Northwest Territories Environmental Studies Research Fund

Annual Report 2015-2016

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Northwest Territories

Environmental Studies Research Funds (ESRF)

Message from the Chair

I am very pleased to present the first annual report for the Northwest Territories Environmental Studies Research Fund. This fund presents an excellent opportunity for the Government of the Northwest Territories and Canada's energy industry to develop a new collaborative process to address shared environmental and social research gaps impacting petroleum exploration and production opportunities in the on-shore NWT. The Management Board of this fund is drawn from government, industry and the public of the NWT, and represents a wide range of perspectives on what research is needed to support decision-making related to sustainable energy resource development in our territory.

Andrew Applejohn
Chair
NWT Environmental Studies Research Fund

Introduction

The Northwest Territories Environmental Studies Research Fund (ESRF) is a research program supporting environmental and social studies to inform decision-making related to oil and natural gas exploration and development on lands within the NWT. The ESRF program replaces the federal ESRF established in 1987 and will be a collaborative effort between the Government of the Northwest Territories (GNWT), industry and the public. Funding for the ESRF will be collected through levies paid by all oil and natural gas related interest holders of lands in the Northwest Territories – Exploration Licence holders, Production Licence holders and Significant Discovery Licence holders alike. Levy rates are determined on an annual basis by the ESRF Management Board and all interest holders are invoiced based upon their land holdings (total number of hectares) within a particular region.

The purpose of the ESRF is to finance environmental and social studies pertaining to the manner in which and to the terms and conditions under which petroleum exploration, development and production activities should be conducted on lands administered by the GNWT. Environment is interpreted in the broadest possible sense and extends from the physical environment and biological environment issues to socio-economic issues.

Summary of Activities in 2015

Appointment of Management Board

The ESRF is directed by a five member Management Board, which has representation from the GNWT (2), the oil and gas industry (2) and the general public (1). After nominations were submitted during the summer of 2015, the full complement of Management Board Members were formally appointed in September.

Management Board Membership
Chair: Andrew Applejohn – ENR, GNWT
Vice-Chair: Ken Hansen – Husky Energy
Menzie McEachern – ITI, GNWT
Scott Gedak – ConocoPhillips Canada Resources Corp.
Ray Case – public member

Management Board Meetings

Two face-to-face meetings of the ESRF Management Board were organized after the Board appointments were completed. Record of Decisions documents are attached to this report. The initial Board meeting July 14, 2015, was convened to discuss a number of items related to the operations and fundamental structure of the Management Board and to discuss critical issues related to guidance documents such as the Board's terms of reference. Key program direction for the 2015 calendar year included:

1. Decision to establish a single levy rate across the NWT as all projects recommended for funding in the initial funding cycle were determined to be of territory-wide value. Future levy rates will be determined based on assessed projects (e.g. single levy rate vs regional levy rate);
2. Decision that any new interest holders would not be responsible for paying levies for preceding two years;
3. Research themes for discussion in 2015 would mirror the themes established and funded by the outgoing federal ESRF program. Researchers funded through the past program would be asked to submit proposals to the Board to continue and complete ongoing work;
4. A clear need for a well-articulated communications strategy was recognized and secretariat staff were directed to follow up with suggestions for the next meeting; and
5. Chair and Vice-Chair were nominated and elected.

The second Management Board meeting was convened September 29. The key issues discussed at this meeting included formal approval of the Board's guidance documents, and the review of proposals solicited from principal investigators either funded by the outgoing federal ESRF or from researchers involved closely with those research themes. A decision was also reached to keep the research program budget relatively modest in order to establish and test the procedures the GNWT would employ to establish and issue levies in support of the fund. Four science programs were selected for funding in 2015:

1. Censusing wolves to determine associations between industrial activity and caribou population growth;
2. Evaluating Risk of Cumulative Effects of Fire and Human Disturbance to Boreal Woodland Caribou Habitat;
3. Caribou Genetic Diversity Population Study 2015/2016; and
4. Proposed Baseline Hydrogeological Evaluation of Central Mackenzie Valley Oil and Gas Exploration Areas Sahtù Region, NWT.

