



# Northwest Territories Environmental Studies Research Fund

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Annual Report and Budget  
2018-2019





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## Environmental Studies Research Funds (ESRF)

### Message from the Chair

I am very pleased to present the fourth annual report for the Northwest Territories Environmental Studies Research Fund (ESRF). In addition to three ongoing multi-year funded projects related to caribou and groundwater monitoring, the NWT ESRF has provided support to three new projects, including one in the Fort Liard area and one on the Beaufort coast.



The Beaufort coastal project marks the first time that the territorial and federal ESRF programs have both provided support for a project of mutual interest. Continuing to support high-calibre research and cost-effective monitoring strategies related to the energy industry in the NWT remains the priority of the Management Board. Maintaining research programs that support fact-based decision-making related to energy development is an excellent investment in the future of the energy industry in the NWT.

**Andrew Applejohn**  
Chair  
NWT Environmental Studies Research Fund

### Introduction

The Northwest Territories Environmental Studies Research Fund (ESRF) supports environmental and social studies relating to oil and gas activity in the NWT that help inform decision-making. The fund is supported through the collection of levies from all interest holders of petroleum lands in the onshore areas of the NWT – Exploration Licences, Production Licences and Significant Discovery Licences alike. Levy rates are determined by the ESRF Management Board on an annual basis, and interest holders are invoiced based upon their total land holdings (total number of hectares under licence) within the onshore NWT. The Management Board is currently composed of representatives from government (2), industry (2) and public (1) of the NWT. With proposed changes to the *Petroleum Resources Act*, it is anticipated that an additional public member will be added to the Board in the future.

The ESRF is proud to be supporting multi-year research projects in the Sahtú Settlement Area of the NWT, in addition to providing single-year leverage funding to a number of projects in other parts of the NWT, including the Fort Liard area and the Inuvialuit Settlement Region in 2018-2019.

### Management Board Membership

Chair: Andrew Applejohn – Environment and Natural Resources, GNWT member

Vice-Chair: Ken Hansen – industry member

Menzie McEachern – Industry, Tourism and Investment, GNWT member

Scott Gedak – industry member

Ray Case – public member

# Summary of Activities in 2018-2019

## Communications

1. In April 2018, ESRF Management Board members met with the National Energy Board, representatives from the Canadian Association of Petroleum Producers (CAPP), the federal ESRF Board and rights holders in the NWT, including:
  - Husky Energy
  - ConocoPhillips Canada
  - Strategic Oil and Gas
  - Paramount Resources/MGM
  - Imperial Oil

The Board members also met with the University of Calgary regarding their Global Research Initiative in Sustainable Low Carbon Unconventional Resources.

2. Presentation by Ken Hansen, Vice-Chair NWT ESRF Management Board, at 2018 NWT Geoscience Forum in Yellowknife, NT: *Northwest Territories Environmental Studies Research Fund: Funding Research in the NWT Related to the Petroleum Industry.*
3. Participation by Scott Gedak, Industry Member NWT ESRF Management Board, at the Canadian Institute's Arctic Oil and Gas Symposium on March 13 to 14, 2019, in Calgary, AB.
4. Two additional meetings between NWT ESRF Management Board members and CAPP, one in Calgary and one in Yellowknife.
5. NWT ESRF on federal ESRF meeting agenda in October 2018.

Project reports available at <https://www.nwt-esrf.org/publications>:

- U of Waterloo, Regional hydrologic and ecologic characterization and baseline assessment 2018-2019 report
- WLU, U of Guelph, Assessing terrain sensitivity to permafrost thaw and fire to understand and predict boreal caribou 2018-2019 report.

## Management Board Meetings

One face-to-face meeting of the NWT ESRF Management Board took place on July 19, 2018, in Yellowknife. Key program direction for the 2018-2019 fiscal year included:

1. Increase Science Program budget by adding \$75,000 for various value-added research projects, over and above core programs, utilizing existing surplus.
2. Existing Board member terms renewed for two years to accommodate a transition period associated with new legislation. Written recommendation for staggering term appointments in the future to be sent to the Minister of ITI.
3. Three new proposals approved for single year funding:
  - Geologic processes and environmental considerations related to thawing permafrost in the Mackenzie Delta area – Geological Survey of Canada;
  - Groundwater monitoring and aquifer characterization in the Liard Basin – University of Guelph/ENR Water Resources;
  - Caribou winter range location characteristics and intactness in the Central Mackenzie Valley, Sahtú Settlement Area – ENR Wildlife/Explor.



