ArcticNet
Québec, QC
keith.levesque@arcticnet.ulaval.ca

File No: 12 404 822 **Licence No:** 15922
Region: IN **Location:** Mackenzie Shelf and Amundsen Gulf

Integrated regional impact study of the coastal western Canadian Arctic
The goal of this research program is to study the changes in the Canadian Arctic coastal marine ecosystem due to climate warming. In order to find out how the coast is changing, the research team spent four weeks in August and September 2016 doing field work in the Inuvialuit Settlement Region onboard the Canadian research icebreaker CCGS Amundsen. During their time in the Beaufort Sea and Amundsen Gulf, the researchers visited four 'moorings', or floating research instruments that were set in the water in 2014. They put the moorings back in the water to collect more information, along with two new floating instruments. These instruments are collecting information including the ocean's currents and temperatures, which will be very useful for understanding how future development and government regulations will impact the Beaufort Sea. The research team also visited two other instruments that are recording information at the bottom of the sea. Aside from collecting the information stored by these instruments, the research team took various samples. They collected seawater, sea ice, bottom sediments, the tiny plants and animals that live in the water, and young fish. The research ship also continuously records

information about the ocean and weather. Overall, information from this project will help the researchers understand the impacts of climate change on the Canadian High Arctic.

Lewkowicz, Antoni G.
University of Ottawa
Ottawa, ON
alewkowi@uOttawa.ca

File No: 12 404 905
Region: DC, NS, SS

Licence No: 15878
Location: (60°56'45”N, 117°21'37”W); (60°56'11”N, 117°22'06”W); (61°36'53”N, 117°09'36”W); (61°41'28”N, 116°57'10”W); (61°44'14”N, 116°50'03”W); (61°47'46”N, 116°44'31”W); (61°42'49”N, 116°49'07”W); (62°29'20”N, 116°31'44”W); (62°27'02”N, 116°29'44”W); (62°20'44”N, 116°28'46”W); (62°27'55”N, 114°32'53”W); (63°08'05”N, 114°00'15”W)

Impacts of forest fire on discontinuous permafrost in the south-western Northwest Territories

The goal of this project is to help scientists and communities plan for climate change by studying permafrost. Permafrost makes up a large portion of the Northern Hemisphere, and changes to permafrost due to climate change will cause problems for the people, plants, animals, roads, and buildings in these areas. Scientists and communities need to understand how permafrost will change in the future in order to make plans in advance; for example, to ensure that building codes are updated and roads are built safely. In addition, thawing permafrost can release carbon into the air, which can make the climate warm up even faster. Forest fires can cause permafrost to thaw much more quickly, but generally fires have not been studied by permafrost researchers in this region. To remedy this, the research team went to 18 burnt and unburnt sites between Yellowknife and Kakisa in 2015 and 2016. Each site had different environmental conditions. The team set up air and ground temperature sensors, and a specialized analysis called ‘electrical resistivity tomography’ was used every year to monitor changes in the ground. The researchers also took frozen ground cores to look at the ground ice and soil. The researchers have found deeper thawed layers near the surface, and possibly a loss of frozen ground at some of the sites that they go back to each year. The researchers found that permafrost is less sensitive where there are thick organic layers, and more sensitive where there are coarse grained soils like sand and gravel.

MacLeod, Roger
Geological Survey of Canada - Pacific Division
Sidney, BC
michelle.cote@canada.ca

File No: 12 404 920
Region: IN

Licence No: 15949
Location: northern Richards Island

Terrestrial geoscience studies of earthquake (seismic) hazards in the Mackenzie-Beaufort area - 2016 activities

No research was conducted under this licence in 2016.

Mamet, Steve D.
University of Saskatchewan
Saskatoon, SK
steven.mamet@usask.ca

File No: 12 404 868
Region: SA

Licence No: 15786
Location: Canol Heritage Trail (63.246164”N, 130.029783”W to 63.475206”N, 129.361818”W)

Long-term ecological and geomorphological investigations in the alpine tundra of the Mackenzie Mountains, NWT

The goal of this ongoing project was to study recent permafrost thaw and see if the treeline is shifting due to climate change in the western Mackenzie Mountains. The researchers measured the permafrost active layer (the part of the permafrost that thaws every summer) at eight sites, and measured specific small-scale weather conditions at five sites. The weather records dating from 1990–2015 from the five stations in the immediate area show an increase of about 1.3°C in the temperature of the permafrost over this time. The warming climate appears to have thawed permafrost, varying from four centimetres (two inches) per decade in low sites, to nearly 12 centimetres (five inches) per decade at higher elevations. Surprisingly, permafrost mounds at the lowest sites had thawed and collapsed catastrophically in the last two years. As temperatures rise and permafrost thaws, Arctic landscapes will change, sometimes quickly. Due to these rapid changes, the current plant and animal residents may find themselves unable to live there, and may die out. The location of the treeline was the other major focus of this research. Warmer temperatures could mean that more trees grow further north, or further upslope in mountainous areas. From 2013 to 2015, the researcher planted tree seeds in some areas to see if they would grow. It appears that the trees can most easily grow on south-facing mountain slopes. The treeline is not shifting much as there are limits on the spread of seeds. For example, seeds are quickly eaten by small animals, and trees at the treeline do not grow quality seeds.

McGeer, Jim
Wilfrid Laurier University
Waterloo, ON
jmcgeer@wlu.ca

File No: 12 404 874
Region: NS

Licence No: 15944
Location: Thor Lake, and along Hwy #4 (the Ingraham Trail) east and west of Yellowknife

Understanding the potential impact of rare earth elements in aquatic systems in the NWT

The goal of this project is to study how a group of metallic chemicals called ‘rare earth elements’ might pollute water systems in the NWT. In order to study these rare earth elements, the researcher visited the NWT in September and October 2016 to take some water samples from two sites. At the first site, Cameron River Crossing Territorial Park, water was collected from the Cameron River just downstream of the bridge. At the second site, Tibbitt Lake Territorial Park, water was collected from the edge of the lake at the culverts. At both sites approximately 200 L of water was taken. Then, the researcher filtered it using a process called reverse osmosis, during which the water is “pushed” through a special filter that allows pure water through, but not the rare earth elements and other impurities. At the end of the process, about eight litres (two gallons) was set aside to be studied later, and the pure water (192 L) was returned to the river or lake. The eight litre sample was kept frozen and shipped to the Centre for Cold Regions and Water Science at Wilfred Laurier University in Ontario. The researcher will use special instruments in a laboratory

there to test for contamination. In particular, the researcher will look at the decaying plant and animal matter in the water, and the tiny plants and animals that live in the water.

Melling, Humfrey
Fisheries and Oceans Canada
Sidney, BC
Humfrey.Melling@dfo-mpo.gc.ca

File No: 12 404 248
Region: IN

Licence No: 15911
Location: Beaufort Sea

Beaufort marine hazards / Integrated Beaufort Observatory

Communities, governments and scientists all need to have an in-depth, long-term understanding of the environment in order to make good decisions and plan for industry, environmental conservation, and safety. The Integrated Beaufort Observatory is a long-term monitoring project with a goal to collect observations about the Beaufort Sea. Therefore, the research team's activities change little from year to year. First, the team recovers, services, and returns specialized recording instruments that stay in the ocean all year. These are called 'oceanographic moorings'. The moorings have instruments that measure ice thickness and ridging, storm waves, sea level, ocean currents, temperature, and salinity. They also measure the small plants and animals that drift in the water and are food for many fish and marine mammals, as well as the sounds that sea mammals make. Second, the research team stops at points through the Beaufort Sea to take samples and study the seawater between the surface and a depth of 500 m. The research is conducted from the Canadian Coast Guard Ship Sir Wilfrid Laurier, which comes north annually on its Arctic Patrol. This patrol is the backbone of the Department of Fisheries and Oceans monitoring in the Beaufort region. Since returning to the Institute of Ocean Sciences, the research team has worked on processing and interpreting the information they obtained from their observations of the water properties and from the instruments on the moorings.

Menounos, Brian
University of Northern British Columbia
Prince George, BC
brian.menounos@unbc.ca

File No: 12 404 664
Region: DC

Licence No: 15891
Location: Glacier Lake (62°04”N, 127°32”W); Brintnell-Bologna Icefield (62°05”N, 127°50”W)

Holocene glacier fluctuations in Nahanni National Park Reserve, Northwest Territories, Canada

The goal of this project is to study the history glaciers and climate variability in the Nahanni National Park Reserve region. To do this, the research team collected three cores from the lakebed sediments of different lakes, and also took 20 rock samples. The three lake sediment cores came from Glacier Lake (two cores) and Anderson Lake (one core). Sediment cores preserve the layers from the lakebed to show the conditions in the lake far into the past, as each layer is from a different year. The 20 rock samples were taken from boulders at various locations near Tungsten and the Brintnell-Bologna Icefield. The boulders were from rocks that were carried overland by the glaciers and then left on the ground in large piles when the glaciers melted, leaving formations known as 'moraines'. Once the researchers were back in the laboratory, they split the three lake cores in half and took samples from within the cores. They were hoping to find out the size of the glaciers that were in the valley in the past. Depending on the information that

is found in the lake cores, the researchers may return to do additional sampling in the late winter of 2017. The research team also use special techniques to find out how long ago the boulders they sampled were deposited by the melting glacier. The research team will publish some of their results by the end of summer 2017.

Miller, Clare B.
Queen's University
Kingston, ON
7cm47@queensu.ca

File No: 12 404 903
Region: NS
Licence No: 15852
Location: Courageous Lake area

Evaluating impacts of climate change on pre-development geochemical baselines through sediment micro analysis and cross evaluation with paleoclimate in northern environments

In a natural, undeveloped areas, there are certain concentrations of several naturally-occuring elements in lake water and soils. These levels make up the “geochemical baseline” for a region. The level of each element can differ among lakes due to differences in weather patterns, differences in the plants and animals that live in the lake, and the type of bedrock under the lake. The geochemical baseline helps scientists and developers find places to set up mines, and also sets the standard for how a region should look when a mine closes. In northern regions, climate change has been shown to naturally increase the concentrations of certain elements. However, the effect of climate change on arsenic levels is not well understood. Arsenic is an element that is found naturally in the lakes and soils of regions where gold is also found, but it can also be a waste produced by mining activities. The goal of this project is to understand how arsenic concentrations in lakes may be impacted by climate change. The research team took water and lakebed sediment samples from five lakes at increasing distances from a former gold mine. They tested these samples for arsenic to see how much came from past mining activities, and how much is natural. It seems that the highest arsenic levels are found in lakes closest to the mine, although the natural concentrations of arsenic and other mining pollutants were higher than anticipated. The next steps of the project will focus on how changes in climate may result in natural changes to arsenic concentrations in lakes.

Miller, Matthew
Northwest Territories Power Corporation
Hay River, NT
mmiller@ntpc.com

File No: 12 404 923
Region: SS
Licence No: 15968
Location: Taltson Hydroelectric Facility

Taltson hydroelectric facility aquatic monitoring

The goal of this on-going monitoring project is to check how the annual shutdown at the Taltson Hydroelectric Facility affects the tailrace directly below the facility. The annual shutdown does affect the creek, and the monitoring team hopes to figure out which way of running the shutdown has the lowest impact. To figure this out, various options have been used in the annual shutdown. Each year when something new is tried, the team checks to see what effect that year’s shutdown has had on Trudel Creek. When all the options have been tried they will know which one is the best option. All work is being completed in conjunction with Fisheries and Oceans Canada and the Mackenzie Valley Land and Water Board. Overall, the goal of the program is to minimize the

impact of the Taltson Hydroelectric Facility annual shutdown on the local environment, which will also be helpful for those communities using the area for on-the-land activities. In addition to protecting the environment, the cost of producing power for local communities will be minimized. Annual reports outlining the results of the monitoring are posted on the Mackenzie Valley Land and Water Board Public Registry.

Montgomery, Shelagh
Arcadis Canada Inc.
Yellowknife, NT
Shelagh.Montgomery@arcadis.com

File No: 12 404 924
Region: NS

Licence No: 15971
Location: Discovery Mine (63.188333°N, 113.897222°W), Giauque Lake, Winter Lake, Borrow Pit, Natural Turbid Pond

Discovery Mine (NWT) year-10 long-term monitoring program
The abandoned Discovery Mine site was contaminated, and the clean-up for the site was the responsibility of the Contaminants and Remediation Division of Aboriginal Affairs and Northern Development Canada. The purpose of the current project was to check on the Discovery Mine Long Term Monitoring Program ten years after the final clean-up to make sure that the clean-up program had worked. The site is located on the west shores of the fish-bearing Giauque Lake. The researchers checked the water quality at seven locations in Giauque Lake, at an unpolluted lake upstream, and at four other lakes and ponds. Fish were collected at Giauque Lake and two other lakes, and were sampled to check the concentration of 31 different chemicals. The researchers also checked the site in general, to make sure that the plans to cover up the tailings with earth had been followed, and to make sure that the tailings were still covered. They checked on tree and plant growth and health, checked for signs of wildlife, and made any other checks needed to make sure the clean-up plan had been effective. Finally, they checked that the permafrost under the borrow pit was stable, and not thawing.

Olefeldt, David
University of Alberta
Edmonton, AB
olefeldt@ualberta.ca

File No: 12 404 892
Region: DC

Licence No: 15783
Location: Scotty Creek research camp area sites (61°17”N, 121°17”W); (60°23”N, 122°24”W); (62°36”N, 122°36”W); (61°11”N, 120°5”W); (62°26”N, 121°16”W); (61°24”N, 121°27”W); and (61°9”N, 119°55”W)

Effects of fire on peatland permafrost stability and carbon cycling
The goal of this ongoing project is to understand how forest fires affect permafrost peatlands. During the 2016 field season, the research team visited sites near the highway between the Alberta border and Wrigley. At these sites, they were studying how wildfire affects the stability of permafrost in peatlands. Soil temperatures and seasonal thaw depths were checked from spring to fall. They found that wildfires accelerate permafrost thaw for about two decades after the fire, as vegetation grows back very slowly on burned peatlands. It seems like more frequent fires and a longer fire season will lead to increased permafrost thaw. Both fire frequency and fire season

length will increase in future due to climate change. This has long-term implications for greenhouse gas release, caribou habitat, and land use. The research team was also studying how wildfires and thawing permafrost affects water quality. They monitored water discharge and water chemistry at two streams where they cross the highway near Ft. Simpson. One stream drains an area that was burned by wildfire in 2013, while the other has not burned in several decades. The researchers are still analyzing the information they collected from the water samples, but it seems that both fire and permafrost thaw have the potential to change water quality. The water coming from burnt areas might cause an increase in the release of greenhouse gases, and the quality might also not be as good from a human perspective.

Orcutt, Beth N.
Bigelow Laboratory for Ocean Sciences
East Boothbay, ME
borcutt@bigelow.org

File No: 12 404 893
Region: IN

Licence No: 15851
Location: Inuvik/Lake 520 (68°18'42.102"N, 133°43'35.94"W); Inuvik/Lake 129 (68°18'18.3774"N, 133°50'34.4754"W); Inuvik/Lake 56 (68°19'22.7706"N, 133°50'45.6"W); Lower Delta/Swiss Cheese Lake (69°13'31.6158"N, 135°14'32.2434"W); Lower Delta/Manta Lake (69°13'6.1854"N, 135°12'11.3394"W); N Richards Island/site 1 (69°22'15.2502"N, 134°26'46.068"W); N Richards Island/site 2 (69°40'46.9806"N, 134°25'55.38"W)

Studies of methane release from lakes in the Mackenzie Delta and on Richards Island
The goal of this multi-year project is to understand how much methane is released from Arctic lakes into the atmosphere when the ice melts each spring. Methane is a potent greenhouse gas that contributes to global warming, and increasing amounts of methane may be released from Arctic lakes as the climate warms up. To understand how much methane is released, the researchers are continuously measuring methane concentrations in frozen lakes throughout the winter using special remote sampling devices. In 2015, nine sampling devices were placed in nine different lakes in the Mackenzie River Delta and on North Richards Island. Five of the lakes are near Inuvik, two lakes are in the outer delta, and two are on North Richards Island. In March 2016, the researchers placed two new sampling devices in the Inuvik area after a presentation about the project to the Inuvialuit Game Council. The sampling devices consist of a milk crate filled with instruments and sensors that is placed on the lake bottom at a depth that won't freeze. Sometimes the crates were secured with weighted rope that was strung out to the lakeshore and staked. Student collaborators collected lake water and sediment samples from the Inuvik area lakes all summer for comparison to the winter measurements. After meeting with the Gwich'in Tribal Council, these students mentored a local summer intern. In August 2016, the research team collected the sampling devices from the lakes, and set out new measuring instruments in the water.

Osawa, Akira
Kyoto University
Kyoto, Kyoto
aosawa@kais.kyoto-u.ac.jp

File No: 12 404 876
Region: SS

Licence No: 15820
Location: Hwy #5 W of Ft. Smith

Structure, carbon dynamics, and silvichronology of boreal forests

The goal of this multi-year project is to study how carbon – an element which exists as a gas in the air but also as a part of living things – moves between trees, animals, the air, and the earth during its natural cycle. The research team visisted three areas of the Northwest Territories in September, 2016 to study how forests grow over the long term (more than 100 years), and to see how tree growth was related to the changing climate. The team collected tree-ring samples from many trees in three areas near Wrigley, Ft. Simpson, and in Wood Buffalo National Park west of Ft. Smith. They'll study and analyze the rings and prepare a report. A tree grows a new ring every year, and the rings change in size based on the growing conditions that year. In previous years, the researchers set up permanent research sites in forests of jack pine, black spruce, and quaking aspen in and around Wood Buffalo National Park. They returned to these sites again and took observations and samples to see how fast the forest is growing. To do this, they collected decaying plant material from the forest floor, checked on tree root growth, and measured how big the trees are. The trees they measured for size were also measured in previous years, so they can compare year to year. To measure tree size, they used measuring tapes but also a special device for measuring tree-height, and a more specialized instrument that uses three-dimensional laser technology.

Panayi, Damian
Golder Associates Ltd.
Yellowknife, NT
damian_panayi@golder.com

File No: 12 404 779
Region: NS

Licence No: 15896
Location: Bluefish Lake, Prosperous Lake, and the Yellowknife River between Prosperous Lake and Bluefish Lake

NTPC Bluefish Hydro repairs

Recently, a new dam and spillway was constructed at the Bluefish Hydro Plant on the Yellowknife River between Bluefish Lake and Prosperous Lake. This ongoing project included two components: flow motioning and fisheries studies. To monitor the flow, the research team needs to know how much water goes out over the spillway. To measure this, they installed special instruments called data loggers in two places along the Yellowknife River between Bluefish Lake and Prosperous Lake. The data loggers record measurements that can be collected later. The purpose of the data loggers was to confirm that the water flowing over the spillway met certain minimum requirements. The fisheries monitoring component of this project included studying the fish migration up the Yellowknife River to see what the fish were eating and where they were spawning. In particular, the research team were looking at the fish spawning in the water channel below the dam. In particular, whitefish and cisco were seen in large numbers in both the river and channel, and they were also seen spawning. The fisheries studies also considered the performance of the artificial 'shoal', or spawning area in Bluefish Lake. Finally, the researchers checked mercury levels in lake trout and pike in Bluefish Lake. Results to date indicate that the artificial shoal is visisted by both small and large fish, but no evidence of spawning has been seen.

Panayi, Damian
Golder Associates
Yellowknife, NT

dpanayi@golder.com

File No: 12 404 779
Region: NS
Licence No: 15921
Location: 5 km NE of the Gahcho Kué Mine

Kennady North diamond project
The goal of this project is to study and record the current conditions around an area with potential for mining diamonds. This type of pre-development research is called a “baseline environmental study” and provides information that will be used to plan out the mine in the future. It will also be used to ensure that after the mine closes, the environment is returned to as natural a state as possible. This project focussed on water, fisheries, and wildlife. To study the lakes and rivers, the researchers set up monitoring stations at six locations between the Kelvin Lake inlet and Kirk Lake. They also set up water level loggers in the lakes near each station, and measured the amount of water flow at each lake ouflow. They picked up each logger in late September to collect the information stored on it. The information will be used to improve their understanding of how and where water flows through the area. The research team also measured the water quality under the ice at five stations in the area between Kelvin Lake and Lake 410 in April 2016. They checked the water quality in the field using standard equipment and tests, and also took samples for later study. As expected, they found that there was a difference in water quality between small lakes and large lakes. The researchers also studied the area’s wildlife and fisheries in July 2016 to help plan the proposed advanced exploration camp.

Pehrsson, Sally J.
Natural Resources Canada
Ottawa, ON
Sally.Pehrsson@NRCan-RNCan.gc.ca

File No: 12 404 504
Region: SS
Licence No: 15897
Location: From 60°N to 61°N, and 104°W to 108°W

South Rae project
The goal of this project is to map out the types of rocks found in the project area to see whether there might be any minerals worth mining. During the 2016 field season, the research team stayed in a camp built on the shore of McArthur Lake along the Talston River system. From here, the research team of geologists from the Geological Survey of Canada and the Northwest Territories Geological Survey studied the area’s rocks and soils. The research team collected small samples with a hammer or shovel to bring back to the laboratory to be analyzed.The geologists are currently writing reports and making maps to display what they found. It seems that the rocks currently exposed at the surface were actually buried very deep in the crust of the earth almost two billion years ago. The geologists are trying to figure out how these rocks where brought back to the surface of the earth, and if any mineral deposits were formed during these processes. The geologists are also studying the movement of the glaciers that once covered the land. Preliminary results show that more than one period of glaciation occurred, and that in general the glaciers were moving to the west and retreated to the east when they melted. The glaciers moved the soils and deposited them along the way.

Pisaric, Michael F.J.
Brock University
St. Catharines, ON
mpisaric@brocku.ca

File No: 12 404 640
Region: IN, GW

Licence No: 15831
Location: Husky Lake; burn area south of Inuvik; Noell Lake area; Campbell Dolomite Upland, Dempster Hwy/Peel Plateau

Examining the impacts of climate and environmental change on aquatic and terrestrial ecosystems of the Mackenzie region, NWT
No work was completed under this research licence in 2016.

Pisaric, Michael F.J.
Brock University
St. Catharines, ON
mpisaric@brocku.ca

File No: 12 404 640
Region: DC, NS, SS

Licence No: 15838
Location: Yellowknife and Ft. Providence areas

Using the past to inform the future: a paleoecological perspective of the impacts of drought and fire on lakes, permafrost and forests
The goal of this research project is to study how living systems in lakes, on permafrost, and in forests have adapted to drought and forest fires in the past. This information can then be used to predict how they will respond in the future. The research team had a very successful first field season working in Yellowknife, with different field crews conducting three different trips. In July, the team travelled to Yellowknife and collected tree core samples from 12 sites between Yellowknife and the Snare hydro facility. A large forest fire near the Snare facility impacted the sampling because of the thick smoke. During this trip, the research team also set up a 'dendrometer' field site in a jack pine forest along the Ingraham Trail. A dendrometer is a band that goes around a tree and measures in very fine detail how much the tree grows during the growing season. The team will use the tree growth information and compare it to weather information for the region, to see how weather conditions influence the growth of these trees. In August, a second field crew took water samples in the South Slave and Dehcho regions to examine the impact of recent forest fires on stream water quality. In particular, they were looking at the tiny animals that are found in the water. Finally, in September the researchers took a third trip to remove the dendrometers for the winter and collect sediment cores from two small lakes along the Ingraham Trail. They also set out water level sensors in five lakes.

Prowse, Terry
University of Victoria
Victoria, BC
terry.prowse@canada.ca

File No: 12 404 309
Region: IN

Licence No: 15843
Location: Noell Lake (68°31'37"N, 133°30' 48"W)

A program to evaluate changing northern lake ice regimes
The main goal of this ongoing research is to collect field-based measurements about lake ice, including ice thickness and 'composition'. Composition refers to the chemical make-up of the ice, which is not just water but has other elements in it as well. This information will be used to ensure that the current understanding of lake ice is correct, and to see what the direct effects of climate-related changes will be on ice-cover composition and under-ice conditions in the lake. In May 2016, research staff travelled by snowmobile from Inuvik to Noell Lake. At Noell Lake a handheld

GPS (Global Positioning System) was used to locate the same measurement locations that were visited in the past. At each location, a tape measure was used to measure the on-ice snow depth. An ice auger was used to drill a hole into the ice cover and assess whether any white ice was present. White ice is formed when snow is flooded with water and then freezes. The ice auger was then used to drill through the complete ice cover, and a measurement of total ice thickness was recorded. The water level at the hole after drilling through the entire ice cover was also recorded. A camera was used to photograph the research staff working, and to document the ice and snow cover. Measurements were collected at 30 locations on Noell Lake that covered north-south and east-west lines.

Quinlan, Roberto
York University
Toronto, ON
rquinlan@yorku.ca

File No: 12 404 823
Region: IN, GW

Licence No: 15811
Location: East Channel lakes area (68°20.139”N, 133°42.124”W); Reindeer Station lakes area (68°40.705”N, 133°54.679”W)

The ecology and paleoecology of benthic macroinvertebrates in the Mackenzie Delta region

The goal of this project is to understand how very tiny creatures called ‘invertebrates’ that live in the lakes in and around the Mackenzie Delta might be impacted by changes in how water flows between these lakes. Water generally flows between the lakes during the spring melt. Warmer temperatures in recent years mean that the flow between the lakes happens more quickly, with less water flowing between them than in the past. This is particularly the case in lakes at a higher elevation above the main water channels. During the summers of 2013 to 2015, the team sampled 11 lakes at different elevations within the Mackenzie Delta near the East Channel at Inuvik, and a series of lakes in the uplands near Reindeer Station and on Richards Island. In 2015, the research team also sampled groups of deltaic lakes near the West and central channels to compare to the East Channel lakes. The researchers took field measurements of the water, and also took samples for later study in the laboratory. From their research to date, it seems that connections between lakes and the floodplain have an important influence on how much food is available for the invertebrates. The types and number of invertebrates were different in lakes that only flood during spring melt, compared to those found in lakes that are connected to the main channels. The researchers also found that overall peak water levels change the invertebrates found in the lakes.

Quinton, William L.
Wilfrid Laurier University
Waterloo, ON
wquinton@wlu.ca

File No: 12 404 570
Region: DC

Licence No: 15824
Location: Scotty Creek

Understanding and predicting the impacts of permafrost thaw on water resources and ecosystems

The goal of this project is to understand how melting permafrost will change water systems at the southern edge of the permafrost, especially around two important disturbances: seismic lines and

wildfires. The research team returned to Scotty Creek to continue their work on how the permafrost thaws and how quickly it has been thawing. They are studying this because climate warming is happening in the Dehcho region, which is causing much of the permafrost in the region thaw. This thawing has caused a gradual decrease in the forested peat plateaus, and an expansion of treeless, permafrost-free wetlands. The land in this region is also extremely sensitive to direct human disturbance. One widely occurring example of human-induced permafrost thaw is from the extensive network of seismic lines. There are many more seismic lines than natural drainages. Over the last year, the research team have carefully studied the formation of 'taliks'. Taliks are perennially unfrozen ground between the active layer (which freezes and thaws annually) and the underlying permafrost. The team have found that these taliks allow a lot of water to drain through them throughout the year, including during the winter. The growth of taliks allow for more runoff, so this is changing how water is stored or drained in these regions. The researchers will use their measurements and observations to fine-tune their predictions of future permafrost thaw and water drainage in the area.

Reimink, Jesse R.
Carnegie Institution of Washington
Washington, DC
jreimink@carnegiescience.edu

File No: 12 404 761
Region: NS

Licence No: 15856
Location: Winter Lake belt, Point Lake, Brown Lake, Patterson Lake, Bell Lake, Dwyer Lake

Exploration of the earliest crust forming events on earth
The goal of this research project is to study very old rocks from the earliest time when there may have been simple life on earth. The researchers conducted fieldwork from July 11 to -August 2. They used previously published geological maps to find areas with these very old rocks. They collected samples of rocks that were from between 2.5 and 3.5 billion years before the present in the four areas that they visited. They took the rock samples back to the United States for further study. So far, they have learned that the rocks contain information about what the surface of the earth was like when they were made. The research team will continue to run special chemical tests on the rocks in the following months, and will publish scientific papers about their work.

Schryer, Rick P.
Fortune Minerals Limited
London, ON
rschryer@fortuneminerals.com

File No: 12 404 900
Region: NS

Licence No: 15967
Location: Marian River

Environmental baseline surveys for the Fortune Minerals Limited NICO project
Due to a lack of project funding, the proposed program could not be implemented in 2016.

Schutt, Derek L.
Colorado State University
Fort Collins, CO
derek.schutt@colostate.edu

File No: 12 404 896

Licence No: 15794

Region: SA

Location: Transect between Haines Alaska and Great Bear Lake

The Mackenzie Mountains earthscope project

The goal of this project is to understand the causes of the earthquakes in the Mackenzie Mountains and the geological processes that continue to cause the Mackenzie Mountains to raise up. In August, five members of the Mackenzie Mountains team traveled to Norman Wells to set up special instruments that measure earthquakes, called 'seismometers'. They also set up precise GPS instruments that measure if and how the earth's surface is moving. The instruments were installed in a rough line that extends from Great Bear Lake to Macmillan Pass. They tested equipment and met with interested local authorities first, and then used a float plane to get to most of the seismometer sites. The team was also able to install two GPS instruments with two of the seismometers. A third GPS was not installed near a quarry near Norman Wells as planned, because the quarry might be expanded soon. The team expects to return to Norman Wells for about two weeks in the next summers to meet any interested parties, check on the sites, repair any damage to the instruments, and collect information from the instruments. In 2018, the sites and all equipment will be removed. Because no information has been recorded on the instruments yet, there are no results to be shared at this time but the team welcomes any questions or opportunities for outreach.

Siegfried, Dian
University of Alaska
Fairbanks, AK
desiegfried@alaska.edu

File No: 12 404 904

Licence No: 15864

Region: IN

Location: Aulavik National Park on Banks Island (73.219963°N, 119.561512°W); Mould Bay on Prince Patrick Island (76.228689°N, 119.298927°W)

Thermal state of permafrost

The goal of this long-term monitoring project is to measure the air temperature, snow depth, and soil temperatures at several locations on Banks Island and Prince Patrick Island. The team does this by visiting the sites to service instruments and make in-person observations about the permafrost. During an expedition in late July 2016, the research team visited permafrost observatories on Banks Island and at Mould Bay on Prince Patrick Island. During the visits, information was downloaded from the instruments located there and repairs were made as needed. Additionally, the research team took measurements and photos to document the changes to the ground surface that have occurred over the last ten years as a result of melting ice wedges. The instruments at the sites are currently measuring air temperature, snow depth, and soil temperatures to a depth of three meters (about nine feet). The instruments automatically take these measurements every week. These observatories are an important part of a larger permafrost monitoring network because they are some of the most northerly sites and have the coldest permafrost. The team have no plans to visit the sites again in the next three years, but are working to get the funding they need for another expedition. The observations and measurements will be published in academic sources.

