2005/2006 ANNUAL REPORT *of the* WESTERN NORTHWEST TERRITORIES BIOPHYSICAL STUDY

Northwest Territories Environment and Natural Resources

Acknowledgements

Reports and proposals submitted by team leaders were much appreciated during the initial compilation of this report. Later contributions by team leaders were used to construct each summary. Thank you, your help has been invaluable.

Photograph credits for summaries are acknowledged on each photograph. Thank you to all contributors.

Photo credits for cover: ©ENR Collection (top left); ©ENR Collection (top right); Alicia Korpach, Ducks Unlimited Canada (bottom left); and Susan Kutz (bottom right).

Department of Environment and Natural Resources,
600, 5102-50th Avenue, Yellowknife, NT X1A 3S8

Printed and bound in Canada by Inkit Ltd., Yellowknife, NT

Table of Contents

Introduction

The Western NWT Biophysical Study 3
ENR Administrative Regions of the NWT 4
Research Project Summary Structure 5

Research Projects

Wildlife

Boreal Caribou Fitness and Habitat Use
in the North Cameron Hills Area of the Dehcho, NWT 7
Boreal Caribou Fitness and Habitat Use
in the South Cameron Hills Area of the Dehcho, NWT 9
Seasonal Ranges of the Bluenose-East Barren Ground Caribou Herd
as Determined by Satellite Telemetry 11
Ecology of Boreal Woodland Caribou
in the Central Mackenzie River Valley 14
Ecology of Boreal Woodland Caribou
in the Lower Mackenzie Valley, NWT 17
Seasonal Range Use and Movement Patterns
of Boreal Caribou Inhabiting Areas of Limited Human Disturbance 20
Seasonal Range Use and Movement Patterns of Boreal Caribou
Inhabiting the Enbridge and Proposed Mackenzie Gas Pipeline Route 23
Dehcho Moose Population Monitoring Program 27
Five-year Peregrine Falcon Survey – Mackenzie Valley 2005 30
Effects of Oil and Gas Exploration, and Development Activities,
on Grizzly Bears (*Ursus arctos*)
in the Mackenzie Delta Development Area 32

Habitat

Establishment of Permanent Monitoring Plots for Growth and Yield,
National Forest Inventory and Cumulative Impact Monitoring 36
Ecosystem Classification and Mapping of the Northwest Territories –
Taiga Plains 38
Trout Lake and Dehcho Earth Cover Inventory 42

Impacts of Human Activity

Air Quality Monitoring 44

Climate Change

An Evaluation of the Role of Climate Change
in the Emergence of Pathogens and Diseases
in Arctic and Subarctic Ungulate Populations 46

The Western NWT Biophysical Study

Rationale

The Western NWT Biophysical Study was established to help ensure baseline data necessary to assess, mitigate and monitor the environmental impacts of proposed developments in the Western NWT is available to industry, regulators, communities and government. The program focuses on areas within the mandate of the Department of Environment and Natural Resources (ENR), namely: wildlife; wildlife habitat; forests; and, air quality.

Background

As the primary authority responsible for managing aspects of wildlife, wildlife habitat and forests in the NWT, the Department of Resources, Wildlife and Economic Development (RWED) initiated a multi-party process to determine what these potential impacts could be and to work to find ways to limit possible negative implications. These areas of responsibility now reside within the Department of Environment and Natural Resources (ENR), formed from the partition of RWED into the Department of Industry, Tourism and Investment (ITI) and ENR on April 1, 2005.

In early 2004, RWED, in collaboration with the Department of Indian and Northern Affairs and Environmental Studies Research Funds, completed a project to identify biophysical information and research gaps associated with hydrocarbon exploration, development and transmission in the Mackenzie Valley. The Western NWT Biophysical Study has allowed the GNWT to initiate research projects necessary to address many of the gaps identified within ENR's mandate.

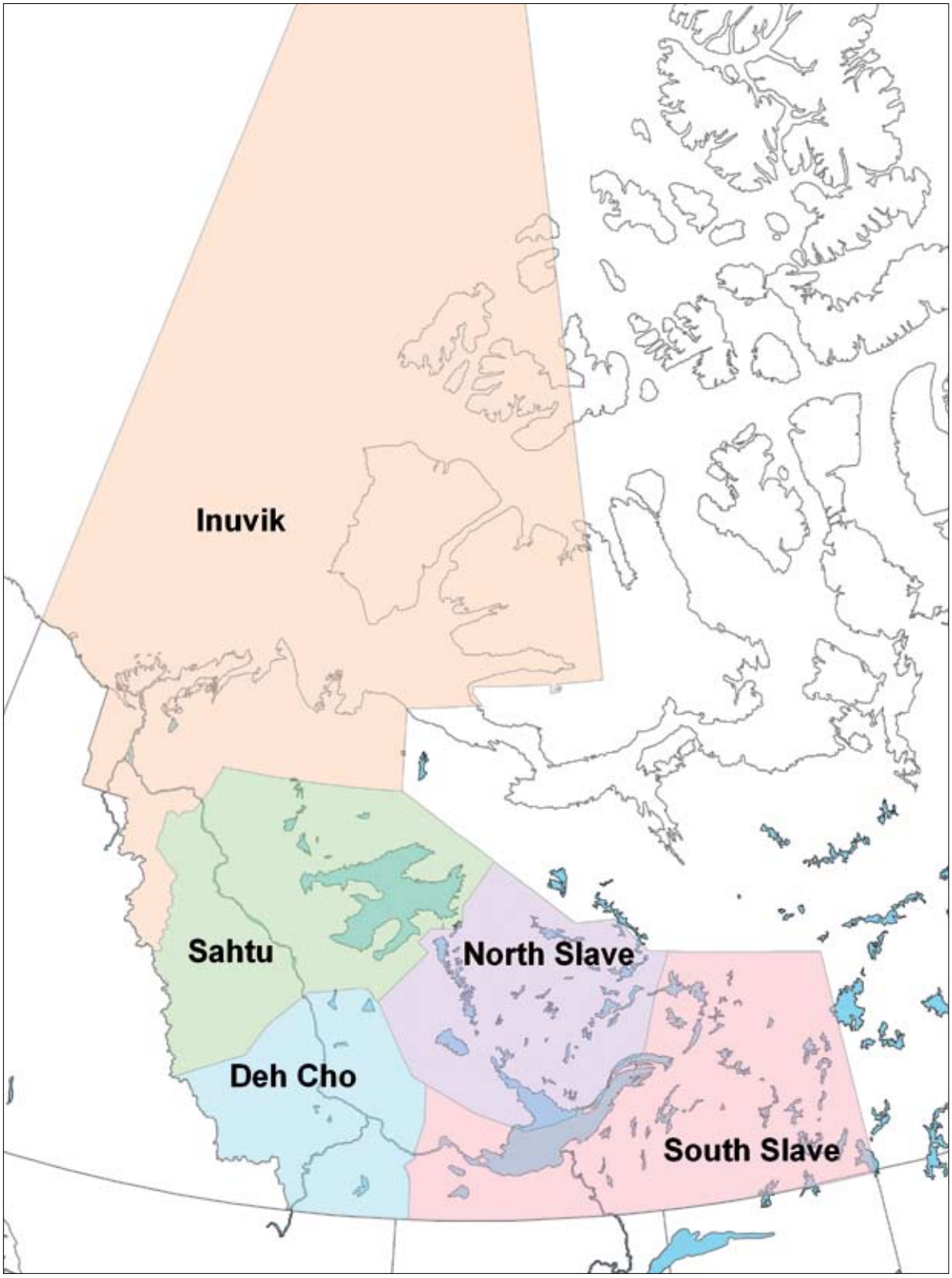
Status

The Western NWT Biophysical Study provided $899,950 towards projects in 2003/2004, $908,000 towards projects in 2004/2005 and $894,000 towards projects in 2005/2006. In addition to research projects, workshops are held in each of the Mackenzie Valley regions to review progress of the Study and to ensure priority information needs are being addressed. Partnerships with federal agencies, wildlife management boards, universities, non-government organizations and industry have been developed on a project-by-project basis. Most projects involve multiple partners and are now in year two or three of multi-year studies, therefore, results from the studies are limited and, where available, are only preliminary.

Disclaimer

The contents of each summary are the sole responsibility of the team leads for each project and do not reflect the official policy of ENR or the GNWT.

