



Northwest Territories Environmental Studies Research Fund

Annual Report and Budget
2019-2020



The artificial islands, which are part of Imperial's Operation in Norman Wells.
Photo credit: Ron Powder, Imperial Oil

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Environmental Studies Research Funds (ESRF)

Message from the Chair

I am very pleased to present the fifth annual report for the Northwest Territories Environmental Studies Research Fund (ESRF). These are challenging times for the energy industry in Northern Canada. The ESRF Management Board has worked with a variety of community, regional and Territorial agencies as well as industry rights holders to ensure that the fund continues to support research which is relevant to future exploration, production and remediation activities in the NWT. In addition to three ongoing multi-year funded projects related to caribou and groundwater monitoring, the NWT ESRF has provided support to two new projects, one led by the Alberta Biodiversity Monitoring Institute and one that is a collaboration between the University of Montreal and Wilfrid Laurier University.



I would like to take the opportunity to thank Ian Butters and Anne Marie Jennings, who have left the NWT ESRF Secretariat, for their great work supporting the program and welcome Mike Harlow from GNWT ITI to the group.

Andrew Applejohn
Chair
NWT Environmental Studies Research Fund

Introduction

The Northwest Territories Environmental Studies Research Fund (ESRF) is a research program established to finance environmental and social studies relating to oil and gas activity in the NWT that will 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 approved changes to the Petroleum Resources Act, an additional public member will be added to the Board after the revised Act comes into force.

2019/2020 was year 3 of 4 for two multi-year caribou related projects and 3 of 5 for a groundwater study led by the University of Waterloo. In addition, two other projects were approved for single year funding, one led by Wilfrid Laurier University/ University of Montreal and one led by the Alberta Biodiversity Monitoring Institute at the University of Alberta.

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 2019-2020

Communications

1. The Management Board had an in person meeting in Norman Wells in May, 2019 in order to meet with community organizations face to face, including representatives from the Sahtú Renewable Resources Board, Tulita and Norman Wells Renewable Resources Councils, and the Norman Wells Land Corporation.
2. In conjunction with the September 2019 Management Board meeting an extra day was taken to meet with various rights holders including ConocoPhillips, Canadian Natural Resources Ltd. and Paramount Resources. In addition, multi-year project leads from the University of Waterloo and Wilfrid Laurier University (remotely) met with Husky Energy and the Management Board to go over current activities and next steps for the work that was taking place in or nearby the Husky lease area.

Project reports available at

<https://www.nwt-esrf.org/publications>:

- University of Waterloo, Regional hydrologic and ecologic characterization and baseline assessment 2019-2020 report
- Guidelines for Groundwater Monitoring and Measurement Techniques for Remote Northern Environments
- Wilfrid Laurier University, University of Guelph, Assessing terrain sensitivity to permafrost thaw and fire to understand and predict boreal caribou 2019-2020 report
- Alberta Biodiversity Monitoring Institute, Facilitation of biodiversity monitoring by northern communities using Acoustic Recording Units (ARU)
- Boreal woodland caribou winter range in the Central Mackenzie Valley
- Wilfrid Laurier University, University of Montreal, Methane Emissions Across the Inuvik to Tuktoyaktuk Region

Management Board Meetings

Two face-to-face meetings of the NWT ESRF Management Board took place, one in Norman Wells May 14-16, 2019 and one in Calgary September 25-26, 2019.

The meeting in Norman Wells included discussions with representatives from Imperial Oil, Sahtú Renewable Resources Board, Tulita and Norman Wells Renewable Resources Councils, GNWT Environment and Natural Resources and the Norman Wells Land Corporation. Presentations were also provided for the Board remotely from the Geological Survey of Canada and the University of Guelph.

The meeting in Calgary included discussions with the Canada Energy Regulator (formerly NEB), and federal Environmental Studies Research Fund.

Key program direction for the 2019/20 fiscal year included:

1. Recommendation to be sent to Minister of ITI that remediation be added as a research priority.
2. 2020/2021 budget of 375K (100K administration, 275K research) is approved.
3. Two new proposals approved for single year funding: Facilitation of biodiversity monitoring by northern communities using Acoustic Recording Units (ARUs), Erin Bayne, University of Alberta; and Methane emissions across the Inuvik to Tuktoyaktuk Region, Phil Marsh, Wilfrid Laurier and Oliver Sonnentag, University of Montreal.