Skeeter, Wesley R.
University of British Columbia
Vancouver, BC
wesley.skeeter@alumni.ubc.ca

File No: 12 404 911
Region: IN

Licence No: 15903
Location: Illisarvik lake basin (69°28'52"N, 134°35'4"W)

Measuring carbon fluxes at Illisarvik with eddy covariance

Carbon dioxide and methane are important greenhouse gases that affect the global climate when they get into the air. One big source of methane release is from lakes that form when permafrost thaws. Sometimes, these lakes drain and the exposed lake-bed is quickly covered by plants. These plants pull carbon dioxide out of the air, and the drier lake-bed gives off less methane than when there was water in the lake. The research team wanted to see how much carbon dioxide is actually absorbed by the plants growing in a drained lake basin. Illisarvik is a permafrost thaw lake on Richards Island that was drained experimentally in 1978, so it is an ideal location for this study. The team measured how much greenhouse gas was both released and absorbed in July and August, 2016. They used a special instrument and careful calculations to study the gas exchange across the whole landscape. They found that the diverse mix of plants in the lake-bed did a good job of absorbing carbon dioxide out of the air, and that methane emissions were low. This means that during the growing season, Illisarvik is a sink for greenhouse gases — that is, it gathers and holds onto greenhouse gases, instead of being a source and releasing even more of them into the air. The researchers also found that lands to the southwest of Illisarvik are a strong source of methane. When winds were coming from that direction, their instruments detected a lot of methane. The research team want to investigate this further in 2017 by conducting a more comprehensive study on Fish Island over an entire growing season.

Smith, Sharon S.
Geological Survey of Canada
Ottawa, ON
Sharon.Smith@nrcan.gc.ca

File No: 12 404 657
Region: IN, GW, SA, DC

Licence No: 15789
Location: Jean Marie River, Ft. Simpson, Wrigley, Tulít'a, Norman Wells, Ft. Good Hope, Tsiigehtchic, Inuvik, Tuktoyaktuk

Permafrost monitoring and collection of baseline terrain information in the Mackenzie Valley Corridor, NWT

Permafrost monitoring sites throughout the Mackenzie corridor, from Wrigley to the Mackenzie Delta, were visited in August and September 2016 to record the temperature of the ground and observe the condition of the active layer. The active layer is the part of the ground above the permafrost that thaws in the summer and freezes in the winter. Guiding services and boat transportation in the Inuvialuit and Gwich'in regions were provided by an Inuvik resident. This project is adding more information to the existing records that span more than 15 years. This allows the researchers to understand how permafrost conditions are changing over time. Knowing how the permafrost is actually changing is useful to community, regional, and territorial governments when they make land management decisions. The researchers found that permafrost temperatures are, in general, continuing to increase. In recent years, however, a smaller increase was seen in the warmer permafrost in the southern corridor compared to the

colder permafrost sites further north. The active layer has generally increased in thickness since 2009. The researchers will continue to measure permafrost temperatures and active layers in the future to see how climate change is affecting the permafrost environment.

Smith, Rod
Geological Survey of Canada
Calgary, AB
Rod.Smith@nrcan.gc.ca

File No: 12 404 337
Region: IN
Licence No: 15800
Location: Banks Island

Geo-mapping for energy and minerals program proposed fieldwork: western Arctic project - Banks Island

The purpose of this project is to understand how rocks on Banks Island and in the Beaufort Sea formed and changed over hundreds of millions of years. This project is also checking to see if there might be diamonds on Banks Island. Geological fieldwork was conducted on Banks Island between June 30 and July 22, in this second and final year of the project. The research team worked for five days at Nelson Head and 2 ½ weeks at Polar Bear Cabin on northern Banks Island. Each day, field parties of between two and six people were flown by helicopter to study and collect samples of rocks. These rocks were taken back to the Calgary office and then sent out to labs where they will be analysed to determine how old they are, the climatic conditions when they formed , and where they were formed (for example, the deep sea, a shallow shelf, or in rivers). The team also looked for evidence that the bedrock had cracked and folded on top of itself. The research team continued to collect samples from streams and the land to test for the presence of minerals associated with the type of rock (kimberlite) that could contain diamonds. Some of the planned work was cancelled because of mechanical issues with the helicopter that prevented the team from flying for six days. This was a successful summer and project. Samples collected over the past two years continue to be analyzed and reports will be issued as results continue to come in.

Smith, Martin R.
Durham University
Durham, England
martin.smith@durham.ac.uk

File No: 12 404 914
Region: SA
Licence No: 15919
Location: Sekwi Range and Canol Trail (63°15”N, 129°45”W to 63°35”N 128°50”W)

The microfossil record of the Cambrian explosion

The goal of this project is to search for and study tiny fossils in very, very old rocks. The tiny fossils being studied, called ‘microfossils’, are from a time early in the earth’s history when most of the major groups of animals first appeared. This is known as the Cambrian explosion. During the summer 2016 field season, the research team made preliminary visits to find microfossils from the start to the finish of the Cambrian explosion. Samples of fine-grained rock from the Ingta and Vampire formations were collected. These are shale deposits in the Mackenzie Mountains. They also took samples and mapped out another, later rock formation called the Sekwi formation. The research team found promising microfossils from the Caribou Pass region and a ridge south of Sekwi Mountain. Further field work found that the outcrops of rocks of the Vampire formation near Mile 222 had been changed in the past by intense pressure or heat, meaning that any microfossils

in those rocks would be ruined or hard to study. The rock samples will be carefully processed in the lab and microfossils hand-picked and mounted for study with a microscope. In some cases, the researchers will dissolve the rock using special acids, with the hope that this will leave just the fossils behind.

Sonnentag, Oliver
Université de Montréal
Montréal, QC
oliver.sonnentag@umontreal.ca

File No: 12 404 806
Region: IN

Licence No: 15807
Location: Trail Valley Creek (68°44'13"N, 133°29'15"W) Havikpak Creek (68°19'13"N, 133°30'48"W)

Quantifying carbon fluxes and budgets of boreal forest-tundra landscapes under the influence of rapidly changing permafrost regimes

The goal of this project is to record how carbon gas, a greenhouse gas that causes climate change, moves from the earth to the atmosphere and back to the earth again. The researchers were studying this process at two sites: Trail Valley Creek and Havikpak Creek. At both sites, the team is measuring the amount of carbon gas and water (in both liquid and vapour forms) moving between the land surface and the atmosphere. The measurements are taken with state-of-the-art special instruments that record the amount of carbon dioxide in the air. By carefully studying the measurements, the research team figured out that the way the instruments were set up meant that they were not measuring the carbon dioxide correctly. The researchers came up with a whole new procedure for measuring carbon dioxide concentrations using the same instruments, and then published it so that other scientists could make use of their information. In August 2016, the instrumental set-up at both Trail Valley Creek and Havikpak Creek was upgraded.

Sonnentag, Oliver
Université de Montréal
Montréal, QC
oliver.sonnentag@umontreal.ca

File No: 12 404 806
Region: DC

Licence No: 15815
Location: Smith Creek (63°09'28"N, 123°14'59"W)

The frontline of permafrost thaw: a transect of eddy covariance towers across the southern Taiga Plains to better understand changing regional carbon and water budgets

The goal of this project is to understand how the weather is changing in the Northwest Territories. Due to delays at the Université de Montréal and at Wilfrid Laurier University, and the solar power supply equipment going missing, the research team were not able to purchase or set-up their instruments at Smith Creek near Wrigley as they had planned to. Consequently, no progress has been made over 2016. The research team will start field work at this site again in April 2017.

Sonnentag, Oliver
Université de Montréal
Montréal, QC
oliver.sonnentag@umontreal.ca

File No: 12 404 806
Region: DC

Licence No: 15816
Location: Scotty Creek

Influence of changing active-layer thickness on permafrost peatland trace gas exchanges and carbon balance

The goal of this project is to understand how thawing permafrost influences carbon, water, and the temperature of both the land and the atmosphere. Carbon is an important greenhouse gas, but as an element it also exists in the water, land, and living things. The research team has been measuring the amount of carbon and water that move between the earth and the air at Scotty Creek since 2013. They have found that the thawing permafrost has caused the overall loss of boreal forest and the expansion of wetlands in the Ft. Simpson area. These changes seem to be changing regional precipitation (rain and snowfall) patterns. In addition, it seems that these changes are slowing down regional warming trends. However, at the same, wetland expansion across the region may dramatically increase future climate warming due to increased methane emissions. Some of the results were published in leading scientific journals and presented at various scientific conferences and workshops. The researcher also gave a public lecture at the Legislative Assembly in Yellowknife in August 2016.

Tank, Suzanne E.
University of Alberta
Edmonton, AB
suzanne.tank@ualberta.ca

File No: 12 404 785
Licence No: 15862
Region: DC, NS, SS
Location: Within 1 km of Hwy's 1 and 3

The effects of fire on diverse aquatic ecosystems of the NWT

The goal of this project was to determine if wildfires have any lasting effects on water quality. During the summer of 2016, the research team identified and surveyed 50 sites in the southern NWT to see what effect wildfires had on on water quality at those locations. The research team continues to study the water samples in the lab, but overall they found that wildfires have a relatively small and short-lived effect on water quality in the streams that were visited. The team will do one final survey during the spring high flow period of 2017.

Tank, Suzanne E.
University of Alberta
Edmonton, AB
suzanne.tank@ualberta.ca

File No: 12 404 785
Licence No: 15887
Region: GW
Location: Peel Plateau, and streams from Inuvik to the NWT/Yukon border

The effect of permafrost slumping on carbon delivery from land to water

The goal of this ongoing project is to study the effects of retrogressive thaw slumps on water quality in the streams of the Peel Plateau. Thaw slumps occur when the permafrost thaws, allowing the ground to slump and expose more permafrost, which then also thaws and slumps. Carbon is an important greenhouse gas, and is stored in large amounts in the permafrost. This project is focused on several types of carbon in streams and thaw slump water. The research team is trying to understand how carbon moves from the thawing permafrost into the water, where it can affect the plants and animals that live there. To achieve this, the research team took water samples upstream, downstream, and from the outflow of active slumps beside streams on the Peel Plateau. The research team also sampled stream water at locations further and further from where the thaw slumps flow into the stream. In the field, they tested for acidity, temperature,

dissolved oxygen, and other chemical properties. They also took samples back to the lab at the Aurora Research Institute (ARI) in Inuvik for further analysis. The team presented their research as part of the ARI speaker series, and hosted the On the Land Environmental Adventure Camp (Ecology North) who visited one of the slump sites. This allowed them to discuss the importance of these features, and demonstrate some of their sampling techniques. The hike-in sites were accessed with local wildlife monitors arranged through the Tetlit Gwich'in Renewable Resources Council.

Turner, Elizabeth C.
Laurentian University
Sudbury, ON
eturner@laurentian.ca

File No: 12 404 813
Region: SA

Licence No: 15888
Location: (65°17"N, 126°16"W); (64°56"N, 127°16"W); (64°43"N, 127°16"W); (64°39"N, 130°45"W)

Early paleozoic earth-surface environments in NWT

This project is one component of a much longer-term and larger study mapping out what the conditions were like on the surface of the earth around 520 to 450 million years ago. To figure out what the conditions were like so long ago, the researchers use rocks that were, at that time, the sand and other loose sediments on the seabed. Over time, this sediment hardened into rocks and can now tell the scientists what the climate was like and what living creatures and plants were found in the sea. To conduct their field work, the researchers visited the Norman Range east of Norman Wells and Dodo Canyon. After a helicopter dropped them off, a team of two people walked around for several days. They measured the layers of the rocks at each study location with a measuring stick, and carefully described each layer in their notes. They also took numerous small samples (lemon-sized or smaller) from each layer at each site. These rock samples were brought back to the lab and will be studied using specialized chemical analyses over the next couple of years. The results will allow the rocks to be compared to other similar rocks of the same age from around the world. Some of the results from the 2016 field work will be published in the next two years, but to get a bigger picture of the geology of the whole region, the scientists will need up to five years to publish their findings.

Vavrek, Matthew J.
Royal Ontario Museum
Grande Prairie, AB
matthew@matthewvavrek.com

File No: 12 404 801
Region: IN

Licence No: 15770
Location: Anderson River (69.3°N, 128.3°W)

Vertebrates of the ancient Arctic seas: palaeontology of the late cretaceous Anderson River formation, northern Northwest Territories, Canada

The goal of this project was to collect and study fossils from the lower Anderson River area. Scientists checked this area for fossils once before in 1964, and found an abundance of them at that time. However, it has not been visited by paleontologists since then. So for approximately three weeks in August 2016, a field crew consisting of members from several Canadian and American institutions conducted field work in the area. They travelled about 220 km due west of Inuvik by helicopter. Once there, they searched the nearby exposed rocks for any fossils. The

researchers found a lot of fossils at multiple sites, with the fossils coming from many types of marine animals such as fish and swimming birds. They also found fossils from extinct animals that were like dinosaurs living in the sea, called mosasaurs and plesiosaurs. The researchers collected most of the fossils they found, but a few were too large and could not be fully excavated and recovered so their location was recorded carefully. The fossils are being sorted and cleaned at the University of Alberta before they are transferred to the Royal Ontario Museum. The researchers will continue to study the fossils.

Wells, David A.
Diavik Diamond Mine (2012) Inc.
Yellowknife, NT
David.Wells@riotinto.com

File No: 12 404 809
Region: NS

Licence No: 15946
Location: Lac de Gras (64°30”N, 110°30”W)

Diavik aquatics effects monitoring program

In 2016, Diavik Diamond Mines continued its ongoing Aquatic Effects Monitoring Program to check on how the mine is affecting the water, sediment, and aquatic life in Lac de Gras. Dust or water discharge from the mine may affect the water in the lake, or the plants and animals that live there. Throughout the year, the researcher measured how much dust was deposited at 12 different sites around the lake. Also, snow samples were collected in late winter at 27 different sites to check for dustfall on the snow, and to record snow water chemistry. In addition, the researcher took water samples from the lake at various times, locations, and depths to measure water chemistry and check for pollution. The water chemistry can be used to see if the waterbodies are changing or are becoming polluted over time. The researcher also took samples to see if the plants and animals in the lake are changing or being impacted by the mine. These samples included lakebed sediment, small fish, and the tiny plants and animals living in the water. In the late summer, samples were also taken of the bottom-dwelling animals in both lakes. These samples will show if there is an effect on the plants and animals in the lake, including metal contaminants in the flesh of fish. The annual report for this project is available on the Wek’eezhii Land and water Board registry.

Whalen, Dustin J.R.
Geological Survey of Canada
Dartmouth, NS
dustin.whalen@canada.ca

File No: 12 404 798
Region: IN

Licence No: 15915
Location: Ellice Island, Garry Island, Pelly Island, Hooper Island, Kendal Island, East Whitefish, Tuktoyaktuk, Toker Point, McKinley Bay South, Russell Inlet, Tuft Point, Cape Dalhousie, Cape Bathurst, Taglu Island, Kumak Channel, Napoiak Channel, Reindeer Channel, Langley Island, Kuluarpak Channel

Beaufort Sea coastal geoscience research

There are two main components to this research project, which builds upon previous similar projects. For the first component, the research team is monitoring how quickly the shorelines are eroding at certain sites along the Beaufort Sea. The researchers used remote-control aerial

vehicles (drones) to fly over the coastline and take air photographs of ten coastal monitoring sites. The air photos were converted to a three-dimensional computer map of the shoreline. This allowed the researchers to figure out how much of the coast has eroded at a number of key sites in the Inuvialuit Settlement Region. Before, they could only measure how far the shoreline had advanced, not the volume of earth that was eroded. The research team focussed on ice-rich cliffs that were more than ten meters high. They found that since 2000, the rate of coastal erosion has increased between 20 to 200%. For the second project component, the research team looked at how weather systems over the ocean change the ocean's temperature. Partnering with the Aurora Research Institute, the researchers found that sustained winds seem to change the local water temperature and depth in Kugmallit Bay. For example, during a major July storm winds reached 60 km per hour and caused a cold ocean surge 1.2 m (about 4 feet) high towards the shore. During the same storm the water temperature dropped over eight degrees in just 48 hours.

White, Brenda M.
ConocoPhillips Canada Resources Corp.
Calgary, AB
Brenda.M.White@conocophillips.com

File No: 12 404 899
Region: SA

Licence No: 15810
Location: The Central Mackenzie Valley, 64.45N to 65.25N and 126.40W to 127.30W

Environmental studies for EL470 - 5yr

The broad purpose of this ongoing project is to monitor ConocoPhillips lease site EL470 to ensure that the company is following environmental protection provisions. The company had drilled two vertical exploration wells in 2012-2013 and two horizontal wells in 2013-2014. The wells were abandoned during the winter of 2015-16. The two goals of the 2016 surface water quality program were to understand normal variations in water quality during the annual "open water" (ice-free) period, and to see if there were any changes in surface water quality during site operations. To meet these goals, the research team monitored surface water quality from August 16 to 19. They collected water samples from 25 locations. Eleven were watercourses such as rivers, streams, and creeks. Fourteen were waterbodies such as lakes, ponds, and sloughs. The samples were analyzed in a lab. The research team found that there are variations in water quality between years, waterbodies, and drainage basins. In some cases, the pollution levels were above Canadian Environmental Quality guideline values. In some cases, the high levels of pollution were found in water samples from locations that were not impacted by ConocoPhillips' operations ("undisturbed"), but were also found in samples from locations near ConocoPhillips' operations ("disturbed").

Wiese, Francis
Stantec Inc.
Anchorage, AK
francis.wiese@stantec.com

File No: 12 404 919
Region: IN

Licence No: 15945
Location: Beaufort Sea

Marine Arctic ecosystem study (MARES)

The goal of this project is to use specialized underwater equipment to record information about the ocean, such as water chemistry and other characteristics of the water. The project uses two types of underwater instruments. The first is a glider, which can stay out in the ocean for weeks

at a time, moving around slowly and taking measurements. It moves through the currents using changes in bouyancy, not an engine of any sort. The researchers are also setting out 'moorings'. Moorings are recording instruments that are anchored in one spot. In mid-August the research team released a glider near Kaktovik, Alaska. It was equipped with sensors to measure ocean currents, temperature, salinity, oxygen, and plankton, the tiny plants and animals that live in the ocean. The glider was directed east, and spent most of its time in the Mackenzie River-Yukon shelf area. It was picked up in early October by a ship in the area, the CCGS Sir Wilfrid Laurier. The information it collected will be examined over the next several months. The Laurier spent four days in this area with other team members on board. They set up five moorings across the shelf west of the Mackenzie trough at depths between 25 and 440 m. They also collected seabed and water samples. The moorings will stay there until next October, and will measure various chemical, physical, and biological water characteristics throughout the year. Together, all these measurments will help us figure out how the different part of the ocean in this area fit together and that relates to the amount and type of species that live in the ocean floor.

Williams, Michael L.
University of Massachusetts
Amherst, MA
mlw@geo.umass.edu

File No: 12 404 915
Region: SS

Licence No: 15926
Location: Snowbird Lake (60.541003"N, 103.091536"W) and Kasba Lake (60.461773"N, 102.271238"W)

Geology of the Snowbird zone, Saskatchewan and NWT

The research team was unable to conduct any research in 2016 because of illness and availability of team members. A new license application has been submitted for 2017. The team hopes to conduct a very short visit to the NWT in 2017 in order to complete their research.

Wolf, Calvin
ConocoPhillips Canada
Calgary, AB
Calvin.R.Wolf@conocophillips.com

File No: 12 404 908
Region: IN

Licence No: 15884
Location: Tarsuit Caissons (69°34'13"N, 138°58'19"W)

Thetis Bay bathymetric survey and benthic sampling

ConocoPhillips conducted Surveys within Federal Lease 117D/11-3-7 during September 2016 in preparation for the removal or disposal of Tarsuit Caissons in 2017. Analysis of materials determined that the Caisson concrete and sand ballast were non-hazardous and marine growth was non-invasive posing no restrictions for removal or disposal. Seabed sediment analysis revealed that the sediment near the Caissons was consistent with regional marine sediments. Benthic surveys near the Caissons showed no significant difference from locations near the Lease edge. Based on the results of material samples of Caisson sand ballast, concrete, marine growth and benthic organisms from seabed sediments, ConocoPhillips found that there were no hazardous materials that would need to be managed during removal or disposal of the Caissons and seabed sediment near the Caissons was not significantly impacted by their presence.

Wolfe, Stephen A.
Natural Resources Canada
Ottawa, ON
swolfe@nrcan.gc.ca

File No: 12 404 549
Region: NS

Licence No: 15804
Location: Ingraham Trail to Contwoyto Winter Road

North Slave permafrost study: characterizing and predicting discontinuous permafrost for climate change adaptation

The purpose of this multi-year research program is to measure ground tempatures in discontinuous permafrost, and to see how underground temperatures change when there is a forest fire over the permafrost. To meet this goal, the research team conducted field work in the Great Slave region during June and September, 2016. They visited research sites along Hwy 3 and 4, along the Tibbitt to Contwoyto Winter Road as far as Lockhart Lake, and at Whitebeach Point. They monitored 'icings', or winter overland flow, at five sites. In addition, they measured the ground temperature at a number of sites, including forest peatland, bare sand sites, winter roads, and burn sites. The team also set up new monitoring sites within recently burned areas at three locations: Lucky Lake, east of the Discovery Mine site; Boundary Creek, 20 km north of Hwy 3; and along the Ingraham Trail near Tibbitt Lake. Finally, the research team continued to monitor a recent thaw slump along the Yellowknife River.

Woodward, Robert
IRIS - Incorporated Research Institutions for Seismology
Washington DC
woodward@iris.edu

File No: 12 404 837
Region: IN, GW

Licence No: 15840
Location: (71.992197°N, 125.261721°W), (69.34763°N, 124.07056°W), (69.51494°N, 132.82442°W), (68.4945°N, 135.84372°W), (68.31°N, 133.53°W), (67.61056°N, 135.78655°W), (67.44096°N, 133.74193°W)

EarthScope transportable array

The goal of the EarthScope project is to study earthquakes and volanoes in North America to understand how the continent was created over millions of years, and to understand how it continues to change. To do this, the researchers are installing and maintaining a network of special earthquake sensors across North America. Sometimes these sensors, which are installed at research stations, need to be visited for maintenance. Other times, the researchers add new stations. In 2016, researchers installed a new station called F31M at the Tsiigehtchic Visitor Center.

Social Sciences

Photos: Top – 1) Stories of Hope, discussion circle with B. Ed. students on the path forward in decolonizing education (Pine Lake, Wood Buffalo National Park) (credit: Rosolen, S.);
Bottom – 2) Stories of Hope, retreat with research partners and community research teams from across Canada (Pine Lake, Wood Buffalo National Park) (credit: Chaillon, P.)

Abele, Frances
Carleton University
Ottawa, ON
Frances.Abele@carleton.ca

File No: 12 410 139
Region: SA, NS

Licence No: 15839
Location: Yellowknife, Behchokǫ̀, Délı̨nę

Review and impact analysis: Health Canada Climate Change Health Adaptation Program
Climate change is affecting northern Canada earlier and with more intensity than most other parts of the world. Harvesting, travel, roads, buildings, and water systems are all affected. Health Canada's Climate Change Health Adaptation Program (CCHAP) was a federal program that supported nearly 100 northern community research projects that investigated the health impacts of climate change. The program was unusual because it directly funded community research projects, and left funding decisions to northern granting committees. The goal of this study was to look at the impacts of the CCHAP funding in Nunavut, NWT, and Yukon. It showed that community research projects got useful results. These results covered a wide range of areas, including water quality, weather, food gathering, and food growing, as well as fishing and hunting. The study found that many communities have excellent capacity to conduct research on the health impacts of climate change, and have new ways of communicating the results using websites, videos, workshops, and publications. Many projects engaged elders and youth effectively, so that science and traditional knowledge worked together. The program also had weaknesses. The most important of these was that multi-year funding was not available. People had to apply each year, with no guarantee of funding from year-to-year. In summer 2017, a study report will be sent to the people who helped with the research. After that, the report will be available to anyone who requests a copy.

Adams, Sheena E.
Royal Roads University
Inuvik, NT
inuvik@aea.nt.ca

File No: 12 410 1074
Region: IN

Licence No: 15975
Location: Aklavik, Uluhkhaktok, Inuvik, Sachs Harbour, Tuktoyaktuk, Paulatuk

Inuvialuktun energy terminology development
The goal of this project is to create new Inuvialuktun words to describe topics relating to energy. These words will be used in the Inuvialuit Settlement Region for education and communication about energy conservation, efficiency, and renewable energy. When all approvals are in place, the researcher will hold a workshop with Inuvialuit elders from each community and translators to record these words. The workshop will be held in March 2017.

Amprako, Francis
Ft. Liard, NT
amprako@northwestel.net

File No: 12 410 1058
Region: IN, GW, SA, DC, NS, SS

Licence No: 15889
Location: Kakisa, Yellowknife, Ft. Providence, Ft. Good Hope, Tsiigehtchic, Inuvik

Teachers' stories: culturally responsive teaching of indigenous students in the Northwest Territories

The goal of this project is to study how teachers can be culturally sensitive with their students, and at the same time, ensure their students do well in school. To study this, the researchers spoke with teachers about their goals and experiences. The teachers were all actively trying to reduce the gap in education outcomes, such as grades and graduation rates, between the NWT's indigenous students and the rest of Canada. The research team found there were some common themes in how teachers approached this. The researchers heard about the importance of preparation, teaching style, and community compatability and support. They also found the teachers were more open-minded towards different ways of learning as well as with other peoples' worldviews. Teachers felt that indigenous practices should be encouraged in the education of NWT indigenous students. The teachers also talked about some issues that are preventing educational success, like the legacy from residential schools, issues with the whole school system, and a lack of support. The teachers also suggested that the grading of Indigenous students should match their way of life. They said there was a need for more mentorships and educational opportunities for cross-cultural education for teachers. The teachers agreed that it is bad to interpret the world solely in terms of European or Anglo-American values and experiences. The researchers and the teachers they spoke with recommend that students are involved in their education. Additionally, they found that teachers need more help and education. Also, that culturally responsive teaching is not just about Native foods, dressing, and dancing; it should include high, achievable academic expectations of the students.

Bennett, Mia
University of California Los Angeles
Los Angeles, CA
mbenett8@gmail.com

File No: 12 410 1049 **Licence No:** 15842
Region: IN, NS **Location:** Inuvik, Tuktoyaktuk, Yellowknife

Geometries of an Arctic highway: transforming the last frontier into a global resource frontier

The goal of this project was to find out how the people living in, or coming from, Inuvik, Yellowknife, and Tuktoyaktuk feel about the new Arctic highway which will provide an all-weather route between Yellowknife and Tuktoyaktuk. The researcher carried out more than 25 interviews with a variety of individuals, including representatives from municipal and territorial governments, indigenous corporations and organizations, and other community groups. The researcher also spoke with residents from diverse backgrounds, ranging from those born and raised in the area who hunt, trap, and fish, to people who moved up from the South for work. Over the course of the interviews, the researcher learned that most people in Inuvik and Tuktoyaktuk support the highway, largely because it will lower the cost of groceries and make it easier to travel. However, many people expressed concerns over the highway's route, noting that it goes too close to Husky Lakes. Many people were also worried about an increase in alcohol. Women tended to highlight the risk of kidnapping and crime due to strangers coming by highway into Tuktoyaktuk. People were generally hopeful that it would improve the potential for tourism, but did not believe that oil and gas development would boom as a result of its construction.

Bonamy, Morgane M.B.
Universite de Montreal
Montreal, QC
morgane.bonamy@umontreal.ca

File No: 12 410 981
Region: NS, SS

Licence No: 15861
Location: Gaméti, Behchokǫ̀, Wekweètì, Whatì, Yellowknife, Detah, Ndilo

Wolverine (*Gulo gulo*) conservation and perceptions by local populations: case studies in Quebec and the Northwest Territories, Canada

Métis and Dene people in the North were interviewed to learn about wolverine, and to see how they felt about them. The goal of the research was to improve the researcher's knowledge and understanding of the relationship between First Nation's people and wolverine. The researcher used a few different techniques during this study: formal interviews, surveys, and participant observation, which means actively living with and observing a community. This combination of different methods gave the researcher a better understanding of the relationship between people and wolverine. Field work started in 2014 when kids at northern schools were surveyed about wolverine. In 2016, 14 formal interviews were conducted by phone in Ft. Smith and 13 additional surveys were conducted in person in Ndilo and Detah. Interviews were in English and the recordings were later transcribed. Interviews lasted between 15 minutes and 2 hours, and included questions about climate change, carnivores in general, wolverines, conservation, hunting practices, and other topics. The survey forms were four pages long with some fill-in-the-blank questions and some short answer ones. The researcher used a special anthropological research technique to review the transcripts and find out what topics people discussed the most, and in what ways.

Coates, Ken S.
University of Saskatchewan
Saskatoon, SK
ken.coats@usask.ca

File No: 12 410 1051
Region: IN, GW, SA, NS, SS

Licence No: 15850
Location: Ft. Good Hope, Inuvik, Ft. McPherson, Ft. Resolution, Behchokǫ̀, Yellowknife

Northern and indigenous peoples and the prospects for nuclear energy

Northerners need new energy sources. Renewable energy sources like solar power and wind are attracting a great deal of international attention, but are less useful or cost effective in northern, sub-Arctic and Arctic regions. The goal of this research project was to interview northern leaders across the NWT to see how they feel about having nuclear energy plants in their communities. The researcher found that northern leaders do feel that the high cost of energy is a problem for northerners. The researcher also found that concern about climate change has changed public attitudes toward alternate energy systems. People are mostly positive about renewable resources, however, as there is considerable indigenous and northern resistance to uranium mining and nuclear energy, although this is not uniform. There was some openness to nuclear energy generation because of the lower cost, reliability, and safety of existing systems. The researcher found that northern leaders' knowledge about uranium mining and nuclear energy come from listening to public debates about this topic, and that they are not well-informed. Overall, the people who want small nuclear generation in northern communities will have to overcome existing concerns about uranium mining and nuclear energy, even if new systems are very different from old ones. While more research is required, particularly at the community level, the researcher found that there does appear to be a considerable openness to talking about nuclear options in the north.

Cohen, Alice
Acadia University
Wolfville, NS
alice.cohen@acadiau.ca

File No: 12 410 991 **Licence No:** 15796
Region: DC, NS, SS **Location:** Yellowknife, Hay River, Ft. Resolution

Northern spaces: resource governance in the southern Northwest Territories
This research project is about how water policy and programs in the NWT deal with uncertainty. In June 2016 a member of the research team traveled to Yellowknife, Hay River, and Ft. Resolution to conduct about a dozen interviews with various government officials on the subject of water governance in the NWT. They found that there is growing interest in, and support for, community-based water monitoring programs, especially to find out more about the potential effects of climate change and industrial development. In a separate project component, the research team carried out a Canada-wide survey of community-based monitoring organizations. They decided to do this survey because, although there are a number of resources available about how to set up community-based monitoring programs, there are many unanswered questions about how they have actually been implemented across Canada. For example, it was not known how many programs existed, how they were funded, or what they were monitoring. The results of the survey were published in a report, and will also be published in an academic journal.