ENR Administrative Regions of the NWT



Research Project Summary Structure

Project summaries contain a short caption denoting the lead agency responsible for the project and the location where work was conducted according to the ENR Administrative Regions of the NWT. Each summary also contains:

Rationale	A short paragraph describing why the project was conducted and its importance to the Western NWT Biophysical Study.
Objectives	A description of the main objectives of the project.
Methods and Information Collected	A brief description of where the work was conducted, how the project was conducted and what information was collected.
Results and Deliverables	A summary of the results, reports and deliverables generated.
Long-term Plans and Recommendations	A summary of long-term plans for the project and recommendations generated from project results.
Partners	A list of organizations that were involved in the project.
Funding	A list of organizations that provided funding for the project.
Contacts	Contact information for research team leads.

Photo courtesy ENR, GNWT

This project aims to gather baseline information on boreal caribou well-being in the Hay River Lowlands to evaluate the population demographics.

Boreal Caribou Fitness and Habitat Use in the North Cameron Hills Area of the Dehcho, NWT

South Slave Region, ENR

Rationale

In the NWT, boreal caribou are currently listed as data deficient. This project aims to gather baseline information on boreal caribou well-being in the Hay River Lowlands (north of the Cameron Hills plateau) to evaluate the population demographics and habitat use in an area that has relatively little past or current industrial development. The effectiveness of mitigation measures and guidelines for proposed developments in the study area will also be monitored. Local communities play a large role in land use planning and need the information necessary to make decisions based on traditional knowledge and sound scientific research.

Objectives

- Monitor adult female survival, 10-month calf recruitment, calf production and population rate of increase (maintain a minimum of 30 collared cows).
- Monitor presence of disease and parasites.
- Broadly document seasonal range use, annual home ranges and fidelity to calving areas.

Boreal Caribou Fitness and Habitat Use in the North Cameron Hills Area of the Dehcho, NWT

South Slave Region, ENR

Methods and Information Collected

- From March 2003 to February 2006, 40 boreal caribou cows were fitted with conventional VHF radio collars.
- Collared cows were located by fixed wing aircraft once per month during the year, weekly during calving (May to June), and twice during the rut (September 10 to September 30).
- Blood and fecal samples were collected from captured adult female caribou to measure pregnancy rates and previous exposure to disease and parasites.
- The collared boreal caribou cows were monitored to measure annual adult female caribou survival and calf recruitment rates, and calculate population rate of increase for each year.

Results and Deliverables

- Draft summary reports were compiled, and information was contributed to annual community meetings and additional outreach materials.
- Presentations of relevant findings were delivered to communities in the Dehcho region.

Long-term Plans and Recommendations

- It is planned that the study will continue over the long-term to capture the natural variation in environmental conditions. The study may, however, be scaled down to only monitor long-term population demographics.
- One or two community meetings are planned to take place per year (as well as the publication and presentation of outreach material) to share the results of the project and promote awareness and understanding of caribou habitat.

Funding

Western NWT Biophysical Study

Contact

Deborah Johnson
South Slave Regional Biologist, ENR
Fort Smith, NT
deborah_johnson@gov.nt.ca

Photo courtesy ENR, GNWT

Oil and gas activities represent an important area to investigate interactions between boreal caribou and industrial developments.

Boreal Caribou Fitness and Habitat Use in the South Cameron Hills Area of the Dehcho, NWT

South Slave Region, ENR

Rationale

The Cameron Hills/Bistcho Lake boreal caribou study was initiated in March 2005 after preliminary movement data from a small sample of collared cows showed a distinct differentiation in areas used from adjacent collared cows immediately north of the Cameron Hills plateau. The sampled cows also readily moved back and forth across the Alberta and territorial border. Furthermore, in the east portion of the Cameron Hills, cows moved in a southeast direction off the plateau in late winter months onto the lowlands east to the Hay and Meander Rivers in Alberta. In the NWT, the Cameron Hills has past and existing oil and gas activities and represents an important area to investigate interactions between boreal caribou and industrial developments. The study area was extended south into Alberta due to the free movement of collared animals between the two jurisdictions.

Objectives

- Monitor adult female survival, 10-month calf recruitment, calf production and population rate of increase (maintain a minimum of 30 collared cows).
- Document seasonal ranges and movements.
- Model boreal caribou distribution in relation to natural and anthropogenic landscape features.
- Monitor presence of disease and parasites (baseline database).

Boreal Caribou Fitness and Habitat Use in the South Cameron Hills Area of the Dehcho, NWT

South Slave Region, ENR

Methods and Information Collected	• Information on caribou gender and age was gathered by helicopter to assess calf survival rates. • Data was gathered from a sample size of 33 collared animals (net-gun) deployed with 15 VHF, 10 GPS-ARGOS (Telonics TGW-3680) and eight SAT-ARGOS (Telonics ST-18) collars to measure adult female caribou survival and calf recruitment rates after release. • Telonic ST-18 collars provide locations every day from May 1 to May 31, and locations every three days for the remainder of the year (June 1 to April 30); Telonic TGW-3680 collars provide three locations per day; and VHF collars are used to increase the sample size to aid in monitoring caribou population demographics. • Blood and fecal samples were collected from captured adult female caribou to measure pregnancy rates and previous exposure to disease and parasites.
Results and Deliverables	• Draft reports were compiled, and information was contributed to annual community meetings and additional outreach materials. • Presentations of relevant findings were delivered to communities in the Dehcho region.
Long-term Plans and Recommendations	• It is planned that the study will continue over the long-term to capture the natural variation in environmental conditions. • One to two community meetings are planned to take place per year (as well as the publication and presentation of outreach material) to share the results of the project and promote awareness and understanding of caribou habitat.
Funding	Western NWT Biophysical Study
Contact	Deborah Johnson South Slave Regional Biologist, ENR Fort Smith, NT deborah_johnson@gov.nt.ca

Photo courtesy of Brad Culling

The study area for this project spans from Bluenose Lake in the north, south and east of Kugluktuk, and east and south of Great Bear Lake to the Wrigley area.

Seasonal Ranges of the Bluenose-East Barren Ground Caribou Herd as Determined by Satellite Telemetry

Sahtu Region, ENR

Rationale

Satellite-tracked radio collars on adult female caribou have been used to map the seasonal ranges of Bluenose-East caribou since 1996. These data are used to delineate critical habitat necessary for the identification and definition of potential Protected Areas and Conservation Zones under the NWT Protected Areas Strategy and the Sahtu Land Use Plan, respectively. The study area for this project spans from the north and east of Bluenose Lake in the north, south and east of Kugluktuk, and east and south of Great Bear Lake to the Wrigley area.

Objectives

- Map the weekly movements of satellite-tracked adult female radio collared caribou. Maps will be posted regularly on the ENR web site (with a three-week delay).
- Use movements of satellite-tracked caribou to continue determination of the herd's seasonal range and habitat use patterns.
- Use movements of satellite-tracked animals to assist with identification and delineation of Protected Areas and to assist with implementation of the Caribou Protection Measures proposed under the Great Bear Lake Watershed Management Plan.

Seasonal Ranges of the Bluenose-East Barren Ground Caribou Herd as Determined by Satellite Telemetry

Sahtu Region, ENR

Methods and Information Collected

- In March 2006, aerial fixed-wing surveys were flown on transect lines spaced at 20 km intervals to document winter distribution of the herd and to identify aggregations of caribou for capture and radio collaring. An additional 26 collars were deployed on 13 male and 13 female adult caribou in March 2006, and for the first time GPS collars (9 of the 26) were deployed on Bluenose-East animals.
- Locations of satellite-collared female caribou are received from ARGOS satellites every four to five days for all eight caribou seasons. These data show movements and up-to-date locations of female caribou, and are posted on the ENR web site. Newly deployed GPS collars obtain three locations daily (at eight hour intervals) and provide more detailed data for future habitat-use assessment.
- The boundaries of the seasonal ranges are created via a fixed-kernel home range estimate with least-squares cross-validation. The movements of caribou are overlaid on each seasonal range to provide information on the direction of movement or migration.
- Biological sampling kits were provided to harvesters, along with instructions for the collection process and data forms. Harvesters collected samples from caribou taken during the February to April period and samples were submitted to ENR.
- Two Wildlife Health Monitors have been trained and established in Deline. The Monitors collect samples from harvested caribou and provide information on animal condition, diseases and parasites, and hunting/snow conditions in the Deline/Great Bear Lake area.
- Elders from Tulita and Deline have been interviewed for their observations on any changes to health and condition of caribou over the last 20 to 50 years. During meetings with stakeholders to discuss research and management of the Bluenose-East caribou herd, scientific and traditional knowledge are freely exchanged.