Photo courtesy of Husky Energy's Remote Camera Wildlife Monitoring Program, Slater River Program Area, Sahtú Region

## 2018-2019 Funded Projects

### Geologic processes and environmental considerations related to thawing permafrost in the Mackenzie Delta area

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**Project Leader:** Scott Dallimore

**Organization:** Geological Survey of Canada (GSC)



Photo courtesy of Scott Dallimore, Geological Survey of Canada

#### Project Description

This research addresses the environmental consequences of thawing/warming of terrestrial permafrost in the Mackenzie Delta/Tuktoyaktuk Peninsula area. The research will help constrain a significant knowledge gap in this field and will provide a baseline understanding of natural processes, including fluxes of fluid and gas, release of contaminants. This knowledge will help address how these processes could be modified by ongoing climate change. Specifically, the research will provide new fundamental science regarding the geochemistry, biogeochemistry and fluid/gas release from naturally thawing permafrost, thus, providing a context to assess the impact of possible oil spills and fugitive release of fluids and gas associated with hydrocarbon development. The research also provides a context to contaminant migration in permafrost and may yield new science to consider the effectiveness of permafrost as a containment strategy for drilling sumps.

In March 2019, the GSC conducted a field drilling and instrumentation program to study the geology and permafrost conditions of Tuktoyaktuk Island. The study was undertaken in part to quantify the geothermal, geologic and geochemical conditions of an eroding coastal bluff. ESRF funding was used to enable several novel environmental research studies looking at methane release from warming permafrost and mercury/methylmercury dynamics associated with permafrost thaw and erosion.

**NWT ESRF Funding:** \$25,000

### Caribou winter range location, characteristics and intactness in the Central Mackenzie Valley, Sahtú Settlement Area

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**Project Leader:** Jesse Tigner

**Organization:** Swamp Donkey/Explor

#### Project Description

Few data are available to assess distribution or habitat use of Boreal woodland caribou (BWC) in the Central Mackenzie Valley (CMV) in the Sahtú Settlement Area. This knowledge gap limits management opportunities and efficacy for a locally important and federally protected species. The CMV holds vast oil and gas resources (e.g. Canol Shale), the development of which, elsewhere, has impacted BWC and BWC habitat significantly and in complex ways. Also, climate models for northern latitudes suggest larger and more frequent wildfires, which reduces BWC habitat quality.

Without a clear understanding of where and how BWC use available habitat in the CMV, or the current quality of BWC habitat in an oil and gas rich area, it is impossible to proactively manage resource development to mitigate undesired impacts to BWC or to evaluate how anthropogenic or natural landscape change may affect BWC or BWC habitat over time in the region.

This project will provide information on BWC and moose distribution in the CMV during winter, identify BWC winter range and the landscape variables associated with winter range in the CMV, and the occurrence of BWC and moose relative to one another and moose relative to BWC winter in the CMV.

One habitat feature considered important for BWC persistence is sufficient space to maintain spatial separation from predators and alternate prey items, moose and wolves in the CMV. Further, winter range is a critical habitat component for BWC and all ungulates to maintain body condition during times of food scarcity in winter. By identifying where winter range occurs in the CMV, characteristics of that range and whether that range is “moose-free”, this project can identify sensitive areas for enhanced management during resource development, where other winter range may occur regionally, how BWC and moose use the CMV, and how winter range may change in the future given anthropogenically and naturally driven landscape change in time.

**NWT ESRF Funding:** \$9,250

## Groundwater monitoring and aquifer characterization in the Liard Basin

**Principal Investigator:** Dr. Beth Parker

**Project Lead:** Amanda Pierce

**Organization:** G360 Institute for Groundwater Research, University of Guelph

### Project Description

The goal of the project is to improve the understanding of groundwater in the transboundary area of the Northwest Territories (NWT) portion of the Liard Basin. The Liard River Basin is an area of high oil and gas potential. According to a National Energy Board (NEB) assessment from March 2016, the Liard Basin is one of the largest shale gas resources in the world and Canada's second largest known gas resource. Knowledge gained through the installation of groundwater monitoring stations will support regulatory decision-making in the region.

