

Compendium of Research in the Northwest Territories **2018**



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
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Canada



Northwest
Territories Environment and Natural Resources



Northwest
Territories Education, Culture and Employment

Foreword

Welcome to the 2018 Compendium of Research in the Northwest Territories. It is with great pleasure that I present this annual publication. For over 30 years the Aurora Research Institute, in collaboration with the Prince of Wales Northern Heritage Centre, the Department of Environment and Natural Resources, and the Department of Fisheries and Oceans, has compiled plain language summaries of all research licensed in the Northwest Territories.

This year (2018) was a record year for number of licenced research projects, with 223 licenced through ARI for research across the NWT. When reading through this year's compendium, I would like to draw your attention to some interesting trends in research in the NWT. First, there is a notable increase in the number of licenses for climate-change research, which includes local, national, and international research projects. Also of interest, there are a number of research projects that focus on the preservation of the rich cultural landscape of the NWT.

In addition to the compendium summaries, please refer to ARI's NWT Research Database, for more information about past and present research initiatives in the Northwest Territories. The NWT Research Database is publically-available, map-based, continuously updated with new records, and 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.

Joel McAlister
Vice President, Research
Aurora Research Institute

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Introduction

This compendium offers a summary of research licences/permits that were issued in the Northwest Territories during 2018. 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).

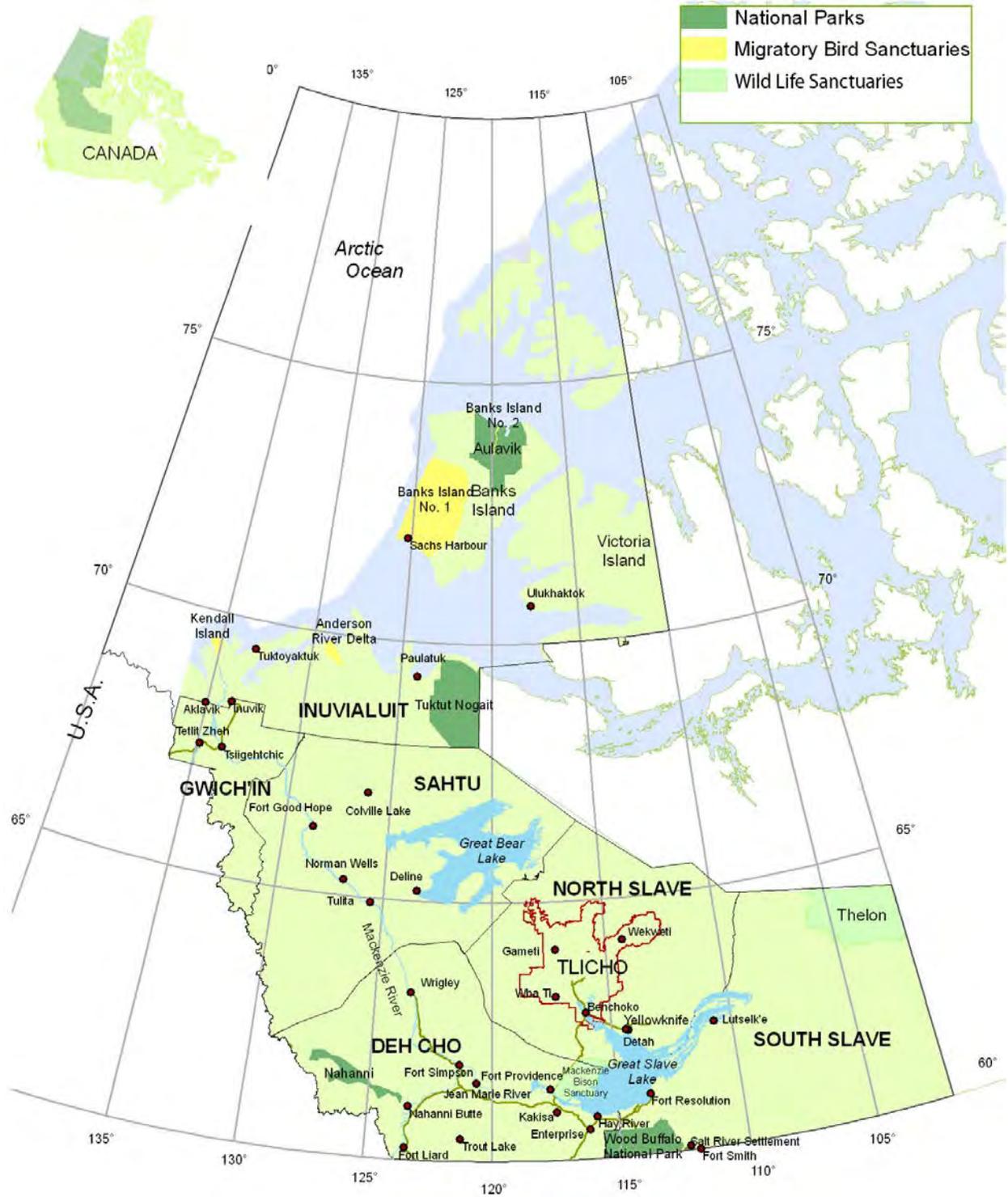


Figure 1. Land claim regions in the Northwest Territories

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 invertebrates, 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



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, 30 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



Biology

Danby, Ryan

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File Number: 12 402 926

Region: NS

Licence No: 16365

Location: Courageous Lake and MacKay Lake

Vegetation productivity on the Bathurst caribou range

This project has two main goals. First, the research team will map how vegetation is changing across the range of the Bathurst caribou herd using satellite imagery from the last 20 years. Second, they will visit different locations in the range of the Bathurst caribou herd to find out why some areas are changing and others are not. For 35 days in July and August 2018, the research team travelled by canoe from Jolly Lake to MacKay Lake. They visited twenty sites; ten where satellite imagery showed that the land was changing significantly, and ten sites where no change was seen. There were no obvious differences in the vegetation between the two types of site. Dwarf shrub birch was the dominant plant species across the region, and the researchers cut samples from sixty birch at each site. They are now counting the annual growth rings for each shrub to see how old they are, and to examine differences in their growth rates over the last two decades. The researchers also documented evidence of caribou use at each site, including shed antlers, trails, and fecal pellets. Differences in caribou use at the two types of sites will help the research team determine whether vegetation changes have indirectly influenced the number of caribou.

Davies, Linda

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File Number: 12 402 916

Region: NS

Licence No: 16394

Location: Yellowknife and Behchokò

Global monograph of the Hymenogastraceae family

Mushrooms in the family of fungi known as Hymenogastraceae live in association with trees. The mushrooms take food from the tree in the form of sugars, and in return provide the trees with essential nutrients. This relationship is essential to the health of the ecosystem. Hymenogastraceae mushrooms grow in most parts of the world, but they are poorly understood because they are very difficult to identify. During September 2018, the researcher went to the Behchokò region and found over 100 of these mushrooms, mainly of the genus *Hebeloma*. Twenty mushrooms were found near the cemetery in Rae, seven were found at Mosquito Creek, and 22 were found in a very fertile, sandy area dominated by pine trees in Edzo. The researcher also stopped to look for mushrooms at many other places along Highway 3. During the next few months these mushrooms will be studied to determine what species they are and what trees they were growing with. Information about these mushrooms will be added to information that was gathered during other studies in Yellowknife and other parts of Canada. The final results of this

study will contribute to a global understanding of Hymenogastraceae distribution, diversity, and ecology. Since this important family of mushrooms is not well-studied, however, more scientific work is needed across the country and particularly in the north.

Doubt, Jennifer

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Ottawa, ON
jdoubt@nature.ca

File Number: 12 402 924**Region:** DC, NS, SS**Licence No:** 16338**Location:** Fort Providence, Yellowknife, Enterprise, Kakisa**Bryophytes of southwest Northwest Territories waterfall areas**

No summary was submitted for this licence. This project is not in compliance with licensing requirements.

Gray, Derek

Wilfrid Laurier University
Waterloo, ON
dgray@wlu.ca

File Number: 12 402 917**Region:** IN, GW**Licence No:** 16257**Location:** Inuvik and Fort McPherson**How will fish communities in Gwich'in and Inuvialuit lakes respond to climate change?**

The goal of this ongoing project is to understand how fish in lakes in the Mackenzie Delta are responding to climate change. In previous years, the researchers took samples from a total of 29 lakes along the Dempster Highway between Fort McPherson and Inuvik. These samples were used to assess what fish species were present and in what numbers. During the 2018 field season, 21 additional lakes were visited along the Inuvik-Tuktoyaktuk Highway. At each lake, the research team made underwater maps, collected water samples for analysis, and set up gill nets to identify and count fish. Common fish species in lakes along the Inuvik-Tuktoyaktuk Highway included cisco, lake whitefish, broad whitefish, northern pike, and ninespine stickleback. Fillets were collected from common species and sent to a laboratory where they were tested for mercury contamination. During the 2019 field season, the research team will visit and sample more lakes in the area so they will have enough information to see how climate change is impacting fish communities.

Insley, Stephen

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

File Number: 12 402 894**Region:** IN**Licence No:** 16330**Location:** Aklavik, Ulukhaktok, Sachs Harbour, Paulatuk**Acoustic monitoring of marine mammals and ship traffic in the ISR**

The main goal of this study is to see how increased shipping and the loss of sea ice may affect marine mammals in the eastern Beaufort Sea. To do this, the research team is monitoring noise at the western entrance to the North-West Passage shipping route, particularly in the Amundsen Gulf and the area near Banks Island. The team uses special microphones with batteries and memory chips that record and store

data files of underwater sounds while they are moored in a location. This project began with a pilot season in 2014, and in 2015 sounds were recorded near Sachs Harbour and western Banks Island. The team continued to record underwater sounds near Sachs Harbour in 2016, and also started recording near Ulukhaktok. In 2017 they added Cape Parry and the Prince of Wales Strait, and in 2018 the research team partnered with Fisheries and Oceans Canada to record sounds further offshore. During the winter and spring of 2018, the researchers met with the Hunters and Trappers Committees in Sachs Harbour, Ulukhaktok, and Paulatuk by telephone and email to plan the activities for the field season. They also met with the committees in person while at each location in July 2018. The researchers visited the underwater microphones at eight sites during 2018. They copied the data and then replaced the recording equipment near Ulukhaktok. They were not able to find the recorders near Sachs Harbour and Browns Harbour Cape Parry, so will look for them again in 2019. The recorder near Johnston Point in Prince of Wales Strait was found and moved to near Jesse Bay. The researchers also added recorders to two existing moorings off of Cape Bathurst in partnership with Fisheries and Oceans, and added two new recorders off of Cape Parry (outside of the Anguniaqvia niqiqyuqm Marine Protected Area) and Pearce Point. The research team will provide a project update during the Inuvialuit Game Council meeting in Inuvik in spring 2019.

Insley, Stephen

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

File Number: 12 402 894**Licence No:** 16331**Region:** IN**Location:** Aklavik, Ulukhaktok, Sachs Harbour, Paulatuk**Seal diet and condition in the ISR**

The goals of this project are to monitor what ringed seals and bearded seals are eating, and their general health and condition, using a long-term, locally-based monitoring program in the Inuvialuit Settlement Region. To record seal diet and condition, the researchers are collecting samples from seals harvested by local residents and then sending the samples to a laboratory for testing. The first year of this project was 2014, when a small number of seals were sampled in Darnley Bay in September. In 2015, sampling in Darnley Bay took place from August until October. In addition, the researchers were able to get a few stomach samples from seals that were collected at Sachs Harbour and Darnley Bay in 2015 and 2016 for the Environment and Climate Change Canada Contaminants Program. The research team is currently summarizing the results from the laboratory analysis of all the stomach samples. In 2017, sampling continued at Darnley Bay and Sachs Harbour, and a fall/winter sampling program started in Ulukhaktok. Sampling at all three sites continued in 2018. The lead researcher met with representatives of the Hunters and Trappers Committees in Paulatuk, Sachs Harbour, and Ulukhaktok by telephone and email before the field season, and in person while doing field work in July. In addition, the research team met with representatives of each Hunters and Trappers Committee and the Inuvialuit Game Council during the Beaufort Sea Partnership meeting in Inuvik in October 2018. The research team will give a project update at the Inuvialuit Game Council meeting in Inuvik in spring 2019.

Jenkins, Emily

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File Number: 12 402 923**Licence No:** 16298

Region: IN**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**

In recent years, more and more animals in the Arctic have been infected with the microscopic parasite *Toxoplasma gondii*. This includes beluga whales in the Inuvialuit Settlement Region (ISR). Humans can then become infected with *Toxoplasma* when they eat raw or undercooked meat from the infected animals. Scientists and community members are worried about how *Toxoplasma* affects beluga health, as well as the health of people who harvest and eat beluga, because it can cause inflammation of the brain and reproductive problems in animals and people. Based on published information, beluga in the ISR are currently at moderate risk of exposure to *Toxoplasma*, but show no evidence of developing disease associated with *Toxoplasma* at this time. At the request of communities and the Department of Fisheries and Oceans, the research team tested samples from beluga harvested in the ISR to confirm whether the beluga are infected with *Toxoplasma*, and see if there are any risks to people who harvest and consume beluga. They found that beluga have been exposed to *Toxoplasma*, but have not detected the parasite in any tissues from harvested beluga. In 2019, they examined samples from 15 beluga, and none had antibodies in blood or DNA of *Toxoplasma* in their heart or brain. *Toxoplasma* in country food can be killed by freezing the food at very cold temperatures (-20 degrees Celsius) for three days, or by cooking the food before eating it. These procedures are recommended for pregnant women and immunocompromised people.

Kutz, Susan

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Calgary, AB

skutz@ucalgary.ca

File Number: 12 402 665**Licence No:** 16202**Region:** IN**Location:** Ulukhaktok**Community-based evaluation of muskox health in the Canadian north**

This project is in its second year and has two main goals. The first is to study the impact of diseases and climate change on muskox populations by integrating traditional ecological knowledge and western science. The second is to see how the traditional and local knowledge of Inuit communities can be incorporated into the policies that guide regional and territorial wildlife management bodies that care for muskox populations and health. Between November 2017 and February 2018, the lead researcher conducted five interviews with community harvesters, bringing the total number of harvesters interviewed to 25. The researcher also conducted five focus groups with several participants in each group, for a total of 18 focus group participants. The focus groups allowed time for the researcher to follow up on specific themes that emerged during the individual interviews, and for the participants to use their collective knowledge to map where muskoxen had died of natural causes and make a body condition tracker for time of year. More than 70 hours of interviews were recorded in total. The lead researcher will analyse the data and present the results to the participants in a feedback session that will take place between November 2018 and February 2019. The final results will be presented to the community during a meeting later in the spring of 2019. Finally, as a result of the good working relationship that the research team has with the community, the team is partnering on a grant obtained by the Olokhaktomiut Hunters and Trappers Committee. The grant is for a community-based monitoring program for caribou and muskox health. The research team will support the Hunters and Trappers Committee as they collect and analyze local knowledge on muskox and caribou populations.

Laroque, Colin

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 Saskatoon, SK
 cpl585@mail.usask.ca

File Number: 12 402 928**Licence No:** 16379**Region:** NS**Location:** Yellowknife**Synchrotron investigations at the CLS**

The goal of this project was to study the impacts of the Giant Mine in the Yellowknife area using tree samples that were analyzed using a special machine called a 'synchrotron'. This machine uses a brilliant light source that is directed at the samples and tells the researchers what the sample is made out of at the molecular level. Researchers from the Mistik Askiwin Dendrochronology Lab collected multiple tree core samples from different tree species in the Yellowknife area, including white spruce, larch, trembling aspen, white birch, and jack pine. They also collected soil samples and some shrub samples. The samples were sent to the Canadian Light Source Synchrotron to see if certain elements were present. The synchrotron was closed unexpectedly between June 2018 and February 2019, so the analysis only started recently. Early results show that there may be traces of arsenic (a known carcinogen) in the bark of trembling aspen and white spruce near Yellowknife. Further analysis of the tree cores and soil samples is needed, however, to see exactly where the arsenic is and how it moves from the soil through the trees and into their bark. No official results have been published from this project yet.

Levasseur, Annie

GNWT, Environment and Natural Resources
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 annie_levasseur@gov.nt.ca

File Number: 12 402 920**Licence No:** 16213**Region:** SS**Location:** Fort Resolution and Fort Smith**Benthic macroinvertebrate monitoring (Slave and Hay Rivers)**

Benthic macroinvertebrates are tiny animals that live at the bottom of rivers. They are useful to biologists because they tell us how healthy the ecosystem is, and changes in their population are an early warning sign of changes or stress in the environment. In summer 2018, the research team collected benthic macroinvertebrates in the Slave and Hay Rivers near the Northwest Territories-Alberta border. They wanted to see what types of macroinvertebrates are found in these rivers, and how many of them are present, so they can track changes that occur over time. The team also studied whether two different sampling methods could be used to get similar information. One method was to kick up the sediment and take a sample of the cloudy water, and the other method used 'Hester-Dendy' samplers or special plates that were left in the water so the macroinvertebrates could attach to them. A total of 24 Hester-Dendy samplers were placed in four spots in the rivers, and a total of 30 kick samples were collected from five spots in the Slave River and six spots in the Hay River. The benthic macroinvertebrates that were collected were sent to a laboratory for identification. Preliminary results show that the communities of benthic macroinvertebrates that were collected using the two different methods were very different, even when sampled in the same spot. The taxonomic richness, or the number of species, was much higher for the kick samples than for the Hester-Dendy samples. A total of 159 species were identified in both the Hay and Slave Rivers. The 2018 benthic macroinvertebrate sampling program was the second year of a four-year project.

Lougheed, Stephen

Queen's University
Kingston, ON
steve.lougheed@queensu.ca

File Number: 12 402 922**Licence No:** 16228**Region:** IN**Location:** Ulukhaktok and Tuktoyaktuk**BEARWATCH: Monitoring impacts of Arctic climate change using polar bears, genomics and traditional ecological knowledge**

The goal of this project is to monitor the effects of climate change on polar bears. It is sponsored by Genome Canada, and will bring together different types of polar bear knowledge such as traditional ecological knowledge, science, and information from historical archives. Currently, the communities of Tuktoyaktuk and Ulukhaktok are participating. A community-based monitoring program has collected and analyzed polar bear scat. In addition to the ongoing scat collection, the researchers will analyze more than 6000 tissue samples that were collected from polar bears between 1992 and 2018. These samples were collected by hunters and biologists and stored by the Governments of the Northwest Territories and Nunavut. This collection will allow recent samples to be compared to samples that were taken during previous decades. The project team presented updates on their sample collection and research plans to the Inuvialuit Game Council in June 2018. At the request of the Game Council, the researchers will develop a communications plan. They are also signing an information-sharing agreement to access the study 'Inuvialuit and Nanuq: A Polar Bear Traditional Knowledge Study'. A team member visited Ulukhaktok and met with the Joint Secretariat to further develop the research approach for this project. Additionally, the research team went to the Hudson's Bay Company archives in Winnipeg to find out more information about the polar bear fur trade. Although the information is fragmentary, they are learning a bit about regional polar bear hunt numbers.

Low, George

Dehcho Aboriginal Aquatic Resources and Oceans Management (AAROM)
Hay River, NT
Geobarbgeo@hotmail.com

File Number: 12 402 857**Licence No:** 16335**Region:** DC**Location:** Jean Marie River**Sanguex Lake fish down study**

The goal of this multi-year project is to see whether intensive fishing can lower mercury levels in large, predatory fish like northern pike and walleye. Previous research has shown that large northern pike and walleye in Sanguex Lake have levels of mercury that exceed the Health Canada guidelines for safe consumption. In fall 2017, community monitors from Jean Marie River First Nation and researchers from the University of Waterloo completed the first phase of a fish-down study on Sanguex Lake. A total of 72 kg of large northern pike were removed from the lake, but fishing was slow because most deep areas of the lake had low oxygen so the fish were not moving very much. Samples from the fish that were caught were sent to the University of Waterloo and analyzed for mercury levels. As expected, the mercury levels were higher than those found in northern pike from other Dehcho lakes. All lake whitefish that were sampled had mercury concentrations below the Health Canada guideline for safe consumption. Northern pike that were smaller than 22 inches and walleye that were smaller than 19 inches had arsenic levels that

were below consumption guidelines, but larger fish were above the guidelines. Fish-down activities continued in 2018, and the results will be reported directly to Jean Marie River First Nation.

Low, George

Dehcho Aboriginal Aquatic Resources and Oceans Management (AAROM)

Hay River, NT

Geobarbgeo@hotmail.com

File Number: 12 402 857

Licence No: 16336

Region: DC

Location: Horn River (61°28'39.1"N, 118°04'55.0"W)

Horn River creel survey and stock study

No research was conducted under this licence in 2018.

McLenaghan, Amy

Tetra Tech Canada Inc.

Edmonton, AB

amy.mclenaghan@tetrattech.com

File Number: 12 402 929

Licence No: 16390

Region: DC

Location: Fort Simpson and Nahanni Butte

Invasive species survey of proposed Prairie Creek Mine all season road

The Canadian Zinc Corporation proposed building a 170 km all season road that will connect the Prairie Creek Mine to the Liard Highway (Highway 7) via the Nahanni Butte access road. Tetra Tech was hired to conduct an invasive plant species survey along 97 km of the proposed route. The survey was completed in August 2018. The researchers found 23 invasive plant species in high densities along the Nahanni Butte access road south of the Liard River. They found one invasive species within a kilometer of the north side of the Liard River, but no further invasive plant species in the 155 km between that point and the Prairie Creek Mine. However, small numbers of four invasive species were observed around the mine site. The developers have prepared an Invasive Species Management Plan to deal with these plants. The plan addresses land management, the detection of invasive species, monitoring methods, reporting, and adaptive management strategies for invasive plant species along the all season road.

Moore, Jonathan

Simon Fraser University

Burnaby, BC

jwmoore@sfu.ca

File Number: 12 402 942

Licence No: 16225

Region: GW

Location: Peel River near Fort McPherson

Community-based long-term monitoring of the Peel River near Fort McPherson

Whitefish, called łuk dagaii in Gwich'in, are an important food fish for communities along the Peel and Mackenzie Rivers and make up a substantial amount of the fish that are caught there. Despite this, there is still a lot about the biology of whitefish that remains unknown. In 2017 a group of scientists working with the Gwich'in Renewable Resources Board and the local Renewable Resource Councils started a community-based monitoring project focused on whitefish. The research team worked at four different fishing camps near Fort McPherson, Tsiigehtchic, and Aklavik. Over 800 fish were measured during the

last two summers, and the research team will continue this work in 2019. The team learned about whitefish migration using some of the fish caught in 2017. For example, the team learned that about one in every five or six fish caught in the Peel River will make a trip down to the ocean at some point in their life. The research team also learned that fish caught in the Peel River seem to spend most of their life in other areas, including the Arctic Red or Mackenzie Rivers, or the Mackenzie River Delta. The research team will continue to learn about fish migration and other fish characteristics over the coming years, and are excited to share their results.

Panayi, Damian

Golder Associates
Yellowknife, NT
dpanayi@golder.com

File Number: 12 402 848

Licence No: 16383

Region: NS

Location: Behchokò and Whatì

Vegetation surveys on the Old Airport Road

The Government of the NWT Department of Infrastructure hired Golder Associates to complete vegetation field surveys along the proposed Tłı̨ch̨ all season road. This study was completed because the Department of Infrastructure committed to doing it during an environmental assessment. The surveyors were looking for exotic and rare plants, but no rare plants were found along the proposed all season road during the 2018 field surveys. Only a few exotic plants were found within the project footprint.

Sullivan, Grant

Nihtat Corporation
Inuvik, NT
gsullivan@nihtatgwichin.ca

File Number: 12 402 927

Licence No: 16374

Region: GW

Location: 68°21'23.60"N, 133°24'29.60"W

Inuvik High Point wind project - vegetation and rare plant survey

The goal of this study, which took place at the Inuvik High Point wind project site in summer 2018, was to complete a baseline vegetation assessment to see what kinds of plants are found along the access road and at the wind turbine location. The research team identified general vegetation types, rare plant species, alien (or non-native) plant species, traditionally-used plant species, and 'epiphytes'. Epiphytes are plants that grow on the surface of another plant, like some mosses, lichens, and ferns. Traditionally-used plant species were identified during a traditional knowledge workshop that was held in March 2018. Plant researchers group different types of plants that usually occur together into 'vegetation types'. The researchers found six of these vegetation types in the study area. Upland tundra, peat plateau, and shrub runnel were the most common vegetation types, while shrub fen, lake, and polygonal peat plateau vegetation types were present in smaller amounts. No rare plant species were found. One alien plant, a small-seeded false flax, was found in the area near the access road. Several traditionally-used plants were also found. Epiphytes were collected and identified during the field survey, but none of the epiphytes are considered rare. However, one liverwort species called Gillman's Lophozia (*Lophozia gillmanii*) and two lichen species, a pelt lichen species (*Peltigera latiloba*) and a cup lichen species (*Cladonia galindezii*), have not been previously reported in the Northwest Territories.

Taylor, Scott

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File Number: 12 402 928**Licence No:** 16382**Region:** SA**Location:** Norman Wells**Fish and fish habitat study at Norman Wells Operations (Artificial Islands), Norman Wells, Northwest Territories (NWT)**

The research team completed a field survey to assess fish habitat around the Artificial Islands at Imperial's Norman Wells Operations between 11 and 13 September 2018. The purpose of the assessment was to study the fish habitat that has appeared near the shoreline around the man-made islands since they were constructed in the mid-1980s, and to see if the shores provide good fish habitat for resident and migratory fish species in the Mackenzie River. The survey was completed by two employees from Wood Environment and one local environmental monitor. The team used a boat operated by a local resident to get to the islands. In general, the research team found that the islands provide relatively diverse fish habitat. On the leading edge of each island, strong currents with moderate to high speeds produce a distinct seam between backwater areas and the nearby mainstem flow. Large areas where sediment is being deposited are also common, which causes sand bars to form in front of and behind each island. Although the islands are similar, each one is a bit different due to its orientation in the river flow path. The edges of all six islands are suitable habitat for a variety of fish species in the Mackenzie River. A study report was given to the Norman Wells Renewable Resource Council on 30 November 2018.

Trimble, Annika

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File Number: 12 402 733**Licence No:** 16368**Region:** IN, GW**Location:** Inuvik and Fort McPherson**Northern native seed development field trials**

No research was conducted under this licence in 2018.

Trimble, Annika

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File Number: 12 402 733**Licence No:** 16403**Region:** IN**Location:** Inuvik and Tuktoyaktuk**Northern native plant development collections in the NWT**

The research team collected seeds along the Inuvik-Tuktoyaktuk Highway in mid-September. Due to a cold growing season, some of the plants did not have mature seeds available for collection before the first deep frost. Seeds were collected for common grasses and a few flowering plants that are abundant in disturbed areas. The seeds will be cleaned and the research team will test the seeds in 2019 to see how viable they are

Contaminants

Blowes, David

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File Number: 12 402 843

Region: NS

Licence No: 16266

Location: Giant Mine (62°29'59"N, 114°21'31"W) and Yellowknife

TERRE-NET: Controls on the release of contaminants from gold tailings at the Giant Mine, Yellowknife, NT

The purpose of this project is to study how contaminants, including arsenic and antimony, move through and out of mine tailings at the Giant Mine site. Mill tailings are rocky waste formed as a byproduct of gold production. The research team spent six weeks at Giant Mine between June and October of 2018. They collected samples of mill tailings and analyzed both the rocks and water in them to see what chemicals were present. The research team also drilled 21 groundwater wells both within and outside of the Northwest Tailings Pond at the mine. They placed a 'piezometer' in each well, which measures the water pressure or level. The researchers took water samples from each well to test the chemical make-up of the water, and also pumped all of the water out of the wells to see how quickly they refilled. The speed at which the wells refill helps the researchers understand the flow of water and the movement of contaminants out of the tailings pond. The research team is using both the field data and laboratory measurements to study groundwater flow and the concentrations of important chemicals and elements. This project will help the people who are designing passive water treatment technologies and special covers for the tailings pond at Giant Mine. Water treatment will treat contamination from the tailings pond, and special covers will isolate arsenic-bearing mill tailings from the environment.

Chetelat, John

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File Number: 12 402 886

Region: NS

Licence No: 16366

Location: Yellowknife Bay and Great Slave Lake

Legacy arsenic pollution in Yellowknife Bay sediments: An assessment of its long-term fate under a changing climate

This two year study, running from 2018 to 2020, examines the present-day and future stability of arsenic contamination from local gold mining in Yellowknife Bay sediments. Long-term environmental change from climate warming during the 21st century could impact the amount of arsenic that is transferred from the sediments to the water in Yellowknife Bay. The goal of this project is to predict how levels of arsenic in the water might change in the future. To do this, the researcher is measuring how arsenic moves from the sediments into the overlying water in the bay, and studying how temperature might control this

process. Initial field experiments were conducted in Yellowknife Bay in August 2018. Twelve sediment cores were collected at sites with varying water depths and at different distances from the Giant Mine site. The cores were kept in holders either near the shore or at the bottom of the lake for six days, to maintain realistic temperatures and light conditions. It seems like there is a substantial short-term release of arsenic from contaminated sediment to the overlying water during summer near the Giant Mine site. This information will be provided to the stakeholders and decision makers who manage this important waterbody for the residents of Ndilo, Detah, and Yellowknife. Additional field and laboratory research will be conducted in 2019.

Evans, Marlene

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File Number: 12 402 681**Licence No:** 16253**Region:** SA**Location:** Tulita, Délıne**Productivity and mercury trends in Great Bear Lake**

In March 2018, a research team from Environment and Climate Change Canada collected a series of sediment cores from McVicar Arm, Dease Arm, and Keith Arm in Great Bear Lake. The sediment cores were collected by slowly lowering a plexiglas tube into the lake bed and then gently bringing it back up to the surface. Each core was cut into 60 or more very thin slices that were about 0.2 cm thick. The surface slice of each core was the youngest, with each slice further down the core being older than the slice above. The researchers used special techniques to find out the age of each core slice. Next they measured various chemicals and fossil plant cells in some of the slices. The cores are still being analyzed, but so far the researchers have found very low concentrations of mercury, metals, and PCBs in the cores. They also found little change in these concentrations with increasing core depth, which means that contaminant concentrations don't seem to have increased in recent times. Plant growth has increased over the past 100 years, possibly because of warming temperature trends. This study was done in collaboration with Queen's University and the Department of Fisheries and Oceans. The researchers will continue to work with the community of Délıne and the Department of Fisheries and Oceans to measure mercury in lake trout and other fish in Great Bear Lake.

Evans, Marlene

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File Number: 12 402 681**Licence No:** 16364**Region:** SS**Location:** Great Slave Lake East Arm (62°25.114"N, 110°50.059"W) and Great Slave Lake West Basin (61°04.926"N, 113°55.713"W; 60°59.053"N, 115°46.442"W)**Spatial and long-term trends in persistent organic contaminants and metals in lake trout and burbot from Great Slave Lake**

No summary was submitted for this licence. This project is not in compliance with licensing requirements.

Horobin, Ric

Regal Cottage

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File Number: 12 402 925

Licence No: 16339

Region: GW

Location: Along the Wind-Peel-Mackenzie River system

Analysis of microplastic in a wilderness river system

Plastic contamination in rivers and oceans causes many problems in different ecosystems around the world. Tiny pieces of plastic, called microplastics, have even been found in the Arctic Ocean. The purpose of this research project was to document whether plastic contamination was present in a river system that is almost entirely free of human development - the Wind, Peel, and Mackenzie River system. The researcher took samples from these rivers in July 2018 and analysed them using a microscope to check for microplastics as well as larger pieces of plastic. Many of the river water samples were free of microplastics, but evidence of what is believed to be plastic were found in five of the 12 samples. Not all of the samples containing plastic were from locations downstream of human habitation. What is not known is whether the plastic that was found in some samples was created by the sampling method, so further work is being done to determine this. One thing that was clear from the results is that larger pieces of plastic were found fairly regularly along the river banks. This shows that, even in areas without permanent communities, the presence of even a small number of humans means that plastic will also be present.

Laird, Brian

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File Number: 12 402 900

Licence No: 16185

Region: SA, DC, SS

Location: Coleville Lake, Déljñę, Fort Good Hope, Norman Wells, Tulita, Fort Liard, Fort Providence, Fort Simpson, Jean Marie River, West Point First Nation, 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 determine a safe level of country food consumption that balances contaminant risks and nutrient benefits in the Dehcho and Sahtú regions. To do this, the research team has monitored how people from participating communities eat country foods, how exposed they are to contaminants, and how much nutrition they receive from country foods since 2015. With the help of a local research coordinator, participants were invited to complete six components: three surveys and three sample collections (hair, urine, blood). All participants were given the choice to take part in one, many, or all of the project components. Between July 2017 and June 2018, 202 people participated in the project. The participants came from the communities of Sambaa K'e, Tulita, and K'asho Got'ine. Samples are still being analyzed for mercury, healthy fat, metals, and organic pollutants. A confidential letter of study results and a community report are being prepared, and will be sent to participants and community leadership in the fall of 2018. In the last year, project results were reported to participants and leadership in communities that took part in this study in earlier years. The communities included Katlodeeche, West Point, Deh Gah Gotie, Ka'a'gee Tu, and Déljñę. Overall, this project has found that the health benefits of country foods generally outweigh contaminant risks. These results support participant communities to eat country food and to promote country food use in their regions.

Palmer, Mike

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File Number: 12 402 921**Licence No:** 16207**Region:** NS**Location:** Lower Martin Lake, Long Lake, Handle Lake

A multidisciplinary investigation of recovery in Yellowknife area lakes from 50 years of arsenic pollution: What are the factors inhibiting recovery and the biological consequences?

Elevated levels of arsenic and antimony persist in the water and sediment of small lakes near closed mines in the Yellowknife area, even though more than 50 years have passed since most of the mining emissions were released. The goal of this project is to better understand how small lakes in the region recover from mining pollution, because arsenic can be washed out of lakes by normal outflows of water. The researchers have taken samples year-round from a small shallow lake (1.2 km² in area, and less than 3 meters deep) near the historic Giant Mine roaster. Early results show that varying amounts of arsenic move between the lake water and the lake sediments, with the amount dependent on location and season. Lake sediments were a small source of arsenic to the overlying lake water during the open-water season when lake water contains a lot of oxygen. However, these sediments became a large source of arsenic by mid-winter, after oxygen levels drop. This difference, with a lot of arsenic in the water in the winter but not as much in the summer, may be inhibiting the long-term recovery of mine-impacted shallow lakes. This is because higher arsenic levels do not typically coincide with periods of high outflow at lake outlets.

Somers, Gila

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File Number: 12 402 915**Licence No:** 16281**Region:** NS**Location:** Walsh (62.577781N, 114.276732W), Banting (62.634963N, 114.290108W), Chitty (62.697561N, 114.120792W)**Metals levels in large bodied fishes near impacted lakes near Yellowknife, NWT**

This project had two main goals. First, the researcher worked with communities in the Gwich'in Settlement Region to increase their capacity to establish a long-term monitoring program for contaminants in fish. Second, the researcher monitored trends in metal concentrations, including mercury, in large-bodied fish within the Mackenzie River watershed and the Yellowknife region. The researcher monitored trends in metal concentrations to check for changes over time and across space. This project began in 2016, and the final results are anticipated in 2019.

Stern, Gary

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File Number: 12 402 869**Licence No:** 16294

Region: SA**Location:** Mackenzie River near Fort Good Hope and the Rampart Rapids**Temporal trend studies of trace metals and halogenated organic contaminants (HOCs), including new and emerging persistent compounds, in Mackenzie River burbot, Fort Good Hope, NWT**

The goal of this project is to measure various types of contaminants in burbot (loche) to see if it is healthy for people to eat the fish. Contaminants are substances that are present in the environment at higher concentrations than natural background levels, and that have the potential to impact animal and human health. Working in partnership with the Fort Good Hope Renewable Resources Council (FGH RRC), the research team is collecting and sampling burbot from the Rampart Rapids of the Mackenzie River. The samples are then tested for two groups of contaminants. The first group is metals such as mercury, and the second group is organic pollutants like pesticides and industrial compounds from the south that travel to the north by air and through river systems. Burbot have been collected from the Rampart Rapids since the mid-1980s. With any long-term project such as this one, it is important to continue to monitor wildlife to look for changes in contaminant concentrations over time. To date, concentrations of mercury in these burbot have been below the Health Canada guidelines for human consumption. In 2018, a total of 20 fish were collected and shipped to the University of Manitoba, where they are currently being analysed for contaminants. The data will be shared with the FGH RRC and community members when it is available.

Swanson, Heidi

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File Number: 12 402 889**Region:** DC, SS**Licence No:** 16243

Location: Kakisa Lake (60°56'48.37"N, 117°45'15.78"W),
 Tathlina Lake (60°34'15.27"N, 117°38'1.51"W), McGill Lake
 (61°18'13.86"N, 121°0'50.00"W), Deep Lake (61°12'45.3"N,
 120°55'08.2"W)

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

The goals of this project are to measure mercury concentrations in fish in Dehcho lakes, to figure out which lakes and fish are the safest, and to figure out how to predict where the safest lakes and fish can be found. In August and September 2017, a team of community monitors and university researchers sampled fish, water, soil, and lake bottom sediments from Kakisa, Big Island, and Ekali Lakes. Over the winter, the fish samples were analyzed to determine the age of the fish and the level of mercury in their flesh. The research team found some useful results that can be used by those eating fish caught in these lakes. All of the lake whitefish that were sampled had mercury levels that were below the Health Canada guidelines for safe human consumption. In general, fish from Kakisa Lake had the lowest mercury levels. In Big Island Lake, lake trout shorter than 21 inches and northern pike shorter than 26 inches had mercury levels that were below the guidelines. In Ekali Lake, walleye shorter than 17 inches and northern pike shorter than 22 inches had mercury levels that were below the guidelines. The project results have been submitted to the Government of the Northwest Territories Department of Health and Social Services, and once their review is complete posters will be sent out. The results will also be presented at the next Dehcho Aboriginal Aquatic Resources and Oceans Management meeting, and during field work that will take place in the summer of 2018.

Engineering

Berg, Aaron

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File Number: 12 406 062

Region: IN

Licence No: 16344

Location: Trail Valley Creek

Hydrological remote sensing

The goal of this project, which is based in the arctic tundra region near Inuvik, is to see if scientists can determine soil moisture and vegetation from satellite images. In dry soils, the organic layer at the surface insulates lower soil layers and keeps them cool, which reduces active layer and permafrost thaw. On the other hand, permafrost under wetter soils is more likely to thaw. Due to these different thaw rates, being able to monitor soil moisture is a very important part of understanding changes in permafrost that will occur in the future. The research team installed several soil moisture stations where both soil moisture and the position of the active layer were monitored throughout the summer. The soil moisture stations were used to check soil moisture estimates that were calculated using satellite images and air photos that were taken from a plane. In the future, the cameras that were on the plane will be attached to satellites. The researchers found that if they created a soil moisture model, it gave them a more accurate estimate of the active layer depth. Several papers on this topic were submitted to academic journals, and presentations were made to the academic community.

Dares, Matthew

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File Number: 12 406 071

Region: NS

Licence No: 16328

Location: CN Hill-Northwestel communications tower
(63°24'15.5"N, 116°10'44.8"W)

Wind energy monitoring at Snare Hill

The goal of this project is to see if it is possible to generate electricity for the city of Yellowknife using wind power. The Aurora Research Institute continued to record wind speeds and direction at the Snare Hill monitoring site. The initial wind assessment at this site was completed in 2017, and the final report will be updated when the equipment is decommissioned. This will likely happen in 2020 or 2021.

Dares, Matthew

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File Number: 12 406 071
Region: GW

Licence No: 16329
Location: Inuvik High Point, about 6 km northeast of the Inuvik airport (68°21'24.12"N, 133°24'25.31"W)

Wind energy monitoring at High Point

The goal of this project is to see how much wind energy can be produced at the Inuvik High Point site, which is located about 6 km northeast of the Inuvik airport. Based on previous monitoring data that was collected at this site, a wind turbine is being installed that will be used as a source of alternative energy for Inuvik. The Aurora Research Institute continued to collect data from this monitoring site, although the initial wind assessment was completed in 2017. The monitoring site will soon be decommissioned due to the upcoming construction of the wind turbine. The final report will be updated to include monitoring data from 2018.

Dares, Matthew

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 matthew.dares@auroracollege.nt.ca

File Number: 12 406 071
Region: IN, GW

Licence No: 16377
Location: Inuvik

Creating heat from waste: Biomass pellets from landfill-destined cardboard

The goal of this project was to see if cardboard that would normally end up in the town dump could instead be transformed into biomass pellets, which can be burned for heat in special stoves. A specialized shredder was ordered to process the cardboard, and this resulted in substantial delays to the installation of the pellet mill. The mill is now expected to begin operations in January 2019, at which time the cardboard pellets will be tested.

Dares, Matthew

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File Number: 12 406 071
Region: SA

Licence No: 16410
Location: Meteorological tower on the northwest edge of Norman Wells (65°17'15.5"N, 126°53'51.5"W)

Wind monitoring in Norman Wells, NT

No data was collected in 2018 due to delays in tower installation.