Results and Deliverables

- Maps of caribou movements have been made available on the ENR web site.
- Presentations have been made to the Sahtu Renewable Resource Board, Renewable Resource Councils and other organizations as requested.
- Data from collars allowed ENR staff to complete a successful photocensus in the summer of 2005, which indicated a significant decline in barren ground caribou herds and led to changes in barren ground caribou harvest levels.

Seasonal Ranges of the Bluenose-East Barren Ground Caribou Herd as Determined by Satellite Telemetry

Sahtu Region, ENR

Results and Deliverables *continued*

- A summary progress report and poster have been created.
- The Wildlife Health Monitor program in the Sahtu provides data that will be used in a larger scientific context, notably via proposals submitted to the International Polar Year (IPY 2007/2008). The proposals fit under the umbrella of the Circum Arctic Rangifer Monitoring and Assessment Network, whose mission is to monitor and assess the impacts of global change on the human/Rangifer system across the Arctic through cooperation, both geographically and across disciplines.
- Satellite locations are used to help identify and delineate Protected Areas and to assist with the implementation of Mobile Caribou Protection Measures, which were proposed under the Great Bear Lake Watershed Management Plan.

Long-term Plans and Recommendations

- This project is ongoing with monitoring and community consultation expected to continue.
- Baseline data has been instrumental in tracking the decline in barren ground caribou and has assisted the establishment of new harvest recommendations. Continued use of collars will be vital in assessing if management actions have been effective.

Partners

Nunavut Wildlife Management Board,
Nunavut Wildlife Service,
Government of Nunavut
Sahtu Renewable Resources Board

Funding

Western NWT Biophysical Study

Contact

Boyan Tracz
Sahtu Cumulative Effects Biologist, ENR
Norman Wells, NT
boyan_tracz@gov.nt.ca

Photo courtesy of Boyan Tracz, ENR

Data generated will be used to mitigate any impacts of human activities and cumulative effects on seasonal ranges of caribou.

Ecology of Boreal Woodland Caribou in the Central Mackenzie River Valley

Sahtu Region, ENR

Rationale

This project aims to provide baseline ecological information on boreal woodland caribou in the NWT, listed as Threatened in Canada by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). The project focuses on the Mackenzie River Valley from north of Fort Good Hope to south of Tulita, with particular emphasis on the proposed route of the Mackenzie Valley Pipeline. Data generated will be used to mitigate any impacts of human activities and cumulative effects (both natural and human-initiated) on seasonal ranges of caribou. In addition, this study provides a baseline for further exploration of the impacts of climate change on caribou populations.

Objectives

- Identify, map and verify boreal woodland caribou habitats by season, with particular focus on groups along, or adjacent to, the proposed Mackenzie Valley Pipeline.
- Continue to obtain baseline data on population dynamics of boreal woodland caribou in the Sahtu and ensure that samples sizes are adequate in the study area through a combination of GPS and ARGOS satellite collars.
- Provide information needed to evaluate the current and potential implications of further habitat loss and fragmentation, and human activities (cumulative effects) on boreal woodland caribou in the Mackenzie Valley.

Ecology of Boreal Woodland Caribou in the Central Mackenzie River Valley

Sahtu Region, ENR

Methods and Information Collected

- Beginning in 2003, adult female boreal caribou were captured and equipped with GPS and satellite-tracked radio-collars.
- Digital maps were created and compiled from aerial classifications of LANDSAT Thematic Mapper images. Data were modelled using GIS software.
- Occurrence surveys were flown, with data collected on calving success and calf survival.
- Local knowledge was gathered from communities in workshops and community interviews as well as voluntary reporting of activity and sightings.
- Tissue and fecal samples were obtained for genetic, forage and parasite-load analysis.

Results and Deliverables

- An additional 11 collars (10 GPS, 1 Argos) were deployed on boreal woodland caribou in the Sahtu region in March 2006.
- Currently, seven collars are deployed in the Stewart Lake (Summit-Keele) region allowing for potential future collaboration with industry on the response of boreal woodland caribou to changes in industrial activity.
- Results have been presented to the Sahtu Renewable Resources Board (SRRB) and the Renewable Resource Councils (RRCs) in the Sahtu.
- Animated movements of radio-collared caribou have been prepared and presented to the SRRB and RRCs.
- Results of this study have been combined with those from the Inuvik region for GNWT Manuscript and File reports, and submission to scientific journals.

Long-term Plans and Recommendations

- The study will continue through 2006/2007, and beyond, to obtain additional baseline data and to monitor changes.
- These baseline data will be used in the development of an Action Plan for Boreal Caribou Conservation in the NWT (as required by federal Species at Risk legislation), and will be used in the continuing assessment of industrial changes, notably the proposed Mackenzie Valley Pipeline.
- A proposal has been presented to Husky Oil Inc. so that a collaborative boreal caribou project can be undertaken in the Stewart Lake (Summit-Keele) area southwest of Tulita. Oil and gas exploration and extraction is anticipated to occur in this area over the next several years, and there is significant community/RRC concern about development and its potential effect on boreal woodland caribou. There is the potential for testing of mitigative measures and for comparison to boreal caribou behaviour in Alberta.

Ecology of Boreal Woodland Caribou in the Central Mackenzie River Valley

Sahtu Region, ENR

Long-term Plans and Recommendations *continued*

- Enhanced vegetation classification using Ducks Unlimited (DU) methods will provide greater classification accuracy for boreal woodland caribou habitat use analysis (via resource selection function analysis, as completed in the Inuvik region). DU staff are continuing with analysis of selected LANDSAT TM imagery in the Mackenzie River Valley; arrival of Sahtu-specific data is pending.

Partners

Dehcho, ENR
Headquarters, ENR
Inuvik Region, ENR
Renewable Resource Councils
Sahtu Region, ENR
Sahtu Renewable Resources Board
South Slave, ENR

Funding

Western NWT Biophysical Study

Contact

Boyan Tracz
Sahtu Cumulative Effects Biologist, ENR
Norman Wells, NT
boyan_tracz@gov.nt.ca

Photo courtesy of John Nagy, ENR

This project aims to provide data, and traditional knowledge, for the creation of a recovery team and plan for the threatened boreal caribou.

Ecology of Boreal Woodland Caribou in the Lower Mackenzie Valley, NWT

Inuvik Region, ENR

Rationale

This project aims to provide baseline demographic and habitat use data, and traditional knowledge, for the eventual creation of a recovery team and plan for the nationally threatened boreal caribou. The study area falls within the northern-most portion of boreal woodland caribou range in Canada and is largely north of the Arctic Circle (66° 33' N). The primary focus of work completed during fiscal year 2005/2006 was to obtain baseline demographic information and to develop seasonal resource selection function models to predict probability of occurrence of boreal caribou in the Lower Mackenzie, Peel Plateau and Middle Mackenzie project areas mapped by Ducks Unlimited in the Inuvik and Sahtu regions, particularly in the area of the proposed Mackenzie Valley Pipeline.

Objectives

- Obtain estimates of the number of boreal woodland caribou in the Inuvik region as well as estimates of productivity, recruitment and survival (calf and adult female) rates.
- Obtain estimates of home range size and seasonal movement rates, and determine seasonal patterns of habitat use and selection. These estimates will include looking at the use of areas burned by wildfires and nearby linear anthropogenic features, such as seismic lines (avoidance).
- Provide recommendations for the long-term management of boreal woodland caribou and their habitats in the Inuvik region.

Ecology of Boreal Woodland Caribou in the Lower Mackenzie Valley, NWT

Inuvik Region, ENR

***Objectives** continued*

- Develop seasonal Resource Selection Function models (RSF models) to map the relative probability of occurrence of boreal woodland caribou across the Inuvik and Sahtu regions using caribou use data obtained through satellite tracking and existing LANDSAT Thematic Mapper based vegetation maps (Ducks Unlimited).
- Identify seasonal habitats that may be limiting for boreal woodland caribou in the Inuvik region.
- Collect samples required to assess the genetic relationships between boreal woodland caribou in the NWT and adjacent jurisdictions and with barren ground caribou.
- Evaluate the implications of cumulative effects of natural (e.g. wildfires, climatic events) and anthropogenic disturbances on boreal woodland caribou and their habitats.