Compton, Mary E.
University of Western Ontario
London, ON
mcompto@uwo.ca

File No: 12 410 1027 **Licence No:** 15809
Region: IN, NS **Location:** Yellowknife, Sachs Harbour, Inuvik

Representation and replication: the digital presentation of archaeological artifacts, a community case study for Banks Island, NWT
The goal of this project is to work with Sachs Harbour community members, especially youth, to make replicas or copies of archaeological artifacts that are stored in the museum, and to record elders' stories about the artifacts. In the summer of 2016, the project team held interviews and focus groups with 15 new participants in Inuvik and Yellowknife. They also held follow-up interviews with the seven participants from 2015. The interviewees shared a lot of information about the importance of artifacts and their replicas. Interviewees said that artifacts and replicas can inspire the adults and youth in Sachs Harbour to re-make ancestral items, or share knowledge for cultural revitalization. The interviewees also talked about the importance of connecting with both artifacts and replicas through storytelling. The researchers found a large diversity of perspectives about how real replicas are seen. The research team made a presentation about the project at the 2016 Canadian Archaeological Association annual meeting in Whitehorse. Members of the Sachs Harbour community were also given an update on the research in May 2016. Throughout this project, results have been shared with community members in Sachs Harbour in-person during community meetings, as well as digitally on the Ikaahuk Archaeology Project Facebook page. The knowledge and perspectives provided by community members as part of this project will guide the future Ikaahuk Archaeology Project website, which is currently in development. The website will be a place where people can continue to discuss the project, the artifacts, and the replicas.

Conrad, Diane H.
University of Alberta
Edmonton, AB
diane.conrad@ualberta.ca

File No: 12 410 944
Region: SA, NS, IN

Licence No: 15769
Location: Ft. Good Hope, Inuvik, Ft. McPherson, Ft. Resolution, Behchokǫ̀, Yellowknife

Aboriginal youth stories of culture, identity, community & place: a rural/urban educational youth exchange through performing arts & technology

The goal of this project is to see how partnerships between university researchers and schools in indiginouscommunities can improve the educational experiences and successes of aboriginal learners, improve the education system, and improve aboriginal people's lives. One member of the research team spent three months, from September to November 2015, working at the Chief T'Selehye School in Ft. Good Hope. This researcher began the project with the teacher of the grade 5/6 class. The project continued in 2016. The research team also worked with two partner schools in Edmonton and on the Kainai Reserve in Alberta. Students in the three schools worked on art projects about their sense of identity, culture, community, and place, which they shared with students from the other schools on the project website. The research team looked at maps of the region and identified and named (in English and North Slavey) places that were significant for families. The teacher and other colleagues continued this work during the rest of the school year, including work on family genealogies, heritage fair projects, and on-the-land activities. The researchers hosted a feast in summer 2016 to provide an update about the project to the community, and took the youth on a week-long camp out. During the last school year, and continuing during this one, the researchers are holding video chats between students from the three schools.

D'Hont, Thomsen
Walter & Duncan Gordon Foundation
Yellowknife, NT
thomsen@dhont.ca

File No: 12 410 1079
Region: NS

Licence No: 15981
Location: Yellowknife

Social accountability of the Canadian medical education system to indigenous students from the Northwest Territories

The goal of this research project is to study what helps indigenous students from the NWT on their journey to become medical doctors. The researcher conducted nine interviews with undergraduate university students, medical trainees, and practicing doctors who are from the NWT and are indigenous. These interviews were recorded. At this time, the researcher is still analyzing the recordings for themes, and the results have not yet been validated by the people who were interviewed. The researcher will write an article about the study results over the coming months with the intent of publishing the findings in an academic journal.

Dutton, Jessica
South Slave Research Centre
Ft. Smith, NT
jdutton@auroracollege.nt.ca

File No: 12 410 1075
Region: SS

Licence No: 15976
Location: Ft. Smith, Ft. Fitzgerald, Bell Rock, Salt River

Homegrown harvest: local food production in Ft. Smith, NT
The goal of this project was to study both the production and purchase of locally-grown or produced food in Ft. Smith, such as vegetables, fruit, jams and jellies, and meat. The research team conducted interviews with local food producers such as gardeners, hunters, and farmers, and also surveyed consumers. Interviewees and survey participants were recruited using an invitation that was sent out by community organizations and posted on social media. Eight producers were interviewed and 53 Ft. Smith residents responded to the consumer survey. In the producer interviews, the research team asked what kinds of food products the interviewees were selling, what their marketing strategy was, where they sold their goods, growth opportunities, and barriers they have encountered. In the consumer survey, the team asked about local food purchasing habits, what the most in-demand local foods were, and local food preferences. The research team used mapping software to create the 'HomeGrown Harvest Map of Ft. Smith's Local Food'. The map shows what is being produced and what people are buying, how producers and consumers are finding each other, and what influences their decisions. The team hopes their map will be useful for producers and others who want this sector of the local economy to grow. The research team also developed the 'HomeGrown Harvest Guide to Mapping the Local Food Market in NWT Communities', as a guide for others who may want to map local food markets in other NWT communities.

Edge, Lois E.
Indspire
Edmonton, AB
loisedge@gmail.com

File No: 12 410 807
Region: DC

Licence No: 15954
Location: Ft. Providence

Deh Gah School: on the land education
Located at Ft. Providence in Dehcho Territory in the southeastern corner of the Northwest Territories, Deh Gah Elementary and Secondary School is implementing a successful On the Land Education initiative. By making changes to scheduling of the school calendar year, adjustments to curriculum and program of study, Indigenous students are graduating from high school to pursue post-secondary education opportunities. Supported by long-term partnerships with the Department of Education, Culture and Employment, Government of Northwest Territories, Dehcho Divisional Education Council and Dehcho First Nations, Deh Gah Elementary and Secondary School is leading the way in support of teaching and learning of Dene language, culture, heritage and life ways to Dene, Métis and non-Dene students and families in the community. Outcomes include increased school attendance, course completion rates, number of credits earned as well as increased student performance and retention.

Erasmus, Lila M.
University of Victoria
Yellowknife, NT
lila.erasmus@outlook.com

File No: 12 410 1054
Region: SA

Licence No: 15868
Location: Délı̨nę

Can Dene ways of resolving conflicts and building peace inform governing structures?
The goal of this project is to try to answer the question: by what principles, processes, and mechanisms do the Dene traditionally build peace within communities? In addition, the researcher has two sub-questions: are Dene principles of peace-building incorporated within the Déline Self-Government Agreement and Constitution? And, how can Dene principles be used in the programs and services that the Dene intend to offer? This study is being carried out on behalf of the Dene Nation of the Northwest Territories. To answer these questions, the researcher checked the reports and knowledge from previous studies and then conducted interviews. The information gathered was carefully catalogued into three themes. First, when it comes to any level of government intervening on someone's behalf, what were the kinds of disputes that called for intervention (principles)? Second, when a government intervention must happen, who was responsible for intervening (processes)? Third, how did they intervene (mechanisms)? The researcher studied conflict using three lenses, or ways of viewing the conflict. Lens 1 is the presenting situation, Lens 2 is the horizon of the future, and Lens 3 is the way a process to change things will be developed. The Déline Ɂehdzo Got'ı̨nę Government was used as a case study, and recommendations were based upon suggestions from the interviews with leaders and elders from Dél ı̨nę.

Evenden, Matthew
University of British Columbia
Vancouver, BC
matthew.evenden@ubc.ca

File No: 12 410 1045 **Licence No:** 15817
Region: NS **Location:** Yellowknife

Impact as a political technology of the settler state: an account of land and territory in Denendeh
This research looked at the history of political change in Denendeh in the 1960s, 1970s, and 1980s. It included the study of archival documents at the Prince of Wales Northern Heritage Centre, and books and reports from the Legislature Library in Yellowknife. The researcher also interviewed people in and around Yellowknife who were active in the movement during that time. The purpose was to learn about the history of the Indian Brotherhood of the NWT, and projects such as the Dene Mapping Project and the land claims research project. Subjects of study also included the construction of the Mackenzie Highway and roads in the NWT, the Mackenzie Valley Pipeline Inquiry of the 1970s, and many of the Royal Commissions carried out over the years. The research also looked at the division of the Northwest Territories, and the history of the Government of the NWT. This research is being used to prepare a doctoral dissertation in the fields of political science and geography, but it also includes a great deal of historical information that will hopefully be interesting to people who want to learn more about it.

Ford, James D.
McGill University
Montreal, QC
james.ford@mcgill.ca

File No: 12 410 1078 **Licence No:** 15980
Region: IN, SS **Location:** Inuvik and Ft. Smith

A conceptual model for best practice in environmental knowledge translation in indigenous communities

The researcher looked at previous studies and conducted interviews to see how best to share knowledge when working with Arctic communities in North America. This sharing of knowledge is known as “knowledge mobilization”. The 24 interviewees included university-based researchers, indigenous research organizations, research licensing bodies, and national funding agencies across the North American Arctic. The researcher found that meaningful and trusting research relationships are important for knowledge mobilization. Ideally, these relationships should be long-term and have strong community input (for example, strong community input might mean the community provides research questions, does field work, analyzes results, and presents results). Many felt that working with communities from the beginning (ideally to design research) could improve the relevance of research projects to communities, and would help incorporate different ways of knowing. The researcher found that translation of the research into local languages was considered important. In addition, research agreements and licenses are used to ensure community approval and limit community risks from research. However, there are also informal expectations between individual researchers and community members on how research should be conducted. The key challenges in achieving these ideals are short-term funding cycles, researchers lacking effective communication skills, and limited capacity at the local level to be involved in all research taking place in the community. Finally, most projects do not check how well knowledge is shared with local communities. This can make it difficult to learn and improve.

Frigault, Julia S.
University of Ottawa
Ottawa, ON
jfrig012@uottawa.ca

File No: 12 410 1066 **Licence No:** 15953
Region: IN **Location:** Inuvik

Culturally safe falls prevention programs for Inuvialuit elders

With the growing global rate of fall-related injuries among senior populations, it is clear that programs to help prevent falls are needed. Research has shown that these programs are beneficial to the elderly; however, researchers have not yet studied how being Inuit, and living in Inuit communities, may change the likelihood of experiencing fall-related injuries. Researchers have also not studied how falls prevention programs can be made culturally safe (in other words, aware of the factors that may influence participants’ day-to-day lives). For this study, the researcher used Inuvik as a case study to see which factors Inuit elders believed were the most important to preventing falls. The researcher also worked with the elders to identify elements that would make a falls prevention program culturally safe for them. This community-based approach included living in the community and interviewing eight elders and six local falls prevention workers. The researcher learned that falls prevention programs are not yet Inuit in nature, but are still western by design. Discussions with participants also showed that they supported the idea of cultural safety; however, they felt that their community provided strong programming.

Giles, Audrey R.
University of Ottawa
Ottawa, ON
audrey.giles@uottawa.ca

File No: 12 410 1014 **Licence No:** 15823
Region: IN, DC, NS **Location:** Délı̨nę, Inuvik, Ft. Simpson

Understanding and addressing males' boating safety practices in the Northwest Territories

The goal of this research is to find out why boating safety practices may be ignored by men, and how best to change their behaviour in order to save lives. The research team worked with three communities: Inuvik, Dél̨nę, and Ft. Simpson. The researchers first looked at what was causing boating accidents in Inuvik. They wanted to see how to promote healthy living and prevent injuries. The researchers found that men in Inuvik believe there are four main risk factors for boating accidents: gender, age, and place, were the first three risks, and the final risk factor was a lack of enforcement, knowledge, and preparation. Importantly, understanding the specific risk factors from aboriginal men's perspectives may lead to health promotion or injury prevention activities that are culturally safe and more meaningful and effective. The researchers also found that there are many indiginouspeoples from Dél̨nę and Ft. Simpson who are making risky decisions when boating, though the behviour differs between communities. They also found that boating is a part of aboriginal peoples' culture, and it serves a different purpose to aboriginal peoples compared to non-aboriginal peoples. Finally, they found that community members want programs that are made for them, both culturally and geographically.

Gingras, Nathalie
University of Waterloo
Waterloo, ON
n2gingras@uwaterloo.ca

File No: 12 410 1080 **Licence No:** 15990
Region: NS **Location:** Yellowknife

Integrating mine legacies into decision making for sustainability in the Northwest Territories: an assessment of the Mackenzie Valley Resource Management Act

Canada has a long history of negative impacts (or legacies) resulting from mining activities. The goal of this project is to see how the environmental assessment process in the Northwest Territories can help northern communities decide whether mining projects would lead to greater long-term sustainability, such as more jobs and a better economy in the region. This project builds upon a lot of previous research about how to make developments like mines more sustainable. The NWT was chosen as the study region for a few different reasons. First, it has an economically significant mining sector. Second, the residents of the NWT have concerns about development. And third, the NWT has a different way of approaching development, with a lot of checks and balances that are not always found in other areas. This project involved fieldwork conducted in Yellowknife over a period of ten days in December 2016. The researcher interviewed territorial and indigenous representatives, administrative and regulatory officers, industry representatives, and other stakeholders. These interviews confirmed what the researcher found when reviewing previous studies, and helped identify weaknesses and potential improvements within the current mining regime.

Grimwood, Bryan S. R.
University of Waterloo
Waterloo, ON
bgrimwood@uwaterloo.ca

File No: 12 410 976 **Licence No:** 15865
Region: SS **Location:** Łutsel K'e, Artillery Lake, Whitefish Lake

Picturing the Thelon River: Restor(y)ing Denesoline relations en route to the headwaters (continued)
No research was conducted under this licence in 2016.

Hall, Teall S.
Carleton University
Ottawa, ON
teallhall@cmail.carleton.ca

File No: 12 410 1065
Region: DC

Licence No: 15952
Location: Yellowknife

Borderless waters: an evaluation of indigenous perspectives in the Mackenzie River Basin transboundary agreements
The goal of this project was to find out how different people were included during the development of the water strategy for the NWT portion of the Mackenzie River Basin Bilateral Water Management Agreement. This is an agreement between the governments of the NWT and Alberta. The researcher interviewed key informants to obtain information. Interviewees were asked about the negotiation processes for this agreement to see how different groups were consulted. Less than ten participants were contacted. The researcher is using the information from the interviews to write a Masters thesis project. This project is in the final stages of writing and editing and will be finished in February 2018.

Horowitz, Wayne
The Hebrew University of Jerusalem
Jerusalem, Jerusalem
wayne.horowitz@mail.huji.ac.il

File No: 12 410 903
Region: GW

Licence No: 15901
Location: Aklavik, Inuvik, Ft. McPherson, Tsiigehtchic

The sounds of Tukudh
The goal of this project is to preserve the sounds of the Tukudh dialect of Gwich'in for future generations. The word Tukudh is often pronounced "Dagoo" by Gwich'in speakers, both of the Teetł'it and Gwichya dialects. It is a joint project of the Cultural Heritage Division of the Gwich'in Tribal Council (GTC) and the Hebrew University. The Tukudh dialect, or perhaps better the Tukudh writing system for the Gwich'in language, is best represented by the Tukudh Bible and Hymnal of Archdeacon McDonald that were translated and published in the late 1800s. With the adoption of the current writing system for Gwich'in in the middle of the 20th century, knowledge of how to read the Tukudh writing system waned despite the fact that the Tukudh Bible and Hymnal has remained in use in the holy liturgy of the Anglican Church communities, including Ft. McPherson and Old Crow. There is a full reading of the Tukudh Bible by Sarah Simon of Ft. McPherson on tape at the Yukon Native Language Center in Whitehorse. During this project, the tapes were converted to computer files, making the Sarah Simon readings available for future generations. These recordings have now been completed, and full sets of the recordings will soon be made available to the Aurora Research Institute, the GTC Department of Cultural Heritage, the GTC Gwich'in Language Centre, and the Gwich'in communities of the Northwest Territories.

Jaker, Alessandro M.
Alaska Native Language Center
New Brighton, MN

amjaker@gmail.com

File No: 12 410 648 **Licence No:** 15973
Region: NS, SS **Location:** Detah, Ndilo, Łutsel K'e

The verb system of Tetsot'ine Yatie (Yellowknife): Łutsel K'e, Detah, and Ndilo dialects
The goal of this project is to study the verbs of the Łutsel K'e, Detah, and Ndilo dialects spoken in Yellowknife. Verbs are action words, such as "to fish", "to walk", and "to think". Work on this project only recently started. However, the researcher has already begun to work with one elder, and will soon start working with two youth assistants from the community. The youth assistants will learn about the language, and will also learn computer skills, including how to correctly type Dene languages into computer programs, how to cut up sound files, and how to measure sounds using a speech and language research program called "Praat". However, there are no major results to report so far.

Kuntz, Janelle
University of Victoria
Victoria, BC
janellek@uvic.ca

File No: 12 410 1040 **Licence No:** 15764
Region: NS **Location:** Behchokǫ̀

Tłı̨chǫ women and traditional knowledge in the environmental assessment of the NICO Project proposed by Fortune Minerals Limited
The goal of this project is to study the participation of Tłı̨chǫ women in the environmental assessment of the NICO project. This is a mine that was proposed by Fortune Minerals Limited. The environmental assessment happened in 2012 and set a whole new standard for engagement between traditional knowledge and western science. Although it did not take a gendered approach, Tłı̨chǫ women's stories and participation in the environmental assessment supported the Tłı̨chǫ Government's interests in the review process and in the final 'mitigation measures'. Mitigation measures are things that the mine must do to reduce its impact on the people and the land. Academic studies do not typically include Indigenous women as participants in, or beneficiaries of, the environmental assessment of mines or other industrial developments. Results from this project show that each case must be considered by itself, and by a researcher who spends time in the communities in question. This is called "ethnographic" research. Ethnographic methods in this project showed the culturally specific, diverse, and complex ways Tłı̨chǫ women participated in, and shared their stories, during the NICO project assessment. Tłı̨chǫ women's stories were found to be important and relevant to the Mackenzie Valley Environmental Impact Review Board's assessment of the potential social and ecological impacts of the NICO project. To conclude, this environmental assessment is a good example of indigenous women's power within a regulatory process, and this research suggests ways to incorporate a gender-based research approach into future environmental assessment processes.

Lacoursiere, Marie-Soleil
University of Saskatchewan
Yellowknife, NT
mariesoleillacoursiere@yahoo.ca

File No: 12 410 1064 **Licence No:** 15951
Region: NS **Location:** Yellowknife

Community renewable energy projects in the NWT
The purpose of this research project was to document ways that northern First Nation communities and utility companies could work together to start new renewable energy projects in the north. The researcher found that there are three different types of partnerships. First, community-based renewable energy projects, where the community is the main stakeholder and the utility company plays a supporting role. The solar panels that were set up in Łutsel K'e were used as a case study of this partnership model. Second, utility-driven projects, where the utility company is the main stakeholder and the community plays a supporting role. The Colville Lake solar panel project led by NTPC was used as a case study of this partnership model. Finally, there are also equity partnerships, where communities and utility companies work together as true collaborators. The Black Lake underground hydroelectric turbine project in Saskatchewan was used as the case study for this model. Overall, this project has found that each of these models has advantages and may be appropriate in a given context. In the future when designing policy, governments and utility companies should be aware that one approach does not fit all, and that all three models should be equally encouraged.

Latta, Alex
Wilfrid Laurier University
Waterloo, ON
alatta@wlu.ca

File No: 12 410 1076
Region: DC

Licence No: 15978
Location: Ft. Providence, Ft. Simpson, Jean Marie River, Nahanni Butte, Trout Lake, Wrigley, West Point, Kakisa

Dehcho K'ehodi needs and assets inventory
The goal of this research project was to ask community members several important questions about a Dehcho First Nations land and water stewardship initiative called Dehcho K'ehodi. The first set of questions was about what parts of the territory are most important for communities, and what kinds of threats those areas face. Answering these questions will help the Dehcho monitor their land and water. The second set of questions were aimed at assessing whether the communities are prepared to participate in Dehcho K'ehodi. The researchers asked participants to describe their communities' assets and needs. Assets included infrastructure such as buildings, equipment, and human resources. Finally, the researchers asked participants about their visions and ideas for Dehcho K'ehodi programming. The questions were posed by a community-based research assistant, who conducted interviews and small focus group discussions with key leaders and knowledge holders from nine different communities in the Dehcho region. In total, twenty-four community members participated in the research. The interviews were recorded, and the interview information was summarized for each community. A final report was presented to the communities at the 2017 Annual Assembly of Dehcho First Nations.

LeRoy-Gauthier, Hilary
International Higher Institute for Leadership
Ft. Smith, NT
hleroyg@gmail.com

File No: 12 410 1070
Region: NS, SS

Licence No: 15965
Location: All NWT

Use of the narrative to understand and support emerging leaders' journeys

No research was conducted under this licence in 2016.

Liddy, Clare
Bruyère Research Institute
Ottawa, ON
cliddy@bruyere.org

File No: 12 410 1072 **Licence No:** 15972
Region: NS **Location:** Yellowknife

What are the costs of delayed medical referrals in Canada's Northwest Territories?
This research project is part of a national study looking at wait times across Canada. The 'wait time' is the length of time between when a medical patient is referred to a specialist and the date they actually see the specialist. This project had two goals. The first was to determine wait times for access to specialist doctors in the Northwest Territories. The second was to study access to medical care in the Northwest Territories in general. To answer these questions, the research team looked at medical charts from Yellowknife doctors who aren't specialists, but who refer their patients to specialists. In total, 101 patient charts were reviewed. The median (middle) wait time to see a specialist was 68 days. The wait time for referrals marked as urgent was 30 days. The most frequent referrals were to internal medicine (doctors who help people with diseases, at 18.8 percent of referrals), general surgery (18.8 per cent of referrals), and orthopedic surgery (surgeons who deal with muscles and bones, at 14.9 percent of referrals). The longest wait times were for psychiatry, internal medicine, and obstetrics/gynecology (doctors who deal with pregnant women or other female-only medical issues), which had median wait times of 111 days, 69 days, and 68 days respectively. Interestingly, the research team found that wait times in Yellowknife were shorter than those at five primary clinics in Ontario. The research team is now in the process of extending this work to other provinces and territories.

Lines, Laurie-Ann
University of Alberta
Yellowknife, NT
lines@ualberta.ca

File No: 12 410 1062 **Licence No:** 15935
Region: NS **Location:** Ndilo and Detah

Health perceptions of Dene First Nations youth in a community context
The research project was set up as an on the land health leadership workshop for youth in partnership with the Yellowknives Dene First Nation Wellness Division. The health leadership workshop was held from August 15 to August 19, and was partly held on the land, youth aged 13-18 developed leadership skills, practiced cultural skills and talked about health meaning, issues and priorities. The researchers got information from the youth about their ideas on health issues, priorities, and meaning in different ways. In a short 'clicker' survey, youth showed their interest in participating in on health research. Youth took photos in their communities and on the land of health priorities and health issues. They talked about the photos and gave stories about each topic as part of an activity called PhotoVoice. In a longer 'iPad' survey, youth shared their ideas on health issues, priorities, and information. On the land, youth also talked in traditional sharing circles about how youth want to receive informtion about health and the role youth could play in addressing community health issues. The youth also created mural art that showed their vision of a healthy community. The youth's views and photos were shared with Elders, who gave an added

perspective in interviews.The YKDFN Wellness Division has used the project results to improve community programming and future health research.

Loseto, Lisa
Fisheries and Oceans Canada
Winnipeg, MB
lisa.loseto@dfo-mpo.gc.ca

File No: 12 410 1050
Region: IN

Licence No: 15848
Location: Inuvik, Aklavik, Ulukhaktok, Tuktoyaktuk, Paulatuk, Sachs Harbour

Knowledge co-production for the identification and selection of ecological, social, and economic indicators for the Beaufort Sea

An indicator is a particular thing (like water temperature, employment rates, caribou birth rate, or the health of a particular fish) that can be easily measured, and that relates to a bigger picture. For example, the health of a whole river system can't be easily measured, but the health of a particular fish and the water temperature can be used instead to make a good guess at the bigger picture. This project is about first identifying good indicators, based on the work already done by co-management agencies in the Inuvialuit Settlement Region, and second, identifying important marine management goals. Next year, the project team will create an inventory of indicators that are currently being used in marine management. They have begun contacting co-management agencies to ask about the information that was collected during any long-term monitoring projects ('datasets'). To date, the team have identified over 400 datasets, and expect to build an inventory of close to 800 datasets by the time they are finished. They will study the datasets to find scientifically meaningful indicators. During the final year, the research team will compare the high priority marine management goals they found out about in year one to the datasets they found. This will allow the team to help marine management agencies choose good indicators for marine management.

Lys, Candice L.
Institute for Circumpolar Health Research
Yellowknife, NT
candice.lys@ichr.ca

File No: 12 410 955
Region: IN, GW, SA, DC, NS, SS

Licence No: 15881
Location: All NWT

F.O.X.Y. participatory action research project

The goal of this research project was to see how effective the 2015 Fostering Open eXpression among Youth (FOXY) peer leader retreats were. The research team collected information about the retreats from 43 participants through a variety of research methods. These included surveys of the participant's knowledge both before and after the workshops, focus groups held at the end of each retreat, and individual interviews completed six months after the retreats. The research team used the results from all the different surveys and interviews to write the 2015-16 FOXY Evaluation Report.

Malla, Ashok
McGill University
Verdun, QC
Ashok.Malla@douglas.mcgill.ca

File No: 12 410 1069 **Licence No:** 15964
Region: IN **Location:** Ulukhaktok

ACCESS open minds: youth mental health – Ulukhaktok
No research was conducted under this licence in 2016.

Marlin, Marguerite
McMaster University
Hamilton, ON
margueritemarlin@gmail.com

File No: 12 410 1046 **Licence No:** 15826
Region: NS **Location:** Yellowknife

Non-governmental influence on Arctic policy through parliamentary committees in Canada and Russia
No research was conducted under this licence is 2016.

Mitchell, Terry
Wilfrid Laurier University
Waterloo, ON
tmitchell@wlu.ca

File No: 12 410 1053 **Licence No:** 15866
Region: NS **Location:** Yellowknife

Consultation and consent: intercultural perspectives in resource governance
The goal of this project is to identify challenges in the management of natural resources, and determine best practices to respect indigenous rights, knowledge, cultural heritage, and self-determination. This is a part of a bigger, international project on the topic, with a focus on ensuring aboriginal communities have free, prior, and informed consent to any resource development on their lands. The researcher held a focus group with the Aboriginal Steering Committee to the NWT Water Stewardship Strategy. They also interviewed the assistant deputy minister of the GNWT Ministry of Environment and Natural Resources (ENR), and an ENR representative who was involved in the transboundary water negotiations process. The researcher later interviewed the Chief Negotiator of the transboundary water negotiation process. Two members of the Aboriginal Steering Committee attended a research workshop in Thunder Bay, where they shared their knowledge and experiences with researchers and Indigenous representatives from the other case studies that are part of the bigger research project. In the next two months, interviews to wrap up the initial phase of research covered by this license will be completed. A full report, along with projected next steps, will be provided to both the Aboriginal Steering Committee and GNWT research participants by the end of February, 2017.

Mulholland, Ron
Laurentian University
Sudbury, ON
rmulholland@laurentian.ca

File No: 12 410 1056 **Licence No:** 15875
Region: NS **Location:** Behchokǫ̀

Corporate social responsibility: the mining company–aboriginal context

The goal of this project is to study the relationship between aboriginal communities and mining companies, and how it grows over time. The researcher is using case studies from across Canada to do this, and the NWT component is a case study of the Tłı̨chǫ Government and DeBeers. The researcher completed one in-depth interview, along with several informal conversations, as part of the research. Additional information has come from public sources. The researcher wrote an eight-page draft of the case study, but still has questions about the mining process and how things worked out for the communities and the mining company at both the Snap Lake Mine and Gahcho Kué. To answer these questions, the researcher would like to schedule one or two further interviews. Once completed and approved, the case study will be published along with those from the other communities (four in total). One of the other case studies is on the De Beers Victor Mine development and partnership with Attawapiskat First Nation, based on information from public sources. Once the Tłı̨chǫ case is complete, the researcher intends to write a paper comparing the similarities and differences in the relationships between DeBeers and the aboriginal communities at Attawapiskat and in the NWT.

Noble, Bram
University of Saskatchewan
Saskatoon, SK
b.noble@usask.ca

File No: 12 410 1067 **Licence No:** 15957
Region: NS **Location:** Yellowknife

Assessing regulators' information needs to make decisions regarding cumulative effects under the MVRMA

The goal of this multi-year project is to determine what information regulators need about ‘cumulative effects’ to make good decisions about impacts to water quality in the NWT, and whether that information is available to them. The term ‘cumulative effects’ refers to all the changes from development taken together, such as climate change, logging, mining, impacts to animals, and impacts to human use in an area. A project kick-off meeting was held in Yellowknife in mid-October, which included the research team and graduate students, and representatives from the NWT Cumulative Impact Monitoring Program, the Mackenzie Valley Environmental Impact Review Board, and technical staff from the various land and water boards. The purpose of this meeting was to see what types of questions the research team should ask regulators about cumulative effects. The researchers also asked whether the regulators have the information they need to make good decisions. The researchers found that different organizations and developers are using different methods to measure cumulative effects, and that not everyone agrees on the best way to measure cumulative effects. The team is currently reviewing the monitoring requirements from some water licenses, checking to see what concerns people have raised in a few environmental assessment decision reports, and looking at what information is available to regulators at this time. Eventually, the researchers will interview people who work for the various agencies that regulate land and water in the NWT to ask about cumulative effects.

Parker, Colleen
WWF-Canada
Inuvik, NT
cparker@wwfcanada.org

File No: 12 410 1060 **Licence No:** 15907
Region: IN **Location:** Ulukhaktok and Sachs Harbour

Integrating local knowledge of ecologically sensitive and culturally important marine areas in Arctic Canada

The goal of this project is to reduce the likelihood of marine incidents by making sure that ships passing through an area are aware of where harvesters are likely to be present, and are aware of any other areas to avoid. To meet this goal, the Northern Marine Transportation Corridors Initiative and the Canadian Coast Guard held a mapping workshop in Ulukhaktok. A group of ten community members, including elders, active harvesters, and youth, helped the researchers identify important local use areas and significant cultural and ecological sites. The workshop participants also recorded the time of year in which the sites are used or are significant. Sites that are most and least sensitive to shipping along the Northern Marine Transportation Corridor were identified and added to a “hot spots” map, which shows low, medium, and high impact areas. This map will help the researchers select the best corridor locations. Community members also identified whether they feel the corridors are in the best locations, and made suggestions for re-prioritization and management.

Pearce, Tristan D.
University of the Sunshine Coast
Sippy Downs, Queensland
tpearce@usc.edu.au

File No: 12 410 650 **Licence No:** 15837
Region: IN **Location:** Paulatuk

Adapting to climate change in the context of multiple stressors

The goal of this study was to understand how Inuvialuit living in Paulatuk are experiencing and responding to changing environmental conditions and changing community conditions. The researchers worked with a local research partner between January and March 2016 to conduct 30 interviews with community members to learn about the conditions that are most important to people, how these conditions are changing, how changes affect people’s lives and livelihoods, how they are dealing with these changes, and what makes it easier or more difficult. The research findings suggest that efforts to address problems in the community like the shortage of houses, the quality and relevance of schooling, and addictions would also help people be better prepared to deal with changing environmental conditions. Community members will be involved throughout the rest of the project to ensure the information that is generated is useful to the community. The results will be returned to the community in January 2018.

