

**Boreal Woodland Caribou Response to Industrial Activity in the Summit-Keele
Development Area, Sahtu Region, NT
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Contact information:

Boyan Tracz
GNWT,ENR
PO Box 130, Norman Wells, NT, X0E 0V0
1 867 587 3521
1 867 587 3525
Boyan_Tracz@gov.nt.ca

Introduction:

- a. In this section, describe the project. The description can come from the proposal (description and justification sections)

An oil and gas test well by *Husky Oil Operations Ltd.* ('*Husky*') ca. 55 km southwest of Tulita yielded more than double the hydrocarbon potential that was originally projected, which has led to significantly increased interest in exploration in and around an area that includes Summit Creek and the lower Keele River. A continued successful drilling program may result in additional seismic activity, improved area access, additional drill sites, and - upon the discovery of economic hydrocarbon reserves - additional construction of gathering systems and access. These activities, while required for economic development in the Tulita District, present potential adverse effects to wildlife and their habitats, particularly for boreal woodland caribou ('boreal caribou'). Though the implementation of 'best practices' (e.g., heli-seismic, avoidance handcutting, etc.) can potentially minimise physical disturbance, concerns continue over the potential disturbance frequent helicopter and other aircraft traffic may pose to wildlife. Further, boreal caribou avoidance of, or habituation to, low-impact seismic still remains to be tested.

Currently, developments in the Summit-Keele area remain relatively minimal and at an early stage (e.g., no operations during 2006-2007 winter, and recent operations in 2007-2008 have been further south in the Redstone River area); therefore, we propose to continue our ongoing study and the collection of baseline data on boreal caribou. This baseline data will provide information for the assessment of impacts of industrial activities on boreal caribou, the effectiveness of *Husky's* mitigative measures, and provide "real-time" data on caribou response to current innovative industry practices. Prior anecdotal observations by workers in the Summit-Keele area have suggested a minimal response by boreal caribou to industrial activities, since no discernable difference in caribou behaviour prior to and during drilling operations were observed. However, it is necessary to establish a before-after/control-impact experimental design to more rigorously test these anecdotal observations with acceptable statistical measures. We have discussed earlier versions of our Summit-Keele proposal with *Husky* and *Northern EnviroSearch Ltd.* representatives to establish their support for the project and outline opportunities for collaboration.

Our specific objectives for this study are:

1. Determine the response of boreal caribou to industrial activity.
 2. Map home range and habitat use of radiocollared caribou by five seasons: pre-calving, calving, and post-calving; early/mid-summer; late summer/fall; early winter; and mid/late winter.
 3. Quantify population dynamics of boreal caribou in the Summit-Keele and surrounding areas.
- Describe personnel involved with the project.

In order to deploy collars, a crew comprised of an experienced net gunner, handler (project leader), and helicopter pilot will be used during all capture operations. The work is dangerous and involves significant stress to both the animals and the crew. Experience reduces capture times, increases safety, and limits stress to captured caribou. Captures will be conducted in March, and will adhere to the NWT Wildlife Care Committee's *Boreal Caribou Capture Standard Operating Procedures*. The project leader (or his designated) will identify candidate caribou for capture and will monitor chase times and sequences during the deployment of (primarily) GPS collars on boreal caribou cows. Post-capture monitoring of the collared animals will be done using location data. All collars will have a programmable breakaway device that allows the collar drop to the ground at a pre-determined time (which is approximately 2.5-3.0 years after deployment). As a result, caribou will not be handled again to remove the collars.

Caribou will not be pursued onto ice or areas which do not have adequate snow cover in order to reduce the chance of falls and physical injuries. Pursuit of individual caribou will be kept short (≤ 2 min of running), and will be terminated when the target animal show signs of fatigue (stumbling, open mouth breathing). A net will be fired over each caribou from a net-gun. If the animal is not fully immobilized with the first net, additional nets will be deployed as required. Approximately 4 packed net canisters will be carried on board at all times so that additional nets can be deployed rapidly if required. When the animal has become entangled in the net, the helicopter will land and handler and net gunner will approach the animal, secure the net, and hold the animal down. As the net is removed, hobbles are used to restrain the legs to minimize struggling, thus preventing injury to the animal and to the capture crew. The animal's eyes are covered to reduce visual stress, and the pulse and breathing rate are visually monitored throughout the handling. The capture crew will minimise noise and contact to reduce stress. Handling generally lasts an average of 12 minutes.