Summaries of Funded Science Programs Proposals

The following are summaries of the four science program proposals selected for funding in 2015.

1. Censusing Wolves to Determine Associations between Industrial Activity and Caribou Population Growth Rates

The most important threat to boreal caribou across their range in Canada, including the NWT, is considered to be habitat disturbance, which in turn increases risk of predation on caribou by wolves, their main predator. Habitat disturbance is cumulative and includes human-caused disturbance – particularly seismic lines, forestry cut-blocks and roads – combined with natural disturbance, specifically forest fire.

This project will help to challenge basic relationships between human development and caribou population dynamics by measuring wolf densities across a gradient of human disturbance footprint. It will also help clarify whether direct actions related to human development affect caribou, or more indirect relationships exist that may involve naturally induced changes in the distribution and abundance of non-caribou prey such as moose or even white-tailed deer that may be expanding into caribou ranges.

Project Objectives

1. Validate the method by estimating the number of collared wolves that are missed during the census; this will be primarily addressed in the Cold Lake/Christina study areas of Alberta and will not require ESRF funds. Validation will also occur in NE BC, with recently deployed wolf collars (though sample size is limited in NE BC) using SCEK (Science and Community Environmental Knowledge) funds.
2. Expand the range of ecological conditions to further test human-induced apparent competition compared to natural habitat drivers that affect caribou-moose-wolf interactions. This objective will require sampling in the NWT where human footprint is minimal and will be funded through a combination of NWT funds and SCEK funds.
3. Continue to test associations between wolf and moose abundance.
4. Continue to increase collaboration among jurisdictions.

The final report will include reporting on all four objectives.

Project Deliverables

Produce the following deliverables to update project status and accomplishments:

1. An estimate of wolf abundance for each caribou range. The estimate will include an evaluation of detectability based on existing collared packs or packs that will be collared before censuses begin.
2. Clear recommendations to adjust methods, including survey intensity and frequency.
3. A discussion on wolf population closure, based in part on information from GPS fitted wolves.
4. Deliverables 1 to 3 will be contained within a year-end report to be completed by August 15, 2016. A draft of this report will be presented to REMB on June 15, 2016.
5. An extension meeting, either in person or by video conference, will be presented to REMB and project partners. A PowerPoint will be submitted if our team members do not attend in person and the meeting will take place via video conference.
6. Longer-term deliverables include a formal integration of relationships between human disturbance, moose and wolf abundance, and caribou vital rates. This deliverable will require collaboration among several partners, which we are currently pursing.

Project Team

ABMI: Dr. Robert Serrouya completed his PhD in 2013 on caribou, moose and wolf population dynamics. His focus was on actively testing recovery options for mountain caribou. Key to this work was developing methods to reliably estimate wolf abundance. He has been conducting applied, management-oriented predator-prey research in mountain and boreal caribou ranges for over 15 years.

ABMI: Dr. Craig DeMars has conducted research in NE BC for the past three years. He will be directly involved in project oversight.

ABMI Contractor: Harry van Oort, M.Sc, R.P.Bio, developed methods to count wolves in the heavily forested areas of the Columbia Mountains, British Columbia. His methods have been adopted throughout the Kootenay region and his skills were used to count wolves in the Yukon.

First Nations: We anticipate working with local First Nations (e.g. Fort Nelson FN, Prophet FN and FNs from the NWT where GNWT biologists have been collaborating) from project initiation onwards. From previous projects, Nexen and U of A both have established working relationships with First Nations within NE BC.

GNWT: Dr. James Hodson completed a PhD in 2011 on post-harvest and post-fire habitat selection by snowshoe hare in boreal forests of northeastern Quebec. He is currently leading the development of range plans for boreal caribou in the NWT, working in collaboration with Nic Larter and Ashley McClaren.

GNWT: Ashley McLaren, M.Sc., is the Manager of Wildlife Research and Monitoring for the South Slave Region. Previously, she worked for the Ontario Ministry of Natural Resources and Forestry as a canid-ungulate biologist on projects involving wolves, coyotes, bears, moose, caribou and white-tailed deer.

