

2004/2005 ANNUAL REPORT *of the* WESTERN NORTHWEST TERRITORIES BIOPHYSICAL STUDY



Acknowledgements

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

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Table of Contents

Introduction	The Western NWT Biophysical Study.....	3
	ENR Administrative Regions of the NWT.....	5
	Research Project Summary Structure.....	7
Research Projects	Wildlife	
	Boreal Caribou Calf Survival.....	9
	Preliminary Assessment of Boreal Caribou Adult Female Mortality.....	11
	Caribou Forage Recovery Following Fire.....	13
	Boreal Caribou and Land Use Planning in the Cameron Hills Area of the Dehcho, NWT.....	15
	Boreal Woodland Caribou Winter Habitat Ecology.....	17
	Ecology of Boreal Woodland Caribou in the Central Mackenzie River Valley.....	20
	Effects of Oil and Gas Exploration and Development Activities on Grizzly Bears (<i>Ursus arctos</i>) in the Mackenzie Delta Development Area.....	23
	Habitat	
	Establishment of Permanent Monitoring Plots for Growth and Yield, National Forest Inventory and Cumulative Impact Monitoring.....	27
	Softcopy Forest Inventory and Creation of DEMs for the Jean Marie River Area.....	29
	Pilot Project: Collection of Forest Ecosystem Classification Field Plot Data in the Hay River Lowland Ecoregion.....	31
	Middle Mackenzie Earth Cover Inventory.....	34
	Ecosystem Classification and Mapping – Taiga Plains Ecozone.....	36
	Impacts of Human Activity	
	IRS-1 Satellite Imagery and Feature Interpretation for the Dehcho Interim Measures Area.....	39
	Air Quality Monitoring.....	41
	Climate Change	
	An Evaluation of the Role of Climate Change in the Emergence of Pathogens and Diseases in Arctic and Subarctic Ungulate Populations.....	43
	Traditional Knowledge	
	Dehcho Wildlife Workshop.....	46

The Western NWT Biophysical Study

Rationale

The Western NWT Biophysical Study was established to help ensure that 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. This report uses the old department name (RWED) for all funding and support of projects initiated before April 1, 2005, but will name ENR for current information, such as the contact information of team leads.

Status

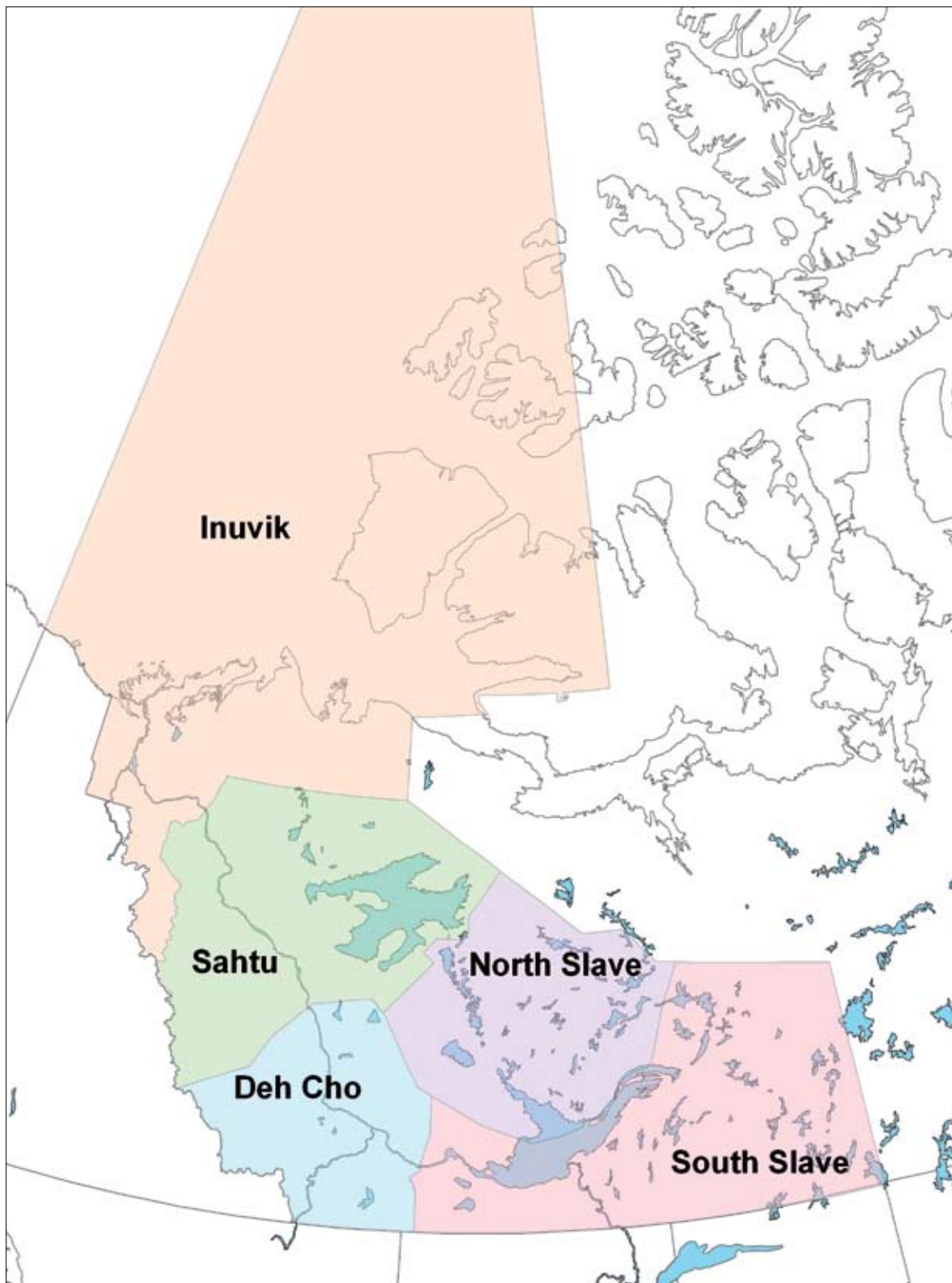
The Western NWT Biophysical Study provided \$899,950 towards projects in 2003/2004 and \$908,000 towards projects in 2004/2005. The Study is projected to provide similar levels of funding through to fiscal year 2007/2008. In addition to research projects, workshops are held in each of the Mackenzie Valley regions to review progress of the Study to date and ensure that 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 and most projects involve multiple partners. Most projects are now in year two or three of multi-year studies, therefore, results from the studies are limited and where available are only preliminary.