Pearce, Tristan D.
University of the Sunshine Coast
Sippy Downs, Queensland
tpearce@usc.edu.au

File No: 12 410 650 **Licence No:** 15913
Region: IN **Location:** Ulukhaktok

A longitudinal approach to community vulnerability and adaptation to climate change

The goal of this study was to understand how Inuit living in Ulukhaktok are experiencing and responding to changing environmental conditions over time. The research team did this by comparing information that was collected during both 2005 and 2016. The study focused on environmental changes affecting traveling, hunting, trapping and gathering on the land, sea and ice. Two researchers went to Ulukhaktok from June 23 to August 11, 2016, and interviewed 32 participants. In addition, the researcher looked at reports from previous studies and participated

in community life and events. Some Inuinnaqtun place names and popular hunting trails around Ulukhaktok were also mapped. Through observation, conversations, and interviews, it became clear that along with changing climatic conditions, the changing economics of hunting and wildlife availability are important challenges for Ulukhaktok hunters. The research team will continue to engage with the community to make sure that their interpretations are correct, and that research findings are useful to the community. Once complete, the results will be presented to the community and community partners will be invited as co-authors on papers.

Pearce, Tristan D.
University of Guelph
Guelph, ON
tristanpearce@gmail.com

File No: 12 410 650
Region: IN

Licence No: 15941
Location: Ulukhaktok

Cultural meaning of food and food security
The goal of this study was to understand what Inuit living in Ulukhaktok know about beluga whales. The research team worked with community members in Ulukhaktok, who shared their knowledge and experiences about observing and hunting beluga whales in 26 in-depth interviews. The research team had asked interviewees about their knowledge of beluga whale behaviour and ecology, how to hunt beluga, and meat-muktuk preparation. The research team surveyed an additional 100 people about how people share, with a particular interest in how country foods including beluga are shared. The research team is currently reviewing all of this information and writing papers. Drafts of these papers will be shared with local research partners, who will be invited to be co-authors. Final papers and other reports will be shared with the community next year.

Piper, Liza
University of Alberta
Edmonton, AB T6G 2H4
epiper@ualberta.ca

File No: 12 410 1044
Region: IN, GW

Licence No: 15937
Location: Aklavik, Inuvik, Ft. McPherson, Tsiigehtchic

Cultural and environmental history of northern food hazards
No research was conducted under this licnece in 2016.

Porter, Dave M.
Aurora College
Ft. Smith, NT
dporter@auroracollege.nt.ca

File No: 12 410 1071
Region: NS, SS

Licence No: 15969
Location: Ft. Smith and Yellowknife

Decolonizing learning in communities across Canada: stories of hope
The purpose of this project is twofold. First, the research team wants to study how teachers are using a “decolonial” approach to education. Decolonial education means that teachers understand and teach that other, indigenous, ways of knowing exist, and that they value such ways. Second,

the research team wants to share the stories of how this is being done with other teachers, so that teachers, schools, and communities will be armed with the knowledge they need to improve education through decolonization. In 2016, the focus of this project was on developing research partnerships and case studies. Two case studies will take place in the NWT, one in Ft. Smith and one in Yellowknife. Each of these will use a regional research advisory team, and will collaborate with local people to determine how to run the project, and how to keep community members informed of their progress.

Raine, Kim D.
University of Alberta
Edmonton, AB
kim.raine@ualberta.ca

File No: 12 404 863 **Licence No:** 15782
Region: IN, GW, SA, DC, NS, SS **Location:** All NWT

Policy opportunity windows: enhancing research uptake in practice! (POWER UP!)
The goal of this project was to promote healthy lifestyles to reduce obesity. The focus was on educating the public, people who are in various jobs relating to healthcare and education, and decision makers. This was part of a larger project (2013-2016) that promoted healthier weights and worked to reduce chronic disease risk through policy in Alberta, the Northwest Territories, and Quebec. As part of this project, researchers conducted a telephone survey in June 2016 to find out about people's knowledge, attitudes, and beliefs about healthy living. The researchers also surveyed decision-makers between the end of June and July. The decision-makers that were contacted to participate in the survey came from various school districts and school boards, other professional workplaces, people who work for newspapers and magazines, and the municipal and territorial government. In October 2016, findings from the "Knowledge, Attitudes and Beliefs" survey of the NWT were shared with NWT POWER UP! and the Northwest Territories Association of Communities.

Rosolen, Sarah
Aurora College
Ft. Smith, NT
srosolen@auroracollege.nt.ca

File No: 12 410 1020 **Licence No:** 15955
Region: SS **Location:** Wood Buffalo National Park and Ft. Smith

B. Ed., a journey
No research was conducted under this licence in 2016.

Rudkevitch, Ashley
University of Waterloo
Yellowknife, NT
arudkevitch@uwaterloo.ca

File No: 12 410 1073 **Licence No:** 15974
Region: NS **Location:** Yellowknife

Subjectivity in cultural heritage tourism: a cultural planning approach to economic development in Yellowknife, NT

This project looked at tourism and the community in Yellowknife. First, the researcher identified thattourism was an important industry in Yellowknife's economy. The researcher then interviewed locals, tourists, and other stakeholders in Yellowknife to identify the different ways that Yellowknife was described as a place of interest to tourists andhow tourism fits into they way people think about Yellowknife as a city. The researcher also participated with tourists in activities operated by tour guides, and volunteered at the Northern Frontier Visitor's Centre. During the interviews and other activities, the researcher heard many common themes. These themes are, from most to least commonly mentioned: a lack of information about Yellowknife; praise for diversity; economic opportunity; desire for more contact between locals and tourists; improvement of downtown; lack of variety in tourism activities; exciting food scene; and upgrading the visitor's center. The researcher selected four key recommendations to help tourism grow in Yellowknife. The first recommendation was to create a tourism board in Yellowknife that includes people from different stakeholder groups. The second recommendation was to get more locals involved in tourism. The third was to bring locals and tourists together. The final recommendation was to create a cultural centre downtown that can be used by both locals and tourists.

Shiri, Ali
University of Alberta
Edmonton, AB
ashiri@ualberta.ca

File No: 12 410 1008
Region: IN

Licence No: 15906
Location: Paulatuk, Ulukhaktok, Sachs Harbour, Tuktoyaktuk, Inuvik, Aklavik

Digital Library North: creating a path for information access in Canada's North
The Digital Library North is a collaborative project between the Inuvialuit Cultural Resource Centre and researchers at the University of Alberta. It is designed to make Inuvialuit books, reports, and files available to the geographically-dispersed population of the Inuvialuit Settlement Region (ISR) through the internet, making sure that confidential files are protected. The research team incorporated local and traditional knowledge in the design, implementation, and sustainability of the project. In addition to the suggestions from the Inuvialuit collaborators about what to include in the digital library, and how to create it, the research team also took a step back and looked at what is going on in the Inuvialuit region and how the library could meet people's needs. Last year, the research team made a list of potential library users, communities, stakeholders, information providers, and information resources through surveys and interviews. They used the information from the surveys and interviews when they set up the library. In 2016, the resarch team made a prototype (or pilot version) of the library, making sure that the computer "interface" (the screen set-up, language, etc.) is culturally appropriate. The prototype is being tested by the communities, and will be officially launched in spring 2017. The 2017 fieldwork will start with community workshops to introduce the system in the six ISR communities. After the workshops, the research team will make any needed changes. Finally, the team will continue to digitize important materials like the Committee for Original Peoples Entitlement (COPE) collection held at IRC.

Simmons, Deborah L.
Sahtú Renewable Resources Board
Tulit'a, NT
director@srrb.nt.ca

File No: 12 410 678
Region: SA

Licence No: 15828
Location: Délı̨nę

Mapping, language and stories in Dél̨nę
As Déline makes a transition to self-government, the community is becoming increasingly interested in stories, song, and concepts of place in order to better understand what these reveal about Dene ts'ili (being Dene). The research team is working with the community to develop an indigenous research methodology. However, the project has already started working with the community to properly document their language, with a focus on creating a digital or computer-based archive of the language. In addition, community researchers have become experts at transcribing and translating recordings. The research team is continuing to work on other components of the project: research on place names around Great Bear Lake, and research on song and its importance to the community of Déline. A team member painstakingly completed Dene and English language transcriptions of a number of oral history recordings, including free and word-for-word translations, using Elan transcription software.

Spring, Andrew
Wilfrid Laurier University
Waterloo, ON
aspring@wlu.ca

File No: 12 410 1037 **Licence No:** 15818
Region: SS **Location:** Kakisa

Building community resilience in Kakisa
The goal of this project is to help the community of Kakisa find community-based solutions that will help the community stay healthy and become better able to withstand changes in the future. The project is based on a partnership built between the Ka'a'gee Tu First Nation and Wilfrid Laurier University. The research team used participatory research methods, which means that the researchers worked closely with the community members and included planning for change as part of the research process. The community identified that food access and availability, as well as ecosystem and community health, were the priority research topics. The research team and community made a lot of progress over the past year. Project components include: building a recycling program for the community, launching a web-based community atlas, setting up a monitoring program to see how the landscape is changing, and growing food in the community. The researchers are also working with the school and youth to grow food and educate them about the impacts of fire on the ecosystem. The research team has also been able to support on-the-land learning initiatives for youth in the community.

Spring, Andrew
Wilfrid Laurier University
Waterloo, ON
aspring@wlu.ca

File No: 12 410 1037 **Licence No:** 15910
Region: NS **Location:** Yellowknife

Community-based food systems research in Yellowknife, NT
The goal of this project is to support the community-led Yellowknife Food Charter Initiative. This work was conducted in partnership with Ecology North, the Yellowknife Food Charter Coalition, and the Yellowknife Farmers' Market. This research was conducted through a 'participatory action' research approach. Participatory action research is a way of studying a topic that fosters community participation and engagement in the research in order to answer community-driven research questions. 2016 was the first year of this project, and much of what the research team

worked on was fostering partnerships and trust within the community.They also participated in community events with their research partners, such as gardening sessions. As well, the research team helped facilitate an education program about local food production to schools, a farmers' market composting program, and a youth gardening camp. As well, the research team coordinated the annual Fall Harvest Fair in partnership with the Yellowknives Dene First Nation. Finally, working with the Food Charter Coalition, the research team created a food system 'snapshot', or description of the current state of the food system. The snapshot included the concerns that people working within the food system have, and their ideas for solutions. This snapshot was presented to Yellowknife City Council on August 22.

Steelman, Toddi
University of Saskatchewan
Saskatoon, SK S7N 5C8
kiri.staples@usask.ca

File No: 12 410 1047 **Licence No:** 15832
Region: SS **Location:** Ft. Resolution and Ft. Smith

Examining how research knowledge is shared in the Slave River Delta

The goal of this project was to study how knowledge is shared in the communities of Ft. Smith and Ft. Resolution. In particular, the research team studied how to best share research knowledge with people who want it and need it. There were four main findings from the project. First, the research team found that there are many barriers to sharing research knowledge, such as researchers not being trained in plain language communication, and local staff who already have many responsibilities. Second, participants talked about what could be done to overcome these barriers, such as providing incentives for local people to become involved in research. Third, community members and researchers agreed that there are three things that are important for effective research: trust (or "credibility"), research that is relevant to the community and decision-makers ("saliency"), and a shared learning process that involves working together ("legitimacy"). Fourth, the researchers found that the involvement of youth was very important for building relationships between community members and researchers, as well as for communicating research results. This project was a partnership between the Slave River and Delta Partnership and the Delta Dialogue Network, a research group based at the University of Saskatchewan.

Strickert, Graham
Yukon College and University of Saskatchewan
Whitehorse, YT
graham.strickert@usask.ca

File No: 12 410 1055 **Licence No:** 15874
Region: DC **Location:** Jean Marie River

Human dimensions of a thawing landscape

The goal of this ongoing research project is to identify the impacts of landscape change on traditional activities, and to find out how communities can be proactive and adapt. During this first year, the focus was on getting licenses and approvals, and on finding community coordinators, community artists and elders, and fine arts students.. A workshop was held in Dawson City (Yukon) to document landscape change in the communities of Old Crow, Yukon, and Jean Marie River, NWT. People from both Old Crow and Jean Marie River participated. During the workshop, participants talked about landscape change and identified how to document these changes through photo, video, and audio recordings in the two communities. Following the workshop, half

the research team went to Old Crow, and the other half went to Jean Marie River. In each community, the student artists collected photos, videos, and audio clips under the guidance of community elders and artists. Researchers interviewed several elders in each community to hear stories of change and adaptation. The information that was collected by the artists was mapped and shared with the two First Nations. The audio, videos, and photos will be combined into vignettes that will be used for community engagement over the next two years, to identify adaptations and plan for future change.

Vizina, Yvonne N.
University of Saskatchewan
Saskatoon, SK
yvonne.vizina@usask.ca

File No: 12 410 1052 **Licence No:** 15863
Region: IN, GW **Location:** Inuvik

Sustainability and indigenous knowledge in aboriginal post-secondary education places of learning

The goals of this project are to study how Aboriginal colleges and universities are planning for sustainability, how they are working with community-based conservation practices, and their involvement with national and international environmental decision-makers. The researcher collected this information using surveys and interviews of educators at select Aboriginal post-secondary places of learning. This research is ongoing, and findings will be reported at a later date.

Watson, Meghan
University of Calgary
Calgary, AB
meghan.watson@ucalgary.ca

File No: 12 410 1048 **Licence No:** 15835
Region: IN, GW **Location:** Aklavik

Exploring what success means from the perspectives of aboriginal elders, parents and educators in Aklavik, Northwest Territories

This project looked at what success means for both Gwich'in and Inuvialuit people in the remote community of Aklavik in the Beaufort Delta Region of the Northwest Territories. This project was completed in a collaborative partnership with the District Education Authority of Moose Kerr School in Aklavik. A group of 12 aboriginal elders, parents, and school educators participated in focus group sessions and semi-structured interviews with a goal to develop a common, balanced, and culturally-based vision of what success in learning means for Gwich'in and Inuvialuit peoples in Aklavik. During focus group and interview sessions, participants proposed a deeper, more holistic understanding of success for the community. The project has highlighted the strengths of the community to foster success, as well as challenges. The community was determined to achieve their own success in this project, which is reflected in both the insightful words brought forward by participants, as well as in the working model of success that was created by the community. The vision of success brought forward in this project provide a foundation for how the current education system can be understood, challenged, and revised in the future.

Wesche, Sonia D.
University of Ottawa
Ottawa, ON

swesche@uOttawa.ca

File No: 12 410 934
Region: IN

Licence No: 15943
Location: Inuvik, Aklavik, Tuktoyaktuk, Paulatuk, Sachs Harbour, Ulukhaktok

Food security, environment and community health: integrating participatory methods, tools and knowledge to promote food security in the Inuvialuit Settlement Region

The goal of this ongoing project is to study food security in the Inuvialuit region. Food security refers to people's ability to get their own healthy and nutritious food now, and into the future. This project builds on research priorities identified by local and regional representatives from the Inuvialuit Settlement Region during workshops held in Inuvik in 2012 and 2014. In November 2016, the researchers met with project participants to share research progress and results for several project components. First, the researchers gave updates to the Inuvialuit Regional Corporation Regional Dietician about the participatory food costing study they had initiated in the fall of 2016. This study documented the price of healthy and commonly eaten foods in Inuvialuit communities. The researchers also co-presented these results at the ArcticNet conference in December 2016. Second, the researchers gave an update on the school-based traditional foods program, initiated in spring 2015, to the staff at the East Three School and to the hospital's Long Term Care Facilitator. A public research presentation was made at the Aurora Research Institute in Inuvik. Additionally, the researchers started a new project component; a study about government organizations and how they are planning for food security. Twelve interviews were conducted, in Inuvik and Yellowknife, to gather information about the organizations that make decisions, government programs concerning food, how food policy decisions are made in the region, and how to better address food security at a regional scale.

Zmeureanu, Radu
Concordia University
Montreal, QC
radu.zmeureanu@concordia.ca

File No: 12 410 1061
Region: IN, GW

Licence No: 15923
Location: Inuvik

Northern sustainable house data analysis

The goal of this project was to see how much energy is required by the Northern Sustainable Housing Project duplex in Inuvik. The duplex is on Reliance Street in Inuvik. Heating and domestic hot water energy demand was recorded from October 1, 2014 to September 30, 2015. The researcher found that the thermal energy needed to heat both houses and power their water heaters, which is supplied by the natural gas boiler, is 122.4 kWh/m^2 of floor area per year. The total annual natural gas energy use for both houses is 178.2 kWh/m^2 per year. The electricity produced by the solar panels on the duplex accounts for about 21% of the annual electricity use for both houses. The duplex also has a solar hot water system, but this produced less than 10% of the needed hot water. Finally, the house has a special system to recover heat that would otherwise be lost through venting, however the efficiency was less than expected. The information contained in the project report will be useful for other sustainable housing projects.

Traditional Knowledge

Photos clockwise from top: 1. Chandra Brietzke, interviewing Abe Wilson about muskrats (credit: Brietzke, C.); 2. Joe Arey, filletting an Arctic Cisco (credit: Worden, E.) 3. Rock your mocks; 4. Nellie Arey, preparing a herring lunch (credit: Worden, E.)

Anderson, David G.
University of Aberdeen
Aberdeen, Aberdeen
david.anderson@abdn.ac.uk

File No: 12 410 948 **Licence No:** 15795
Region: GW **Location:** Ft. McPherson

Arctic Domus
This project is a component of a larger, international project. The goal of the bigger project is to study domesticated animals in the north around the globe. This component is focussed on dogs in the Gwich'in area. The research team searched archives for information about a few different topics. The topics included colonialism and dog breeds in the NWT, the use of dogs by governments such as the North-West Mounted Police, and the use of dogs in northern development schemes. They looked at dogs in early American anthropology, at the question of domestication in the NWT, and how Canadians in general view the idea of domestication in the Canadian north. During the 2015-2016 research year of 2015, the Arctic Domus project focused primarily on writing and sharing their research at academic conferences. Several publications were completed during this period: for example, 'Architectures of Domestication' (forthcoming), 'Dogs in the North' (edited book by Routledge), and the article 'Dog Craft' (published in Hunter-Gatherer Research in 2015). One member of the research team travelled to Ft. McPherson to attend the funeral of Shitsuu Caroline Snowshoe, spent time at Nitainlaii fishing and working with wood, and participated in the annual Midway Lake Festival.

Anisman, Adar
University of Victoria
Victoria, BC
aanisman@uvic.ca

File No: 12 410 1063 **Licence No:** 15938
Region: NS **Location:** Behchokǫ̀

Conditional and temporal expressions in Tłı̨chǫ Yatii
This two-year project had two main goals. First, the researcher wanted to study conditional clauses and counterfactuals in Tłı̨chǫ. Conditional clauses and counterfactuals are types of phrases that people say when they are expressing complex ideas. There are two parts to the phrase, and they relate to each other in a particular way—such as phrases that contain the words "if" and "then". Second, the researcher is updating the online Tłı̨chǫ dictionary with new words, audio for existing words, and additional example sentences for existing entries. The researcher advertised this project by word-of-mouth and recruited three participants for one session each between July and August 2016. A total almost three hours of audio recording were made of the participants translating some very particular stories from English to Tłı̨chǫ. The researcher is currently transcribing these recordings for linguistic analysis.

Johnson, Leslie M.
Athabasca University
Edmonton, AB
lmainjohnson@gmail.com

File No: 12 410 553 **Licence No:** 15916

Region: IN, GW

Location: Inuvik, Tsiigehtchic, Ft. McPherson, Aklavik

Traditional knowledge for northern community well-being: examining collaborative approaches

The focus of the research was on connections between land, language, and wellness. The two researchers interviewed ten Gwich'in elders from Inuvik, Aklavik, Ft. McPherson, and Tsiigehtchic in late June and early July 2016. Seven women elders and three male elders shared their experiences growing up on the land, and their views on the importance of knowing the land, traditional foods and medicines, knowing the language, and being well. They were also asked what advice they had for the youth, and how they thought the youth should be taught about the land, language, and ways to be healthy. The interviews were video recorded with the permission of all participants. The researchers are still typing out the interviews and editing the videos so they can be returned to the participants. The Gwich'in Tribal Council Department of Cultural Heritage provided guidance for the project, and will receive copies of all of the videos and written interview material as soon as they are ready. The researchers gave an oral presentation about the project in May 2017 at the ethnobiology meetings in Montreal, after review by the Department of Cultural Heritage.

Lantz, Trevor C.
University of Victoria
Victoria, BC
tlantz@uvic.ca

File No: 12 410 906
Region: IN, GW

Licence No: 15854
Location: Aklavik, Inuvik, Sachs Harbour, Tuktoyaktuk, Tsiigehtchic, Ft. McPherson

Using Inuvialuit and Gwich'in observations to monitor environmental change in the Beaufort Delta Region

The Mackenzie Delta Region is an important region that is changing so quickly that communities and researchers cannot keep track of it. Since Inuvialuit and Gwich'in land users see and understand what is changing on the land, the goal of this research project is to use interviews to document their observations of the environment. The research team showed pictures and video of land disturbances to the interviewees to help them talk about these changes. In 2015-2016, the researchers asked about muskrats, fish, and changes in the environment of the Mackenzie Delta. Specifically, they asked about how muskrats make a living and the role of muskrats in peoples' lives. Interview participants talked about three important things: first, how economic and social changes in the last 50 years have affected muskrat harvesting. Second, they talked about changes they are seeing in beaver, otter, and muskrats. Third, they talked about changes to the muskrat populations. The research team also organized knowledge-exchange fish camps near Inuvik, Aklavik, Ft. McPherson, and Tsiigehtchic. Before every camp, youth representatives were trained to use GPS units and interview equipment, including digital cameras, audio recorders, and video cameras. Youth, traditional-knowledge holders, and camp owners spoke about fish, and interviews were held about a range of topics. These topics included fish and river health, water quality and quantity, environmental and socioeconomic changes, access to fishing camps and equipment, knowledge sharing, and future project activities and goals. The researchers will publish reports in academic publications that will be shared with community members in the coming year.

March, Maya
Parks Canada Agency
Paulatuk, NT
maya.march@pc.gc.ca

File No: 12 410 1077 **Licence No:** 15979
Region: IN, SA **Location:** Paulatuk and Déline

Pilot project to assess climate change vulnerability of Tuktut Nogait National Park through aboriginal knowledge
This project included the Indigenous traditional knowledge (ITK) portion of the "Climate Change Vulnerability Assessment" (CCVA) project conducted for Tuktut Nogait National Park. The CCVA project was Parks Canada's contribution to the Government of Canada's Adaptation Theme under the Clean Air Agenda. The purpose of the Adaptation Theme was "to implement programs to help Canadians adapt to the impacts of climate change under Canada's Clean Air Agenda" (Government of Canada, 2011). The official title of the CCVA project within the Adaptation Theme was "Understanding Climate-Driven Ecological Change in the North.

Parlee, Brenda L.
University of Alberta
Edmonton, AB
bparlee@ualberta.ca

File No: 12 410 522 **Licence No:** 15958
Region: IN, GW, SA, DC, NS, SS **Location:** All NWT

Tracking change: local and traditional knowledge in watershed governance
This project is a six year research program funded by the Social Sciences and Humanities Research Council and led by the University of Alberta, the Mackenzie River Basin Board, and the Government of the Northwest Territories, in collaboration with many other valued indiginous organization partners and universities. The broad goal of the project is to share local and traditional knowledge about social and ecological change in the Mackenzie River, Lower Mekong, and Lower Amazon Basins, and see how the local and traditional knowledge can be used by the organizations that govern these watersheds. The Mekong River is in southeast Asia, and the Amazon River is in South America. In 2016-2017, the project will fund between eight and ten community-based and collaborative research activities in the Mackenzie River Basin that address changes in fish, water, and community well-being, among other issues. Research in future years will build on these community projects.

Pearce, Tristan
University of Guelph
Guelph, ON
tpearce@uoguelph.ca

File No: 12 410 650 **Licence No:** 15920
Region: IN **Location:** Tuktoyaktuk

Local and traditional ecological knowledge of beluga whale (Delphinapterus leucas) under changing climatic and non-climatic conditions in the Inuvialuit Settlement Region (ISR)

The goal of this study was to document Inuvialuit traditional ecological knowledge (TEK) of beluga whale in Tuktoyaktuk. This included the whale's behaviour and ecology, as well as how they are hunted, and how they are prepared to eat. To gather this information, the researcher conducted 17 interviews with knowledgeable community members, and also made observations about how beluga was prepared to eat. Research was conducted during a field season in Tuktoyaktuk from June 15 to August 10, 2016. After the field season, the research team started to transcribe recordings and study the transcripts and field notes. The researcher returned to Tuktoyaktuk in February 2017 and shared information from the study with the community. The researcher will work with the community to better include Inuvialuit TEK in beluga management.

Ruben, Diane
Paulatuk Hunters and Trappers Committee
Paulatuk, NT
phtc@live.ca

File No: 12 410 1057 **Licence No:** 15886
Region: IN **Location:** Paulatuk

Documenting traditional knowledge of whitefish in Paulatuk, NT
In the Inuvialuit Settlement Region, whitefish are an ecologically and culturally important species that play a large part in people's diet. The Paulatuk Hunters and Trappers Committee found that there is a lack of recorded information about this species, especially considering the designation of the Anguniaqvia niqiqyuam Marine Protected Area. For this reason, the Paulatuk Hunters and Trappers Committee started a project to document traditional knowledge about lake whitefish (*Coregonus clupeaformis*), broad whitefish (*Coregonus nasus*) and Arctic cisco (*Coregonus autumnalis*) near Paulatuk. A youth researcher interviewed elders and active harvesters to find out where whitefish are harvested and what factors affect that harvest. The youth also asked where the whitefish migrate, where they spawn, what they eat, what they are eaten by, and what changes in whitefish have been observed over time. Participants were also able to give information about how they would like to see coastal monitoring take place. This information will be valuable for future generations to learn about traditional knowledge related to whitefish.

Shimoyama, Junko
McGill University
Montreal, QC
junko.shimoyama@mcgill.ca

File No: 12 410 1068 **Licence No:** 15960
Region: NS **Location:** Behchokǫ̀

Non-canonical relative clauses: universals and variation in compositionality
No research was conducted under this licence in 2016.

Uunila, Laani
Naast'ihch'oh National Park Reserve, Parks Canada
Tulít'a, NT
laani.uunila@pc.gc.ca

File No: 12 410 1059 **Licence No:** 15893
Region: SA **Location:** Tulít'a and Norman Wells

Nááts'ihch'oh National Park Reserve traditional knowledge study

The purpose of this project is to study culturally important places and cultural resources found within Nááts'ihch'oh National Park Reserve. These might include place names, harvesting and hunting areas, trails, places from stories or legends, among other areas. The research team also want to record the value of these places, to help Parks Canada plan and manage the park. The research team held individual interviews with more than 20 elders, and held workshops in Tulít'a and Norman Wells to get more information about the areas, their place names, and oral histories. Six Shúhtaot'ine elders visited the park, as well as six community members, including two younger Tulít'a District Land Corporation members. The study has been successful to date in deepening the understanding of the cultural importance and traditional uses of the park – including Mount Nááts'ihch'oh. Study participants provided place names for many of the key locations in the park. An application will be made for a 2017 research licence to continue this research. The team will hold a follow-up workshop to confirm traditional names for four locations, and will prepare a draft report which will be reviewed by the study participants.

Archaeology

Photos: Top – 1) Excavation of the large house at Kuukpak. The floor, made of carefully trimmed driftwood logs, is in the centre of the photo (credit: Friesen, M.); Bottom – 2) knife blade made out of nephrite, a clear green stone similar to jade. This blade was found on the beach at Kuukpak, where it had eroded out of a house (credit: Friesen, M.)

Bennett, Tim
Representing: LTS Infrastructure Services Limited Partnership

Permit Number: 2016-014
Region: GW
Class: 2
Location: Hwy 8 right-of-way corridor running between Inuvik and the Yukon border

Ledcor Dempster Highway fibre build heritage resources overview assessment
The goal of this project was to check for archaeological sites along the proposed route of the Canada North Fiber Link – Phase 1 Dempster Highway Project. The proposed Fibre Link project will bury a fibre optic communications line from Dawson City, YT, to Inuvik, NWT, which will provide high-speed internet to Inuvik and other communities. In the NWT, the line will likely be buried within the right-of-way of the Dempster Highway. There are usually a few stages to archaeology projects like this. First, the researchers use maps to find areas that seem more likely to have archaeological sites. Then, they go out in the field and make sure their maps are correct. Finally, they do field work which involves digging test pits and checking for archaeological sites. This project is in the second stage, aimed at checking the maps that show areas that are more likely to have buried archaeological sites. The researchers went to check almost 600 landforms (277 located in the NWT), over 600 areas near water features (214 in the NWT), and 31 previously recorded archaeological sites (2 in the NWT). All of these areas are located within 100 m on either side of the Dempster Highway. Additionally, the researchers visited three culturally sensitive areas pointed out by the Gwich'in Tribal Council, two in the Yukon and one in the NWT.

Finch, David M.
Representing: Himself

Permit Number: 2016-012
Region: SS
Class: 1
Location: Within 10 Km of Pine Point Mine, south shore of Great Slave Lake

Pine Point 1928 Base Camp documentation
The goal of this archaeological research project was to document two sites near Pine Point, Northwest Territories, that contain mining-related structures dating to the 1920s and 1930s. Both locations are south of Great Slave Lake and within 10 km of Pine Point Mine. The sites reflect a period in NWT history when the economy was changing, getting bigger but also branching out. In addition to showing the growth of mining, the final abandonment of the site shows what things were like at the end of the boom-and-bust mining cycle. The first site was the Pine Point Base Camp, constructed and first occupied in 1928-29 by prospectors and miners with Cominco. It was occupied until around 1948-1951. The researchers carefully mapped out this site and the 19 buildings on it, including cabins, offices, storehouses, a garage, a pumphouse, and various outbuildings. Most of the buildings were made from logs. The researchers also mapped out and catalogued a can dump, core boxes, several ramps, and an old airstrip. Most structures are in poor shape but are not in immediate danger. Some appear to have been used in recent years by campers and other non-industrial users. The second location was the Genx Prospector Cabin, a single log structure constructed in 1929 and only lived in for one year. There was no excavation or collection of artifacts.

Foster, Jean-Paul
Representing: Public Works and Government Services Canada - Northern Contaminated Sites

Permit Number: 2016-011
Class: 2

Region: NS **Location:** 25 km east of the Ingraham Trail corridor

Archaeological Impact Assessment of PWGSC bullmoose area mine sites
No summary available.

Friesen, Max
University of Toronto
Representing: Inuvialuit Cultural Resource Centre

Permit Number: 2016-008 **Class:** 2
Region: IN **Location:** Richards Island and the Tuktoyaktuk Peninsula in the Mackenzie Delta region

Arctic cultural heritage at risk: climate change impacts on the Inuvialuit
The lower East Channel of the Mackenzie River is home to many important and old Inuvialuit heritage sites. However, these sites are now threatened by climate change, which is thawing permafrost and causing erosion of the coasts, so delicate artifacts that have been frozen for centuries are now rotting and being destroyed. The goal of this project is to find out which heritage sites are most at risk, and then to excavate selected sites in order to save their contents. In 2016 the researchers excavated at Kuukpak, a quickly-eroding site on Richards Island. Kuukpak is an extremely important and very large Inuvialuit heritage site – it was the central village of the Kuukpangmiut, a large and powerful regional group. Although there are 23 houses there now, it probably once held over 40 very large houses. Kuukpak was abandoned during the late 1800s. The research team recorded erosion damage, test excavated one house, and finished the excavation of a very large house. The results of the excavations were spectacular. The large igluryuaq (winter house) turned out to be much more complicated than expected. Beneath each of the three sleeping benches, at least one additional bench was found, and in one case two additional benches. This means that the house was re-built several times, and occupied for an extremely long time – probably for many decades and maybe more than a century. The bench areas contained many very finely made artifacts, including combs, needles, ulus, daggers, arrowheads, and harpoon heads. The research team also excavated in front of the house, where the remains of meals would have been discarded. This area contained thousands of animal bones – mainly fish and beluga whale, but also caribou, moose, seal, bird, fox, and other species. The team started to dig another house, but was not able to finish.