Ensom, Timothy

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File Number: 12 406 063
Region: IN

Licence No: 16263
Location: Trail Valley Creek (68°44'22.26"N, 133°27'49.91"W), Parsons Lake (68°53'27.99"N, 133°32'20.01"W), Gungi Creek (69°18'34.09"N, 132°59'42.35"W), Gungi Creek Crossing

(69.343944°N, 133.038305°W), Jimmy Creek (68.625695°N, 133.632011°W), Havikpak Creek (68.316203°N, 133.516296°W)

Winter flow regime and icing dynamics of tundra streams near the Inuvik to Tuktoyaktuk Highway

The goal of this multi-year project is to better understand how tundra streams along the Inuvik-Tuktoyaktuk Highway change in winter. The research team took many measurements over the 2018 field season. In April and May, they measured the depth and density of snow at the streams, and also drilled holes in the stream ice cover to map where the streams were frozen down to their beds. Large amounts of stream overflow ice were observed at the first, second, third, fifth, and sixth bridges along the highway as the researchers traveled north along the highway away from Inuvik. Samples of this overflow ice, as well as samples from the snow and stream surface ice, were collected and will be analyzed to figure out where the overflow comes from. The shape of the overflow ice was also mapped using a GPS. In May and June, the researchers measured peak flow in several streams along the highway in order to estimate the amount of water flow in these streams each year. In August, a full year of ground and water temperature measurements were successfully copied from monitoring devices on streambeds and streambanks. The temperature measurements were used to determine where permafrost is located near the streams. The research team also mapped the shape of stream channels using GPS so they could estimate the volume of overflow ice they had found in the spring. They installed special devices that will measure water pressure on the beds of several streams, which will help the researchers understand how stream water pressure changes in winter when icings form. The electrical conductivity of the ground under several streams was measured because this information can be used to understand the shape of the permafrost under the streams. Early results suggest that, in winter, streams might be getting colder in the places where they run under bridges than in natural locations without bridges.

Jacobson, Ashley

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File Number: 12 406 066

Region: IN, GW

Licence No: 16230

Location: (68°21'43"N, 133°41'57"W), (68°21'21"N, 133°41'34"W), (68°21'04"N, 133°41'16"W), (68°21'44"N, 133°44'20"W)

Correlation of snow density and depths of urban disturbed and undisturbed areas in Inuvik

No summary was submitted for this licence. This project is not in compliance with licensing requirements.

Kasook, Davonna

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File Number: 12 406 065

Region: IN

Licence No: 16291

Location: Forested site along Inuvik water tower trail (68°21'43.41"N, 133°41'22.86"W), tundra site along the Mackenzie Valley Highway (69°12'50.54"N, 132°53'45.37"W)

Comparing the snow depths and densities of different habitats in the Beaufort Delta region

Snow is an important aspect of the Mackenzie Delta environment because it is significant to the region's ecology, water systems, and climate. Snow also has a recreational and traditional importance to the people of the Mackenzie Delta. The snow pack has different layers that are created by different processes. The purpose of this project was to study how different landscapes affect snow depths, densities, and morphology (the shape and type of snowflake), thereby affecting layers in the snow pack. The researchers chose two sample sites, one in a vegetated area in the Town of Inuvik, and one in the open tundra alongside the newly constructed Mackenzie Valley Highway. Samples were collected every month to allow time for snow to accumulate and 'morph', or change into layers. At each sample site, the researchers took depth and density measurements along transect lines, and also measured temperature and snow density from deeper snow in a snow pit. They also measured the temperature of the snow at different depths within the snow pack. At the vegetated site, snow pack temperature stopped changing in April. The researchers found differences in seasonal snow density at both sites, and found higher density snow at the Mackenzie Valley Highway site. Variability in snow depths and densities can partially be explained by differences in vegetation, landscape, and weather. Understanding the physical characteristics of the snow pack, and how they change seasonally, are important both to predict how water moves through the ground and for people to travel safely.

Layden, Ronald

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File Number: 12 406 069

Region: NS

Licence No: 16283

Location: Whati and the La Martre River basin

Groundwater and permafrost study in La Martre River basin

The goal of this study was to investigate the relationship between groundwater, permafrost, and the increased water flow observed over the past 50 years in the La Martre River. This river flows out of the third largest lake in the NWT. The research team worked with the Tłı̨chǫ government and the community of Whati to involve community members and local government employees in the study. The team also sponsored a youth to attend a water stewardship meeting in Yellowknife, partnered with the Tłı̨chǫ lands department to collect ongoing water samples with community involvement, updated some imagery for the La Martre River basin, and interacted with community members to learn traditional knowledge related to the basin.

Marsh, Philip

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File Number: 12 406 059

Region: IN

Licence No: 16237

Location: Trail Valley Creek approximately 50 km north of Inuvik (68°44.734N, 133°30.003W), and Havikpak Creek located near Inuvik Airport (68°19.196N, 133°31.193W).

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 climate change. Since Inuvik was founded in the late 1950s, the number of winter days with an average temperature below -40°C has gradually decreased. Over the last few years there have been very

few days with such low temperatures. In the summer, the number of days with an average temperature 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, with lower snowfall and fewer days with snow on the ground. More shrubs are growing on the tundra north of Inuvik, the permafrost is thawing, and water levels in lakes and rivers are changing. There are also examples of lakes that are rapidly draining due to thawing permafrost. Everyone is wondering – how will the snow, the lakes, and the rivers change in the coming decades? What will they be like 50 years from now, when children born in 2018 are adults? To help answer these questions, the research team is studying the snow, lakes, and rivers at a location north of Inuvik. The water at this site has been studied since the 1970s, and the researchers have carried out detailed measurements since 1991. This project has used many new types of equipment, including drones to map the snow and vegetation, and special instruments to measure snow, soil moisture, icings in stream channels, and summer runoff. The researchers are also investigating the impacts of the Inuvik-Tuktoyaktuk Highway on the snow and streams in the area. The data will be used to see whether computer models can predict the water in this region, and then the models will be used to consider what the waters in this area will be like in the future. These predictions will help communities, co-management boards, and decision makers.

Quinton, William

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File Number: 12 406 068

Region: DC

Licence No: 16279

Location: Within a 2 km radius of the Scotty Creek Research Station

Impacts of permafrost thaw on hydrology and water resources

The goal of this ongoing project is to improve scientists' understanding of how permafrost thaws, and to also improve their ability to predict permafrost thaw. The research team did fieldwork around the Scotty Creek Research Station and selected sites in the Dehcho region, where they took many measurements, installed some sensors, and collected data from other sensors. The sensors were installed in unfrozen talik layers at Scotty Creek to measure the rate and direction of underground water flow over the winter. New ground freezing systems were also installed at Scotty Creek, and the data from these devices showed that the talik layers rapidly re-froze. In January, this project hosted more than 80 people from around the Dehcho for a Dehcho Regional Meeting on Permafrost that was part of the Dehcho K'eodi Regional Gathering. Each community presented their experiences and observations of permafrost thaw and its impacts. This meeting was a critical step toward forming a Dehcho regional collaboration on permafrost. This research team also hosted an experiential learning field course that took the form of an on-the-land camp on winter hydrology. The course took place at Scotty Creek in March 2018, and involved Dehcho senior high school students and senior undergraduates from Wilfred Laurier University. Since October 2018, the research team have published several key research articles that contribute new knowledge on permafrost thaw processes and their impacts on water resources.

Sullivan, Grant

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File Number: 12 406 067

Licence No: 16249

Region: GW**Location:** 68°21'23.60"N, 133°24'29.60"W**GNWT High Point wind project - geotechnical investigations**

The purpose of this project was to make recommendations for the design of the access road and the proposed wind turbine site at the Inuvik High Point site. These recommendations would take the nature of the soil and permafrost into account. The research team finished the geotechnical investigations in March 2018. They drilled at the site, and also tested samples in a laboratory. A total of five holes were drilled along the proposed access road, and the researchers found two types of material. One was an organic-rich and ice-rich overburden, and the other was glacial till which is a mix of silt, sand, and rocks. Based on their results, the team does not recommend cut-and-fill road construction for this site. Instead, they recommend that a road embankment should be built up above the ground surface. Most of the ground will not support construction equipment unless it's frozen, so construction should be scheduled for the winter. Large blast rock fill should be considered, because it can be placed more easily than sand and gravel fill in the winter. In addition to the drill holes along the road, the team also drilled one hole beneath the proposed wind turbine site where they found ice-rich silty and clayey permafrost soils. These soils are suitable to support the wind tower using a pile foundation with thermosyphons, which passively cool the ground under the foundation.

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File Number: 12 406 070**Licence No:** 16318**Region:** DC**Location:** Hay River**Demonstration of an agro-ecological PoultryPonics Dome in Hay River, NWT**

No summary was submitted for this licence. This project is not in compliance with licensing requirements.

Health

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File Number: 12 408 102

Region: NS

Licence No: 16244

Location: Yellowknife

Health effects monitoring program

This program is one part of the Giant Mine Remediation Project. The goal of the program is to check for contaminants and related health issues in people living in Yellowknife, Ndilo, and Detah. The team collected urine, toenail clippings, and saliva samples from people in all three communities in the summer of 2018. The samples are currently being analyzed in labs at the University of Ottawa and Genome Quebec. Approximately 2040 individuals between the ages of three and 79 participated in the program in Fall 2017 (wave 1) and Spring 2018 (wave 2). Out of this number, 1,768 participants are from the general population of Yellowknife, 46 are members of the North Slave Métis Alliance, and 226 are members of the Yellowknives Dene First Nation. In summer 2018, those who participated in the first wave of sampling received the initial results of the study in a personal letter from the lead researcher, Dr. Laurie Chan. Individuals who had a possibly unhealthy level of arsenic, lead, and/or cadmium in their samples were asked to meet with a nurse practitioner to learn how to lower their exposure. Final results will be ready in 2019, at which point all participants will receive personal letters. The general results of the study will be shared with the public at community meetings in February 2019. The personal health information of all participants will be kept confidential throughout the study.

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File Number: 12 408 149

Region: IN, GW

Licence No: 16196

Location: Aklavik, Tuktoyaktuk, Sachs Harbour, Fort McPherson, Inuvik

Addressing community concerns about health risks from *H. pylori* infection

The Canadian North *Helicobacter pylori* (CANHelp) Working Group conducts health research projects in Beaufort Delta and Yukon communities to address concerns about *H. pylori* infection. *H. pylori* is a bacteria that can live in people's stomachs and cause an infection. In February 2018, the group returned to Fort McPherson, where they had done 'breath tests' before 2015. The participants who had enrolled in the breath test component were given a long-term breath test follow-up in 2018. In March 2018, the group, in partnership with the Inuvik Regional Hospital local healthcare providers, held an endoscopy clinic for the Inuvik project participants. They also conducted follow-up endoscopies for the Fort McPherson participants, totalling 15 endoscopies. Another round of treatment was offered to interested participants

in Inuvik and Fort McPherson, with a post-treatment breath test planned for September or October of 2018. The team also reviewed the patient charts for 100 participants in the Inuvik project. A total of 68 participants from Aklavik, Fort McPherson, and Inuvik participated in a new study called 'Social Inequity, Gender, and *H. pylori* Infection'. The results of the new study will be available in February 2019. Throughout the year, the team consulted with project planning committees about their research plans and the results from previous project activities.

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File Number: 12 408 149

Licence No: 16220

Region: IN, GW, SA, DC, NS, SS

Location: All NWT

Practices for managing *H. pylori* infection in northern Canada: A consultation with health care practitioners

No research was conducted under this licence in 2018.

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File Number: 12 408 222

Licence No: 16414

Region: IN, GW, SA, DC, NS, SS

Location: All NWT

Measuring the developmental health of children in NWT

In 2018, this project was in its very early stages. Service agreements and data sharing agreements were finalized between the Government of the NWT and the Offord Centre for Child Studies at McMaster University.

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File Number: 12 408 199

Licence No: 16205

Region: IN, GW, SA, NS, SS

Location: Blachford Lake

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

In the summer, the research team held peer leadership training with young women and men as part of the Fostering Open eXpression among Youth (FOXY) project. Peer leadership training took place during a retreat and included four core components. First, youth are taught to be peer leaders for HIV prevention in their communities. Second, the peer leadership training retreat was grounded in Indigenous knowledge and methods of teaching and learning. Third, visual (body-mapping) and performance (theatre) arts were used. Fourth, the focus was on youth empowerment. Young men and women who participated in the peer leader training completed surveys before the training, right after the training, and six months after the

training. The purpose of the surveys was to see how FOXY peer leadership training had impacted young Indigenous men and women's HIV vulnerability, self-empowerment, and cultural connectedness. In the summer of 2017, 40 girls and 20 boys attended peer leader training. The team found that the participants had increased resilience, empowerment, and cultural connectedness. The project team are analyzing the data and preparing to submit academic publications and presentations. One presentation will be about the young men who participated, because land-based Indigenous-led peer leader training for young men increased HIV and STI knowledge and safe sex practices. It also built leadership skills, communication skills, knowledge of self and Indigenous community, and new conceptions of strength and masculinity. These results reflect the promise of a strengths-based, culturally-grounded, and holistic approach to HIV/STI prevention with young men in the NWT.

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File Number: 12 408 199

Region: IN, GW, SA, DC, NS, SS

Licence No: 16526

Location: Aklavik, Whatì, Fort McPherson, Ndiloq, Lutselk'e, Fort Liard, Fort Simpson, Yellowknife, Ulukhaktok, Fort Resolution, Behchokò, Inuvik, Tuktoyaktuk, Hay River, Katlodeeche First Nation, Fort Smith, Norman Wells

Visual and performance art for HIV prevention with Indigenous youth in the Northwest Territories

The research team spent the first half of the year collecting survey data for two projects. One was the Fostering Open eXpression among Youth (FOXY) project, and the other was the Strength, Masculinities, And Sexual Health (SMASH) project. The research team then spent the summer cleaning the data, entering it into a database, and checking that it was entered correctly. Right now, the team is in the process of analyzing the data. The team will have more results to report in the new year, after the analysis is complete.

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File Number: 12 408 196

Region: NS

Licence No: 16203

Location: Yellowknife

Canadian primary care sentinel surveillance network (CPCSSN) project

This research project is now complete. The goal of the project was to gather information about health care and treatment for people with chronic diseases, and then provide the information to doctors and nurses to help them determine how best to treat people with chronic diseases. In 2014, research agreements and data sharing agreements were set-up with the Yellowknife Health and Social Services Authority. These agreements ensured that strict codes of confidentiality and privacy were followed during this project. In 2016, a unique electronic medical record log-in was obtained so the data manager could access patient files. The electronic medical records for more than 25,000 patients were obtained from 26 primary care providers. All of the names and identifying information were removed from the files, and the data was used to provide feedback reports to the 26 primary care providers in May and October of 2016. In 2017, there were changes made to the NWT health information and privacy act, and as a result, the

research team was not able to access any more patient files. Although the project showed that data from the electronic medical records could be used to provide clinicians with individualized feedback reports, this project was completed in 2017 because no further electronic medical records could be accessed after that time.

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File Number: 12 408 215

Licence No: 16222

Region: IN, GW, SA, DC, NS, SS

Location: All NWT

Physical activity monitor 2018

The purpose of this research project is to understand what may help or prevent people from participating in physical activity and sport. To understand this, the researchers contacted people living in the north by phone and then used a questionnaire to gather information from them, called the 'Physical Activity Monitor' (PAM). Several versions of the PAM have been in use since 1995. The results show how different factors, such as individual, environmental, and social factors, affect physical activity. Currently, the PAM asked participants what types of physical activities they were doing and how often, the reasons for participating in physical activity, the reasons that they do not participate, or how supportive friends, family and others are for helping people be more active. These are examples of the types of research that the federal, provincial, and territorial governments are interested in. Repeating the questionnaire over time allows the researchers to measure changes in both physical activity levels, and the factors that affect physical activity levels. The researchers are still collecting data.

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Licence No: 16284

Region: IN, GW, DC, SA, NS, SS

Location: NWT schools

HBSC - health behaviour in school-aged children

The goal of this project was to understand what kinds of healthy behaviours are regularly undertaken by school-aged children. In 2018, students in 34 schools in the NWT completed 'health behavior in school-aged children' (HBSC) surveys. A total of 1724 students in Grades 6 through 10 participated, meaning that more than half of all students in these grades in the NWT filled out the survey. Based on the survey results, and in collaboration with representatives from the Government of the NWT Department of Education, Culture, and Employment, the researcher wrote a 125-page report that broke down the results. The results were reported for Yellowknife schools, schools in regional centres, and schools in small communities. The full set of questions and all of the results tables were also provided in a 500+ page appendix. The responses from students in the NWT are now part of a national data set, the results of which will be available at a later date. A report that compares NWT students to those in the rest of Canada will also be produced.

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File Number: 12 408 221
Region: NS

Licence No: 16404
Location: Yellowknife

Informing a health ICT strategy for Alberta's Ministry of Health

No research was conducted under this licence in 2018.

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File Number: 12 408 186
Region: NS

Licence No: 16397
Location: Yellowknife

Digital knowledge translation (KT) tools for parents, on common pediatric conditions in ED visits

The purpose of this study was to work with parents to see how best to teach them about childhood fever. Fevers are very common in children and can be due to many different reasons. Researchers created a video and infographic on fever after interviewing parents who came to the emergency department with a child who had a fever. Health care professionals and different parent groups assessed the video and infographic, and once these educational 'tools' were almost complete, they were shared with parents at hospitals in the Northwest Territories and Alberta for feedback. Overall, parents found that the tools were useful, simple to use, and provided information that was relevant to the parent. The parents stated that both the video and the infographic could be used without further instructions, and that the length and visuals were suitable. Most parents said that they would use the tool in the future to make decisions regarding their child's health. When the parents were asked if they would recommend the tool to their friends, the majority said yes. Based on this feedback from parents, the research team determined that the fever video and infographic were usable.

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File Number: 12 408 141
Region: GW, SA

Licence No: 16275
Location: Fort Good Hope and Inuvik

Improving the utilization of cancer screening services in northern Indigenous communities

Cancer screening involves different tests to detect many types of cancer at early stages. Screening can mean better treatment and better survival rates. The goal of this project is to develop educational videos about cancer screening that meet the priorities of the communities. This past year, the research team consulted community stakeholders, community members, and band councils in Yellowknife, Fort Good Hope, Norman Wells, and Inuvik about cancer screening videos. In Yellowknife the team met with the Government of the NWT Department of Health and Social Services, administrators from the Stanton Territorial Hospital Foundation, and members of the NWT Breast Cancer Action Group. The team then travelled to Fort Good Hope and met with members of the GOBA group (Goba means 'light of the horizon' and the group is a cancer support group), as well as health professionals from the Fort Good Hope Public

Health Centre, members of the Band Council, and the Community Adult Educator from Aurora College. In Norman Wells the team met with members of the NWT Health and Social Services department in the Sahtú Region. The final stop was Inuvik, where the team met with staff at the Inuvik Public Health Centre, staff at the Inuvialuit Regional Corporation, the president of the Gwich'in Tribal Council, staff at the NWT Housing Corporation, members and staff at the Aurora Research Institute, and health professionals at the Inuvik Regional Hospital. In September 2017, Dr. Sharma and the research team made another trip to Yellowknife, Fort Good Hope, Norman Wells, and Inuvik. During the visit to Inuvik, the team met with the president of the Nihtat Gwich'in Council and members of the Inuvialuit Regional Corporation to discuss the project, and to collect ideas and thoughts on the videos that were being prepared. A locally-owned video production company, Artless Collective, was hired to work on the videos series.

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File Number: 12 408 1412

Licence No: 16292

Region: IN, GW, NS

Location: Inuvik and Yellowknife

50+ and Elders health survey in the Northwest Territories

The goal of this project is to study the health of Elders over the age of 50. In September 2017, members of the research team traveled to Yellowknife, Fort Good Hope, Inuvik, and Norman Wells to discuss the project and draft a questionnaire with supporters and collaborators from the Government of the NWT, the Aboriginal Health and Community Wellness Team, Aurora College, the NWT Seniors Society, Aurora Research Institute, Inuvialuit Regional Corporation, NWT Housing Corporation, the Elders Day Program at the Inuvik Regional Hospital, and the Sahtú Health and Social Services Authority. In Fort Good Hope, community members and many seniors talked with the team about the project and agreed to review the draft questionnaire and provide comments. In late May 2018, members of the team attended the Hotii Ts'eeda annual meeting in Yellowknife and presented information about the project and its current status. From 26 May to 9 June, 2018, three team members were in Inuvik where they conducted one-on-one interviews with seniors, caregivers, and health professionals. To arrange these interviews and recruit Elders the team spoke with key members of the local Indigenous governments and community organizations, as well as local health professionals. In addition to the one-on-one interviews, key informant interviews and sharing circles were held with key leaders and caregivers in Inuvik. Currently the team is analyzing the data.

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File Number: 12 408 223

Licence No: 16417

Region: IN, GW, SA, DC, NS, SS

Location: Inuvik, Norman Wells, Fort Simpson, Yellowknife, Fort Smith

Creating a representative health and social services system in the NWT

The goal of this project was to increase the number of Indigenous employees in the Northwest Territories Health and Social Service Authority (NTHSSA). This will improve the delivery of health and social services to Indigenous people, support the self-determination of Indigenous people in the NWT, and meet the

policy direction of the government. First, the research team studied why Indigenous representation in the HSSA is low. They researched the plans and programs that are available, and the views and perceptions of the people making hiring decisions. These key stakeholders were asked to identify what they believed to be barriers, and for their recommendations to increase the number of Indigenous hires. They were also asked for their views on the government's affirmative action policy and stated goal of a representative public service. The research team also spoke with an NWT organization that has had more success in achieving representation, and reviewed the academic literature. The team found that there needs to be more monitoring, oversight, and strategic planning to increase the representation of the HSSA. Changes in leadership, education and training, merit, workload, and organizational culture are also required. The research team made a total of 44 recommendations. These included improving planning and data collection, clear messaging from leadership, improving training for senior and hiring managers, developing and improving supports for hiring managers, establishing supports for new staff (including cultural and clinical mentoring for Indigenous staff), developing program and job description reviews, supporting active representation of Indigenous employees, and improving career planning with Indigenous employees.

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File Number: 12 408 220

Licence No: 16309

Region: SA, NS

Location: Fort Good Hope and Behchokò

APPLE Schools evaluation

APPLE Schools is a school-focused health promotion project that helps to improve the lives of students through healthy eating, physical activity, and good mental health habits. Two schools in the Northwest Territories became APPLE Schools in September 2018. Two assistants conducted research at the Chief T'Selehye School in Fort Good Hope and the Chief Jimmy Bruneau School in Behchokò in May and June of 2018. The research looked at five topics. First, an online survey was conducted that asked students about their physical activity, screen time, mental health, and eating habits. Second, step counters were worn by students for nine days to measure their physical activity. Third, the researchers measured the height and weight of students. Fourth, the researchers conducted a survey of parents and guardians that asked about healthy living habits at home and levels of parental support for health-related policies in schools. Fifth, the researchers conducted a survey with the principals to ask about the school environment and how the school carries out territorial programs. Research findings for each school were put into a report that was sent to each principal. The team will continue to do research on the healthy living habits of these two APPLE School communities in 2019 and 2020.

Physical Sciences

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File Number: 12 404 962

Licence No: 16333

Region: NS

Location: Behchokò, Gamètì, Wekweètì, Whatì

Impacts of climate change on wildfire risk in boreal forests in the Northwest Territories

The fire history for the last 50 years was reconstructed for the Tłıchǫ territory using data from the Canadian National Fire Database. Exceptionally large fires that were larger than 10 000 hectares account for 80% of the total burned area. Over the last 50 years, six fire seasons stood out as 'extreme' in terms of the amount of area burned, four of which were in the last decade. These seasons were 1976, 1979, 2008, 2013, 2014, and 2016. Extreme years had more fires, larger fires, or both. The research team is working to identify the climate or environmental variables that explain the occurrence of extreme fire years. They also extended the time period covered by this project back several thousand years by sampling lake sediments that contain wood charcoal. To do this, seven lakes within a 50 km radius of Wekweètì were sampled in June 2018. According to the Fire Database, the forest around the seven sampled lakes was last burned in different years (1970, 1973, 1979, 1998, and 2014), which will allow the fire histories to be reconstructed using an overlay perspective. Finally, the team will interview Tłıchǫ community members about the impacts of extreme fires on traditional land use during another field campaign in early 2019.

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File Number: 12 404 815

Licence No: 16288

Region: DC

Location: Fort Liard, Wrigley

Yukon-Northwest seismic network: Characterizing earthquakes and earth structures

Seven earthquake recording stations were installed in the summer of 2013. Each station contains a very sensitive machine called a 'seismometer' that measures ground movement that is caused by earthquakes, even if the earthquakes are not very strong or are far away. The seismometers were buried in holes that were dug by hand. Information about any earthquakes that are detected by the seismometers is sent by satellite through a small station that's powered by solar panels, batteries, or an electrical outlet. The data that is collected at the stations is used to produce maps of earthquake activity and to produce images of the Earth's deep interior. Using these maps and images, the researchers have found that the boundary between a mountain chain and a flat sedimentary basin that is located about 50-100 km below-ground is more variable than they had thought. They are learning more about how the mountains were made by the slow movement of the Earth's crust over many millions of years. Just like icebergs floating on water,

the Earth's crust floats over the weaker, hotter rocks below. As the crust moves, this causes earthquakes. The researchers are also developing a way to assess the risk of an earthquake in any particular area. In 2018, the research team fixed problems at three of the seven stations. The Yukon stations in Watson Lake, Faro, and at the Twin Creeks airport were serviced. Unfortunately, the station in Fort Liard was flooded and is out of service. The research team is writing a lot of academic papers and other publications using the information they have gathered.

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File Number: 12 404 815**Region:** IN**Licence No:** 16303

Location: Bar Harbour E-76 (74.258N, 123.901W), Victoria Island (72.901N, 115.973W), Nelson Head (71.39N, 122.959W), Ulukhaktok (70.76305N, 117.8058W), MuskoX D-87 (73.602N, 117.453W)

Teleseismic investigations of the crust and mantle structure beneath Banks Island, NWT

The goal of this project is to produce images of the deep geological structure under Banks Island in order to understand its origin. There are two theories – one is that Banks Island was made long ago by volcanoes under the ocean. If this is true, there may be oil and gas deposits in the area. The other theory is that Banks Island is part of the Canadian Shield like all of mainland Nunavut and the eastern half of the NWT. If this is true, there may be diamonds in the area that can be mined. To figure which theory is true, the researchers used very sensitive machines called seismometers to record ground motion that is produced by distant earthquakes. The seismometers are buried in the ground, are powered by solar panels or batteries, and have a small station that records and stores data. Earthquakes move through different types of ground in different ways, which allows the researchers to figure out the type of ground that is deep under Banks Island. Seismometer stations at Bar Harbour, Nelson Head, Ulukhaktok, and Johnson Point were serviced in 2018. The researchers collected the data and carried out site maintenance while they were at each station. The researchers analyzed the information they collected, and the results were presented at both the Northwest Territories Geoscience Forum in Yellowknife in November 2018, and at the American Geophysical Union Fall Meeting in Washington in 2018. The research team will return to the area next year to collect more information from the stations.

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File Number: 12 404 855**Region:** DC, NS**Licence No:** 16311

Location: A polygon with corners at approximately 60.714°N, 117.027°W; 63.206°N, 123.702°W; 64.175°N, 113.974°W; and 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 to certain locations called 'plots' and took careful measurements of what is growing there, what seeds are present, and how the permafrost and soil were

affected by the fire. The number of seeds and how many had germinated and started to grow into trees were also counted. The researchers visit the same plots year after year to see how the plants, lichen, shrubs, and trees are re-growing over time. They chose plots in areas that had burned during a particularly severe fire in 2014, but also in many other areas that weren't affected by that fire so they could compare the plots to each other. The team also engaged in a range of outreach activities over the field season, including working closely with the community of Kakisa. Several community members were hired to take samples. The researchers also contributed to a fire education initiative in Kakisa, the Kakisa Cultural Camp, and community-led or government-led workshops and talks at territorial parks and in Behchokò, Kakisa, Tulita, Fort Simpson, and Yellowknife. They are also writing academic papers and reports about this project.

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File Number: 12 404 855**Licence No:** 16345**Region:** SA**Location:** 80 km from Norman Wells and the Husky Lease site**Northern water futures baseline environmental monitoring**

The goal of this project is to understand the current and future impacts of climate change and resource development in the Sahtú region. First, this project examines the impacts on ground stability due to permafrost thaw, especially around communities and culturally-important areas. Second, the project looks at the impacts on plants, especially in areas that are important wildlife habitat. Third, the project examines the impacts on water, and fourth, it looks at how these changes will affect the tiny plants and animals that live in the water. The researchers are using information from other projects, and are also doing fieldwork to study the bogs that form when permafrost thaws in the Sahtú. In addition, they set up permanent monitoring plots in fire scars of different ages during the summer of 2018. This allows the researchers to evaluate the impact of wildfire on the availability of caribou forage. They can also compare the recovery of caribou forage in the Sahtú to what is seen in other parts of the NWT and northern Saskatchewan. The research team used existing water and permafrost data, air and satellite photos, and fieldwork to map icings, which are locations where groundwater upwells. During the closure and capping of the groundwater monitoring wells on the Husky lease, the research team collected groundwater samples so they could compare them to samples that had been collected during the well installation. The research team took water and other samples from lakes that had been impacted by wildfires in 2014, as well as from lakes that had no history of fire in the area. While changes in water chemistry four years after the fires were minimal, the team did find changes in the the plants and animals living in the fire-impacted lakes. The team is working closely with the Sahtú Renewable Resources Board and several Sahtú communities to develop on-the-land events when information about the project will be shared.

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File Number: 12 404 974**Licence No:** 16375**Region:** IN**Location:** Within 1 km of the Inuvik-Tuktoyuktuk Highway, Trail Valley Creek site (68.745483°N, 133.499070°W), Havikpak Creek site (68.333624°N, 133.500439°W), HUS_Slump (NTGS 17)

(69.014376°N, 133.281190°W), slump 108 (68.757985°N, -133.520005°W)

MOSES rapid permafrost thaw

From 15 August to 5 September 2018, research teams from the Alfred Wegener Institute and GEOMAR in Germany visited sites along the Inuvik-Tuktoyaktuk Highway. They were studying how active thaw slumps along the shorelines of lakes influence both the aquatic and terrestrial environments. Using a canoe, the team mapped the depth of the lakes and measured the methane concentrations in the water and air. In addition, they collected samples for other chemical properties of the water (total alkalinity, dissolved inorganic and organic carbon, stable isotopes, major cations and anions, methane, oxygen, pH, and conductivity). They took shallow cores from the frozen soils (permafrost) both in and near the thaw slumps in order to determine the amount of ice in the soil. They also recorded the vegetation characteristics, soil properties, active layer thickness, and light environment in and around the thaw slumps. Using a GPS, the researchers surveyed each thaw slump to see how it had changed over the years. GPS observation stations were installed at five locations along the highway to measure how the ground is sinking. Results are not available yet because data processing has just begun and the sample analysis is not complete.

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File Number: 12 404 885

Licence No: 16206

Region: NS, SS

Location: peatland areas surrounding Great Slave Lake

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

The goal of this project was to use information gathered from fieldwork, air photos, and satellite photos to investigate the impacts and consequences of fires that occurred in the Northwest Territories in 2014 and 2015. In August 2018, the team visited the sites of seven fires, measured how many trees and shrubs were present, and determined their size before the fire. They checked how well the shrubs and trees had grown during the four years after the 2014 fires, and also measured the soil moisture, soil temperature, the depth to frozen ground, and the depth of peat at both burned and unburned sites. The research team made maps of the type of land cover that existed before the fires, and the level of fire severity, using satellite images. They then checked these maps using the field data. They found that the two types of satellite map products are allowing them to analyze the burn severity by ecosystem (land cover) type across the region.

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File Number: 12 404 707

Licence No: 16238

Region: IN

Location: Melville South ice cap (75°27'N, 115°W)

Glacier mass balance of the Melville South ice cap

Ice caps in the Canadian Arctic are losing mass (melting) rapidly, which has been an important contributor to global sea-level rise since the mid-2000s. The Melville ice cap is one of five glaciers that have been

measured over a very long period of time by Natural Resources Canada. These measurements help the researchers understand how quickly climate change is occurring in the Arctic, and the contribution of glacial melt to global sea-level change. The research team took measurements of the Melville South ice cap in the spring of 2018. The height of the glacier was measured at 22 measuring poles that were set during previous years. These measurements showed that the ice cap became 4 cm thicker between 1 September 2016 and 1 September 2017. This thickening highlights how variable the melting of the ice cap is among years. The glacier is now about 80 cm thinner than it was in 2005, but in an individual year it might get a little bit thicker. The researchers also downloaded temperature data and measurements of ice thickness from an automatic weather station. The temperature data showed that the summer average temperature was cool (-1.9°C), with a maximum temperature of +18°C on 4 July 2017, and minimum temperature of -37°C on 13 February 2018. Due to the low amount of melting that occurred, none of the measuring poles needed to be replaced in 2018. There were no sightings of wildlife during the team's visit to the ice cap.

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File Number: 12 404 235**Licence No:** 16290**Region:** IN**Location:** Garry Island (69°29.94N, 135°46.67W), Illisarvik (69°28.78N, 134°35.59W), Inuvik at Dempster Highway km 256, Paulatuk (69°19.84N, 124°06.05W)**Permafrost and climate change, western Arctic Canada**

The goal of this ongoing research project is to understand how climate change is affecting permafrost in the western Arctic, particularly in the outer Mackenzie Delta. In 2018, fieldwork took place at Garry Island, Illisarvik on Richards Island, and near Inuvik. The research team mainly took measurements of ground temperatures while in the field, but also made several maps of the ice wedge polygons at Garry Island. A paper is now being written that shows how ground temperatures near the western Arctic coast have warmed over the last 20 years, from 1997. It includes ground temperature data at depths up to 50 m below the ground surface that show that, even if climate warming in the western Arctic stopped now, the ground is so much warmer near the surface that permafrost in the top 10 m of the ground would continue to warm for about 50 years. Also, permafrost below 10 m would continue to warm for much longer than 50 years. The research team took measurements of how the ground surface has sunk because the top of the permafrost has melted. The most substantial sinking of the ground surface was observed over two ice wedges at Illisarvik, where the pure ice in the wedge has melted incrementally at the end of each summer. Near Inuvik, measurements of how far trees tilt were made and compared to data from 1994-1998. The goal was to see if trees in the 'drunken forest' are progressively tilting in the same direction, or just moving back and forth each year.

Busby, Robert

Incorporated Institutions for Seismology

Washington, DC, USA

busby@iris.edu

File Number: 12 404 947**Licence No:** 16198

Region: IN, GW

Location: A36M (71.992197N, 125.261721W), C36M (69.34763N, 124.07056W), E31M/CN.INK (68.31N, 133.53W), F30M (67.61063N, 135.78635W)

EarthScope transportable array

The goal of the EarthScope project is to study earthquakes and volcanoes in North America, both to understand how the continent was created over millions of years and how it continues to change. To do this, the researcher team maintains a network of special earthquake sensors across North America. Six of these stations are located in the NWT. Sometimes these sensors need to be visited for maintenance. In 2018, the researcher team only needed to visit one station in the NWT to upgrade its communications and software. Now that the full EarthScope network has operated for an entire year, researchers have found some preliminary results that can be viewed on a variety of websites.

Cairns, Scott

Northwest Territories Geological Survey
Yellowknife, NT
scott_cairns@gov.nt.ca

File Number: 12 404 551

Region: SS

Licence No: 16223

Location: East Arm of Great Slave Lake, between Outpost Islands and Union Island

Metallogenic investigation of the East Arm

No research was conducted under this licence in 2018.

Campbell, Janet

Geological Survey of Canada
Ottawa, ON
janet.campbell3@canada.ca

File Number: 12 404 952

Region: SS

Licence No: 16299

Location: Area 1 (boundaries are: NW corner 65°8'N, 108°15'15"W; NE corner 65°8'N, 105°W; SE corner 63°30'N, 105°W; SW corner 63°30'N, 108°15'15"W), and Area 2 (boundaries are: NW corner 64°14'N, 105°W; NE corner 64°14'N, 103°6'38"W; SE corner 63°21'N, 103°6'38"W; SW corner 63°21'N, 105°W)

Synthesis of glacial history and dynamics in the Western Rae geological province

A team of three researchers spent two-and-a-half weeks taking samples and observations at sites in the Aylmer-Healey-Moraine lakes area. Their work was supported by one helicopter that was stationed with the team at a lodge in the area. At each site, information was collected about the glacial sediments, the landscape and indicators of glacial ice flow, and samples were collected for analysis and dating. The rock samples that were taken from either boulders or bedrock for dating will help the team determine when the rocks were exposed to the sun as the ice sheet melted from the area and exposed the land that was underneath. The information that the researchers gathered will help answer questions about the age of the glacial terrain and the composition of the ground that sits on top of the bedrock. This new knowledge will provide the baseline (natural) content of glacial sediments, help trace the paths of receding glaciers, and indicate whether there is any anything in the area that can be mined. The fieldwork done in 2018

successfully accomplished the objectives of the project, and confirmed that this region has a very complex glacial history. The team will continue to analyze the samples they collected in 2018, and will publish reports as results come in.

Campbell, Joseph

TerraX Minerals Inc.

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File Number: 12 404 859

Licence No: 16399

Region: NS

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. These metals can come from either natural sources or pollution. To figure this out the researchers needed to study both ground and water conditions. Ground temperatures that were taken from three drill holes showed that the temperature increased above 0° Celsius below depths of three metres (10 feet), which means that the ground is not permafrost. Instruments that record water levels and barometric pressure were installed in eight lakes. The data that was recorded from 2016 to 2018 showed that water levels dropped by between 0.2 and 0.9 metres in seven of the eight lakes. This corresponds to the very dry conditions that existed in the area from 2014 to 2017. The single lake that showed an increase in water levels (Likely Lake) has the smallest volume of the eight lakes, and was the first lake to show the effects of increased precipitation in 2018. Water samples were taken from all eight lakes, and water quality analyses showed that the levels of arsenic and fluoride exceeded drinking water standards. These higher levels are caused by naturally occurring arsenic and fluorine in the bedrock around the lakes. An 'Archaeological Potential Model' that outlined areas for field investigation was completed for the northern part of the project area. The researchers did not complete a walking survey because no work that would alter the ground was planned in this area.

Chamberland, Joseph

GNWT, Department of Natural Resources

Ottawa, ON

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File Number: 12 404 888

Licence No: 16378

Region: NS, SS

Location: Along the Slave River, going north out of Fort Smith, and going south down the Slave River and Delta out of Fort Resolution. Great Slave Lake out of Fort Resolution, and out of Yellowknife going south into Great Slave Lake

Remote sensing water indicator monitoring for the Mackenzie and Slave Rivers, and Great Slave Lake

During the spring and summer of 2018, three sampling programs were conducted in Fort Smith, Fort Resolution, and Yellowknife. On three occasions in each community, team leaders and members collected water samples that were used to validate temperature and suspended sediment models for the Slave River and Delta. The Yellowknife team collected similar samples to tune a similar model for Great Slave Lake. Unfortunately, due to the cloudy weather, there were not as many Great Slave Lake samples as needed, so fine-tuning the lake model has been pushed back to 2019. The samples that were collected from the other locations were analyzed by Taiga labs, and the results are being used to validate the models in the Slave River and Delta. The research team discussed data access, future use of the data, and

traditional knowledge at the Water Strategy Workshop in Detah on 24 and 25 November, during a session on understanding different ways of knowing. The team showed raw satellite data and their interpretation of the satellite data, and then discussed how community members can often make more sense of this data because they know the land and have traditional knowledge. Both allow community members to understand the raw data in a very localized context, which is something that an analyst in another location can't do.

Chiperzak, Doug

Stantec Consulting Ltd.
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doug.chiperzak@stantec.com

File Number: 12 404 978

Region: IN, GW, SA, NS

Licence No: 16392

Location: Between Inuvik and Tuktoyaktuk, Gunghi Creek, Highway 8 at km 266.1, Highway 8 at km 147.0, Oscar Creek, and Great Bear River

2018 fisheries and hydrotechnical assessments

No summary was submitted for this licence. This project is not in compliance with licensing requirements.

Cully, Christopher

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Calgary, AB
cmcully@ucalgary.ca

File Number: 12 404 951

Region: NS

Licence No: 16285

Location: Prosperous Lake (62.538°N, 114.147°W) and near Behchokò

Pulsating aurora observed from balloons and from the ground

'Pulsating aurora' are northern lights in large patches of the late-night sky that slowly pulse green and then black. They are different from the closely-related auroral 'arcs', the long beautiful ribbons of light that occur earlier in the night sky. The green glow in both types of aurora is caused by electrons raining down from space and hitting the upper atmosphere. However, the underlying reason why the electrons hit the atmosphere is different for pulsating aurora. To better understand what creates pulsating aurora, the research team launched a high-altitude balloon over a sensitive camera. While the camera watched the auroral display, the balloon payload searched for x-rays that were created along with the aurora. These x-rays revealed how many electrons were involved in creating the aurora, and how much energy they had. The balloon was successfully launched on 3 March 2018 from Prosperous Lake. It flew roughly 300 km before landing northeast of Great Slave Lake, and was later recovered by helicopter. The x-rays showed that the electrons that produce pulsating aurora have much more energy than those that make auroral arcs. This research project was featured on an episode of The Nature of Things on CBC ('The Wonder of the Northern Lights').

Dallimore, Scott

Geological Survey of Canada
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File Number: 12 404 351
Region: IN

Licence No: 16371
Location: The Kugmallit Pock Mark Field, located approximately 35 km northwest of Tuktoyaktuk (69°45'N, 133°21.5'W) outside of the Kittigaryuik Marine Protected area

Marine geohazard and environmental studies in the southern Beaufort Sea

Research activities for this project did not take place due to challenging sea ice conditions that prevented the Alaskan research vessel 'Ukpik' from arriving in Tuktoyaktuk. Therefore, the research team have no plain language summary to provide. The team will attempt to accomplish these research activities in 2019 on the Parks Canada research vessel, the 'RV David Thompson', during seven days between 25 July and 6 August 2019 (depending on ice and weather conditions). The team will apply for a renewal of our multi-year research licence.