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 that are within ENR's mandate.

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:

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



This study will assist in assessing the status of boreal caribou, considered threatened nationally but data deficient in the NWT.

Boreal Caribou Calf Survival

South Slave Region, RWED

Rationale

Boreal caribou are listed as threatened 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. This study will assist in assessing the status of boreal caribou, which are considered data deficient in the NWT. Demographic rates will provide a more detailed picture of the health of the caribou population, and help managers to understand factors that influence survival and reproduction rates. The study will also identify critical and limiting time periods for calf survival.

Objectives

- ✦ Measure annual variation in calf survival from birth to 10-months of age.

Methods and Information Collected

- ✦ Visual surveys of calf production rate and survival took place during fixed-wing and helicopter flights.
- ✦ Blood serum samples, received from captured cows, were also used to determine calf production rates.

Results and Deliverables

- ✦ A database was created using annual variation in calf survival.
- ✦ Data has been included in a draft government report and in presentations to various communities in the Dehcho.

Boreal Caribou Calf Survival

South Slave Region, RWED

Funding

Western NWT Biophysical Study

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More preliminary information on mortality rates and causes is needed in order to determine limiting factors for caribou populations.

Preliminary Assessment of Boreal Caribou Adult Female Mortality

South Slave Region, RWED

Rationale

This project will provide information on mortality rates of adult female boreal caribou, listed as threatened by COSEWIC in 2002. By examining adult females, a more detailed picture of the health of the boreal caribou population will be provided as well as an understanding of the factors that influence survival and reproduction rates. More preliminary information on mortality rates and causes is needed in order to determine limiting factors for caribou populations in the Cameron Hills area.

Objectives

- ✦ Gather information on annual variation in adult female mortality.

Methods and Information Collected

- ✦ Fixed-wing telemetry flights were used to survey caribou survival. Flights were conducted monthly during the year, except for May to September when flights were biweekly, to determine the survival status of collared adult cows. Cows were collared to allow tracking of animals for the determination of seasonal and annual survival rates.
- ✦ When mortalities were detected, a helicopter was used as soon as possible to investigate each incident on the ground. Ground inspections of mortality sites were conducted to determine cause of death by examining evidence of struggle and presence/absence of tissues remaining. Where possible, teeth and tissue samples were collected to assess age and body condition.

Preliminary Assessment of Boreal Caribou Adult Female Mortality

South Slave Region, RWED

<i>Results and Deliverables</i>	<ul style="list-style-type: none"> • A database was created using annual variation in calf survival. • Data has been included in a draft government report and in presentations to various communities in the Dehcho.
<i>Long-term Plans and Recommendations</i>	<ul style="list-style-type: none"> • Data on adult female survival rates and causes of mortality have been incorporated into a draft government report on boreal caribou population demographics. • Results have been presented to various communities in the Dehcho. • Survey to be completed annually in order to gather accurate demographic data.
<i>Funding</i>	Western NWT Biophysical Study
<i>Contact</i>	Deborah Johnson South Slave Regional Biologist, ENR Fort Smith, NT deborah_johnson@gov.nt.ca





Monitoring will allow for predictions that can contribute to land use and recovery planning.

Caribou Forage Recovery Following Fire

South Slave Region, RWED

Rationale

As the cumulative effects of natural and man-made disturbance have been implicated in the decline of boreal caribou, this project will monitor changes in key elements of boreal caribou habitat following fire. Habitat quantity and quality, as well as the regime of habitat re-growth, influence the density and distribution of caribou. Monitoring will allow for predictions of caribou ecology following forest fires, contributing to land use and recovery planning, cumulative effects assessment and assessment of potential climate change impacts.

Objectives

- Assess the relationship between time since disturbance and forage available to caribou.
- Quantify the biomass of lichen available for forage along various gradients.
- Compare results with those of previous studies.

Methods and Information Collected

- Sampling of study sites took place via helicopter and field visits in the spring, and consisted of collecting tree cookies, estimating percent cover of vegetative species and collecting, drying and weighing lichen in study plots.

Results and Deliverables

- A draft report on boreal caribou forage recovery following fire, and its implications to management in the NWT, will be compiled.

Long-term Plans and Recommendations

- Plans are to continue long-term sampling and statistical analysis of data as well as the weighing of dried samples and analysis of collected tree ring samples.

Caribou Forage Recovery Following Fire

South Slave Region, RWED

Funding	Western NWT Biophysical Study
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Local communities play a large role in land use planning and need the information necessary to make decisions.