GNWT: Dr. Nicholas (Nic) Larter is the Manager of Wildlife Research and Monitoring for the Dehcho Region. Previously, he was the caribou/muskox biologist for the Inuvik Region. He has extensive field experience with northern wildlife populations, including Peary and boreal caribou, muskox, moose and wood bison. He received his PhD in Zoology from UBC in 1994.

Project Budget

NE BC ranges, 2 @ $35,000 each = $70,000
NWT, 2 areas @ $40,000 each = $80,000
Alberta sampling, 2 ranges @ $35,000 each range = $70,000

Coordination of data collection, timing, liaison and data sharing among all three jurisdictions: $7,000 to cover travel expenses, extension meetings and coordination. It was suggested at the June 25 REMB meeting that such a role is required.

Total: $227,000

Secured Funding Sources

- Alberta Government, ABMI and the Regional Industry Caribou Collaboration – $70,000 for surveys in two Alberta ranges
- SCEK – $107,000 for surveys in two NE BC ranges, part of one NWT study area and travel
- GNWT-ENR – $10,000 towards part of one NWT study area

Total secured: $187,000

Funding Requested from NWT ESRF

- $40,000 to complete surveys in the second NWT study area.

2. Evaluating Risk of Cumulative Effects of Fire and Human Disturbance to Boreal Woodland Caribou Habitat

GNWT-ENR is in the process of developing a range management plan for boreal caribou in the Northwest Territories (NWT) to meet its obligations under the federal recovery strategy for boreal caribou. Currently, there is a 67 percent undisturbed habitat in the range, but there is substantial variation across the range in terms of the amount and type of disturbance.

Fire is currently the main source of habitat disturbance in the NWT, but there is also an extensive human disturbance footprint, mainly from past oil and gas exploration.

The GNWT recently signed two new Forest Management Agreements (FMAs) with Aboriginal companies, which signifies the commencement of a new forest industry in the southern NWT. Forest harvesting will be a significant contributor to landscape disturbance in the southern NWT over the next 25 years, the term of the FMAs.

Modelling to develop spatial predictions of timber harvesting over 10, 25, 50 and 100 years has recently been completed, but did not incorporate spatial predictions of future fires. The ability to make spatial predictions about the combined impact of timber harvesting and future forest fires would be of great value for informing long-term goals and strategies for boreal caribou habitat management in the NWT. Predicted increases in fire severity and annual area burned under a changing climate may make it particularly challenging to maintain 65 percent undisturbed habitat for caribou in the southern part of the range over the long term. Fires may also impact sustainable timber harvest levels when trying to meet targets for caribou habitat.

Project Objectives

- Identify areas that are more susceptible to fires during the next 25 years. This information could be used to guide short-term decisions about which areas of undisturbed habitat should be protected for caribou, selected for timber harvest or which might require more intensive fire management to maintain as undisturbed habitat. A burn probability analysis project was completed for the southern NWT in 2013/2014, which could be used as a starting point for further analyses (Armitage 2014).
- Conduct spatially explicit forest landscape simulation modelling to generate projections of the combined footprint of fires and timber harvesting (including access roads) under different scenarios of future fire frequency, severity and annual area burned, and different timber harvesting scenarios, to assess the implications for the amount and patch size distribution of undisturbed habitat for boreal caribou at different time scales (e.g. 25, 50 and 100 years in the future). This could include an assessment of how fire and timber harvesting influence one another (e.g. timber harvesting in winter may affect which areas are likely to burn and how fire spreads the next summer; fires occurring in the summer will affect which stands can be harvested in the following winter). Timber harvest projections have already been completed for the two FMA areas and will be made available for use in combined fire/timber harvest modelling.
- Assess the potential impacts of trying to meet boreal caribou habitat targets/constraints under different future fire scenarios on opportunities for future commercial timber harvesting. Targets/constraints include maintaining or achieving at least 65 percent undisturbed habitat (using Environment Canada's definition of undisturbed habitat) and maintaining roughly half of the undisturbed habitat in patches >500 km^2 in size.
- Assess the implication of different scenarios of linear feature recovery on the future combined natural and human disturbance footprint in the southern NWT. This project will not try to predict the future footprint of other types of new human land use activities such as oil and gas development, but different scenarios will need to be developed to predict when, where and how much of the existing landbase that is disturbed by linear features will transition back to undisturbed habitat. For example, it could be assumed that linear features in upland habitats can be taken off the map in 25 years, but linear features in lowland habitats may persist for another 50 years.
- Explore different strategies to use timber harvesting to manage fire risk, fire spread and maintenance of caribou habitat.