Each animal will be examined to assess condition (fat cover over ribs, back, and hip bone) and to check for any capture-related injuries. The radio-collars will be fastened around the animal's neck. Approximately 40 mls of blood (2 X 10 ml purple top vacutainers and 2 X 10 ml red top vacutainers) will be collected from each animal from the cephalic vein, or jugular vein if cephalic is not viable. Blood will be analysed for genetic microsatellites and trypanosomes and serum will be used to determine pregnancy, concentrations of micronutrients, and exposure to disease (Brucellosis, etc.). A sample of approximately 50 gms of feces will be collected from the ground upon defecation, or the rectum of each caribou during handling. Fecal samples will be analysed to determine diet and the prevalence and intensity of infection by gastro intestinal

parasites. Incisors will be photographed to assist in estimation of age from the amount of wear visible. Eye covers are removed, and eyes checked for Brucellosis. Hobbles are removed, and the animal will then be released.

In the event that an animal is injured during the net-gunning, the handler and net-gunner will assess the injuries. A broken antler would be re-cut with a hand saw to smooth the broken edge. A broken leg or other broken bones will require that the caribou be shot (helicopter will carry a shot-gun). If there are any human safety concerns about shooting the animal; the caribou will be physically restrained, and the handler will pith the caribou by inserting a knife between the base of the skull and the atlas (1st cervical vertebra) and immediately severing the spinal cord. The animal will be dressed in the field and transported, if logistically feasible, to the nearest community so that the meat can be used.

Telemetry flights will be conducted at regular times during the year (via helicopter) to locate all radio-collared cows and determine the status of cows, calves and other individuals associated with collared animals. Flights will take place in:

- i) April/May - Productivity survey to estimate reproductive status (calf production)
- ii) Late Oct/early Nov - Fall composition survey to estimate over-summer calf survival and adult sex ratio
- iii) March - Recruitment survey to estimate over-winter survival of calves

During all surveys sightings of all caribou, moose, wolves, and other wildlife observed will be recorded and their location will be documented using a GPS. During surveys staff will record boreal caribou group size, classify animals to sex and age-class, mark GPS locations, and take pictures to assist with identification. Any mortality sites of radiocollared animals located will be investigated; retrieved collars will be re-deployed.

The data obtained from the satellite collared animals will be analyzed using standard techniques to determine seasonal patterns of habitat use and selection, home range size, and seasonal movement rates and to map the relative probability of occurrence and important seasonal habitats of boreal woodland caribou in the Sahtu Settlement Area. This methodology will follow on work completed on boreal caribou in the Inuvialuit Settlement Region, and will primarily utilize Resource Selection Function Analysis (RSF) techniques, which will also allow for examination of the response caribou may have to industrial activities.

- Describe any other similar work that has been done, taking place or expected to take place in the future.

Although the primary focus of this project is to explore the response boreal caribou to industrial activities, it also adds to ongoing studies of boreal caribou along the entire Mackenzie River valley, which are clarifying our understanding of caribou distribution, habitat use, and population dynamics. Concern about boreal caribou in much of Canada led to their being listed as Threatened under the federal Species at Risk Act (SARA) in 2004. They are now protected on federal lands and a national Recovery Strategy is being developed to conserve and recover boreal

caribou populations and their habitat across Canada. Under this national strategy, the Department of Environment and Natural Resources (DENR) is developing an Action Plan for the conservation of boreal caribou in the NWT - a plan that will require both sound baseline scientific knowledge and Traditional Knowledge. DENR biologists, in addition to conducting science-based research, are now in the process of discussing boreal woodland caribou at community and co-management meetings throughout the NWT.