Boreal Caribou and Land Use Planning in The Cameron Hills Area of the Dehcho, NWT

South Slave Region, RWED

Rationale

In the NWT, the status of boreal caribou is currently data deficient. This project aims to gather baseline information on boreal caribou well-being in order to evaluate the consequences of habitat changes and assess the status of this nationally threatened species. The effectiveness of mitigation measures and guidelines for proposed development 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 boreal caribou population health.
- ♦ Map annual and seasonal habitat use and predicted habitat.

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 30 captured animals (net-gun) deployed with VHF-radio collars to measure adult female caribou survival and calf recruitment rates after release.
- ♦ Blood and fecal samples were collected from captured adult female caribou to measure pregnancy rates and previous exposure to disease and parasites.

Boreal Caribou and Land Use Planning in The Cameron Hills Area of the Dehcho, NWT

South Slave Region, RWED

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

- 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, with visual location of VHF-radio collared cows and calves by aerial monitoring occurring yearly.
 - Two to three community meetings are planned to take place per year (as well as the publication and presentation of outreach material) in order to share the results of the project and promote awareness and understanding of caribou habitat.

Funding

Western NWT Biophysical Study

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This project will provide demographic and habitat use data, and traditional knowledge, for the creation of a recovery plan.

Boreal Woodland Caribou Winter Habitat Ecology

Inuvik Region, RWED

Rationale

This project aims to provide baseline demographic and habitat use data, and traditional knowledge, for the eventual creation of a recovery plan for the 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 ($66^{\circ} 33' \text{ N}$). The primary focus of work completed during fiscal year 2004/2005 was to obtain baseline demographic information and to develop resource selection function models to predict probability of occurrence of boreal caribou in the Inuvik region, 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, selection and avoidance. This will include looking at the use of areas burned by wildfires and nearby linear anthropogenic features, such as seismic lines.
- Develop resource selection function models (RSF models) to map the relative probability of occurrence of boreal woodland caribou across the Inuvik Region using caribou use data obtained through satellite tracking and existing LandsatTM based vegetation maps.

Boreal Woodland Caribou Winter Habitat Ecology

Inuvik Region, RWED

Objectives continued

- Identify seasonal habitats that may be limiting for boreal woodland caribou in the Inuvik Region.
- Collect samples required to assess the genetic relationships of boreal woodland caribou in the NWT and adjacent jurisdictions.
- Evaluate the implications of cumulative effects of natural (e.g. wildfires, climatic events) and anthropogenic disturbances on boreal woodland caribou and their habitats.
- Provide recommendations for the long-term management of boreal woodland caribou and their habitats in the Inuvik Region.

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.

Results and Deliverables

- Baseline data on population numbers, productivity, recruitment and habitat use were summarized in two reports and one presentation/expanded abstract presented at the 10th International Caribou Workshop, Girdwood, Alaska, May 2004.
- Posters were created showing movements of satellite-collared caribou and distributed to the Renewable Resource Councils (RRCs) in the Gwich'in Settlement Area.

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.

Boreal Woodland Caribou Winter Habitat Ecology

Inuvik Region, RWED

Partners

Gwich'in Renewable Resource Board
Inuvik Region, RWED

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
RWED
Western NWT Biophysical Study

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Data generated will be used to ensure that seasonal ranges of caribou are not further impacted by human activities and cumulative effects.

Ecology of Boreal Woodland Caribou in the Central Mackenzie River Valley

Sahtu Region, RWED

Rationale

This project aims to provide baseline ecological information on boreal caribou in the NWT. The project will focus on the Mackenzie River Valley from Fort Good Hope in the north to Clark Mountain/Blackwater Creek in the south. Data generated will be used to ensure that seasonal ranges of caribou are not further impacted by human activities and cumulative effects, both natural and human-initiated. In addition, this study will provide a baseline for further exploration on the impact of climate change on caribou populations.

Objectives

- Identify and map seasonal boreal caribou habitats using resource selection function models.
- Estimate home range sizes, document seasonal movements and document habitat use along the proposed route of the Mackenzie Valley pipeline and other related oil and gas exploration and developments.
- Obtain baseline population data.
- Conduct genetic analysis to evaluate distinctiveness of caribou populations.
- Provide information needed to evaluate implications of cumulative effects of human activities (current and potential).
- Contribute to the NWT Action Plan for boreal woodland caribou using scientific and traditional knowledge data collected within the Sahtu Settlement Area.

Ecology of Boreal Woodland Caribou in the Central Mackenzie River Valley

Sahtu Region, RWED

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 with data modelled using GIS software.
- Occurrence surveys were flown.
- Traditional knowledge was gathered from communities in workshops and community interviews as well as voluntary reporting of activity and sightings.
- Habitat use models were created to predict caribou distribution under different conditions.
- Fieldwork on the land included verification of woodland caribou habitat using GPS and satellite-tracked radio collars and the use of ArcInfo GIS software for data analysis.
- Tissue and fecal samples were obtained for genetic, forage and parasite-load analysis.