Project Leads

Dr. James Hodson, PhD, Wildlife Biologist, Environmental Assessment/Habitat, Wildlife Division, Environment and Natural Resources, Government of the Northwest Territories

Lisa Smith, Inventory and Planning Forester, Forest Management Division, Environment and Natural Resources, Government of the Northwest Territories

Project Budget

Hire contractor to:

- Determine, compile and prepare necessary date inputs (20 days)
- Develop spatially-explicit burn probability modes to predict where future fires are more likely to occur and their rate of speed (20 days)
- Develop fire regime models under baseline conditions and two climate change scenarios to predict frequency, severity and extent of future fires (20 days)
- Develop cumulative effects simulation models to integrate different fire predictions with timber harvesting projections, seismic line recovery projections and caribou habitat targets/constraints (40 days)
- Run model scenarios and generate model outputs with landscape metrics for boreal caribou habitat supply and configuration (20 days)
- Write report describing modelling process, results and recommendations for approaches to landscape management to meet caribou objectives (30 days)

Total Estimated Cost for Contracted Services:
150 days @ $1,100/day = $165,000

Secured Funding

- GNWT-ENR – $70,000
- Environment Canada Habitat Stewardship Program for Species at Risk – $70,000

Funding Request from NWT ESRF

- $25,0000

3. Caribou Genetic Diversity Population Study 2015/2016

Purpose of this research is to establish a baseline landscape-scale ecological characterization of boreal caribou in the Sahtú Region and develop a comprehensive understanding of the identities and relationships among caribou populations and Aboriginal people in order to inform and prioritize management efforts. The project will bring together traditional knowledge and non-invasive population genetics to organize and understand the biological diversity of caribou and to develop an approach to caribou research that balances and accommodates Aboriginal and scientific ways of knowing.

Project Leads

Jean Polfus, PhD candidate, University of Manitoba, in collaboration with the Sahtú Renewable Resources Board (SRRB)

Project Objectives

1. **Caribou Biodiversity:** Identify and map the main evolutionary caribou lineages and apply genomic analysis to assess the basis for differentiation and adaptation at the subspecies and ecotype levels.
2. **Spatial Organization of Caribou:** Conduct population genetic analysis to describe the spatial organization of boreal caribou at the ecotype and population levels, identify core range areas and demographic and genetic connectivity among those areas. This work will provide a baseline characterization of boreal caribou in the Sahtú, which will allow for development of best practices for monitoring caribou at different spatial scales in the future.
3. **Traditional Knowledge:** This study will shed light on people's relationships with caribou and how they identify different groups and types of caribou in the region. This includes descriptions of the social dynamics within groups, spatial dynamics and movements. The traditional knowledge (TK) work will facilitate the interpretation of genetic results. To effectively share data it is important to facilitate understanding and the distribution of ideas. By focusing on community involvement through RRCs, research meetings and the project website, we hope to promote clarity and communication, even when knowledge crosses cultural divides.

2015/2016 Proposed Activities

Swabbing Samples: During the winter of 2015 we collected over 200 additional caribou fecal samples, in collaboration with Polar Continental Shelf, Environment and Natural Resources department of GNWT, SRRB and Parks Canada, to add to the current database of samples from the Sahtú Region (now over 1,000 samples). By analyzing the caribou DNA we will be able to identify individual caribou and understand how caribou groups and populations are related to each other. Swabbing removes the mucus layer (made up of epithelial cells from the inside of the intestine) on the outside of the pellets so that the DNA can be isolated and amplified. The prepared vials of epithelial cells will be sent to Trent University, where subsequent analysis of the genetic sequences and markers will take place.