### Objectives of the project:

1. Develop methods and techniques to establish hydrogeological baseline conditions for groundwater quality and quantity in the Basin.
2. Initiate a long-term groundwater monitoring program in the Liard Basin, with emphasis on transboundary aquifers.
3. Advance the ability to identify potential groundwater flow pathways from hydrocarbon bearing units into transboundary freshwater aquifers.

Increasing this understanding of groundwater in this area will better enable Indigenous and community governments, industry, regulators, decision-makers and the public to make environmentally sustainable decisions about future industrial development and groundwater use.

**NWT ESRF Funding:** \$30,000



Photo courtesy of Nathan Glas,  
University of Guelph

## Multi-year Funded Projects – Updates

### Assessing terrain sensitivity to permafrost thaw and fire to understand and predict Boreal caribou habitat and forage quality in the Sahtú

**Project Leaders:** Dr. Jennifer Baltzer, Dr. Merritt Turetsky

**Organization:** Wilfrid Laurier University/  
University of Guelph

The research will address how fire and permafrost conditions interact to determine caribou habitat responses to climate change and human activity in the Sahtú region, a resource rich region where substantial resource extraction has occurred in the past and much more is anticipated in the future. Developing a solid understanding of the interaction between permafrost thaw and boreal wildfire and what this means for caribou habitat regionally will provide critical insights into the rates of change that we can anticipate in the face of ongoing environmental change. When combined with projected rates of habitat degradation or loss due to resource development activities, we will have the capacity to understand the cumulative impacts of these environmental and anthropogenic drivers on the extent and quality of caribou habitat.

#### Progress during 2018-2019 Funding Year

Updates below on three distinct, though interconnected, components of this project:

1. Thermokarst vulnerability assessments: To date this part of the project has completed field reconnaissance during which features that were not identifiable on the remote sensing imagery were ground-truthed. From August 1 to 20, 2018, the team was in Norman Wells, NT, visiting areas that had recently thawed and experienced wildfire. These field visits also included site assessments that involved collecting



Photo courtesy of Carolyn Gibson, University of Guelph

- data on numerous biophysical indicators. This work was complemented with aerial surveys to capture images of sites from above to link on-the-ground conditions to spectral characteristics in photos and remotely sensed images.
2. Post-fire forage lichen recovery: During the summer of 2018, we established 12 sites in which we sampled stand age, ground vegetation, soils development and forage lichen biomass recovery. We used methods identical to an ongoing study in the southern NWT, allowing us to compare these processes in the Sahtú, Tłı̨chǫ and Dehcho regions.
3. Post-fire soil recovery: More than 1km of soil has been sampled across our sites in the NWT, with a total of 3,300 soil monoliths processed for soil texture, bulk density to model carbon recovery. Mixed-effects modeling techniques were used to understand soil depth recovery over time after wildfire activity in the three regions. Time-since-fire, soil drainage, non-vascular plants, ecozone, jack pine and tree stand type all were significant explanatory variables in predicting peat layer thickness after fire. Peat layer recovery after wildfire is more rapid in the driest sites comparative to wetter sites that start out with greater residual organic layer following fire. Overall, the Taiga Plains had the greatest variation and deepest soils compared to the other ecozones.

**NWT ESRF Funding:** \$50,000/year for four years

Full project update available at  
<https://www.nwt-esrf.org/publications>

### Regional hydrologic and ecologic characterization and baseline assessment of remote northern Canadian terrain in advance of shale oil and gas development

**Project Leader:** Dr. David Rudolph

**Organization:** University of Waterloo

Landscape changes related to anthropogenic activity and climate variability may have a significant impact on the cycling of water within the terrestrial system, including the subsurface due to the presence of discontinuous permafrost in the Sahtú Settlement Area. This five year project will address a number of knowledge gaps related to groundwater by conducting extended baseline hydrologic and ecologic monitoring within the field study area that will inform potential future development of the shale oil resources within the Canol Formation.