Heffner, Ty
Stantec Consulting Ltd.
Representing: Department of Transportation, GNWT

Permit Number: 2016-004 **Class:** 2
Region: SA, DC **Location:** Along corridors of the Liard Trail, Mackenzie Hwy, and the proposed Mackenzie Valley Hwy

Archaeological Impact Assessment of GNWT DOT granular supply source areas (west)
The goal of this project was to check for archaeological sites at the gravel pits along the Liard Trail and the existing and new parts of the Mackenzie Highway. If archaeological sites are found, they can be protected when the gravel pits are used. Fieldwork was completed in three shifts; from September 2 to 7 along the Liard Highway, from September 15 to 29 along the Mackenzie Highway, and from September 14 to October 6 along the proposed Mackenzie Valley Highway. Fieldwork was based out of various NWT communities and conducted by crews of archaeologists

and local community assistants. Before they went into the field, the researchers planned their fieldwork by mapping out areas that were more likely to contain archaeological sites. They walked over these areas, carefully checking the surface of the ground, and dug small test holes to check for artifacts. They found stone tool debris on the surface of the ground and in the test holes. They found nine new sites; seven along the proposed Mackenzie Valley Highway, and two along the existing Mackenzie Highway. All sites were from pre-contact times, and the artifacts found at the sites were the by-products or debris from making stone tools. The stones were fine-grained sedimentary rock types called chert and chalcedony, as well as Tertiary Hills Clinker which is from the Mackenzie Mountains.

Leyden, Jeremy
Stantec Consulting Ltd.
Representing: Department of Transportation, GNWT

Permit Number: 2016-003
Region: NS, SS
Class: 2
Location: Corridors of the Yellowknife Hwy, Ft. Resolution Hwy and Ft. Smith Hwy

Archaeological Impact Assessment of GNWT DOT granular supply source areas (east)
The goal of this project was to check for archaeological sites at some proposed gravel pits, and proposed expansions to gravel pits, along Hwy's 3, 5 and 6. If archaeological sites are found, they can be protected when the gravel pits are used. This project is within the traditional territories of four First Nation communities in the Northwest Territories: the Tłı̨chǫ, Deh Gah Got'ie, Katlodeeche, and Deninu K'ue. The researchers worked with the local community during the project. The field crew consisted of two archaeologists plus local wildlife monitors and/or assistants. They walked around each location checking the ground for artifacts and digging test holes to find buried artifacts. Gravel pits are usually higher, dry landforms, which are also the locations where people like to stay. This means that gravel sources are more likely to have archaeological sites than lower, wetter areas. No artifacts were found, but the researchers found four historic sites, including one possible grave site and three tin can scatters near Pine Point. The DOT will avoid the possible grave site by at least 100 meters, and is working with the territorial archaeologist at the Prince of Wales Northern Heritage Centre to ensure it will stay safe.

MacKay, Glen R.
Prince of Wales Northern Heritage Centre
Representing: Yellowknives Dene First Nation

Permit Number: 2016-007
Region: NS
Class: 2
Location: Yellowknife Bay, Yellowknife River and Prelude Lake Territorial Park

Yellowknife Bay archaeology project
No summary available.

MacKay, Glen R.
Prince of Wales Northern Heritage Centre
Representing: Jean Marie River First Nation

Permit Number: 2016-009
Region: DC
Class: 2
Location: Five Lakes candidate protected area

Five Lakes archaeology project

No summary available.

MacKay, Glen R.
Prince of Wales Northern Heritage Centre

Permit Number: 2016-013
Region: SA

Class: 2
Location: Mackenzie Mountains near the confluence of Stelfox Creek with the Natla River, south of Stelfox Mountain

2016 Moosehorn Caribou fence project
No summary available.

MacKay, Glen R.
Prince of Wales Northern Heritage Centre
Representing: Government of the Northwest Territories and K'ágee Tu First Nation

Permit Number: 2016-015
Region: DC

Class: 2
Location: K'ágee Tu (Kakisa Lake) and possibly Tathlina Lake

K'ágee Tu archaeology project
No summary available.

McGhee, Robert
Representing: Adventure Canada

Permit Number: 2016-005
Region: IN

Class: 1
Location: Winter Harbour, Melville Island

Into the Northwest Passage
No summary available.

Prager, Gabriella
Representing: De Beers Canada Inc.

Permit Number: 2016-010
Region: NS

Class: 2
Location: Snap Lake to Kennady Lake area, 280 km NE of Yellowknife

Gahcho Kué project
The goal of this project was to check for archaeological sites at a new diamond mine development on Kennady Lake in the central barrenlands, about 280 km northeast of Yellowknife. The main objective of the 2016 field season was to go back and check archaeological sites that had been marked in the field to ensure that the development did not impact them. These 11 sites are near the mine and along the winter road between the Gahcho Kué project and the Mackay Lake section of the Tibbitt to Contwoyto winter road. Some of the stakes that mark the location of the sites were replaced and all stakes were spray painted again. Given the significant number of stakes that were down or leaning heavily, and the extreme degree of fading of spray paint, the researchers will recommend that annual visits to staked sites continue every year as long as the winter road is in use. A second objective of this project was to return to some archaeological sites that were recorded in the past and make sure their coordinates are correct. The researchers tried to find 13

previously recorded sites where the exact location was uncertain. They were able to relocate ten of those sites and update the coordinates. Another site may have been found (the location description seemed correct but no artifacts were observed), and two others could not be rlocated. All of the relocated sites were far enough away from the currently used road that they are not in danger.

Walker, Daniel
Representing: TerraX Minerals Inc.

Permit Number: 2016-002
Region: NS
Class: 2
Location: 15 km north of Yellowknife

Yellowknife City Gold Project
No summary available.

Young, Patrick
Golder Associates Ltd.
Representing: Aurora Geosciences Ltd.

Permit Number: 2016-006
Region: NS
Class: 2
Location: Approximately 400 km NE of Yellowknife

Kennady North Property Archaeological Impact Assessment
The goal of this project was to check for archaeological sites at the location of a proposed diamond exploration site near Kelvin and Faraday Lake at the Kennady North Property. This site is located about 280 km northeast of Yellowknife, NT. In addition, other nearby areas were also surveyed, where the developer may explore (drilling, trenching, bulk sampling) or build winter and all season roads. Finally, an esker was surveyed as it may be used for gravel. Eskers are special hills created when a glacier retreats, and are known both to be good sources of gravel and the location of archaeological sites. The archaeological survey was carried out by low level helicopter survey, and a walking survey of select landforms that were identified as being more likely to contain archaeological sites. The researchers also surveyed specific development footprint areas by foot. Over the course of the eight day field program, eight previously recorded archaeological sites were checked. These sites included four stone circle sites, and four sites with either a stone tool or the by-products of making stone tools. Six new archaeological sites were also found. All of these sites had either a stone tool, or the by-products of making stone tools. Two broken cutting tools made of quartzite and one cutting tool made from chert were found, although none could tell the archaeologists the age of the sites. Each site will be protected by avoidance.

Young, Patrick
Golder Associates Ltd.
Representing: Terra X Minerals Inc.

Permit Number: 2016-016
Region: NS
Class: 2
Location: Approximately 2.5 km south of Yellowknife along the north shore of Great Slave Lake

Terra X Minerals Inc. southbelt property, Yellowknife City Gold Project
The goal of this project is to check for archaeological sites at a gold mine south of Yellowknife along the north shore of Great Slave Lake. The mine will be doing most of their excavations underground, but there will still be some surface disturbances.

Wildlife

Photos clockwise from top left: 1. Adult Peregrine Falcon (credit: Hodson, K.); 2. Two Red Foxes, black variation and original colour (ARI photo); 3. GRRB staff surveying for Dall Sheep (credit: Callaghan, K.); 4. Little Brown Myotis (bat) (credit: Kelly, E.)

Allaire, Danny
Environment and Natural Resources
danny_allaire@gov.nt.ca

Permit Number: 500288
Region: DC
Species Studied: All wildlife species
Location: Near communities in the Dehcho region

Dehcho Trail camera study

The goal of this project is to study wildlife, especially rare wildlife, using motion-dectecting cameras set up on the land. Six cameras were set up near Ft. Simpson, Wrigley, Jean Marie River, Trout Lake, Ft. Liard, and Nahanni Butte. Cameras were set up on harvester trails, seismic lines, the Enbridge pipeline, waterways, and winter roads. Because the cameras are motion sensitive, the researchers learned that camera placement is key. When they checked the cameras, they found thousands of photos of willows moving in the wind and moving ice on the waterways, instead of pictures of wildlife. They found that 134 of the 222 usable photos were taken on traditional harvester trails, making traditional trails the most successful location to set up these cameras. The most commonly photographed species were black bear, snowshoe hare, red squirrel, and lynx. Wolves were rarely photographed. No photos were taken of rare wildlife.

Amuno, Solomon
University of Saskatchewan
solomon.amuno@gmail.com

Permit Number: 500454
Region: NS
Species Studied: Snowshoe hare
Location: 0-15 km radius of Giant Mine

Oxidative stress, DNA damage and bone metabolism disruption in small mammal population exposed to arsenic in and around Yellowknife

The goal of this study was to check if and how snowshoe hares living near the Giant Mine site are affected by arsenic pollution. The researchers checked for arsenic in three ways: first, they checked to see how much arsenic was in the hares' bodies, and how their bodies were reacting to it; second, they looked at how the hares' skeletons grew; and third, they looked at thin slices of the hares' bodies under a microscope to see if the arsenic changed the way their bodies grow on a microscopic level. They looked at hares from near the mine, as well as hares from further away, so they could compare them to make sure it was the arsenic pollution that was causing any differences. The researchers found that arsenic concentrations were about 20 to 70 times higher in the stomach contents of hares living closer to Giant Mine. In other words, there was more arsenic in the food that the hares closer to the mine were eating. They also found high arsenic levels in their nail clippings, organs and intestines. The Giant Mine site hares had some expected organ disease caused by arsenic, and their bones were weak and had odd, unnatural growths. This research seems to show that snowshoe hares breeding near Yellowknife are exposed to higher levels of arsenic, and it's affecting their bodies and, in particular, their bones.

Armstrong, Terry
Environment and Natural Resources
terry_armstrong@gov.nt.ca

Permit Number: 500421
Region: NS, SS
Species Studied: Bison and moose
Location: Ft. Providence and Behchokǫ̀ areas

Bison population and disease studies

The goal of this project is to find out the approximate bison population levels in the Ft. Providence and Behchokǫ̀ areas. The researchers counted moose and bison from two airplanes, which flew over the areas between February 29 and March 6, 2016. The research team included five observers from Ft. Providence. The survey took over 87 hours of flying, and weather conditions ranged from good to excellent for counting wildlife from the air. Only half a day was lost due to poor weather. Using specialized math equations, the researchers were able to estimate that there are about 4.2 bison per km^2, which means a total of about 850 bison. The researchers are pretty confident that the population range for bison is between 528 – 1371. The bison population seems to have gone up from the 2013 estimate of 706 bison, when the population range was between 453 – 1100. The research team were unable to estimate how many of the bison in the herd were males, females, or calves, which is something they usually do. The bison have been found in different places since 2014, when forest fires burned nearly half of the study area and the team were unable to find enough bison to calculate their population. There were no reported cases of anthrax, brucellosis, or tuberculosis in the Mackenzie bison population in 2016. Although the researchers were focussed on bison, they counted enough moose on their airplane surveys that they could estimate the moose population, too, although they found that their estimate was slightly lower than had been found using a different population counting method.

Bidwell, Mark
Canadian Wildlife Service
mark.bidwell@canada.ca

Permit Number: 500432
Region: SS

Species Studied: Whooping crane
Location: Nearest community is Ft. Smith

Whooping crane ecology and rehabilitation

The goal of this project was to check on whooping crane pairs. There are two types of pairs that scientists study: breeding/nesting pairs, who are having young ones, and territorial pairs, who do not have nests but are setting up a new homeland to use in later years. During aerial surveys in May 2016, the researchers counted 78 nesting pairs of whooping cranes. One additional nest was added to the count in August based on the presence of a young crane that was seen in an area not known to have nests in May. This brought the total nest count to 79. In addition to nesting pairs, 18 territorial pairs were counted, which means there is the potential for the crane population to grow rapidly in coming years. Of the 79 nests, seven were outside of Wood Buffalo National Park. One of these was in the Lobstick Creek area on Salt River First Nation reserve lands, and six were north of the Nyarling River. In August 2016, the researchers also studied young birds after they had hatched and grew feathers. They counted 45 young in 44 family groups, which means that one pair had two chicks. There were slightly more young birds per nest than the 20-year average, which is about one chick for every two nests, but this was within the long-term natural range.

Bienentreu, Felix
Laurentian University
fbienentreu@laurentian.ca

Permit Number: 500433
Region: SS

Species Studied: Wood frog, boreal chorus frog, northern leopard frog, Canadian toad, western toad, and red-sided gartersnake
Location: 21 wetlands throughout the South Slave region (Ft. Smith, Hay River, Ft. Resolution) and Wood Buffalo National Park

Disease dynamics of infectious diseases in low-diversity northern ecosystems
The goal of this project was to check on the health of toads, frogs, and snakes, and to also check on the health of their habitat. The project team was trying to understand animal heath from a population level, rather than an individual animal level, which is helpful for understanding if the animals are at risk of disappearing from an area. In 2016, the researchers studied frogs and toads in and around Wood Buffalo National Park. They checked for two illnesses that can affect frogs and toads – a virus known as a "ranavirus", and a type of mould called "chytrid fungus". They took samples from wood frogs, Canadian toads, and boreal chorus frogs. Generally they just took a small sample, but sometimes they took the whole animal. They saw what looked like animals sick from the ranavirus at one site, but no obvious signs of the fungus. The researchers were also given two red-sided garter snake carcasses that were collected by Parks Canada staff at the Salt River day use area. The researchers dissected the snakes and took samples from the liver, muscle tissue, and stomach for later study. From the samples of frogs and toads, it seems that less than ten percent are infected with the ranavirus, and less than 1% have the chytrid fungus. Aside from illnesses, the researchers were also looking for physical problems like missing legs or healed wounds. The team found seven adults with physical issues like this. All of them had been injured when another creature tried to eat them, and did not have developmental abnormalties.

Bourassa, Kelly
Golder Associates
kelly_bourassa@golder.com

Permit Number: 500407
Region: NS
Species Studied: Wolveine, wolf, mink, mice, voles, coyote, fox, snowshoe hare, red squirrel, fisher, marten, otter, grouse, and ptarmigan
Location: 2 km from the footprint of Giant Mine

Giant Mine winter wildlife track surveys
All surveys were conducted between January 21 and March 1, 2016. Please contact the team lead for further information.

Callaghan, Kristen
Gwich'in Renewable Resources Board
kcallaghan@grrb.nt.ca

Permit Number: 500342
Region: IN
Species Studied: Dall's sheep
Location: Chigwaazraii/Black Mountain, northern Richardson Mountains

Dall's sheep monitoring pilot project
The purpose of this project is to use remote camera footage to monitor Dall's sheep in the Richardson Mountains. Community input and data collected during this project will support future community-based monitoring of this sheep population by co-management partners. Remote cameras are a good tool for assessing multiple habitat and sheep behavioral factors, however, camera positioning and placement affect which factors can be adequately assessed. Ewes and lambs were photographed on a different camera from ram groups, however inferences about the habitat use of the different groups cannot be made using this data alone. Recruitment could not be well assessed from the footage obtained, but future refinements to camera positioning seem like a promising way to use camera footage to create an index of recruitment on Chigwaazraii. Direct observation from camps near where the footage is captured must still be tested for

adequate comparison; the timing of such camps in relation to ewe and lamb activity are key to meeting this objective.

Cluff, Dean
Environment and Natural Resources
dean_cluff@gov.nt.ca

Permit Number: 500475
Region: NS

Species Studied: Moose
Location: North Slave Region

2016 moose abundance aerial aurvey in the North Slave Region
Summary report unavailable.

Cole, Sarah
University of Calgary
sarah.cole@ucalgary.ca

Permit Number: 500367
Region: SA

Species Studied: Vascular and non-vascular plant species
Location: central Mackenzie Valley

Developing remote sensing tools for mapping human disturbance in the central Mackenzie Valley - Government of the Northwest Territories
The main goal of this research is to create a new and cost-effective method to map “linear disturbances” like seismic lines, pipelines, and roads in northern boreal forests. To do this, the researchers used computerized mapping files that are created by a special instrument called LiDAR. LiDAR is a big laser scanner that is towed under a plane and creates very detailed computer models of the surface of the earth. The researchers used the LiDAR information to map out where there are linear disturbances, and how wide they are, on their computers. Then they compared their new, computer-generated map to maps made in the field, which included information from air photos taken by a drone. They found that their new method was better than some other ways of using computers to find and map linear disturbances. This new method will help map human-caused disturbances in the Sahtu region of Canada’s Northwest Territories, and will support ongoing efforts to understand the environmental effects of resource extraction in Canada’s north.

Cook, John
cookjg.ncasi@gmail.com

Permit Number: 500447
Region: DC, SS

Species Studied: Woodland caribou
Location: From the community of Jean Marie River east along Hwy #1 to areas north of Ft. Providence and south to near the Alberta border; also further east from Hay River along Hwy #6 to Ft. Resolution and south along Hwy #5 to Wood Buffalo National Park

Sampling nutritional resources for caribou in Northwest Territories
The goal of this project was to see how healthy the food is for caribou in a large area in the South Slave region, and also to see how much food is available to them. The researchers visited 105 different sites to check for caribou food quality and quantity between early July and mid-September, 2016. Each sampling site was a rectangular area about the size of an indoor running

track. The researchers stopped at six places in each sampling site and clipped off a piece of each of the different plants they found. They also recorded their observations of the forest in each sampling location. The researchers collected more than 9,000 bags of clipped vegetation, which were dried and weighed. Using these weights, they will be able to figure out how much of each plant and lichen species is available for the caribouto eat. The researchers also collected hundreds of other samples of plants and lichens which are being used in specialized laboratory tests. Plants were collected from seven major vegetation types: shrub-dominated fens, tree-dominated fens, white/black spruce uplands, black spruce bogs, black spruce uplands, and jack pine and aspen-dominated forest types. Due to recent wildfires, the researchers were able to take samples from forests ranging in age from 1-2 years old up to about 250 years old. This will tell the researchers whether forests of different ages contain different amounts and quality of caribou food.

Cooper, Kaytlin
Gwich'in Renewable Resources Board
kcooper@grrb.nt.ca

Permit Number: 500359
Region: GW

Species Studied: Banks swallow
Location: The study was in the Tsiigehtchic area, 30 km north and south along the Mackenzie and Arctic Red Rivers from Tsiigehtchic, and at gravel pits along the Dempster Hwy between the Yukon/NWT border and Inuvik

Bank swallow - Mackenzie and Arctic Red River survey

The goal of this ongoing survey is to monitor bank swallow populations. Bank swallows are considered to be threatened by the federal government committee which oversees endangered animals (Committee on the Status of Endangered Wildlife in Canada). Their populations have declined severely across their range. The researchers surveyed around Tsiigehtchic, approximately 30 km up- and downstream on the Mackenzie River, and approximately 30 km upstream on the Arctic Red River. They counted the number of nests, birds, and burrows at colonies, which were mapped using GPS. They also described the habitat characteristics. The majority of colonies were located on banks surrounded by shrubland. In 2016, the researchers counted 1057 burrows in 19 colonies, compared to 870 burrows in 33 colonies in the previous year. Colonies ranged from two burrows to around 200 burrows per colony. Only 27 birds were counted, compared to 441 birds in 2014. The low number of birds seen was due to a delay in surveying, which meant that most birds had already left to migrate. The researchers also saw a lot slumping along the river banks. The researchers also went to 27 gravel pits along the Dempster Highway from the Yukon/NWT border to Inuvik. Ten colonies were found at seven locations. The research team will repeat river and gravel pit surveys every other year to see whether the population is declining.

Corey, Laura
Dominion Diamond Corp.
laura.corey@ddcorp.ca

Permit Number: 500350

Species Studied: Caribou, grizzly bears, wolves, wolverine, foxes, upland breeding birds, raptors, and arctic ground squirrel

Region: NS

Location: The Ekati Diamond Mine, 150 km north of the treeline between Yamba Lake and Lac De Gras

Wildlife effects monitoring program (WEMP)

One of the requirements of the Ekati Diamond Mine is to study how the mine might affect wildlife around it. For this reason, the mine monitors various animals every year, including keeping track of the animals seen by the mine employees. The following observations were made in 2016. Employees saw about 264 caribou within the Ekati Diamond Mine study area. This is around the lowest number of caribou seen per year since observations began in 2006. In addition to caribou observations, researchers carried out eight behavioural surveys near the mine. The surveys showed that caribou spend most of their time feeding, bedded, walking, or standing. From January to December, mine staff saw grizzly bears 60 times, with 75 grizzly bears seen in total. They saw wolves on 69 different occasions, and saw a total of 194 foxes on 132 days. In the same time period, there were nine vehicle-related animal mortalities. None of the vehicle-related mortalities were caribou or other culturally- or ecologically-valued species.

Cox, Karl
Environment and Natural Resources
karl_cox@gov.nt.ca

Permit Number: 500315/500354
Region: SS

Species Studied: Barren-ground caribou
Location: The traditional Beverly barren-ground caribou winter and/or spring migration range near L Łutsel K'e, Ft. Resolution, and Ft. Smith

Distribution and movements of Beverly and Ahiak barren-ground caribou

Caribou in the Beverly and Ahiak herds range from northern Saskatchewan, through the NWT, and into Nunavut. Within the NWT they are found around the East Arm of Great Slave Lake. The nearest NWT communities are Łutselk'e, Ft. Resolution, and Ft. Smith. These caribou are usually only seen when the herds come close to the communities, or when hunters travel to accessible harvesting areas. For this reason, collars were placed on some Beverly and Ahiak caribou to collect information on how caribou move throughout the years, and to help researchers find good locations to do field work. Using the information collected through the collared caribou, the goal of this project is to study the habitat and movements of collared cows, count how many caribou there are, see how their migration routes change over time, and see how human activities like industrial development and awildfires might impact them. The researchers are also studying which areas the caribou prefer so these areas can be protected, and whether the caribou seem to return to the same areas, or if they move around. Finally, the researchers are using the information from the collared caribou to see how many males, females, and young caribou there are across the Northwest Territories and Nunavut. They are comparing different herds and this information can be used to manage the harvest from each.

Cox, Karl
Environment and Natural Resources
karl_cox@gov.nt.ca

Permit Number: 500410
Region: SS

Species Studied: Wood bison
Location: Ft. Providence and Hay River area

Bison control area program - 2015/2016 surveillance season

Summary report unavailable.

Croft, Bruno
Environment and Natural Resources
bruno_croft@gov.nt.ca

Permit Number: 500316
Region: NS

Species Studied: Barren-ground caribou
Location: Transect survey spaced between 20 and 40 km interval, extending from Dél̨nę, south of Great Bear Lake, Kellet Lake, Grandin Lake, and all areas between the communities of Behchokǫ̀, Whatì, Gamètì, Wekweètì, Detah, Łutsel K'e, and the area between Great Slave Lake and the mining locations of Snap and Kennady Lakes.

Monitoring of the Bathurst and Bluenose-East caribou herds
Summary report unavailable.

Davison, Tracy
Environment and Natural Resources
tracy_davison@gov.nt.ca

Permit Number: 500312
Region: IN

Species Studied: Barren-ground caribou
Location: Range of Tuktoyaktuk Peninsula, Cape Bathurst, and Bluenose-West caribou herds

Collaring and photo survey of Tuktoyaktuk Peninsula, Cape Bathurst, and Bluenose-West barren-ground caribou
The goal of this ongoing project is to monitor how many caribou are in these three herds, and to understand if the herds are growing, stable, or shrinking. The research team put radio collars on caribou in the three herds to help them with their post-calving population counts. The post-calving population numbers come from pictures taken from airplanes, and the researchers need to know where the caribou are in order to take the best pictures. The researchers flew over the area in early March 2016 to see where the caribou were. Between March 6 and March 23, a total of 107 collars were placed on adult caribou found in the known winter ranges of the herds. Sixty collars (43 cows, 17 bulls) were placed on caribou from the Tuktoyaktuk Peninsula and Cape Bathurst herds, and 47 collars (34 cows, 13 bulls) were placed on caribou from the Bluenose-West herd. In June, the research team closely followed the radio signals coming from the collars on these caribou by plane, and waited for a good day to take pictures. They also waited for the caribou to form large groups, which typically happens in warmer weather with low wind conditions. Weather hindered the work with many days of fog, but pictures of the Tuktoyaktuk Peninsula herd were taken on July 6, and the Cape Bathurst and Bluenose-West herds were photographed on July 18. The researchers will count caribou in these pictures, and use those numbers to figure out the approximate size of the herds.

Davison, Tracy
Environment and Natural Resources
tracy_davison@gov.nt.ca

Permit Number: 500378
Region: IN

Species Studied: Barren-ground caribou
Location: Range of Tuktoyaktuk Peninsula, Cape Bathurst, and Bluenose-West caribou herds

Monitoring of the Tuktoyaktuk Peninsula, Cape Bathurst and Bluenose-West barren-ground caribou

The goal of this ongoing project is to count how many caribou are in these three herds, and to figure out if the herds are growing, stable, or shrinking. To see if the herds are stable or not, the researchers do what is called a "composition survey" – this means counting how many calves and bulls there are compared to the number of cows. They also do a "recruitment survey" – this tells them how many calves made it through the winter and will likely end up in the herd as adults. A fall composition survey was conducted in November 2016, and a recruitment survey was conducted in April 2016. For both surveys, the researchers flew in a single pass over the caribou, counted all the caribou they saw, and categorized them as cow, calf, or bull. Caribou from the Tuktoyaktuk Peninsula and Cape Bathurst herds were mixed together during the fall survey time periods, so separate survey information is not available. The fall composition surveys were delayed by weather, but in the end the researchers counted a total of 1376 caribou. There were around 43 bulls per 100 cows. Recruitment surveys were conducted April 5 and 6, 2016, when the calves were approximately 10 month old. Recruitment is expressed as the ratio of calves observed per 100 cows. A total of 1937 caribou in 32 groups were counted. The groups ranged in size from 3 to 337 caribou. The researchers found that a good number of calves survived the winter; around 55 calves were counted for every 100 cows in the Cape Bathurst herd and Tuktoyaktuk Peninsula herd.

Elkin, Brett
Environment and Natural Resources
brett_elkin@gov.nt.ca

Permit Number: 500393
Region: NS, SS, DC, IN, GW, SA
Species Studied: All wildlife species
Location: All NWT

Wildlife health, condition, stress & genetic monitoring

The goal of this ongoing project is to keep a good record of wildlife diseases. The researchers run tests on any hunter-submitted samples and animals that are found dead. They also actively investigate any diseases or outbreaks. They provide the results of the testing to the Department of Environment and Natural Resources, individual harvesters, the public, wildlife management agencies, national wildlife disease agencies, and wildlife co-management boards. In 2016, about 150 samples were submitted by hunters for field and lab testing. They tested for the following conditions and diseases: anthrax, health/condition/pregnancy of caribou, brucellosis, tuberculosis, chronic wasting disease, stomach or gut parasites in wolves and wolverine, Erysipelas, avian influenza, West Nile virus, rabies, trichinella, and contaminants. This wildlife disease surveillance is ongoing every year.

Fronczak, Dave
US Fish and Wildlife Service
Division of Migratory Bird Management
dave_fronczak@fws.gov

Permit Number: 500462
Region: SS
Species Studied: mallard, northern pintail, American green-winged teal, American wigeon, and blue winged-teal
Location: Mills Lake Marsh on the Mackenzie River

Western Canada cooperative preseason waterfowl banding program - Mills Lake Station, NWT

The governments of Canada and the USA work together to put leg bands on a small number of migratory waterfowl every year, to help researchers understand more about these birds. In 2016, the researchers put leg bands on 1979 ducks (1590 mallard, 353 northern pintail, 13 American wigeon, 8 blue-winged teal, 7 northern shoveler, 6 American green-winged teal, and 2 redhead). This banding campaign took 21 days, from August 6 to 28. Twenty two percent of the mallards banded were young, and 29% of the northern pintail were young. The researchers caught 38 ducks that had been banded in previous years: 28 mallard and ten northern pintail. Water levels were normal compared to previous years, and remained stable throughout the month. Trap sites were located inside Mills Lake and near the Mackenzie River. Detailed information is available in the Mills Lake 2016 Preseason Banding Report, which can be requested from the South Slave GNWT, ENR office.

Hache, Samuel
Canadian Wildlife Service
samuel.hache@canada.ca

Permit Number: 500310

Species Studied: Vultures, hawks, grouse, dove, cuckoos, owls, nighthawks, swifts, hummingbirds, kingfishers, woodpeckers, and passerines

Region: NS

Location: Along the Tibbitt to Contwoyto Winter Road

2015/16 winter road long-term landbird monitoring program

Under the Migratory Birds Act, the federal department of Environment and Climate Change is supposed to monitor and care for migratory bird populations. Currently, there is not enough monitoring of these birds. Scientists do not know if the populations of many boreal bird species are going down, up, or staying the same. This includes some birds that have been classified as species at risk. Information about these birds, such as population numbers and breeding status, and how things change from year-to-year, is necessary for management decisions and species conservation. To study these birds, the researchers ran a pilot project in 2015. They put special recorders called ‘automated recording units’ in various kinds of forestto record birds singing. The nine recording units were collected from the field in 2016. All had worked properly and were able to withstand the extremely cold winter temperatures. Therefore, the pilot study was deemed a success, and more recording units have been placed in the forests. In 2015, 41 different bird species were detected. This included olive-sided flycatchers and common nighthawks, both of which are species at risk that are important to monitor and conserve. Other species that scientists don’t know very much about, but were relatively common on the recordings, include the harris sparrow, American tree sparrow, white-crowned sparrow, fox sparrow, orange-crowned warbler, blackpoll warbler, grey-cheeked thrush, hoary redpoll, common redpoll, and willow ptarmigan. A better understanding of population trends for these species will be important for their conservation.

Hache, Samuel
Canadian Wildlife Service
samuel.hache@canada.ca

Permit Number: 500420

Species Studied: Landbirds (vultures, hawks, grouse, doves, cuckoos, owls, nighthawks, swifts,

hummingbirds, kingfishers, woodpeckers, and passerines)

Region: SS, DC

Location: The Edéhzhíe (Horn Plateau) proposed National Wildlife Area. The nearest communities around the proposed study area are Ft. Providence, Jean-Marie River, Ft. Simpson, and Wrigley.