Photo credit: Danny McNeely

2019-2020 Funded Projects

Facilitation of biodiversity monitoring by northern communities using ARUs

Project Lead: Erin Bayne

Organization: Alberta Biodiversity Monitoring Institute (ABMI)

Project Description

The purpose of this workshop was to train participants from the Sahtú Region how to use wildlife cameras and autonomous recording units (ARUs) so that they can work with the Canadian Wildlife Service, Environment and Natural Resources (ENR), and other longer-term wildlife monitoring projects. This particular meeting emphasized getting participants ready to collect data in the Ts'udé Niljné Tuyeta protected area. In addition to field deployment information, participants were introduced to basic concepts of data management so that they can safely bring data back from the field and assist with data backup. The last part of the workshop introduced participants to WildTrax, an online application for processing both wildlife photos and bioacoustic recordings to show them how data is processed after it is collected.

This workshop was intended to increase community capacity for biodiversity monitoring and data processing in the Sahtú Region, and was driven by the need for a community-based environmental monitoring framework within the region.



Photo credit: Amelie Roberto-Charron

Scoping and delivery of the workshop was a collaborative effort with multiple organizations, including the Sahtu Renewable Resources Board (SRRB), the Fort Good Hope Renewable Resources Council, the Government of Northwest Territories, and the Canadian Wildlife Service. The three days of protocol training were part of a broader training effort being organized by this group in order to implement a community-delivered wildlife monitoring program for the Ts'udé Niljné Tuyeta protected area. The involvement of the SRRB On the Land Program Manager, Lex Scully, was critical to the success of this workshop.

NWT ESRF Funding: \$10,000

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



Photo credit: Dave Evans

Methane Emissions Across the Inuvik to Tuktoyaktuk Region

Project Leaders: Philip Marsh, Oliver Sonnentag

Organizations: Wilfrid Laurier University, University of Montreal

Project Description

This report summarizes ongoing ecosystem- and plot-scale net methane (CH₄) exchange measurements made at Havipak Creek and Trail Valley Creek, two research sites in the Inuvik Region, in 2017 and 2018, and from 2014 to 2019, respectively. The goal of the described efforts is to provide a preliminary baseline for the southern Arctic landscape's natural CH₄ sink-source strength for comparison with potential fugitive CH₄ emissions from abandoned oil and natural gas wells.

Practically nothing is known about the contamination hazard potential of the abandoned oil and natural gas wells of the Inuvik Region or their contribution to the southern Arctic landscape's annual total CH₄ budget largely dominated by natural CH₄ sinks and sources.

Several important questions are emerging from this knowledge gap: are fugitive CH₄ emissions and releases of contaminants from abandoned oil and natural gas wells threatening the environment and community health in the Inuvik Region? Are fugitive CH₄ emissions from abandoned oil and natural gas wells in the Inuvik Region significant contributions to the southern Arctic landscape's annual total CH₄ budget? Can specific well characteristics regarding status and history (e.g., plugged vs unplugged), geographic setting, and tundra ecosystem and land cover type help to identify high-emitting wells and wells of high contamination hazard potential? These knowledge gaps are of particular interest and concern from Indigenous community well-being and regulatory perspectives (e.g., development of territorial strategies to reduce CH₄ emissions from natural and anthropogenic sources).

The full report describes initial efforts to find answers to the above questions.

NWT ESRF Funding: \$25,000

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



Eddy covariance tower and automated chambers measuring carbon and water fluxes at Trail Valley Creek Research Station, June 2019. Photo credit: C. Voigt
Inset photo: Automated chamber set-up with transparent and dark chambers at Trail Valley Creek Research Station, June 2019. Photo credit: C. Voigt

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: Drs. Jennifer Baltzer (jbaltzer@wlu.ca) and Merritt Turetsky (mrt@uoguelph.ca)

Organization: Wilfrid Laurier University and University of Guelph

Research progress

Below, we provide updates on three distinct though interconnected components of this project:

1. Thermokarst vulnerability assessments
2. Vulnerability of lichen peatlands to fire and thaw
3. Post-fire forage lichen forage recovery

Thermokarst vulnerability assessments

We are employing the framework presented in our 2017/18 and 2018/19 reports to evaluate thermokarst vulnerability in the Sahtú region. Over the last year, we have made considerable progress toward this goal. The first steps of this framework involve the detection of thermokarst. Gibson has completed the mapping of lowland thermokarst vulnerability for the entire Taiga Plains, including the Sahtú region as part of the NWT Thermokarst Collective initiative. Using the broad-scale thermokarst inventory techniques of Kokelj et al. 2017, Fraser et al. 2018 and the methodologies of Segal et al. 2016, permafrost peatlands were mapped using a 15 by 15 km grid system within the Taiga Plains ecozone of the NWT.