DeMontigny, Dallas

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 dallasdemontigny@gmail.com

File Number: 12 404 980
Region: SA

Licence No: 16411
Location: Area 1 (64.437378°N, 124.752261°W), Area 2 (64.421863°N, 124.718194°W)

Enbridge KP 158 Little Smith Creek

Enbridge Pipelines (NW) Inc. is reviewing options that will prevent damage to a segment of its Line 21 pipeline (near kilometer post 158) that is affected by slope instability. There is an area of erosion and instability on the river valley slope at the Little Smith Creek meander that is encroaching on the pipeline right-of-way. In order to see how things are changing on the ground, the research team looked at existing maps and research results, and also did a preliminary biophysical study of the area in October 2018. They recorded fish and fish habitat, vegetation, and wildlife species in the immediate area, including species-at-risk and species of management concern. Six fish species, 93 plant species, and 15 wildlife species were observed during the study. There were no species-at-risk, or species of management concern, identified during the study.

d'Entremont, Marc

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 Sidney, BC
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File Number: 12 404 972
Region: SS

Licence No: 16367
Location: Within the Taiga Plains ecoregion between Buffalo River and Little Buffalo River, north of Wood Buffalo National Park

Recovery of boreal caribou habitat after forest fires

The goal of this project is to determine how long it takes for foraging habitat to become suitable for use by boreal caribou after a fire. To address this question, the research team is measuring the abundance of forage lichens in experimental (burned) and control (unburned) sites in the South Slave Region. In 2018, the team collected data from 30 large sites called 'macroplots', which were 30 m by 30 m in size. Seven 30 m transects were spaced within each macroplot at 5 m intervals, and one random location per transect

was selected for lichen sampling. At each sampling location, the team recorded the species or genus of lichen that was present, and the height of the lichen at numerous locations within a 50 cm by 50 cm square. The percent of ground that was covered by lichens was also measured. Some areas had more plots than others, based on the historic age of forest fires in the area. Based on the data collected in 2018, the average percent of ground covered by lichen varied between the fire age categories, with a low of only 1% lichen coverage in plots that burned between 6 and 10 years ago, and up to 13% lichen coverage in plots that burned more than 40 years ago. Areas that had never burned had about 21% lichen coverage. The team will collect more data from 50 new sites in 2019.

Derksen, Chris

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File Number: 12 404 641

Licence No: 16245

Region: IN

Location: Trail Valley Creek (68.746200°N, 133.501930°W)

Investigating the relationship between snow microstructure and airborne synthetic aperture radar measurements of tundra snow to improve environmental prediction capabilities in polar regions

The amount and extent of snow plays a crucial role in both the climate and the water cycle. However, there are only scientifically accurate measurements of snow at isolated weather stations in northern Canada. There are also techniques that use satellite images to estimate how much snow is on the ground across the entire Arctic region, but these techniques are limited to just one estimate for each square that is about 25 km by 25 km in size. This means that they aren't that useful for climate and weather predictions. Environment and Climate Change Canada and the Canadian Space Agency have proposed launching a new satellite (the Terrestrial Snow Mass Mission) that would be able to measure local snow amount and extent. This technique would make one estimate for each square that is about 250 m by 250 m in size. This will improve climate and weather predictions in Arctic regions. To help ensure that the satellite measurements work well, the research team went into the field and took detailed measurements of the snow depth, density, layers, grain size, and temperature. They then assessed how variable these snow properties are within a square that is about 25 km by 25 km in size. The team is using the measurements they collected, as well as computer analysis, to plan for future satellite missions.

Dudley, Judy

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File Number: 12 404 954

Licence No: 16305

Region: SS

Location: Pine Point District

Environmental quality at Pine Point

The research team took samples to document the current conditions in the Pine Point District, particularly the brownfield areas where there was mining and milling infrastructure. They located existing groundwater wells at Pine Point and took water samples for analysis. They also collected water samples from several mine pits and at the base of existing waste rock piles in the Pine Point area to check for metal contamination and water quality. The team also collected samples of waste rock and drill core to see if they might produce acid rock drainage or leach metals. Finally, the team mapped the underwater depths of several mine pits. The field programs were completed prior to freeze-up, and the research team is

currently analyzing the samples. Depending on what they find, the team may need to do additional field studies in the summer of 2019. The information they collected may be used for Land Use Permits and Water Licence applications, because it shows current land and water conditions at the site.

Dyck, Brendan

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File Number: 12 404 971**Licence No:** 16363**Region:** SS**Location:** 61°37'50.80"N, 112°10'59.77"W**Obtaining a strength profile of an exemplary lower crustal fault segment — the Great Slave Lake shear zone, Northwest Territories Canada**

Earthquakes pose a significant risk to the population of western British Columbia, for example in Vancouver and Victoria, as well as people living in many major cities around the world. Scientists have been working hard to 'model', or predict, where and when earthquakes might occur in order to reduce the risk they pose to people and infrastructure. The goal of this research project is to produce a better model for how earthquakes work. To do this, scientists need to know how strong the lower part of Earth's crust is. While the risk of earthquakes in the NWT is low, the rocks found at the surface of the East Arm of Great Slave Lake were once more than 15 km below the Earth's surface. These rocks can therefore be used to measure the strength of rocks from the lower crust. To make these measurements, the research team spent two weeks doing fieldwork in July 2018. The fieldwork was successful, and a small collection of rocks was gathered and sent to researchers at Simon Fraser University, University of Oxford, and Utrecht University for analysis. These measurements are still ongoing, but the team anticipates that results will be ready by the end of 2020.

Eitel, Jan

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McCall, ID, USA
jeitel@uidaho.edu

File Number: 12 404 931**Licence No:** 16246**Region:** IN, GW

Location: Area 1: Fort McPherson to NWT/Yukon Border
(67°16.586"N, 135°3.812"W; 67°14.511"N, 135°16.858"W;
67°13.149"N, 135°30.478"W; 67°10.760"N, 135°42.330"W), and
Area 2: Inuvik-Tuktoyaktuk Highway

Forest ecotone experiment

The line where two types of ecological zones meet is called a 'transition zone.' The transition zone between the forest and the tundra is one of the largest vegetation transition zones in the world. Changes in this transition zone due to environmental change (for example, moving further north) might have far reaching consequences for both humans and animals. The goal of this project is to study the forest-tundra transition zone near Inuvik over the next few years to get a better understanding of how and if this important transition zone might respond to environmental change. During the first field season in 2017, the research team installed a range of ground sensors along the new Inuvik-Tuktoyaktuk Highway that allow the team to monitor the stress level of trees, and how their stress level responds to variability in weather conditions. Some of the results from the ground sensors indicate that it may be possible to use satellite data that was recorded over the last 15 years to understand if the transition zone between the

forest and the tundra responds to climate change. The researchers are planning to look at this satellite record over the next year, and hope to share some results later in 2019.

Errington, Ruth

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File Number: 12 404 815**Region:** DC, SS**Licence No:** 16337

Location: Kakisa area (60°56'26.2"N, 117°21'48.8"W); (60°56'26"N, 117°21'52.7"W); (60°56'28.4"N, 117°22'59.3"W), Enterprise area (60°0'27"N, 116°59'30.3"W); (60°0'25.1"N, 116°59'30.9"W); (60°0'19.9"N, 116°59'19.1"W), Trout Lake area (60°21'3.5"N, 120°28'24.5"W); (60°20'54.3"N, 120°28'14.6"W); (60°21'22.4"N, 120°28'22.1"W); (60°37'21"N, 121°54'4.9"W); (60°37'22"N, 121°54'2.1"W); (60°37'5.2"N, 121°53'57.7"W); (61°6'12"N, 120°58'29.1"W); (61°6'11.7"N, 120°58'24.2"W); (61°6'28.8"N, 120°58'24.3"W), Fort Simpson area (61°38'10.4"N, 121°23'51.7"W); (61°38'13.2"N, 121°23'51"W); (61°38'15.1"N, 121°23'51.2"W); (62°14'44.1"N, 122°34'16.7"W); (62°14'43.7"N, 122°34'20.4"W); (62°14'37.2"N, 122°34'42"W); (62°15'11.1"N, 122°35'58.3"W); (62°15'12.8"N, 122°35'59.6"W); (62°15'26.6"N, 122°35'11"W); (62°4'37.1"N, 121°21'22.1"W); (62°4'30.1"N, 121°21'20.3"W); (62°4'11"N, 121°21'14.3"W); (62°1'54.2"N, 121°21'25.9"W); (62°1'50.9"N, 121°21'26.8"W); (62°1'39.1"N, 121°21'26.9"W), Wrigley area (62°30'32"N, 123°29.1"W); (62°30'32.4"N, 123°1'59.7"W); (62°30'35.4"N, 123°0'58.1"W); (62°59'41.7"N, 123°11'38.5"W); (62°59'42.2"N, 123°11'35"W); (62°59'37.3"N, 123°12'9.7"W)

Impacts of 10 years of climate warming on forests and peatlands in the Dehcho

Ten years ago, the research team established a series of permanent monitoring sites in the Mackenzie Valley. Each site contains plots in upland forest, peat plateau (permafrost bog), and collapse scar (thawed bog) environments. In 2018, the team returned to these sites to complete a 10-year re-measurement. Additionally, they surveyed sub-transects to document both vegetation change and the rate of expansion, or increased permafrost thaw, across the areas where peat plateaus transition into collapse scars. In total, 33 plots and 13 sub-transects were revisited in the Dehcho. The team measured and took samples of soil, permafrost, trees, understory plants, and ground lichens. It will be a few years before there are results to present from this work, because complex plant community and tree ring data sets take a very long time to process. In the Dehcho, the permafrost boundary between peat plateaus and collapse scars moved an average of nearly three meters over ten years, ranging from 6 to 60 cm per year. This rate of thaw was greater than what was observed in the more northerly Sahtú region (4 to 14 cm per year). The size and number of trees increased at the research plots throughout the Mackenzie Valley, but decreased in the mid-boreal upland forests in the southern Dehcho. These changes were related to warmer and drier climates, but were highly variable and also depended on local site conditions.

Fedorowski, Jerzy

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File Number: 12 404 962**Region:** DC**Licence No:** 16343**Location:** Mississippian/Pennsylvanian strata in the Liard Basin (61°07.23"N, 123°29.13"W); (60°33'50"N, 123°48'20"W); (60°52'30"N, 124°03'40"W); (60°59'03"N, 123°57'30"W); (61°06'38"N, 123°45'54"W); (61°11'00"N, 123°37'38"W); (60°36'05"N, 123°45'00"W); (61°07'23"N, 123°29'13"W)**Global and regional environmental signals of the Mississippian/Pennsylvanian strata in the Liard Basin Northwest Canada**

On 24 July 2018, the research team traveled by helicopter to Jackfish Gap near the Tlogotsho Plateau, 33 km west of the village of Nahanni Butte. They worked there until 7 August, collecting fossil-corals from nearby exposed rocks of the Middle Mississippian age from 330 to 346 million years ago. The research team gathered many small solitary corals, a few larger ones that were 3 to 8 cm in diameter, and a few colonial corals. They examined and sampled the rocks the fossil-corals came from, which were limestones of the Flett Formation, to determine their characteristics and where the sediments that formed the rocks were originally deposited. The team also studied the overlying sandstones of the Mattson Formation, which are more than 1,000 m thick, and collected samples to determine their mineral composition and sand sources. In addition, the team sampled the sandstone that occurs below the Flett limestones, called the 'Yohin Formation' of the Lower Mississippian age from 346 to 358 million years ago. The limestones of the Flett Formation were deposited in offshore marine slope settings, while the Mattson sandstones were likely deposited in deltaic environments. The team shipped the corals and rocks to Poland and started preparing the specimens for microscope work. Preliminary identification of corals shows two dominating genera (*Amplexizaphrentis*, and a new one similar to *Siphonodendron*). A paper on two new species of fossil-coral is almost complete.

Fiess, Kathryn

Northwest Territories Geological Survey

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File Number: 12 404 807**Region:** GW, SA**Licence No:** 16350**Location:** Carcajou River (64°46.36"N, 126°49.29"W), Dodo Canyon (65°00.07"N, 127°20.46"W), Powell Creek (65°16.37"N, 128°46.26"W), Turnabout Creek (65°19.30"N, 129°38.46"W), Rumbly Creek (65°24.28"N, 131°18.33"W)**Shale basin evolution 2**

Four outcrops were visited during the 2018 Northwest Territories Geological Survey (NTGS) Petroleum Geosciences Group field program: Carcajou River, Dodo Canyon, Powell Creek, and Rumbly Creek. All four sites were measured, sampled, and photographed by hand-held camera or drone for the creation of a three-dimensional computer model of the rock faces. The field team also took small samples at all four sites for geochemical and mineralogical analysis. The natural radiation of the outcrops at Carcajou River and Dodo Canyon was also measured, and samples were collected to identify tiny fossils from conodonts, which are ancient eel-like creatures. At Powell Creek, a sample of the Imperial Formation was taken to measure the amount of interconnected pore space within the sample. The interconnected pore space is an indirect indicator of the amount of space in the rock that can store and flow oil or gas. All field samples

are currently being analyzed, and the detailed results will be available in upcoming NTGS publications and conference presentations.

Fischer, Beth

Northwest Territories Geological Survey
Yellowknife, NT
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File Number: 12 404 968

Region: SA

Licence No: 16357

Location: In the area of 63°30' to 63°45"N, and 129°30' to 130°0"W (about 257 km southwest of Tulita, 243 km southwest of Norman Wells, 308 km south of Fort Good Hope, and 30 km north of Mile 222 on the Canol Trail)

Stratigraphic studies, Mackenzie Mountains

Two geologists spent 20 days on the land studying outcrops of rock near Caribou Pass that may hold deposits of gold or other metals. The rocks were deposited as sediments on an ocean floor, 300 to 500 million years ago, that were buried by more sediments and hardened into rock. Millions of years later, the rock was uplifted into mountains. The geologists want to understand what the margins of the ancient ocean were like, and how the rocks were deformed when they were uplifted into mountains. In one area, they recognized five different rock units and four faults. Only one rock unit and one fault were shown on existing maps. They discovered a rock made of sand-sized grains of volcanic rock, which means there was a volcano somewhere nearby in the ancient ocean. The rocks underneath the volcanic unit are early Cambrian in age, and the rocks on top of it are middle Cambrian. Therefore, the volcano existed at the end of the early Cambrian, roughly 510 million years ago. Finally, the geologists discovered a rock that was once part of an underwater reef made by colonies of microscopic creatures called cyanobacteria.

Fraser, Paul

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File Number: 12 404 979

Region: SS

Licence No: 16401

Location: NWT lease no. 85B/16-9-11 (60°53'16"N, 114°25'12"W)

Pine Point Mine reclamation research plan - tailings impoundment area

In order to develop an updated Closure and Reclamation Plan for the Pine Point Mine, the project team needs to conduct some research in the area. The first phase of the 2.5 year research program started in 2018. The goal of this phase is to understand the movement of zinc and other metals within the tailings, water, and soil both in and around the tailings impoundment area at the former Pine Point Mine. The team collected information about the current conditions at the mine, including geotechnical information, water balance and quality, and geochemical evaluations. They recorded information about plant cover, human and ecological risks from the mine, and the long-term water treatment options. To obtain the information they needed in the field, the team sampled tailings, soil, surface water and groundwater, as well as drilling boreholes and installing special environmental monitoring equipment. They also reviewed historical environmental conditions and evaluated water quality and treatment technologies. In future phases of this research program, the team will collect and analyze more site data and do community

engagement before they prepare the final closure plan. Data collection and evaluations will continue through 2019 and 2020.

Froese, Duane

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File Number: 12 404 744

Region: SA, DC

Licence No: 16361

Location: Hare Indian River Channel (66°1.8'N, 125°28.2'W; 66°7.8'N, 126°7.6'W), 20 km east of Norman Wells (65°20'24"N, 126°36'00"W), crest of the easternmost ridges of the Canyon Ranges (64°57'36"N, 127°33'36"W), Mackenzie River banks between Wrigley and the mouth of the Mountain River (65°40'48"N, 128°51'36"W)

Deglaciation of the NW Laurentide Ice Sheet and opening of the Mackenzie Valley

The field work for this research project took place from 19 July to 3 August in the Fort Good Hope, Norman Wells, and Tulita regions. The project team collected samples of about one kg from boulders that were left behind during the retreat of the Laurentide Ice Sheet from the Mackenzie Mountains, and during the subsequent freshwater flooding through the Hare Indian River valley. The samples will be used to more accurately determine when the freshwater flooding happened around the end of the last Ice Age. Organic and sediment samples were also collected from Ice Age deltas along the Mackenzie River. Additionally, the research team has used time-lapse satellite imagery to find numerous active thaw slumps (places where permafrost is thawing and slumping) in the upper Keele and Redstone River basins. These thaw slumps appear to have started melting in the last 10 to 20 years. Preliminary results were presented at the Canadian Permafrost Association Annual Meeting in October 2018.

Fujii, Kazumichi

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File Number: 12 404 944

Region: GW

Licence No: 16260

Location: Along the Dempster Highway (68°03'N, 133°30'W)

Reconstructing history of hummocky soil formation in drunken forest

The term 'drunken forest' refers to areas of forest where the trees lean in odd directions. This happens in areas with a shallow permafrost layer and many small hills or mounds. Ice wedges cause the ground in these areas to move up and down, which causes the trees to tilt. The goal of this research project was to see if tree rings from trees in drunken forests can be used to study the movement of the ground, and to see whether the development of drunken forests is directly related to hummocky soil with a lot of small hills or mounds. The research team analyzed the relationships between tree leaning and soil hummock formation for this reason. Trees show evidence of leaning events in their tree rings; for example, the research team found that black spruce trees deposit lignin on the downslope side when they are leaning. This feature is most easily seen on mature trees between about 0 cm and 30 cm height from the ground. The team found that there is less of this particular type of 'reaction wood' formed in trees growing on soils with a deeper permafrost table that is greater than 60 cm. Reaction wood formation occurs only in trees growing at the edge of mounds, and more is formed in trees growing in clayey soil than in sandy soil.

Thus, the team concluded that tree rings of black spruce at 0 (ground) to 30 cm height do record the movement of clayey soil with shallow permafrost tables, and therefore they can be used to reconstruct the movements of soil hummocks.

Giff, Garfield

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File Number: 12 404 965

Region: IN

Licence No: 16349

Location: Reindeer Station on the East Channel of the Mackenzie River north of Inuvik

Online digital hazard maps of landslides along the Caribou Hills

The goal of this project is to map and monitor the landslide that occurred in the area around Reindeer Station, which is located on the bank of the East Channel of the Mackenzie River north of Inuvik. The map of the landslide will be uploaded to an online Geographic Information System (GIS), which will be made available to the community. The GIS will be available for use by regulators, the community to assess possible dangers or to help with the location or relocations of cabins, for water transportation, hunting and trapping, and other recreational activities along the Caribou Hills. For example, the Inuvialuit Land Administration could use the GIS to plan for the cabins at Reindeer Station, to plan infrastructure, to identify suitable locations for warning signs, and to issue safety bulletins. The first phase of the project was collection of relevant data, and this was completed during the summer of 2018. The research team used a UAV (a drone) to map the landslides and all relevant natural and man-made features in the area. They also took soil and water samples from selected landslides. The team is currently processing data to produce maps and elevation models that show the ground heights and terrain in the area. The processed data will then be uploaded into the GIS.

Gray, Derek

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File Number: 12 404 956

Region: GW

Licence No: 16310

Location: Within 2 km upstream and downstream of the Fort McPherson ferry landings on the Peel River (67.34°N, 134.87°W), and upstream and downstream of the Tsiigehtchic ferry landings on the Mackenzie and Arctic Red Rivers (67.46°N, 133.76°W)

Impact of ferry landings on water quality and traditional fish harvesting in the Mackenzie and Peel Rivers

Ferry operations on the Peel and Mackenzie Rivers near the Gwich'in communities of Fort McPherson and Tsiigehtchic have been a cause for concern for years. Specifically, there is concern that the gravel used to build the ferry landings is altering fish habitat and the quality of the water downstream, because adding sediments to rivers can impact fish and other animals downstream. The goal of this project is to assess if and how the sediments from the gravel might be affecting the water. In order to determine the impacts of the ferry landings, a number of different methods were used. After ice breakup in May 2018, samples of sediments, aquatic insects, and water were collected both upstream and downstream of the landings on both rivers. Early results show that the ferry landings are not affecting the cloudiness of the river, or

the amount of sediment moving downstream in the river. The research team will take more samples in 2019, and will also interview and meet with Elders and other knowledge holders to better understand the past impacts of ferry operations. Final results will be presented to the communities and the Government of the NWT Department of Infrastructure at the end of 2019.

Grogan, Paul

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File Number: 12 404 687

Licence No: 16270

Region: NS

Location: Daring Lake

Biogeochemical controls on the structure and functioning of low Arctic ecosystems

One of the main goals of this research project is to understand how soil nutrient availability influences the growth of common plant species in the low Arctic, including in the Daring Lake region of the NWT. An increase in summer air temperature is widely predicted to occur in the Arctic, and has already been documented in many locations. However, increased summer air temperatures have not been observed at Daring Lake yet. Warming air will increase microbial activity in the soil, which may then result in more soil nitrogen and phosphorus that is available to plants. Nitrogen and phosphorus are food for plants, and can make the plants grow faster. The research team documented nitrogen and phosphorus concentrations in various plant species, and then measured the corresponding concentrations in the soil. The samples are being analysed now. Unfortunately, although the team has done it every other year, this year it was not possible for them to participate in the Daring Lake Science Camp that involves about 20 northern high school students and several Elders. The results of this project will help to predict how arctic vegetation will be affected by a changing climate. One paper has been published in an international peer-reviewed journal (Arctic Science), and a talk about this project will also be given at the annual ArcticNet conference in Ottawa in December 2018.

Gruber, Stephan

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File Number: 12 404 878

Licence No: 16256

Region: NS

Location: Yellowknife and Lac de Gras regions, along Highway 3, the Ingraham Trail, and the Tibbitt to Contwoyto Winter Road

Quantifying permafrost thaw

The goal of this multi-year research project is to better understand how permafrost differs in temperature, chemical characteristics, and physical characteristics from place to place. In 2018, team members worked around Yellowknife and in the taiga-tundra transition zone south of Lac de Gras. At three locations around Yellowknife, the team measured the amount of ice-loss in the ground. The ground surface at all sites goes up and down in very different patterns and at different times of year. So, in order to know how much the ground lowers from year to year, researchers also need to know how the ground is going up and down in the summer. The research team collaborated with the NWT Geological Survey in Yellowknife and with Aurora Geosciences/Kennedy Diamonds at the KDI camp. Many of the measurements they collected during earlier field seasons have now been analysed and reported at conferences such as the Yellowknife Geoscience Forum. Overall, the researchers have found that in the Lac de Gras area, the average ground

temperature varies by as much as 10°C within a distance of only a few kilometers. The measurements collected by the research team are now being used to test and improve computer models that predict how permafrost at specific sites is likely to change in the future.

Gurney, Kirsty

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File Number: 12 404 939

Region: SA

Licence No: 16229

Location: Ts'ude niline Tu'eyeta Candidate Protected Area at 66°10'21.22"N, 129°52'33.50"W and 66°14'07.62"N, 129°25'30.45"W

Understanding changes in aquatic ecosystem health and water quality in the Fort Good Hope – ramparts area

The wetlands in the ramparts area near Fort Good Hope are highly valued natural resources with unique cultural benefits. To understand how environmental change might affect these natural areas, partners from the Fort Good Hope ʔehdzo Got'ıne (Renewable Resources Council), Environment and Climate Change Canada, and the Government of the NWT Water Resources Division are developing a long term, community-based monitoring program focused on wetlands and water quality. In 2017, project team members visited Fort Good Hope, where they learned about the importance of the Ts'ude niline Tuyeta Protected Area (Tuyeta) and worked closely with local environmental monitors to plan access to the study sites. During visits to wetlands, monitors taught the scientists about the respect Dene people have for water, and scientists taught the monitors how to collect samples and record data that will help describe the current baseline conditions in the wetland. The team collected measurements and samples from 13 wetlands in Tu'eyeta and the Fossil Creek area. The researchers found that the wetlands had low nutrient levels and low levels of environmental pollutants. Also, it appears that not all wetlands are equally connected to groundwater. Moving forward, project partners will continue to work together to watch and understand changes in wetland ecosystems.

Hadlari, Thomas

Geological Survey of Canada
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File Number: 12 404 916

Region: IN, GW

Licence No: 16302

Location: NTS 106 M 3, 4, 6, 7, 13, 14; NTS 107 B 4, 5; NTS 116 I 16; NTS 116 P 1, 10, 11, 14, 15, 16; NTS 117 A 1, 2, 7, 8, 9, 10

2018 Richardson Mountains

The Geological Survey of Canada led a study to see how the bedrock of the Richardson Mountains was affected by movement along a fault line that formed the Arctic Ocean and also pushed rocks up to form the mountains. A field crew of 13 people was based in Aklavik and took daily helicopter flights to the mountains from 12 to 23 July. Groups of 3 or 4 people went out hiking in the mountains, made rock observations, and collected rock samples with hammers and backpacks. The collected rock samples are presently being analyzed in labs at the University of Calgary, the University of Alberta, and at the Geological Survey of Canada. This study hasn't concluded yet, although a report is available online. The

lead researcher held meetings in Aklavik, Inuvik, and Old Crow in January 2019 to provide an in-person summary of activities conducted the prior summer.

Hajnsek, Irena

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File Number: 12 404 958**Region:** IN, GW, DC, NS**Licence No:** 16323

Location: Yellowknife Airport (62°27'57"N, 114°25'06"W), Baker Creek (62°35'00"N, 114°25'60"W - flight distance 15 km to Yellowknife), Scotty Creek (61°17'60"N, 121°17'60"W - flight distance 50 km to Fort Simpson), Smith Creek (63°09'60"N, 123°19'60"W - flight distance 190 km to Fort Simpson), Havikpak Creek (68°19'60"N, 133°30'00"W - flight distance 3 km to Inuvik), Trail Valley Creek (68°41'06"N, 133°42'01"W - flight distance 45 km to Inuvik), Siksik Creek (68°45'00"N, 133°30'00"W - flight distance 50 km to Inuvik), Mackenzie vegetation transect (68°33'34"N, 133°30'10"W - flight distance 30 km to Inuvik), Gordon Lake and area (63°05'55"N, 113°12'00"W - flight distance 90 km to Yellowknife), Inuvik and area (68°17'59"N, 134°11'57"W)

PermASAR - airborne SAR campaign on permafrost soils and boreal forests in the Canadian north-west

Synthetic Aperture Radar (SAR) is a way to monitor variations in vegetation, soil moisture, and permafrost conditions using a special instrument carried by a plane. The goal of the PermASAR 2018 summer field season was to study how this instrument performed in areas with permafrost soils and boreal forests. Although technical difficulties delayed the start of the project by two weeks, the research team, research aircraft, and instrument were eventually transferred to Yellowknife. On 7 August the first two measurement flights were flown, over the Yellowknife airport so that the instrument could be calibrated, and then over the Baker Creek site. For the period from 11 to 20 August, the whole team moved to Inuvik and completed airborne SAR measurements over the Mackenzie vegetation transect, Havikpak Creek, Siksik Creek, and Trail Valley Creek. From 24 August to 2 September, they flew over the Baker Creek, Scotty Creek, and Smith Creek boreal forest sites. The team also flew SAR flights over Herschel Island in the Yukon and La Ronge in Saskatchewan. All staff, the aircraft, and the instrument went back to Germany on 5 September, three days after the last measurement flight. This first phase of the project has been completed successfully.

Hartmann, Jörg

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File Number: 12 404 922**Region:** IN, GW**Licence No:** 16372

Location: Mackenzie Delta along the Dempster Highway and Inuvik-Tuktoyaktuk Highway

AirMeth 2018

The goals of this project are to monitor methane emissions from the Mackenzie Delta, to record coastal erosion along the delta's northern shore, and to detect thaw depth in the active layer and thaw-induced surface subsidence (lowering) in selected areas. To reach these goals, the research team used special instruments pulled by planes to scan the ground and record information. A total of 58 hours of measurement flights were flown over the NWT, and about 9 hours over the Yukon Territory to Herschel Island, in August 2018. In previous years, the research team found strongly increased methane fluctuations at the boundary between deep to shallow permafrost in the northern part of the Delta, which can be attributed to geological sources. The new measurements seem to confirm those findings. The researchers took a scan of the fire scar in the southern part of the delta to see if it influences thaw depths or methane emissions. They also repeated a detailed scan of the Trail Valley Creek area in order to monitor landscape change. This will help the researchers understand changes in vegetation, permafrost, and snow distribution. Finally, they scanned the entire Inuvik-Tuktoyaktuk Highway using several instruments, to monitor in detail any alterations in topography that might occur.

Hille, Erika

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File Number: 12 404 953**Region:** IN, GW**Licence No:** 16304

Location: (67°6'20.26"N, 136°5'28.98"W); (67°8'23.50"N, 135°59'43.57"W); (67°9'58.94"N, 135°53'44.53"W); (67°10'48.51"N, 135°45'38.74"W); (67°10'38.56"N, 135°45'13.46"W); (67°10'40.85"N, 135°43'33.42"W); (67°10'41.66"N, 135°43'51.18"W); (67°22'54.36"N, 134°9'7.35"W); (67°45'23.92"N, 133°52'0.78"W); (68°5'11.29"N, 133°29'28.19"W); (68°18'46.64"N, 133°31'5.36"W); (68°29'22.46"N, 133°45'57.95"W); (68°44'25.85"N, 133°32'18.07"W); (68°45'32.73"N, 133°32'40.89"W); (69°20'37.82"N, 133°2'23.13"W); (69°21'32.95"N, 133°2'30.12"W)

Investigating the quality of water runoff from different terrain types found along the Dempster-ITH corridor

The main goal of this research program is to determine how different factors control the water quality of freshwater systems in the Beaufort Delta region. In 2018, researchers from the Aurora Research Institute in Inuvik collected water samples from streams located along the Dempster and Inuvik-Tuktoyaktuk Highways. Water samples were collected at different times of the year (spring, summer, and fall) to determine how water quality changes between seasons. The next stage of the study will focus on grouping the streams by landscape type. This will allow the researchers to determine how different landscape-level features affect water quality. These features include geological history, vegetation, latitude, disturbances (fire or landslides), and infrastructure (roads and buildings).

Hille, Erika

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File Number: 12 404 953**Licence No:** 16354

Region: IN**Location:** (69°27'16.95"N, 133°0'27.45"W); (69°26'22.19"N, 132°55'18.82"W); (69°25'15.65"N, 132°52'56.75"W); (69°24'31.26"N, 133°7'58.58"W); (69°33'43.17"N, 132°58'49.52"W)**Beaufort Sea coastal restoration – exploring the potential for using Indigenous plant species to revegetate coastline affected by permafrost thaw slumping**

The Beaufort Sea coastline is made up of permafrost, which is ground that remains frozen year-round. Permafrost thaw slumping occurs when permafrost warms up above freezing, causing the ground to become unstable and collapse. The two main goals of this project are, first, to learn how permafrost thaw slumping is affecting the surrounding landscape and water quality of Kugmallit Bay, and second, to determine ways that local plants can be used to lessen these effects. In March 2018, the research team chose five key study sites with guidance from the Tuktoyaktuk Hunters and Trappers Committee. In July 2018, they collected detailed imagery from each site using an unmanned aerial vehicle (or drone). This imagery will give the team useful information about the landscape, including the size of the thaw slump, the type of vegetation growing there, and the amount of ice in the permafrost. In August 2018, the team collected water samples at each site. Samples collected from water flowing over top of a thaw slump will be compared to samples collected from water flowing over unaffected terrain. This comparison will improve their understanding of how permafrost thaw slumps affect the quality of water flowing into Kugmallit Bay. This data is still being processed. In August and September of 2018 the team collected seeds from plants local to the Kugmallit Bay region. The seeds will be used in future revegetation efforts.

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File Number: 12 404 953**Licence No:** 16384**Region:** IN**Location:** Within the Noell Lake catchment approximately 20 km northeast of Inuvik (68°31'36.58"N, 133°34'13.03"W)**Impacts of natural and anthropogenic disturbances on the aquatic health of tundra lakes in the upland region northeast of Inuvik, NT**

The goal of this study was to examine the effects of permafrost thaw slumping and wild fire on the aquatic health of tundra upland lakes. In August 2018, the research team took water samples from 11 lakes in the upland region east of Inuvik, near Noell Lake. Four of the lakes were undisturbed, three were affected by thaw slumping, and three were affected by wildfire. The research team sampled both the lake water and runoff water at each lake. Water runoff was collected from both disturbed and undisturbed terrain for comparative purposes. The water samples were analyzed for carbon, major ions, nutrients, and heavy metals by the National Laboratory for Environmental Testing in Burlington, ON. The data is currently being processed.

Holmes, Robert Max

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File Number: 12 404 713**Licence No:** 16204

Region: GW**Location:** Mackenzie River near the Tsiigehtchic ferry crossing
(67°27'21"N, 133°45'11"W)**The Arctic great rivers observatory III**

This project studies the six largest rivers that flow into the Arctic Ocean: the Mackenzie and Yukon in North America, and the Ob', Yenisey, Lena, and Kolyma in Russia. The research team is measuring the concentration of naturally occurring chemicals, such as carbon, nitrogen, and phosphorus, in these rivers. The goal of this project is to obtain baseline (current) information about the flow of these chemicals to the Arctic Ocean, in order to better understand how climate change is affecting Arctic rivers. This project began in 2003, and is currently funded until 2024. The current phase of the project is funded for three years, and the team is nearing the end of the second year of sampling, which began in January 2018. In the NWT, the team samples the Mackenzie River near the Tsiigehtchic ferry crossing every second month. The samples are taken by staff at the Aurora Research Institute, in collaboration with the Gwichya Gwich'in Renewable Resources Council in Tsiigehtchic. Water samples are collected from the mid-point of the river just upstream of the Tsiigehtchic ferry crossing using a motor boat in the summer, and an ice auger in winter. During each sampling trip, the research team takes eight litres of water, which is transported back to Inuvik for further processing in the lab at the Aurora Research Institute. These samples are currently being analysed.

Hood, Alexandra

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File Number: 12 404 808**Licence No:** 16252**Region:** NS**Location:** Snap Lake Mine**De Beers Canada Snap Lake Mine environmental monitoring**

The goal of this research project is to meet regulatory requirements by collecting data on the aquatic environment, including bottom-dwelling plants and animals, plankton, sediment and water, as well as collecting other data such as air quality and vegetation. All fieldwork takes place within 31 km of the Snap Lake Mine. The research team monitored aquatic resources in Snap Lake by boat and helicopter, as well as at sites downstream of the lake and in two reference lakes. They monitored air quality through passive sampling. The Snap Lake research project has had an ongoing community consultation program since 1998. It is the intent of De Beers to continue this dialog throughout the life of Snap Lake Mine. Discussions held to date include meetings with the Yellowknives Dene First Nation, the Tłıchǫ Government, the North Slave Métis Alliance, and the Łutselk'e Dene First Nation. These consultations have focused on updating the communities on the activities at Snap Lake, presenting results, arranging for site visits by community members, and including members as assistants in field programs where possible. Discussions about traditional knowledge began in 2000, and this input has been reflected in the design of the research program. Project results are communicated through the various annual reports that are submitted by the mine to the Mackenzie Valley Land and Water Board and the Snap Lake Environmental Monitoring Agency. These include the Wildlife Effects Monitoring Program Report, the Air Quality Annual Report, the Vegetation Annual Report, the Hydrology Annual Report, the Aquatic Effects Monitoring Program Annual Report, and the Water License Annual Report. Additional fieldwork for this project will be conducted from 1 January to 31 December 2019.

Hopkinson, Chris

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File Number: 12 404 975
Region: IN, GW, SA, DC, NS, SS

Licence No: 16385
Location: Airborne data collection targets plots that are widely distributed across forested areas of the NWT, with all aerial data collection conducted at an altitude greater than 1000 m above ground level and speeds above 140 knots

Airborne laser mapping

The goals of this project are to map the surface of the ground in great detail using a special scanning instrument that is towed by an airplane, and then validate the map on the ground. In the last week of July and first few days of August, the research team ran aerial missions out of Yellowknife with occasional stops in Fort Simpson and one stop in Norman Wells. They also had a ground crew that operated out of Hay River, Yellowknife, and Fort Simpson to provide support for global positioning system (GPS) base stations. The team traveled to Scotty Creek to work with another research team for one day in order to collect data for ground validation. The team had hoped to make it up to Inuvik to participate in missions over the Mackenzie Delta, but this work has been delayed until 2019. The research team is processing the aerial scans as well as the ground surveys. The team was interviewed by a local newspaper while they were traveling through Hay River, and they also had one meeting with colleagues from the government of the NWT in Yellowknife.

Irving, Elaine

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File Number: 12 404 964
Region: NS

Licence No: 16347
Location: Great Slave Lake at Jackfish Bay (62°22'50.71"N, 114°24'34.66"W), Jackfish Bay (62°22'32.91"N, 114°24'44.14"W), Horseshoe Island Bay (62°23'04.32"N, 114°16'30.00"W), Kam Bay (63°23'6.15"N, 114°23'20.09"W)

Con Mine phase 6 EEM - periodic monitoring

The goal of this ongoing project is to monitor the water around the Con Mine, as well as the plants and animals that live in the water. In August and September, the research team surveyed fish and bottom sediment in three places. One is Jackfish Bay, which is an area that is exposed to the mine, another is Horseshoe Island Bay, which is an area that is not affected by the mine (known as a reference area), and the last is Kam Bay, which is another reference area specifically for bottom sediments and the plants and animals that live in them. The team caught ninespine stickleback from Jackfish Bay and Horseshoe Island Bay using seine nets. Approximately 160 stickleback from the exposed area were weighed and measured, and approximately 140 from the reference area were weighed and measured. They also harvested about 100 fish from both sampling and reference areas for later analysis, including males, females, and juveniles. The team collected benthic invertebrates (insects, worms, and molluscs that live in the bottom sediment) from Jackfish Bay and Kam Bay so they could compare the two areas. They also collected sediment and water quality samples from each area so they could be analysed for metals in the laboratory. They took water quality measurements in the field, including temperature, dissolved oxygen, pH, and conductivity. The team also collected sediment samples to test how toxic they are. Finally, they did contamination

surveys in Jackfish Bay to estimate the area that was affected by the mine. Technical reports will be submitted to Environment and Climate Change Canada, and will be available upon request from Con Mine.

Kelly, Richard

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File Number: 12 404 925**Region:** IN**Licence No:** 16216**Location:** Trail Valley Creek (68°44.734'N, 133°30.003'W)**Radar remote sensing of snow**

No research was conducted under this licence in 2018.

Kershaw, Geoffrey

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File Number: 12 404 116**Region:** SA**Licence No:** 16276**Location:** Between Dale Valley (63°15'58.18"N, 130° 5'6.37"W) and Caribou Pass (63°34'21.70"N, 129°12'4.19"W)**A mass-energy analysis of permafrost and vegetation change across a Mackenzie Mountain treeline ecotone: 1944 to 2017**

The goal of this multi-year research project is to study how and why ice-rich permafrost landforms, and the plants and trees growing on them, change across the treeline. In April and May of 2018, the research team used a drone to survey the snow at five locations in the study basin. The drone took pictures of the basin nine times over the study period to record changes in the extent of the snow pack during the spring melt. As the melt proceeded, the team used sensors to measure the water leaving the basin through the main channel at regular intervals. When the melt was complete, they collected the sensors that had recorded the water levels, downloaded the measurements, and then reinstalled the sensors. The team also recorded thaw depths along the same transects that had been used for the snow surveys. Finally, water samples for isotope analysis were taken from 13 different locations in the basin before, during, and after the spring melt. In September, the team installed another series of sensors to record water table depth, soil moisture, and temperature throughout the year. The team also collected soil samples and water samples for laboratory analysis. Finally, the team downloaded data from a weather station, which takes year-round measurements of atmospheric conditions, and a drone survey was used to take pictures that were used to create a map of surface water during a period of low flow.

Kiss, Frank

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File Number: 12 404 546**Region:** GW, SA, DC**Licence No:** 16197**Location:** In the Mackenzie Mountains area, including (64°49'48"N, 132°28'48"W), (64°22'12"N, 130°55'48"W),

(63°58'12"N, 130°42'00"W), (63°49'12"N, 130°16'48"W),
(63°30'00"N, 129°49'12"W)

Mackenzie Mountains aeromagnetic survey

The goal of this multi-year project is to map the earth's magnetic field in the Mackenzie Mountains using special instruments towed by twin-engine planes. Magnetic mapping can show the general location of certain minerals, like iron-bearing minerals, in the surface of the earth. It can also show what makes up the bedrock, even if it's hidden under soil or water. The maps that are produced are used to find minerals to mine and oil and gas deposits. To construct these maps, the research team flew approximately 91,000 km with four twin-engine aircrafts, at an average height of 1972 feet above the ground. Each flight line was about 800 m (or about half a mile) from the previous flight line. Due to very bad weather conditions, the survey flights, which started in July 2017, were completed six months later than expected. The team used the instruments to successfully measure the magnetic field in its raw form throughout the survey area and finished flying by April 2018. As a result of the weather delays, the team is still processing the data. Maps are being prepared for publication at the end of this project. The data compilation and processing are monitored by the Geological Survey of Canada, who will make the processed data and colour maps freely available on the internet in the fall of 2018.

Knox, Bernadette

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File Number: 12 404 918

Region: NS

Licence No: 16255

Location: Sunset Lake area approximately 120 km northeast of Yellowknife (62°54'15.494"N, 112°23' 10.462"W; 62°50'19.035"N, 112°21'5.256"W)

Beaulieu River belt collaborative VMS project

The main goal of this project was to learn more about the geological history of ancient volcanic rocks along part of the Beaulieu River near Sunset Lake. The fieldwork team recorded information about the type of rocks they found in the area, and the temperatures and pressures the rocks were likely exposed to. They also recorded the types of rock alterations they saw, and checked for metals such as copper, zinc, and gold. They collected rock samples in addition to recording their observations in the field. In 2018, the team also looked at volcanic and granite rocks in the Jolly Lake area that are suspected to be the same age as the Sunset Lake rocks. Both the Sunset Lake and Jolly Lake areas sit along an ancient fault that runs north-to-south. This study added new geological information about each area, and allowed for many aspects of the rocks to be compared between the two areas. The team will present the information they collected at the Yellowknife Geoscience Forum in November 2018, and will publish a preliminary bedrock map with the Northwest Territories Geological Survey.