Results and Deliverables

- Results have been presented to the Sahtu Renewable Resources Board (SRRB) and the five Renewable Resource Councils (RRCs) in the Sahtu.
- Animated movements of radio-collared caribou have been prepared and presented to the SRRB and five 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 2005/2006, and beyond, to obtain additional baseline data and to monitor changes.
 - A proposal for additional funding will be presented to industry so that additional GPS tracked radio collars can be purchased to focus on boreal caribou ecology in the Stewart Lake area west of Tulita. Oil 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 caribou.
 - Enhanced vegetation classification is required using the Ducks Unlimited (DU) method to provide greater accuracy. DU staff are continuing with analysis of selected LANDSAT™ imagery in the Mackenzie River Valley.
-

Ecology of Boreal Woodland Caribou in the Central Mackenzie River Valley

Sahtu Region, RWED

Partners

Canadian Wildlife Service Habitat Stewardship Fund for Species at Risk
(Traditional Knowledge study)
Ducks Unlimited Canada
Gwich'in Renewable Resource Board (Traditional Knowledge study)
Inuvik Region, RWED
Sahtu Region, RWED

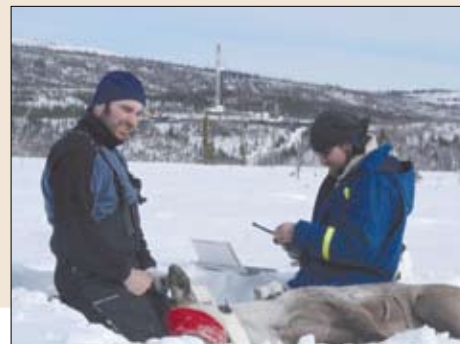
Funding

Canadian Wildlife Service Habitat Stewardship Fund for Species at Risk
(Traditional Knowledge study)
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Improved knowledge of the ecology and distribution of north-coastal grizzlies is necessary for management and conservation of this vulnerable population.

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

Rationale

With an estimated 7 billion barrels of oil and 65 trillion cubic feet of natural gas laying beneath the Mackenzie Delta, there has been renewed interest in resource extraction. With the development of a pipeline and gathering system to transport hydrocarbon-based products to southern markets, increasing human activity on the landscape will take place. 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. An improved knowledge of the ecology and distribution of north-coastal grizzlies is necessary for management and conservation of this vulnerable population. The goals of this study are to collect baseline information, describe grizzly bear distribution and movement patterns, and identify important grizzly bear habitats. This data will allow for an assessment of the potential influence of future hydrocarbon exploration and extraction, and the associated increase in human activity on the landscape.

Objectives

- ♦ Produce a vegetation classification model for the development area.
- ♦ Quantify habitat use and identify important grizzly bear habitats in the Mackenzie Delta.

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

Objectives continued

- Model spatial-temporal movement patterns of grizzly bears in the Mackenzie Delta and assess the potential influence of increased hydrocarbon development in the area 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 habitat. Such measures should secure critical habitat and reduce negative impacts.
- Link empirically derived results to management strategies, reducing the chance of population declines for grizzly bears in the Delta.
- Determine diet preference and the importance of marine protein for grizzly bears living in coastal areas of the Beaufort Sea 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 movement patterns.
 - Data is being used to develop habitat selection and/or resource selection function models to identify important habitat and to assess the potential influence of future pipeline development on seasonal and annual habitat use strategies.
 - Individual-based movement models are being developed to describe changes in the movement of grizzly bears relative to future human activities on the landscape.
 - For the above-mentioned model, the development of an accurate vegetation model for the area is required. Using remote sensing, image analysis and training site surveys a vegetation classification model for the development area 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

Results and Deliverables

- Detailed demographic and morphological information for all captured grizzly bears.
 - Maps showing annual home range distribution and movements of 38 collared grizzly bears using over 20,800 location data points.
 - Vegetation inventories from over 500 training sites and preliminary results for vegetation classification model development.
 - Preliminary analysis of data for resource selection function model development.
 - Map showing the delineation of potential zones of influence from development using spatial-temporal grizzly bear distribution.
 - 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 spatial-temporal distribution and contiguity of the Mackenzie Delta grizzly bear population.
 - Completion of the vegetation classification model for the development area.
 - 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

Partners

Department of Biological Sciences, University of Alberta
RWED

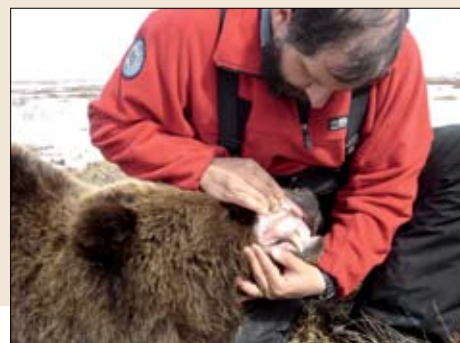
Funding

Alberta Cooperative Conservation Research Unit
Circumpolar Boreal/Alberta Research
Endangered Species Recovery Fund, World Wildlife Fund
Northern Scientific Training Program
Polar Continental Shelf Program
Western NWT Biophysical Study

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These plots will provide baseline information on the state of the forest resource and will be used to monitor long-term change and cumulative impact.

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

Forest Management Division, RWED

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 Plain and Boreal Plain 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 impact. This is a long-term project with plots surveyed periodically every ten 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 natural (i.e. fire origin) and regenerated (i.e. after harvest) stand conditions for various forest types. Potential yield volumes will be determined to assess forest productivity 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, RWED

Objectives continued

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

Methods and Information Collected

- Permanent monitoring plots were established on a national grid system. Each plot consists of large, small and mini tree plots, biomass transects and a soil pit.
- On-site surveys were conducted by trained personnel on plots accessible by road, ATV or helicopter.
- Data collected included tree measurements, shrub and herb species identification, biomass measurements, detailed soils assessments and site assessments, including disturbances and stand structure.
- Non-vegetated plots were monitored via remote sensing.