Genetic Analysis: Samples will be profiled at the DNA Centre at Trent University, which provides major automated platforms used for profiling of caribou specific microsatellite DNA and mtDNA. These platforms include a MegaBACE 1000 and an ABI 3730 (48-capillary system). DNA extraction and amplification protocols will be implemented following Ball et al. (2007). The current microsatellite loci (nuclear DNA) applied to caribou in previous work was implemented through automated workstations (i.e. liquid handlers and thermocyclers). A 429 bp mtDNA control region fragment (mitochondrial DNA) will be amplified and sequenced (as per Klütsch et al. 2012).

Funding Request to NWT ESRF

- Analyze 200 caribou genetic samples for microsats and mtDNA at Trent University at $50 per sample = $10,000

4. Baseline Hydrogeological Evaluation of Central Mackenzie Valley Oil and Gas Exploration Areas

Project Objectives

1. Desk top survey of hydrogeological reports and current groundwater information within the vicinity of several lease sites selected by the study team.
2. Compilation of permafrost investigation and research information in the region, in collaboration with research personnel from Wilfred Laurier University and the Geological Survey of Canada (Steve Wolfe and Yves Michaud).
3. Field investigation of permafrost extent and depth at selected field sites. This may include shallow drilling and sediment coring, vertical temperature profiling, geophysical surveys and monitoring well installation. (Detailed field program to be developed in consultation with entire study team.)
4. Development of conceptual model of regional groundwater flow conditions in the vicinity of the selected field study sites through the integration of all existing data with in-depth hydrogeological evaluation.
5. Development of a numerical model of groundwater flow, including the influence of permafrost to investigate potential scenarios related to near surface environmental impacts of shale gas development.

Project Team

David L. Rudolph, Ph.D., P.Eng., University of Waterloo

A. R. (Tony) Lotimer, M.Sc., P.Geo., ARL Groundwater Resources Ltd.

James F. Barker, Ph.D., P.Geo., Waterloo Hydrogeology Advisors Inc.

Financial Statement of the NWT ESRF for the Fiscal Year 2015-2016

Administration		
Revenue *	**$**	**-**
Expenses		
Compensation and Benefits	$	-
Travel	$	(2,435)
Communications and Promotions	$	(1,509)
Publications	$	(1,155)
Other	$	(126)
Total Expenses	**$**	**(5,225)**
Total Administration Surplus (Deficit)	**$**	**(5,225)**
Science Program		
Revenue *		
Industry Levies	$	-
Expenses		
Wolves/Caribou	$	(25,000)
Caribou Genetics	$	(9,998)
Total Expenses	**$**	**(34,998)**
Total Science Program Surplus (Deficit)	**$**	**(34,998)**
Total 2015-2016 Surplus (Deficit)	**$**	**(40,223)**

Summary		
Opening Balance (April 1, 2015)	$	325,000
Revenue *	$	-
Expenses	$	(40,223)
Closing Balance (March 31, 2016)	**$**	**284,777**

Proposed Budget of the NWT ESRF for the Fiscal Year 2016-2017

Administration		
Revenue *	**$**	**149,000**
Expenses		
Compensation and Benefits	$	(58,000)
Travel	$	(20,000)
Communications and Promotions	$	(10,000)
Publications	$	(10,000)
Other	$	(10,000)
Total Expenses	**$**	**(108,000)**
Total Administration Surplus (Deficit)	**$**	**41,000**
Science Program		
Revenue *		
Industry Levies	$	100,000
Expenses		
Caribou Studies	$	(75,000)
Sahtu Hydrogeological Baseline	$	(25,000)
Total Expenses	**$**	**(100,000)**
Total Science Program Surplus (Deficit)	**$**	**-**
Total 2016-2017 Surplus (Deficit)	**$**	**41,000**

Summary		
Opening Balance (April 1, 2016)	$	284,777
Revenue *	$	249,000
Expenses	$	(208,000)
Closing Balance (March 31, 2017)	**$**	**325,777**

* Industry levies are shown in the Main Estimates in the year they are invoiced. However, these amounts are to fund the projects for the following fiscal year. For the purposes of this report, revenue is shown in the year the work has been budgeted.