Sahtu research team using SIPRE drill for taking frozen soil samples.
Photo by A. Sniderhan

The next steps in our framework involve the determination of predictors of thermokarst vulnerability. We are in the process of compiling these spatial data layers, most notably ground ice content.

Vulnerability of lichen and peatlands to fire and thaw in the Sahtú

In addition to these remote sensing-based efforts, in 2019, we conducted new field sampling in lowland permafrost environments in the Sahtú region. These efforts were focused on permafrost peatlands dominated by reindeer lichen cover. Our sample design involved characterizing vegetation communities and soil carbon stocks for peatlands ranging in fire-free interval (from sites that burned in 2014 to those that have not burned since 1969).

Post-fire forage lichen recovery

In 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, Tlicho and Dehcho regions.

This combined dataset has supported the first comprehensive evaluation of forage lichen recovery times following fire for the NWT and provides Sahtú-specific estimates as well.

The next steps for this dataset is to develop ecological forecasting tools to provide managers the ability to evaluate changes in forage lichens under different wildfire scenarios.

Next steps

Unfortunately, the COVID-19 situation is preventing our final field season scheduled for this summer and a one-year extension on the project has been approved. In the coming summer, Caitlyn Lyons (incoming PhD) will be using air photo analysis evaluating landcover change for areas of known ground-ice content. This will allow us to pre-select sampling locations at which we will conduct detailed ecological evaluations during the summer of 2021. This will allow us to assess how changes in permafrost conditions over the last 20 years have affected land cover and associated caribou forage availability.

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

This winter marked the sixth year of the winter track survey program in Tulít'a. ENR met with the Tulít'a Renewable Resources Council (TRRC) and Sahtú Renewable Resources Board (SRRB) on November 18, 2019 to discuss the results from winter 2018, and to plan for the winter 2019 field season. This year we did not attempt to conduct surveys out of Norman Wells, due to difficulty finding available monitors from Norman Wells in previous years and reduced availability of ENR staff in the region to provide logistical support to the program. On the recommendation of the TRRC, the Tulít'a monitors went out in early January to break trail along the survey routes due to higher snow accumulation this year. ENR staff met with the new and returning monitors in Tulít'a on January 29, 2020 and conducted a half-day training session on the track survey methods along the Enbridge Pipeline.

Eight routes (the same as in previous years) were surveyed around Tulít'a between February 05-26, 2019, and each route was surveyed 2-3 times. Another round of surveys was completed between March 19-23, which focused on sections of the Enbridge Pipeline corridor further north and south from what was surveyed earlier in the winter, as well as surveying the Husky access road on the west side of the Mackenzie River. Each of these routes was surveyed twice. Only data from the first round of surveys was available at the time of writing this report. Preliminary results indicate that tracks of 11 different species were recorded this winter (down from 14 last year). Marten, lynx, moose and ermine continue to be the most frequently encountered species. Not accounting for differences in survey effort between 2019 and 2018, there appeared to be far fewer wolverine tracks detected this year. Other notable, but less common, species included boreal caribou, wolves, and muskox.

Over the upcoming year we will focus data analysis to assess the temporal and spatial trends in track detections over the past 6 years, as well as habitat associations of the different species detected. The final report will discuss the successes and challenges associated with the project and will provide recommendations to inform future decisions about improving the program and potentially expanding it to other Sahtú communities.

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



Moose tracks observed along Enbridge Pipeline south of Tulít'a (January 30, 2020)

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 2019-2020 Funding Year

The Year 3 work activities associated with the project have been focused on:

1. Ground truthing field measurements to support and verify the identification of groundwater phenomena based on the satellite optical imagery and low-elevation thermal imagery completed at the Husky Slater River lease areas;
2. Coordinating and expediting a focused regional summer water sampling and field monitoring campaign with Husky personnel;
3. Combining inorganic and organic geochemical data with environmental isotope data to characterize surface and groundwater flow phenomena within the deep and shallow groundwater flow systems at the site, and
4. Developing a new mathematical modeling tool to study groundwater flow in discontinuous permafrost environments.