Kokelj, Steve

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File Number: 12 404 545

Region: IN, GW

Licence No: 16273

Location: Fort McPherson (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); Inuvik (68°23.019'N, 133°45.355'W), (68°31.732'N, 133°44.665'W); outer Mackenzie Delta and Tuktoyaktuk (69°21.573'N, 133°2.544'W), (69°21.792'N, 133°2.192'W), (69°13.609'N, 134°35.975'W), (69°12.949'N, 134°59.500'W); Sachs Harbour (72°0.598'N, 125°11.432'W), (71°58.967'N, 125°24.069'W), (71°58.350'N, 124°58'57'W)

Permafrost in the western Arctic

In this multidisciplinary project, the research team used both fieldwork and air photos to study permafrost conditions and map 'thermokarst' across the northwestern NWT. Thermokarst is the name for the irregular bogs that form when permafrost warms up and thaws. Air photos and thermal images were taken by UAVs, or 'unmanned aerial vehicles' (these are also called drones). The photos were used to create a map that will allow the team to monitor changes in the permafrost. The changes they are looking for include retrogressive thaw slumping, areas of thaw subsidence, and disturbances from construction or development such as road embankments and borrow pits. The team has also used satellite images to map permafrost thaw features, to see how fast the permafrost is thawing, and to map where permafrost thaw has affected streams, lakes, and coastal areas. The team has focused on the Dempster-to-Tuktoyaktuk road corridor, the Peel Plateau, and Banks Island, although the thermokarst conditions throughout the entire territory will also be mapped. The team also used information from boreholes that were drilled along the Inuvik-Tuktoyaktuk Highway during its construction to monitor ground temperatures along this road corridor. The team will continue to study and monitor landscape change in 2019 and 2020, with an increased focus on communities and the surrounding environment.

Korosi, Jennifer

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File Number: 12 404 929

Region: DC

Licence No: 16306

Location: Near Scotty Creek Research Station (61°17'53.47"N, 121°17'5.38"W) approximately 50 km south of Fort Simpson

Long-term aquatic ecosystem change at the southern limit of permafrost

For this ongoing research project in the Scotty Creek basin near Fort Simpson, the research team is examining how thawing permafrost is altering lakes in the region. Permafrost in this region is patchy and located under peat plateaus. As the peat plateaus thaw, the landscape is dramatically altered. In 2018, the team collected water samples and sediment cores from 16 lakes in the Scotty Creek basin in order to answer two questions. First, how have lakes in the region responded to ongoing landscape changes, and when did these changes begin? To answer this question, the team will analyse the sediment cores and reconstruct the environmental histories of these lakes over the past few hundred years. This will allow them to detect changes due to thawing permafrost. The second question is, are the landscape features that are related to thawing permafrost linked to the current conditions in the lakes? To answer this question, the team took water samples and analyzed the water chemistry, including its organic content, nutrients, and metals. They also used satellite images to map catchment characteristics, such as how the lakes and streams flow into each other. They found that it is possible to study the differences amongst lakes in this region, and whether the differences are caused by thawing permafrost. It seems that lake

chemistry varies amongst lakes, and interestingly, that lakes that are close to each other can have very different water properties.

Koster, Kajar

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File Number: 12 404 969

Region: GW, DC

Licence No: 16359

Location: Inuvik to Tsiigehtchic, Fort Providence

Short and long term effects of forest fires on the stability of carbon pools in the arctic permafrost and subarctic forests (ARCTICFIRE)

The goal of this study was to see how low- and high-intensity prescribed fires affect Canadian boreal forest soils. In particular, the research team studied the effects of the fires on soil carbon and nitrogen content, soil 'respiration' or how carbon dioxide moves in or out of the soil, soil pH, soil temperature, and soil moisture. The intensive field sampling program was held during August 2018 in stands of jack pine forest located 50 km north of Fort Providence. The team took measurements and samples from areas affected by two different types of fires. The first type was high-intensity prescribed fires, also known as crown fires. These areas burned in 2000, 2012, 2015, 2016, and 2017, so the measurements are 1, 2, 3, 6, and 18 years after the fire. The second type was low-intensity prescribed fires, also known as surface fires, in areas that had burned in 2015, 2017, and 2018. These measurements were made from a few days after the fire up to three years after the fire. They found that both the time-after-fire and the fire intensity were important for predicting soil moisture, whereas only fire intensity was important for predicting soil temperature. Neither carbon nor nitrogen content were significantly different between the the two types of fires, either in the humus or the mineral layers. In the high-intensity fire areas, soil respiration was lowest in the first two years after the fire, and increased with time after the fire. In the low-intensity fire areas, soil respiration was significantly higher during the first days after fire, compared to three years later.

Kramers, Patrick

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File Number: 2 404 948

Region: NS, SS

Licence No: 16214

Location: Lockhart and Hoarfrost watersheds

De Beers - Gahcho Kué environmental monitoring program

Monitoring is conducted for aquatic effects, benthic invertebrates, plankton, water quality, sediment quality, fish health, air quality, soil and vegetation, wildlife, hydrology, and geochemistry. Weather and snow pack is measured annually. Flow rates in downstream channels and lake elevations are recorded. Snow berms are measured along the winter road. Weekly wildlife surveys are conducted at site. Air quality is measured through continuous particulate in the air and dust deposition on the ground. Water quality is measured both within the controlled area boundary and in downstream lakes and channels. Arctic grayling movements and occupancy is monitored by the University of Waterloo and the aquatic effects monitoring program. An annual fish tasting is conducted involving six Aboriginal groups and Ni Hadi Xa.

Krizan, Julia

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File Number: 12 404 803

Region: IN

Licence No: 16200

Location: Panarctic Satellite F-68 well site at Satellite Bay on the northwest coast of 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. The well was drilled in 1971 by BP Exploration Canada Limited and abandoned soon after, with only limited clean-up. There were a variety of materials left behind at the site, including contaminated soil that was impacted by fuel and metals, and solid waste such as used fuel drums, scrap metal, and other debris. Repsol Oil and Gas Canada Inc. started to remediate the site in 2017. They consolidated contaminated soil in an on-site containment structure, and removed large debris and barrels. The clean-up work was disrupted in 2017, and also could not be completed in 2018 due to poor weather conditions. However, the project team were able to inspect the Mould Bay and Satellite Bay air strips, inspect the operational areas to identify potential issues, inspect and do maintenance on the data loggers installed in 2017, and inspect the equipment and tools they left onsite in 2017. They were also able to take water samples to determine the water quality in ponds near the contaminated soil containment structure, and take soil samples to map impacted areas so that the contaminated soil can be excavated and moved to a containment area in 2019.

Lafleur, Peter

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File Number: 12 404 621

Region: NS

Licence No: 16199

Location: Daring Lake Tundra Ecological Research Station

Toward predicting future tundra carbon balance

The goal of this project is to study how the plants and the soil in the tundra interact with the atmosphere (or the air). Understanding this will help scientists predict how changing tundra vegetation will affect the climate in the future. Tundra ecosystems exchange energy, water, and carbon gases with the atmosphere, which are all important elements of the climate system. As tundra vegetation changes in response to global warming, these exchanges will be altered, and this will affect climate warming. In late April each year, the research team revisits a number of sites to set up the instruments they use to take measurements of the atmosphere and snow. The instruments run until early autumn and continuously monitor tundra-atmosphere exchanges. The team is also collaborating with various science teams from the NASA ABoVE (Arctic Boreal Vulnerability Experiment) project. Several aircraft carrying different scientific instruments flew over the research site throughout the summer of 2018 to collect information about the plants, shrubs, soil, and permafrost, as well as how carbon moves between the earth and atmosphere. The team was notified each time a flight over the Daring Lake region took place, and were sent flight summaries with preliminary data and updates. The data that was collected by the team on the ground will be shared with ABoVE, after the data quality is checked and it is processed.

Lamoureux, Scott

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File Number: 12 404 567**Region:** IN**Licence No:** 16340

Location: Pit I401A (68.43232°N, 133.73327°W), Pit PW10 (68.53105°N, 133.68108°W), Pit 174 (69.14310°N, 133.15929°W)

Landscape response from altering ice-rich terrain

No summary was submitted for this licence. This project is not in compliance with licensing requirements.

Lantz, Trevor

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File Number: 12 404 758**Region:** IN, GW**Licence No:** 16322

Location: Core sites with instrumentation: N68.82816, W133.20030; N69.12682, W132.93147; N69.07905, W132.96325; N68.315157, W133.428259; N68.648, W133.626; N68.59476, W133.72319; N67.234565, W135.38760 (approximately 40 sites in this area); N71.98704, W125.25402; N71.98245, W125.54319; N72.01232, W125.20729; N72.02425, W125.27744; N72.02494, W125.27372; N72.01212, W125.21447; N69.05891, W134.13219; N68.76454, W133.54950; N69.36256, W133.03657; N69.366, W133.035; N72.417, W124.586; N72.437, W124.071; Husky C1: N69.189202, W132.995430; N69.103069, W133.084753; N68.862708, W133.548601; N72.061, W125.348; N72.296, W125.42; N72.635, W124.69; N72.953, W124.339; N69.06334, W132.286; N69.634, W127.896; N68.92385, W134.321; N68.45171, W133.431; N69.35156, W133.049; N69.2183, W129.508; N69.194, W135.537; N69.217, W135.620; N68.315, W133.428; N68.648, W133.626; N69.366, W133.035; N67.234, W135.387 (approximately 40 sites in this area); N68.594, W133.723; N68.764, W133.549; N69.362, W133.036

Drivers and constraints of ecological change in the western Arctic

Recent research shows that climate change and disturbances to the ground are changing northern vegetation and permafrost in important ways. These changes are concerning because they impact animal habitat and water quality, threaten northern infrastructure, and influence the regional and global climate. The goals of this research project are to understand the rate and causes of these changes, and to assess their impacts. To accomplish this, the research team used air and satellite photos as well as field studies to examine changes at landscape, regional, and continental scales. In 2018, they conducted fieldwork at six study sites within the Beaufort Delta region that were affected by tundra fires. At these sites, the team measured how the severity of the burn affects ecological recovery in tundra environments. The team recorded information about the plants and soil, took air photos using an unmanned aerial vehicle (UAV,

or drone), and inserted 12 'thermistors' that continuously measure and record ground temperatures. The team also re-visited several sites where they are monitoring vegetation, permafrost, and soil over the long-term. At the long-term sites, the team uses various field survey methods and instruments to measure a number of things, including 1) vegetation composition, structure, and population structure, 2) soil pH, moisture, and nutrient availability, and 3) permafrost thaw depth and ground temperature.

Laurent, Cyrielle

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File Number: 12 404 966**Region:** DC**Licence No:** 16351**Location:** Jean Marie River area, including Ekali, Sanguetz, Gargan, McGill, Deep, and Goodall lakes**Permafrost mapping and food security vulnerability assessment in Jean Marie River First Nation lands**

Climate change causes permafrost to thaw, which brings changes to the landscape. This raises concerns for remote communities like Jean Marie River First Nation (JMRFN) that rely heavily on country food. Following recommendations from a climate change baseline study, JMRFN has developed a research approach that includes both Traditional Knowledge and scientific knowledge through partnerships with researchers. This project, which resulted from this partnership approach, expanded an existing map of areas that are vulnerable to permafrost thaw that was developed for part of the JMRFN Traditional Territory. The project also updated an existing impact assessment on country food. The research team found that in JMRFN, 51% of the study area is vulnerable to permafrost thaw. They also found that permafrost in these areas is warm and close to degradation, with some areas that are already severely degraded. This means there is a possibility that the degradation process will be completed in only a few decades. The team also found that landscape changes affect wildlife habitat and behaviour. They found that about one-third of the sites that are used by animals for food overlap with areas that are vulnerable to permafrost degradation. The impact assessment on food security showed that landscape changes have considerable impacts on country food, which makes up about 75% of the diet of JMRFN community members. The results of this impact assessment greatly concern the research team. Access to country food, and the decreasing quality and quantity of country food, are issues that require research and community attention.

Layden, Ronald

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File Number: 12 404 917**Region:** IN, GW**Licence No:** 16250**Location:** Mackenzie Delta**Using novel technology to survey methane emissions in the Mackenzie Delta**

This was a pilot study to measure natural methane emissions in the Arctic. Research began in the spring with truck-based and snowmobile-based surveys of the Mackenzie Delta. The research team discovered permafrost thaw-related anomalies, in addition to natural geological seepage. The methods and hardware that were developed during this project will help expand the research and application of mobile surveying.

Lewkowicz, Antoni

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File Number: 12 404 905
Region: DC, NS, SS

Licence No: 16211
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), (62°33'14.4"N, 113°20' 60"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 study permafrost to help scientists and communities plan for the effects of climate change. Permafrost makes up a large part of Canada's north, 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 by destroying the moss layer that insulates the permafrost and keeps it cool. However, fires have not generally been studied by permafrost researchers in the NWT. To address this research gap, the team went to 18 burnt and unburnt sites between Yellowknife and Kakisa in 2015, 2016, and 2017. Each site had different environmental conditions. The team set up air and ground temperature sensors, and used a specialized analysis called 'electrical resistivity tomography' to monitor changes in the ground each year. The team also took frozen ground cores to look at the ground ice and soil. The team has found deeper thawed layers near the ground surface, and possibly a loss of permafrost at some sites. The greatest changes have been at sites that have both severe burning and coarse grained soil (sandy soil, rather than clay). However, sites that have thick moss layers don't seem to be changing much at all, which shows that permafrost can be resilient in some situations.

MacDonald, Alan

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File Number: 12 404 973
Region: IN

Licence No: 16373
Location: Between 12 and 16 km south of Tuktoyaktuk and west of the Inuvik-Tuktoyaktuk Highway in an area with the following corners: NW corner 69°20'11.2"N, 133°01'46.5"W; NE corner 69°19'06.2"N, 133°00'46.5"W; SE corner 69°17'11.8"N, 133°05'09.8"W; SW corner 69°17'47.0"N, 133°06'26.6"W

Mackenzie Beaufort energy project pre-feasibility research

ATCO completed several environmental studies and surveys in the Inuvialuit Settlement Region during the summer of 2018. The goal of this project was to see whether a proposed development south of Tuktoyaktuk is feasible. The study area of Kangi Creek is located on Inuvialuit private lands, west of the

Inuvik-Tuktoyaktuk Highway and about 12 to 16 km south of Tuktoyaktuk. The research team examined a few different things. They identified fish and fish habitat in Kangi Creek, and looked at the creek's hydrology to determine stream size, water flow, and water properties. They also looked at wildlife to identify any endangered, at-risk, or protected animals and birds that were present in the study area. The team identified rare plants, so they could identify and mark the location of any rare or at-risk plant species or plant communities. They looked at historical resources to identify and mark the location of any heritage or cultural resources. And finally, the team studied the permafrost and local soil conditions, and surveyed the height of the land and depth of the lakes. The results show that the development of the area can be done in a way that would protect the environment. This project also provided useful information for community engagement and planning, if the development goes ahead in the future.

Machtans, Hilary

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File Number: 12 404 799

Licence No: 16320

Region: NS

Location: Jackfish Lake, Yellowknife (62°28'N, 114°23'W)

Jackfish Lake environmental monitoring

The goal of this ongoing monitoring project is to study the fish and fish habitat in Jackfish Lake. For three days in July 2018, the project team visited the lake to take samples and fish. They caught 39 fish using gill nets, beach seine nets, gee-type minnow traps, angling, and backpack electrofishing. The fish they caught included northern pike, lake whitefish, and trout-perch. A subsample of whitefish and pike were sent to a lab for tissue analyses. In addition to fishing, the project team collected water samples over two days in each of May, July, August, September, and December. These samples were tested for water quality and plankton. Additionally, water temperature and level loggers that were installed in Jackfish Lake in April recorded continuous measurements until they were retrieved in December. The team also collected samples of sediment and invertebrates (the tiny animals living in the water) in September, to test them for sediment quality and the size and diversity of the invertebrate population.

MacNaughton, Robert

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File Number: 12 404 529

Licence No: 16264

Region: GW, SA

Location: Mackenzie Mountains, at 64°30'N between 130°W and 131°W, and 64°15'N between 131°W and 132°W; in an area bordered at 65°15'N, east to 129°30'W, south to 64°N, and west to 132°30'W

Mackenzie Mountains bedrock mapping and stratigraphic studies

This report summarizes fieldwork done by the Geological Survey of Canada in the Mackenzie Mountains during July and early August, 2018. The field season began with a research team from the Geological Survey of Canada in Calgary and Texas A&M University doing fieldwork together in the western Mackenzie Mountains from 3 to 25 July. The team was small and had a low-impact tent camp for a short stay at one work site, while working out of a base camp at Poacher Lake. After leaving Poacher Lake, a small team worked out of Norman Wells, and flew by helicopter into the region between the Keele and Silverberry

rivers on days when the weather was good. Fieldwork involved helicopter visits or hikes to 195 bedrock exposures on mountain ridges or stream banks. Eight sites were studied in detail by measuring and describing the thickness and order of rock layers. The locations and rock descriptions were recorded, photographs were taken, and rock thicknesses and orientations were measured. Approximately 216 rock samples were collected, varying from about walnut-sized to slightly larger than a loaf of bread. The only tools that were used to collect samples were hammers. Samples were shipped to the Geological Survey of Canada office in Calgary, where the team will study their composition, fossils, age, and chemistry. The research team will produce new geological reports and maps of the bedrock geology in the western Mackenzie Mountains (National Topographic System map area 106B). These reports will be publicly available once they are complete.

Mamet, Steve

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File Number: 12 404 868**Licence No:** 16254**Region:** SA**Location:** Data are collected along a trail from 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 project was to study recent permafrost thaw and track any movement of the treeline resulting from climate change in the western Mackenzie Mountains. In 2018, the research team measured permafrost active layer depths at eight sites, and used weather stations to study the 'microclimate' (the local climate conditions) at five sites. The data from the weather stations was added to the long-term record, which shows that from 1990 to 2018 the permafrost temperature increased by about 1.3°C. The warming climate appears to have thawed permafrost, varying from a low of four centimetres per decade at low elevation sites, to nearly 12 centimetres per decade at high elevation sites. The team also found that wetter areas had thicker thaw depths. Landscapes will change as temperatures rise and permafrost thaws. Sometimes this may happen abruptly, and the current plants and animals in the area may not be able to adapt. The treeline was the other major focus of this project. Warmer temperatures in the future could mean that more trees will grow further north, or further upslope in mountainous areas. From 2016 to 2018, the team planted tree seeds in some areas to see if they would grow. Surveys of these seeds in 2018 suggest that south-facing alpine slopes may be ideal environments for new trees to establish. However, two things may limit treeline expansion. First, existing trees along the Canol Trail do not currently produce enough good seed to colonize new areas, and second, seeds in shrubby areas are quickly eaten by small mammals. The team put cages over the planted seeds at the treeline, and found that all tree seeds would be devoured by animals if not protected by the cages. This would limit treeline advance. Further monitoring is necessary to determine if current patterns of tree growth and permafrost thaw will continue into the future.

Maps, Frederic

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File Number: 12 404 967**Licence No:** 16353**Region:** IN**Location:** Beaufort Sea

Identification of hybrid copepods between *C. finmarchicus* and *C. glacialis*

Due to unfavourable and heavy ice conditions, the research team was not able to reach the study area. None of the scientific activities planned for 2018 were undertaken in NWT waters. The team hopes to attempt the same expedition in 2019.

Martel, Edith

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File Number: 12 404 582**Licence No:** 16293**Region:** SS**Location:** Nonacho Lake**Nonacho bedrock mapping project**

A 'craton' is the stable, interior part of a continent that doesn't get bashed around or remodelled as much as the edges. During the summer of 2018, the research team examined sedimentary and volcanic rocks that were deposited on an old craton, in a basin that formed during or soon after the collision of two cratons. The team's goal is to document which cratons were responsible for the formation of the basin, and to figure out when they collided. The team spent 20 days in the field using a boat and helicopter to access the study area. They examined rocks along shorelines and walked inland as well. The team used their five days of helicopter support to access areas and rocks important to their research that were not accessible by boat. The team took careful observations and also collected fist-sized samples of rock for laboratory analyses. The samples were cut and sent to various laboratories to identify their mineralogy, geochemistry, and ages of crystallization, deposition, and metamorphism. The team will produce geological maps and write reports that include their field observations and interpretations. Students have started research projects that will become a M.Sc. thesis at the University of Alberta, and a B.Sc. thesis at the University of British Columbia. The team's observations will be presented during the Yellowknife Geoscience Forum in November 2018. All data that were collected will be compiled and then made available to the public on the Northwest Territories Geological Survey website.

McPeak, Sara

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File Number: 12 404 963**Licence No:** 16346**Region:** NS**Location:** Yellowknife area**Application of passive seismic methodologies to the determination of overburden thickness in a permafrost-rich environment**

No summary was submitted for this licence. This project is not in compliance with licensing requirements.

McWilliams, Kathryn

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File Number: 12 404 935**Licence No:** 16201**Region:** GW**Location:** Inuvik (68°24'52"N, 133°46'11"W)**Inuvik SuperDARN radar facility**

The SuperDARN Canada radar in Inuvik is part of a worldwide network of more than 35 radars that monitor space weather conditions in the upper atmosphere. The radar is operated remotely from the project headquarters in Saskatoon. The radar is designed to make a scan every minute of every day. In 2018, the data from the Inuvik radar were shared with researchers worldwide and used in more than 30 academic publications with researchers from more than 14 countries. SuperDARN Canada engineers from Saskatoon did not visit Inuvik in 2018; instead, they requested that personnel from the Aurora Research Institute do any required in-person maintenance in January 2018. High-visibility plastic covers were placed on guy wires around the perimeter of the site to improve safety. Any computer updates that were needed were performed remotely, including making network changes as required by the internet service provider. An employee from the internet service provider also visited the site when the network settings had to be changed. The SuperDARN Canada engineers are planning a maintenance visit to Inuvik in 2019 to perform regular inspections and maintenance, as well as to install an improved radar system. This upgrade will improve remote operations and create a more flexible system for radar experiments.

Merchant, Michael

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File Number: 12 404 970**Licence No:** 16360**Region:** DC**Location:** Fort Simpson and Fort Providence**Dehcho region wetland mapping project**

In 2018, Ducks Unlimited Canada began developing a cost-effective, digital wetland map of the Dehcho region with support from an advisory committee of scientists, Indigenous leaders, resource managers, and other stakeholders. The map will cover a total of 20.5 million hectares. The project team used satellite imagery to identify the location and type of wetlands across the Dehcho region. In July 2018, they went into the field in the Dehcho to confirm that the wetland types they identified in the satellite imagery are accurate on the ground, and also to determine the accuracy of the final wetland maps. The team conducted fieldwork in the Dehcho region for two weeks, all from helicopters. Mapping analysts flew to 365 preselected sites across the region, identified the vegetation species and percentages, and assigned a 'land cover class' to each site. A land cover class is a general term describing the plants, trees, or other ground cover in the area. The field observations have since been checked for accuracy and completeness. The team is now using the field data to complete the digital wetland map of the region, with an anticipated completion date of fall or winter 2019. An update to this mapping project has also been presented at the 27th Dehcho Annual Assembly in Fort Simpson.

Miller, Charles

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File Number: 12 404 928**Licence No:** 16355**Region:** IN, GW, SA, DC, NS, SS**Location:** Across the Mackenzie Valley corridor

NASA ABoVE airborne campaign 2018 addendum

The goal of this ongoing project is to create new and finely-detailed maps of the ground surface and vegetation in the north using special instruments flown by planes. The 2018 ABoVE Airborne Campaign built on the success of the prior year, as additional funding allowed for some of the sensors to be flown along the 2017 flight lines again. During the summer of 2018, the project team mapped over four million square kilometers (about three times the size of the NWT) in Alaska and northwestern Canada. Often, field crews on the ground visited the same areas that were flown over on the same day, to take additional measurements and observations. This links field-based studies (on the ground) with airplane and satellite measurements (taken from the air), and helps ensure that the maps are accurate. The planes had a number of scientific instruments on them. One instrument (AVIRIS-NG) took images that show the plants and trees covering the ground. Another instrument (L-band SAR) takes detailed maps of the ground topography. The planes flew over areas of the NWT that had on-the-ground field sites that are used by researchers in the ABoVE science team, as well as sites used by other research teams. These included the Canadian Cold Regions Hydrology sites in the tundra near Trail Valley Creek, the interdisciplinary science station at Scotty Creek, the Slave River and Slave Delta watershed, and numerous forest and fire disturbance plots maintained by the Canadian Forest Service. Additionally, ABoVE coordinated flights and ground validation with the German Aerospace Center (DLR). The DLR flew their F-SAR instrument (which also maps ground topography) over the same regions as ABoVE in the NWT and Saskatchewan in August 2018. DLR and ABoVE will share some of their measurements and observations from the Baker Creek watershed near Yellowknife.

Miller, Matthew

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File Number: 12 404 923**Region:** SS**Licence No:** 16239**Location:** Immediately downstream of the Taltson Hydroelectric Facility**Taltson Hydroelectric Facility aquatic monitoring**

The goal of this study was to find ways for the Taltson Hydroelectric Facility to minimize the environmental impact of their annual shutdown on areas downstream of the Facility. In previous years, the team assessed various 'mitigation' options (mitigation refers to ways to reduce harm), and the results have been reviewed annually to determine the best strategy for the annual shutdown. All work is done in collaboration with Fisheries and Oceans Canada (DFO) and the Mackenzie Valley Land and Water Board. Based on past monitoring results and in consultation with DFO, the project team will apply for a Fisheries Act Authorization for the annual shutdowns. This authorization will include the final mitigation strategy as well as the offsetting plan, which will improve areas outside of the affected area to offset any damages. Additional monitoring work may be required in 2019 to assess how well the mitigation and offsetting plans are working. Overall, the program is working to minimize the impact of the Taltson Hydroelectric Facility annual shutdown, which will benefit the local environment and those using it for on-the-land activities. It will also minimize the cost of producing power for local communities. Annual reports outlining the results of the monitoring program are posted on the Mackenzie Valley Land and Water Board Public Registry.

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File Number: 12 404 892**Region:** IN, GW, DC, NS**Licence No:** 16317**Location:** (67°23'N, 134°13'W), (69°06'N, 133°06'W), (63°8'N, 123°14'W)**Impact of climate change on catchment biogeochemistry in plains and shield regions**

The researcher traveled to Fort McPherson, Wrigley, and just south of the NWT border in order to measure greenhouse gas emissions, specifically methane, from small lakes. The researcher visited each location two or three times. At each location, the researcher walked to five lakes and took water samples that were used to examine the water chemistry in each lake, and also took measurements of methane emissions using a portable instrument. Water samples were sent to a lab in Edmonton where the nutrient concentrations will be measured, which will tell the researcher how these nutrients may be influencing the amount of methane coming out of the lakes. Initial results suggest that, in the spring (May and June), methane emissions from lakes in Fort McPherson are lower than those from lakes either in Wrigley or south of the NWT border. This suggests that emissions from northern lakes could increase if temperatures increase and become similar to the temperatures in lakes in the south.

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File Number: 12 404 876**Region:** SS**Licence No:** 16261**Location:** Along Highway 5 between Wood Buffalo National Park (west of Fort Smith) and Angus Tower (excluding the settlement near the Salt River), and a forested area with a 6 km radius around Rainbow Lakes in Wood Buffalo National Park and south of Fort Smith**Structure, carbon dynamics, and silvichronology of boreal forests**

The objective of this ongoing project is to study how carbon moves between trees, animals, the air, and the earth. The overall goal is to develop a method to estimate landscape-level vegetation change over a century in large areas of boreal forest, so that the effects of global warming on forests can be better understood. During the 2018 field season, the project team estimated the forest vegetation around Pine Lake in Wood Buffalo National Park over the past 150 to 200 years. They tried two methods, both based on new theories in forestry and pollen analysis, that will be compared to one another at the end of the project. The first method was developed in Japan about ten years ago. The second was developed in northern Europe, also about ten years ago. In 2018, field work was done in Wood Buffalo National Park at four different times during the spring and summer. In late March and mid-May, the team of researchers from Japan and Estonia, along with local volunteers, first checked out the study area and had a planning meeting with Parks Canada. They took forest measurements in early July, and in early September, they cut tree stem samples and collected samples of lake sediments. The samples have now been analyzed in detail by two laboratories in Japan.

Pacholski, Laura

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File Number: 12 404 949
Region: NS, SS

Licence No: 16221
Location: Ekati Diamond Mine

Ekati engineering and environmental monitoring programs

In 2018, the main goals of this research project was to collect data that captures the current conditions to determine if the Ekati Diamond Mine is or is likely to affect the surrounding lakes, rivers, and air quality. Environmental monitoring programs that were conducted in 2018 included the Surveillance Network Program, the Aquatic Effects Monitoring Program, the Wildlife Effects Monitoring Program, and the Air Quality Monitoring Program. These programs were designed to detect potential changes in the lakes and rivers, air, vegetation, wildlife, wildlife habitat, soil, water and sediment quality, and the plants and animals that live in the water, that may result from mine activity. Baseline environmental studies were also conducted in Lac du Sauvage, in lakes and streams near the Sable development, and at the outlet of Lac de Gras. The research team monitored the lakes and rivers, weather and climate, water quality, sediment quality, and the small plants and animals that live in the water and sediments. They also collected data on fish and fish contaminants, wildlife observations, wildlife behaviour, and how well plants in the streams and on the shore are growing. The results of this research program will be made publically available through Dominion Diamond Ekati ULC.

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File Number: 12 404 779
Region: SS

Licence No: 16319
Location: Rivers surrounding the Kennady North Project, 5 km northeast of the Gahcho Kue Mine; the study area extends approximately from (599000E, 7036000N) to (590000E, 7048000N) on UTM Map 12V

Kennady North Diamond Project

This research licence was for both a water quality program and a hydrology program at the Kennady North Project. The goal of the water quality program was to collect under-ice water samples, and other measurements, from lakes downstream of the development and along a possible water diversion route. These samples were analysed to see how the development has affected the water. Water quality samples and other measurements were taken from a depth between 4 m and 8 m below the surface of the water. The goal of the hydrology program was to start hydrological monitoring around the mine by monitoring nearby lakes, rivers, and streams. To do this, the research team measured how the streams and rivers flow into and out of lakes using a special measuring device that recorded water levels, temperature, and other information. These devices were placed on the bottom of each lake that was monitored, at the spot where the lake drains out into a river or creek. The devices recorded water depth every 15 minutes. The team also flew over the watersheds and lakes in the area so they could map them. This monitoring program will continue in 2019.

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File Number: 12 404 779

Licence No: 16380

Region: NS**Location:** Yellowknife River between Prosperous Lake and Bluefish Lake**NTPC Bluefish Hydro**

The 2018 Bluefish Lake Mercury Monitoring Program included research on both large-bodied and small-bodied fish. Two site visits were required to complete the research program; one from 7 to 9 August, and the other from 2 to 3 October. The team took samples from a total of 20 adult northern pike by removing small tissue plugs from the muscle near the dorsal fin. The fish were then given a type of liquid band-aid to cover the plug and released back into the water. In addition, the team caught a total of 20 slimy sculpin by electrofishing near the shoreline of the inundated part of the old dam. These fish were killed, and samples from their ear bones were removed to determine their age. The samples from the pike and sculpin were sent to a lab for analysis. The team is waiting to receive the results that will tell them the concentration of mercury in these fish.

Paulen, Roger

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File Number: 12 404 934**Licence No:** 16226**Region:** DC, NS, SS**Location:** Between (60°0'0"N, 114°0'0"W) and (62°00'0"N, 122°00'0"W)**Southern Mackenzie surficial mapping**

The research team conducted fieldwork in Great Slave Lake, and in areas to the south and west of Great Slave Lake, that are pictured in topographic maps with the codes NTS 85B, 85C, 85F and 85G. Their goal was to map the surficial geology of the area, and to take samples from regional 'tills' (tills are rocks and sand that were left behind by glaciers). This area was selected for study because there are currently no existing surficial geology maps at a good enough scale to be used by scientists and developers to answer various geoscience questions. In contrast, geological information is available for the surrounding regions. In 2018, the team collected 59 till samples from the study area. A total of 11 samples were collected south of Great Slave Lake between Pine Point and Hay River (NTS 85B), 8 till samples from the region shown in topographic map NTS 85C, 27 samples from NTS 85F, and 13 samples from NTS 85G. In 2018, most sites were accessed by helicopter or a boat on the Mackenzie River. Holes at samples sites were dug by hand, and then refilled after sampling to minimize the impact on the land. A map is available that shows all of the places where samples were collected for this project in 2017 and 2018.

Perzoff, Tania

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File Number: 12 404 930**Licence No:** 16408**Region:** DC**Location:** Cantung Mine (61°58'1.12"N, 128°13'58.95"W)**Cantung Mine human health and ecological risk assessment**

The goal of this project is to see if metal contaminants from the Cantung Mine are affecting the health of animals and people. For three nights in October 2018, a team of staff from Tetra Tech and representatives from the Nahanni Butte Dene Band and Liard First Nation trapped small mammals at nine sampling sites

around the Cantung Mine. Five baited lethal mouse traps were placed in each sampling area at least two hours before sunset. Traps were checked two hours after sunset, and again the following morning. A total of 16 small mammals (14 voles and 2 shrews) were captured. The researchers compared the contaminants found in the voles and shrews with the contaminants they would expect to see, based on the location of the traps relative to the mine. Metal concentration values in small mammals are useful to know because, when other larger animals eat the small mammals, the metal contamination might become concentrated in the bodies of the larger animals. The concentrations of metals measured in tissue samples were, in all cases, below the maximum amount the research team expected to see, based on other work they've done in the area. Additionally, in almost all cases, the metal concentrations were also below the average of what was expected. This means that the team was conservative when they estimated how much metal contamination would be found.

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File Number: 12 404 748**Region:** IN**Licence No:** 16356**Location:** From the USA/Canada border to Amundsen Strait, roughly 141°W to 125°W**Assessment of the Western Arctic Boundary Current**

Fieldwork for this project took place between 25 October and 18 November on the US Coast Guard Cutter Healy, which departed from and returned to Dutch Harbor, Alaska. The cruise was part of an ongoing project for the Arctic Observing Network called 'Monitoring the Western Arctic Boundary Current in a warming climate: atmospheric forcing and oceanographic response' that is funded by the National Science Foundation. A special instrument that logs observations about the water and water currents has been moored in the Pacific Arctic Boundary Current on the continental slope of the Alaskan Beaufort Sea. The research team uses observations from this instrument, as well as shipboard observations, to study ocean currents. The team retrieved the instrument, downloaded the observations stored on it, and redeployed it. They also carried out a hydrographic survey that mapped the terrain of the ocean floor in the area of the boundary current, from Barrow Canyon along the continental slope. The survey consisted of 13 transects and used a special instrument that is lowered into the water to measure the salinity, temperature, oxygen, depth, and concentration of particles. The team also took water samples to measure salinity, nutrients, and radium, and measured the speed of the water current.

Pisaric, Michael

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File Number: 12 404 640**Region:** DC, NS**Licence No:** 16212**Location:** Yellowknife and Fort Providence areas**Using the past to inform the future: a paleoecological perspective of the impacts of drought and fire on lakes, permafrost and forests**

In April 2018, the research team collected sediment cores from the bottom of four unnamed ice-covered lakes in the Yellowknife region. The sediment records from these lakes appeared to cover the period from the present back to the end of the last glaciation in the area. The bottom of each core had sediments from

the time when the land was covered with glaciers and rivers. During the summer of 2018, the team also visited a tree research site along the Ingraham Trail about 30 minutes from Yellowknife. Dendrometers, which are instruments that measure various qualities of trees, were re-installed on the same 14 trees that had been studied in previous years. Installation occurred in late April or early May, and the dendrometers were taken down for the winter in late September. The team also collected micro-cores from the same 14 trees each week throughout the period when the dendrometers were collecting data.

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File Number: 12 404 640**Region:** IN, GW, SA**Licence No:** 16271**Location:** Husky Lake, a burn area south of Inuvik, Noell Lake area, Campbell dolomite upland, and the Dempster Highway and Peel Plateau**Examining the impacts of climate and environmental change on aquatic and terrestrial ecosystems of the Mackenzie region, NWT**

No research was conducted under this licence in 2018.

Prowse, Terry

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File Number: 12 404 309**Region:** IN**Licence No:** 16289**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 project is to collect measurements of lake ice thickness and composition. These measurements are used to understand the living systems under the lake ice, and to study the direct effects of climate change on both the lake ice and the living systems under the ice. On 29 May 2018, the research team travelled by helicopter from Inuvik to Noell Lake. At the lake they used a handheld GPS (Global Positioning System) to locate the spots where measurements would be taken. At each spot, a tape measure was used to measure the snow depth. An ice auger was then used to drill a hole into the ice cover to see if any white ice was present. The team then used the ice auger to drill all the way through the ice cover, and the total ice thickness was measured. Finally, they measured the water level as the lake water flowed up into the newly drilled hole. The team took pictures of the sampling spots and of themselves working. In total, the team took measurements at nine locations on Noell Lake, along both a north-south and an east-west transect.

Reid, Kirsten

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File Number: 12 404 960**Licence No:** 16325

Region: IN, GW**Location:** Along the Dempster Highway, from Dawson City in the Yukon to Tuktoyaktuk**Do diversity gradients and wildfires interact to facilitate tree range expansion across a broad latitudinal scale?**

The goal of this project is to understand when and where tree species can expand their range farther north into the tundra as a result of a warming climate. From June to August 2018, the research team established a total of 12 sites, eight in the Yukon and four in the NWT. At all sites, the team measured the number and types of five different groups of species; 1) large mammals such as bears and caribou, 2) small mammals such as mice and voles, 3) insects such as ants and spiders, 4) vegetation such as fireweed and cranberry, and 5) microscopic soil organisms. In addition, the team planted seeds from three common tree species (black spruce, white spruce, and tamarack) at each site. The team will return to all sites in both 2019 and 2020, so they can record further observations about the plants and animals that will help them understand the relationship between tree establishment and growth, and the numbers and types of species that live at these sites.

Salmabadi, Ehsan

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File Number: 12 404 955**Licence No:** 16308**Region:** DC

Location: Cantung Mine site (61°58'8.76"N, 128°13'57.09"W;
 61°57'29.97"N, 128°17'50.16"W; 62° 3'40.29"N,
 128°26'33.47"W; 61°56'19.36"N, 128°14'14.87"W)

Structural framework for the Cantung Tungsten deposit and its relation to the regional deformation history

The goal of this project was to understand how the layers of rocks that form the bedrock in the area around the Cantung Mine are folded and broken. The research team visited the area across the Flat River east of Cantung Mine, and around the Flat Lakes north of the mine. They collected samples of layered rocks and granite rocks. The rocks often had two or three layers that could be seen with the naked eye. Each layer was at a different orientation, and the layers overlapped each other. The different layers allowed the team to reconstruct how the rocks were squeezed, and how they are currently folded across the mountains. The order in which the layers overlap with each other also shows how the rocks were squeezed and in what direction. Other more microscopic features in the rocks contain information about the pressure and temperature of the rock when it was folded. The results indicate that the folds at Cantung, which are shaped like the blade of a snow plow, happened slightly after the folds that are commonly seen in the area, which are shaped like a half-pipe that opens upward towards the sky. The reason that the folds at Cantung are very different appears to be because of the large granite bodies that have pushed against the layered rocks. A similar style of folded rock is also seen further south at Pyramid Mountain.

Schutt, Derek

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File Number: 12 404 896**Licence No:** 16233

Region: SA**Location:** Along a transect between Haines (Alaska) and Great Bear Lake**The Mackenzie Mountains earthscope project**

The goal of this project is to study earthquakes and earth structure in the broader northwestern Canadian and Alaskan regions. In August 2018, a team of three people visited earthquake-sensing equipment that was already installed in the Mackenzie Mountains. They collected data from the equipment, and then removed the equipment.

Simon, Angel

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File Number: 12 404 950**Licence No:** 16231**Region:** IN, GW**Location:** Inuvik Sewage Lagoon (68°22'08.3"N, 133°45'17.6"W),
Aurora Research Institute (68°21'21.9"N, 133°43'12.5"W),
Aurora College (68°21'33.0"N, 133°43'05.3"W)**Exploring the effectiveness of vegetation for water sewage treatment**

The goal of this research project is to determine if the use of the common cattail in a constructed wetland will naturally improve the effectiveness of the sewage lagoon in Inuvik. The resilience of the cattail species and its documented high performance in the removal of nitrogen and phosphorus make it an excellent candidate for water treatment in a harsh, Arctic climate. The researcher plans to construct two artificial wetlands with cattails, and will allow local water to flow into one, and wastewater to flow into the other. This will allow the researcher to compare plant size, biomass quantities, and the nitrogen and phosphorus contents of the soil in both the fresh and wastewater experimental wetlands. The results of the project will help the community of Inuvik decide whether to use cattails to improve the quality of the sewage lagoon effluent. This project was delayed due to the short growing season in Inuvik, and the need for further study into the seed germination process. Once the team can germinate cattail seeds, the experiment to determine the effectiveness of the common cattail in nutrient removal in wastewater lagoons will proceed.