Until recently, limited scientific knowledge was available for boreal ecotype woodland caribou (*Rangifer tarandus caribou*) that occur along the Mackenzie River Valley from the NWT/Alberta border to the area of the Mackenzie Delta. Unlike barren-ground (*R. t. groenlandicus*), Peary (*R. t. pearyi*), and mountain ecotype woodland caribou (*R. t. caribou*), these caribou only recently became the focus of biological studies in the NWT. Since 2002, DENR-Sahtu biologists have deployed both GPS collars and ARGOS satellite collars on boreal woodland caribou in the Sahtu - from north of Blackwater Lake (north of Wrigley), to north and west of Ft. Good Hope (such as in the Ramparts area), 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 boreal caribou habitat. In addition, this larger study provides a baseline for further exploration of the impacts of climate change on boreal caribou populations. Collar deployment will provide DENR staff with a sufficient sample size to obtain more reliable estimates of productivity and recruitment rates and will provide information on the distribution, movements, and habitats used by boreal woodland caribou within the Mackenzie Valley Pipeline corridor in the Sahtu Region. Currently, ENR staff maintain approximately 20 GPS on boreal caribou in the Sahtu section of the Mackenzie Valley.

Location data from ENR Sahtu boreal caribou have also assisted in the ecological assessment of the Ts'ude niline Tu'eyeta (Ramparts River and Wetlands) Candidate Protected Prea. Location data were used by the Canadian Wildlife Service (the sponsoring organization) to help determine the amount of late winter critical habitat within Ts'ude niline Tu'eyeta, and to determine the relative abundance of boreal caribou within the protected area. Also, on a related note, in 2007 collars were deployed near Willow Lake north of Tulita with the intent to provide additional information on the importance of that area to boreal woodland caribou, collaborating existing field observations and traditional knowledge.

Lastly, the start of a new project on the ecology of muskoxen in the Sahtu region (started in for November 2007) offers examination of the feasibility of addressing local concerns within the Sahtu about negative muskox/caribou interactions. It is hoped that at minimum there can be a quantitative assessment on the overlap of annual and seasonal ranges between the two species, with examination of more detailed habitat-use a topic for later discussion.

Methods:

- a. In this section, give a detailed record of how the project was completed.

Objective 1 (response of boreal caribou to industrial activity) – since 2005 we have deployed 10 GPS-tracked, and 1 satellite tracked ('ARGOS') radio-collars on boreal caribou within the Summit-Keele area. The GPS collars are located daily at 8-hr intervals with an average location accuracy <10 m. Locations of radiocollared caribou will be compared to industrial activities

(footprint, locations of activity, air/land traffic) within the development area prior to and during exploration and development activities to determine caribou response. Radio-collared caribou outside the Summit-Keele development area are a 'control group' for comparison with those animals in or near the development area – the 'exposure group.' However, there have been serious issues with 5 of the deployed collars (see Results section), current data for this project have not been as great as had been hoped for.

Objective 2 (map home range and habitat use by season) - ENR staff propose to divide the year into five seasons: pre-calving, calving, and post-calving, early/mid-summer, late summer/fall, early winter, and mid/late winter. LANDSAT Thematic Mapper imagery (Ducks Unlimited; Forest Management, ENR), and / or EOSD data will be used for vegetation/habitat classification. In conjunction with ENR-Inuvik, we will use GPS radiocollar data to generate and cross-validate seasonal Resource Selection Function (RSF) models and generate separate probability-of-use maps for each caribou season. Data from the two regions will be integrated where possible to develop larger landscape-level models. With data from caribou within and outside the Summit-Keele development area over three years (i.e., before and during development), staff can evaluate any changes to habitat resulting from industrial activity, from forest fires, or other natural disturbances. The RSF models will be combined with information collected from extensive Traditional Knowledge interviews done in Sahtu and Inuvik Regions (2002) and a broad-scale model of boreal caribou distribution in the Deh Cho (Integrated Ecological Research, Nelson, B.C.).

Objective 3 (population dynamics) - aerial monitoring of radiocollared animals has occurred at 3 key times:

- i) Productivity (Apr/May) - estimate reproductive status
- ii) Fall composition (late Oct/early Nov) - estimate over-summer calf survival and adult sex ratio
- iii) Recruitment (Mar) – estimate over-winter survival of calves

During all surveys we have recorded group size, classify animals to sex and age-class, mark GPS locations, and take pictures to assist with identification. Any mortality sites of radiocollared animals located will be investigated; retrieved collars will be re-deployed. See Results section for specifics.

b. Describe how the communities/organizations were involved.

This project is a partnership among the SRRB, ENR, the Research Group for Arctic Parasitology, and the Canadian Cooperative Wildlife Health Centre (University of Saskatchewan). Sahtu Region ENR staff are the lead on the project; however, ENR staff from Headquarters and other regions assist in the field and with data analysis as the need arises. We also look forward to the involvement of personnel with *Husky Oil Operations Ltd.* with field logistics, data procurement, and even assistance with data analysis.