Results and Deliverables

- Seven plots in the North Slave Region and 33 plots in the Dehcho Region were established.
- A database was created to input and store the data.
- Soil samples were sent to a laboratory for detailed soils analysis.
- 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 ten years. Thirty PMPs are planned for 2005 and 34 PMPs are planned for 2006.
- The re-measurement period for established PMPs is ten years.

Partners

Canadian Forest Service, Natural Resources Canada
Forest Management Division, RWED

Funding

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Inventory data will be used for assessment of economic potential and sustainability, for land use planning and decision-making.

Softcopy Forest Inventory and Creation of DEMs for the Jean Marie River Area

Forest Management Division, RWED

Rationale

This project involves the implementation of a medium scale forest vegetation inventory of approximately 250,000 km² in the NWT, beginning with an area of 5,200 km² located along the Mackenzie River between Fort Providence and Jean Marie River. A forest vegetation inventory will be created using 1:40,000 scale black and white photography. The process will involve creation of a five metre accuracy Digital Elevation Model (DEM) and new base maps for the project area. The inventory data will be used for quantifying forest resources, national reporting and monitoring of long-term change. It may also be used for assessment of economic potential and sustainability, for land use planning and decision-making. Forest resource inventories address several priority Valued Ecosystem Components, providing baseline information for enhancing satellite reconnaissance inventory and for ecosystem classification.

Objectives

- ♦ Forest resource assessments will allow for medium scale inventory. This inventory will be used for forest resource analysis and as a resource for forest vegetation information.
- ♦ NWT 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.

Softcopy Forest Inventory and Creation of DEMs for the Jean Marie River Area

Forest Management Division, RWED

Methods and Information Collected

- The project area is along the Mackenzie River between Fort Providence and Jean Marie River, and has an area of 5,200 km². DEMs and orthophotos were created using kinematic airborne GPS controlled photography, GPS ground control and an aerotriangulation process.
- Scanned photography was interpreted in a digital environment to create forest cover GIS and attribute data files. Vector base maps were also created through interpretation of the scanned aerial photography.
- The inventory was created from 2003 1:40,000 scale black and white photography.

Results and Deliverables

- Five metre accuracy DEM, orthophotos and base maps.
- Forest vegetation inventory data for approximately 5,200 km² near Jean Marie River.
- The information is currently being audited and will be available for distribution under a licensing agreement from Forest Management Division in January 2006.

Long-term Plans and Recommendations

- More inventory work is planned for an area of 9,000 km² immediately east of the recently completed Jean Marie River inventory.
- Forest Management Division will continue to collect and update inventories as needed for forest management planning activities.

Partners

Forest Management Division, RWED

Funding

Forest Management Division, RWED
Western NWT Biophysical Study

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Ecosystem classification can provide managers with an understanding of ecosystem dynamics and enable them to make reliable predictions on how these ecosystems will respond to disturbance.

Pilot Project: Collection of Forest Ecosystem Classification Field Plot Data in the Hay River Lowland Ecoregion

Forest Management Division, RWED

Rationale

Ecosystems are complex and evolving systems involving the flow of energy of both living and non-living systems within a given environment. Ecosystem classification helps to organize current understanding about ecosystem function. Managers must balance resource use at sustainable levels with an understanding of ecosystem dynamics. Ecosystem classification enables them to make reliable predictions on how these ecosystems will respond to disturbance. Forest ecosystem classification specifically attempts to integrate ecological understanding of forest vegetation communities and their relationship to environmental gradients, such as regional climate and site-specific moisture and nutrient regimes. The collection of site-specific ecological plot data is a prerequisite to developing an understanding of the inherent ecological relationships that drive succession and produce the vegetation communities that occur on the landscape.

Objectives

- To provide additional ecological plot data to improve Ecological Land Classification (ELC) unit delineations for the ELC revisions that are currently being undertaken for the Taiga Plains ecozone.
- To contribute ecological plot data to the Canadian Forest Ecosystem Classification (CFEC) initiative, which is developing national definitions and descriptions for the classification of Canadian forest and woodland ecosystems at the vegetation community level.

Pilot Project: Collection of Forest Ecosystem Classification Field Plot Data in the Hay River Lowland Ecoregion

Forest Management Division, RWED

Objectives *continued*

- To collect ecological plot data needed to develop future operational Forest Ecosystem Classification (FEC) field guides for forest/vegetation ecosystem classification.

Methods and Information Collected

- A contractor (Dave Downing, Timberline Forest Inventory Consultants, Edmonton, AB) with considerable experience in designing and carrying ecological survey/sampling programs was hired to coordinate a three day workshop in Hay River (June 2004) to train RWED headquarters and regional staff on ecological sampling and data collection. An outcome of the ecological sampling workshop was the selection of 50 sampling locations for the FEC pilot project.
- Fifty forest inventory polygons (stands), representing the range of nutrient (poor to rich) and moisture (dry to wet) conditions present within the eastern Hay River Lowland ecoregion study area, were selected using existing Northwest Territories forest inventories.
- The specific sampling site within a given forest stand was selected through aerial photograph interpretation, in combination with an approach designed to be consistent with the ecological sampling site selection method advocated by Mueller-Dumbois and Ellenburg (1974) – ‘subjective without preconceived bias’.
- A contractor with highly qualified staff, experienced in collecting ecological field data (EcoDynamics Consulting Group International Inc., Prince Albert, SK) was hired, through a tendering process, to carry out the field data collection.
- Site, soil and vegetation data were collected at each plot using the procedures and field forms found in the *Ecological Land Survey Site Description Manual* – 2nd Edition (Alberta Sustainable Development, 2003).
- Forest mensuration data was collected at each plot in a manner consistent with the *NWT Inventory Field Sampling Manual* – Version 2.0 (Forest Management Division, RWED, 2004).