Smith, Rod

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File Number: 12 404 337**Licence No:** 16210**Region:** IN**Location:** Smoking Hills (69°22'44.5"N, 126°56'02.9"W)**Geo-mapping for energy and minerals program: western Arctic project - Smoking Hills**

The Smoking Hills get their name from an unusual situation where small landslides mix and expose fresh surfaces of the underlying bedrock. The minerals within the bedrock begin to heat up, which ignites small areas of organic-rich bedrock. The sites where the bedrock is burning are called 'bocannes'. Geological fieldwork to study the bocannes was conducted in the Smoking Hills area between 18 and 31 July. The pH levels of ponds and streams around the bocannes are extremely acidic, and the research team is trying to understand what roles the properties of the local bedrock, play in this acidity. The team also spent a lot of time collecting samples of different types of bedrock, often walking uphill and collecting a sample every

2 to 4 m. These samples will be analyzed to help the team determine the age of the bedrock, where the rock formed, and what the environment was like when these sediments accumulated between 65 and 145 million years ago. Finally, the team collected samples from some of the surface deposits to test for the presence of minerals that would indicate the presence of diamonds somewhere nearby. Previously the team had worked on Banks Island, and they wanted to see if the rocks and geological formations they found there are related to possible diamond sources south of the Smoking Hills. The summer fieldwork was a success, and samples collected during the summer of 2018 are being analyzed. Reports summarizing this work will be published as the results come in.

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File Number: 12 404 657**Region:** IN, GW, SA, DC**Licence No:** 16265**Location:** Trout River, Jean Marie Creek, Liard spruce, Harris River, Fort Simpson, Willowlake River, Snafu Creek, Fort Good Hope, Tsiigehtchic, Rengleng River, Caribou Creek, Campbell Lake, Mackenzie Delta**Permafrost monitoring and collection of baseline terrain information in the Mackenzie Valley corridor, NWT**

The goal of this ongoing monitoring program is study how permafrost is changing over time. In August 2018, the research team visited permafrost monitoring sites throughout the Mackenzie Valley corridor, in the Inuvialuit, Gwich'in, Sahtú, and Dehcho regions. They measured the ground temperature and the depth of the 'active layer', which is the top layer of the permafrost that warms up and thaws in the summer. These measurements were added to the existing data records, some of which have been recorded for more than 25 years. Having long-term information that goes back many years ensures that land management organizations have good baseline permafrost information that they can use to make decisions about land development and management. The team has found that, generally, the permafrost in the Mackenzie Valley has been warming over the last decade. In the northern portion of the study area, the ground temperature had increased up to 0.1°C per year. In the southern portion of the study area it was more variable. Ground temperatures had increased by up to 0.03°C per year at sites between Norman Wells and Fort Good Hope, and by less than 0.02°C per year at sites south of Norman Wells. Active layer thickness has generally increased over the last decade. The team is compiling the data they collected in 2018, and will publish a detailed report that contains data summaries. They will also continue to collect observations on permafrost in future years.

Somers, Gila

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File Number: 12 404 921**Region:** DC, SS**Licence No:** 16313**Location:** South Slave region (60.020650N, 111.885033W; 61.267417N, 113.416117W; 61.081557N, 113.916189W), Dehcho region (60.445833N, 121.236867W; 60.440250N, 121.269017W; 60.504867N, 121.448767W; 61.853039N,

121.278852W; 61.732399N, 121.23635W; 61.444700N,
121.235700W)

Community-based water quality monitoring in the Northwest Territories

The field sampling component of this community-based water monitoring program ran from 2012 to 2016. During these years, community members took water samples from more than 40 water quality monitoring sites three or four times during the open water season that runs from June to October. Staff from the Government of the NWT Department of Environment and Natural Resources supported the sampling by providing equipment, training, and other technical support. This program produced good quality data that can be used to find changes and trends in water quality across the NWT. Differences in water quality across the NWT seem to be related to how fast water flows, and the type of rocks that the water flows through. Water quality is also affected by climate change in some regions. The program confirmed that when turbidity in the water is high, so are the amounts of certain metals. The team analysed hydrocarbon data from 2012 to 2017, and found that all hydrocarbons in the water were much lower than the amount (400 ug/L) that will affect fish. All project data can be download for free from Mackenzie DataStream, an online open-access data portal.

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File Number: 12 404 806

Region: DC

Licence No: 16314

Location: Scotty Creek (61° 18N, 121° 18W)

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. This is an ongoing project that began in 2013. The research team used special scientific instruments to gather continuous measurements of net carbon, water and energy fluxes throughout 2018. Different members of the research group are working on different analyses based on these measurements.

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File Number: 12 404 806

Region: DC, SS

Licence No: 16315

Location: South Slave (60.020650N, 111.885033W; 61.267417N,
113.416117W; 61.081557N, 113.916189W), Dehcho
(60.445833N, 121.236867W; 60.440250N, 121.269017W;
60.504867N, 121.448767W; 61.853039N, 121.278852W;
61.732399N, 121.23635W; 61.444700N, 121.235700W)

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 ongoing monitoring project is to record how carbon gas moves between the earth and the atmosphere. The research team made continuous measurements of carbon, water, and energy fluxes

throughout 2018 using special scientific instruments that record the measurements. Different members of the research team are working on different analyses of these measurements. They will make conference presentations and publish academic papers in 2019.

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File Number: 12 404 806**Region:** IN, GW**Licence No:** 16316**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**

There is general agreement that permafrost landscapes are vulnerable to climate change, but scientists don't understand how the changing permafrost will affect boreal forests and the tundra overall. The goal of this ongoing monitoring project is to figure this out. Using special instruments, the research team made continuous measurements of net carbon, water, and energy fluxes in 2018. Different members of the team are working on different analyses of these measurements. They will make several conference presentations and publish academic papers in 2019.

Sparling, Paul

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File Number: 12 404 977**Region:** IN**Licence No:** 16389**Location:** Inuvik-Tuktoyaktuk Highway corridor**Imaryuk monitor pilot program**

No summary was submitted for this licence. This project is not in compliance with licensing requirements.

Tank, Suzanne

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File Number: 12 404 785**Region:** GW**Licence No:** 16327**Location:** Peel Plateau**The effect of permafrost slumping on carbon delivery from land to water**

This ongoing project investigates the effects of retrogressive thaw slumps, which are formed by thawing permafrost, on streams in the Peel Plateau. Carbon exists in many forms, and is locked away in frozen permafrost. However, when permafrost warms up and thaws, it can enter streams or even become a gas and contribute to climate warming. The goal of this project is to measure how carbon moves from slumps to streams, and to understand how the carbon is transformed within streams. This will allow the team to better understand how thawing permafrost affects aquatic ecosystems. In 2018, the team measured the water quality and chemistry of streams to see how the carbon released from slumps impacts the bacteria

living in the water, because the bacteria use the carbon as a food source. Between June and August 2018, the team measured water upstream, downstream, and from the outflows of active slumps beside streams on the Peel Plateau. They also took samples directly from slump 'headwalls', which are the permafrost soils that have been exposed by slumping. The results show that the soil carbon that was previously frozen in slumps can be transformed and decomposed to CO₂ (carbon gas) in this region, which means that slumping can result in even more climate change. In turn, climate change can result in more slumping. The team presented their project as part of the Aurora Research Institute speaker series.

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File Number: 12 404 813

Region: SA

Licence No: 16267

Location: Gayna River, Mackenzie Mountains (64°57'N
130°42'W)

Neoproterozoic stratigraphy, Mackenzie Mountains

The goal of this project is to map the geological layers in the Gayna River area. From 26 June to 6 July 2018, the research team was based at a camp on a tributary of the Gayna River that they accessed by helicopter. Two members of the team conducted fieldwork by foot from the base camp. The team mapped, took measurements, and took samples that were about the size of a lime that were later analyzed in a laboratory. The rocks in the Gayna River area are very complex and contain a lot of information, and so the field work each year accomplishes only a small part of the overall goal of the project. The project has therefore run for several years, and will continue to run for many more years to complete all of the required field and laboratory work. The goal of the field work done in 2018 was to understand the growth of the upper parts of giant fossil reefs that are 850 million years old. These ancient reefs are kilometers in diameter and hundreds of meters thick. They were built by bacteria at a time when there was no life on land yet, and no animals had evolved yet. The reefs are important to understand the early evolution of ecosystems, and also to understand where zinc can be found at the Gayna River zinc camp, a mining development that was drilled in the 1970s. A recent publication on Gayna River zinc summarizes what is known so far; that the formerly-buried fossil reefs controlled the flow of subsurface fluids that deposited the zinc.

Ullmann, Tobias

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File Number: 12 404 957

Region: IN, GW

Licence No: 16312

Location: Between Inuvik (68.35°N, 133.72°W) and Tuktoyaktuk (69.44°N, 133.02°W); north (69.72°N, 134.43°W), central (69.36°N, 134.58°W), and south (69.02°N, 134.68°W) of Richards Island; between Inuvik and Fort McPherson (67.44°N, 134.86°W); between Fort McPherson and the Yukon/NWT border (67.05°N, 136.20°W)

Remote sensing and geophysics of tundra landscapes

The goals of this project are to make observations of tundra systems in order to study any seasonal changes occurring in the land surface, and to detect and measure both freeze-thaw cycles and the seasonal development of vegetation. In August 2018, fieldwork took place along the Inuvik-Tuktoyaktuk Highway, in the northern part of Richards Island, and in the Richardson Mountains between the Rock River Campground and James Creek. The research team took measurements along 200-meter long profiles, including measurements of the active layer thickness (the top layer of the permafrost that melts during the summers) using a steel rod. They also took photographs of the vegetation from ground-level and using a small drone, and measured the electric resistivity of the soil. All investigations were non-invasive, and no vegetation or ground was disturbed or sampled. In addition, small loggers were installed at each site that take measurements of the near-surface soil moisture and soil temperature at intervals of one hour. The data that was collected on the ground will be compared to the data collected from space borne satellites, such as imagery from the Landsat, TerraSAR-X, Sentinel-1, or Sentinel-2 satellites. The sites will be revisited in August 2019.

von Kuster, Jenica

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File Number: 12 404 797**Region:** SA**Licence No:** 16398**Location:** Northwest corner 65.3°N, 126.9°W; southeast corner 64.6°N, 125.6°W**EL494 surface water monitoring program 2016-2018**

The goal of this ongoing project is to monitor surface water and groundwater at Exploration Licence (EL) 494 by collecting surface water samples from locations that are near areas where exploration activities occurred. There was more rain than usual in August 2018, when fieldwork for this project was conducted. Samples were taken from a total of 27 locations. Twelve samples were taken from watercourses such as rivers, streams, and creeks. Of these, four watercourses had samples taken from both upstream and downstream of EL 494. The research team also sampled 11 waterbodies such as lakes, ponds, and sloughs. Due to the increased precipitation in August 2018, there was water flow or standing water at all sampling locations. The team also collected data from eight thermistors that monitor the permafrost; the thermistors are special instruments that log the ground temperature. They were unable to take samples from any groundwater wells due to frozen well bores. The team will use the water samples they collected to evaluate the quality of the water flowing into and out of EL 494. The researchers are now analyzing their data and finishing a 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 respective public registries.

Wells, David

Diavik Diamond Mine (2012) Inc.
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File Number: 12 404 809**Region:** NS**Licence No:** 16296**Location:** Lac de Gras (64.30°N, 110.30°W)**Diavik aquatics effects monitoring program**

In 2018, Diavik Diamond Mines continued its Aquatic Effects Monitoring Program to evaluate the effects of the mine on the water, sediment, and aquatic life in Lac de Gras. The research team measured dust deposition at 14 locations and took snow samples at 27 stations in late winter to check for dustfall and snow water chemistry. They also collected lake water samples in both late winter (April) and late summer (August) from 21 stations throughout Lac de Gras, its outflow to the Coppermine River, and its inflow from Lac du Sauvage. These water samples were analyzed for water chemistry. Field measurements of water temperature, acidity, conductivity, and oxygen levels were also made at different depths in the lakes. The team also took plankton samples from the lakes during late summer. In August 2018, a traditional knowledge camp with Elders and youth from the nearby communities also took place on Lac de Gras. The team is currently analyzing the data that was collected in 2018, and will publish a detailed analysis of the effects of the mine in a public registry on 31 March 2019.

Whalen, Dustin

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File Number: 12 404 798

Region: IN, GW

Licence No: 16286

Location: Outer Mackenzie Delta (69.300156N, 135.802998W), Cape Bathurst (70.372027N, 129.267028W), Toker Point (69.628248N, 132.958076W), Atkinson Point (69.9317N, 131.07607W), Kugmallit Bay (69.481524N, 133.606366W), Hooper Island (69.6977N, 134.9319W), Kendal Island (69.4733N, 135.2875W), Tuktoyaktuk (69.447N, 133.03848W), Toker Point (69.64665N, 132.79718W), McKinley Bay South (69.9317N, 131.07607W), Russell Inlet (70.14N, 130.565W), Topkak Point (69.51167N, 132.9967W), Tuft Point (69.7233N, 132.55W), Pelly Island (69.614481N, 135.508549W)

Beaufort Sea coastal and nearshore geoscience research 2018

The goal of this project is to examine and track the environmental changes that are occurring across the coastal landscape of the Inuvialuit Settlement Region. There were four main fieldwork activities that took place in 2018. First, the research team assessed how the coast across the region is changing in general, with a focus on key sites along the Yukon North Slope, the outer Mackenzie Delta, and Tuktoyaktuk Peninsula. These sites are believed to have eroded more quickly over the last one or two decades. At these sites, the team used drones to take air photos of the changing coastline. The second component was to study how permafrost coastal landscapes react to increased melting. The team took a series of special photos that showed ground temperatures so they could study how the permafrost ice is melting and slumping. They measured the volume of coastal material that eroded over the short-term (one day), moderate-term (10 days to a year), and longer-term (13 years). The third component was to study the timing and severity of ice breakup, including the breakup of the river and the landfast ice bridge, because this has an affect on open water, wave forces, and coastal erosion. In 2018, the ice bridge broke up later than usual; a full 10 days later than when it broke up in 2017. The final component of this project was to study the erosion on Pelly Island. The team took a series of time lapse photos and used instruments on the seabed and in the water to study a site with extreme rates of erosion. The team also produced 18 Mackenzie-Beaufort Ice Breakup Reports, gave presentations to the Inuvialuit Game Council, local Hunters and Trappers Committees, and the Tuktoyaktuk Hamlet Council, and participated in the Aurora Research Institute public speaker series.

Wiese, Francis

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File Number: 12 404 919**Licence No:** 16369**Region:** IN**Location:** Beaufort Sea**Marine arctic ecosystem study (MARES)**

The goal of this project was to collect information about ocean dynamics in the eastern Beaufort Sea. This included information about ice, waves and water movement, life in the water, and the water chemistry. To collect this information, the research team used instruments that were anchored to the ocean floor and equipment that glides through the ocean. Fieldwork took place in the fall of 2018, and was conducted from the Canadian Coast Guard Ship Sir Wilfrid Laurier. The team joined the ship on 25 September at Kugluktuk, Nunavut. Heavy ice conditions in the Amundsen Gulf delayed the ship's arrival in the study area north of Herschel Island, but, on 10 October, the researchers were able to recover three of the four instruments anchored to the ocean floor that were installed in 2017. No new instruments were deployed in 2018. The plan is to recover the last instrument in the summer of 2019 as part of the Canadian Coast Guard operations. Analysis of the data that was collected between 2016 and 2018 has already revealed interesting information about how winds, ice cover, and freshwater flow from the Mackenzie River interact in this region to create ocean conditions that are favorable for different animals (plankton and fish) at different times of the year.

Wolfe, Brent

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File Number: 12 404 599**Licence No:** 16341**Region:** NS**Location:** Lakes and their catchments along Highway 3 west of Yellowknife, and along an 80 km transect northwest of Yellowknife**SAMMS: Sub-arctic metal mobility study**

The goal of this study is to see how metal contaminants from Giant Mine, such as arsenic, are blown through the environment on prevailing winds that blow northwest from Yellowknife. Fieldwork in the summer of 2018 included the collection of sediment cores from small headwater lakes at 10 km intervals along a transect to the northwest of Yellowknife. The research team will analyze these sediment cores to identify how far arsenic travelled from Giant Mine. The team also conducted fieldwork at lakes that could be accessed from Highway 3 northwest of Yellowknife. They took lake sediment cores, as well as soil, snow, and lake water samples. The team was able to confirm the results of other projects; for example, they found that a sediment core retrieved from 'Lake 10', which is located 57 km northwest of Yellowknife, had arsenic concentrations that were higher than expected. These higher-than-expected concentrations were even seen deep in the core, showing that arsenic carried by wind had an effect even this far from the mine. Lake 10 is readily accessible from Highway 3, and the team will conduct additional terrestrial and aquatic ecosystem research there in the future. The team gave an overview of SAMMS research to the government of the NWT, and also to Sir John Franklin High School in Yellowknife. During the fall and

winter, the team will analyze the samples that were collected in the laboratory. The results will help the team shape their fieldwork plans for the summer of 2019.

Wolfe, Stephen

Natural Resources Canada
Ottawa, ON
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File Number: 12 404 549

Region: NS

Licence No: 16259

Location: Ingraham Trail and the Tibbitt to Contwoyto winter road

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

The goal of this multi-year project is to study where discontinuous permafrost exists at research sites north of Great Slave Lake. This will allow planners and scientists to predict where it will occur elsewhere, so that communities and industry can make better decisions about new buildings and roads. In September 2018, the project team conducted field work along Highways 3 and 4, along the Tibbitt to Contwoyto winter road (as far as the north end of Gordon Lake), and at Whitebeach Point. They finished their observations and measurements of 'icings' (where water flows overland in the winter and then freezes) at one portage site, and removed the instruments they had placed there in previous seasons. They downloaded temperature data from instruments that had been placed at a number of sites, including active layer temperatures from forest peatland, and ground temperatures from winter roads and burn sites. They also took measurements and observations in recently burned areas at Lucky Lake east of the Discovery Mine site, at Boundary Creek 20 km north of Highway 3, and along the Ingraham Trail near Tibbitt Lake. They will use the collected data to understand ground temperature changes and the effects of fire on permafrost conditions. Finally, the researchers also continued to monitor recent thaw slumping along the Yellowknife River.

Wright, Greg

AECOM
Edmonton, AB
greg.wright@aecom.com

File Number: 12 404 976

Region: IN, GW, SA, DC

Licence No: 16386

Location: Tulita (65°3'25.236"N, 126°10'12.756"W; 64°48'26.244"N, 125°5'47.508"W; 64°55'10.236"N, 125°53'28.68"W; 61°3'55.764"N, 116°32'35.304"W; 69°20'44.844"N, 133°49'39.216"W), Norman Wells (65°14'15.216"N, 126°41'40.884"W; 65°12'28.224"N, 126°31'51.852"W; 65°13'23.196"N, 126°43'40.872"W; 65°23'8.196"N, 127°23'15.036"W), Inuvik (68°45'50.004"N, 134°29'53.988"W; 68°29'2.76"N, 134°4'27.984"W), Wrigley (63°58'39"N, 124°12'48.996"W; 63°2'48.984"N, 123°15'11.988"W), Tsiigehtchic (67°36'9.684"N, 134°3'56.772"W; 67°28'12.9"N, 131°24'2.556"W; 67°20'18.924"N, 130°48'16.488"W), Aklavik (68°12'30.708"N, 134°28'1.956"W), Fort Good Hope (65°40'35.976"N, 128°49'13.944"W), Tuktoyaktuk (69°13'42.816"N,

134°14'27.204"W), Tulita (64°32'45.24"N, 124°54'20.412"W), Fort Providence (61°28'16.248"N, 118°2'57.624"W), Fort Providence (61°24'11.232"N, 118°24'26.64"W), Kittigazuit Bay (69°20'44.844"N, 133°49'39.216"W)

Mackenzie River class HHERA - navigational aid stations

The goal of this project is to assess the Navigational Aid Stations (NAS) along the Mackenzie River to see if they present any risks to the people who use them or the environment. These stations are typically less than one hectare in area, and have navigational aids such as front range and rear range markers, buoy caches and compounds, day beacons, and tie-up markers. These aids are required for watercraft traveling along the Mackenzie River. The project team assessed 22 stations in 2018, and had assessed 24 during previous years. Despite finding some localized impacts on soil quality at a small number of NAS stations, the team found that the level of contaminants of concern in the soil do not present an appreciable risk to human health. When considering the risk to ecological health, the team predicts that 41 of the 46 NAS stations have negligible (very low) risk, three have low potential risk, and two have high potential risk. The two high risk stations had concentrations of metals in the soil that pose a potential risk to the plants and animals in the water nearby, and that may be impacting species-at-risk.

Zdanowicz, Christian

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File Number: 12 404 959

Region: IN, GW, SA, DC, NS, SS

Licence No: 16324

Location: Many locations along the Mackenzie River to get a good coverage of the river basin

Identifying sources of mercury in Arctic rivers

The goal of this project is to identify the sources of the mercury that is transported by rivers in the Mackenzie River Basin. Some of this mercury is discharged to the Beaufort Sea. In June 2018, the research team traveled across the NWT and took samples of water from 19 rivers with help from local communities. The team have now completed about 80% of the laboratory analyses for the samples. The first results show that the particles of carbon found in most of the rivers were between 1000 and more than 10,000 years old. The oldest carbon particles were found in the northernmost rivers, such as the Arctic Red River. This suggests that the mercury found with carbon particles in the rivers probably comes from old reservoirs, such as thawing permafrost in the northern Mackenzie River basin. The team is waiting for the mercury chemistry results to confirm this. In 2019, the team will return to two or three of the sites to find out how the mercury and carbon in the river water change between seasons (from high flow to low flow). This will help them figure out the importance of mercury that comes from sources like snow melt and thawing permafrost.

Social Sciences

Aitken, Alec

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File Number: 12 410 1128

Region: NS

Licence No: 16415

Location: Yellowknife

Perception of risk from environmental contamination in Yellowknife, NT

For this research project, 21 residents of Yellowknife were interviewed to find out what they know about arsenic contamination in the area, and how they felt this contamination affected them. The interviews took place in November 2018. The ages of the people interviewed ranged from 19 to 60 years old, and the length of time they had lived in Yellowknife ranged from 3 months to 38 years. Five people were born and raised in Yellowknife. Although everyone was aware of the arsenic trioxide stored at the Giant Mine site, and arsenic contamination in the soil and water in the area, most people said that they did not think they had enough information about the actual risks or about how the contamination might affect them. Generally, people were more confident when they learned about the local environment from their families and neighbours, and less confident about information provided by various levels of government. Many people were concerned about using local water bodies for swimming or fishing, even those areas that had not been identified as contaminated, and many people avoided eating locally caught fish. Overall, it was felt that more information needs to be provided to local residents about how arsenic contamination could affect people's health now and in the future.

Ashthorn, Heather

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File Number: 12 410 1090

Region: IN, GW

Licence No: 16370

Location: Tsiigehtchic, Fort McPherson, Inuvik, Aklavik, Tuktoyaktuk

Arctic Borderlands Ecological Knowledge Society - community based monitoring

The Arctic Borderlands Ecological Knowledge Society (ABEKS) uses both local and scientific knowledge to monitor and assess changes in an area that covers the range of the Porcupine Caribou herd and nearby coastal and marine areas. In 2018, senior and youth monitors in Tsiigehtchic, Fort McPherson, Inuvik, Aklavik, and Tuktoyaktuk worked with their local Renewable Resource Council or Hunters and Trappers Committee to identify local experts for the interviews. The monitors conducted interviews between September and December using a standard interview form, and collected information about caribou and other mammals, birds, fish, berries, weather, and time spent on the land. After the interviews, the monitors entered information from the surveys into an online database. At the end of the survey period, they submitted a written report about what they heard and learned from the local experts. These reports

are made available to all participants, funders, and other interested parties, and can be found on the ABEKS website. The community monitor report includes examples of how data can be used to look at what is happening on the land in a given year, or to compare between regions. In 2018, 150 interviews were conducted overall, with 130 of those conducted in the NWT.

Bakker, Karen

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File Number: 12 410 1092**Licence No:** 16278**Region:** IN, GW, SA, DC, NS, SS**Location:** Yellowknife, Fort Smith, Horton River, Peel River**Sustainable water governance and Indigenous law project**

No research was conducted under this licence in 2018.

Barnes, Justin

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File Number: 12 410 1115**Licence No:** 16326**Region:** IN**Location:** Inuvik and Tuktoyaktuk**Implications of environmental securitization on sustainable development of the Beaufort Sea coastline**

This research project had two main goals. The first was to study how Beaufort Sea communities are able to have a say both in resource development on their lands and sustainable development policies in the Beaufort Sea area. The second was to study how the community members are resistant and receptive to both oil and gas development and sustainable development policies. Resistance might include environmental concerns and negative community impacts, while receptiveness include economic or social benefits, security, and safety, and might be to the benefit of development. The research team conducted 12 individual interviews in person, and asked each participant about their views on climate change and its impacts on the Mackenzie Delta and Beaufort Sea, along with their perspectives on sustainable development. Seven interviews were held with leaders from Tuktoyaktuk and five interviews were held with leaders from Inuvik. The team found that the federal government should engage in deeper consultation with Arctic communities, and work in partnership with northern communities, groups, and other stakeholders. They also found that the federal government should increase and improve education about the issues northerners are facing, and the role northern communities play in Canada, in the South. Finally, they found that the federal government should continue to devolve governance, so that the policies that are developed better reflect the needs of northern communities rather than the perspectives of southern policy-makers.

Becker, Matilda

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File Number: 12 410 1124**Licence No:** 16396**Region:** NS**Location:** Yellowknife

Legislating space: cartographic technologies, geological data, Indigenous land governance and the mineral resources act of the Northwest Territories, Canada

The goal of this study is to learn about and document the governance structures around cartographic work in the NWT. The fieldwork for this project began in Yellowknife on 23 September 2018. The researcher formally interviewed ten geologists at government and private organisations in Yellowknife. The researcher used the interviews to gain an understanding of geoscience data management and collection methods, and mapping techniques. The researcher also had informal discussions with two land use planning boards about their role in land governance, and to identify geographic and governance areas on which to focus the project. The information from the interviews and discussions has fed into part of the project that looks at cartographic technologies and geological data. Work on the final sections, 'Indigenous land governance' and 'the Mineral Resources Act', will start by the end of 2018, and will be completed in 2019.

Behe, Carolina

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File Number: 12 410 1100

Licence No: 16215

Region: IN

Location: Inuvik, Ulukhaktok, Tuktoyaktuk, Paulatuk

Collaborative research: food sovereignty and self-governance – Inuit role in managing Arctic marine resources

The goal of this project is to study Inuit management practices about food sovereignty and self governance. The project will also consider co-management, federal management laws and how they are being implemented, challenges from a rapidly changing environment, and what may be missing from existing federal laws and policies. Two members of the research team visited five NWT communities; Aklavik, Ulukhaktok, Inuvik, Paulatuk, and Tuktoyaktuk. They held three focus groups with Hunters and Trappers Committees, and a focus group with the Inuvialuit Game Council. They also conducted individual interviews with local Indigenous knowledge holders. The team is also working in Alaska, where they held two focus group meetings and one workshop in each of Anchorage, Bethel, and Nome. Over the life of the project, the team has engaged with representatives from 33 communities. In addition to the focus groups, the researchers have carefully studied co-management laws and regulations in Canada and the USA. A review and summary of the first phase of the legal analysis is now underway. The team has found that Inuit have always had 'management' practices that guide peoples' relationships within their environment and govern their behaviour; management is not a new concept. Inuit have a holistic understanding of management and do not manage through a single-species approach. International, national, and regional management policies can have far-reaching effects on even the smallest community.

Bull, Julie

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File Number: 12 410 1126

Licence No: 16402

Region: NS

Location: There is no specific location because this project seeks input from research ethics board members, chairs, and other

research administrators about the review and approval of research involving Indigenous Peoples.

Research is relational and reflexive: peoples, policies, and priorities at play in ethically approving health research with Indigenous peoples

No summary was submitted for this licence. This project is not in compliance with licensing requirements.

Charles, Tony

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File Number: 12 410 1121

Licence No: 16388

Region: IN

Location: Ulukhaktok, Sachs Harbour, Tuktoyaktuk, Paulatuk

Community-based responses to marine hazards

Coastal communities are facing an increasing range of hazards coming from or taking place in the ocean. These hazards are also becoming more frequent and more intense as a result of climate change. This project asks what people in coastal communities have done, and can do, to respond to these marine hazards. The goal is to better understand the current reality of marine hazards in coastal communities across Canada. To do this, the research team distributed a questionnaire to 617 coastal communities, including four in the Northwest Territories. The questionnaire had 11 questions covering four major topics; 1) the community's general priorities and interests, 2) which marine hazards are relevant to the community, 3) how they currently respond to hazards, and 4) their current needs and barriers to responding to any hazards. Sachs Harbour and Paulatuk completed the questionnaire, and their answers are now part of a sample from 144 coastal municipalities across Canada. This information is being analyzed, and when the analysis is complete the researcher will make recommendations to federal, provincial, and territorial governments. These recommendations will include the best ways to support coastal municipalities in implementing hazard responses that are effective, adapted to their specific context, and that address the priorities of the community.

Deacon, Leith

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File Number: 12 410 1108

Licence No: 16227

Region: NS

Location: Yellowknife and Detah

Boom/bust in Canada: tempering Canadian experiences of resource-dependency

No research was conducted under this licence in 2018.

Debassige, Brent

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File Number: 12 410 1111

Licence No: 16287

Region: IN, GW

Location: Inuvik

Integrating Gwich'in and Inuvialuit perspectives into a community school in the Northwest Territories: a case study

The goal of this study is to investigate how teachers incorporate Gwich'in and Inuvialuit culture and language in school, using a 'case study' approach at one school in the Beaufort Delta region of the NWT. Case study research usually involves three ways of collecting information on a specific subject and its context. The three methods used in this study were 1) interviews with six teachers, 2) reviewing several school policy documents, and 3) documenting first-hand observations while in the school. The researcher's preliminary findings found many successes to celebrate in terms of cultural integration at this school. Many teachers strive to include culturally-relevant materials in their lessons, and the school offers many additional cultural experiences outside of the traditional classroom. It was also evident that there is room for improvement in culturally-relevant programming, with many teachers stating that they felt they could benefit from more support to incorporate local cultures and languages in a meaningful and respectful manner. The researcher plans to complete the analysis and write-up of the findings by December 2019.

Farnel, Sharon

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File Number: 12 410 1116

Region: IN

Licence No: 16342

Location: Paulatuk, Ulukhaktok, Sachs Harbour, Tuktoyaktuk, Inuvik, Aklavik

Metadata driven by Indigenous communities in Canada's north: an exploration

In the field of library sciences, 'metadata' refers to information about a book or source. Some examples of metadata include the project that a report was produced for, what language it is in, and who funded it. The purpose of this project is to find out what kinds of culturally-appropriate metadata are needed for digital libraries of cultural resources in northern Canada, and how to develop them. This project builds on and expands the work of the 'Digital Library North' project, which resulted in the development of the Inuvialuit Digital Library. In 2018, the research team focused on growing relationships with community collaborators and continuing work on the Inuvialuit Digital Library. While in Inuvik from 13 to 25 August, the team held informal discussions and demonstration sessions with six individuals in the heritage and culture sector, and one formal interview with a language specialist. They described the Inuvialuit Digital Library and demonstrated how to use it, to visitors from the Inuvialuit Settlement Region communities and elsewhere, at the Cultural Centre. The team presented the project at the Aurora Research Institute Summer Speaker Series on 23 August, and an article about the presentation and the project appeared in the Inuvik Drum on 30 August. The researchers continue to analyse interview information, including alternative ways of accessing language learning materials, changes to the labels of some metadata elements, and revisions to the 'browse' page. The project will be presented at the Association of Canadian Universities for Northern Studies Student Conference in Edmonton in November 2018.

Fresque-Baxter, Jennifer

GNWT, Department of Natural Resources

Yellowknife, NT

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File Number: 12 410 885

Licence No: 16277

Region: SS**Location:** Fort Resolution**The state of Northwest Territories country food systems: planning for long-term sustainability**

The goal of this research project is to study country food systems across the NWT using different research styles. Researchers from the Government of the NWT Department of Environment and Natural Resources and the Aurora Research Institute have partnered with Indigenous governments, academic partners, and other participants to accomplish this goal. Starting in 2017 and continuing into 2018, the research team started four regional projects to collect information about current country food use. Each project was developed by regional Indigenous government partners with researcher support, and focused on answering questions or gathering information that is important to them. After all of the regional projects are complete, the team will analyze the data to paint a picture of country food systems in the NWT. This will include, for example, the current state, observations, challenges, issues, and opportunities. Following the completion of regional projects and the larger project synthesis, the results will be communicated publicly. The findings of this study will help researchers and governments who need more information about country foods.

Fresque-Baxter, Jennifer

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File Number: 12 410 885**Licence No:** 16387**Region:** SS**Location:** Along the Slave River**The state of Northwest Territories country food systems: planning for long-term sustainability - youth OTL project**

The goal of this research project is to study country food systems across the NWT using different research styles. Researchers from the Government of the NWT Department of Environment and Natural Resources and the Aurora Research Institute have partnered with Indigenous governments, academic partners, and other participants to accomplish this goal. Starting in 2017 and continuing into 2018, the research team started four regional projects to collect information about current country food use. Each project was developed by regional Indigenous government partners with researcher support, and focused on answering questions or gathering information that is important to them. After all of the regional projects are complete, the team will analyze the data to paint a picture of country food systems in the NWT. This will include, for example, the current state, observations, challenges, issues, and opportunities. Following the completion of regional projects and the larger project synthesis, the results will be communicated publicly. The findings of this study will help researchers and governments who need more information about country foods.

Gaudry, Adam

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File Number: 12 410 1102**Licence No:** 16224**Region:** GW**Location:** Fort McPherson**Land-based learning in Teetl'it Zheh: a university-community bush camp partnership**

During the 2017-2018 academic year, the main task for the team from the 'Land-Based Learning in Teetl'it Zheh' project was to consult with the community of Fort McPherson. In October 2017, the project team was invited to meet with Elders and community knowledge holders for a visioning meeting and to design a future bush camp school. In addition to the visioning meeting, the team met with five Elders individually, and then with Elders and knowledge holders as a group, to map out a general vision for the camp. During this process, the team was also invited to the community school to get input from junior high and high school students on the kinds of land-based learning activities they were interested in. These meetings allowed the team to develop a basic curriculum for the camp, to identify a key focus for the camp, to plan for youth and Elder needs while on the land, and to generate interest in future research activities. This was key for the future development of the project, and for ensuring that community perspectives are at its core. The team will meet again in Edmonton to develop this information into concrete curriculum for the camp, which will be delivered in 2019.

Gauthier, Maeva

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File Number: 12 410 1120**Region:** IN**Licence No:** 16376**Location:** Tuktoyaktuk**Food security, social and environmental justice and resilience in the western Canadian Arctic, using participatory video method**

The goals of this ongoing project are to study 'food security' and the ability of northern communities to have a say in environmental policy by having kids make videos in their community. Food security refers to whether people can get their own healthy and nutritious food now and into the future. The researcher went to Inuvik and Tuktoyaktuk for community visits from 7 to 16 August 2018. Because this was the first community visit, her focus was on meeting people and visiting local organizations. The communities confirmed the environmental topics that mattered to them, and the researcher asked about the topics that the kids would work on and make videos about during the next visit in May 2019. The researcher also asked about collaborations with other community organizations. She then met with Parks Canada and the Inuvialuit Regional Corporation in Inuvik, and the Tuktoyaktuk Community Corporation, the Hamlet of Tuktoyaktuk, and the youth community centre in Tuktoyaktuk. She also met with youth who were interested in participating in the project, and together they discussed environmental topics that might be of interest to the youth. The youth confirmed their interest in climate change topics such as shoreline erosion and changes in the timing of subsistence activities, as well as topics like plastic in the food chain, waste management issues, and the impacts of coastal development. The researcher held an 'Introduction to Filmmaking' workshop as an evening session, from 8 PM to midnight, with 18 youth ranging in age from 13 to 17 years old. She collected some film footage around Tuktoyaktuk with 10 youth to document shoreline erosion, waste management and plastic issues at the dump, coastal development, and wildlife.

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File Number: 12 410 582**Region:** SA**Licence No:** 16381**Location:** Colville Lake, Délıne, Fort Good Hope, Norman Wells, Tulita

Culturally appropriate search and rescue (SAR) prevention and survival training in the Sahtú Region, Northwest Territories: an on-the-land program

Colonial practices and policies removed Indigenous peoples - especially children, through Indian Residential Schools - from their traditional territories. This disrupted the transmission of knowledge of land-based practices within families. Indigenous peoples argue that relationships with the land and land-based practices are fundamental to holistic wellbeing. Also, Elders in the region have become increasingly concerned about the ability of local youth to be safe while on the land. The research team, in collaboration with the Sahtú Renewable Resources Board, studied the Board's efforts to teach safety to Sahtú Dene and Métis youth using on-the-land programming delivered through its Dene Ts'ili ('Being Dene' or 'Dene Way of Life') School. Elders and non-Indigenous certified trainers taught the youth traditional survival skills, wilderness first aid, hunting, firearm and boat safety, and how to navigate. The team also taught digital storytelling methods to the youth, and nine youth created digital stories about safety. The team learned that youth struggle with inter-generational trauma, which impacts a number of things including their ability to be at home on the land, their identity, language, their relationships, and the role of healing, spirituality, and thankfulness in their lives. The young women and men expressed a desire to re-learn their roles so they could 'dechita nezo got'sudi' (live on the land in a good way) through a more holistic and culturally-informed understanding. The team realized the Dene Ts'ili School needs to help youth become safe in a broader way, and that time on the land where they can listen to their Elders' stories is a crucial component of this help. The team advocates for continued learning in an on-the-land context.

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File Number: 12 410 1112

Region: IN, NS

Licence No: 16295

Location: Yellowknife, Inuvik, Aklavik, Tuktoyaktuk, Sachs Harbour, Ulukhaktok, Paulatuk

Challenging norms: exploring the materiality of gender in the western Canadian Arctic

The goal of this project was to learn about Inuvialuit gender roles and gender identity both now and in the past. The researcher interviewed a number of Inuvialuit community members, including Elders and knowledge holders, about gender during in-person meetings in Inuvik, Tuktoyaktuk, and Aklavik. The researcher is currently incorporating the knowledge that was shared with her into her PhD dissertation. The information about gender roles and identity will eventually be shared with all community members through the Inuvialuit Living History project webpage and through their social media channels. The researcher and her collaborators will also create educational materials that celebrate the knowledge that was shared. She plans to share how Inuvialuit cultural knowledge has also helped with archaeological research during community meetings in summer 2019.

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File Number: 12 410 1111

Region: IN, GW

Licence No: 16247

Location: Inuvik

Government of Northwest Territories - Inuvik wind design basis and performance specification: traditional knowledge and traditional land use workshop

The Government of the NWT is looking to develop a wind energy project that will bring renewable energy to Inuvik. As part of this project, a traditional knowledge (TK) and traditional land use (TLU) study was conducted with the Gwich'in and Inuvialuit in the Inuvik area. The purpose of this project is to gather important information about TLU in the project area, and to better understand how the project will affect the land, plants, and animals in the project area. A two-day workshop and four interviews were held in March 2018. The workshop and interviews focused on hunting, trapping, and plant harvesting in the proposed project footprint and the surrounding area. The area surrounding the project footprint is used for many different traditional activities, such as hunting, trapping, fishing, plant harvesting, and transportation. However, most of these are not currently conducted within the proposed project footprint. Two land users and their families use parts of the footprint for moose hunting and berry picking. No trapping or fishing happens within the project footprint right now. The results of this project will be used to figure out details such as the access route location, and to support project requirements such as permit applications.

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File Number: 12 410 1086

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Region: NS

Location: Yellowknife

Examining alcohol warning labels as a tool to increase public awareness of alcohol-related health risks and reduce alcohol intake at the population level

The primary goal of this project, which is funded by Health Canada, was to conduct a real-world test to see if labelling alcohol containers with health messages leads to safer and more careful use of alcohol. The research team also partnered with the Yukon Liquor Corporation to do this study. The study tested the impact of posting these warning labels on all alcohol sold in the liquor store in Whitehorse, relative to the alcohol sold in the liquor store in Yellowknife which did not have the new alcohol warning labels. This study began on 20 November 2017, when the labels were applied to alcohol containers in the Whitehorse liquor store. Although the study was supposed to take place over an eight-month period, it was halted on 19 December 2017 because of pressure from the alcohol industry. The first label that was used advised that alcohol can cause cancer, and mentioned two types of cancers that are particularly common in Canada and the Yukon. The second label presented Canada's low risk drinking guidelines. Also planned was a third label that showed the number of standard drinks that were contained in different sized containers and in alcoholic beverages with different strengths. The team conducted surveys in Whitehorse and Yellowknife both before and after the alcohol warning labels were used to see if people buying liquor saw them, whether they paid attention to the labels, and whether the labels affected their alcohol intake.

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Region: NS

Location: Yellowknife

Marijuana legalization policy: impact on prevalence and risk behaviours in Canada

The goal of this study is to see how legalizing non-medical cannabis (marijuana) will affect Canadians, including residents of Yukon and the NWT. The team hopes to answer five primary research questions about how legalization will change how much and when people are using cannabis. The first question is about levels of dependence, and the second is about risk behaviours, including driving after cannabis use and its use in 'high risk' occupational (on-the-job) settings. The third question is about the commercial retail environment (or cannabis stores), including the price and the type of products that people are buying, the use of high potency products, and if people are shopping commercially rather than from 'illicit' sources. The fourth question is whether people feel cannabis is safe, and if they are judged for using it, and the final question is whether advertising restrictions, product labelling and warnings, and public education campaigns are effective. The research team surveyed people between the ages of 19 and 65 from across Canada (except in Nunavut) and the USA, between August and September 2018. This survey will be repeated annually for three years to monitor changes over time, and to see if the answers to the questions are different in each of three jurisdictions: Canada (including all provinces, Yukon, and the NWT), states in the USA where cannabis is legal, and states in the USA where cannabis is illegal. The team will also look at changes that occur over time in Canadian provinces and territories to see if various policies affect cannabis use.