Methods and Information Collected

- Female boreal woodland caribou were captured and equipped with ARGOS and GPS satellite collars and VHF radio collars.
- Telemetry flights were conducted in mid to late May to determine calving rates for collared females. Flights were also conducted in late October and late March to determine over-summer and over-winter survival of radio-collared cows and their calves. Calf and adult female survival and recruitment rates were determined in this manner.
- GPS satellite tracking data were used to determine seasonal movement rates and to assess seasonal patterns of avoidance of linear anthropogenic features.
- Satellite tracking data (GPS and ARGOS), in combination with earth cover maps produced by Ducks Unlimited, was used to determine seasonal shifts in habitat use and to model seasonal probability of occurrence (RSF models) of boreal woodland caribou in forested areas in the Inuvik region.
- Traditional knowledge was gathered, recorded, compiled and mapped.

Ecology of Boreal Woodland Caribou in the Lower Mackenzie Valley, NWT

Inuvik Region, ENR

Results and Deliverables

- Baseline data on population numbers, productivity, recruitment and habitat use were summarized.
- Posters were created showing movements of satellite-collared caribou and seasonal Resource Selection Function models and distributed to the Renewable Resource Councils (RRCs) in the Gwich'in Settlement Area. A document summarizing the results of RSF modelling work completed was prepared.
- A poster showing the results of RSF modelling work was presented at the 11th North American Caribou Workshop in Jasper, Alberta.
- A presentation was given to Yellowknife ENR staff and members of the Gwich'in Renewable Resources Board summarizing information on demographics of boreal woodland caribou obtained to date with specific reference to environmental impact assessment.

Long-term Plans and Recommendations

- This project will continue to provide baseline data for management of boreal woodland caribou and their habitats in the Inuvik region and other areas of the NWT, and for the development of an action plan for boreal caribou conservation.

Partners

Gwich'in Renewable Resource Board
Inuvik Region, ENR

Funding

Department of Environment, Government of Yukon Territory
Government of Canada Habitat Stewardship Fund for Species at Risk
Gwich'in Renewable Resource Board
Polar Continental Shelf Project
Department of Environment and Natural Resources, GNWT
Western NWT Biophysical Study

Contact

John A. Nagy
Senior Wildlife Researcher
Mackenzie Valley Development, ENR
Inuvik, NT
john_nagy@gov.nt.ca

Photo courtesy of Danny Allaire, ENR

This study will assist in assessing the basic ecology of boreal caribou in order to collect baseline information over as wide an area as possible.

Seasonal Range Use and Movement Patterns of Boreal Caribou Inhabiting Areas of Limited Human Disturbance

Dehcho Region, ENR

Rationale

Boreal caribou are listed as Threatened in Canada by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2002). The cumulative effects of natural and man-made disturbance have been implicated in the decline of this species. Similar studies have been initiated throughout the range of boreal caribou including the Inuvik, Sahtu, South Slave and Dehcho regions. Conducted in the area found between Celibeta, Cormack, Trainor and Trout Lakes in the southern Dehcho, this study will assist in assessing the basic ecology of boreal caribou in order to collect baseline information over as wide of an area of boreal caribou range as possible.

Objectives

- To document seasonal range use and movement, as well as calving areas, of female boreal caribou over multiple years.
- To assess range use, calving areas and movement patterns of boreal caribou, and to study these patterns in relation to anthropogenic factors, including seismic lines and other disturbances resulting from development.
- To document seasonal female:calf ratios of caribou and to estimate adult female survival.
- To document seasonal disease, parasites and diet in boreal caribou.

Seasonal Range Use and Movement Patterns of Boreal Caribou Inhabiting Areas of Limited Human Disturbance

Dehcho Region, ENR

***Objectives** continued*

- To assess gene flow of boreal caribou in the NWT.
- To provide empirical data to test the predictions and robustness of a study that predicts boreal caribou habitat.

Methods and Information Collected

- Residents of Trout Lake have been consulted extensively in the delineation of areas for capturing caribou and also with respect to the number of collars to be deployed.
- Animals were captured by net-gun fired from a helicopter. Blood and fecal samples were collected from each animal for analysis. Four additional satellite radio collars equipped with VHF beacons were deployed.
- Collars were retrieved from deceased animals and re-deployed. All collars are equipped with a release mechanism and have a four-year life span.
- Satellite collars provide daily locations during the expected calving period (May 1 to June 14) and provide locations once every three days for the remainder of the year.
- Blood samples were submitted for DNA analysis and fecal samples were submitted for diet and disease/parasite analysis. Samples were taken during capture and field work, and were provided from harvesters on a voluntary basis.

Results and Deliverables

- Community meetings, consultation and the sharing of posters showing caribou movements with residents of Trout Lake and Nahanni Butte are ongoing. (Collared animals now reside in the Arrowhead area, which is of interest to the Nahanni Butte Dene Band as well as Sambaa K'e Dene Band, Trout Lake.)
- Blood and fecal samples have been analyzed and will continue to be forwarded for analysis as they come in.
- Aerial relocation flights were conducted in June and September 2005 and classification counts using a helicopter were conducted in March 2006. An annual report of the program has been circulated amongst Dehcho First Nations and other ENR regions.
- Posters and presentations of the results were presented at Regional Wildlife Workshops and at the 11th North American Caribou Workshop in Jasper, Alberta.

Seasonal Range Use and Movement Patterns of Boreal Caribou Inhabiting Areas of Limited Human Disturbance

Dehcho Region, ENR

Long-term Plans and Recommendations

- Monitoring of collars is ongoing, with flights to collect and re-deploy collars to be made as required.
- Relocation flights to determine which collared females have calved by early June should be conducted using rotary aircraft to collect this information accurately and efficiently.
- There is a plan to deploy retrieved satellite collars and two GPS collars (which will provide three locations daily for approximately three years) in January 2007.

Partners

Department of Environment and Natural Resources, GNWT
Sambaa K'e Dene Band

Funding

Western NWT Biophysical Study
NWT Cumulative Impacts Monitoring Program

Contacts

Nic Larter
Dehcho Regional Biologist, ENR
Fort Simpson, NT
nic_larter@gov.nt.ca

Photo courtesy of Danny Allaire, ENR

This project will document seasonal range use and movement, as well as calving areas, of female boreal caribou in an area bisected by the proposed pipeline.

Seasonal Range Use and Movement Patterns of Boreal Caribou Inhabiting the Enbridge and Proposed Mackenzie Gas Pipeline Route

Dehcho Region, ENR

Rationale

Preliminary DNA analyses indicate that the historical genetic flow of boreal caribou in the NWT took place in both a north-south and east-west direction. Caribou residing in the Ebbutt Hills area not only provide an opportunity to collect important ecological baseline data in an area that is part of the proposed Mackenzie Gas Pipeline (MGP) route, but also key DNA data which could shed light on historic gene flow corridors for boreal caribou. This study was conducted in a similar and complementary manner to the seasonal range use study taking place in the area found between Celibeta, Cormack, Trainor and Trout Lakes in the southern Dehcho. Given the wide dispersion of animals during the calving period, the additional collared individuals in this study will greatly assist in documenting calving areas in relation to wintering areas, and will allow researchers to distinguish areas where harvest of different subspecies of caribou (barren ground, mountain and/or boreal) may be taking place.

Objectives

- To document seasonal range use and movement, as well as calving areas, of female boreal caribou over multiple years in an area bisected by a pipeline and the proposed Mackenzie Gas Pipeline (MGP) right-of-way.
- To assess range use, calving areas and movement patterns of boreal caribou and to study these patterns in relation to anthropogenic factors, including seismic lines and other disturbances resulting from development.

Seasonal Range Use and Movement Patterns of Boreal Caribou Inhabiting the Enbridge and Proposed Mackenzie Gas Pipeline Route

Dehcho Region, ENR

***Objectives** continued*

- To increase the number of collared caribou in the Ebbutt Hills study area to 10 animals using a mixture of satellite and VHF collars as resources dictate.
- To document seasonal female:calf ratios of caribou and to estimate adult female survival.
- To document seasonal disease, parasites and diet in boreal caribou.
- To assess gene flow of boreal caribou in the NWT.
- To provide empirical data to test the predictions and robustness of a study that predicts boreal caribou habitat.