Results and Deliverables

- Ecological data was collected during early/mid August 2004 from 50 field plots in the eastern Hay River Lowlands ecoregion study area. Sites sampled included the range of edatopic conditions – from poor to rich nutrient status and dry to wet moisture regimes.

Pilot Project: Collection of Forest Ecosystem Classification Field Plot Data in the Hay River Lowland Ecoregion

Forest Management Division, RWED

Results and Deliverables *continued*

- A summary report (November 2004) was prepared by the contractor outlining the results of the FEC pilot project, including insightful recommendations for future FEC sampling and data analysis.

Long-term Plans and Recommendations

- Continue with an ongoing FEC sampling program in future years.
- Number of plots established yearly should be increased from the pilot project level of 50 to a target level of 150 to 200/year.
- Develop a database for storage of FEC data with a structure designed to facilitate analysis.
- FEC sampling should focus initially in the southern NWT and specifically on the Hay River Lowlands and Slave River Lowland ecoregions.
- As sufficient ecosystem classification plot data are collected, forest ecosystem classification field interpretation guides should be developed. It is anticipated that approximately 500 plots would be required as a minimum for the production of each field guide. A least three separate field guides would be required to adequately cover the Hay River Lowlands and Slave River Lowland ecoregions.
- Forest ecosystem classification sampling and production of additional field guides should eventually be considered for the remainder of the Mackenzie River Valley.

Partners

Forest Management Division, RWED
South Slave Region, RWED
Wildlife and Fisheries Division, RWED

Funding

Forest Management Division, RWED
Western NWT Biophysical Study
Wildlife and Fisheries Division,
RWED

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An accurate inventory of wetlands and surrounding uplands prior to development is essential for conserving natural areas.

Middle Mackenzie 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 Middle Mackenzie 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 52,000 km² of LANDSAT™ 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 30 initial cover classes later verified in the field.
- Field verification was conducted by helicopter and 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.

Middle Mackenzie Earth Cover Inventory

Ducks Unlimited Canada

Methods and Information Collected continued

- Information collected during field verification included vegetation species present, tree and shrub heights, 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
Gwich'in Renewable Resource Board
North American Wetlands Conservation Act
Sahtu Renewable Resources Board
United States Forest Service
Western NWT Biophysical Study

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This project will be important for guiding resource development activities to ensure minimal disturbance to wildlife habitat.

Ecosystem Classification and Mapping – Taiga Plains Ecozone

Wildlife Division and Forest Management Division, RWED

Rationale

The Northwest Territories requires an ecologically-based landscape classification for environmental assessment, cumulative effects management, biodiversity monitoring and reporting, forest resource analysis and planning, wildlife habitat evaluation and conservation, and protected area identification. Currently, the 1996 *National Ecological Framework for Canada* is used by jurisdictions for regional, national and international reporting. However, due to its broad nature, it has not been effectively applied to resource management in the NWT. A report commissioned by the Government of the NWT in 2004 concluded that the ecozone/ecoregion/ecodistrict concept of the national framework was appropriate for resource management purposes, and recommended several changes to the ecoregion boundaries and enhancements to the polygon information within the Taiga Plains and some peripheral portions of adjacent ecozones. This project aims to develop an ecosystem classification framework for the NWT through revisions to specific ecoregion/ecodistrict assignments and improvements to the Soil Landscapes of Canada (SLC)-derived attribute data associated with these units. The improvements will be important for guiding resource development activities to ensure minimal disturbance to wildlife habitat.

Objectives

- To refine and revise boundaries of the *National Ecological Framework for Canada* ecozone/ecoregions and, where possible, their constituent SLC polygons.

Ecosystem Classification and Mapping – Taiga Plains Ecozone

Wildlife Division and Forest Management Division, RWED

Objectives continued

- To enhance the existing SLC information associated with the polygons within the ecoregions of the Taiga Plains ecozone.
- To simplify the current SLC-derived 'landscape units' that have been used by the NWT Protected Areas Strategy (PAS) for its representation approach.

Methods and Information Collected

- A critical examination and procedural application of all available mapped physiographic, climatic and vegetation data has been conducted to describe and identify possible revisions to the Taiga Plains ecozone, its ecoregions and their constituent polygons.
- Preliminary re-classification, proposed boundary changes and a new naming convention for NWT ecoregions and sub-regions have been facilitated by two focussed workshops attended by GNWT and federal government personnel, and by consultation with regional RWED staff and other soil and vegetation experts.
- Limited fieldwork in support of other projects has provided early justification to reclassify a number of ecoregions in the southern portion of the Taiga Plains ecozone.

Results and Deliverables

- Critical examination of the original polygon boundaries and the rationale used to create them, coupled with application of newer post-1996 data, more effective analytical procedures, and input by qualified experts in a workshop setting allowed for a preliminary review, revision and enhancement to the Taiga Plains ecozone.
- Limited fieldwork in summer 2004 provided a provisional reclassification of the Nahanni Plateau, Sibbeston Lake Plain, Northern Alberta Uplands and Horn Plateau ecoregions.
- A poster presentation describing the project and summarizing proposed Taiga Plains ecozone and ecoregion changes was prepared for workshops and regional information sessions.