Edéhzhíe long-term landbird monitoring program

Environment and Climate Change Canada started a new monitoring program in the Edehzhie candidate National Wildlife Area (Horn Plateau) in 2016. The goal of the project is to monitor wildlife diversity — the number of different wildlife species that are found in a given area — and population size. The researchers collect information about diversity and population using sound recorders, which record the sounds and calls of the birds. The sounds were recorded from early May to late July at 41 study sites and 201 sampling stations. The information that was collected in 2016 is currently being analyzed by the research team.

Hache, Samuel
Canadian Wildlife Service
samuel.hache@canada.ca

Permit Number: 500435

Species Studied: Vultures, hawks, grouse, doves, cuckoos, owls, nighthawks, swifts, hummingbirds, kingfishers, woodpeckers, and passerines

Region: SS, NS

Location: Two burn areas along Hwy #3 between Ft. Providence and Behchokǫ̀.

National disturbance long-term landbird monitoring program

Environment and Climate Change Canada started a new long-term study in 2015 to investigate how forest fires affect boreal birds, especially those birds that are known to live in burned-out areas. To study the birds, the researchers put special recorders called ‘automated recording units’ in both recently burned forest stands and nearby forest that had not burned. These machines record birdsong so the researchers can tell which birds, and how many, are in the area. This program provides important information for land managers, and is the largest study being conducted in burned areas without salvage logging in northern Canada. As climate change is expected to increase the number and severity of forest fires, this program will help scientists understand how birds will respond to increases in forest fires. This will help wildlife managers make conservation strategies that anticipate climate change, rather than just reacting to it. In addition, the olive-sided flycatcher uses burned out areas, and is a species at risk of extinction. This project will therefore help the researchers figure out how important recent burns are, compared to undisturbed forests, for this bird.

Hebert, Craig
National Wildlife Research Centre
craig.hebert@canada.ca

Permit Number: 500429

Species Studied: California gull and herring gull

Region: SS

Location: Egg Island on Great Slave Lake

Assessing impacts of oil sands development on aquatic birds

The goal of this research project was to see if pollution from the oil sands development has made its way into gull eggs on Egg Island, Great Slave Lake. The researchers collected gull eggs from

Egg Island on June 14, 2016. They worked in collaboration with the Ft. Resolution Métis Council and the Deninu K'ue First Nation. The research team went to the island by boat from Ft. Resolution, and spent about 45 minutes on the island. Fifteen herring gull (*Larus argentatus*) and 15 California gull (*Larus californicus*) eggs were collected. For each species, one egg was collected from 15 different nests. The eggs were placed in padded cases and transported to the National Wildlife Research Centre in Ottawa. All of the eggs arrived safely, and were prepared for a variety of chemical tests. The researchers are still completing these tests. Left-over eggs are now stored frozen in the National Wildlife Specimen Bank, where they are available for future use.

Hobson, Keith
khobson6@uwo.ca

Permit Number: 500426
Region: DC, SS

Species Studied: Red-winged black birds
Location: Wetlands near Ft. Simpson, and between Ft. Providence and Behchokǫ̀

Tracking origins of nutrients to eggs of red-winged blackbirds: a test using stable isotopes

The research team were unable to conduct their research in 2016 due to unforeseen circumstances, so did not collect any samples. The team intend to collect samples in 2017.

Hodson, James
Environment and Natural Resources
james_hodson@gov.nt.ca

Permit Number: 500391
Region: SA

Species Studied: Caribou, moose, wolf, wolverine, lynx, fox, marten, weasels, mink, and otters
Location: Near Tulít'a on both the east and west sides of the Mackenzie River

Multi-species monitoring using winter wildlife track surveys in the Sahtú Settlement Region

The goal of this ongoing study is to determine the population size of certain animals in the Sahtú Region. The research team counts animals by following a set snowmobile route and counting how many tracks they find along the way. They then use a special math formula to figure out the population size of each species using their track counts. The research team conducted surveys by snowmobile in January and February 2016, using GPS, rugged field computers, and a tablet to record the tracks. They used computer programs to record information about each track, including pictures and audio notes about the track and the surrounding habitat. This collection method ensured that everyone on the team collected the same details. The team surveyed six routes, including two new routes that were established in 2016. They recorded a total of 153 tracks from nine different species over the 140 km that was surveyed. Marten tracks were the most numerous of all the recorded species, which is consistent with the results from winter 2015. The 2016 surveys provided important lessons about the coordination, logistics, and implementation of collaborative monitoring programs, which will guide future work in this area.

Hodson, Keith
khhodson72@gmail.com

Permit Number: 500448
Region: DC, SA

Species Studied: Peregrine falcon
Location: Mackenzie River from Wrigley to Inuvik

Bioelectronic monitoring of peregrine falcons along the Mackenzie River, Northwest Territories

The goal of this ongoing research project is to check on peregrine falcons and their nests. Peregrine falcon nesting sites have been counted along the Mackenzie River for fifty years. There were only eight occupied nest sites in 1969, which increased to 74 occupied nest sites in 2010. This increase follows a similar worldwide increase wherever the numbers of peregrine falcon nests have been counted. The increase is due to the reduction of organochlorine pesticides like DDT in the environment, after they were banned in the early 1970s. During the past five years, 280 special leg bands have been put on nesting peregrines. These leg bands have an electronic chip that can be read by a special monitor. Starting in 2017, a monitor will be used at nesting sites to see if the birds are returning to their home nesting sites. The research team also hopes to learn about peregrine breeding, age, and life span. Usually, when using leg bands, researchers only learn about the birds when they die and the leg bands are returned. There have only been three peregrines leg bands returned to scientists from the Mackenzie population of peregrines in almost 50 years of banding. These bands have shown a wide range of winter migration destinations, including the far southern end of South America (Terra de Fuego), Cuba, and Texas. In 2016, 71 nest sites were occupied by at least one bird. Of these, 62 were considered “active sites”, making 2016 the highest count of active sites in 50 years.

Kaupas, Laura
University of Calgary
laurakaupas@gmail.com

Permit Number: 500459

Species Studied: Little brown myotis, northern myotis, big brown bat, hoary bat, eastern red bat, and silver-haired bat

Region: SS

Location: Ft. Smith and Kakisa

Bat monitoring in the South Slave Region

Bats are facing serious threats to their populations. The research team investigated bats in the South Slave region in a couple of different ways. One was to count bats as they flew out of their caves or houses. Another was to capture bats in various locations to take DNA samples for later study, to assess how many were caught and banded before, and to put new bands on them. In the summer of 2016, the research team captured 111 little brown bats (*M. lucifugus*) and four northern long-eared bats (*M. septentrionalis*) from two colonies; the Thebacha Campground colony and the Lady Evelyn Falls colony. They put leg bands on 60 of these bats, including 26 adults and 34 young bats. Twenty-five adults and 48 young bats were captured at the Thebacha Campground little brown bat colony. Seventy-five percent of the captured females from this colony were reproductive. A total of 313 bats flew out of the roost during the annual South Slave community bat count on 22 July. At the Lady Evelyn Falls little brown bat colony, the researchers caught 20 adults and 18 young bats. All 20 of the captured females from this colony were reproductive. A total of 194 bats flew out of two bat houses on 30 July. The team captured a lactating northern long-eared bat at a foraging site 45 km west of Ft. Smith on 26 July, which means there is likely a colony nearby where mother bats have young ones.

Kelly, Allicia
Environment and Natural Resources
allicia_kelly@gov.nt.ca

Permit Number: 500383

Species Studied: Wolves

Region: SS

Location: Hay River lowlands

Wolf research and monitoring - South Slave 2015/16
The goal of this ongoing project is to estimate the number of wolves in the South Slave region. The researchers went on two surveys to look for wolves. Tracking conditions were good during both surveys, but the weather prevented the first survey centred on Tathlina Lake from being completed. After the first survey, the researchers changed the survey area to the west of Tathlina Lake in order to include caribou ranges and avoid areas that aren't suitable for wolves. There was poor weather, including dull lighting, rain and snow, during the second survey. In the end, however, the researchers completed the survey with largely good lighting, so they are confident in their results. Although the researchers were not able to complete the first survey, their counts indicated that wolf density was very low (3 to 3.5 wolves per 1,000 km^2). On the more successful second survey, two packs were located in the study area. However, the estimated density during the second survey was even lower (1.4 to 1.6 wolves per 1,000 km^2).

Kelly, Allicia
Environment and Natural Resources
allicia_kelly@gov.nt.ca

Permit Number: 500408
Region: SS
Species Studied: Moose
Location: Ft. Providence area

Fort Providence area 2016 moose population survey
Ft. Providence has expressed concern about low numbers of moose in recent years, specifically after the large anthrax outbreak in the Mackenzie bison population in 2012. The goal of this research project is therefore to estimate the moose population in the Ft. Providence area. This is the first survey of moose since 1997. The research team used a special method that has been used to estimate moose populations across the Northwest Territories and Alaska. This method divides the area into square 'grid cells' that are about 4 km by 4 km (2° latitude by 5° longitude). Then, the researchers use airplanes to survey a selection of these cells across the whole study area. They count the moose seen in each grid cell from the plane, and then use those numbers to make an estimate of the whole population. The moose population survey took place from February 23 to 28, 2016. The overall population estimate for the survey area is about 360 moose, or a density of 4.8 moose per 100 km^2. The population estimate for the area north of Lafferty Creek (west and north of Mink Lake) is about 114 moose, or 7.0 moose per 100 km^2. The remaining survey area has a lower moose density of about 4.2 moose per 100 km^2, and a total population estimate of about 246 moose.

Kutz, Susan
University of Calgary
skutz@ucalgary.ca

Permit Number: 500361
Region: IN
Species Studied: Muskoxen, caribou, and geese
Location: Ulukhaktok area

Muskox resilience under changing climate conditions
Researchers do not know very much about muskox health, such as their parasites and diseases. Recently, there have been large die-offs of muskoxen in northern Canada. The goal of this project is therefore to study muskox health, and in particular, to study how climate change may affect their susceptibility to diseases and parasites. In 2016, the researchers found that of the two types of lungworm that infect muskox, only one has expanded its range as far as Ulukhaktok, but neither have been found in muskox on Banks Island yet. The slug that transmits one of the lungworms is common around Ulukhaktok. Previously, two diseases that affect muskoxen, the bacteria

Erysipelothrix rhusiopathiae and a parapox virus, have been found on both Victoria and Banks Islands. The researchers found evidence of erysipelothrix exposure in caribou, and geese from Banks Island are currently being tested for this bacterium. To see how stressed muskoxen are, the researchers measured stress hormones from qiviut (muskox wool) and found that, in general, muskoxen on Banks and Victoria Islands seem to have higher stress levels than muskoxen on the mainland. Stressed animals are at greater risk for illness. Finally, the researchers are concerned because the muskoxen are very similar to each other genetically, almost as though they are all from the same family. For example, the researchers found that muskoxen from Ulukhaktok and Cambridge Bay are genetically similar. This could be an issue in the changing Arctic, where greater genetic diversity would mean that some animals are less likely to get sick than others.

Larter, Nic
Environment and Natural Resources
nic_larter@gov.nt.ca

Permit Number: 500276
Region: DC

Species Studied: Boreal caribou
Location: Dehcho region

Continued monitoring and deployment of satellite collars on Dehcho boreal caribou

This ongoing project began in 2004 at the request of, and after consultation with, the Sambaa K'e Dene Band in Trout Lake. Other First Nations groups joined the study as well. Between 2004 and 2015 a total of 136 collars were placed on boreal caribou cows. In 2016, the researchers put GPS collars on 11 female caribou. They took blood and fecal samples from the cows, to check for diseases and pregnancy status, and for use in a study on caribou genetics. They also measured animal fatness using an ultrasound. In a separate project component, the researchers surveyed the caribou population in March to determine the proportion of cows, calves, and bulls. They classifed 303 caribou, which is the most of any survey. The researchers finished an annual progress report in April which includes survey results, the home range size, adult female and calf survival, calving and pregnancy rates, death rates, population growth rates, diseases, and parasites. The population growth rate in 2014/15 was the highest since 2004. The researchers found that at least some boreal caribou in the Dehcho have been exposed to a disease-causing bacterium, *Erysipelothrix rhusiopathiae*. Six of ten collared caribou that had died were visited and their collars were retrieved. The researchers took teeth from five of the caribou, to check how old they were when they died. It appears that all ten caribou died from wolf predation. Nine caribou will be collared next year.

Larter, Nic
Environment and Natural Resources
nic_larter@gov.nt.ca

Permit Number: 500326
Region: DC

Species Studied: Wood bison
Location: Within the current range of the Nahanni wood bison population.

Nahanni wood bison population monitoring

The goal of this ongoing project is to study the Nahanni wood bison population to see if it is growing, stable, or shrinking. The Nahanni wood bison population lives in an area where bison also used to live long ago. All the bison died out, so to bring them back, animals from Elk Island National Park were released here in the 1980s and 1990s. The communities in the area were concerned that little was known about what bison were doing in the area, which is why this project

began. One project component is to count how many bulls and calves there are, relative to cows, which can help researchers predict if the population is shrinking or growing. This is called a "classification". In 2016, the researchers classified 190 bison, including 87 adult females, 29 calves, 15 yearlings, and 59 males. They subdivided the males into four age groups based on their horn shape, horn size, and body size. The researchers found that there are about 33 calves for every 100 adult females, and about 17 yearlings for every 100 adult females. This is somewhat below the 15 year average. It appears that about half of all calves survive over the winter. There were about 38 adult males for every 100 adult females. Biological samples were collected from three adults (one female and two males) that were either killed in car crashes or harvested. Teeth from these three bison were collected to determine how old they were when they died. The research team tried to put collars on bison on two occasions, but were unsuccessful.

Larter, Nic
Environment and Natural Resources
nic_larter@gov.nt.ca

Permit Number: 500346
Region: DC

Species Studied: Moose
Location: North of the Mackenzie River, including the pipeline right-of-way and areas in the Liard Valley.

Moose population monitoring

The goal of this ongoing project is to monitor moose populations north of the Mackenzie River and in the Liard Valley. In order to count the moose, the researchers divide the area into square 'grid cells' that are about 4 km by 4 km (2° latitude by 5° longitude). Then, the researchers use airplanes to survey a selection of these cells across the whole study area. They count the moose seen in each grid cell from the plane, and then use those numbers to estimate the size of the whole population. In 2016, the research team surveyed 78 grid cells where they counted 84 moose; 56 in the Mackenzie and 28 in the Liard harvest areas. The team also estimated that there are about 32 calves per 100 adult females, up from 27 calves per 100 adult females that were counted during the previous survey. Moose were more abundant in areas away from the main Mackenzie and Liard hunting corridors. The survey was flown a week later than in previous years to ensure a good freeze in the Liard Valley. The research team also collected biological samples of moose from local harvesters for a moose contaminant study, which is ongoing. Early results show that moose meat remains a healthy food choice, and were presented at the 8th Biennial Dehcho Regional Wildlife Workshop.

Larter, Nic
Environment and Natural Resources
nic_larter@gov.nt.ca

Permit Number: 500382
Region: DC

Species Studied: Wolves
Location: SW Dehcho Acho Dene Koe traditional area

Wolf survey in SW Dehcho

The goal of this ongoing project is to monitor the wolf population in the area by flying over it and counting wolves and wolf tracks. The survey took place from January 25 to January 30, 2016, with 16.3 hours survey time during 25.3 hours total air time in four days. There were good tracking conditions during the survey because snow had fallen on January 19. The research team couldn't survey on one day due to high wind, and the northeastern corner of the study area couldn't be

surveyed due to poor lighting conditions and a risk of aircraft icing. Other than these two instances, the weather and lighting conditions were adequate and the surveyors were confident of their results. The team surveyed 4,354 km^2, or around a tenth of the total area of Wood Buffalo National Park. The researchers saw fresh tracks from four wolf packs of around 21 to 23 wolves. They also saw older tracks from before the January 19 snowfall from an additional two packs at the survey area boundary. The estimated density was around 4.8 to 5.3 wolves per 1,000 km^2.

Martin, Pamela
Environment and Climate Change Canada
pamela.martin2@canada.ca

Permit Number: 500446
Region: NS
Species Studied: Herring gulls
Location: North Arm of Great Slave Lake

2016 chemical management plan wildlife national monitoring program collection of herring gull eggs on the North Arm of Great Slave Lake

The goal of this ongoing project is to see if there are contaminants in the eggs of herring gulls from across Canada. It is part of a larger group of projects that track chemicals in the environment and wildlife. When researchers find pollution and chemicals in herring gull eggs, it tells them that the gulls came in contact with the chemicals somehow - for example, by eating contaminated food. This helps them understand pollution, how it's affecting wildlife, and what chemicals we should be worried about. Eggs collected in 2016 have not yet been tested in the laboratory, however, eggs collected from 2008 to 2015 show that levels of flame retardants and chemicals like Scotchguard fabric protector (perfluorinated compounds) were similar to those found in island colonies on the Atlantic and Pacific coasts of Canada. On the other hand, the levels of those two chemicals found in gulls' eggs that were collected from the Great Lakes, St. Lawrence River, and prairie areas are far higher. This annual monitoring program will continue across Canada in 2017 to track emerging and priority chemical compounds in all components of the environment, including wildlife.

McLean, Sarah
De Beers Canada Inc.
sarah.mclean@debeersgroup.com

Permit Number: 500406
Region: NS
Species Studied: Various wildlife species
Location: 70 km by 80 km rectangle centred on Kennady Lake

2016 Gahcho Kue wildlife program

The owners of the Gahcho Kue Mine, De Beers, have to conduct various studies on wildlife as part of their environmental licensing. This includes ongoing monitoring for wildlife around the mine site. In 2016, routine monitoring included daily checks of the winter road, weekly wildlife surveys around the site, and the collection of wildlife observations from the mine staff. De Beers also conducted mine pit monitoring to see if there were any raptors. Finally, they conducted a small mammal trapping program in collaboration with Environment and Natural Resources. They provided the results of this trapping program and samples to Environment and Natural Resources.

Michiel, Genny
genny_michiel@gov.nt.ca

Permit Number: 500375
Species Studied: Grizzly bears and muskrats

Region: IN

Location: Along the Inuvik to Tuktoyaktuk Hwy right-of-way where winter work was planned.

Grizzly bear denning survey for the Inuvik to Tuktoyaktuk highway

The goal of this study was to check on grizzly bear dens along the Inuvik-Tuktoyaktuk Highway corridor, and also to carry out other related wildlife monitoring and research along the corridor. No active grizzly bear dens were found during the survey in 2016, and very few tracks were seen along the corridor. In addition, the research team monitored all the locations where gravel and other materials were excavated, both before and after any blasting. The final component of this project was a study on muskrats along the highway corridor. Muskrat push-ups were found in three of the lakes that might be used for water withdrawal,or where winter roads may be built. The number of muskrat push-ups and beaver lodges seen in one of the lakes, known as Lake KP55, likely means that it will be removed from the list of potential water withdrawal lakes. The muskrat push-ups in the other two lakes should not be affected by construction activities. The researchers will pass along the muskrat push-up locations to the wildlife monitors so that these sites can be monitored and remain undisturbed through the winter.

Obst, Joachim
obst100@gmail.com

Permit Number: 500439

Species Studied: Loons, songbirds, and shorebirds

Region: NS

Location: Tundra ecosystem research station, Daring Lake and Yamba Lake watershed

2016 climate change impacts on habitats, breeding densities and population trends of tundra birds at Daring Lake, NT - accumulation of mercury in loons

The goal of this ongoing project is to see if the population of tundra birds nesting near Daring Lake are in decline from climate change and mercury contamination. On July 27, the researchers surveyed loons for two hours from a boat on Daring Lake, and then watched them for four more hours from a high point overlooking the lake. Only two pairs of pacific loons, and two pairs of red-throated loons, were observed. None of these pairs had chicks. Only four of the eight known yellow-billed loon territories were occupied: two pairs with two chicks each, a pair without chicks, and a single adult. Egg shells were collected from one nest to check for mercury contamination and to study the bird's DNA. The researchers are concerned about the decreasing population of yellow-billed loons that has been observed on Daring Lake since 2011. This is not only happening in the NWT. Yellow-billed loon populations in other places have been declining since 2009. In 2010, the International Union for the Conservation of Nature categorized the yellow-billed loon as "near-threatened" because of these decreasing population trends. Many yellow-billed loons die in their wintering areas in the North Pacific Ocean and South China Sea due to commercial fishing and other human-caused factors. In addition, contaminants and mercury from their southern wintering areas, as well as their northern breeding areas, are likely affecting the ability of yellow-billed loons to have young ones.

Oldham, Michael
michael.oldham@ontario.ca

Permit Number: 500451

Species Studied: Relatively common and widespread invasive alien plant species

Region: NS, SS, IN, GW, SA, DC

Location: All highways in the NWT

Survey of wildlife habitat along all highways in the NWT - a 10 year update on distribution of alien species of vascular plants

The goal of this project is to find and catalogue “alien” plant species in the NWT. Alien plants are ones that are not native to the region of the NWT in which they are found – in other words, they are growing outside the regions where they are usually found. To meet this goal, the researchers looked for alien plants along all eight of the NWT’s territorial highways. They drove a total of 5,319 km in August 2016, surveying almost the entire length of the highways. They used both 10 km-long driving surveys, where they counted all the alien plants they could see, and walking surveys at highway pullouts to find and catalogue smaller plants that can’t be seen from a vehicle. They did 185 ten-kilometer driving surveys and 37 walking surveys. The researchers catalogued more than 3,500 individual plants and took 470 plant samples, which were sent to the Agriculture Canada herbarium. Of the 59 alien plant species they found, the ten most common were, from most common to least: white sweet-clover, common dandelion, field sow-thistle , narrow-leaved hawksbeard, awnless brome, red clover, alsike clover, yellow sweet-clover, alfalfa, and pineapple-weed. Three alien plants that had not been catalogued before in the NWT were also found: woolly burdock, golden clematis, and orchard grass. The Inuvik to Tuktoyaktuk Highway corridor was surveyed to catalogue alien plants before the highway opens, but no alien species were found.

Olson, Steve
US Fish and Wildlife Service
Division of Migratory Bird Management
steven_olson@fws.gov

Permit Number: 500468

Region: SA

Species Studied: Mallards and northern pintail ducks

Location: Near the outlet of Willow Lake, 40 km north of Tulita

Western Canada cooperative waterfowl banding program, at Willow Lake, Sahtu Settlement Area, Northwest Territories

In 2016, the Sahtu Renewable Resources Board, the Tulita Renewable Resources Council, the Government of the Northwest Territories’ Department of Environment and Natural Resources, and the United States Fish and Wildlife Service all worked together on the 20th year of duck banding at Willow Lake. A waterfowl biologist from the US supervised one other biologist and two contract employees from the Hamlet of Tulita. Together, they banded a small number of waterfowl. This allows the research partners to track and understand changing waterfowl populations and migration. Up to 18 swim-in style duck traps with trap doors were set on 19 nights, catching about 5.4 ducks per night. Leg bands were placed on a total of 1,436 ducks. The leg bands have a web address and 1-800 number so a hunter can report their catch. The leg bands were put on 822 northern pintail (57% of the total number of banded ducks), 547 mallard (38%), 57 American green-winged teal (4%), and 10 American wigeon (1%). The number of ducks caught in 2016 was the 11th highest total out of the 20 years that this study has run, and was 2% above the long-term average of 1,411 for the Willow Lake Banding Site. About a third of the banded ducks were young ducks that had hatched in 2016.

Panayi, Damian
Golder Associates Ltd.
damian_panayi@golder.com

Permit Number: 500449

Species Studied: Caribou, grizzly bear, wolves, raptors, upland birds, and waterbirds

Region: NS

Location: Within 10 km of the Kennady Diamonds Inc. Kelvin Camp

2016 Kennady north project baseline environmental studies - Kelvin Camp
The goal of this project is to study the wildlife around the Kennady Diamond Mine Kelvin Camp, so that in the future it will be possible to tell if and how the mine has changed the wildlife. The research team surveyed the area around the proposed exploration camp, including the roads and quarries. They didn't see any grizzly bear or wolf dens. The researchers flew a single aerial survey to find raptor nests, count water birds on Kelvin and Faraday Lakes, and to map caribou trails. They saw a northern harrier, but no raptor nests or suitable cliff sites were seen. No waterbirds were seen on Kelvin or Faraday Lakes, but a pacific loon and long-tailed duck were seen during a ground survey. The researchers mapped out caribou trails, which showed that caribou used to use the area, but no caribou were observed. The information gathered by the researchers was used to develop the Project Wildlife Mitigation and Monitoring Plan, and a Screening Level Environmental Impact Assessment. Both of these reports were submitted to the Mackenzie Valley Land and Water Board.

Plato, Natalie
Aboriginal Affairs and Northern Development Canada
natalie.plato@aandc-aandc-gc.ca

Permit Number: 500470

Species Studied: Deer mice, northern red-backed vole, and unidentified shrew

Region: NS

Location: Giant Mine and Baker Creek basin

2016 Giant Mine human health and ecological risk assessment
The goal of this project was to see if small animals like mice have metal contaminants in their bodies. Metal contaminants are common around old mines, and include arsenic and cadmium. To meet this goal, the researchets set up almost 100 mousetraps, in clusters of two or three, in places where they were likely to catch mice. They set the traps on September 6 using a mixture of peanut butter and oats to bait them, and checked each trap daily until September 10. The traps were set up in lines, and their locations were mapped using a GPS. The traps were moved to different locations as mice were caught. Three small mammal species were caught, including deer mouse (*Peromyscus maniculatus*), northern red-backed vole (*Myodes rutilus*), and an unidentified shrew species (*Sorex sp.*). The researchers identified the mice, froze them, and sent them (with a sample of the bait) to a laboratory in Yellowknife where they were tested for metal contaminants. The researchers provided the information about what they caught, where it was caught, and its metal content to two federal government departments. These were the Department of Architecture, Engineering, Consulting, Operations, and Maintenance, and the Department of Public Works and Government Services Canada.

Reed, Eric
Canadian Wildlife Service
PO Box 2310
eric.reed@ec.gc.ca

Permit Number: 500440

Species Studied: Dabbling ducks, diving ducks, loons, grebes (mallard, northern pintail, American wigeon, green-winged teal, lesser scaup, ring-necked duck, red-necked grebe and horned grebe), and cackling geese

Region: NS

Location: Within 400 m of each side of the Yellowknife Hwy, starting 16 km west of Yellowknife and going westward for 48 km.

2016 abundance and productivity of waterfowl and other aquatic birds breeding in the boreal forest

The goal of this ongoing project is to monitor the populations of ducks, geese, and other water birds in the NWT. In 2016, the research team found that the population of some birds was higher than the long-term average. These species were the ring-necked duck, bufflehead, mallard, American wigeon and American green-winged teal. However, the numbers of lesser scaup were below average. This is one of the birds known as “black ducks”. Another way that the researchers monitor duck population trends is to see how many ducklings have hatched. There were more ducklings hatched in 2016 than average for the American wigeon, bufflehead, mallard, and American green-winged teal. Lesser scaup and ring-necked duck had about an average number of ducklings in 2016. Of particular concern to the research team are horned and red-necked grebes, because the western population of horned grebe may be at risk for extinction. Both horned and red-necked grebes are relatively common in the area, with an average of 50 horned grebe and 32 red-necked grebe breeding pairs. In 2016 there were fewer pairs of horned grebe than usual, and they had fewer ducklings than usual. However, there were more red-necked grebe pairs and ducklings than average. The research team will continue to monitor boreal waterfowl and aquatic bird populations near Yellowknife, and will conduct their next survey in 2017.

Reed, Eric
Canadian Wildlife Service
eric.reed@ec.gc.ca

Permit Number: 500443

Species Studied: Ross's goose, lesser snow goose, and black brant

Region: IN

Location: Within Banks Island Migratory Bird Sanctuary #1

Western Arctic snow goose management: banding lesser snow geese in the Western Canadian Arctic to monitor fall/winter distribution, survival and harvest rates

The goals of this five year project are to study where snow geese migrate to in the fall and winter, to see how many of them survive the winters, and to study harvest levels. To meet these goals, the research team is banding snow geese on Banks Island. The 2016 field season was the second year of this five-year banding program. A crew of six people, including an assistant from Sachs Harbour, banded almost 2,500 geese between July 11 and July 20. Despite some delays due to weather, including three days of snow with a record amount of snowfall on July 20, the banding program was a success and all different age classes of geese were banded. One female Ross's goose had a ‘brood patch’, which means she had sat on eggs in a nest. Of the birds they caught, about 30 had been banded before on Banks Island, including eight birds that were ten years old or older. Two of these were at least 19 years old. The research team also caught five male geese that were originally caught and banded near North Slope Borough, Alaska. Unfortunately, the bad weather prevented the team from visiting the Storkerson River area or banding any black brants. Future plans are to continue banding snow geese in the Banks Island Migratory Bird Sanctuary #1 for at least three more years, which will help the researches estimate the goose population.

Sharam, Greg
Environmental Resources Management
greg.sharam@erm.com

Permit Number: 500320

Species Studied: Arctic fox, red fox, muskox, wolverine, grey wolf, grizzly bear, and waterfowl

Region: NS

Location: Seabridge Gold Inc.'s Courageous Lake property, located approximately 240 km northeast of Yellowknife.

Courageous Lake project wildlife baseline program

The goal of this project was to monitor caribou and other wildlife as they moved through a proposed development northeast of Yellowknife. In 2015, the researchers set up remote cameras in the area. The cameras took pictures of wildlife, which can be used to see when and how often animals were in the area. At this time, there are no plans to study the pictures taken by the remote cameras. The pictures are instead being stored for later use when the developer will need information about how their proposed project will affect caribou (for example, as part of the Developers Assessment Report). Such a report would likely include information such as how often the cameras detected caribou, which then could be compared among seasons and areas to determine whether caribou might be affected by the project. This will help the developers reduce their impact on caribou.

Tout, Ann Marie
Enbridge Pipelines Inc.
annmarie.tout@enbridge.com

Permit Number: 500392

Species Studied: All wildlife species

Region: DC, SA

Location: along the pipeline right of way

Wildlife monitoring - Enbridge right of way

Enbridge did not conduct any work under this wildlife research permit. In late 2015, Enbridge replaced their wildlife monitoring programs with community donations to support traditional activities.

Tsetso, Jonathon
Parks Canada/Nahanni National Park Reserve
jon.tsetso@pc.gc.ca

Permit Number: 500381/500295

Species Studied: Woodland and northern mountain caribou

Region: DC

Location: Prairie Creek and vicinity; primarily upper watershed for captures - possibly upper Ram River and Sundog Creek areas. Nahanni National Park Reserve and/or on lands outside of the park reserve.

Movements and status of caribou in the Prairie Creek area

The goal of this ongoing project is to study how boreal and mountain woodland caribou move throughout the Prairie Creek area. The researchers have placed satellite collars on six caribou in order to track them and map their movements. Early information from the tracking collars shows that the caribou move around seasonally, and that there seem to be two different groups. Three individual caribou that were collared in the North Nahanni drainage travelled several hundred kilometres northeast during April and May 2015, in areas north of Nahanni National Park Reserve, within and around Naats'ihch'oh National Park Reserve. They then returned southwest during the summer. The three caribou collared in the Prairie Creek drainage showed much less in the way

of seasonal movements, remaining largely in Prairie Creek and nearby watersheds. In May 2015, one of the collars sent a signal that the caribou wearing it had died within the Naats'ihch'oh National Park Reserve. The researchers were able to get to the collar within 36 hours of the signal, and found that the caribou likely died as a result of a wolf kill. Wolf kills are common in this area during that time of year. Currently, the remaining five collars are still working.