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File Number: 12 410 849**Licence No:** 16332**Region:** IN**Location:** Inuvik and Tuktoyaktuk**Digital mapping of Inuvialuit archaeology & heritage**

The purpose of this research project was to document and share Inuvialuit traditional knowledge and skills using Google Earth, which is a free online mapping service. The researcher also wanted to ask the Inuvialuit community how to design the interactive Google Earth map. Inuvialuit community members felt that a Google Earth map would be an excellent way to link photographs, videos, and stories about traditional activities to the actual places on the land where they occurred. Such a map would closely resemble the mental maps that many Inuvialuit carry in their heads, which reflect their ways of knowing the world. The researcher made an example map and showed it to them, and it appealed to Inuvialuit youth who saw its potential to help them to learn more about their cultural history and heritage. Google Earth can mirror traditional approaches to Inuvialuit learning that emphasize listening and observation in addition to hands-on experience, because it has photos, maps, and recordings of people's stories. These research findings will be used by the Inuvialuit Living History project to construct a map that will be added to the Inuvialuit Living History Website. The map will help share this important cultural information with all Inuvialuit, and with other Canadians who want to learn about Inuvialuit history and traditions.

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File Number: 12 410 1117**Licence No:** 16348**Region:** NS**Location:** Behchokò and Yellowknife

The semantics of relative clauses in Tłjchq Yatii

The goal of this project was to study ‘relative clauses’ in the Tłjchq Yatii (language). A ‘relative clause’ refers to a part of a sentence that gives more information about (or modifies) another part of a sentence, but that can’t stand on its own. An example can be found in the sentence ‘I like the canoe that my grandfather gave me’. In this sentence the relative clause is ‘that my grandfather gave me’. Several interesting facts about relative clauses in Tłjchq Yatii were documented during this study. Relative clauses that modify nouns that have a quantifier (for example, in Tłjchq ‘wehdaa’ or ‘hazoo’, which in English means ‘some’ or ‘all’) cannot be perfectly translated into English relative clauses. This is because the nouns modified by Tłjchq relative clauses appear inside the clause, while nouns modified by English relative clauses appear next to it. The different positions of the nouns leads to slightly different meanings. Additionally, Tłjchq relative clauses are often ambiguous, so a sentence like ‘Tli deghoo segha nezii-le ile’ can be translated either as ‘I didn’t like the fact that the dog was barking’ or ‘I didn’t like the dog that was barking’. During this study, the team found that there is actually a difference between these two interpretations, and the difference is whether or not there is an object marker on the verb. So a sentence like ‘Madle do ti ta k’etloo sii yek’eezho’ has a meaning like ‘Madle saw a man who was walking in the water’ because it has the object marker ‘ye-’. A sentence like ‘Madle do ti ta k’etloo sii k’eezho’, which does not have an object marker, has a meaning like ‘Madle saw a man walking in the water’.

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Licence No: 16234

Region: IN, GW, SA, DC, NS, SS

Location: Yellowknife

Canadian domestic homicide prevention initiative with vulnerable populations

In 2017, the Canadian Domestic Homicide Prevention Initiative with Vulnerable Populations conducted an online survey followed by interviews with professionals who work with families experiencing domestic violence. ‘Domestic homicide’ refers to someone killing their spouse, their partner, or their child(ren). The purpose of the survey and interviews was to learn about risks for domestic homicide within four vulnerable populations; Indigenous Peoples, immigrants and refugees, children exposed to domestic violence, and those living in rural, remote, and northern communities. Another purpose of the survey was to learn about how professionals reduce these risks and keep families safe. A total of 1405 professionals from across Canada (22 from NWT) completed the survey. Most professionals reported that they assess risk, and use strategies to reduce risk and provide safety for victims and children. Yet, many of the professionals said that there are no common risk assessment tools, that more tools should be developed for specific populations, and that there needs to be more focus on the safety of children. Many of the survey respondents volunteered to take part in follow-up interviews. The project team completed a total of 345 interviews (seven in the NWT). The interviews have been transcribed and will be analyzed for themes. There will not be a separate analysis for the NWT to ensure confidentiality.

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File Number: 12 410 648

Licence No: 16405

Region: NS

Location: Ndilq and Yellowknife

Yellowknives Dene placenames and Tetsot'ine (Chipewyan) dictionary

The researcher participated in several meetings with Yellowknives Dene First Nation Elders to record traditional placenames in both traditional languages, Wiiliideh (Tłıchǫ) and Tetsot'ine (Chipewyan). The researcher also transcribed interviews with Elders about the impact of mining on the traditional lands of the Yellowknives Dene. These materials are confidential, but have been shared with the Yellowknives Dene First Nation Land & Environment Office. The researcher also worked on proofreading the Tetsot'ine dictionary. The dictionary still needs to be typed up and entered into a database, but should be finished around the end of 2019. The dictionary will be an important contribution to language revitalization for the Yellowknives Dene First Nation, because it will be the first dictionary specifically in the Tetsot'ine dialect and the first that accurately records all of the unique features of this dialect, including eight different vowels in stems. This will contribute to Dene literacy and will also help raise awareness about the diversity of Chipewyan (Dene Sųłiné) dialects.

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File Number: 12 410 1129**Licence No:** 16416**Region:** SS**Location:** Łutselk'e, east arm of Great Slave Lake**Community-based traditional knowledge monitoring for better decision-making**

No summary was submitted for this licence. This project is not in compliance with licensing requirements.

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File Number: 12 410 1088**Licence No:** 16219**Region:** IN, GW**Location:** Aklavik**On the land and in the water: connecting and disconnecting the Mackenzie Delta**

The goal of this research project is to study current uses and meanings of the Mackenzie Delta for the people of Aklavik. After a five-month fieldwork period from August to December 2017, the researcher and his family returned to Aklavik for another four months from February to June 2018. Having established good relations in Aklavik, and already knowing many inhabitants, the researcher was able to participate in and learn about many traditional activities in Aklavik and the Mackenzie Delta. He accompanied hunters and trappers on their trips through the delta, and into the mountains and hills nearby. The researcher visited camps, took part in various ice fishing trips and competitions, went to get firewood, and witnessed how a local contractor hauled gravel from a nearby pit. Within Aklavik, the researcher attended various meetings with individuals from the hamlet, the Gwich'in, and the Inuvialuit, and had the opportunity to participate in numerous social and cultural events, including Aklavik's Mad Trapper Rendezvous, Inuvialuit Day, Treaty 11 Day, birthday parties, funerals, jam sessions, and singalong evenings. Through participating in these various activities, and through the generous openness and patience of many people in Aklavik, the researcher was able to gain many insights into current life in the Mackenzie Delta.

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File Number: 12 410 906**Region:** IN, GW**Licence No:** 16274**Location:** Aklavik, Inuvik, Sachs Harbour, Tuktoyaktuk, Tsiigehtchic, Fort McPherson**Using Inuvialuit and Gwich'in observations to monitor environmental change in the Beaufort Delta Region**

Recent research shows that climate change and disturbance are changing northern vegetation and permafrost in significant ways. These changes are concerning because they impact animal habitat and water quality, threaten northern buildings and roads, and influence the regional and global climate. Researchers working in the Arctic Landscape Ecology Lab at the University of Victoria are trying to understand how fast things are changing, why they are changing, and what the impacts will be. To accomplish this, the research team is using air and satellite photos, field studies, and computer programs to look at changes at the landscape, regional, and continental scales. In 2017, the work focused on western Banks Island and the Tuktoyaktuk coastlands. On western Banks Island the team studied why plants were growing more slowly, and why the land was dryer in low-lying areas. They walked along transects and recorded observations about the plant life, soil moisture, and permafrost thaw depth at 19 sites. To see if the growing number of lesser snow geese is responsible for some of the changes, the team also recorded goose habitat use. In addition to walking transects, the researchers took pictures of each site using an unmanned aerial vehicle (a drone). It appears that the changes to the plants are related to the combined effects of decreased surface water, decreased soil moisture, and increased snow goose foraging. In the Tuktoyaktuk coastlands the team is monitoring changes in vegetation, soils, permafrost, and snow using foot surveys and special data-logging instruments.

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File Number: 12 410 1076**Region:** DC**Licence No:** 16334**Location:** Kakisa and Sambaa K'e**Community-based Dehcho K'éhodi planning**

The goal of this research project is to support the Ka'a'gee Tu First Nation and Sambaa K'e First Nation in their development of Dehcho K'éhodi strategies for their communities. Dehcho K'éhodi is an environmental stewardship program across Dehcho First Nations that combines traditional Dene practices of caring for the land with environmental monitoring using western science. The program also includes education, youth engagement, and language and cultural practices, which are interconnected and link the community's well-being, environmental sustainability, and the planning and management of protected areas. By the end of 2018, the project team had held strategy development workshops in both communities, with each involving 10 to 12 community members. The project was delayed for various reasons, such as meeting cancellations due to weather or other community activities, which means that the project ran longer than the anticipated timeline. The team will present draft Dehcho K'éhodi strategies to the communities early in the new year, so the communities can provide feedback and further develop

the strategies. The team anticipates final results by June. In addition to the Dehcho K'éhodi strategies, this project will result in a best-practices report and related materials for consideration as Dehcho First Nations contemplate similar processes in other communities.

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File Number: 12 410 1062

Licence No: 16407

Region: NS

Location: Ndilo, Detah, and the Chief Drygeese Territory

Developing YKDFN youth-led health messaging programs with communities

This multi-year research project has two goals. The first goal is to understand the views of Yellowknife Dene First Nation youth and other community members on health, community strengths, and how best to communicate health information. The second goal is to work with young people to develop 'messaging' that will help them be healthy. 'Messaging' refers to how people get information, such as posters, on TV, and internet ads. Throughout the past year, the research team shared and discussed the results of the research they carried out in summer 2016 and summer 2017 with youth and community partners. They also asked young people more questions about their perspectives on health and ideas about health messaging. Planning meetings were held with more community members, including Elders and additional Yellowknives Dene First Nation staff. In previous years, the youth participants started to make videos about health topics, and in 2018, they continued editing their videos. The team also worked with youth and community partners to develop surveys. The community has shown great interest in keeping youth involved in addressing health issues through health communication and messages. The team want to continue to explore the perspectives of youth and the community on health issues, and roles of youth in addressing health in the community.

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File Number: 12 410 1050

Licence No: 16241

Region: IN

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 that can be easily measured, and that stands in for a bigger picture. Examples of indicators are water temperature, employment rates, caribou birth rates, or the health of a particular fish. As another example; the health of a whole river system can't be easily measured, but the health of a particular fish and the water temperature in the river can be used to make a good guess at how healthy the system is. The goal of this project is to identify good indicators of marine health, including marine mammal health, based on the work already done by other scientists. During 2018, the project team was dedicated to writing and reporting. They provided reports to the Fisheries Joint Management Committee and the Beaufort Sea Partnership, in addition to previous community reports they provided to Tuktoyaktuk and Aklavik. The reports were based on their work to identify regional indicators for marine monitoring, which was done between 2015 and 2018. The indicators were chosen based on

community perspectives, management perspectives, and scientific research, which have been used together for the long-term management of the Beaufort Sea. Each of these project components has been completed, and the team is now in the reporting phase. Management presentations have been made at the Beaufort Sea Partnership meeting in 2017, and the Fisheries Joint Management Committee meeting in 2018. Community reports were distributed to Hunters and Trappers Committees during 2018, and the last two reports will be finalized in early 2019. Two papers are in development and will be submitted to academic journals in 2019. Finally, a community tour is being planned for February or March 2019 to ensure that all products are distributed back to the communities.

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File Number: 12 410 1069

Licence No: 16208

Region: IN

Location: Ulukhaktok

ACCESS open minds: youth mental health – Ulukhaktok

The goal of this research project is to improve the mental health services that are offered to youth aged 11 to 25 in Ulukhaktok. The researchers also want to see if mental health services are having an impact. At this stage in the project, the researchers have finished collecting data. One member of the project team spent time in Ulukhaktok in July, conducting interviews and a community mapping exercise in partnership with the Inuvialuit Regional Corporation and youth groups. A manuscript is currently being written for submission to an academic journal. The manuscript describes the project in Ulukhaktok in its entirety, including the changes that have taken place. The team will continue to deliver mental health programs in the coming years, in partnership with the Inuvialuit Regional Corporation and the Ulukhaktok Community Corporation.

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File Number: 12 410 982

Licence No: 16209

Region: IN, GW, SA, NS, SS

Location: Inuvik, Tuktoyuktuk, Fort Good Hope, Behchokò, Yellowknife, Lutsel'ke

Keeping families safe: emergency protection orders in the Northwest Territories

Emergency Protection Orders (EPO) have been used in the NWT since 2005. However, an Intimate Partner Violence study that ran from 2011 to 2016 found that they are used inconsistently across the territory. The goal of this research project was to understand and reduce inconsistencies, and to address questions from some frontline workers and administrators about the effectiveness of the EPO process. The research team used a case study approach, including semi-structured interviews with 19 people who have applied for an EPO and 32 frontline service providers and government stakeholders. They also looked at court transcripts and statistics from the Department of Justice and Alison McAteer House (a shelter), and observations from the Supreme Court where cases were raised with a judge. The interviews were conducted in six communities. The researchers found out about the types of emergencies that cause people to seek this court order, the relationships that applicants have, and what frontline workers say is working (or not working) in the EPO process. They also summarized information from all the documents

they read. With this information, they recommended 1) legislative changes so that stalking is included in the Protection Against Family Violence Act, 2) practice changes so that women are provided more personal support and assistance with their families, 3) educational opportunities so that communities learn about EPOs before they need them, and 4) other recommendations.

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File Number: 12 406 064

Licence No: 16217

Region: IN

Location: Sachs Harbour

Predicting the future(s) of renewable energy in Canada's Arctic: MEOPAR year of polar prediction project

No summary was submitted for this licence. This project is not in compliance with licensing requirements.

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File Number: 12 410 1122

Licence No: 16391

Region: IN, GW, SA, DC, NS, SS

Location: Inuvik, Tuktoyaktuk, Yellowknife, Fort Smith, Hay River

Untying our hands

Research activities for this project have focused on strengthening relationships with the directors and supervisors of the women's shelters through telephone and emails, on establishing a schedule for travel to conduct the research that meets the needs of each shelter and community. The research team has finalized and distributed promotional materials to the shelters. This includes a pamphlet for women interested in taking part in the project, and a poster for use within the shelters. The research team has established a community of practice and have held a meeting. The project staff were trained on the use of the equipment and different interviewing scenarios.

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File Number: 12 410 1104

Licence No: 16240

Region: NS

Location: Yellowknife

Contesting infrastructure: political claims along pipelines

The goal of this multi-year project is to study current pipeline controversies in North America by looking at the history of pipeline regulations, financing, and public debate. In 2017, the researchers visited the NWT archives in Yellowknife and spent several days immersed in records of the Legislative Assembly, details of oil and gas development discussions (especially in the Mackenzie Valley), and other related

construction and economic plans. To date, the researchers have written a conference paper based on some of this archival work, which they presented at the annual meetings of the International Studies Association in San Francisco in April 2018, and the Canadian Political Science Association in Regina in June 2018. The paper is a theoretical look at different understandings of infrastructure, with a brief case study of the proposed Mackenzie Valley pipeline in the NWT. The analysis in the paper considers how pipelines, once they are built, are fixed, physical objects on the landscape - but during the planning process before they are built, pipelines are still mobile because routes can be changed. At present, the research continues to be based on reviewing archival documents. However, the project has expanded to include both global developments in oil and gas company financing, and the shift in the focus of the Canadian government to the southern Yukon for pipeline development in the 1970s and 1980s.

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File Number: 12 410 1109
Region: GW, SA, DC, NS, SS

Licence No: 16232
Location: All NWT

National collaborative centre of Indigenous education

Eight interviews were completed by the research team based in Yellowknife. These included interviews with the following education centres: Dene Nahjo, Dechinta University, Dene Kede YK1 School District, Willow Lake Culture/Science Camp, Łutselk'e Annual Hide Tanning Camp, Łutselk'e Dene School, the Dehcho K'ehodi Stewardship Program, and the Dene Zhatie Indigenous Language Revitalization Program. The research team, which included three community members, also interviewed eight people in the Sahtú Region. These interviews included people from Victim Services, Economic Development, and the Heritage Fair, several teachers of language and culture, a traditional knowledge holder, and two traditional cooking experts. A workshop was held in Yellowknife on 21 February 2018. People from across the NWT were invited, and about 30 attended. Also, approximately ten people from the NWT, including project team members, attended the National Collaborative Centre of Indigenous Education National Forum in Ottawa on 22 and 23 March 2018. At this forum, three people from the NWT participated in different panel discussions. More work is planned, because the First Nations University of Canada has funding to continue the project through June 2019.

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File Number: 12 410 1067
Region: GW, SA, DC, NS

Licence No: 16236
Location: Yellowknife

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

The impact of a single activity on water quality, such as a mine or a town's wastewater, may seem small, but when these impacts are added together they can be significant. 'Cumulative impacts' is a term for the total effect of a number of different activities on a system. Monitoring water quality is important in order to manage cumulative impacts on aquatic systems. In the Mackenzie Valley, when a water license is issued it requires each license holder to monitor and report on water quality. Monitoring also happens under

government and community monitoring programs. This project examined whether the monitoring that is being done is helpful for identifying and managing the cumulative impacts of all water uses. The project results show that there is some consistency in what is being monitored across the different monitoring programs, which is helpful for identifying cumulative impacts. How things are monitored is often different, however, meaning that it is hard to compare results and know whether cumulative impacts are occurring. The results of monitoring programs are not always available to those who need to use them, such as developers or communities, so that they can understand the cumulative impacts of their own projects. Land and Water Boards and the Cumulative Impact Monitoring Program (CIMP) can help solve these challenges by identifying some of the key aspects of water quality that should be monitored in all locations and for all projects, providing guidance on how to do the monitoring, and tracking how things are changing and reporting these results to everyone.

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File Number: 12 410 522**Region:** IN, GW**Licence No:** 16413**Location:** Reindeer Station (68.6917°N, 134.1307°W) and the Gwich'in Wellness Camp**Energy needs and solutions at off-grid camps**

No summary was submitted for this licence. This project is not in compliance with licensing requirements.

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File Number: 12 410 650**Region:** IN**Licence No:** 16235**Location:** Ulukhaktok**A longitudinal approach to community vulnerability and adaptation to climate change**

During this project, the research team worked with Inuit in Ulukhaktok to examine how people are experiencing and responding to changing climatic conditions over time. The team focused on subsistence activities such as hunting, fishing, trapping, and gathering, because these activities were studied in a project in 2005. They conducted 32 interviews with Ulukhaktomuit in 2016, and compared these interviews with those done in 2005. In addition to interviewing people, the team looked at how the sea ice has changed over the last decade, as well as harvest numbers and economic datasets, to help them understand change over time. Overall, they found that many of the climatic conditions that were identified as problematic in 2005 have either persisted or worsened. This has limited travel and hunting opportunities. They also found that the way people are affected by changing climatic conditions is not just based on the actual changing climate. Similar to 2005, Inuit in Ulukhaktok are adapting to climatic conditions on their own terms and in their own ways, although they are being restricted more and more by policy and conditions outside their control. This has led to some 'maladaptive', or unhelpful, trends. Finally, the team found that climate adaptation programs need to be flexible so local opportunities can be recognized. These programs should focus on the social-subsistence economies, the wage economy, sharing networks, and traditional knowledge.

Porter, Dave

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File Number: 12 410 1075
Region: IN, GW, SA, DC, NS, SS

Licence No: 16268
Location: Yellowknife, Fort Smith, Fort Providence, Fort Simpson, Inuvik, Norman Wells

Breaking trail: developing community-engaged curriculum with former residential schools students in the NWT

No research was conducted under this licence in 2018.

Porter, Dave

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File Number: 12 410 1071
Region: NS, SS

Licence No: 16269
Location: Fort Smith and Yellowknife

Decolonizing learning in communities across Canada: stories of hope

No research was conducted under this licence in 2018.

Power, Ellen

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File Number: 12 410 1123
Region: SS

Licence No: 16395
Location: Fort Resolution and Lutselk'e

Exploring memories of cosmos 954 in Denesoline communities

No summary was submitted for this licence. This project is not in compliance with licensing requirements.

Ross, Paulina

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File Number: 12 410 1118
Region: DC

Licence No: 16358
Location: Fort Providence

Local food procurement in Fort Providence, Northwest Territories: examining community resilience and adaptive capacity to environmental change

Across Canada, social and environmental stressors are challenging the capacity of Indigenous communities to attain land-based and culturally significant food security. If a community has food security, it means that the community can get its own healthy and nutritious food now and into the future. Whether or not people across northern Canada have food security is a complex question that depends on

socio-economic and environmental factors. Indigenous communities are finding that environmental change makes it harder to get food from the land. Because local food is very important to food security, the ability of communities to bounce back and adapt to change helps them get local food, and therefore have food security. This research project explores the impacts of climate change on land-based food systems in the community of Fort Providence. It will also use the observations of community members to identify what is preventing people from getting their own food, and what would help the most. All aspects of this project will rely on Indigenous methodologies to foster a collaborative approach that reflects the values and priorities of the community. The team will use in-depth semi-structured personal interviews with community members. Research outcomes could help the community and the community members find ways to improve local food access both on a personal level and through policy. This project will also help to deconstruct Euro-Canadian decision-making about ecological governance, land use, food security, and environmental change.

Ruttan, Lia

Lia Ruttan, Ph.D.
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File Number: 12 410 575**Region:** SS**Licence No:** 16251**Location:** Fort Smith**We had a good mind to do it: oral histories of Indigenous forest firefighters, Fort Smith (NT)**

This unfunded but community-initiated research project is about the experiences, knowledge, and skills of former Indigenous forest fire fighters. The research team spoke face-to-face with 35 potential participants in people's homes, in public places, and at a booth at an Indigenous Peoples Day event. The researchers explained the nature of the project to see if people were interested in participating. Close to 75% were interested. On the advice of project advisors the team have focused on interviewing the oldest people first, including men in their mid 80s to 90s, who provided interview data from the 1950s on. The team have transcribed these interviews, totaling over 20 hours, and are currently rechecking them with participants. Rechecking transcripts is necessary and also allows interviewees to add new information. The team is seeing some patterns in the interviews. In the second phase of the project, the team will interview more people from a larger group, and will hold sharing circles to gather information using Indigenous story-telling. As they begin to understand what people are telling them, the team will hold focus groups and present the project results to fire fighters. They will produce a final report, community presentations, and academic papers and presentations. The research team will try to get funding for project advisors to make presentations, because this will reflect the community-based nature of the entire project.

Shimoyama, Junko

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File Number: 12 410 1068**Region:** NS**Licence No:** 16406**Location:** Behchokò**Non-canonical relative clauses: universals and variation in compositionality**

No summary was submitted for this licence. This project is not in compliance with licensing requirements.

Spring, Andrew

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File Number: 12 410 1037

Licence No: 16321

Region: NS

Location: Yellowknife

Community-based food systems research in Yellowknife, NT

'Food systems' refers to everything involved in feeding a community. This includes growing food, hunting or harvesting, processing, packaging, transporting, marketing, buying, eating, and disposal of food and food-related items. Over the past year, researchers from Wilfrid Laurier University have worked with organizations in Yellowknife to see what kinds of questions and research about food systems would be useful for the community. Two graduate students were positioned at Ecology North, and helped to plant the community gardens there. They also helped out with other programs that promoted local food production in Yellowknife, including the Fall Harvest Fair. The research team also helped establish the Territorial Food Network, and collaborated with departments in the government of the NWT on agriculture and country food policy and programming.

Spring, Andrew

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File Number: 12 410 1037

Licence No: 16352

Region: SS

Location: Kakisa

Food systems and community well-being in Kakisa, NT

Wilfrid Laurier University has built a rich and diverse research partnership with the Ka'a'gee Tu First Nation. Over the past year their research has resulted in the development of a community recycling and composting program, community gardens, youth engagement through on-the-land camps, mapping and monitoring initiatives, and food security studies. These studies will continue to be developed in future years.

Strickert, Graham

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File Number: 12 410 1055

Licence No: 16262

Region: DC

Location: Jean Marie River

Human dimensions of a thawing landscape

The goal of this project was to understand how the traditional land uses of the Jean Marie River First Nation and the Vuntut Gwitchin First Nation are affected by climate change and a thawing landscape. Another goal was to understand how biophysical and social science research can be used together to support adaptation planning. A workshop was held in Dawson City, Yukon, that brought together art students from the School of Visual Arts at Yukon College and Elders from both Old Crow, Yukon, and Jean Marie River in the NWT. During the workshop, participants and researchers came up with ways to

document the project using photos, sound recordings, and video recordings about landscape change and adaptation in the two communities. Art students and researchers visited the two communities to capture photo, audio, and video footage related to landscape change and adaptation. These were combined into 'vignettes', or short films, about the communities and Elders involved in the project. A follow-up workshop was held with community members in Jean Marie River to discuss landscape change and develop adaptation and project ideas. There were presentations on past climate change work in the community, and interactive activities to identify priorities and develop future research and adaptation ideas. The researchers also visited Old Crow to report back and present the vignettes. Project results and products are currently being prepared for the two communities.

Sutherland, Colin

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File Number: 12 410 1101

Region: DC, NS, SS

Licence No: 16258

Location: Wood Buffalo National Park and field offices in Fort Smith, Nahanni National Park, Fort Simpson, Parks Canada and NWT offices in Yellowknife

Pyrogeographies in context: geographies of wildfire knowledge in Canada

No research was conducted under this licence in 2018.

Underwood, Kathryn

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File Number: 12 410 1125

Region: NS

Licence No: 16400

Location: Yellowknife

Inclusive early childhood service system project

This project is a long-term study about early childhood. The research team is interviewing families once per year for a six year period, with the first interview taking place before the child starts school and the last interview when they are in grade three. There are two phases to this project. The first group that was interviewed started in 2014 and will continue to be interviewed until 2020, and the second group started in 2018 and will continue until 2025. This project was developed through a partnership with community, academic, and policy organisations. Interviews are taking place in eight geographic areas: the County of Wellington in Ontario, the District of Timiskaming in Ontario, the City of Hamilton in Ontario, the City of Toronto in Ontario, the Constance Lake First Nation/Hearst in Ontario, Brandon in Manitoba, Comox Valley in British Columbia, and Yellowknife in the NWT. The interviews in Yellowknife took place from 30 October until 1 November 2018. There are currently five participants from Yellowknife. When the research team receives their ethics approval, they will try to get more participants from Yellowknife, up to their target of 15 participants. Because this is an ongoing 'longitudinal study' (it follows the same people over a number of years), there is currently no final report.

Wesche, Sonia

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File Number: 12 410 934

Licence No: 16300

Region: IN

Location: Aklavik, Inuvik, Ulukhaktok, Paulatuk, Sachs Harbour, Tuktoyaktuk

Supporting food security in the Inuvialuit Settlement Region: working with communities to integrate participatory methods, tools and knowledge

The goal of this ongoing project is to help the Inuvialuit Regional Corporation write and carry out a regional food security strategy that will ensure people can get their own healthy and nutritious food now and in the future. There are three components to the project. First, the research team documented the price of healthy and commonly-consumed foods in all six Inuvialuit communities between 2014 and 2016. They are currently doing a second round of data collection in Inuvik and Tuktoyaktuk, to see if the new Inuvik-Tuktoyaktuk Highway is affecting food prices. For the second component, a research assistant in Paulatuk surveyed community members about country food harvesting and food sharing in the spring of 2017. The survey showed that there are strong food sharing networks, significant levels of harvesting, and a range of opinions on selling and buying country food in Paulatuk. The researchers verified the results with the community in February 2018, and presented the results to both the Inuvialuit Game Council and the Paulatuk Annual General Meeting in June 2018. For the third component, the team worked with partners at the Inuvialuit Regional Corporation to hold focus groups and interviews in each of the six Inuvialuit communities. Participants identified local priorities for food security, community strengths and programs, as well as areas that may require support or development. The team is processing the data, and plans to verify the data with communities in fall 2018 and winter 2019.

Wolf, Jake

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File Number: 12 410 1127

Licence No: 16412

Region: IN, GW

Location: Inuvik

Designing culturally appropriate long-term care facilities in NWT

The goal of this research project was to design long-term care centres that are more culturally appropriate to the Beaufort Delta region. The researchers hosted a luncheon discussion at Ingamo Hall in Inuvik with Elders, the Elderly, residents of the long-term care center, and their support staff. The goals of the discussion were to better understand how this group of people imagines a good life at their age, and how long-term care could be better designed to meet their needs. The researchers asked questions to the group, gave informal surveys, and invited the group to direct the conversation as they saw fit. Attendees expressed a desire to have a closer connection to nature, to have an easier time getting to community events, to have multi-generational programming, to eat food that they grew up eating, and to see signs of the culture they grew up in. Many people expressed a desire to be outdoors, out on the land, and at camps. They also thought it would be better for long-term care centres to be smaller and spread out among all of the communities in the Beaufort Delta.

Worden, Elizabeth

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File Number: 12 410 1095**Licence No:** 16242**Region:** IN**Location:** Aklavik, Shingle Point in Yukon (69°00'00"N, 137°22'00"W)**Human-beluga relations and subsistence hunting in Aklavik, NT**

The goal of this project was to understand why Aklavik's beluga whale harvest has declined in recent decades. Historically, Inuvialuit from Aklavik harvested upwards of thirty whales in summer months, but recently, yearly harvests have been only five whales or less. The research team worked with the Aklavik Hunters and Trappers Committee, and interviewed 32 participants from June to August 2017 in both Aklavik and at Shingle Point in the Yukon. Interviews were meant to be open and like a conversation, with each person able to share their stories, what was important to them about the beluga whale harvest, and the changes that are affecting it. Another method that was used was 'learning through experience', a method that is very important culturally to Inuvialuit. This method emphasizes that, in order to truly understand something, you have to live it. The lead researcher immersed herself in daily life in Aklavik and on the coast for two months, learning a lot about the values of the community along the way. Climate change has caused shallow water, changing channels, and dangerous storms and winds along the coast, and as a result some people no longer hunt whales. This environmental change also means that Shingle Point in the Yukon is the main camp that is used for summer harvesting. This isn't good for whale hunting because it is too busy, which makes the whales swim farther out in deep water. Community members also said that Elders passing away contributes to the decreased whale harvest, because Elders used to encourage everybody to hunt, had the knowledge of how to hunt, and shared values that were taught to them that made whale hunting easier and better for everybody. Finally, other things, such as the high cost of the hunt, young people losing interest, school and work demands, and a reduced sharing culture, were named as big issues stopping the whale harvest.

Traditional Knowledge

Giles, Audrey

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File Number: 12 410 582

Region: IN

Licence No: 16282

Location: Aklavik, Inuvik, Tuktoyaktuk, Paulatuk, Sachs Harbour, Ulukhaktok

Project Jewel: using Inuvialuit ways of knowing to understand how on-the-land programming can foster wellness

Project Jewel is an on-the-land wellness program in the Inuvialuit Settlement Region (ISR). It is an 'after care' program that people can take part in after they receive medical or other services. The goal of this ongoing research project is to understand how Project Jewel's on-the-land programming offers culturally safe ways to address past trauma and violence that also meet the needs identified by ISR residents. To date, the research team has held one meeting in Inuvik to ensure the full involvement of the Inuvialuit Regional Corporation, and to ensure that past Project Jewel participants are included in the research process. The team also conducted interviews with project stakeholders. The team attended an on-the-land program outside of Paulatuk, and held focus groups where the participants took digital photos of things or scenes that were important to them. They then gave a description of the photos that they took and talked about why they took the photos and why they were important. This is a research method known as 'photo voice'. The researchers also used photo voice methods with past Project Jewel participants at Reindeer Station in September. The research team will collect more data this summer, and will be finished with the project within a year.

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File Number: 12 410 1038

Region: SA, NS

Licence No: 16280

Location: Délíne, Tulita, Detah

Sahtú Dene and Yellowknives Dene astronomy and sky-related knowledge

This project is part of a larger, decade-long research study on northern Dene astronomical knowledge (knowledge of the stars and sky) that is taking place in Alaska and Canada. The research team met with Elders in Délíne over the course of several days in October 2018. Elders in Délíne confirmed that the ancient traveler/transformer figure (Yamoria) who circled the world in distant times became a part of the stars as the large constellation Yi'hda (formerly documented as just the Big Dipper) after completing his work on earth. Although this traveler is widely known in mythology, his enigmatic transformation into the stars is the same transformation that early shamans underwent when they gained power and knowledge. This constellation is not only a world custodian and a good example of a Dene shaman, but also a game

keeper and a shaman's teacher, ally, and the embodiment and distributor of medicine power. The traditional astronomical knowledge learned from Elders in Délı̨ne confirms other northern Dene astronomical knowledge systems that have been recently documented in parts of Alaska and Canada. The incarnation of Ya'mo?re'ya in the sky can be interpreted as a powerful projection of northern Dene worldview that connects the past, present, and future. It also relates the individual to the society, and the society to the universe. This project provides cross-cultural evidence of a rich, although enigmatic, system of astronomical knowledge. During this project Elders explained a diverse range of astronomical and sky-related knowledge, including approximately 20 newly documented Sahtúot'ine star and constellation names related to the Yamoria cycle.

Klein, Peter

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File Number: 12 410 1113**Region:** IN**Licence No:** 16297**Location:** Aklavik, Inuvik, Tuktoyaktuk, Paulatuk, Sachs Harbour, Ulukhaktok**Turning points: a collaborative digital storytelling project in Yellowknife**

The goal of this project is to film storytellers, and work with the storytellers to make videos about them. The process will help journalists improve how they report stories in Yellowknife. The project team reached several milestones this year. Although they thought they would only recruit five storytellers, there was a lot of excitement in the community and the team ended up recruiting eight storytellers in May 2018. In the summer, the team finished filming each of the eight storytellers. The storytellers enjoyed having the chance to control what was filmed by directing the journalists during the filming process. The team is now editing the video stories. They have completed drafts for three of the storytellers, and all stories will be finished by December. The team will present drafts to the storytellers to see what they think about their story, hear what changes they would like made, and how they feel about participating in the project. This review process will continue until the storytellers give approval to finalize and share their stories. Their reflections will be written into a Ph.D. dissertation and presented to journalists in Yellowknife to improve reporting practices. The team is writing up the project findings so they can be shared at a community screening event in Yellowknife in 2019, once the storytellers approve their finished films.

McMahon, Rob

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File Number: 12 410 1091**Region:** GW**Licence No:** 16272**Location:** Inuvik**Exploring Indigenous digital literacy with Gwich'in Tribal Council Department of Heritage**

'Digital literacy' refers to how well someone can use computers and online resources. The two goals of this project are to train northern community-based digital literacy instructors, and to create a regionally-appropriate open access digital literacy curriculum. The course materials were designed to encourage and inspire northerners to use online and digital resources, while reducing the negative impacts that digital technologies can have on community members. Building on a pilot project that was run in 2017, the purpose of this project was to increase digital literacy among Gwich'in participants. The project team

expanded their pilot digital literacy curriculum and workshop materials, which were then used to deliver two-day workshops in the Gwich'in communities in June 2018. The team developed the curriculum using an online survey and in-person interviews with workshop participants and other knowledgeable local people. They also surveyed workshop participants after the workshop. The team published an article about the project in Northern Public Affairs, and presented at several conferences including the Canadian Communication Association Annual Conference in both 2018 and 2019. The team have developed a 150-page student workbook called 'Eetsii tthak t'agwahii (Learning About the Machine that Does It All): Digital Content and Connectivity with Dinjii Zhuh Contexts'. This workbook is currently under review with the Gwich'in Tribal Council, and once approved, will be made available as a free and open access learning resource.

Pearce, Tristan

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File Number: 12 410 650

Licence No: 16426

Region: IN

Location: Ulukhaktok

Importance of sewing to Inuit women

The goal of this project is to document the stories of women in Ulukhaktok about how important sewing is to them. People that sew in Ulukhaktok have been invited to share their stories about sewing with a local researcher and university student. Twelve participants have shared their stories so far. The research team will continue to work with sewers who are interested in sharing their stories.

Pruys, Sarah

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File Number: 12 410 1114

Licence No: 16307

Region: SS

Location: Salt River First Nation, Smith's Landing First Nation, Fort Resolution, Fort Smith

Reconciling traditional knowledge through protocols: a framework for Indigenous communities and publishers

This research project examines the relationship between the local book publishing industry in Fort Smith and the Dënë Sųłíné (Chipewyan) community. The goal is to see how this established relationship can guide other publishers as they consult with communities and seek to understand local protocols. The research team gathered information from both the Dënë Sųłíné and the non-Indigenous people in the publishing industry. From both of these perspectives, the team identified the core elements and ideas of a successful working relationship that is built on continued consultation, trust, and understanding.

Siivola, Delia

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File Number: 12 410 1119

Licence No: 16362

Region: IN, SA**Location:** Déljñę, Paulatuk, Inuvik**Indigenous knowledge in protected areas management: adaptation, sustainability and opportunities in the circumpolar North**

The goal of this research project is to promote better and more ethical use of Indigenous knowledge in park and protected areas management. The researcher will work with local people and share their opinions on how they feel their knowledge is being used, and how it could be better used. The study includes Indigenous peoples from three different regions of the circumpolar north: Inuit of Auyuittuq National Park in Nunavut, the Inuvialuit and Sahtú Dene and Métis of Tuktut Nogait National Park in the NWT, and Altaian of Uch Enmek Nature and Culture Park in Siberia, Russia. The researcher is looking at the available academic literature, and is also using a method called 'participant observation' where the researcher participates in local events and life. Also, the researcher is using interviews to gather information. The researcher asked local committees for the names of people who should be interviewed. Results will be shared with the communities after the work is complete.

Simmons, Deborah

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File Number: 12 410 678**Licence No:** 16218**Region:** SA**Location:** Colville Lake, Déljñę, Fort Good Hope, Norman Wells, Tulita**From Dene Kede to Dene Ts'ili: review of Dene language and cultural revitalization initiatives in the Sahtú region**

In Canada and around the world, Indigenous languages and ways of life are increasingly recognized as important to wellbeing. They are an essential priority for governance in Canada. In the Sahtú Region, there are three major dialects of Dene kədə (language) spoken in five communities with a strong spirit of self-determination and continued land-based practices. The goal of this project was to identify community and regional strengths with respect to language and Dene ts'lj (way-of-life) revitalization in the Sahtú. The research team used literature reviews and their own experiences to reflect on changes in law and policy, education, and local knowledge over time. They realized that there are challenges in strategic planning due to the complex history of the region. The team have sought to identify Sahtú-based solutions, such as gaining support from local organisations like the ʔehdzo Got'jñę (the Renewable Resources Councils that were established by the Sahtú Dene and Métis Comprehensive Land Claim Agreement), the Ne K'ə Dene Ts'j l Living on the Land Forum (a Sahtú advisory body involving ʔehdzo Got'jñę and working with government, industry delegates, and academic collaborators), and a Sahtú Youth Network. Indigenous languages, knowledge, and land-based ways of life have been shown to be important for sustainability in Canada and around the world. This knowledge synthesis points to the role that in-depth regional and local research can play in providing valuable understanding of Indigenous resurgence, and how it can be meaningfully supported.

Spring, Andrew

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File Number: 12 410 1037**Licence No:** 16301

Region: SA

Location: Déljñę

Sahú Benígodi: traditional knowledge of Great Bear Lake and its watershed

Over the years, there have been many different studies, reports, and community-led initiatives to collect traditional knowledge about Great Bear Lake and the surrounding lands. Unfortunately, many of these reports and recordings have disappeared, are not easily available, or have not been properly catalogued. For these reasons, these resources have not been used in decision-making by local or regional entities. This project will work to catalogue and collect available data from existing sources. Where gaps are identified, the project team will collect additional traditional knowledge using interviews with Elders. The end result will be a comprehensive catalogue of traditional knowledge that will describe changes that have been witnessed over time. This is the first year of this project and the researchers, in partnership with the Tsa Tse Biosphere Reserve and community members, have started to collect and catalogue the available studies. The team has also supported other research and monitoring initiatives in the community.

Archaeology

Arnott, Charla

Soriak Consulting and Research Ltd.

Permit Number: 2018-019

Class: 2

Region: SS

Location: East Arm of Great Slave Lake

Fort Reliance former weather station project

In 2018, the research team conducted an Archaeological Impact Assessment (AIA) as part of a data gap sampling program at the Fort Reliance Weather Station in Fort Reliance, NWT. The goal was to see whether remediation would harm cultural material at the site. After studying the site on maps, the field team did a shovel test at seven locations that were likely to have archaeological sites. No prehistoric sites were identified, but numerous items dating to the historic period were found. No previously recorded prehistoric sites are located at the site, either. The Fort Reliance Weather Station site was occupied by the Department of National Defence between 1948 and 1970, and the Atmospheric Environment Service used the site as a weather station from 1959 to the 1990s. The site is contaminated, and research about the contaminants has been underway since the 1980s. The Fort Reliance Weather Station buildings are federal heritage buildings, and six of them were originally constructed in the late 1940s for the Northwest Territories and Yukon Radio System run by the Department of National Defence. These buildings include an ice house, a warehouse, a radio control building, a transmitter building, a refrigerator building, and a power house (this last building is no longer present). They have utilitarian architecture with a simple design and minimal details, and are well adapted to the northern climate. These buildings have fallen into disrepair, however, and the field team documented them carefully. The buildings will be conserved at a later date. Other buildings on site may be demolished, and the refuse either taken off site or buried on site. These reclamation activities will cause significant ground disturbance.

Bennett, Tim

Ecofor Consulting Ltd.