Long-term Plans and Recommendations

- Planning is underway for the next phase of the project, which is to verify the proposed ecoregion and sub-region boundaries using fixed-wing overflights and follow-up sampling stops with helicopter.
- Final mapping and report preparation is scheduled for September/December 2005.
- A plain language poster of the 'revised' Taiga Plains ecozone will be prepared for April 2006.

Ecosystem Classification and Mapping – Taiga Plains Ecozone

Wildlife Division and Forest Management Division, RWED

Long-term Plans and Recommendations continued

- Mid- to longer-term goals are to eventually reclassify the Taiga Plains' sub-regions and ecosites within them, in order to develop a field-guide and to publish up-to-date educational materials on ecosystem classification.
- 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 ten years.
- Assembly of information using more advanced GIS software and more accurate classification schema and exposure to more training will be needed by GNWT staff to improve our understanding of ecosystem classification and mapping.

Partners

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

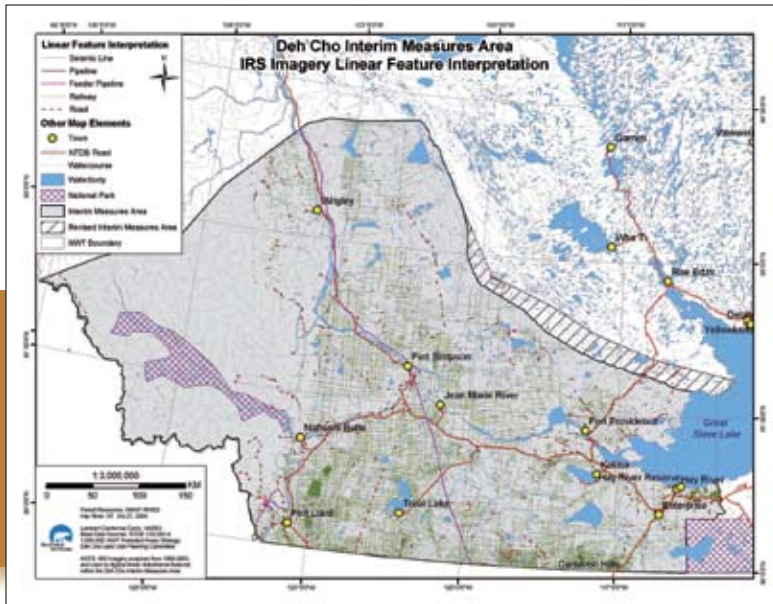
Funding

Forest Management Division, RWED
Western NWT Biophysical Study
Wildlife and Fisheries Division,
RWED

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Land use information is required within the Dehcho Interim Measures Area to conduct cumulative impact-related analyses.

IRS-1 Satellite Imagery and Feature Interpretation for the Dehcho Interim Measures Area

Forest Management Division, RWED

Rationale

The acquisition of a copy of satellite imagery and feature interpretation originally commissioned by the Dehcho Land Use Planning Committee (DCLUPC) in 2004 was this project's sole objective. DCLUPC was contacted in February 2004 and data transfer was completed by March 31, 2004. These images were requested in order to accurately map man-made disturbance in the Dehcho Region. Land use information, such as linear disturbance data, is required to effectively monitor land use within the Dehcho Interim Measures Area (DCIMA) and to conduct subsequent cumulative impact-related analyses. This IRS-1 feature interpretation provided a very comprehensive dataset that satisfied many of these needs.

Objectives

- The main objective of the project was to capture and interpret linear and polygonal disturbance features within the DCIMA using IRS-1 five metre panchromatic imagery.
- Data generated is to be used in a variety of land use planning purposes by the Dehcho First Nations and DCLUPC, and will be used in various land use monitoring analyses by the GNWT.

Methods and Information Collected

- The DCLUPC contracted Colt Geomatic Solutions Ltd. to complete the image acquisition and interpretation. IRS-1 five metre panchromatic imagery was collected from 1999 to 2003.

IRS-1 Satellite Imagery and Feature Interpretation for the Dehcho Interim Measures Area

Forest Management Division, RWED

Methods and Information Collected *continued*

- The Contractor interpreted all physical human disturbances within the contract area, including, but not limited to, settlements, roads, trails, airstrips, seismic lines, pipelines, electric transmission lines, cut-blocks, well-sites, gravel pits and mine sites.
- Features were digitized and feature-coded as line or polygon GIS shape files.
- Features were interpreted visually on screen via 'heads up' digitizing at 1:10,000 scale.
- Visual interpretation was aided by the use of ancillary maps, such as the 1:50,000 NTS sheets.

Results and Deliverables

- Five metre resolution IRS-1 panchromatic images.
- Interpretation of digitized human disturbances in appropriate data format.
- Metadata text files for each NTS tile, including details.
- Attributed polygon shapefile showing IRS-1 image coverage within each tile and dates.

Long-term Plans and Recommendations

- The DCLUPC intends on updating this dataset and dialogue will be undertaken with the DCLUPC to discuss an update process for this dataset.

Partners

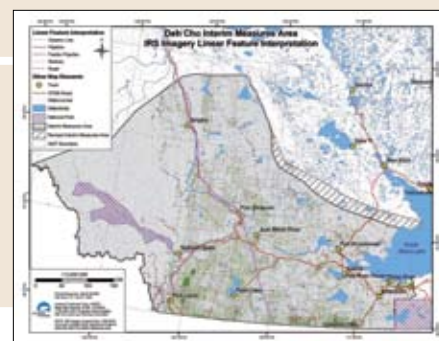
Government of Canada, Department of Indian and Northern Affairs
RWED

Funding

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

Air Quality Monitoring

Environmental Protection Division, RWED

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

- In 2004, additional gas analyzers and particulate monitors were installed in the monitoring stations in Inuvik, Norman Wells and Fort Liard, along with a new data management and reporting system at ENR headquarters in Yellowknife.
- Hourly average data is collected on air pollutant concentrations of hydrogen sulphide, sulphur dioxide, nitrogen oxides, ground level ozone and fine particulates. Meteorological variables, such as temperature, wind speed, wind direction and turbulence, will also be collected.