Following the approach established during Years 1 and 2 of the project, the majority of the field activities undertaken in Year 3 were focused within the Bogg Creek Watershed. As defined in previous reports, the Bogg Creek subwatershed is situated within Husky's Slater River Lease region, which is part of the Sahtu Settlement Area (SSA).

The planned activities for Year 4 of the project will in part depend on travel restrictions related to the Covid-19 pandemic. We are planning to conduct low-elevation, air borne EM geophysical surveys designed to regionally map the upper and lower boundaries of the permafrost within the Bogg Creek region. We have connected with two geophysical contractors and by combining financial resources from several sources, the air borne geophysical surveys are now feasible. Access to the Norman Wells airport and local facilities, including helicopter services will be necessary and will depend on permission to visit this region by health officials. Should access to the region and field sites be secured, we anticipate a final, very focused field sampling campaign in collaboration with Husky personnel.

In addition to the geophysical surveys, we plan to continue detailed assessment of all of the collected field data, and continue to advance the permafrost monitoring tools and applications for simulation experiments within the Central MacKenzie Valley region.

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

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



Photo of groundwater sampling procedure at a spring. The portable sampling instrument is installed to a depth of about 1 m below the ground surface. Water at this depth is under artesian pressure, and so it rises in the tube above the height of the ponded water at the surface. Water is collected from this depth to analyze for water quality and isotopes.

Photo credit: University of Waterloo

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

Financial Statement of the NWT ESRF for the Fiscal Year 2019-2020

Revenue *	
Industry Levies	\$ 224,738
Expenses	
Administration	
Compensation and Benefits	\$ (60,000)
Travel	\$ (13,267)
Communications and Promotions	\$ -
Publications	\$ (3,447)
Other	\$ (11,775)
Total Administration Expenses	\$ (88,490)
Science Program	
Caribou Studies	\$ (99,942)
Sahtú Hydrogeological Baseline	\$ (100,000)
Various Studies	\$ (35,000)
Total Science Program Expenses	\$ (234,942)
Total Expenses	\$ (323,432)
Total 2019-2020 Surplus (Deficit)	\$ (98,694)

* 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 \$224,738 was invoiced in 2018-2019 to fund projects in 2019-2020.

Summary	
Opening Balance (April 1, 2019)	\$ 373,777
Revenue **	\$ 224,738
Expenses	\$ (323,432)
Closing Balance (March 31, 2020)	\$ 275,083

** 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.

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

Proposed Budget of the NWT ESRF for the Fiscal Year 2020-2021

Revenue *	
Industry Levies	\$ 225,000
Expenses	
Administration	
Compensation and Benefits	\$ (60,000)
Travel	\$ (30,000)
Communications and Promotions	\$ (10,000)
Publications	\$ -
Other	\$ -
Total Administration Expenses	\$ (100,000)
Science Program	
Caribou Studies	\$ (100,000)
Sahtú Hydrogeological Baseline	\$ (100,000)
Various Studies	\$ (75,000)
Total Science Program Expenses	\$ (275,000)
Total Expenses	\$ (375,000)
Total 2020-2021 Surplus (Deficit)	\$ (150,000)

Summary	
Opening Balance (April 1, 2020)	\$ 275,083
Revenue **	\$ 225,000
Expenses	\$ (375,000)
Closing Balance (March 31, 2021)	\$ 125,083

Levy Breakdown 2019-2020

Interest	Hectares	Amount levied
Exploration Licences	174,782	\$ 56,454.59
Significant Discovery Licences	473,037	\$ 152,790.95
Production Licences	36,265	\$ 11,713.60
Pioneer Leases	21,107	\$ 6,817.56
Total	705,191	\$ 227,776.69

Region	Hectares	Amount levied
Arctic Islands	10,719	\$ 3,462.24
Mackenzie Delta	119,454	\$ 38,583.64
Central Mackenzie Valley	455,340	\$ 147,074.82
Southern NWT	119,678	\$ 38,655.99
Total	705,191	\$ 227,776.69

The levy rate for 2019/20 was \$0.323 per hectare.



Photo credit: Office of the Regulator of Oil and Gas Operations (OROGO)

www.nwt-esrf.org