Wells, David
Diavik Diamond Mine Inc.
david.wells@riotinto.com

Permit Number: 500353
Region: NS
Species Studied: Barren-ground caribou, wolverine, grizzly bear, raptors (peregrine falcons and gyrfalcons), waterfowl, and shorbirds
Location: Diavik wildlife study area, situated on Lac de Gras

2015 wildlife monitoring program for Diavik Diamond Mine
Summary report unavailable.

Wilson, Joanna
Environment and Natural Resources
Bag Service #1
joanna_wilson@gov.nt.ca

Permit Number: 500317 / 500427
Region: NS, SS, DC, SA
Species Studied: Bats
Location: Various locations in the North Slave, South Slave, Tłı̨chǫ, Dehcho, and Sahtu regions

Bat monitoring in the Northwest Territories
Bats are an important animal that help keep northern areas in a natural balance. Bats are facing threats, however, and bat researchers do not know much about their presence in the NWT. For this reason, bats are being studied at a number of different locations in the NWT. The researchers are using ‘bat detectors’, which are special devices with microphones that can record the sounds that bats make when they travel and hunt. These sounds are called ‘echolocation calls’, and are so high-pitched that people can’t even hear them. Since 2010, bat detectors have been set up at sites in the South Slave, North Slave, Dehcho, and Sahtú regions. The recordings made by the bat detectors are still being studied, but already the researchers can see there is a high level of bat activity in the Dehcho region, with many different species in the Liard River Valley. In the Dehcho, bat calls are recorded from late April until late September or early October. A smaller number of bat calls are recorded in Yellowknife later in the season, beginning around mid-July. No bat calls have been recorded yet in the Sahtu region, at Willowlake River, or the East Arm of Great Slave Lake. There are also many bats in the South Slave region and in the Nahanni area, where monitoring has been done by other researchers. Research papers on bats in the NWT are available, and this information is helping the organizations that assess species at risk plan for their recovery.

Fisheries

Photos clockwise from top left: 1) Elizabeth Worden holding a recently caught Northern Pike (credit: Worden, E.); 2) DFO Staff asisting with beluga whale subsistence harvest monitoring program (ARI photo). 3) Whitefish hanging in a smokehouse to dry (credit: Michel, J.); 4) Confluence of Arctic Red River with Mackenzie River (credit: Michel, J.); 5) DFO researcher collecting sample for beluga whale subsistence harvest monitoring (ARI photo).

Crowe, Justine
Dominion Diamond Ekati Corporation

Licence Number: S-16/17-3005-YK
Species: All fish species **Location:** Sable Haul Road

Sable Road stream crossing fish salvage at Ekati Diamond Mine 2016
The goal of this project was to make sure that the construction of a stream crossing on the Sable Haul Road to the Ekati mine would have little or no impact on fish. Part of the stream was blocked off during construction of the crossing at stream section SR5. The fish trapped by the construction were captured and moved downstream of the culvert construction activities.

Darwish, Tamara
Golder Associates Ltd.

Licence Number: S-16/17-3029-YK
Species: All fish species **Location:** Lac de Gras (Diavik)

Diavik Diamond Mines Inc. annual aquatic effects monitoring program
The goal of an aquatic effects monitoring program like this one is to make sure that a development isn't harming the water, or the plants and animals in the water, beyond what was agreed to in the development license. The researcher took samples of slimy sculpin from Lac de Gras to see what effect the Diavik Diamond Mine is having on the lake and the organisms living in it. They took samples from some slimy sculpin and then released them back into the lake. They also harvested and killed some sculpin to study them further in the laboratory. where they checked the fish's overall health and tested for contaminants in their flesh. In addition, the researcher also took samples of the tiny plants and animals that live in the water, as required by their water license.

Evans, Marlene
Environment Canada
marlene.evans@ec.gc.ca

Licence Number: S-16/17-3024-YK
Species: Cisco, lake trout **Location:** Great Bear Lake area

Monitoring of mercury, flame retardants, and other chemicals in lake trout and cisco from Great Bear Lake
The goal of this study is to see if the levels of contaminants in lake trout and cisco from Great Bear Lake are changing over time. The researcher is testing for various contaminants, including mercury and flame retardants. Flame retardants are sprayed onto furniture to prevent it from burning in house fires, but they are dangerous when they leach into the environment. Previous monitoring projects have recorded the contaminant levels in these fish over many years. Because the levels are known over a longer time span, the researcher will be able to see whether the levels of contaminants are changing over time.

Evans, Marlene
Environment Canada
marlene.evans@ec.gc.ca

Licence Number: S-16/17-3026-YK
Species: Lake trout, burbot, northern pike **Location:** Hay River area, Resolution Bay, Great Slave Lake area

Spatial and long-term trends in persistent organic contaminants and metals in fish from the NWT

The goal of this ongoing study is to see whether contaminant levels in fish in the Northwest Territories are changing, with a focus on Great Slave Lake. The research team has been checking contaminant levels in fish from Great Slave Lake since the early 1990s, so they have a lot of information over a long time-span. They collected lake trout from Great Slave Lake, in both the Hay River area and the Łutselk'e area. They also collected burbot (loche) from the Łutselk'e and Ft. Resolution areas of Great Slave Lake, and northern pike from the Ft. Resolution area. All fish will be tested for contaminants, and the results will be compared to those from previous years to see if the levels are increasing, decreasing, or staying the same.

Gallagher, Colin
Fisheries and Oceans Canada
colin.gallagher@dfo-mpo.gc.ca

Licence Number: S-16/17-3007-YK
Species: Arctic charr
Location: Darnley Bay, Lesard Creek, Hornaday River

Arctic charr monitoring in Darnley Bay NT, 2016

This ongoing project has two goals. The first is to check on the Arctic charr populations in the Hornaday River, Darnley Bay, and at the mouth of Lasard Creek. The second goal is to gather information about the life history of Arctic charr captured at the mouth of the Hornaday River, and at Lasard Creek. The researchers also studied some fish known locally as 'blue charr', which are found near Tippitiuyak (western Darnley Bay). Local harvesters consider these fish to be different from Arctic charr. Finally, the research team continued to work with the community of Paulatuk to collect important information that is needed to fulfill the Paulatuk Charr Management Plan.

Gallagher, Colin
Fisheries and Oceans Canada
colin.gallagher@dfo-mpo.gc.ca

Licence Number: S-16/17-3014-YK
Species: Dolly varden
Location: Big Eddy, Rat River Mouth, Destruction City, Fish Creek

Biological investigation of Dolly Varden from the Rat River

The goal of this ongoing project is to collect information about Dolly Varden in the Rat River. There are several types of Dolly Varden that can be found in this river. Some travel to the ocean to feed, and then return to the Rat River to spawn. Others stay in creeks instead of migrating to the ocean. The research team worked with local harvesters to conduct this study. They travelled to Fish Creek, a tributary of the Rat River, when the Dolly Varden were spawning in the fall. They caught fish that had previously been tagged, which helps the research team figure out the size of the population. The team then recorded information about the fish, such as their weight and size, before returning them to the creek. They also harvested some of the fish who stay in the creek all year, to take samples for a later study. Finally, they put ten satellite tages and 60 “archival” tags on Dolly Varden. An archival tag has a tiny computer in it, which records and stores information such as the water temperature, salt level, and depth. The computer also records information about the fish itself, like its pulse and swimming speed. The researchers also asked harvesters how many fish they had caught, and how long they had to spend fishing to catch them. This information also helps the researchers understand population size.

Gallagher, Colin
Fisheries and Oceans Canada
colin.gallagher@dfo-mpo.gc.ca

Licence Number: S-16/17-3017-YK
Species: All fish species **Location:** Shingle Point

Community based monitoring of coastal fish ecology and harvest of Dolly Varden
The goal of this on-going community-based monitoring program is to learn more about the ecosystem of the Tarium Niryutait Marine Protected Area. The 'ecosystem' refers to the plants and animals in an area, as well as the local environment, and how all of these living and non-living components work together. To understand more about this ecosystem, the researchers took samples from fish caught by local harvesters at Shingle Point and tested the samples for chemicals that show what the fish had eaten. The researchers also recorded how many Dolly Varden the harvesters had caught, and measured the length, weight, sex, and age of these fish. The DNA of Dolly Varden fish was tested, and the researchers looked at their stomach contents to see what these fish had eaten. This information will be used to understand the normal yearly variations in the fish, and how this affects what people harvest. The program provided training that supports long-term, community-based coastal monitoring. This program will also help other researchers understand how to check if the oceans are changing due to the combined effects of development and other man-made changes.

Gallagher, Colin
Fisheries and Oceans Canada
colin.gallagher@dfo-mpo.gc.ca

Licence Number: S-16/17-3018-YK-A1
Species: Dolly Varden **Location:** Little Fish River, Joe Creek fish hole in Ivvavik National Park, Babbage River system, Firth River system, Herschel Island area

Population studies on Dolly Varden from the Northwest Territories and Yukon North Slope
The goal of this on-going project is to check the population of Dolly Varden char. The researchers estimated the number of Dolly Varden using a method called "mark-recapture". To do this, they first caught fish and put tags on them. Later, they returned to the same place, harvested fish again, and counted the number of both tagged and untagged fish they caught. Using these counts and specialized math equations, they can make a good guess at the total population number. The researchers do this every year, and in 2016 they put a total of 2,000 tags on fish from the Big Fish, Babbage, and Firth Rivers, as well as Joe Creek. The research team used a variety of other tagging systems to study the fish, as well. For example, some Dolly Varden migrate to the ocean, while others live their whole lives in mountain streams. The researchers put satellite tags on ten ocean-migrating Dolly Varden in the Babbage River, to see when and where they migrate. Thirty other fish were tagged with electronic archival tags, which are like small computers that record information about the water the fish live in, as well as information about the fish itself. The researchers harvested small spawning Dolly Varden from the Babbage and Firth Rivers, and from Joe Creek, to study these fish further. They also harvested resident (non-migrating) Dolly Varden from the Big Fish, Babbage, and Firth Rivers, as well as from Joe Creek. They recorded the length, weight, age, sex, maturity, and diet of these fish, and took samples from them to test for

contamination. They also took samples from fish caught by community members at Herschel Island and Ptarmigan Bay in northern Yukon.

Gallagher, Colin
Fisheries and Oceans Canada
colin.gallagher@dfo-mpo.gc.ca

Licence Number: S-16/17-3019-YK
Species: Arctic Charr
Location: Ulukhaktok area - coastal marine waters, Fish Lake

Assessment of Arctic charr stock from Fish Lake and age validation study 2016
There are two parts to this ongoing project. The first is to record the number of Arctic charr that are caught by harvesters at Kuujjuar River, and to collect information about them such as their size, sex, and age. This information helps the researchers understand if the charr population is stable, decreasing, or increasing. It also helps the researchers predict what will happen to the charr population if the amount of fishing increases or decreases. The second part of this project is to make sure that the way scientists figure out the age of a fish works for Arctic charr. Scientists figure out how old a fish is by removing special bone-like growths, called otoliths, from its ear. The otoliths get a new ring every year, just like a tree, so the scientists can count the rings to figure out how old the fish is. To see whether this method works for charr, the researchers captured charr and injected them with a type of salt called strontium chloride. This leaves a bright, easily seen mark on the otolith. If these fish are caught in futre years and their otolith rings are counted, the scientists will be able to see the bright layer added in 2016 and will be able to tell if their way of aging fish works for this species.

Gallagher, Colin
Fisheries and Oceans Canada
colin.gallagher@dfo-mpo.gc.ca

Licence Number: S-16/17-3049-YK
Species: All fish species
Location: Kakisa Lake

Assessment of walleye in Kakisa Lake 2016
The goal of this ongoing project is to collect information about fish harvesting to better understand the walleye population in Kakisa Lake. The walleye fishery has been identified as a regional priority for DFO Fisheries Management. Walleye have therefore been sampled from time to time in past years to collect information about their life history and population status. The information that has been collected will also help the researchers with another study of walley, in nearby Tathlina Lake.

Gowman, Joel
Indigenous and Northern Affairs Canada

Licence Number: S-16/17-3021-YK
Species: Lake whitefish, Arctic grayling, benthos
Location: Sandy Lake, Contol Lake, Hambone Lake, Powder Mag Lake

Tundra Mine remediation risk assessment
This project is one component of a larger study. The goal of the larger study is to see whether the closing of the Tundra Mine will leave any residual risks to human health or the area around the mine, including the plants and animals that live in the water nearby. If any risks remain, the

researchers working on this project will give recommendations that will reduce the likelihood of problems in the future. To make sure the researchers have all the information they need about current conditions near the mine, they conducted a field research program that specifically looked at the surface water and measured contaminant levels in the lakebed sediments. This information will be used to predict future risks after the mine is closed.

Harwood, Lois
Fisheries and Oceans Canada
lois.harwood@dfo-mpo.gc.ca

Licence Number: S-16/17-3003-YK
Species: Ringed seal, bearded seal **Location:** Safety Channel

Assessment of reproduction, condition, disease, and contaminants of ringed seals and bearded seals

The goal of this project was to check on the health of ringed and bearded seals. Seal health is determined by looking at whether the seals are in good enough condition to have young ones, whether they have any diseases, and whether there are a lot of contaminants in their flesh. The research team can then use the health of the seals to both monitor the seal population in general, and to determine whether the plants, water, and animals they rely on are healthy. The researchers took samples from 100 ringed seals and five bearded seals that were harvested by hunters in the Ulukhaktok area. The researchers noted what types of prey animals the bearded seals preferred. They also shared their information and samples with other researchers outside of the Canadian arctic. In 2011, there was an “unusual mortality event”, or a disease that caused a lot of seals to become ill, lose their hair, and die. The cause has of this event has not been determined, although by 2016 the disease appeared to have mostly run its course. Sharing information with other researchers working on the 2011 unusual mortality event may shed further light on the issue.

Howland, Kimberly
Fisheries and Oceans Canada
kimberly.howland@dfo-mpo.gc.ca

Licence Number: S-16/17-3009-YK
Species: All fish species **Location:** Great Bear Lake area

Long-term monitoring of cumulative impacts to fisheries and ecosystems in Great Bear Lake

The goal of this long-term monitoring program is to check the health and population levels of trout and cisco in the Dareli (Keith), Turili (McVicar), Kwit tla (McTavish), Tugacho (Dease), and Tirato (Smith) arms of Sahtu (Great Bear Lake). The researchers recorded the size and age of lake trout to see whether the fish are changing over time. They also recorded the number of eggs per female, which helps them determine how productive they are – in other words, how many young ones they have had. The research team used this information to see if lake trout numbers are changing over time. The researchers also wanted to know how many types of ciscos can be found in Great Bear Lake. To figure this out, they took ciscos that had been caught and frozen in the past seven years, and carefully studied them. They measured the size of the fish, as well as its scales, fins, and other body parts. Finally, the research team studied the whole system that supports the fish in Great Bear Lake. They studied the plants and small animals that the fish eat, as well as the quality of the water, all of which helps the fish grow and reproduce (have young ones).

Insley, Stephen
Wildlife Conservation Society Canada
sinsley@wcs.org

Licence Number: S-16/17-3004-YK
Species: Ringed seal, bearded seal **Location:** Amundsen Gulf

Darnley Bay seal monitoring
The goal of this ongoing project is to use a community-based monitoring method to study ringed seals and bearded seals in the Darnley Bay region of the Inuvialuit Settlement Region. Both the diet and condition of ringed and bearded seals are being monitored in a reliable and consistent manner over time. The collected information will be useful for scientists, harvesters, and wildlife managers into the future, particularly when assessing the effects of climate change on Arctic marine species.

Insley, Stephen
Wildlife Conservation Society Canada
sinsley@wcs.org

Licence Number: S-16/17-3048-YK
Species: Ringed seal, bearded seal **Location:** Ulukhaktok area - coastal marine waters

Winter seal diet in Ulukhaktok
The goal of this project is to study what ringed and bearded seals in the Ulukhaktok area eat over the winter. The researchers looked at the stomach contents of seals that were harvested during the winter months of the local subsistence hunt. They then catalogued everything they found in the seals' stomachs. This catalogue of stomach contents will provide a reliable and specific list of what seals in the Ulukhaktok area are consuming during the winter.

Janjua, Muhammad Yamin
Fisheries and Oceans Canada
muhammad.janjua@dfo-mpo.gc.ca

Licence Number: S-16/17-3001-YK
Species: All fish species **Location:** Great Slave Lake, Buffalo River

Buffalo River spring sampling and acoustic tagging study
The goal of this long-term research program is to monitor inconnu (coney) at the mouth of the Buffalo River during the spring season. The researchers are also gathering information from tagged inconnu in the Buffalo River. The tags on the fish emit a sound that can be used by researchers to map out their migration routes, and to track their seasonal movement patterns through Great Slave Lake and the Buffalo River.

Janjua, Muhammad Yamin
Fisheries and Oceans Canada
muhammad.janjua@dfo-mpo.gc.ca

Licence Number: S-16/17-3031-YK
Species: Inconnu **Location:** Norman Wells area

Genetic sampling of inconnu from Mackenzie River and its tributaries near Norman Wells

The goal of this project was to study the DNA of inconnu (coney) in the NWT, to see whether populations that are found in different parts of the NWT are genetically distinct from one another. Populations become genetically distinct when they remain separate from one another for a long period of time – for example, two groups of coney may remain separate because they live in different watersheds, or because they migrate at different times of year. If the groups stay separated for long enough, the different populations will have different genes. This project will look at the genes in the coney's DNA to see if there are any differences that indicate that the fish are not meeting and interacting, and are therefore genetically distinct.

Janjua, Muhammad Yamin
Fisheries and Oceans Canada
muhammad.janjua@dfo-mpo.gc.ca

Licence Number: S-16/17-3050-YK-A1
Species: Inconnu **Location:** Whitesand River, Yates River

Buffalo River inconnu genetic sampling
The goal of this project was to study inconnu (coney) in the Buffalo River. The researchers used tags to track the coney's seasonal movements in Great Slave Lake, the Buffalo River, upstream to Buffalo Lake and its tributaries, including Yates River and Whitesand River. In addition, the researchers took samples from some other fish species in order to study their DNA.

Lair, Stephane
University of Montreal
stephane.lair@umontreal.ca

Licence Number: S-16/17-3015-YK
Species: Beluga **Location:** Hendrickson Island

Health assessment of beluga whales harvested at Hendrickson Island
The goals of this ongoing program are to check on the health of beluga whales that are harvested around Hendrickson Island. The research team partnered with the Fisheries Joint Management Committee and the Department of Fisheries and Oceans to create this long term monitoring and sampling program in the Tarium Niryutait Marine Protected Area. They used Hendrickson Island as their main sampling site, but also supported similar programs at other community beluga hunt locations, such as East Whitefish, Kendall Island, Shingle Point, and Paulatuk. For example, the research team worked with the Paulatuk Hunters and Trappers Committee on their beluga sampling efforts in the proposed Anguniaqvia niqiqyuam Area of Interest Marine Protected Area in Darnley Bay. Using the information they collected, the researchers were able to chart out year-to-year changes in the conditions around Hendrickson Island, as well as natural year-to-year changes in the beluga populations. The researchers need this information to predict how regional-level changes, such as climate change, will affect beluga. They also need this information to understand how smaller-scale changes, such as oil and gas activities, might affect them. Finally, the research team is helping to build capacity for science and long-term beluga health monitoring in the Inuvialuit Settlement Region.

Lea, Ellen
Fisheries and Oceans Canada
ellen.lea@dfo-mpo.gc.ca

Licence Number: S-16/17-3016-YK-A1

Species: Arctic charr

Location: Ulukhaktok Area - coastal marine waters

Ulukhaktok summer coastal harvest monitoring 2016

The goal of this ongoing project is to collect information about Arctic char from the Ulukhaktok area, to ensure that the community's fishing management plans are based on up-to-date information. Community monitors work with local harvesters to gather information about harvested fish, such as their size and the total number of fish that were caught. This information is used in the community fishing management plans, which are created jointly by the Olokhaktomiut Hunters and Trappers Committee, the Fisheries Joint Management Committee, and the Department of Fisheries and Oceans Canada.

Lea, Ellen
Fisheries and Oceans Canada
ellen.lea@dfo-mpo.gc.ca

Licence Number: S-16/17-3022-YK
Species: Cod, sea-run Arctic charr

Location: Sachs River

Sachs River habitat and harvest monitoring 2016

The goal of this ongoing project is to collect information about Arctic charr, and their 'habitat', in the Sachs River. The term 'habitat' refers to both the living parts of the river, such as the plants and animals, and the non-living parts, such as the water temperature and depth. Together, all of these living and non-living things make up the habitat that supports the char and provides them with what they need to survive in the river. A community member was hired to work on this research project as a sentinel fisher. This person counted how many fish they caught, and how long it took to catch them. This information can be used to estimate the Arctic char population in Sachs River.

Lea, Ellen
Fisheries and Oceans Canada
ellen.lea@dfo-mpo.gc.ca

Licence Number: S-16/17-3023-YK
Species: All fish species

Location: Tuktoyaktuk area

Tuktoyaktuk Peninsula char project 2016

Fish researchers do not fully understand a couple of important questions about the char family around the Tuktoyaktuk Peninsula. First, they do not know all the places where the members of the char family (including Dolly Varden char, Arctic char, and lake trout) can be found. Second, in areas where they know that char can be found, they do not necessarily know which family those char belong to. In 2016, the Tuktoyaktuk Hunters and Trappers Committee hired sampling crews to catch char using gillnets of various sizes. The crews worked for up to ten days between mid-July and early August at McKinley Bay, Char Point, and other ideal fishing locations along the Tuktoyaktuk Peninsula.

Lea, Ellen
Fisheries and Oceans Canada
ellen.lea@dfo-mpo.gc.ca

Licence Number: S-16/17-3025-YK
Species: All fish species

Location: Tuktoyaktuk Harbour and area

Tuktoyaktuk Harbour fish study
This multi-year project about fish and fishing in the Tuktoyaktuk Harbour has five goals. First, the researchers want to chart the populations of traditionally-important fish that are harvested during the main fishery, between July and September, over a three-year period. The researchers want to see how these populations relate to those of cisco and other species that are eaten by traditionally-important fish. Second, the researchers are recording the number, size, sex, age, and maturity of Arctic cisco and other related fish that are harvested from Tuktoyaktuk Harbour during the months of July and September. Third, the researchers are comparing the fish harvested now to those that were harvested in 1997-1999, to see if there are any differences in the number, size, and types of fish between the two periods. Fourth, the researchers are studying what kind of fish, and how many, are found along different parts of the peninsula where the conditions differ. They are doing this to understand any changes that might happen in the future, if community harvesting changes due to climate change, shoreline erosion, or industrial development (such as oil and gas). Finally, the researchers want to work more effectively with the community, make use of community expertise, and improve community capacity to work on scientific monitoring projects.

Lea, Ellen
Fisheries and Oceans Canada
ellen.lea@dfo-mpo.gc.ca

Licence Number: S-16/17-3027-YK
Species: All fish species **Location:** Kellett River, Lennie River

Banks Island coastal fisheries assessment 2016
There were two goals to this project that investigated fish on Banks Island. The first goal was to find out how many fish, and what types, were harvested at the outflow of the Kellett and Lennie rivers on southwest Banks Island. The researchers used a special technique to figure out the approximate population of fish, using the number of fish that were harvested and the amount of time it took to catch them. The second goal was to find out more about the Kellett and Lennie river Arctic char stocks. To do this, the researchers took samples from harvested char. This information from the samples wil be used by the Sachs Char Working Group.

Lea, Ellen
Fisheries and Oceans Canada
ellen.lea@dfo-mpo.gc.ca

Licence Number: S-16/17-3035-YK
Species: Bowhead whale **Location:** Beaufort area

Bowhead whale tagging - Beaufort Sea 2016
The goal of this on-going project is to to study where and how bowhead whales move, where their feeding areas are, their diving behavior, and where they spend their time. The project is also tracking whether the behavior of the bowheads changes when they are near seismic operations or other industrial noises. To get this information, the research team put two types of tags on some whales. The first is a satellite transmitter, which sends information about where the bowheads are in the ocean to the research team. The other instrument is called an “acoustic tag”. This tag records sounds, so the researchers can use this information to determine how often the bowhead whales call, compared to the background noise in the ocean.

Lea, Ellen
Fisheries and Oceans Canada
ellen.lea@dfo-mpo.gc.ca

Licence Number: S-16/17-3045-YK
Species: Arctic grayling, sea-run Dolly Varden **Location:** Big Fish River

Big Fish River Dolly Varden harvest sampling 2016
The goal of this on-going program is to collect information about Dolly Varden from Big Fish River that are harvested at Little Fish River, near Aklavik. The researchers took samples from fish that were harvested by Aklavik residents under an Aboriginal Communal Fishing Licence, which was licensed to the Aklavik Hunters and Trappers Committee. They collected information about how many fish were caught, took the tags from these fish, and also took biological samples from them. Finally, the researchers asked the harvesters how long it took them to catch their fish, because this information can be used to estimate the Dolly Varden population.

Loseto, Lisa
Fisheries and Oceans Canada
lisa.loseto@dfo-mpo.gc.ca

Licence Number: S-16/17-3013-YK
Species: Beluga **Location:** Sachs Harbour area, Hendrickson Island, Whitefish Point, Shingle Point, Kendall Island, Ulukhaktok area - Coastal Marine Waters, Darnley Bay

Assessment of health in beluga whales through harvest-based monitoring
The goal of this on-going program is to check on the health of beluga whales that are harvested around Hendrickson Island. This work is a partnership between the Fisheries Joint Management Committee (FJMC) and Fisheries and Oceans Canada. The program, which includes sampling harvested beluga, is focused on the Tarium Niryutait Marine Protected Area. Although Hendrickson Island is the main sampling site, the research team also supports monitoring programs at other community beluga hunt locations. In 2016, for example, a science crew worked at both Hendrickson Island and East Whitefish, but the project also supported community monitoring at other locations by providing sampling kits and funds through FJMC. Using the information they collected, the researchers have charted out how both the environmental conditions and the beluga populations change naturally, from year-to-year. This information is necessary to predict potential impacts to beluga populations. The researchers want to be able to predict how regional-level changes, such as climate change, might affect beluga. They also want to be able to predict how smaller-scale changes, such as oil and gas activities, might affect them. Finally, the research team is building science capacity, and the capacity to conduct long-term monitoring of beluga health, in the Inuvialuit Settlement Region.

Maier, Kris
Gwichya Renewable Resource Council
kmaier@grrb.nt.ca

Licence Number: S-16/17-3033-YK
Species: Dolly Varden **Location:** Fish Creek

Examination of distribution and density of juvenile Dolly Varden in Fish Creek

The goals of this ongoing project are to study young Dolly Varden to find out more about where and how they live, and to find out how many of them make it to adulthood and produce young ones. The research team was building on the success of their 2014 and 2015 field programs. They took samples of young Dolly Varden in Fish Creek by electrofishing. The information they collected was used to map out where the young char live in the Fish Creek watershed. The information was also used to understand which parts of the Fish Creek watershed are essential for young Dolly Varden; in other words, the areas that must be protected to ensure healthy Dolly Varden populations in future.

McLean, Sarah
De Beers Canada Inc.
sarah.mclean@debeersgroup.com

Licence Number: S-16/17-3002-YK-A1
Species: Arctic grayling, burbot **Location:** Various streams

Gahcho Kué project
As part of the environmental review process for the Gahcho Kué mine, an Aquatic Effects Monitoring Program (AEMP) was made to ensure that the mine development does not impact nearby lakes and rivers beyond what is allowed in its development licence. This includes the things living in the water. The AEMP outlines the monitoring program that must be followed. In 2016, the mine had to conduct five different surveys. The first survey was of fish habitat, which refers to all of the things, living or not, that the fish need to stay alive. This includes the water chemistry and the plants and animals that the fish eat. The second survey was a community monitoring survey. In the third, they surveyed the health of fish during the open-water season. The fourth survey involved taking samples from fish to check for contaminants. In the final survey, the tiny plants and animals that live in the water, and that some fish eat, were sampled.

Miller, Matthew
Northwest Territories Power Corporation
mmiller@ntpc.com

Licence Number: S-16/17-3037-YK
Species: All fish species **Location:** Taltson River system

Taltson twin gorges hydro generating facility Aquatic Effects Monitoring Program (AEMP)
The Northwest Territories Power Corporation has to conduct an Aquatic Effects Monitoring Program to meet the requirements of their water license. The goal of an AEMP is to make sure that a particular development isn't affecting a waterway beyond what was agreed to in the license. The Power Corporation checked both Trudel Creek and the Lower Taltson River to see if fish were stranded during a period when the flow from the dam was reduced to allow for annual maintenance. This period is called a "rampdown". Field crews were on-site and ready to catch any fish that became isolated or stranded during the rampdown, and moved these fish to another location. All stranded fish were identified and counted. The research team took a sample from each species and age class, and also measured and weighed these fish. The samples (fin rays and scales) will tell the researchers how old the fish is, and will help the researchers learn more about the fish community.

Mochnacz, Neil
Fisheries and Oceans Canada
neil.mochnacz@dfo-mpo.gc.ca

Licence Number: S-16/17-3011-YK
Species: Bull trout, Arctic grayling, slimy sculpin **Location:** Funeral Creek, Prairie Creek

Bull trout ecology in the south Nahanni watershed
The goal of this on-going project is to study bull trout and their habitat in the Northwest Territories. Their habitat is made up of all the things a bull trout needs to survive, including things such as the food they eat, the water they live in, and the conditions in the water. Although bull trout are the focus of this project, other species are also studied. The researchers wanted to map out the whole area where bull trout live in the south Nahanni watershed. They also wanted to test their new research method to see whether it properly maps out bull trout areas in the north. This method uses certain types of information that were gathered in the field, and then uses specialized math equations to create maps of where bull trout live. Because they are testing this method, the researchers also checked and re-checked their work to see whether their math accurately predicted where bull trout are found in the real world. Finally, they want to use their new method to map out trout locations to see how impacts to the environment, such as climate change and development, might affect bull trout and other similar fish.

Morinville, Genevieve
Rescan Environmental Services Ltd.
gmorinville@rescan.com

Licence Number: S-16/17-3006-YK-A2
Species: All fish species **Location:** Sable Lake, Two Rock Lake

Sable and Two-Rock Lakes Ffish salvage at the Ekati Diamond Mine
The Sable kimberlite pipe is a tube of rock containing diamonds that extends deep underground. It is located beneath Sable Lake, and will be mined as part of the future development of the Ekati Diamond Mine. Two-Rock Lake, located less than a kilometer from Sable Lake, will be used as a settling facility. This means that water from the Sable kimberlite pipe mining operations will flow into Two-Rock Lake, where it will be trapped so the sediment in the water can settle out. Before any construction at the Two-Rock settling facility, and before mining starts at the Sable pipe, the mine had to fish both lakes to try to remove all the fish from them. These two lakes were actually fished out in 2001-2002, but due to delays in the development of the pit, more fishing was needed in 2016 to finish the program. The fish salvage program for Sable and Two-Rock Lakes followed standard methods. The research team also collected some scientific information about the fish during the program.