Results and Deliverables

- Funds were used to purchase three continuous particulate monitors and two nitrogen oxides analyzers for installation in monitoring stations in Inuvik, Norman Wells and Fort Liard.

Air Quality Monitoring

Environmental Protection Division, RWED

Results and Deliverables *continued*

- Remaining funds were used towards the purchase of a new data management and reporting system that will allow for almost real-time collection of data, data archiving and retrieval as well as posting to the internet for public or research use.
- Installation of the monitoring equipment was completed in 2004 and the vast majority of programming and implementation of the data management system was completed in late summer 2004.
- Continuous monitoring of air pollutants and meteorological variables is now conducted in the selected communities. The data is on-line and automatically downloaded every hour for review by Environmental Protection Division staff. The data is electronically archived and will shortly be available via the internet.

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) –
supplied two gas analyzers for the Inuvik station
Environmental Protection Division, RWED

Funding

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

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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,
Western College of Veterinary Medicine, Saskatchewan

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. 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 in order 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,
Western College of Veterinary Medicine, Saskatchewan

Methods and Information Collected

- Traditional and ecological knowledge on diseases in caribou, muskoxen, Dall's sheep and moose was gathered from interviews and workshops in the Sahtu, Gwich'in and Inuvialuit regions.
 - 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 were compiled and sent to all participants and relevant stakeholders and government agencies.
 - A comprehensive summary of published and unpublished information is being compiled.
 - Tissues from 20 caribou collected by Wildlife Health Monitors in Deline in 2004 were examined and results presented in poster format to the Sahtu communities.
 - Tissues from an additional 50 caribou collected by Wildlife Health Monitors from Colville Lake and Deline in 2005 are being analyzed.
 - Data for pathogen distribution and climate are being integrated in GIS formats, describing current and anticipated pathogen distributions.
 - Summary reports will be created and, together with a web-based bibliography and database, will be available to interested parties.
-

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,
Western College of Veterinary Medicine, Saskatchewan

Long-term Plans and Recommendations

- This study is expected to take an additional year to complete.
- 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.

Partners

Research Group for Arctic Parasitology, Western College of Veterinary Medicine
RWED

Funding

Climate Change Action Fund, Natural Resources Canada
Government of Canada, Department of Indian and Northern Affairs,
Cumulative Impacts Monitoring Program
Western NWT Biophysical Study

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The goals of the workshop were to ensure continued dialogue about research and monitoring between all Dehcho First Nations and RWED.

Dehcho Wildlife Workshop

Dehcho Region, RWED

Rationale

On October 19 and 20, 2004, RWED held a Regional Wildlife Workshop in Fort Simpson. This workshop occurred roughly two years after the inaugural Regional Wildlife Workshop in September 2002. Members of the Dehcho First Nations, RWED technicians and biologists, a Nahanni National Park biologist and parks officer, and community members attended as participants.

Objectives

- ✦ The goals of the workshop were to:
 - ✦ Provide an update of RWED wildlife research in the Dehcho.
 - ✦ Provide an assessment of how well RWED had addressed 12 action items previously put forward at the inaugural September 2002 workshop.
 - ✦ Provide a forum for other agencies and other RWED program staff to present research findings.
 - ✦ Provide a forum for the discussion of regional wildlife issues.
 - ✦ Ensure continued dialogue about research and monitoring between all Dehcho First Nations and RWED.

Methods and Information Collected

- ✦ October 19 started with a presentation detailing how RWED had addressed the 12 action items that had been tabled following the inaugural September 2002 workshop.
- ✦ The rest of October 19 featured presentations by researchers (RWED and Parks Canada) on the major wildlife research projects that were ongoing in the Dehcho Region.

Dehcho Wildlife Workshop

Dehcho Region, RWED

Methods and Information Collected *continued*

- ✦ After an initial discussion on furbearers, October 20 was devoted to round-table discussions of any and all wildlife related topics. Key topics of discussion included moose research, boreal caribou research, future regional youth ecology camps, and biological sampling needs and procedures.
- ✦ Posters describing wildlife research programs, both specific to and including the Dehcho, covered the walls of the Cultural Centre. These posters became topics of discussion during coffee/lunch breaks and throughout the workshop.

Results and Deliverables

- ✦ Seven action items were put forward as a result of round-table discussion at the workshop:
 - ✦ The Final Report of the workshop was to be delivered to all First Nations by RWED.
 - ✦ RWED was to ensure that the workshops would become a biannual event, with active participation by elders and youth.
 - ✦ RWED needs to ensure the development of a bison management plan for the Nahanni and Liard area.
 - ✦ RWED needs to initiate discussion with trappers in the Dehcho to stimulate cooperation with research and monitoring.
 - ✦ RWED needs to discuss changes and modifications to the current youth ecology camp format with local communities and DFN.
 - ✦ RWED needs to continue to promote and support community wildlife monitoring programs.
 - ✦ RWED needs to support self-management programs related to wildlife harvest initiated by local First Nations.

Partners

Dehcho First Nations (DFN)
RWED

Funding

Western NWT Biophysical Study

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