Main Estimates 2015-2016 (Actuals)		
Revenue *	$	249,000
Expenses	$	(40,000)
Surplus (Deficit)	**$**	**209,000**
Opening Balance (April 1, 2015)	$	325,000
Closing Balance (March 31, 2016)	**$**	**534,000**

Main Estimates 2016-2017 (Revised)		
Revenue *	$	298,000
Expenses	$	(208,000)
Surplus (Deficit)	**$**	**90,000**
Opening Balance (April 1, 2016)	$	534,000
Closing Balance (March 31, 2017)	**$**	**624,000**

APPENDIX A

Records of Decisions

NESRF Management Board
July 14, 2015 Meeting
Record of Decisions

Participants:

Management Board
Menzie McEachern – GNWT ITI
Andrew Applejohn – GNWT ENR
Ken Hansen – Husky Energy
Scott Gedak – Conoco Phillips Canada
Ray Case – public member

Secretariat
Ian Butters
Bruce Hanna

Minutes
Nushreen Ukkhoy

1.	Board Member Responsibilities	• Draft Board Member responsibilities approved, now final.
2.	Executive Committee	• Establishment of an Executive Committee deemed not necessary for NESRF.
3.	Levy Rates and Payment	• Agreed that it would be best to have one levy rate apply to the entire NWT. • Agreed that new interest holders would not have to pay levy for previous two years. Related clause to be removed from Program Description and NESRF Terms of Reference.
4.	NESRF Themes	• Agreed to keep federal ESRF themes of water and wildlife in the Central Mackenzie Valley for now.
5.	Advisor to the NESRF	• Agreed that it would be beneficial to have Linda Graf (formerly with EISC, Conoco and federal ESRF Management Board) as an advisor to the new NESRF Management Board.
6.	Program Description/ Terms of Reference	• Program Description to be for external audience, Terms of Reference to be NESRF internal guiding document.
7.	Communication Strategy	• Distinct identity for NESRF, not embedded in GNWT. • Website required. • Live database would be beneficial. • Focus on electronic rather than hard copies of NESRF generated reports.
8.	Chair/Vice Chair	• Andrew Applejohn nominated for Chair, Ken Hansen for Vice Chair – unanimous approval.
9.	Next Meeting	• Sometime in early fall 2015, specific date to be determined.

NESRF Management Board
September 29, 2015 Meeting
Record of Decisions

Participants:

Management Board
Menzie McEachern – GNWT ITI
Andrew Applejohn – GNWT ENR
Ken Hansen – Husky Energy
Scott Gedak – Conoco Phillips Canada
Ray Case – public member

Secretariat
Ian Butters
Anne Marie Jennings
Bruce Hanna

1.	NWT ESRF Board Member Responsibilities	• Slight revision approved.
2.	NWT ESRF Terms of Reference	• Approved
3.	NWT ESRF Program Description	• Revision required, input from GNWT ENR Communications will be requested.
4.	Communications	• Live website by mid-November. • NWT ESRF brochure to be ready in time for NWT Geoscience Forum.
5.	Proposal Review	• *Censusing wolves to determine associations between industrial activity and caribou population growth* – recommendation to approve requested funding. • *Evaluating risk of cumulative effects of fire and human disturbance to boreal woodland caribou habitat* – recommendation to approve requested funding. • *Caribou genetic diversity population study 2015/2016* – recommendation to approve requested funding. • *Traditional harvesting and industrial development* – recommendation not to approve funding this cycle. • *Sahtu community mapping initiative* – recommendation not to approve funding this cycle. • *Proposed baseline hydrogeological evaluation of Central Mackenzie Valley oil and gas exploration areas Sahtu Region, NWT* – recommendation to move forward, obtain budgets for initial tasks for approval. • For all proposals, project leads to be asked whether methodology is transferable and how the project will inform decision-making in other parts of the NWT.
6.	Next Meeting	• Tuesday, November 3, 2015 (teleconference)