Methods and Information Collected

- Members of Liidlii Kue First Nation, Fort Simpson Métis and Jean Marie River First Nation have been consulted extensively in the delineation of areas for capturing caribou and also with respect to the number of collars to be deployed.
- Animals were captured by net-gun fired from a helicopter. Blood and fecal samples were collected from each animal for analysis. Five satellite and four VHF collars were deployed.
- Satellite collars provide daily locations during the expected calving period (May 1 to June 14) and provide locations once every three days for the remainder of the year.
- Aerial relocation flights will be conducted annually to visually observe animals, monitor calf production and survival, and locate animals equipped with VHF collars. A helicopter will be used to get a thorough classification count.
- Local harvesters will be asked to provide biological samples from harvested caribou in an active promotional campaign.
- Wolf scat and the stomach contents of harvested wolves will be analyzed for dietary components.
- Aerial photographs of locations where collared animals are relocated and habitats will be taken throughout the year to assist Ducks Unlimited with their vegetation classification.
- Blood samples were submitted for DNA analysis and fecal samples were submitted for diet and disease/parasite analysis. Samples were taken during capture and field work, and were also provided by harvesters on a voluntary basis.

Seasonal Range Use and Movement Patterns of Boreal Caribou Inhabiting the Enbridge and Proposed Mackenzie Gas Pipeline Route

Dehcho Region, ENR

Results and Deliverables

- Community meetings, consultation and the sharing of posters showing caribou movements with residents of Fort Simpson, Jean Marie River and, by request, Wrigley, are ongoing.
- Blood and fecal samples have been analyzed and will continue to be forwarded for analysis as they come in.
- Aerial relocation flights were conducted in June and September and classification counts using a helicopter were conducted in March 2006.
- An annual report of the program has been circulated amongst Dehcho First Nations and other ENR regions.
- Posters and presentations of the results were presented at Regional Wildlife Workshops and at the 11th North American Caribou Workshop in Jasper, AB.

Long-term Plans and Recommendations

- As there is overwhelming support from the Fort Simpson Métis, the Liidlii Kue First Nation and the community of Jean Marie River for this project, it is recommended that the number of deployed collars be increased.
- Wrigley has indicated they would support having more animals collared in their traditional lands.
- There is a plan to deploy retrieved collars and three GPS collars (which will provide three locations daily for about three years) on caribou throughout the study area, including the Fish Lake area near Wrigley.
- Monitoring of collars is ongoing, with flights to collect and re-deploy collars to be made as required.
- Relocation flights to determine which collared females have calved by early June should be conducted using rotary aircraft to most accurately and efficiently collect this information.

Seasonal Range Use and Movement Patterns of Boreal Caribou Inhabiting the Enbridge and Proposed Mackenzie Gas Pipeline Route

Partners	Department of Environment and Natural Resources, GNWT First Simpson Métis Nation Liidlii Kue First Nation Jean Marie River First Nation
Funding	Western NWT Biophysical Study NWT Cumulative Impacts Monitoring Program
Contacts	Nic Larter Dehcho Regional Biologist, ENR Fort Simpson, NT nic_larter@gov.nt.ca

Photo courtesy of Danny Allaire, ENR

This project will establish baseline estimates of moose density in the Dehcho and a community-based moose monitoring project.

Dehcho Moose Population Monitoring Program

Dehcho Region, ENR

Rationale

Moose are at the edge of their northern range in the NWT. Current moose density estimates for areas within and adjacent to major harvesting corridors and current and proposed industrial development are lacking. Moose surveys were last conducted in the Dehcho in the mid 1980s in relation to the then Liard Highway, with one survey having been conducted in the Liard Valley in 1994. Moose continue to be a highly sought after traditional country food by residents of the Dehcho and are frequently harvested in the region by hunters who reside in other regions of the NWT. Hunting pressure on moose has increased since the last surveys were completed and local concerns, from the seven first nations of the five communities in the Dehcho region, have voiced that moose numbers appear to be depressed. These concerns, in combination with increased oil and gas activity in the Liard Valley, indicate the need to assess moose populations prior to additional habitat loss and increased accessibility in the region.

Objectives

- Establish baseline estimates of moose density in the Dehcho and establish a community-based moose monitoring project.
- Conduct annual small-scale aerial surveys for moose in areas of interest to the five communities in the Dehcho region. Surveys would be conducted with the assistance of local harvesters over a multi-year period.
- Document health and condition indices of locally harvested moose throughout the region and increase community involvement in harvesting programs.

Dehcho Moose Population Monitoring Program

Dehcho Region, ENR

***Objectives** continued*	• Document the levels of various heavy metals and other contaminants found in moose throughout the region. • Provide information that can be used to determine the timing of further large-scale moose surveys in the region.
Methods and Information Collected	• Traditional knowledge was used to stratify the survey area into low and high moose density areas. ver Hoef geospatial moose surveys were flown in November 2003 in the Mackenzie Valley area and in the Liard Valley area in February 2004. Based on these two sources of information, an annual moose population monitoring program was initiated with five communities in the Dehcho region (Wrigley, Fort Simpson, Jean Marie River, Nahanni Butte and Fort Liard). • The monitoring program consists of an aerial November survey component to assess moose distribution, density and calf production, and a biological sampling component to physically assess animal health and condition. Sampling also allows for the documentation of levels of various contaminants. • Sampling kits and sampling protocols were circulated to harvesters in all five communities.
Results and Deliverables	• Preliminary results, posters and summary reports were provided to First Nations. • Government reports and scientific publications will be produced and presented in a variety of forms and forums.
Long-term Plans and Recommendations	• Similar aerial monitoring programs will be conducted annually each November through 2007/2008. • It is anticipated that a large-scale moose survey would be conducted during 2008/2009 unless preliminary results indicate a need for a large-scale survey earlier. • Biological sampling and analysis will continue through 2007/2008, with samples stored for additional analysis should the need or funding arise. • The analysis of contaminant levels in the organs of harvested moose will be completed by March 2007.

Dehcho Moose Population Monitoring Program

Dehcho Region, ENR

Partners	Dehcho First Nations NWT Cumulative Impact Monitoring Program Parks Canada
Funding	Western NWT Biophysical Study Parks Canada Northern Contaminants Program
Contact	Nic Larter Dehcho Regional Biologist, ENR Fort Simpson, NT nic_larter@gov.nt.ca

Photo courtesy of ENR Collection

This project will determine the nest occupancy and productivity of the threatened anatum subspecies of peregrine falcon along the Mackenzie River.

Five-year Peregrine Falcon Survey – Mackenzie Valley 2005

Wildlife Division, ENR

Rationale

The peregrine falcon (*Falco peregrinus anatum*) is listed as Threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 1999). Occupancy and nesting success can be highly variable for this subspecies. A five-year survey is considered the minimal monitoring effort necessary to provide valuable information on the health of the peregrine falcon population in the Mackenzie Valley. There are approximately 110 known peregrine nest locations along the Mackenzie Valley, from north of Wrigley to Inuvik. These nests include a large portion of the core northern population of anatum peregrine falcons residing within the NWT. Uncertainty exists as to the stability of this population. The five-year Mackenzie Valley Survey provides population status information and allows researchers to monitor nest occupancy of historical nest sites along the valley, aiding in Species at Risk monitoring. Additionally, peregrine falcons are at the top of the food chain and are a good indicator species for ecosystem health.

Objectives

- To determine the nest occupancy and productivity of the threatened anatum subspecies of peregrine falcon along the Mackenzie River in 2005 as part of a larger continent-wide survey.

Five-year Peregrine Falcon Survey– Mackenzie Valley 2005

Wildlife Division, ENR

Methods and Information Collected *continued*

- The survey was conducted by helicopter in July, during chick-rearing period. All known nests were visited by air to determine occupancy, egg numbers and other descriptive information. Data was recorded using a standard protocol developed for the NWT/NU Raptor Database using definitions shared by all agencies on the International Peregrine Falcon Recovery Team. To ensure consistency, the same lead investigator used in previous surveys performed the survey.
- A minimal amount of time was spent surveying each nest and impacts on nesting pairs were negligible. The falcons returned to their nests soon after the helicopter left the site.
- A riverboat survey was done along the river to verify occupancy recorded by helicopter for sites visible by the river. This survey allowed for chick banding in sites accessible from the river. Chick banding provides valuable information on survival rates and migration routes.
- The results of the helicopter and boat surveys were merged.