Morinville, Genevieve
Rescan Environmental Services Ltd.
gmorinville@rescan.com

Licence Number: S-16/17-3030-YK-A1
Species: All fish species **Location:** Ross Lake, Horseshoe Lake, Logan Lake

2016 Ekati Diamond Mine Sable AEMP baseline
This project is a part of a larger, on-going monitoring project called the Sable Aquatic Effects Monitoring Program (AEMP). The goal of an AEMP is to make sure that a development isn't affecting a waterway beyond what was agreed to in the license. The goal of this specific part of the project was to collect information on the population of small fish known as slimy sculpin, which are eaten by many other larger fish. The mine needed to know the population of these fish before

they started development, so they can measure the slimy sculpin population in future years and compare it to the natural population. They can use this information to make sure that fish populations are not impacted by future mining activities.

Reist, Jim
Fisheries and Oceans Canada
jim.reist@dfo-mpo.gc.ca

Licence Number: S-16/17-3020-YK
Species: All fish species **Location:** Paulatuk area

Darnley Bay nearshore fish survey
This multi-year project investigates the fish living close to the ocean coastline in Darnley Bay. This includes capelin in particular, although other species were collected as well. Capelin are a small fish that are eaten by larger fish and sea mammals. The researchers were also studying how the whole living system of the ocean works in Argo Bay, which is at the southern end of Darnley Bay. They studied how the plants and animals in the water, and the non-living elements such as the water temperature and salt levels, work together to support life. Because this study is on-going, the researchers have information from many years, not just from a single year. This allows them to see how things are changing over time. In addition, the researchers can include information gathered by other research projects, and they are also studying how nearshore and offshore areas are linked. All of this information will be used for a proposed Marine Protected Area in Darnley Bay.

Ruben, Diane
Paulatuk Hunters and Trappers Committee
phtc@live.ca

Licence Number: S-16/17-3028-YK
Species: whitefish **Location:** Hornaday River, Billy Lake

Paulatuk whitefish assessment
This project had two goals. The first was to document traditional knowledge about whitefish. The second was to find out what whitefish eat, and check them for contaminants.

Sharpe, Rainie

Licence Number: S-16/17-3010-YK-A1
Species: All fish species **Location:** Unnamed Lake (Northeast Lake), Snap Lake, Unnamed Lake (Lake 13), Unnamed Lake (Lac Capot Blanc)

De Beers Snap Lake Mine
The water licence for the De Beers Snap Lake Mine requires on-going fish sampling programs. One part of the sampling program is the “fish community component”. The main goal of this component is to see if the fish community in Snap Lake - that is, all the different types of fish, from small to large, and the number of each - will be affected by changes in water quality resulting from the Snap Lake Mine. The effects on the fish community are tracked every year by checking fish health, taking counts of fish population numbers, comparing the numbers of old, young, and healthy fish to previous populations, and checking how many of each type of fish are present in the lake. This information is compared to information that was collected before the mine was built.

Sharpe, Rainie

Licence Number: S-16/17-3012-YK
Species: All fish species **Location:** Lac du Sauvage, Thonokied Lake

Dominion Diamond Resources Corporation - Jay 2016 baseline survey
The goal of this on-going project is to check the fish in Lac du Sauvage and Thonokied Lake to see whether the Dominion Diamond Corporation mine is having any effect on their health. To do this, the project team will see what kinds of fish live in the lakes, how many of each type of fish there are, and whether there are any contaminants in their flesh. In 2016, the project team sampled small-bodied fish from both lakes, but focused their sampling on slimy sculpin. Slimy sculpin are a small fish that are an important part of the diet of many larger fish. The research team also collected samples of the tiny plants and animals that live in Lac du Sauvage and Thonokied Lake, both because these form part of a healthy water system and because they are eaten by fish. Having this information will allow the mine to check if anything changes in the future, after the mine starts operations. The team will continue to check on fish through their Aquatic Effects Monitoring Program, which is required by their water licence.

Sibbald, Carey
Stantec Consulting Ltd.
carey.sibbald@stantec.com

Licence Number: S-16/17-3038-YK
Species: All fish species **Location:** former Colomac Mine Site

Comprehensive environmental monitoring at the former Colomac Mine site, Northwest Territories
The goal of the habitat compensation monitoring program at the former Colomac Mine site is to make sure that the previously-contaminated site remains safe. After the mine closed, the site was remediated, or cleaned up and returned to a closer-to-natural state. The researchers were checking to make sure that the site was still in its remediated state. To do this, they checked two water channels that were created to compensate for changes that the mine made to the landscape. They checked the length of the streams, the water quality and contamination, the condition of the streambed, and how the water moves in the streams. They also checked the tiny animals that live in the deepest part of the stream, how fish are using the streams, and whether the man-made channels are stable.

Somers, Gila
Department of Environment and Natural Resources, Water Resources Division
gila_somers@gov.nt.ca

Licence Number: S-16/17-3032-YK-A1
Species: All fish species **Location:** Martin, Grace and Long Lake

Metal levels in large-bodied fishes near communities along the Mackenzie River
The goal of this on-going project is to study metal contaminant levels in larger fish that live close to Mackenzie River communities, and to compare these with the contaminant levels found in fish exposed to mine waste in lakes near Yellowknife. The research team collected tissue samples from the types of fish that people regularly harvest. These were tested for metal contaminants, such as arsenic and cadmium. The researchers looked for patterns in contamination levels over

the length of the Mackenzie River and throughout the Yellowknife region, and also checked for seasonal or yearly changes to contaminant levels. The team will share their results with other researchers to help the scientific and local communities understand regional impacts and changes in the Northwest Territories, including changes to both living and non-living systems.

Stevens, Cameron
Golder Associates Ltd.

Licence Number: S-16/17-3000-YK
Species: Northern pike **Location:** Burke Lake, Marion River

Dominion Diamond Corporation 2016 - Lynx Offsetting baseline fisheries program
An expansion of the Ekati Diamond Mine will affect a section of Pike Creek where jackfish are known to spawn. For this reason, the Ekati Mine will create a new, man-made spawning area, under a program known as the Lynx Offsetting Plan. Before that can happen, however, the researchers need to know more about the natural spawning area. They checked on the jackfish spawn in Pike Creek, which is near Łutselk'e, at the same time as the peak run of spawning jackfish. They harvested some fish from near the mouth of the creek using two fyke nets, which are special shallow-water nets that are set at a creek outflow and act like a fish trap. The researchers set one trap to catch fish migrating upstream to spawn, and another to trap fish migrating downstream. The fyke nets were left in the water until the end of the upstream migration.

Stevens, Cameron
Golder Associates Ltd.

Licence Number: S-16/17-3044-YK
Species: Lake whitefish, inconnu **Location:** Unnamed river (Lac la Martre)

Sachs River habitat and harvest monitoring 2016:
Spawning Habitat Assessment for Adfluvial Lake Whitefish and Inconnu on the La Martre, NWT
Lake whitefish and inconnu (coney) live together in some lakes in the Great Slave Lake region, including lakes along the La Martre River in the Marian River system. The fish in these lakes go up into small creeks to spawn, but otherwise live in the lakes. Scientists do not know much about the areas where these fish spawn or their life histories, but local knowledge suggests that lake whitefish and coney spawn below La Martre River falls. The goal of this study was therefore to find out more about the fish that spawn below La Martre River falls and their life histories. The researchers also wanted to identify and confirm inconnu and lake whitefish spawning locations so they can study them more carefully and count how many fish spawn there. The information collected by the researchers will help with the conservation and management of inconnu in the Great Slave Lake region. It will also be useful for Dominion Diamond's Jay Project Offsetting Plan at the Ekati mine, which may reintroduce inconnu to the Yellowknife River.

Stevens, Cameron
Golder Associates Ltd.

Licence Number: S-16/17-3046-YK
Species: All fish species **Location:** Bluefish Lake

NTPC Bluefish Hydro Facility mercury monitoring
The goal of this monitoring program is to make sure that the fish that people regularly harvest and eat from Bluefish Lake remain safe to eat. This work follows up on a 2015 study of mercury concentrations in slimy sculpin in Bluefish Lake. In 2016, 20 lake trout and 20 northern pike were

caught and a sample was taken from their skin using a special needle. The fish were then released. The samples will be tested for total mercury concentration.

Vecsei, Paul
Golder Associates Ltd.
paul_vecsei@golder.com

Licence Number: S-16/17-3034-YK-A1
Species: Northern pike, inconnu, lake whitefish **Location:** Marian River

Stenodus genetics-stock inconnu identification on the Marian River
The goal of this study is to figure out whether there are separate groups of inconnu (coney) that do not interbreed in the Marian River. If so, then the researchers would be able to tell the different groups apart using their DNA. This would be important for wildlife managers to know so they can better protect the fish. To investigate this, the researchers collected genetic samples from 125 coney from Marian River during their annual upstream migration. They will study the DNA from the samples in the laboratory to see if there are groups of coney that remain separate, or if they are all part of one group.

Vecsei, Paul
Golder Associates Ltd.
paul_vecsei@golder.com

Licence Number: S-16/17-3041-YK
Species: All fish species **Location:** Snare Lake

Tłı̨chǫ Aquatic Ecosystem Monitoring Project - Snare Lake fish sampling
The goal of this on-going project is to check on the health of fish in the Wekweètì (Snare Lake) area, and to see whether they are contaminated. To do this, the researchers documented local traditional knowledge of fish, and compared it with what scientific or conventional fish sampling methods have found. They also took samples from the types of fish that are regularly eaten by local community residents, and have tested them for mercury contamination.

Vecsei, Paul
Golder Associates Ltd.
paul_vecsei@golder.com

Licence Number: S-16/17-3043-YK
Species: All fish species **Location:** Marian River

Tlicho Aquatic Ecosystem Monitoring Project – La Martre-Marian River junction fish sampling
The goal of this project was to check on the health of fish and the water system where Marian River meets Lac La Martre. To meet this goal, the researchers collected fish samples from the Marian River in the area where it joins up with Lac La Martre.

Vecsei, Paul
Golder Associates Ltd.
paul_vecsei@golder.com

Licence Number: S-16/17-3047-YK

Species: Lake whitefish, cisco

Location: Bluefish Lake, Tartan Rapids (Yellowknife River)

Yellowknife River cisco

This on-going program has several components. First, the researchers took fish samples from both Bluefish Lake and the Tartan Rapids of the Yellowknife River to see what kinds of fish live in each location. The research team also wanted to find out when cisco and lake whitefish migrate to their spawning areas, and how long the migrations last. To find this out, they mapped spawning locations and took samples of fish throughout their spawning runs to measure their length, weight, age, and health.

Zhu, Xinhua
Fisheries and Oceans Canada
xinhua.zhu@dfo-mpo.gc.ca

Licence Number: S-16/17-3008-YK

Species: All fish species

Location: Great Slave Lake (area IV)

Monitor/assess cumulative impacts on important fish population productivity and community diversity in Great Slave Lake

This on-going project had two goals. The first was to create a way to study ‘cumulative impacts’ on fish in Great Slave Lake. ‘Cumulative impacts’ refers to all of the impacts on an environment taken together. This includes impacts from climate change, mines, and oil and gas production, among other things. The researchers wanted to see if changes to the environment were threatening any groups of fish, either by changing the groups or by changing how well the fish could reproduce. They also wanted to study the whole lake system that supports the fish, such as their food and the quality of the water, among other things. To create a method to do this, the researchers partnered with other researchers, resource users, Aboriginal communities, and decision makers. These partners worked together to share information, to ensure that community goals as well as scientific goals were met, and to ensure that the scientific research had a good grounding in community knowledge. The second goal of this project was to see whether future environmental changes might affect fishing levels. To do this, the researchers measured both the amount of fishing that occurs each year, as well as how the environment is changing. Using all of the information they have collected, they started to calculate how, in the future, the communities may need to regulate fishing to preserve fish populations.

Glossary

Active layer -The area where the soil freezes during the autumn and thaws during the summer

Adaptation - A process by which a living organism (human, animal or plant) changes to become better suited to a new environment. This generally on an evolutionary timescale however, in the human context, it may be over a short period.

Aerial - In the air

Algae - Simple living aquatic single or multi celled plant organisms that contains chlorophyll

Alkali - A basic substance that can range in strength

Analytical - A detailed examination of the structure or some other parameter of a substance or thing

Anoxic - A situation where oxygen is present in very low amounts or not at all, common in water

Annual - Occurs every year

Anthropogenic - Caused by a human action

Anthropology - The study of the human beings including their origins, cultures, evolution

Aquatic - Of water

Aquatic Biota - All living organisms in the aquatic environment

Arable - Land fit to be cultivated

Archaeology - The study of past human life and culture by looking at remains and artifacts like tools

Archean - A period of geologic time from about 3.9 billion years to 2.5 billion years ago

Archival - Pertaining to a collection of documents, normal over long periods of time

Arsenic - A chemical element that is gray in color and that is highly poisonous with no taste

Artifact - A historical tool, weapon or other human-made object that can be studied

Asexual - An organism that reproduces without the aid of a partner and who passes on all of its genetic information

Atmosphere - The layers of gases that surround and protect the Earth

Attributed - To explain by indicating a cause

Avifauna - the birds of a particular region or period

Bacteria - A large and varied group of single-celled microorganisms

Baseline - A set of information and data serving as a basis for comparison into the future

Bathymetry - Underwater topography. Mapping the underwater contours of the bottoms of water bodies

Beaufort Gyre - The major ice and ocean current circulation of the Arctic Ocean

Benthos - The bottom of the ocean or body of water

Biochemistry - The study of chemical processes in living organisms

Biodiversity - Pertaining to the variety of species in an area

Biogenic - Produced by living organisms or biological processes

Biogeography – The study of the geographical distribution of organisms

Biomass - The total amount of all living material within a specific volume of the environment

Biomes - Distinct areas of the Earth that are common in climate conditions, life forms and physical features like the tundra or woodland

Biostratigraphy - Identification and differentiation of rocks based on the types of fossils they contain

Biotic - Having to do with living organisms

Boreal - Relating to the forest areas of the Northern Temperate Zone that are dominated by coniferous trees such as spruce, fir and pine

Breccia - Rock composed of sharp-angled fragments embedded in a fine-grained matrix

Brunisol Soil - soil type that is associated with forest vegetation. It is usually poorly developed and immature

Carnivore - A flesh/meat eating animal

Characterized - To describe an object or idea

Chlorophyll A - A pigment in plants that give them their green color and which absorb energy from the sun. Plants use Chlorophyll to change carbon dioxide and water into food and oxygen

Classification - Organize into groups or categories

Climate – Typical weather patterns of a region over long time periods

Community - All organisms in a particular environment

Comprehend - Being able to understand

Comprehensive - Conveying or including everything or almost everything

Coniferous woodland - A wooded area that is dominated by evergreen trees

Conifers - A group of woody plant commonly known as evergreen trees such as pine, spruce or fir that bears cones

Connectivity - As something is able to connect or relate with another thing

Core - A part removed from the interior of a mass especially to determine the interior composition

Correlated - A mutual relation between two comparable things

Cretaceous - Of or belonging to the geologic time, system of rocks and sedimentary deposits of the third and last period of the Mesozoic Era, characterized by the development of flowering plants and ending with the sudden extinction of the dinosaurs and many other forms of life

Crustacean - any mainly aquatic arthropod usually having a segmented body and chitinous exoskeleton

Cryosols - Cryosols are characterized by frozen soil within 1 metre (39 inches) of the land surface and by waterlogging during periods of thaw. They often show disrupted soil layers, cracks, or patterned surface features such as frost mounds, caused by the physical actions of ice formation and melting. Cryosols may be either mineral soils or humus-rich materials

Cryosphere - frozen water in the form of snow, permanently frozen ground (permafrost), floating ice and glaciers

Cumulative - Objects or ideas that add together

Deciduous – A plant that lose their leaves during one season, usually winter

Deducing – To draw a conclusion

Deformation - A measurable change in structure, normally for the worse

Degradation - To reduce something or to place something at a lower level

Delta – The land formed where a river deposited silt as it enters into a larger water body, classic example, the Mackenzie Delta

Dendrochronology - A system of dating wooden objects by studying the tree growth rings

Density - A quantity of mass per unit volume

Devonian - Of or belonging to the geologic time, system of rocks, or sedimentary deposits of the fourth period of the Paleozoic Era, characterized by the development of lobe-finned fishes, the appearance of amphibians and insects and the first forests

Discontinuous – Not continuing or linked

Diurnal - Relating to or occurring in a 24-hour period; daily. Occurring or active during the daytime rather than at night

Diversion - A changing of the direction an object is going

Ecology - The science that deals with how living organisms live in relation to each other and their environment

Ecological integrity - Ensuring the relationship in plant and animal communities remains healthy

Ecosystem – The organisms present in a defined area and how they interact with the non-living surrounding (the biotic and the abiotic)

Effluent - A pollutant that flows out from a main source, such as sewage or waste matter

Ekman Grab - A box core type of sediment sampling device.

Electrofishing - Using electricity to stun and kill fish, usually used during scientific scenarios

Electromagnetic - Magnetism that is caused by electricity

Emissions - A water product that is radiated outward or discharged from a source

Endocrine – 1) designating or of any gland producing one or more hormones 2) designating or of such a hormone

Endophyte - An organism, especially a fungus or microorganism, that lives inside a plant, in a parasitic or mutualistic relationship

Environment – An organism's physical surroundings

Erosion - Group of natural processes (weathering, disintegration, abrasion, corrosion, transportation) where the Earth's surface is worn away and removed

Eskers - A long, narrow ridge of coarse gravel deposited by a stream flowing under a decaying glacial sheet of ice

Estuary - A place where coastal seawater comes into contact with the current of a freshwater stream

Eukaryote - any member of the *Eukarya*, a domain of organisms having cells each with a distinct nucleus within which the genetic material is contained. Eukaryotes include protoctists, fungi, plants and animals

Eutrophication – The enrichment of aquatic systems, promoting dense algal and plant growth in a body of

water, depriving the water of oxygen and forcing change in species composition

Evaporites A sedimentary deposit that results from the evaporation of seawater

Evolution - A process where different species come into existence by differentiation and genetic mutations from common ancestors over a long period of time.

Excavated - Extracting or revealing something by removal of the surrounding earth

Fauna - Animal life of a particular region, environment, or geological period

Fault - A fracture in a rock along which the rocks move; the place of origination of seismic activity; types include: strike-slip and thrust

Fecundity - Ability to reproduce

Fen - Low, flat, swampy land; a bog or marsh

Flora - The plants of a particular region, environment or geological region

Fluvial - Pertaining to something's existence or growth around a stream or river

Fossil -Trace of an organism of a past age, embedded and preserved in the Earth's crust

Fry – Infant fish

Fungi - A kingdom of heterotrophic organisms that produce spores

Fyke - A long, bag-shaped fishing net held open by hoops

Gas hydrates (clathrates) – Crystalline water based solids physically resembling ice, in which small non polar molecules (typically gases) are trapped inside "cages" of hydrogen bonded water molecules

Gender - One's characteristics or traits determined socially as a result of one's sex

Genetic - Pertaining to an organism's traits or characters being linked to genes

Genera - A group of organisms that share common characteristics

Geochemistry - The science that deals with the chemical composition of and chemical changes in the solid matter of the Earth

Geochronological - The chronology of the earth's history as determined by geologic events and not by human history

Geomorphologic - Pertaining to the physical features of the Earth's surface

Glauconite - A greenish mineral of the mica group, a hydrous silicate of potassium, iron, aluminum, or magnesium

Gonad - a gland in which gametes (sex cells) are produced

Grams (g) - A unit of measurement for mass

Habitat - A place where organisms live

Hepatic – (Anatomy) of or relating to the liver; (Botany) *botany* of or relating to the liverworts

Heterogeneous - A situation where something is in a mixed composition

Holocene - The most recent 11,000 years of the Earth's history starting at the end of the last major iceage, which has been relatively warm

Hydraulic - Pertaining to movement caused by water

Hydroacoustic survey - An echo-sounding (SONAR) survey used for measuring such things as fish stocks, water velocity, etc.

Hydrocarbon – A molecule containing hydrogen and carbon, often petroleum, natural gas and coal

Hydrograph - A graph showing the water level, discharge, or other property of river volume with respect to time

Hydrology - Science dealing with the properties, distribution and circulation of water

Isotope - Atoms that have nuclei with the same number of protons (as the atomic number) but different numbers of neutrons

Igneous - A rock or mineral that solidified from molten or partly molten material, i.e. from magma; one of three rock types with metamorphic and sedimentary

Implement - To put into effect

Iron - A metallic element used for making tools and essential for all living organisms' survival

Jarosite - a yellow to brown secondary mineral consisting of basic hydrated sulphate of iron and potassium in masses or hexagonal crystals

Kimberlite – An igneous that forms in volcanic pipe, an indicator of diamond deposits

Larvae - A premature stage for an insect where it feeds before becoming a pupa

Latitude - A measurement of the from the equator to a given point on the Earth's surface in the north and south direction

Laurentide Ice Sheet - Principal glacial cover of North America during the Pleistocene Epoch (2.6 million – 11,700 years ago). At its maximum extent it spread as far south as latitude 37° N and covered an area of more than 5 million sq mi (13 million sq km). In some areas its thickness reached 8,000 – 10,000 ft (2,400 – 3,000 m) or more

Ligotrophic (oligotrophic) - The opposite of eutrophic. Waters having very low levels of primary

productivity and (usually) low concentrations of nutrients; good, clear water quality

Limestone - A sedimentary rock that contains mostly calcium carbonate and can be formed by either inorganic or organic processes

Limnology - The scientific study of the life and phenomena of fresh water, especially lakes and ponds

Lithic - Of, like, or made of stone. Archaeological artifacts made of stone

Mesic - Of, characterized by, or adapted to a moderately moist habitat

Metabolism - The chemical processes occurring within a living cell or organism that are necessary for the maintenance of life. In metabolism some substances are broken down to yield energy for vital processes while other substances, necessary for life, are synthesized

Metamorphic rock - Any rock derived from pre-existing rocks by changes in response to environmental factors such as temperature and pressure over a long period of time; one of three types of rocks with igneous and sedimentary

Methane - The simplest hydrocarbon that is the main ingredient in natural gas (CH_4)

Microclimate - The climate of a small area that is different due to changes in geography

Microorganisms - Organisms that must be viewed under a microscope, such as bacteria or a virus

Migration – The long range movement of a group of animals based on the seasons

Molecular analysis - A detailed look at the chemical structure and properties of a molecule

Moraine - A mound of rock debris carried and deposited by a glacier

Multicellular – Composed of more than one cell

Nutrient – Any chemical that an organism removes from the environment to aid with growth and development; common nutrients include nitrogen and phosphorus

Otolith – A part of a fish's inner ear, often used to determine the age fish

Organic - Material pertaining to plants or animals

Outcrop - A portion of bedrock or other stratum protruding through the soil level

Overlie - Sedimentary or volcanic rock that lies on top of older rock

Paleoecological - A relationship or study of ancient organisms and how they related to their ancient environment

Paleoenvironmental - An environment that existed in the past

Parr - a juvenile fish

Parameter - One set of measurable factors, such as the temperature and pressure that define a system and determine its behavior and are varied in an experiment

Pelagic - Relating to or living in or on oceanic waters. The pelagic zone of the ocean begins at the low tide mark and includes the entire oceanic water column

Permafrost – The permanently frozen layer of soil that characterizes the Arctic's ground; there are two various types: continuous and discontinuous

Pertinent – An object, idea or concept that is relevant to the topic

Phylogeography - the study of the historical processes that may be responsible for the contemporary geographic distributions of individuals

Phylum – (Biology) a major taxonomic division of living organisms that contain one or more classes. An example is the phylum *Arthropoda* (insects, crustaceans, arachnids, etc., and myriapods)

Physiological - Pertaining to the physical structures and functions of living organisms

Phytoplankton - A group of plant-like plankton that all sea animals depend on either directly or indirectly

Pingo – A large frozen mound covered with vegetation in permafrost areas

Pleistocene - An age of notable ice ages and development of humans between 2,000,000 and 10,000 years ago

ppm – An abbreviation of parts per million

Precipitation – Water (in the form of rain, snow hail, etc.) falling from the atmosphere

Prokaryote - An organism of the kingdom Monera (or Prokaryotae), comprising the bacteria and cyanobacteria, characterized by the absence of a distinct, membrane-bound nucleus or membrane-bound organelles, and by DNA that is not organized into chromosomes.

Qualitative – A complete detailed descriptions usually taken from a small sample that allows for distinctions to be drawn from the data

Quantitative - Use of large amounts of data where statistics can be applied to interpret the data

Quaternary - Of or belonging to the geologic time, system of rocks, or sedimentary deposits of the second period of the Cenozoic Era, from the end of the Tertiary Period through the present, characterized by the appearance and development of humans and including the Pleistocene and Holocene epochs

Radiocarbon dating - The determination of the approximate age of an ancient object, such as an archaeological specimen, by measuring the amount of carbon^{14} it contains

Raptor - A bird of prey such as an eagle, falcon or osprey

Remote Sensing – A technique used to study locations using technology that does not require the researcher to be in the field

Revitalization - To give new life or vitality to something

Riffle – a) A rocky shoal or sandbar lying just below the surface of a waterway b) A stretch of choppy water caused by such a shoal or sandbar; a rapid

Satellite imagery - Computer images generated by a satellite which allow researchers to look at a specific area and monitor surface features such as vegetation

Sediment - Solid fragment material that occurs from the weathering of rocks. In water it is material that has settled from a state of suspension

Sedimentary rock - Rock derived from loose particles that have accumulated over time

Sedimentation - The process where small particles are moved and deposited to accumulate into layers

Seine - A large fishing net made to hang vertically in the water by weights at the lower edge and floats at the top

Seismic - Pertaining to vibrations in the Earth, both natural and induced

Shovel testing - A simple test where a sample of ground is taken by use of a shovel and examined

Species - A group of organisms that share common characteristics that group them together and also distinguish them from others

Stratified - A system that is set up in layers or strata

Stratigraphic - Formation of rock where different layers can be picked out based on type and age of the rock

Subsidence - The shifting of the Earth's surface downwards (compared normally to sea-level)

Succession - A progressive change in the biological community as a result of a response from species to the changing environment

Surficial - Pertaining to something that is on the surface

Suspension - A situation where the medium is able to support the weight of the particles trapped inside it, example: silt in a river.

Symbioses – An interaction between two or more organisms that usually benefits both

Sympatric - Occupying the same or overlapping geographic areas without interbreeding. Used of populations of closely related species

Systematic - Done according to a plan

Taxonomy - The classification of organisms in an ordered system that indicates natural relationships

Thermokarst - Sinking holes, caves and underground drainage that are produced in regions with permafrost from melting of ground ice and settling of the remaining ground

Thermocline - Layer in a large body of water that sharply separates regions differing in temperature. An abrupt temperature gradient in a lake

Topography - A description of the surface of a given area

Trace metals - A metal that is not essential in the sample but is found in small quantities

Transect - An imaginary line across a surface where observations are made

Tributary - A stream or river which feeds into a larger body of water

Turbid - Stirred up material suspended in a medium leaving it unclear and opaque

Ungulate - Hoofed animals

Velocity - Rate of change of position; quickness of motion

Volatile - Unstable; a substance that easily vapourizes

Watershed - A region draining into a river, river system, or other body of water

Weather – Daily variable changes in temperature, precipitation, wind and other atmospheric conditions

Zooplankton - Microscopic animal organisms floating in water

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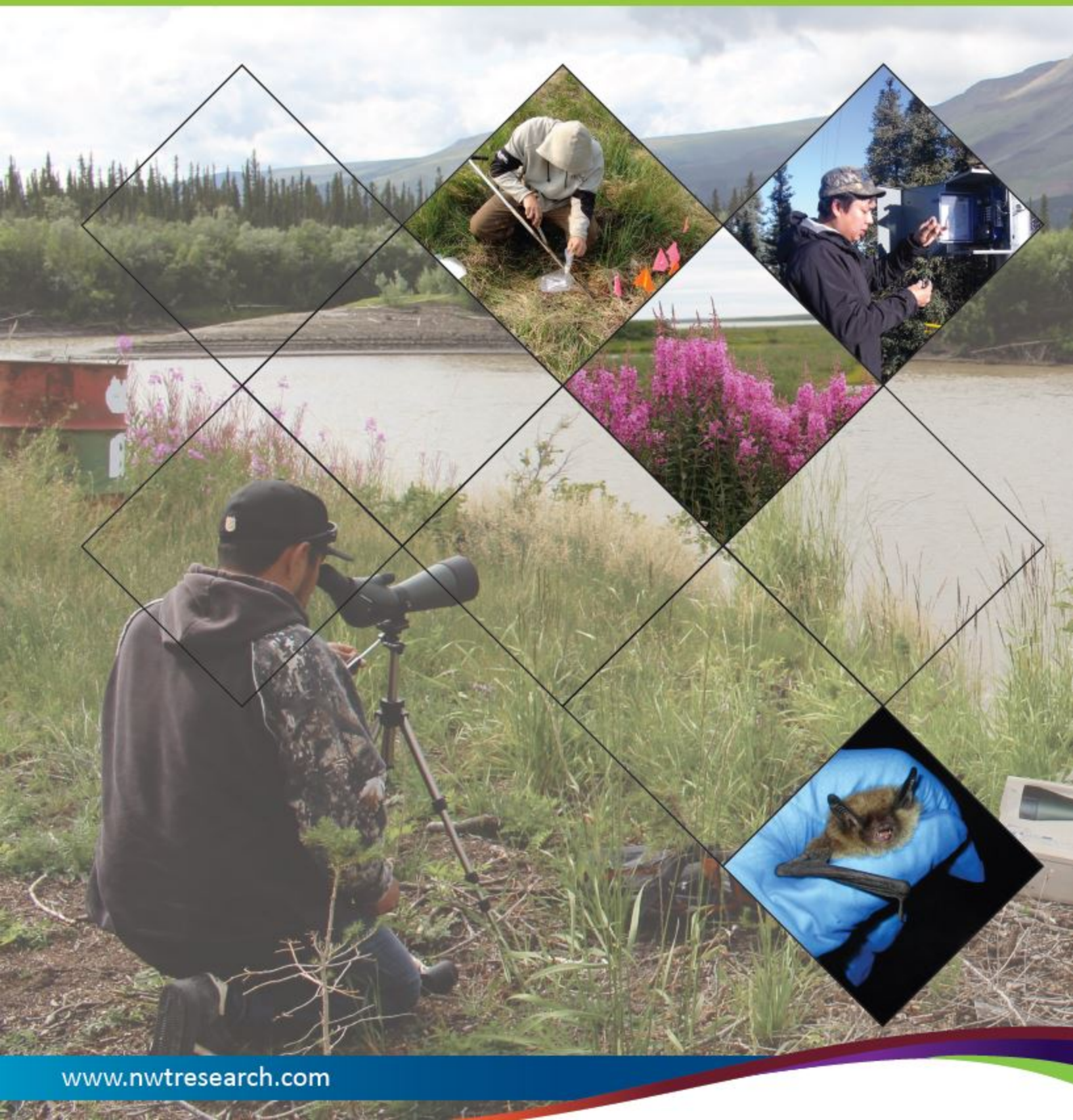

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