#### Progress during 2018-2019 Funding Year

The Year 2 work activities associated with the project have been focused on: 1) developing a field work protocol to access the Husky Slater River lease areas; 2) coordinate and expedite a regional summer and winter water sampling



campaign with Husky personnel; 3) design and conduct low-elevation, helicopter-based infrared radiation (IR) and optical surveys in Bogg Creek watershed; 4) integrate remote sensing surveys with terrestrial based measurements, and 5) locate and conduct terrestrial geophysical mapping of permafrost occurrence. Following the approach established during Year 1 of the project, the majority of the field activities undertaken in Year 2 were focused within the Bogg Creek Watershed.

**NWT ESRF Funding:** \$100,000/year for five years

Full project update available at  
<https://www.nwt-esrf.org/publications>

## Multi-species monitoring using winter track surveys in the Sahtú Settlement Region

**Project Leader:** James Hodson

**Organization:** GNWT Environment and Natural Resources

**Project Partners:** Sahtú Renewable Resources Board (SRRB), Tulít'a Renewable Resources Council (TRRC), Norman Wells (Tłegóh̄h̄) Renewable Resources Council

Oil and gas exploration licences currently cover ~1.35 million hectares of the Sahtú Settlement Area and overlap the western limit of the NWT Boreal caribou range. Exploration activity will increase habitat and sensory disturbance to wildlife and provide new access to remote areas. This project aims to establish a collaborative (communities, industry and government), regionally-based, long-term wildlife snow track monitoring program in the Sahtú Settlement Area to measure cumulative impacts of industrial development and other land use activities by assessing the link between patterns of abundance and occupancy of Boreal woodland caribou, caribou predators, alternate prey and other furbearers to changes in disturbance footprint and landcover over space and time.

### Progress during 2018-2019 Funding Year

This winter marked the fifth year of the winter track survey program in Tulít'a and the third year of the program in Norman Wells. Meetings were held with the Tulít'a Renewable Resources Council (TRRC) and Sahtú Renewable Resources Board (SRRB) on December 13, 2018 and with the Norman Wells (Tłegóh̄h̄) Renewable Resources Council on December 14, to discuss the results from winter 2018 and to plan for the winter 2019 field season. Environment and Natural Resources (ENR) staff travelled to Tulít'a on January 22, 2019, to work with the monitors for two days to train them on an updated version of the Trailmark mobile data collection app. Updates to the Trailmark mobile data collection platform, and the purchase of new Android-based mobile devices, allowed us to run four separate data

collection apps. This included new data collection forms for information about the start and end of each survey and for deployment and collection of trail cameras, in addition to the data collection form for the track surveys themselves. These changes allowed us to move towards completely paperless data collection.

Two teams of two monitors (one youth and one elder) surveyed eight routes around Tulít'a between January 22 and March 14, 2019, and each route was surveyed three to five times. We had difficulty finding monitors in Norman Wells this year, as the NWRRC members that had initially expressed interest in conducting the surveys ended up working on Husky Oil Operations Ltd.'s well abandonment program. Consequently, one of the experienced monitors from Tulít'a worked with a monitor from Norman Wells to complete 10 days of surveys covering seven survey routes, one to three times each.

These surveys were conducted from March 18 to 28, 2019, but conditions were less than ideal due to the unusually warm weather, which resulted in low rates of track detections. Preliminary results indicate that tracks of 14 different species were recorded this winter. Consistent with previous years, marten, lynx, moose and ermine were the most frequently encountered species. Muskox tracks were recorded for the first time in winter 2018 and were encountered again in 2019. Other notable species included Boreal caribou, wolverine and wolves.

A full analysis of the data collected over the past five years will take place in the coming year to look at temporal and spatial trends in track detections. A review of the accomplishments and challenges associated with the project will also help to inform future plans to continue the program and potentially expand it to other Sahtú communities.

**NWT ESRF Funding:** \$50,000/year for four years



Photo courtesy of the Government of the NWT, Environment and Natural Resources

# Budget for NWT ESRF Supported through 2019-2020 Levies

## 1. Administration of the Fund

This budget provides funding for a half-time equivalent position to perform Secretariat functions. Other costs associated with the budget are related to Board travel, direct meeting expenses and communications.

Administration Budget	
Compensation and Benefits	\$ 60,000
Travel	\$ 30,000
Communications and Promotions	\$ 10,000

## 2. Science Budget

The following science programs were recommended for approval by the ESRF Management Board.