Results and Deliverables

- Information on the status of peregrine falcon in the Mackenzie Valley study area will be used in updated COSEWIC reports.

Long-term Plans and Recommendations

- This survey program is proposed to take place every five years, but can be re-designed if populations are found to be decreasing. A re-designed survey would collect data yearly by rotating portions of the entire Mackenzie River study area.

Partners

Canadian Wildlife Service,
Species at Risk Program
Department of Environment
and Natural Resources, GNWT

Funding

Western NWT Biophysical Study

Contact

Lead Investigator:
Steven Matthews
Wildlife Biologist, Environmental Assessment/Habitat
Wildlife Division, ENR
steven_matthews@gov.nt.ca

Dr. Suzanne Carrière
Ecosystem Management Biologist
Wildlife Division, ENR
suzanne_carriere@gov.nt.ca

Photo courtesy of Benedikt Gudmannsen

The goals of this study are to collect baseline information, describe grizzly bear distribution and movement patterns, and identify important grizzly bear habitats.

Effects of Oil and Gas Exploration, and Development Activities, on Grizzly Bears (*Ursus arctos*) in the Mackenzie Delta Development Area

Department of Biological Sciences, University of Alberta
Inuvik Region, ENR

Rationale

Beneath the river channels and rolling tundra of the Mackenzie Delta region there is an estimated 7 billion barrels of oil and 65 trillion cubic feet of natural gas that has fostered new interest in hydrocarbon extraction and economic renewal. The development of a pipeline and gathering system to transport hydrocarbon-based products to southern markets will result in increased levels of human activity in this once remote landscape. Wildlife managers and the affected communities are concerned that increased human-related disturbance has the potential to put added pressure on grizzly bears as they forage for resources required for successful reproduction and over-winter survival. Current information on the ecology and distribution of north-coastal grizzlies is necessary for effective management and conservation of this vulnerable population at the edge of its geographical range. The goals of this study are to collect baseline information, describe grizzly bear distribution and movement patterns, and identify important grizzly bear habitats. This information will form the foundation required to assess the effects of development on grizzly bears and the associated increase in human activity on the landscape.

Effects of Oil and Gas Exploration, and Development Activities, on Grizzly Bears (*Ursus arctos*) in the Mackenzie Delta Development Area

Department of Biological Sciences, University of Alberta
Inuvik Region, ENR

Objectives

- Produce a Vegetation Classification Model for the development area.
- Quantify habitat use and identify important grizzly bear habitats in the Mackenzie Delta region.
- Model spatial-temporal movement patterns of grizzly bears in the Mackenzie Delta.
- Assess the potential influence of increased oil and natural gas development on grizzly bear habitat use and movement patterns.
- Assess the potential implications of mortalities resulting from development-related activities on the local and regional population of grizzly bears.
- Work with wildlife managers to mitigate the influence of exploration, development, and production activities in bear habitats with the goal of securing critical habitat and reducing adverse effects.
- Link empirically derived results to management strategies, thereby reducing the chance of population declines for grizzly bears in the Delta.
- Determine the diet of grizzly bears using stable isotope analysis.

Methods and Information Collected

- Grizzly bears were captured, collared and monitored via GPS-ARGOS satellite-linked telemetry to quantify fine-scale habitat use and movement patterns.
- Data is being used to develop habitat selection models to identify important habitats.
- Information from collared grizzlies is being used to assess the potential effects of future pipeline development on seasonal and annual habitat use strategies.
- Individual-based Movement models are being developed to describe movement patterns of grizzly bears relative to existing human activities on the landscape.
- Using remote sensing, image analysis and training site surveys, a Vegetation Classification Model is being developed.
- Dietary analysis using stable isotope analysis is being conducted using samples of grizzly bear hair, claw shavings and prey items.

Effects of Oil and Gas Exploration, and Development Activities, on Grizzly Bears (*Ursus arctos*) in the Mackenzie Delta Development Area

Department of Biological Sciences, University of Alberta
Inuvik Region, ENR

Results and Deliverables

- Demographic and morphological information for all captured grizzly bears.
- Maps showing annual home range distribution and movements of 41 collared grizzly bears using over 28,000 location data points.
- Vegetation inventories from over 500 training sites and the development of a Vegetation Classification Model.
- Analysis of data for Habitat Selection Model development.
- Map showing the within-population structure (i.e. subpopulation) delineation for partitioning development influence for various factions of the regional population.
- Publication in peer-reviewed and popular media.
- Presentations to public, national and international forums.

Long-term Plans and Recommendations

- Establish a long-term monitoring program for grizzly bears in the Mackenzie Delta.
- Reconfiguration of grizzly bear management zones based on subpopulation structure and the spatial contiguity of the Mackenzie Delta grizzly bear population.
- Model completion of grizzly bear habitat selection strategies and movement patterns.
- Expansion of grizzly bear sampling and monitoring east of the Husky Lakes region to investigate the ecology of grizzly bears inhabiting the eastern regions of the Inuvialuit Settlement Region.
- Implementation of a mark-recapture program to calculate a regional grizzly bear population estimate.
- Increased focus on coastal and off-shore habitat use by grizzly bears.

Effects of Oil and Gas Exploration, and Development Activities, on Grizzly Bears (*Ursus arctos*) in the Mackenzie Delta Development Area

Department of Biological Sciences, University of Alberta
Inuvik Region, ENR

Partners

Department of Biological Sciences, University of Alberta
Department of Environment and Natural Resources, GNWT

Funding

Alberta Cooperative Conservation Research Unit
Circumpolar Boreal/Alberta Research
Endangered Species Recovery Fund, World Wildlife Fund
Lorraine Allison Scholarship Fund
Natural Sciences and Engineering Research Council of Canada
Northern Scientific Training Program, Indian and Northern Affairs Canada
Polar Continental Shelf Program
Western NWT Biophysical Study

Contact

Andrew Derocher
Department of Biological Sciences
University of Alberta
Edmonton, AB
derocher@ualberta.ca

Mark Edwards
Department of Biological Sciences
University of Alberta
Edmonton, AB
mae@ualberta.ca

John Nagy
Department of Environment and Natural Resources
Government of Northwest Territories
Inuvik, NT
john_nagy@gov.nt.ca

Photo courtesy of Forest Management Division, ENR

The project will assist with land use planning and management decisions, and provide data for climate change modelling and carbon accounting.

Establishment of Permanent Monitoring Plots for Growth and Yield, National Forest Inventory and Cumulative Impact Monitoring

Forest Management Division, ENR

Rationale

Approximately 590 Permanent Monitoring Plots (PMPs) are slated for establishment throughout the NWT within the next five years, with an initial focus on the Taiga Plains and Boreal Plains ecozones that encompass the forested area of the NWT. These plots will provide baseline information on the state of the forest resource to be used to assess forest growth and yield, and to monitor long-term change and cumulative impacts. This is a long-term project with plots surveyed periodically every 10 years, indefinitely. The project will ultimately assist with land use planning and management decisions, and provide data for climate change modelling and carbon accounting. This project satisfies requirements of the Five-year Growth and Yield Strategy for the NWT 2001, and addresses several priority Valued Ecosystem Components.

Objectives

- Growth and yield information will be gathered to assess rates of forest growth under disturbed (i.e. regeneration after fire) and undisturbed conditions for various forest types. Potential yield volumes will be determined to assess economic potential and sustainability.
- Cumulative impact monitoring data will contribute to the Western NWT Biophysical Study and will satisfy four components of the Cumulative Effects Assessment and Management (CEAM) Framework: land use planning, baseline studies and monitoring, research, and information management.

Establishment of Permanent Monitoring Plots for Growth and Yield, National Forest Inventory and Cumulative Impact Monitoring

Forest Management Division, ENR

***Objectives** continued*

- National Forest Inventory (NFI) data will be gathered to provide national data on the status of NWT forests and trends over time, for use by interested parties.

Methods and Information Collected

- A grid system was established and a permanent plot system consisting of large, small and mini tree plots, as well as transects and plots for visual and soil assessment, were created within the Taiga Plains and Boreal Plains ecozones.
- On-site surveys were conducted on plots accessible by road, ATV or helicopter.
- Data collected includes tree measurements, shrub and herb species identification, biomass measurements, detailed soils assessments and site assessments, including disturbances and stand structure.
- Non-forested plots were monitored via remote sensing.