Permit Number: 2018-007

Class: 2

Region: GW

Location: northeast of the Inuvik Airport

Inuvik High Point wind project HRIA

Ecofor Consulting Ltd. conducted a Heritage Resource Impact Assessment (HRIA) of the Inuvik High Point area where a wind project is taking place. The purpose of this study was to see if the construction of a wind turbine, and the roads and buildings that will support the turbine, will impact any archaeological sites. The study built on the results of a Heritage Resource Overview Assessment that evaluated the potential for archaeological sites within the proposed project area using maps, satellite images, and other information. Although five potential archaeological sites were identified, fieldwork was not limited to those areas. The fieldwork team surveyed on foot and by helicopter throughout the project area. The team surveyed along the proposed road corridor and northward toward the proposed turbine site. The terrain along the road corridor has both sloping and flat stretches. Transitions between the slopes and flat areas were gradual, with no well-defined breaks in slope, which is often where archaeological sites are

found. Moreover, flat areas throughout the access road corridor were waterlogged. There was therefore a low likelihood of finding archaeological sites along the access road corridor, and no shovel tests were done in this part of the study area. Around the high point summit, which is the proposed site of the wind turbine, there are rolling hills with low willows. There are also sparse spruce trees around two ponds near the high point summit, but no significant tree cover. Forty-six shovel tests were done at five locations in the northern portion of the study area, but no heritage resources were found. No further heritage resource assessment work is recommended for lands within the Inuvik High Point wind project area, unless new lands are added to the project footprint.

Dixon, Ashley

Athabasca University/K'ágee Tu First Nation

Permit Number: 2018-011

Class: 2

Region: DC

Location: K'ágee Tu

K'ágee Tu First Nation archaeology project

The goal of this project is to learn more about the archaeological record, and to attain archaeological materials which may be used by the community to tell their own history and stories.

Downey, Charla

Soriak Consulting and Research Ltd.

Permit Number: 2018-009

Class: 2

Region: DC

Location: 11 km south of Great Slave Lake between Hay River and Fort Resolution

Pine Point Mine project

The goal of this project was to assess seven areas near the former Pine Point Mine to see if they contained any archaeological sites. First, the survey team conducted ground surveys in places that were likely to have archaeological sites. The team looked for rises, breaks in slope, and ridges, because these landscape features are more likely to have archaeological sites than low-lying areas. Ten potential archaeological sites were identified, and the survey team did 114 shovel tests, but no prehistoric artifacts were found. The rest of the study area was not likely to have archaeological sites due to the low topography, or due to past mining construction, mining operations, and mine remediation activities. Three previously recorded archaeological sites were revisited to confirm their location, document their current condition, and determine whether they might be impacted. The Pine Point Mine operated between 1964 and 1987, when numerous open pits and two underground mines were developed. Materials from the mine were observed and documented during the 2018 fieldwork, such as historic drill hole markers, remnants of metal and wooden machinery, stacks of cores and core boxes, former utility lines and infrastructure, tin cans, oil filters, and buckets. While materials from the exploration, operation, and remediation of the Pine Point Mine that are from 1968 or after are not currently considered archaeological sites, they eventually will be. Proposed construction activities, as well as natural erosion processes, may result in the loss of these materials.

Jollymore, Kay

ERM Consultants Canada Ltd.

Permit Number: 2018-004

Class: 2

Region: NS

Location: 240 km northeast of Yellowknife

Courageous Lake project

The objective of this project was to identify archaeological sites that may be impacted by proposed future drilling at the mine, and to confirm the archaeological potential of the locations that were drilled in 2018. To do this, the archaeological field team conducted walking surveys that focused on areas that had moderate to high archaeological potential. The team found and recorded six new archaeological sites, and also revisited four previously-recorded sites. The team adjusted the site boundaries for one of the previously-recorded sites because they found new artifacts outside of the previous site boundary. Of the six newly recorded archaeological sites, four contained prehistoric lithic material (stone tools and stone tool debris) and two contained stone cairns of unknown age. There are no archaeological sites located in the proposed drilling areas. Additional archaeological studies are planned for 2019.

Krahulic, Tobi

Stantec Consulting Ltd.

Permit Number: 2018-020

Class: 2

Region: DC

Location: 30 km east of Fort Liard

AIA for Celibeta winter road

The research team conducted an Archaeological Impact Assessment (AIA) for a proposed winter road to a retired wellsite that is being remediated. The road will extend in a general west-east direction, from about 30 km east of Fort Liard to 8 km southeast of Celibeta Lake. This is within the traditional territories of the Acho Dene Ko First Nation and the Samba K'e First Nation (SKFN). The crew, including local assistants, worked through mid-October to complete the field assessment. The wildlife monitor and local assistants provided additional insights (e.g., local wildlife, current land use, etc.) about the areas that were being assessed. In addition, a community meeting was held with Elders and council members of the SKFN in Trout Lake. This meeting provided the archaeologists with insight into the current and historic use of the land, and information about the areas that are important to members of the community. The research team identified areas of high archaeological potential along the proposed winter road, particularly at creek crossings. These areas formed the basis of the field assessment, although the field crew also inspected the whole proposed road either on foot or by helicopter. The proposed winter road passes through areas that are low, flat, and poorly-drained, so are unlikely to contain archaeological sites. Only one creek crossing had high banks with adequate drainage, so the field assessment focused on the banks of this creek. The field crew did a total of 28 shovel tests and examined one exposure, but no new archaeological sites were found.

Krahulic, Tobi

Stantec Consulting Ltd.

Permit Number: 2018-021

Class: 2

Region: SA

Location: approx. 70 km southeast of Norman Wells

AIA for Tulita borrow sources

The research team conducted an Archaeological Impact Assessment (AIA) for six proposed borrow sources and their access routes in the Sahtú region. The borrow sources will be used for maintenance and construction of Highway 1 and the Déline winter road. The crew, including wildlife monitors and local assistants from Tulita and Déljñę, worked through early October to complete the field assessment. Because the wildlife monitors and assistants were locals from the area, they were able to provide additional insights about things like local wildlife and current land uses in the areas that were being

assessed. The research team identified areas that were likely to have archaeological sites, and these areas formed the basis of the field assessment. The field crew also inspected the entire project footprint on foot or from a helicopter. The field assessment focussed on the borrow sources, which were on landforms that were high, level, and better-drained than the surrounding areas, and therefore were more likely to contain archaeological sites. The field crew also revisited previously recorded archaeological sites within or near the borrow sources. They did a total of 103 shovel tests and examined 20 exposures. No new archaeological sites were found, but two traditional land use sites were recorded. Additionally, one airstrip feature with historic value, dating between the 1930s and 1960s, was identified. This airstrip site is currently in use by the local communities. The research team recommended that the airstrip not be disturbed due to its historic value and current use, and also that the local community be consulted about the two traditional land use sites.

Kramers, Patrick

De Beers Group of Companies

Permit Number: 2018-001

Class: 1

Region: NS

Location: 280 km northeast of Yellowknife

Gahcho Kue Mine archaeological monitoring

De Beers is operating the Gahcho Kué Mine, a diamond mine located approximately 280 km northeast of Yellowknife. Mine operations at Gahcho Kué include open pit mining and milling, and the seasonal operation of a 120 km winter road that links the mine to the main Tibbet to Contwoyto winter road. Previous archaeological studies were completed for the Gahcho Kué Mine by Points West Heritage Consulting Ltd. in 2004 to 2007, 2010, and 2012 to 2016. In 2018, the archaeological field work was limited to monitoring and maintenance at 11 previously-identified sites that are at high risk of being impacted by the mine. Site monitoring and maintenance were conducted at these 11 sites on July 24th and 25th, 2018. The field team confirmed that the sites remained clearly marked and visible in order to prevent impacts on the sites due to mining activities or the operation of the winter road. At each site the area was checked for any signs of disturbance, and any damaged, missing, loose, or leaning stakes were replaced. All of the stakes were repainted using highly-visible orange surveyors' paint. Of the 11 sites visited, none showed any signs of disturbance, but all required some maintenance of the marking stakes.

Kwiecien, Grzegorz

Taiga Heritage Consulting Ltd.

Permit Number: 2018-017

Class: 2

Region: DC

Location: southern NWT, along the Hay River

Stories from the ground 2018 NWT

This project was initiated by the Dene Tha' in 2014. During the 2018 field season, an archaeological excavation was conducted at one site during the fall. Dene Tha' First Nation Elders, a representative of the Dene Tha' Lands Department, a member of K'at'l'odeeche First Nation, and archaeologists from Taiga Heritage Consulting Ltd. excavated a site that is very deep and has many cultural layers. The site is known as JbQd-1, and is located at the confluence of Swede Creek and the Hay River overlooking Grumbler Rapids. JbQd-1 was discovered during the 2017 archaeological survey, when many lithic (stone) materials, bone fragments, and a few formed tools from three different times in the past were found. The artifacts were associated with distinct layers of ancient soil, known as paleosols. In 2018, an excavation trench was dug near the sites that were excavated in 2017. The field crew found 13 geological paleosols up to a depth of 2 meters below the surface of the trench, which is very deep for NWT archaeological sites. While few

tools were found, the field crew found stone tool-making debris from many different types of stone, along with numerous bone fragments. The stone and bone fragments were found in seven of the paleosols. Two possible hearths were also recorded. Historic and contemporary artifacts were also discovered just below the surface. The field crew also found another site nearby, and dug shovel tests along a high ridge paralleling the Hay River. These shovel tests yielded a handful of lithic artifacts in at least one of the paleosols. The research and excavations from 2017 and 2018 reveal that this area yields deeply stratified sites with distinct cultural components.

Lobb, Murray

Wood Environment & Infrastructure Solutions

Permit Number: 2018-022

Class: 2

Region: NS

Location: near Yellowknife

AIA of Highway 3 & 4 gravel pits

For this Archaeological Impact Assessment (AIA), a total of eight gravel pits or gravel pit extensions were checked for archaeological sites and traditional land use. Three of these gravel pits were located on Highway 3, where the team found four new archaeological sites. These archaeological sites included two quarries for collecting quartzite for making stone tools, a site with 10 quartzite flakes produced by making stone tools, and a site with a quartzite core and a quartzite flake find. The other five gravel pits that were checked were located on Highway 4, where the team found five new archaeological sites.

The archaeological sites along Highway 4 included two stone tool workshops, a site with three quartzite flakes and a quartzite retouched flake cutting tool, a site with a single quartzite flake, and a historic trail complete with trail scars and eight trail markers. In addition, the team also found a modern cabin, a modern hunting camp, a modern trail, and two modern rock cairns. This AIA shows that people in the past consistently used quartzite found in the bedrock outcrops of the Canadian Shield on the north side of Great Slave Lake. The quartzite would have been a reliable resource for making new stone tools in this area.

MacKay, Glen

Prince of Wales Northern Heritage Centre

Permit Number: 2018-010

Class: 2

Region: SA

Location: Great Bear Lake

Tsá Tué Biosphere Reserve archaeology project

The goal of this project is to document the archaeological record of the Tsá Tué Biosphere Reserve. Documenting the archaeological sites will ensure they are protected, and will contribute an archaeological perspective to the history of the Tsá Tué Biosphere Reserve.

MacKay, Glen

Prince of Wales Northern Heritage Centre

Permit Number: 2018-015

Class: 2

Region: SA

Location: Mackenzie Mountains

NWT ice patch monitoring program

This project is a continuation of the field research focused on alpine ice patches that has taken place over the last ten years. Under some conditions, ice patches can have well-preserved ancient artifacts and

biological specimens. The 2018 research program will visit four ice patches by helicopter. If time permits, the team will also visit three sheep fences.

Murphy, Brent

Lifeways of Canada Ltd.

Permit Number: 2018-018

Class: 2

Region: DC

Location: near Nahanni Butte

Canadian Zinc Corporation Prairie Creek Mine all season road geotech program

The purpose of this project was to check for archaeological sites that might be impacted by the proposed geotechnical program for the Prairie Creek Mine all season road. The Prairie Creek Mine is in the southern Mackenzie Mountains in the Decho Region of the NWT, approximately 90 km northwest of Nahanni Butte. The mine infrastructure and facilities were constructed in the early 1980s. The proposed all season road that will link the mine to the Nahanni Butte access road will be 170 km long and will generally follow the track of the previous winter road. Approximately 85 km of the western end of the road goes through the Nahanni National Park Reserve (NNPR). The geotechnical work for the all season road includes digging test pits and bore holes along the road right-of-way and in potential borrow pits. These activities might impact archaeological sites, so the 67 bore holes and 81 borrow pits were examined using helicopter and ground surveys, as well as shovel tests. The field team dug 45 shovel tests and found one new prehistoric (pre-European contact) archaeological site that is a lithic scatter site. Artifacts were also collected from a roadcut along the original 1980s winter road to the Prairie Creek Mine. This site is on the Ram Plateau within the NNPR. The artifacts collected include a biface (cutting tool) and two modified flakes, possibly used to scrape hides. This site is regionally significant because of the artifacts that were found and because much of the site is undisturbed. Impacts to this site, known as JiRx-1, should be avoided, but if this is not possible the site should be studied by archaeologists before it is impacted.

Murphy, Brent

Lifeways of Canada Ltd.

Permit Number: 2018-023

Class: 2

Region: SA

Location: 70 km southeast of Tulita

Enbridge Line 21 AIA near Tulita

This project was an Archaeological Impact Assessment (AIA) in advance of planned maintenance on the Enbridge Line 21 pipeline at KP 158, at the crossing of Little Smith Creek.

Prager, Gabriella

Points West Heritage Consulting Ltd.

Permit Number: 2018-003

Class: 2

Region: NS

Location: Kennady Lake area, along the winter access road to MacKay Lake

Gahcho Kue project

This project includes archaeological investigations for the Gahcho Kué Mine and access road, such as any required archaeological work for changes to the footprints of the mine or access road.

Smethurst, Naomi

Prince of Wales Northern Heritage Centre

Cultural Places Program

Permit Number: 2018-005

Class: 2

Region: SS

Location: Great Slave Lake, Buffalo River

Kát'odeeche First Nation archaeology project

The goal of this project is to document the archaeological record of the traditional territory of the Kát'odeeche First Nation (KFN). This work will be conducted in partnership with KFN and builds upon previous traditional use studies, and also previous archaeological work that was conducted in 2017.

Smethurst, Naomi

Prince of Wales Northern Heritage Centre

Permit Number: 2018-012

Class: 2

Region: NS

Location: Yellowknife Bay

Yellowknife Bay

No summary was submitted for this licence.

Tattrie, Tim

Associated Engineering

Permit Number: 2018-016

Class: 1

Region: NS

Location: Yellowknife

2018 archaeological inspection for the Tibbitt to Contwoyto Winter Road

The Joint Venture partnership that runs the Tibbitt to Contwoyto Winter Road is committed to the protection of heritage and historical sites along the winter road corridor. Over the course of the last several years, archaeologists have been hired to locate these important sites so they can be protected. Many of the recorded sites have been in close proximity to the winter road alignment and quarry sites. In many cases, however, the quarry sites are no longer used for winter road operations. During a one-day visit to the sites, the team conducted a visual inspection by helicopter to see if there were any signs of encroachment from the winter road operations. After that, the team visited the sites on foot to ensure that the boundary markers were properly placed. The boundary markers were sprayed with fluorescent paint to make them more visible to personnel if an active quarry was nearby. The team also fixed all damaged markers. At quarry sites that are no longer used for winter road operations, the boundary markers were removed and stacked close to the winter road so they could be picked up during the 2019 winter road season

Walker, Daniel

ERM Consultants Canada Ltd.

Permit Number: 2018-006

Class: 2

Region: NS

Location: north of Yellowknife

Yellowknife Gold city project

The goal of this project is to conduct an archaeological impact assessment prior to the development of drill pads and associated roads north of Yellowknife.

White, Lori

Le Soleal, Ponant

Permit Number: 2018-013

Class: 1

Region:

Location:

The Northwest Passage - Le Soleal, Ponant

No summary was submitted for this licence.

Young, Patrick

Golder Associates Ltd.

Permit Number: 2018-002

Class: 2

Region: NS

Location: Yellowknife

Giant Mine remediation project

This permit was for an Archaeological Impact Assessment for remediation activities at the Giant Mine project area.

Young, Patrick

Golder Associates Ltd.

Permit Number: 2018-008

Class: 2

Region: NS

Location: off Highway 3 near Whatì

Tłı̄chų all season road project

The goal of this project was to conduct an Archeological Impact Assessment in areas that will be affected by proposed revisions to the route of the all season road. The purpose was to see if archeological sites may be affected by the all season road. Previous assessments were done in 2014 and 2017.

Young, Patrick

Golder Associates Ltd.

Permit Number: 2018-014

Class: 2

Region: NS

Location: approx. 25 km northeast of Diavik Mine and Lac de Gras

Dominion Diamond Glowworm

The goal of this project is to document archaeological sites within the Glowworm Lake Property before exploration activities take place.

Fisheries

Antoniak, Kevin

Consultant

Licence Number: S-18/19-3049-YK

Species: Inconnu

Location: Slave River area

No summary was submitted for this licence.

Bonhomme, Erica

Stantec Consulting Ltd.

Licence Number: S-18/19-3045-YK

Species: All species (excluding marine mammals)

Location: Watercourse crossings along the Dempster Highway

2018 fisheries and hydrotechnical assessments

The goal of this project was to collect the necessary data to design new watercourse crossing structures in specific areas. The Government of the NWT Department of Infrastructure plans to upgrade or construct new watercourse crossings at several locations along the Dempster Highway (Highway 8), the Mackenzie Valley Winter Road, and the Access Road to the community of Behchokò.

Cavanagh, Nigel

Tetra Tech EBA Inc.

Licence Number: S-18/19-3039-YK

Species: All species (excluding marine mammals)

Location: 69°18'31.68"N, 133°03'37.78"W

2018 ATCO midstream fish habitat study

The goal of this research project was to conduct a visual ground survey, and also use nets and minnow traps, to identify the fish species and fish habitat present in a small creek, in order to determine the best location for a road crossing. The research team sampled fish at two possible road crossing sites. The sampling extended from 100 m upstream of the road crossing sites to 300 m downstream. Fish were collected using a variety of methods, including electro-fishing, seine nets, minnow traps, and hoop (fyke) nets. No fish were harvested or purposefully harmed. The team collected the information that will be needed for any future DFO Fisheries Authorization applications that are required.

Darwish, Tamara

Golder Associates Ltd.

Licence Number: S-18/19-3011-YK

Species: All fish species

Location: (63°28.787'N, 109°4.824'W),
(63°30.278'N, 109°2.865'W), (63°31.186'N,

109°2.964'W), (63°31.257'N, 109°3.717'W),
(63°32.060'N, 109°3.403'W)

Northwest Territories Power Corporation - Jackfish Lake environmental monitoring program

The main goal of this research project is to collect one year of aquatic monitoring data that can be used to evaluate the effects of cooling water discharge on Jackfish Lake. This project will provide baseline data on the fish species that are present in Jackfish Lake, and information that can be used to evaluate the effects of the cooling system on these fish. This information is required for the Northwest Territories Power Corporation 2019 water license application.

Day, Michael

Golder Associates Ltd.

Licence Number: S-18/19-3041-YK

Species: All fish species

Location: (63°28.787'N, 109°4.824'W),
(63°30.278'N, 109°2.865'W), (63°31.186'N,
109°2.964'W), (63°31.257'N, 109°3.717'W),
(63°32.060'N, 109°3.403'W)

Kennady North Diamond Project

This research project is the start of a baseline study that will likely take place at the Kennady North Diamond Project. The project will be done for either De Beers Canada Inc. or Mountain Province Diamonds, and is being developed as a satellite operation of the Gahcho Kué Mine. It is possible that an environmental assessment will be required under the Mackenzie Valley Resource Management Act before development can occur. This was the first year of the project. The research team focused on information gaps about the fish species that are present in several lakes, and their use of the habitat in the lakes. Samples of plankton and benthic invertebrates were also taken to provide information about aquatic resources in the lake.

Evans, Marlene

Environment and Climate Change Canada

Licence Number: S-18/19-1056-NU

Species: Lake trout

Location: Great Bear Lake area

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

The goal of this study is to determine the levels of contaminants of concern in lake trout and cisco from Great Bear Lake. Previous data exists for some of these contaminants, such as mercury, so the research team will be able to use the new data they collect to determine whether contaminant levels are changing over time.

Evans, Marlene

Environment and Climate Change Canada

Licence Number: S-18/19-3012-YK

Species: Burbot, lake trout, northern pike

Location: Great Slave Lake area including the East Arm in the Łutselk'e area (62°25.114'N, 110°50.059'W), Hay River area, Resolution Bay

Spatial and long-term trends in persistent organic contaminants and metals in fish from the NWT

This study continues a long-term investigation of whether contaminant levels in fish in the NWT are changing. This study, which focuses on contaminant levels in fish in Great Slave Lake, has been running since the early 1990s. In 2018, the research team collected lake trout from Great Slave Lake in the areas near Hay River and Łutselk'e. The team also collected burbot from near Łutselk'e and Fort Resolution, and northern pike from near Fort Resolution.

Gallagher, Colin

Fisheries and Oceans Canada

Licence Number: S-18/19-3021-YK**Species:** Arctic charr (searun or landlocked), broad whitefish, starry flounder**Location:** Darnley Bay, Hornaday River, mouth of Lasard Creek (69°30'00.0"N, 123°13'00.0"W)**Arctic charr monitoring in Darnley Bay NT, 2018**

The goal of this long-term monitoring project is to continue to gather information on the status and life history of Arctic charr captured at the mouth of the Hornaday River and Lasard Creek. Other goals include confirming the presence of 'blue charr' near Tipipi in western Darnley Bay, and collecting important information that will support the design, delivery, and implementation of the Paulatuk Charr Management Plan.

Gallagher, Colin

Fisheries and Oceans Canada

Licence Number: S-18/19-3022-YK**Species:** Arctic charr (searun or landlocked)**Location:** Fish Lake**Assessment of Arctic charr stock from Fish Lake**

The goal of this project is to collect information about Arctic charr in Fish Lake. To do this, the research team gathered information about the charr catch and charr biology. The data was used to monitor the status of the stock and develop a model that can be used to predict the response of the charr population to harvesting.

Gallagher, Colin

Fisheries and Oceans Canada

Licence Number: S-18/19-3024-YK**Species:** Dolly Varden charr (searun)**Location:** Rat River big eddy (68°11"N, 135°07"W), Fish Creek (67°44"N, 136°16"W and 67°54"N, 136°31"W)**Biological investigation of Dolly Varden from the Rat River 2018**

This research project has three main goals. First, to conduct a harvest-based monitoring program that will allow the research team to collect catch-per-unit-effort and biological information. The second is to gather biological information about anadromous Dolly Varden charr that were captured in Fish Creek during the fall. Data were collected from live charr at an area that they use for spawning and overwintering. The third goal was to harvest fish and record biological information about them to find out more about the life history of Dolly Varden charr.

Gallagher, Colin

Fisheries and Oceans Canada

Licence Number: S-18/19-3025-YK-A1**Species:** Dolly Varden charr (searun or landlocked), round whitefish, Arctic grayling**Location:** Babbage River system, Firth River system, Herschel area, Joe Creek fish hole in Ivavik National Park, Little Fish River, Ptarmigan Bay (69°29'00.00"N, 139°04'00.00"W and 69°28"N, 140°13"W)**Population studies on Dolly Varden from the Northwest Territories and Yukon North Slope**

This research project had a number of different components. The first was to conduct mark-recapture studies. By recapturing fish that had previously been tagged, the research team can figure out the size of the population. The team recaptured previously-tagged Dolly Varden in the Big Fish and Babbage rivers, and then tagged 500 Dolly Varden charr in the Big Fish River, Babbage River, Firth River, Joe Creek, and Fish Creek. The second component was to harvest 20 resident Dolly Varden charr from the Big Fish, Babbage, and Firth Rivers as well as Joe Creek. The team also harvested 50 Dolly Varden from Fish Creek near Komakuk Beach. The fish were harvested during the fall, and their biological information was recorded. This included their length, weight, age, sex, maturity, and diet. Tissue samples were also taken for contaminant analysis. The third component was to harvest 25 'anadromous' Dolly Varden charr in the Babbage River, Firth River, and Joe Creek, as well as 30 'anadromous' fish in Fish Creek near Komakuk Beach. An anadromous fish is born in freshwater, but spends most of its life in the sea before returning to freshwater to spawn. Fourth, the team attached satellite tags to large-sized Dolly Varden (longer than 21.5 inches) from the Babbage River or Firth River drainage basins. The fifth component was to harvest 50 isolated Dolly Varden in the Babbage River system, from the part of the river above the falls. The sixth and final component was to record the biological information for the subsistence catch of Dolly Varden charr at Herschel Island and Ptarmigan Bay in the Yukon.

Gallagher, Colin

Fisheries and Oceans Canada

Licence Number: S-18/19-3026-YK**Species:** All fish species**Location:** Shingle Point**Community based monitoring of coastal fish ecology and harvest of Dolly Varden**

The goal of this project was to gather more information about ecosystem structure and function within the Tarium Nirvutait Marine Protected Area. This was done by collecting samples of fish that were analyzed for stable isotopes and fatty acids. These fish were caught by local fishermen at the Shingle Point fish camp. The research team also collected information about the fish catch, and recorded biological information about the fish such as their length, weight, sex, maturity, and age. Fin clip samples were taken for genetic analysis, as well as samples from the fish stomachs. The results of these analyses will provide information on harvest levels and how much the biological information of this species varies among years. This data will be useful to evaluate the Dolly Varden mixed stock fishery at Shingle Point. The program also provided training to support long-term, community-based, coastal monitoring in the area, and helped to evaluate the most effective indicators that could be used in cumulative impact monitoring programs.

Gallagher, Colin

Fisheries and Oceans Canada

Licence Number: S-18/19-3053-YK

Species: All fish species

Location: Kakisa Lake

Assessment of walleye in Kakisa Lake 2018

The goal of this project is to collect information that will be used to assess the population of walleye in Kakisa Lake. This information will also be helpful when assessing the walleye population in nearby Tathlina Lake. Walleye have been periodically sampled in the past to collect information about their life history and population status. The walleye fishery has been identified as a regional priority for Fisheries and Oceans Canada (DFO) Fisheries Management.

Gray, Derek

Wilfrid Laurier University

Licence Number: S-18/19-3033-YK

Species: All fish species

Location: Mackenzie Delta

How will fish communities in Gwich'in and Inuvialuit lakes respond to climate change?

This study has four goals. The first is to develop a baseline data set for fish populations, fish habitat, water quality, and water temperatures in small and medium-sized lakes in the Mackenzie Delta region. The second is to develop fish habitat models to identify habitat that is suitable for coldwater fishes in the region. The third is to forecast how the distribution of coldwater fish will change under different climate change scenarios. The final goal is to assess the likelihood that the distribution of coldwater fishes, such as walleye, will expand in the Gwich'in Settlement Area and Inuvialuit Settlement Region.

Harris, Katherine

Crown-Indigenous Relations and Northern Affairs Canada

Licence Number: S-18/19-3027-YK-A1

Species: All fish species

Location: Baker Creek, Yellowknife Bay

Giant Mine fish use and habitat assessment 2018

As part of the Giant Mine Closure and Reclamation plan, there are some planned reclamation activities within Baker Creek and along the adjacent shoreline of Yellowknife Bay in Great Slave Lake. During this research project, fish were sampled using non-lethal methods such as electrofishing, seine netting, gillnetting, block netting, dip netting, and kick netting. Data were recorded to confirm what parts of Baker Creek and Yellowknife Bay are important habitats that are used by the fish.

Howland, Kimberly

Fisheries and Oceans Canada

Licence Number: S-18/19-3013-YK-A2

Species: All fish species

Location: McVicar Arm, Great Bear Lake

Long-term monitoring of cumulative impacts to fisheries and ecosystems in Great Bear Lake

This project has three main goals. The first is to monitor the size, age, fecundity (the number of eggs produced per female), growth, and mortality of lake trout populations from the Dareli (Keith), Turili (McVicar), Kwit tla (McTavish), Tugacho (Dease), and Tirato (Smith) Arms of Sahtú (Great Bear Lake). These data will be used to assess the stocks of lake trout, and to see how the biological characteristics of lake

trout stocks change over time. The second goal is to use collections of ciscos that were harvested from Great Bear Lake in the past to see whether there are multiple forms or species of fish present in the lake. This will be done by examining a few different things about the fish; their morphology (their structure and form), their meristic variation (the number of gill slits, scales, fins, or other body parts), and their life history characteristics (how the fish grow, survive, and reproduce over time). The third and final goal is to measure ecosystem components in Great Bear Lake that influence fish productivity, such as limnological parameters, the diversity and density of aquatic invertebrates in both the sediment and water, and nearshore terrestrial invertebrates.

Insley, Stephen

Wildlife Conservaton Society Canada

Licence Number: S-18/19-3023-YK

Species: Bearded seal, ringed seal

Location: Amundsen Gulf, Darnley Bay

ISR seal monitoring

The goal of this project is to design and maintain a long-term, locally-based research program focused on the diet and condition of ringed seals (*Pusa hispida*) and bearded seals (*Erignathus barbatus*) in the Amundsen Gulf. A reliable and consistent record of ringed and bearded seal diet and condition is important to evaluate the ecological health of these species, as well as to evaluate the impacts of climate change on Arctic marine species more generally.

Janjua, Muhammad Yamin

Fisheries and Oceans Canada

Licence Number: S-18/19-3008-YK

Species: Burbot, goldeye, inconnu, lake whitefish, northern pike, sucker, walleye

Location: Great Slave Lake

Buffalo River spring sampling

The goal of this study was to continue a long-term monitoring program at the mouth of the Buffalo River. This study takes place each spring, and assesses the health of inconnu by gathering biological information about the fish and collecting data on the catch-per-unit-effort.

Janjua, Muhammad Yamin

Fisheries and Oceans Canada

Licence Number: S-18/19-3050-YK

Species: Burbot, cisco, inconnu, lake trout

Location: Great Slave Lake

GSL fall sampling in area 1E & 1W

The goal of this project is to promote the development of sustainable fisheries in Great Slave Lake while ensuring that fish populations are preserved. This project will also collect biological data on lake trout and lake whitefish during their spawning seasons, and will establish catch-per-unit-effort levels using commercial and scientific multimesh gillnets. This will help to establish a proper management reference point for lake trout and lake whitefish, and will also help the research team gather information that will be used to provide scientific advice for the management of lake trout.

Kuchapski, Kathryn

ERM Consultants Canada Ltd.

Licence Number: S-18/19-3034-YK-A1

Species: All species (excluding marine mammals)

Location: Waterbodies in the Ekati Diamond Mine lease area

2018 Ekati aquatic effects monitoring program

This research project is part of the Ekati Aquatic Effects Monitoring Program (AEMP) at the Ekati Diamond Mine. The AEMP is one of a number of monitoring and management plans that uses an adaptive approach to identify, understand, and reduce the effects of mine activities on the surrounding environment. This project addresses fisheries near the mine, and in 2018 the goal of this project was to collect information on small- and large-bodied fish for the AEMP. Sampling for small-bodied fish species (for example, slimy sculpin) is conducted every three years, while sampling for large-bodied fish species (lake trout and round whitefish) is conducted every six years. In 2018, both large-bodied and small-bodied fish were sampled.

Lea, Ellen

Fisheries and Oceans Canada

Licence Number: S-18/19-3005-YK

Species: Bearded seal, ringed seal

Location: Safety Channel

Assessment of reproduction, condition disease and contaminants of ringed seals and bearded seals through harvest-based monitoring at Ulukhaktok, NT, 2018

This study has four main goals. First, to sample and measure ringed seals that are taken in the annual harvest in the Ulukhaktok area. This totals about 100 ringed seals each year. The reproductive status and body condition of the seals is an indicator of ecosystem productivity and fluctuations in the seal population level. Second, to examine the data collected for the first goal in the context of regional ice conditions. Third, to co-ordinate with, and provide samples for, diet and stock health studies. These studies include examinations of disease in the populations, which are particularly relevant given the unusual mortality events that have occurred in Alaska, NWT, Nunavut, and Russia. The fourth and final goal is to use community-based monitoring programs to sample and measure any bearded seals that happen to be taken in the annual harvest in the Ulukhaktok area. This totals about 10 bearded seals each year. They are studied to determine the reproductive rates, growth, condition, and prey preferences of bearded seals.

Lea, Ellen

Fisheries and Oceans Canada

Licence Number: S-18/19-3006-YK

Species: Arctic charr (searun or landlocked), sand lance, capelin, Greenland cod

Location: Ulukhaktok area waters

Ulukhaktok summer coastal harvest monitoring 2018

The goal of this research project is to collect harvest and biological information during the summer subsistence Arctic charr harvest in the coastal waters near Ulukhaktok. The information that was collected by the monitors is an integral part of the community fishing management plans that are established between the Olokhtomiut Hunters and Trappers Committee, the Fisheries Joint Management Committee, and Fisheries and Oceans Canada.

Lea, Ellen

Fisheries and Oceans Canada

Licence Number: S-18/19-3029-YK**Species:** All fish species**Location:** Areas along the Tuktoyaktuk Peninsula**Tuktoyaktuk Peninsula charr project 2018**

The goal of this research project is to address the gap in our knowledge of charr populations, such as Dolly Varden charr, Arctic charr, and lake trout, in the Tuktoyaktuk Peninsula area. Sampling crews that were hired by the Tuktoyaktuk Hunters and Trappers Committee used gillnets of various sizes at McKinley Bay, Char Point, and other locations that are ideal for fishing along the Tuktoyaktuk Peninsula. This work took place for up to 14 days in July and August 2018.

Lea, Ellen

Fisheries and Oceans Canada

Licence Number: S-18/19-3030-YK**Species:** All fish species**Location:** Tuktoyaktuk Harbour**Tuktoyaktuk Harbour fish study**

This research project has five goals. First, to collect a three year record of catch-per-unit-effort (CPUE) data that can be used to determine the abundance of cisco and other fish species in Tuktoyaktuk Harbour during the main fishery seasons in July and September. Second, to monitor the number, species, and CPUE of fish harvested in Tuktoyaktuk Harbour by residents of Tuktoyaktuk during the summer season. Third, to compare fish diversity, abundance, and demographics from 2018 with the results of studies that were carried out between 1997 and 1999. Fourth, to link characteristics of the fish community and its diversity with changes in fish habitat in Tuktoyaktuk Harbour, in order to provide a baseline of current seabed conditions. This is particularly important given the growing evidence of coastal erosion and sedimentation in the area. This baseline data is critical to support and monitor any future changes to the seabed and fisheries that result from proposed industrial development (dredging) or climate-driven change in the region. The fifth and final goal is to enhance and use existing expertise in the community to collect biological data, and to coordinate the delivery of this program at the community level.

Lea, Ellen

Fisheries and Oceans Canada

Licence Number: S-18/19-3037-YK**Species:** Bowhead whale**Location:** Beaufort Sea**Bowhead whale tagging – Beaufort Sea 2018**

The goal of this research project is to place satellite-linked transmitters and acoustic instruments on bowhead whales. The data collected from these instruments will be used to determine whale movements, feeding areas, diving behavior, residence times, and behavior near seismic operations or other sources of industrial noise. The acoustic tags will be used to determine the rates at which bowhead whales make their calls, relative to ambient noise.

Loseto, Lisa

Fisheries and Oceans Canada

Licence Number: S-18/19-3019-YK

Species: Beluga whale

Location: Aklavik, Darnley Bay, Hendrickson Island, Inuvik, Sachs Harbour area, Tuktoyaktuk area, Ulukhaktok area

Beluga health research and monitoring in the Inuvialuit Settlement Region

This research project has three main goals. First, to support the development and maintenance of a long-term monitoring and sampling program for beluga whales in the Tarium Niryutait Marine Protected Area. This will be done by collecting data about stock indicators such as age, sex, and length, and about beluga health such as diet, disease, parasites, contaminants, and whale condition. This data will be collected in partnership with the Fisheries Joint Management Committee and Fisheries and Oceans Canada. Second, to use samples collected from harvested whales to provide a baseline characterization of beluga health. This is needed to assess the potential impacts of regional changes, such as climate change, and localized changes, such as oil and gas activities, on beluga and their habitat. The final goal is to build capacity for science and long-term monitoring of beluga health in the Inuvialuit Settlement Region.

Loseto, Lisa

Fisheries and Oceans Canada

Licence Number: S-18/19-3020-YK

Species: Beluga whale

Location: Hendrickson Island

Eastern Beaufort Sea beluga tagging program

The movement of beluga whales in relation to their prey species, and during a period when beluga habitat is changing, were identified as areas requiring further research at both the Beluga Summit in February 2016, and the Eastern Beaufort Sea Beluga Stock Assessment meeting in January 2017. This research project was designed to address these research priorities, and the project results will support decision-making by management groups within Fisheries and Oceans Canada and co-management organizations. The goal of the project is to characterize the movement patterns, dive behaviour, and resource and habitat use of beluga whales in the eastern Beaufort Sea. To do this, the research team integrates spatial and temporal data gathered using telemetry and traditional knowledge. Telemetry data is gathered through the capture and tagging of free-swimming beluga whales. The team then uses this data to assess potential changes in the behavior of beluga whales over time. Telemetry data will also provide information that can be used to correct dive data and spatial/temporal coverage data that will be collected during an aerial survey that will be done in 2019. This aerial survey will be used to update estimates of population abundance, which has been identified as a research priority because the last population abundance estimate for beluga in the eastern Beaufort Sea was conducted more than 25 years ago.

Loseto, Lisa

Fisheries and Oceans Canada

Licence Number: S-18/19-3028-YK

Species: All fish species

Location: Kuujjua River (Minto Inlet), Ulukhaktok area coastal marine waters

Acoustic monitoring of fish habitat use in the Ulukhaktok area

This research project has three goals. The first is to deploy acoustic receivers in Prince Albert Sound, Minto Inlet, and coastal lakes near Ulukhaktok. The second goal is to surgically implant electronic tags in 50 Greenland cod, 75 Arctic charr, ten Pacific salmonids (for example, pink salmon), ten Greenland shark,

and 50 Arctic cod. The third goal is to attach five external pop-up satellite archival tags on either Arctic charr, Pacific salmon, or Greenland Shark. The research team will also collect environmental data, information about the marine invertebrates that make up the base of the food web, and biological information from fish such as life history, tissue samples, and diets.

Low, George

Dehcho Aboriginal Aquatic Resource and Oceans Management

Licence Number: S-18/19-3000-YK

Species: Walleye, lake whitefish, northern pike

Location: Sanguéz Lake

Sanguéz Lake fish down study

This research project has five main goals. The first is to establish a population estimate of walleye in Sanguéz Lake through a two year tag and recapture study. The second is to estimate current concentrations of mercury in walleye and northern pike. In 2013, mean mercury concentration in walleye was 0.71 mg/kg wet weight, and in pike was 1.09 mg/kg wet weight. The third goal is to reduce the number of adult walleye and pike so that fewer young walleye will be consumed; this is called a 'fish down'. However, a suitable number of large walleye adults need to be left in the lake as spawning stock. The size and age distribution of the walleye population will be re-examined for a ten-year period after the fish down. Once stocks have stabilized, a safe harvest level will be established for the lake. The fourth goal is to determine if population structure and mercury concentration data from this study can be used to inform management strategies for other lakes in the region. This will be done through both data analysis and an extensive literature review. The fifth goal is to provide a traditional knowledge and science experience for youth in the Dehcho.

Low, George

Dehcho Aboriginal Aquatic Resource and Oceans Management

Licence Number: S-18/19-3016-YK

Species: Lake whitefish, northern pike, walleye

Location: Horn River (61°28"N, 118°04"W)

Horn River creel survey and stock study

The goal of this project is to collect information on the walleye population in the Horn River that can be used to manage the fishery and make future changes to the fisheries regulations. In order to do this, the research team will collect two types of information. First, the population structure and spawning rate will be determined by setting gill nets of varying mesh sizes and recording information from a portion of the catch. The information that will be recorded includes the length, weight, sex, maturity, and age of the fish. Second, information about the current recreational fishery will be collected through a creel survey. This type of survey is done by interviewing all of the anglers in an area. The interview will include questions about the amount of time spent fishing, the number and type of fish that were caught, the number of fish released, and the place where the angler lives. The surveys will also be an opportunity for community monitors to develop good recording techniques.

Machtans, Hilary

Golder Associates Ltd.

Licence Number: S-18/19-3003-YK

Species: All fish species

Location: Horseshoe Island, Jackfish Bay in Yellowknife Bay (62°22'45.9"N, 114°24'34.5"W),

Kam Bay in Yellowknife Bay (62°23'10.6"N,
114°23'22.7"W)

Con Mine environmental effects monitoring phase 6 study – periodic monitoring (Miramar Northern Mining Ltd.)

The Con Mine is in the sixth phase of an Environmental Effects Monitoring (EEM) program that is required under the federal Fisheries Act Metal Mining Effluent Regulations. The goal of this study is to monitor fish and benthos (organisms that live in the sediment at the bottom of the water) at several locations to determine if treated Con Mine effluent is affecting fish and fish habitat. The locations include Jackfish Bay (which was exposed to the effects of the mine), Horseshoe Island Bay (which is a reference area that was not exposed to any effects from the mine), and Kam Bay (another reference area for the benthos survey). This study was designed to replicate the study design for an earlier phase of the EEM, so the data from the two phases could be compared.

Majewski, Andrew

Fisheries and Oceans Canada

Licence Number: S-18/19-3018-YK

Species: All species (excluding marine mammals)

Location: Amundsen Gulf

Canadian Beaufort Sea – marine ecosystem assessment 2017-2021

This research project was designed to address gaps in our knowledge about offshore marine fish and the ecosystem components that support them. The results of this study will therefore support the conservation of Arctic biodiversity through science-based decision-making, contribute to the establishment of low impact shipping corridors by understanding the potential impacts on fish and marine mammals, and ensure abundant Arctic fisheries by contributing to our knowledge of inshore and offshore resources. This project will also contribute to a science-based approach to the development of oil and gas and other resources in the region.

McLean, Sarah

De Beers Canada Inc.

Licence Number: S-18/19-3007-YK

Species: All fish species

Location: Kennady Lake watershed and waterbodies in the Gahcho Kue Mine lease area

Gahcho Kué Mine aquatic effects monitoring program (AEMP)

The Gahcho Kué Mine has a water licence that requires a team to monitor the effects of the mine on nearby aquatic systems. This monitoring program is called an Aquatic Effects Monitoring Program (AEMP). In 2018, the following information will be gathered to support the Gahcho Kué Mine AEMP; 1) fish habitat and community monitoring data, 2) fish health and fish tissue chemistry during the open-water period, and 3) phytoplankton, zooplankton, and benthic invertebrate sampling. The information will be used to document conditions in the study lakes, as well as in the system downstream of the mine between Area 8 (Kennady Lake) and Lake 410.