NWT ESRF Project Funding	
Industrial Activity and Caribou Populations	\$ 100,000
Baseline Hydrogeological Evaluation of Central Mackenzie Valley Oil and Gas Exploration Areas Sahtú Region, NWT	\$ 100,000
Various Projects	\$ 75,000



Photo courtesy of Husky Energy's Remote Camera Wildlife Monitoring Program, Slater River Program Area, Sahtú Region

## Financial Statement of the NWT ESRF for the Fiscal Year 2018-2019

Revenue *	
Industry Levies	\$ (5,506)
Expenses	
Administration	
Compensation and Benefits	\$ (60,000)
Travel	\$ (3,736)
Communications and Promotions	\$ -
Publications	\$ (1,720)
Other	\$ (4,943)
<b>Total Administration Expenses</b>	<b>\$ (70,399)</b>
Science Program	
Caribou Studies	\$ (96,344)
Sahtú Hydrogeological Baseline	\$ (100,000)
Various Studies	\$ (55,000)
<b>Total Science Program Expenses</b>	<b>\$ (251,344)</b>
<b>Total Expenses</b>	<b>\$ (321,743)</b>
<b>Total 2018-2019 Surplus (Deficit)</b>	<b>\$ (327,249)</b>

## Proposed Budget of the NWT ESRF for the Fiscal Year 2019-2020

Revenue *	
Industry Levies	\$ 225,000
Expenses	
Administration	
Compensation and Benefits	\$ (60,000)
Travel	\$ (30,000)
Communications and Promotions	\$ (10,000)
Publications	\$ -
Other	\$ -
<b>Total Administration Expenses</b>	<b>\$ (100,000)</b>
Science Program	
Caribou Studies	\$ (100,000)
Sahtú Hydrogeological Baseline	\$ (100,000)
Various Studies	\$ (75,000)
<b>Total Science Program Expenses</b>	<b>\$ (275,000)</b>
<b>Total Expenses</b>	<b>\$ (375,000)</b>
<b>Total 2019-2020 Surplus (Deficit)</b>	<b>\$ (150,000)</b>

\* Industry levies are shown in the Main Estimates in the year they are invoiced and these amounts are to fund the projects for the following fiscal year. Revenue total of \$265,053 was invoiced in 2017-2018 to fund projects in 2018-2019. In 2018-2019, there was a change in timing of revenue reporting from calendar year to fiscal year April 1, 2018 - March 31, 2019. Revenue reported in 2018-2019 is a correction of overage in invoice.

Summary	
Opening Balance (April 1, 2018)	\$ 701,026
Revenue **	\$ (5,506)
Expenses	\$ (321,743)
<b>Closing Balance (March 31, 2019)</b>	<b>\$ 373,777</b>

Summary	
Opening Balance (April 1, 2019)	\$ 373,777
Revenue **	\$ 225,000
Expenses	\$ (375,000)
<b>Closing Balance (March 31, 2020)</b>	<b>\$ 223,777</b>

\*\* The ESRF budget and actuals are provided each year in the Main Estimates as information. As 2019-2020, progresses and information on the current budget is updated, the revised Main Estimates for 2019-2020 will be reflected in the 2020-2021 Main Estimates. Levy invoices for 2016-2017 were not issued until 2017-2018 to avoid two levies issued in one year.

2018-2019 Levy by Region	Hectares	Amount Levied
Arctic Islands	10,719	\$ 3,462.24
Mackenzie Delta	123,285	\$ 39,821.06
Central Mackenzie Valley	511,655	\$ 165,264.57
Southern NWT	115,847	\$ 37,418.58
<b>Total</b>	<b>761,506</b>	<b>\$ 245,966.44</b>

2018-2019 Levy by Interest	Hectares	Amount Levied
Significant Discovery Licence	464,737	\$ 150,110.05
Exploration Licences	239,397	\$ 77,325.23
Production Licences	36,265	\$ 11,713.60
Petroleum Land Leases	21,107	\$ 6,817.56
<b>Total</b>	<b>761,506</b>	<b>\$ 245,966.44</b>

The levy rate for 2018-2019 was \$0.323/hectare

[www.nwt-esrf.org](http://www.nwt-esrf.org)