Results and Deliverables

- In 2005, 33 PMPs were established, six in the Dehcho region and 27 in the Sahtu region.
- Soil samples were sent to a laboratory for detailed soils analysis.
- Tree cores were sent to a laboratory for counting under a microscope.
- Data is being input to a database and will be available for use by interested parties.

Long-term Plans and Recommendations

- Forest Management Division plans to establish several hundred PMPs over the next five to 10 years. To date there are 109 NFI PMPs and 75 Growth and Yield PMPs.
- The re-measurement period for established PMPs will be every 10 years.

Partners

Canadian Forest Service, NRCAN
Forest Management Division, ENR
Gwich'in Renewable Resource Board

Funding

Canadian Forest Service, NRCAN
Forest Management Division, ENR
Western NWT Biophysical Study

Contact

Lisa Smith, Inventory Forester
Forest Management Division, ENR
Hay River, NT
lisa_smith@gov.nt.ca

Photo courtesy of Bob Decker, ENR

This project will enhance and more completely describe the physiographic landscape, vegetation and wildlife of each of the revised Taiga Plains ecoregions.

Ecosystem Classification and Mapping of the Northwest Territories – Taiga Plains

Wildlife Division and Forest Management Division, ENR

Background and Rationale

Ecologically-based landscape stratification that can be meshed with national classification efforts is required for forest management, wildlife habitat management, protected areas and environmental assessments in the Northwest Territories (NWT). The National Ecological Framework for Canada (1996) is the only broad ecological classification available for the NWT, however, in its current form it has only had limited usefulness for resource management. Other jurisdictions have modified the national framework by using provincial information to develop their own regionally applicable classification. As the NWT recognizes the need for similar modifications to the existing national framework and given projected oil and gas development scenarios, the Taiga Plains has been the highest priority for revision. In January 2004, Timberline Forest Inventory Consultants (Timberline) was contracted to review the existing national framework with reference to adjacent jurisdictions and to research the information available to improve existing mapping for the NWT. The focus of the study was on the Taiga Plains and Boreal Plains; a report summarizing the history of land classification relevant to this area and recommended modifications was produced by Timberline in March 2004.

Ecosystem Classification and Mapping of the Northwest Territories – Taiga Plains

Wildlife Division and Forest Management Division, ENR

Background and Rationale *continued*

In December 2004, a workshop was held involving ENR staff, federal scientists from Agriculture and Agri-food Canada, previous ENR staff and representatives from Timberline. Workshop participants supported the ecozone and ecoregion re-classification proposed by Timberline earlier in 2004. Participants also agreed that both regional climatic trends, as provided in Ecoclimatic Regions of Canada (1989) and sub-regional climate, as influenced by major physiographic features, be incorporated in the delineation of ecoregions. In addition, participants felt that an improved naming system should include the climate and geography as part of the ecoregion name (e.g. Horn Plateau – High Subarctic). Much of the December 2004 workshop was devoted to improving ecoregion delineations and suggesting places where boundary changes might be needed. Accordingly, another meeting was held in January 2005, at which ecoregion line revisions suggested at the December workshop were confirmed and, where necessary, augmented. The naming convention for the new ecoregions was also finalized and a revised work plan to March 2005 and continuation throughout 2005/2006 was developed.

The purpose of the Taiga Plains project was to work with the existing national framework and to incorporate regional and sub-regional climate as influenced by physiographic features; revisions to the existing line work were needed to construct a consistent landscape classification for the NWT.

Objectives

- To refine and revise boundaries of the National Ecological Framework for Canada (1996) NWT ecozones and ecoregions, and to finalize the initial revisions proposed for the Taiga Plains in 2004.
- To incorporate regional and sub-regional climate patterns described in Ecoclimatic Regions of Canada (1989) in the delineation and naming of the Taiga Plains ecoregions.
- To enhance and more completely describe the physiographic landscape, vegetation and wildlife of each of the revised Taiga Plains ecoregions.

Ecosystem Classification and Mapping of the Northwest Territories – Taiga Plains

Wildlife Division and Forest Management Division, ENR

Methods and Information Collected

- A critical examination, review and procedural application of all available mapped physiographic, climatic and vegetation information has been conducted to describe and identify possible revisions to the Taiga Plains and its constituent ecoregions.
- Re-classification, boundary changes and a new naming convention for the Taiga Plains ecoregions have been facilitated through a series of focussed workshops attended by ENR and federal government personnel, and by consultation with regional ENR staff and other soil and vegetation experts.
- Extensive aerial transects by fixed-wing aircraft and helicopter were conducted in summer 2005. The intent of fixed-wing flights was to circuit the entire Taiga Plains, with a reconnaissance focus on the areas with the least information, including the Taiga Plains northeast boundary. Helicopter work allowed ground assessment of selected sites and collection of soil and vegetation samples.
- A series of digital photos were collected for each ecoregion, both to document landscape features for the revision process and to include in various educational publications and poster presentations.

Results and Deliverables

- Critical examination of the original ecozone/ecoregion boundaries and the rationale used to create them, coupled with application of newer post-1996 data on climate and landscape features, improved analytical procedures and input by qualified experts in a workshop setting resulted in an effective review, revision and enhancement to the Taiga Plains classification.
- Extensive fieldwork in summer 2005 provided an ecological reclassification and a new naming convention for 46 ecoregions in the Taiga Plains; ecoregion boundary revisions were confirmed from fixed-wing overflights and helicopter-assisted ground assessments.
- Several poster presentations describing the project and summarizing the Taiga Plains revisions were prepared for workshops and regional information sessions.
- Final mapping and a technical report for the revised Taiga Plains classification were completed in March 2006 and are currently being prepared for an ENR publication.
- A plain language educational poster and technical overview map of the Taiga Plains will be prepared later in 2006.

Ecosystem Classification and Mapping of the Northwest Territories – Taiga Plains

Wildlife Division and Forest Management Division, ENR

Long-term Plans and Recommendations

- Mid- to longer-term goals are to eventually re-classify smaller sub-regions and ecosites within each of the 46 new ecoregions, to develop field-guides for the Taiga Plains and to publish educational materials on ecosystem classification.
- Planning is underway for the next phase of the project, to re-classify and map the Taiga Shield and confirm boundaries adjoining the Taiga Plains.
- Data acquisition, storage and analysis are constantly in a state of revision and improvement, with the revised classification likely required to be updated in five to 10 years.
- Assembly of information using more advanced GIS software and more accurate classification schema, and exposure to more training, will be needed by ENR staff to improve our understanding of ecosystem classification and mapping.

Partners

Agriculture and Agri-food Canada
Alberta Sustainable Resource Development
Forest Management Division, ENR
Wildlife Division, ENR

Funding

Forest Management Division, ENR
Western NWT Biophysical Study
Wildlife Division, ENR

Contact

Bas Oosenbrug,
Habitat Conservation Biologist
Wildlife Division, ENR
Yellowknife, NT
bas_oosenbrug@gov.nt.ca

Bob Decker,
Forest Ecologist
Forest Resources, ENR
Hay River, NT
bob_decker@gov.nt.ca

Photo courtesy of Alicia Korpach, Ducks Unlimited Canada

The Trout Lake and Dehcho project is one piece of an ongoing inventory project that includes earth cover classification of the Mackenzie River Valley.

Trout Lake and Dehcho Earth Cover Inventory

Ducks Unlimited Canada

Rationale

The NWT portion of the boreal forest remains relatively untouched by human activity and provides critical habitat for many North American waterbirds. However, the recent re-opening of the Western Arctic to oil and gas exploration has increased the potential for conflict between waterbird habitat and human activity. An accurate inventory of wetlands and surrounding uplands prior to development is essential for conserving natural areas within the boreal forest. Ducks Unlimited Canada (DUC) has developed a rigorous, efficient protocol for regional-scale earth cover mapping. The Trout Lake and Dehcho project is one piece of an ongoing inventory project that includes earth cover classification of the Mackenzie River Valley. The inventory will result in user-friendly products that will not only help DUC to identify and describe key habitat areas for waterbirds, it will aid land use managers and biologists in better assessing the impacts of future development activities.