McLean, Sarah

De Beers Canada Inc.

Licence Number: S-18/19-3009-YK-A1

Species: All fish species

Location: Redknife River

Gahcho Kué offsetting – Redknife River baseline data study

This research project is part of the Gahcho Kue Fisheries Act Authorization, and will characterize the baseline conditions in Redknife River. This project is being done in advance of an 'offsetting project' that will mitigate losses of fish caused by the Gahcho Kue Mine. The offsetting project will improve the ability of fish to move upstream at the Mackenzie Highway bridge crossing. This project is in its first phase, and in 2018 will use electrofishing methods to evaluate current fish movement, with a focus on what species are present, in what numbers, and when they move upstream.

McNicholl, Darcy

Fisheries and Oceans Canada

Licence Number: S-18/19-3001-YK

Species: All fish species

Location: Paulatuk area, Argo Bay, Cape Parry Peninsula

Darnley Bay nearshore fish survey 2018

The goal of this research project is to investigate the community of coastal fishes and their habitat in Argo Bay, which is located at the southern end of Darnley Bay. Information on habitat structure and function will be examined and combined with data that was gathered during previous field programs. The project will look for linkages between nearshore and offshore ecosystems, build on previous field research, and collect data related to the Anguniaqvia niqiqyuam Marine Protected Area.

McNicholl, Darcy

Fisheries and Oceans Canada

Licence Number: S-18/19-3017-YK

Species: All fish species

Location: Sachs Harbour area

Sachs Harbour coastal survey 2018

This research project was designed as part of a community-based coastal monitoring program in the Beaufort Sea region. Baseline data will be collected on fish diversity, fish habitat, and how fish habitat changes under changing environmental conditions.

Miller, Matthew

Northwest Territories Power Corporation

Licence Number: S-18/19-3042-YK

Species: All fish species

Location: Twin Gorges forebay

Taltson Twin Gorges hydro generating facility aquatic effects monitoring program (AEMP)

The Northwest Territories Power Corporation has a water licence that requires a team to conduct an Aquatic Effects Monitoring Program (AEMP) at the hydro generating facility at Taltson Twin Gorges. In 2018, the research team identified and relocated fish that become stranded during the August rampdown event at the hydro facility. As they were relocated the fish were identified by species and counted. Up to 30 individual fish from each species and age class were measured, weighed, and sampled to determine their age (for example, by taking samples of fin rays or scales). The team expects that the number of fish

that die while being relocated will be low, and no fish will be harvested in 2018. This is in contrast to prior years of the study (2014 to 2016) when fish were harvested for analysis.

Moore, Jonathan

Simon Fraser University

Licence Number: S-18/19-3015-YK

Species: Broad whitefish, inconnu

Location: Arctic Red River, Mackenzie Delta, Peel River

Community-based long term monitoring of whitefish in the lower Mackenzie system

This research project had two main goals. The first goal was to establish a community-based monitoring program in three Gwich'in communities; Fort McPherson (sampling the Peel River), Tsiigehtchic (sampling the Arctic Red River), and Aklavik (sampling in the Mackenzie River delta). The community-based monitoring projects focused on the ecology and biology of broad whitefish, the species that contributes most to the subsistence fisheries in the area. The second goal was to use the data collected by this community-based monitoring program to address two research questions. The first question was, how do the size and age of broad whitefish captured in the subsistence fishery today compare to the size and age of fish captured in the 1990s and early 2000s? The second question was, what are the relative contributions of anadromous, semi-anadromous, and non-anadromous broad whitefish to the present-day subsistence fishery?

Niemi, Andrea

Fisheries and Oceans Canada

Licence Number: S-18/19-3054-YK

Species: All species (excluding marine mammals)

Location: Minto Inlet

A new approach for monitoring winter life cycle parameters of key forage species using moored technology

This research project had three goals. The first was to assess winter habitat use by different life-stages of fish and zooplankton, including the habitat where ice and water meet. This was investigated using moored instruments. The second goal was to use a new combination of acoustic monitoring technologies to identify winter life cycle events (such as spawning and migrations) and take biological measurements (such as biomass) for ecologically significant species. The third goal was to compare moored and ship-based acoustic measurements of the distribution and biomass of ecologically significant species across life history stages. For example, the number of young-of-year and adult Arctic cod would be measured using the two methods in order to assess the feasibility of using moored acoustics for long-term monitoring.

Rosabal, Maikel

Université du Québec à Montréal

Licence Number: S-18/19-3014-YK

Species: Benthos, lake whitefish, northern pike, yellow perch, zooplankton

Location: Long Lake, Lower Martin Lake, Handle Lake

A multidisciplinary investigation of recovery in Yellowknife area lakes

This research project had two goals. The first was to assess how past Giant Mine operations have contributed to the bioaccumulation of arsenic and other trace elements (such as antimony, mercury, lead,

zinc, nickel, cadmium, copper, and selenium) in freshwater biota in several nearby lakes. The second goal was to determine if any bioaccumulation that was observed in lakes that were impacted by the mine poses a risk to the fish species and invertebrates living there.

Sharpe, Rainie

Golder Associates Ltd.

Licence Number: S-18/19-3010-YK

Species: All fish species

Location: Snap Lake, waterbodies within the Snap Lake Mine lease area

Snap Lake Mine aquatic effects monitoring program for De Beers Canada Inc.

A fish survey will be conducted in 2018 to document fish health and fish tissue chemistry in the area around the Snap Lake Mine. This will be done as part of the Aquatic Effects Monitoring Program (AEMP) that is required to fulfil the requirements of the water licence and fisheries authorization for the Snap Lake Mine. The fish survey will investigate a small-bodied fish species, lake chub (*Couesius plumbeus*), that will be harvested from Snap Lake, Northeast Lake, and Lake 13. Plankton and benthos (small creatures living in the sediment on the lake bottom) will also be collected from all three lakes.

Sharpe, Rainie

Golder Associates Ltd.

Licence Number: S-18/19-3035-YK-A1

Species: All fish species

Location: Matthews Lake, Sandy Lake at Tundra Mine, Reference Lake B (64°00'28.8"N, 111°04'26"W)

Tundra Mine fish health and tissue chemistry program (2018)

The goal of this research project is to conduct a fish health assessment to measure the potential effects of the Tundra Mine on fish. These effects would result from the release of water and effluent from the mine into waterways near the project site. Sampling for this project will include both lake whitefish (*Coregonus clupeaformis*) and lake trout (*Salvelinus namaycush*), and will include both lethal and non-lethal fish sampling.

Sharpe, Rainie

Golder Associates Ltd.

Licence Number: S-18/19-3040-YK

Species: All fish species

Location: Lac du Sauvage, Thonokied Lake

Dominion Diamond Ekati Corporation – Jay 2018 baseline survey

The Dominion Diamond Ekati Corporation (DDEC) will conduct a sampling program of small-bodied fish in 2018 to document the baseline conditions for fish health and fish tissue chemistry at Lac du Sauvage. This sampling program is a requirement for an aquatic effects monitoring program. Sampling will target slimy sculpin (*Cottus cognatus*) in both Lac du Sauvage and Thonokied Lake. DDEC will also collect plankton (small creatures and plants living in the water) and benthos (small creatures living in the sediment at the bottom of the lake) from both Lac du Sauvage and Thonokied Lake.

Sibbald, Carey

Stantec Consulting Ltd.

Licence Number: S-18/19-3044-YK

Species: All fish species

Location: Truck Lake Channel (64°24'12"N, 115°06'12"W), Dam 2 Channel (64°26'58"N, 115°03'08"W)

Comprehensive environmental monitoring at the former Colomac Mine site, Northwest Territories

The main goal of this research project is to collect data in two channels, Truck Lake Channel and Dam 2 Channel. The data that will be collected includes stream reach characteristics, water chemistry, hydrology, substrate characteristics, benthic macroinvertebrates, fish use, and the geotechnical and hydrotechnical stability of the channel.

Sinclair, Sean

Diavik Diamond Mines Inc.

Licence Number: S-18/19-3031-YK

Species: Lake trout, lake whitefish, longnose sucker, round whitefish

Location: Lac de Gras area

Diavik fish palatability and tissue chemistry study

This research project had three goals. The first was to catch fish in Lac de Gras for local citizens to evaluate for texture and taste. The second was to collect samples from 20 lake trout in Lac de Gras that could later be analyzed to determine fish age and mercury content. These samples will contribute to a better understanding of how age relates to mercury concentrations in local trout populations. The third goal was to monitor mercury levels in Lac de Gras trout to determine if these concentrations are increasing over time.

Sparling, Paul

White Mountain Environmental Consulting

Licence Number: S-18/19-3032-YK

Species: All species (excluding marine mammals)

Location: Waterbodies within the Inuvik-Tuktoyuktuk Highway corridor

Assessing and documenting fish utilization of fresh water habitats adjacent to the Inuvik to Tuktoyuktuk all season road

The goal of this project was to study how fish use waterbodies near the Inuvik-Tuktoyuktuk Highway. These waterbodies are vulnerable to the effects of construction of the new all-season highway from Inuvik to Tuktoyuktuk. The data collected during this study will be used to inform local management practices.

Stevens, Cameron

Golder Associates Ltd.

Licence Number: S-18/19-3004-YK

Species: All fish species

Location: Paulette Creek

Offsetting baseline study at Paulette Creek

This research project duplicates a study that was done in 2017. The goal of this project is to assess the presence and distribution of species that spawn in the spring, specifically longnose sucker, in Paulette

Creek. Another goal is to determine whether existing beaver dams present a barrier to migrating fish species like the longnose sucker.

Stevens, Cameron

Golder Associates Ltd.

Licence Number: S-18/19-3036-YK

Species: Arctic cisco, burbot, lake whitefish, northern pike, slimy sculpin

Location: Bluefish Lake

Northwest Territories Power Corporation – Bluefish Hydro

The goal of this research project is to fulfill the requirements of the water licence for the Bluefish Hydro installation. This project includes a study of the effects of mercury accumulation in slimy sculpin and northern pike that live in flooded areas of Bluefish Lake, as well as any changes in the rate of mercury accumulation in species living in this lake.

Stevens, Cameron

Golder Associates Ltd.

Licence Number: S-18/19-3043-YK-A1

Species: Inconnu, lake whitefish

Location: Marian River

Stenodus genetics - inconnu stock identification on the Marian River

The goal of this project is to collect genetic samples from up to 200 inconnu from Marian River during their annual upstream migration. This project will support a basin stock assessment run by Fisheries and Oceans Canada. The samples will be collected during two sampling events, one during the mid-August migration and one during the early September migration. The results of this study will help determine whether these two migrations are distinct sub-stocks of inconnu, or the same stock.

Stevens, Cameron

Golder Associates Ltd.

Licence Number: S-18/19-3046-YK

Species: Arctic grayling, coregonid eggs, inconnu, lake whitefish

Location: Lac La Martre, La Martre River

Spawning habitat assessment for adfluvial lake whitefish and inconnu on the La Martre, NWT

Currently there is a lack of information about the spawning habitat and life history of lake whitefish and inconnu in the Great Slave Lake region, including stocks that live in the La Martre River. Local knowledge and previous baseline studies indicate that the two species of fish spawn below La Martre River falls. The goal of this research project is to obtain ecological and life history information on coregonids spawning below the La Martre River falls, and to identify and describe inconnu and lake whitefish spawning locations. The information that is collected during this project will contribute to the conservation and management of inconnu in the Great Slave Lake region, and will address data gaps for the Dominion Diamond Ekati Corporation Jay Project offsetting plan. Specifically, the results of this project will provide information about the potential use of the Marian River inconnu stock as a source for the reintroduction of inconnu in the Yellowknife River.

Stevens, Cameron

Golder Associates Ltd.

Licence Number: S-18/19-3047-YK

Species: All species (excluding marine mammals)

Location: 63°6'36"N, 116°24'27"W

Tłıchq Government fish camp at Shoti Lake for the Marian watershed stewardship program (MWSP)

This research project has two goals. The first is to capture lake whitefish and a predatory species (either walleye or northern pike) in Hislop Lake. The second goal is to conduct a fish health assessment that includes the collection of muscle tissue and ageing structures from up to 20 individuals from each species. This is the second year of baseline data collection for this project in Shoti Lake; the first year of sampling occurred in 2014. The fish will be collected under the Tłıchq Marian Watershed Stewardship Program, which is a community-led, community-based monitoring program that is intended to build community capacity while determining fish health over time in the lakes in the Marian River watershed.

Stevens, Cameron

Golder Associates Ltd.

Licence Number: S-18/19-3048-YK

Species: All species (excluding marine mammals)

Location: La Martre Lake (63°13'49"N, 117°43'13"W)

Tłıchq aquatic ecosystem monitoring project (TAMEP) – Lac La Martre fish sampling

The goal of this research project is to capture both lake whitefish and a predatory species (for example, lake trout), and conduct a fish health assessment that includes the collection of muscle tissue and ageing structures from up to 20 of each species in Lac La Martre. This is the second year of baseline data collection in Lac la Martre. The fish will be collected under the Tłıchq Aquatic Ecosystem Monitoring Project (AEMP), which is a community-led, community-based monitoring program. The goal of the AEMP program is to build community capacity while determining fish health over time in the lakes in the Tłıchq territory.

Stevens, Cameron

Golder Associates Ltd.

Licence Number: S-18/19-3052-YK

Species: Cisco, lake whitefish

Location: Tartan Rapids and Bluefish Rapids on the Yellowknife River

Yellowknife River cisco monitoring

The goals of this research project are to assess the timing and duration of the spawning migration, to determine spawning locations, to take a sub-sample of fish throughout the spawning migration, and to collect data on fish health, length, weight, and age. The same methods for fish surveys and processing will be used in 2018 as were used in previous years at the Tartan Rapids and Bluefish Rapids. These ongoing field studies will support Fisheries and Oceans Canada in the development of an integrated management plan for river-run cisco in the Yellowknife River, in cooperation with the Yellowknives Dene First Nation.

Taylor, Scott

Wood Environment & Infrastructure Solutions

Licence Number: S-18/19-3038-YK

Species: All fish species

Location: Mackenzie River near Norman Wells

Fish and fish habitat study at Norman Wells artificial islands, Northwest Territories (NWT)

The goal of this research project is to conduct an assessment of the fish and fish habitat in the immediate vicinity of the Norman Wells operations at the artificial islands in the Mackenzie River. The purpose of this study is to understand the extent of fish habitat that may have been established since the artificial islands were constructed in the mid-1980s. This project will characterize the fish habitat around the shoreline of the artificial islands and in nearshore areas, and will assess the current use of these areas by fish species that are present in the Mackenzie River at Norman Wells.

Zhu, Xinhua

Fisheries and Oceans Canada

Licence Number: S-18/19-3002-YK-A1**Species:** All fish species**Location:** Great Slave Lake**Monitoring and assessing the cumulative impacts on important fish population productivity and community diversity in Great Slave Lake**

This is a multi-year research project with the goal to develop a standard monitoring framework that can be used to assess the cumulative impacts on fish population productivity and community integrity. To do this, the research team will pursue a number of activities. First, the team will create methodologies, in accordance with the Cumulative Impacts Monitoring Program Pathways Approach to Protocol Development, that can be used to monitor changes in fish population productivity, fish community dynamics, and aquatic ecosystem attributes. Second, the team will set up a framework to integrate information on the biological, ecological, and socio-economic characteristics of fish in Great Slave Lake. Third, the team will establish collaborative partnerships between researchers, resource users, Indigenous communities, and decision makers to ensure the effectiveness of Great Slave Lake fisheries and ecosystems. Another scientific goal is to construct an assessment network for fisheries and ecosystem changes in Great Slave Lake, to ensure the sustainable development of fisheries. To accomplish this goal, the research team will compare the mesh-specific capture efficiency of fish in Great Slave Lake, develop a model-based evaluation of management tactics for Great Slave Lake fisheries, and develop science advice for fisheries management.

Wildlife

Adamczewski, Jan

GNWT, Department of Environment and Natural Resources
jan_adamczewski@gov.nt.ca

Permit Number: 500575

Region: NS, SS

Species Studied: Muskox, moose, caribou, wolves

Location: Lutselk'e area

Muskox surveys North Slave region February-March 2018

No summary was submitted for this licence.

Amuno, Solomon

University of Saskatchewan
solomon.amuno@gmail.com

Permit Number: 500561

Region: NS

Species Studied: Muskrat, squirrel

Location: Yellowknife, Ndilq

Toxic effects of chronic arsenicosis in muskrats and squirrels from Yellowknife

No summary was submitted for this licence.

Armstrong, Terry

GNWT, Department of Environment and Natural Resources
terry_armstrong@gov.nt.ca

Permit Number: 500633

Region: SS

Species Studied: Wood bison

Location: Slave River lowlands

Slave River lowlands bison population studies

The goal of this project was to count the various types of bison in the Slave River lowlands, such as cows, calves, and bulls. This is called a 'classification survey'. The project team counted 475 bison, a much larger number than they counted in 2017. In 2018, the 'calf ratio' was 31.5 calves for every 100 cows, which was slightly lower than the calf ratio in 2017. The 'yearling ratio' was 13.6 yearlings for every 100 cows, which was slightly higher than the yearling ratio in 2017. Since 1999, the average calf ratio has been 36.2 calves for every 100 cows, and the average yearling ratio has been 18.0 yearlings for every 100 cows. The bull-to-cow ratio in 2018 was 149.4 bulls per 100 cows, higher than the average of 89.7. The high bull-to-cow ratio in 2018 probably does not reflect the true ratio on the ground. This has happened in other years, when the cows move away in a tight group, so the project team can't classify many of them, but the bulls move more slowly and are more spread out, which makes them easier to see. In addition to the classification survey, the research team conducted five flights over the Slave River lowlands to monitor for anthrax, but did not detect any anthrax mortalities. No mortalities were reported by fire operations flights over the area either. The project team did not collect any bison tissue or fecal samples in 2018.

Armstrong, Terry

GNWT, Department of Environment and Natural Resources

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Permit Number: 500617**Species Studied:** Bison**Region:** NS, SS**Location:** Fort Providence and Behchokò area**Mackenzie bison population monitoring**

The goal of this project was to conduct a 'classification survey' within the range of the Mackenzie wood bison. To do a classification survey, the number of bulls and calves are compared to the number of cows. This helps the researchers predict whether the population is shrinking or growing. The research team surveyed the study area on July 6, 2018. Like every year since 2014, bison were difficult to find but the researchers were able to find and classify 180 bison, which is the most since 2013. This is still a relatively small sample of the total population of bison, however, so the results need to be used with caution. The number of calves per 100 cows, known as the 'calf ratio', was 46.5. The number of yearlings per 100 cows, known as the 'yearling ratio', was 23.9. The ratio of bulls to cows was 83.1 bulls per 100 cows. Since 1999, the average calf ratio has been 34.0, the average yearling ratio has been 19.0, and the average ratio of bulls to cows has been 85.8. In addition to the classification survey, the researchers conducted three flights to monitor for anthrax, but did not find any anthrax mortalities in the Mackenzie population. There were no reports of disease in bison that had been killed in collisions or by hunters, either.

Bidwell, Mark

Canadian Wildlife Service

mark.bidwell@canada.ca

Permit Number: 500612**Species Studied:** Whooping crane**Region:** SS**Location:** Within a 200 km radius of 60°10'N, 113°20'W**Ecology and recovery of endangered whooping cranes**

The goal of this project was to check on whooping crane pairs. In 2018, the Canadian Wildlife Service and Parks Canada conducted surveys for whooping cranes in breeding areas in the southern Northwest Territories and northern Alberta. These breeding areas were in and near Wood Buffalo National Park. They found 87 nests in May, which is the second highest count on record. Sixteen of the nests were outside the area designated as critical habitat, and eight were outside Wood Buffalo National Park. The project team also found between 27 and 29 whooping crane pairs without nests. During surveys in August, the research team saw 24 families with a single juvenile crane. This means that there were only 0.28 juveniles per nest, which is well below the 20-year average of 0.49 but within the natural long-term range of variation. Heavy rainfall during the egg hatch, or in the first few weeks after the egg hatch, probably contributed to the low number of young cranes in 2018. Results from 2018 show that the number of breeding cranes continues to increase, although it is still well below Canadian and international goals for population recovery. The results also show that cranes continue to use breeding habitat that is not currently designated as critical habitat.

Carter, Laurence

McGill University

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Permit Number: 500604**Species Studied:** Muskox

Region: IN

Location: Ivvavik National Park, Yukon North Slope, and northern Richardson Mountains

Muskox resource selection and interactions with caribou in the Yukon North Slope

No summary was submitted for this licence.

Croft, Bruno

GNWT, Department of Environment and Natural Resources
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Permit Number: 500484

Region: NS

Species Studied: Barren-ground caribou

Location: Délı̄nə south of Great Bear Lake, Keller Lake, and Grandin Lake; all areas between the communities of Behchokò, Whatì, Gamètì, Wekweètì, Detah, and Lutselk'e; and the area between Great Slave Lake and the mining locations of Snap and Kennady Lake

Monitoring of the Bathurst, Bluenose-East and Beverly caribou herds

No summary was submitted for this licence.

Detwiler, Jillian

University of Manitoba
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Permit Number: 500642

Region: IN, GW

Species Studied: Voles, northern red-backed vole, snails

Location: Inuvik

Assessing parasites of voles and freshwater snails in the Mackenzie River Delta

No summary was submitted for this licence.

Diavik Diamond Mines (2012) Inc.

Permit Number: 500537

Region: NS

Species Studied: Barren-ground caribou, wolverine, grizzly bear, raptors (peregrine falcons, gyrfalcons), waterfowl, shorebirds, vegetation, and lichen

Location: The Diavik wildlife study area situated on Lac de Gras

2017 wildlife monitoring program for the Diavik Diamond Mine

No summary was submitted for this licence.

Elkin, Brett

GNWT, Department of Environment and Natural Resources
brett_elkin@gov.nt.ca

Permit Number: 500489

Region: NS

Species Studied: Boreal caribou

Location: Behchokò and Whatì area

Boreal caribou population trends, habitat use and response to the proposed Tłı̄chò all-season road in the Taiga Plains, North Slave region

No summary was submitted for this licence.

Errington, Ruth

Canadian Forest Service
ruth.errington@canada.ca

Permit Number: 500634

Region: DC, SS

Species Studied: Flora

Location: From 63°0'38.6"N and 123°12'32.3"W, to 60°0'27"N and 116°59'30.3"W

Mackenzie Valley permanent monitoring plot network

No summary was submitted for this licence.

Fronczak, David

US Fish and Wildlife Service
dave_fronczak@fws.gov

Permit Number: 500644

Region: SS

Species Studied: Waterfowl

Location: Mills Lake Station

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, which helps researchers understand more about these birds. The 2018 fieldwork season ran from August 9 to August 26. During this time, the Mills Lake crew banded a total of 1,567 ducks (792 mallard, 668 northern pintail, 98 American green-winged teal, eight blue-winged teal, and one American black duck). They also banded five American coot and one hooded merganser. Of all of the mallards caught, 24% were young birds, and 26% of the northern pintail that were caught were young birds. Sixty previously banded ducks were recaptured, which gives the researchers valuable information about the population size and its migration. Water levels were above normal compared to previous years, and remained fairly stable before declining slowly throughout the month. This allowed trap sites to be widely spread throughout the Mills Lake marsh. The weather was warm in August with mid-day temperatures averaging 22°C and night-time temperatures averaging 10°C. The research team worked with the Department of Environment and Natural Resources (ENR) Wildlife Veterinarian Division to take samples to test for avian influenza in waterfowl for the first time. Detailed information can be obtained from the 'Mills Lake 2018 Preseason Banding Report' that was submitted to the South Slave ENR office in Fort Smith.

Hache, Samuel

Canadian Wildlife Service
samuel.hache@canada.ca

Permit Number: 500482

Region: SA, DC

Species Studied: Vultures, hawks, grouse, doves, cuckoos, owls, nighthawks, swifts, hummingbirds, kingfishers, woodpeckers, and passerines

Location: Along the Délı̄ne/Colville Lake winter roads

Winter road long-term landbird monitoring program

No summary was submitted for this licence.

Hache, Samuel

Canadian Wildlife Service
samuel.hache@canada.ca

Permit Number: 500597

Region: SS

Species Studied:

Location:

Using autonomous recording units to investigate multiple avian research questions

No summary was submitted for this licence.

Hache, Samuel

Canadian Wildlife Service
samuel.hache@canada.ca

Permit Number: 500600

Region: DC

Species Studied: Owls

Location: Highway 1 north of Fort Simpson

Using autonomous recording units to investigate multiple avian research questions

No summary was submitted for this licence.

Hache, Samuel

Canadian Wildlife Service
samuel.hache@canada.ca

Permit Number: 500609

Region: NS, SS

Species Studied: Vultures, hawks, grouse, doves, cuckoos, owls, nighthawks, swifts, hummingbirds, kingfishers, woodpeckers, and passerines

Location: Within 2.5 km of Highway 3 between Fort Providence and Yellowknife, and within 2.5 km of Highway 4 (Ingraham Trail) outside of Yellowknife

Understanding landbird population structure and the role of natural disturbance

No summary was submitted for this licence.

Hino, Takashi

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Permit Number: 500616

Region: IN, NS

Species Studied: *Colias hecla*, *rankinensis*, *nastes*, and *tyche thula*, and other Holarctic species of *Oeneis*, *Boloria* and *Erebia* genera

Location: Ulukhaktok, Yellowknife

A research of butterflies in far north

The researcher visited Ulukhaktok from July 2 to 9, to conduct research on the variation and habitat of *Colias* species. *Colias* are a genus of butterflies that are sometimes called 'clouded yellows'. Because of cold days during the late summer, the researcher did not find any *Colias*. The researcher did see a few *Oeneis*, *Erebia*, and *Boloria* butterflies in the vicinity of Ulukhaktok. This included *Oeneis bore* (a white, grey, and brown butterfly also known as the white-veined Arctic or Arctic grayling), *Oeneis polixenes* (also known as the Polixenes Arctic or Norique Alpin), *Oeneis Melissa* (a translucent butterfly also known as the

Melissa Arctic), *Erebia fasciata* (the banded alpine), and *Boloria polaris* (a yellow, spotted butterfly also known as *Polaris fritillary*). These butterflies seem to be similar to those found in Nunavut. Rain prevented the researcher from finding any butterflies during fieldwork in Yellowknife on July 13 and 14. As a whole, this field season of butterfly research in the NWT was unfortunately fruitless, although the researcher will probably visit Ulukhaktok again sometime in the near future.

Hodson, Keith

khhodson72@gmail.com

Permit Number: 500639**Region:** SA, IN**Species Studied:** Peregrine falcon**Location:** Mackenzie River, from Johnston River to Separation Point**Bioelectronic monitoring of peregrine falcons along the Mackenzie River, Northwest Territories**

No summary was submitted for this licence.

Hurst, Madison

GNWT, Department of Environment and Natural Resources

madison_hurst@gov.nt.ca

Permit Number: 500566**Region:** SS**Species Studied:** Boreal caribou**Location:** South Slave area**Boreal caribou population trends and habitat use in the Hay River lowlands, Mackenzie, and Pine Point/Buffalo lake areas**

No summary was submitted for this licence.

Hurst, Madison

GNWT, Department of Environment and Natural Resources

madison_hurst@gov.nt.ca

Permit Number: 500567**Region:** SS**Species Studied:** Grey wolves**Location:** West of the Little Buffalo River**Wolf research and monitoring - South Slave 2017-2018**

No summary was submitted for this licence.

Hurst, Madison

GNWT, Department of Environment and Natural Resources

madison_hurst@gov.nt.ca

Permit Number: 500573**Region:** SS**Species Studied:** Moose**Location:** Slave River lowlands, Fort Resolution, and Fort Smith**Moose population survey - Slave River lowlands**

No summary was submitted for this licence.

Hurst, Madison

GNWT, Department of Environment and Natural Resources

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Permit Number: 500574

Region: SS

Species Studied: Wood bison

Location: Fort Providence and Hay River area

Bison control area program 2018 surveillance season

No summary was submitted for this licence.

Larter, Nic

GNWT, Department of Environment and Natural Resources

nic_larter@gov.nt.ca

Permit Number: 500445/500528

Region: DC

Species Studied: Boreal caribou

Location: The traditional areas of eight Dehcho First Nations, from 60° to 64°N latitude and from 119° to 123°30'W longitude

Continued monitoring and deployment of GPS collars on Dehcho boreal caribou

No summary was submitted for this licence.

Larter, Nic

GNWT, Department of Environment and Natural Resources

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Permit Number: 500525

Region: DC

Species Studied: Wood bison

Location: Along the Liard and South Nahanni River Valleys north of the 60th parallel to Blackstone River, including the communities of Fort Liard and Nahanni Butte

Nahanni wood bison population monitoring

No summary was submitted for this licence.

Larter, Nic

GNWT, Department of Environment and Natural Resources

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Permit Number: 500527

Region: DC

Species Studied: Moose

Location: North of the Mackenzie River, including the pipeline right-of-way and the proposed routing for the Mackenzie Valley Highway, and areas along the Liard Valley

Moose population monitoring

No summary was submitted for this licence.

McLean, Sarah

De Beers Canada

sarah.mclean@debeersgroup.com

Permit Number: 500570

Region: NS

Species Studied: Barren-ground caribou, nesting upland birds, and small mammals

Location: Gahcho Kue Mine, and the winter spur road that connects the mine to the Tibbitt to Contwoyto winter road

Gahcho Kue wildlife program

No summary was submitted for this licence.

Obst, Joachim

obst100@gmail.com

Permit Number: 500621

Species Studied: Loons

Region: NS

Location: Daring Lake

2018 climate change impacts on habitats, breeding densities and population trends of tundra birds and accumulation of mercury in loons at Daring Lake, NT

The goal of this project was to see if the population of tundra birds nesting near Daring Lake are declining from mercury contamination or the effects of climate change. Breeding birds were surveyed on foot for 17 days, from June 5 to June 21. The number of songbirds that the team saw was low because the weather was bad, although they spent more time surveying. Songbirds were seen in 117 of 279 (or less than half) of the traditional territories of 12 songbird species that were originally recorded in 2013. For the savannah sparrow, lapland longspur, and American pipit, only about one-quarter to one-third of their territories were reoccupied. It remains to be seen if the low number of birds seen in 2018 was due to unfavorable weather, negative population trends, or a low point in their natural population cycles. The populations of six breeding shorebird species also decreased by around two-thirds, from 35 to 11 occupied territories, and semi-palmated plovers decreased by 75% from 20 to only five breeding pairs in five years. Three other shorebirds that used to live in the area were no longer present and the numbers of long-tailed ducks also continued to decrease, from 220 to only 20.

O'Keefe, Harry

Dominion Diamond Ekati Corporation

harry.okeefe@ddcorp.ca

Permit Number: 500546

Species Studied: Caribou, grizzly bears, wolves, wolverine, foxes, upland breeding birds, falcons

Region: NS

Location: 1600 km² surrounding the Ekati Diamond Mine

Wildlife effects monitoring program

No summary was submitted for this licence.

Panayi, Damian

Golder Associates Ltd.

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Permit Number: 500598

Species Studied: All bird species

Region: NS

Location: Along the proposed route of the Tłı̄ch̄q all-season road, from the junction with Highway 3 (approx. 40 km southwest of Edzo) north to the junction with La Martre River

Tłı̄ch̄q all-season road migratory bird studies

The goal of this project was to study migratory birds along the proposed route for the Tłı̄ch̄q all-season road before any construction starts. Fieldwork began in May, when the survey team covered the first 50 km of the road route from Highway 3 northward. This is about half of the proposed route. The survey

team left 20 special sound recorders in some places to record the vocalizations of birds in the study area. These were installed by ATV within 300 m of the Old Airport Road in May and June. The locations they selected included a variety of habitat types within the study area, with preference given to wetland areas because they have the highest diversity of species-at-risk. The survey team went back to the area in July and retrieved all of the recorders. The focus of the 2018 fieldwork was just to build up a database of recordings, because a larger study is planned for 2019. The team has only analyzed recordings from two of the 20 locations, but from these two recordings they have identified 19 bird species. This included the common nighthawk, which is listed as 'threatened' in the Federal Species-at-Risk Act.

Perzoff, Tania

Tetra Tech EBA

tania.perzoff@tetrattech.com

Permit Number: 500652**Region:** DC**Species Studied:** Voles, shrews, mice, lemmings, and hares**Location:** Cantung Mine**Cantung Mine human health and ecological risk assessment**

No summary was submitted for this licence.

Powell, Norma

Hemmera Envirochem Inc.

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Permit Number: 500605**Region:** GW**Species Studied:** Grizzly bear, black bear**Location:** High Point area, 12 km east of Inuvik and 6 km north of the Inuvik airport**Inuvik high point wind design basis and performance specification**

No summary was submitted for this licence.

Powell, Norma

Hemmera Envirochem Inc.

npowell@hemmera.com

Permit Number: 500611**Region:** GW**Species Studied:** All birds**Location:** High Point area, 12 km east of Inuvik and 6 km north of the Inuvik airport**Inuvik high point wind design basis and performance specification**

No summary was submitted for this licence.

Powell, Norma

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Permit Number: 500649**Region:** GW**Species Studied:** All birds**Location:** High Point area, 12 km east of Inuvik and 6 km north of the Inuvik airport**Inuvik high point wind design basis and performance specification**

No summary was submitted for this licence.

Rausch, Jennie

Canadian Wildlife Service
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Permit Number: 500585

Region: NS

Species Studied: Lesser yellowlegs

Location: In the vicinity of Yellowknife, primarily at sites accessed by Highway 3 and the Detah road

Boreal shorebird monitoring program collaborative

The lesser yellowleg is a type of shorebird that nests in boreal areas across North America. It is designated a species of concern because its population is declining significantly across its range. The cause of the decline is not well understood, but it may include problems at their wintering grounds or during migration. In order to better understand the migratory routes and wintering areas used by birds from the NWT, the research team banded lesser yellowlegs near Yellowknife and placed GPS tracking devices on them. These GPS 'pinpoint tags' are tiny devices that repeatedly record where the bird is. The locations are then uploaded to satellites, where they can be downloaded by researchers. The tags provide high-quality location data, but are limited by battery life and only have enough power to record a limited number of locations. Also, the tags are only used on birds weighing 80g or more. Four lesser yellowlegs were captured and banded near Yellowknife during June, and one of them received a GPS pinpoint tag. The tag is still recording, so the tracking information is not yet available at the time of this report. The researchers will place tracking devices on more lesser yellowlegs near Yellowknife in 2019.

Reed, Eric

Canadian Wildlife Service
eric.reed@canada.ca

Permit Number: 500610

Region: NS

Species Studied: Dabbling ducks, diving ducks, loons, grebes, gulls, american wigeon, green-winged teal, lesser scaup, ring-necked duck

Location: Within 400 m of Highway 3, starting 16 km west of Yellowknife and going westward along the highway for 48 km

Abundance and productivity of waterfowl and waterbirds breeding in the boreal forest

The project team for this on-going waterfowl and waterbird monitoring project surveyed ponds by foot or canoe once each month from May to August. They found that the number of ring-necked duck, bufflehead, mallard, and American widgeon pairs was higher in 2018 than the long-term average (1985-2018). The number of lesser scaup was average, while the number of green-winged teal was below average. The team observed fewer ducklings of several species than the average, including American widgeon, lesser scaup, mallard, green-winged teal, and ring-necked duck. They observed about an average number of bufflehead ducklings, however. This Yellowknife Study Area (YKSA) survey has run from 1991 to 2018, and is one of the few long-term monitoring programs for red-necked and horned grebes. This is important because the western population of horned grebe has been classified as 'special concern' by the Committee On the Status of Endangered Wildlife In Canada (COSEWIC). Both red-necked and horned grebes are present in relatively high numbers in this area. Usually, there are about 48 horned grebe and 32 red-necked grebe breeding pairs found in the study area each year. The number of horned grebe pairs in the YKSA was below average in 2018, but the number of young was about average. The number of red-

necked grebe pairs was average and the number of young was above average in 2018. The project team will take their next survey of the YKSA in 2020.

Reed, Eric

Canadian Wildlife Service
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Permit Number: 500618**Species Studied:** Surf scoters, black scoters, white-winged scoters, greater scaup, lesser scaup, red-breasted merganser, and long-tailed duck**Region:** NS**Location:** Near Lutselk'e and Yellowknife**Integrated fixed-wing and helicopter surveys to improve detection and species identification of breeding scoters**

This was the second year that the project team conducted helicopter surveys looking for waterfowl in the boreal forest. The main species they observed were black scoters, surf scoters, white-winged scoters, greater and lesser scaup, and long-tailed ducks. As they did in previous years, the team made note of any areas where there were high numbers of waterfowl, because this shows the importance of the barrenlands region of Canada for breeding ducks and other waterfowl species. The surveys found much higher numbers of breeding scoters in the study areas than are found in other parts of Canada (e.g. Labrador and the Hudson Bay lowlands of Ontario). In addition to helicopter surveys, the team also flew over the study areas using fixed-wing aircraft because the different types of aircraft have different advantages and disadvantages. The team is now integrating the information from both survey types to develop a useful and cost-effective monitoring program.

Sharam, Greg

ERM
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Permit Number: 500548**Species Studied:****Region:** NS**Location:** Courageous Lake**Courageous Lake project: wildlife baseline program**

No summary was submitted for this licence.

Smith, Kevin

Ducks Unlimited Canada
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Permit Number: 500607**Species Studied:** King eider, common eider**Region:** IN**Location:** Masoyuk Island, located 10 km south of Ulukhaktok**Ulukhaktok spring eider survey and mercury assessment**

No summary was submitted for this licence.

Wells, David

Diavik Diamond Mines Inc.
david.wells@riotinto.com

Permit Number: 500538**Species Studied:** Barren-ground grizzly

Region: NS**Location:** 16,000 km² in the Lac de Gras region approx. 300 km northeast of Yellowknife**2017 joint regional grizzly bear DNA hair snagging program**

No summary was submitted for this licence.

WMAC (NWT)

Joint Secretariat

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Permit Number: 500608**Species Studied:** Insects, nematodes, and plants**Region:** IN**Location:** Sachs Harbour and Banks Island Migratory Bird Sanctuary**Investigating the insect, nematode and plant communities in and around Sachs Harbour**

No summary was submitted for this licence.

Wood, Cindy

Canadian Wildlife Service

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Permit Number: 500615/500641**Species Studied:** Geese, swans, ducks**Region:** All NWT**Location:** Mackenzie Valley, from the southern border of the NWT to the Mackenzie Delta region**Cooperative waterfowl population aerial surveys in the NWT**

The governments of the USA and Canada work together to manage migratory waterfowl because these birds move between the two countries. For this project, the team surveyed the population of geese, swans, and ducks in the entire Mackenzie Valley. For most bird species, fewer birds were observed in 2018 than in 2017, although the 2018 estimates were still well above the long-term average. The total estimated number of ducks in 2018 was 13% lower than the 2017 estimate, but 33% higher than the long-term average. The 2018 estimates for Mallard and American wigeons were similar to those in 2017, but 36% and 42% higher than the long-term averages. Gadwall numbers were similar to both the 2017 estimate and the long-term average. The 2018 estimates for green-winged and blue-winged teal were similar to 2017 estimates, and were 79% and 73% higher than the long-term averages. The number of northern shovelers was 29% lower than the 2017 estimate, but 71% higher than the long-term average. The number of northern pintail was 26% lower than the 2017 estimate, but 34% higher than the long-term average. Redhead numbers were 46% higher than the 2017 estimate, and 92% higher than the long-term average. Canvasback numbers were similar to those in 2017, but 39% higher than the long-term average. Scaup numbers were similar to those in 2017, but 22% below the long-term average. The team found that the waterfowl habitat was in good-to-excellent condition across the NWT, northeastern British Columbia, and central and northern Alberta.

Glossary

Abiotic – Not living

Active layer -The area where the soil continually freezes and thaws above the permafrost

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.

Adipose - Of, relating to, or composed of animal fat; fatty

Aerial - In the air

Aeromagnetic survey - Surveys from aircraft that make use of the magnetic field caused by magnetized rocks in the Earth's crust to make estimates about underlying geology of a given area such as distribution of potential resources

Algae - Simple living aquatic single or multi celled plant organisms that contains chlorophyll

Algorithm - A procedure or formula for solving a problem

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

Brachiopods - Any of various marine invertebrates of the phylum Brachiopoda, having bivalve dorsal and ventral shells enclosing a pair of tentacled, armlike structures that are used to sweep minute food particles into the mouth. Also called *lampshell*.

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

Carbon¹⁴ – A radioactive isotope of carbon used to date ancient rocks and artifacts

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

Cyanobacteria - predominantly photosynthetic prokaryotic organisms containing a blue pigment in addition to chlorophyll; occur singly or in colonies in diverse habitats; important as phytoplankton

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.

ELC data - Ecological Land Classification data

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

Epoch - A period of time during which something important developed or happened

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

Meristic - Having or composed of segments; segmented

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 (CH₄)

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

Postglacial - Relating to or occurring during the time following a glacial period

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. Also called *moneran*

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

Qiviut - The soft downy undercoat of muskoxen

Radiocarbon dating - The determination of the approximate age of an ancient object, such as an archaeological specimen, by measuring the amount of carbon¹⁴ it contains

Raptor - A bird of prey such as an eagle, falcon or osprey

Regolith - The layer of loose rock resting on bedrock, constituting the surface of most land. Also called *mantle rock*

Regosol - a type of azonal soil consisting of unconsolidated material derived from freshly deposited alluvium or sands

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

Stone flakes/chards - debris left over from a rock while making tools

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

Theodolite - a surveying instrument for measuring vertical and horizontal angles. Also called (in the US and Canada) **transit**

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

210-Pb Method - is used to determine the accumulation rate of sediments in lakes, oceans and other water bodies. It is used for over a period of 100 - 200 years

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