Objectives

- Classify approximately 30,500 km^2 of LANDSAT Thematic Mapper 7 imagery.
- Delivery of draft and final products to project partners.

Methods and Information Collected

- GIS analysts began by conducting an unsupervised (computerized) classification of satellite scenes covering the project area. This provided approximately 46 initial cover classes later verified in the field.

Trout Lake and Dehcho Earth Cover Inventory

Ducks Unlimited Canada

Methods and Information Collected *continued*

- Field verification was conducted by helicopter and by ground crews. The analysts selected representative examples of all of the different initial cover classes and visited them on the ground to compare them to, and later refine, the unsupervised classification.
- Information collected during field verification included: vegetation species present, tree and shrub heights, and total percent cover of species, slope and drainage. Digital photos were also taken to assist in the classification process.
- Image analysis included the development of a hierarchical classification scheme, with data available for use at various scales. An accuracy assessment was conducted to ensure that the classification was as correct as possible.

Results and Deliverables

- GIS tools for demos and data organization.
- The final classified image in digital GIS-ready format.
- A final report documenting procedures and analysis results, and a debriefing meeting for project partners.

Long-term Plans and Recommendations

- DUC has completed several earth cover inventory projects in the NWT to date, with a focus on the Mackenzie River Valley. Several more are currently in progress.
- DUC's primary intent for earth cover products is to help identify key wetlands and habitats, and their relative value to continental waterbirds.
- Use of the inventory by land use planners and researchers will result in various applications that will help advance conservation efforts as well as sustainable resource development.

Partners and Funding

Ducks Unlimited Canada
Ducks Unlimited Inc.,
Western Regional Office
North American Wetlands
Conservation Act
United States Forest Service
Western NWT Biophysical Study

Contact

Shannon Haszard
Prairie - Western Boreal Forest Region
Ducks Unlimited Canada
Yellowknife, NT
s_haszard@ducks.ca

Photo courtesy of ENR, GNWT

There is a need to gather baseline air quality data ahead of ongoing and planned industrial and community development activities.

Air Quality Monitoring

Environmental Protection Division, ENR

Rationale

Prior to this project there was very little monitoring of air pollutants conducted in the NWT outside of Yellowknife. Therefore, there was a need to gather baseline air quality data ahead of ongoing and planned industrial and community development activities. The placement of monitoring stations in Inuvik, Norman Wells and Fort Liard provides a wide geographic coverage across the NWT.

Objectives

- To provide baseline data on air pollutants in selected NWT communities.
- To provide ongoing data for trend and cumulative effects assessment as development activities continue.
- To make the data easily accessible to interested users, such as the public, other government agencies, consultants and industry.

Methods and Information Collected

- Data are collected on a continuous basis for air pollutant concentrations of hydrogen sulphide, sulphur dioxide, nitrogen oxides, ground level ozone and fine particulates using instantaneous gas analyzers and particulate monitors installed in monitoring stations in Inuvik, Norman Wells and Fort Liard.
- Meteorological variables, such as temperature, wind speed, wind direction and turbulence, are also monitored on an instantaneous, continuous basis at the monitoring stations.
- The data is stored as hourly averages by station dataloggers and collected every hour by a data acquisition, management and reporting system at ENR headquarters in Yellowknife.

Air Quality Monitoring

Environmental Protection Division, ENR

Results and Deliverables

- Continuous monitoring of air pollutants and meteorological variables is now conducted in the selected communities. The monitoring stations are on-line and raw data are automatically downloaded every hour and posted to the ENR Air Quality Monitoring Network web site at: http://lisin.rwed-hq.gov.nt.ca/NWTAQ/NetworkSummary.aspx, enabling 'almost real-time' review by Environmental Protection Division staff and the public. Validated data are electronically archived and also available via the ENR web site.

Long-term Plans and Recommendations

- ENR will continue to operate the NWT Ambient Air Quality Monitoring Network and make the data available to the public and other users.
- ENR will continue to explore opportunities to upgrade and expand the Network by addition of new stations and/or monitors to existing stations.

Partners

Environment Canada
(Yellowknife Office)
Environmental Protection Division,
ENR

Funding

Environmental Protection Division,
ENR
Government of Canada,
Environment Canada (Yellowknife Office)
Western NWT Biophysical Study

Contact

Graham Veale, Air Quality Programs Coordinator
Environmental Protection Division, ENR
Yellowknife, NT
graham_veale@gov.nt.ca

Photo courtesy of Jessica Wu

This project addresses knowledge gaps associated with the effects of climate change on pathogen-ungulate ecology.

An Evaluation of the Role of Climate Change in the Emergence of Pathogens and Diseases in Arctic and Subarctic Ungulate Populations

Research Group for Arctic Parasitology, Faculty of Veterinary Medicine, University of Calgary

Rationale

Wildlife in the Northwest Territories has historically, and continues to be, an important renewable resource. Climate is an important driver that affects the patterns of disease in wildlife, and climate change may result in emergence of some diseases and impact the health of northern wildlife and people. This project addresses knowledge gaps associated with the effects of climate change on pathogen-ungulate ecology. Local stakeholders will be consulted, along with a comprehensive summary and analysis of previous literature and studies. This analysis will be conducted to identify vulnerabilities and develop recommendations for more specific research and monitoring of the response of northern host-pathogen systems to climate change.

Objectives

- Summarize historical and current knowledge on pathogens in northern ungulates.
- Identify host-pathogen systems that may be altered by climate change.
- Use climate change scenarios to develop projections for pathogens and disease, and their effects on hosts.
- Provide recommendations to managers.
- Provide recommendations for addressing public health concerns.

An Evaluation of the Role of Climate Change in the Emergence of Pathogens and Diseases in Arctic and Subarctic Ungulate Populations

Research Group for Arctic Parasitology, Faculty of Veterinary Medicine, University of Calgary

Methods and Information Collected

- Individual interviews to record wildlife and environmental observations in the past year were held with local hunters (Wildlife Health Monitors) in the communities of Fort Good Hope, Colville Lake and Deline.
- Published and unpublished literature and databases were summarized to determine the known geographic distribution of pathogens in caribou. Similar work on muskoxen, Dall's sheep and moose is in progress.
- Individual assessments for host-pathogen pairs will be done using gathered data and known epidemiology of the pathogens.
- Ongoing data collection on health and parasites of northern ungulates was done through the Sahtu Wildlife Health Monitor Program and surveillance activities through ENR and the Research Group for Arctic Parasitology.
- All information gathered will be used to develop models for projecting climate change scenarios, and for integration into a computer GIS database.

Results and Deliverables

- Preliminary reports on the interviews are being compiled.
- A comprehensive summary of published and unpublished information on caribou disease is being compiled and mapped.
- Tissues from an additional 22 caribou collected by Wildlife Health Monitors from Colville Lake and Deline and five moose collected near Fort Good Hope in 2006 were analyzed and a poster of the results distributed to these communities.
- Data for pathogen distribution and climate are being integrated in GIS formats, describing current and anticipated pathogen distributions.
- A veterinary summer student intern gained valuable training and community experience in the Sahtu by assisting with hunter interviews and processing and analyzing caribou and moose samples.

Long-term Plans and Recommendations

- Results will lead to identification of high priority pathogens and vulnerabilities for further monitoring and research. Continued surveillance and biodiversity assessment is needed to fill knowledge gaps. Surveillance should be community-based, such as the Sahtu Wildlife Health Monitor Program.
- Targeted laboratory and field studies on specific pathogens would provide valuable data on the ecology, impact and management of disease in northern ungulates.

An Evaluation of the Role of Climate Change in the Emergence of Pathogens and Diseases in Arctic and Subarctic Ungulate Populations

Research Group for Arctic Parasitology, Faculty of Veterinary Medicine, University of Calgary

Partners	Research Group for Arctic Parasitology Sahtu Renewable Resources Board Environment and Natural Resources, GNWT Department of Geography, University of Calgary
Funding	Western NWT Biophysical Study Climate Change Action Fund, Natural Resources Canada Government of Canada, DIAND, Cumulative Impacts Monitoring Program Nasivvik Centre for Inuit Health and Changing Environments Faculty of Veterinary Medicine, University of Calgary University of Guelph
Contact	Susan Kutz Research Group for Arctic Parasitology Faculty of Veterinary Medicine University of Calgary skutz@ucalgary.ca