Husky lists Environmental/Wildlife Monitors and Security/Access personnel under their employment opportunities for local communities. Though exploration work was not scheduled for winter 2007/08, drilling immediately south in the Redstone river area provides an opportunity

for additional training to these employees on boreal caribou monitoring. In February (12-15) ENR staff were invited to attend part of the Environmental Monitor training provided by EnviroSearch, and an ENR biologist presented to prospective wildlife monitors from Tulita on boreal caribou studies in the Sahtu, including the project underway in the Summit-Keele region. The ENR biologist also had the opportunity to go on a tour of the drilling facilities with the prospective monitors, and saw Husky's operations first-hand.

c. Describe how traditional knowledge was used, if applicable.

In 2001/02 an extensive Traditional Knowledge study was done with 40 experienced hunters (as selected by RRCs) in the Sahtu (Zimmer et al 2002); the project was done in collaboration with biologists with the Gwich'in Renewable Resources Board for Gwich'in communities and ENR (Inuvik) for Inuvialuit communities. Additional TK will be collected through the duration of the project. *Husky Oil Operations Ltd.* has also conducted Traditional Knowledge surveys, and there may be potential to incorporate this information as well.

Results:

a. Describe what results were discovered or learned.

This project fulfills NWT CIMP's "Monitoring and Research" category and caribou are one of the NWT CIMP's *Valued Ecosystem Components* (NWT CIMP 2007; <http://www.nwtcimp.ca/vcstknowledge.html>). Mineral, oil, and gas exploration and extraction activities, forest fires, and road access have altered some portions of boreal caribou range in the NWT, but the degree to which these disturbances have impacted boreal caribou in the territory is still not fully understood and is still being studied. However, elsewhere in Canada, a combination of human activities and natural disturbances, such as fire, agricultural expansion, resource extraction (i.e., cumulative effects), has been implicated in the decline (e.g., Alberta) or even extermination (Nova Scotia and New Brunswick) of boreal caribou populations.

Concern about declines in boreal caribou elsewhere in Canada and a general lack of information about their status in the NWT led to their being listed as Threatened in the NWT by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). As such, they came under the protection of the *Species at Risk Act* when it was established in 2004. A national *Recovery Strategy* is being developed to conserve and recover boreal caribou populations and their habitat across Canada. Under this national strategy, ENR biologists are developing an *Action Plan* for the conservation of boreal caribou in the NWT.

Discussions across the NWT among governments, aboriginal organizations, and industry concerning the construction of a Mackenzie Valley gas pipeline are coupled with continued interest in an all-season road, hydro-electric developments, and mineral exploration (e.g., coal southeast of Tulita). This potential requires the acquisition of baseline ecological information on boreal caribou and other important species to ensure that important habitats are not impacted by these developments.

Climate change models for the Mackenzie Valley predict an increase in wild fire frequency and severity. Further, increased snowfall, the incursion of new species (including parasites), and significant changes in forest composition are also predicted. Co-management Boards (e.g., SRRB), Land Corporations, and RRCs are also voicing concerns over changes to the land, water, and wildlife. Data are required to assist these organizations in addressing their concerns and to assist with identification and performing Renewable Resource Assessments for Conservation Zones in land use plans (e.g., Sahtu Land Use Planning Board) and as candidate areas under the NWT Protected Areas Strategy (PAS).

This study blends with ongoing research and monitoring activities on boreal caribou lead by ENR biologists elsewhere in the NWT. These studies, coupled with Traditional Knowledge studies on boreal caribou, provide baseline and quantitative data for discussions of industrial activities, fire management, and climate change during meetings with community members, industry representatives, RRCs, and members and staff with renewable resources and land use planning boards, and with NWT PAS.

Currently there are 9 collars active in the Summit-Keele region (1 *Telonics* Argos, 3 *Telonics* GPS, 5 *Habit* GPS), with the 5 *Habit* collars experiencing regular technical issues. The 5 *Habit* collars were obtained in 2006 to test the viability of a Canadian company as a provider for collars versus the American company *Telonics* from which ENR has purchased telemetry equipment for over 20 years. Unfortunately, the *Habit* collars have had serious technical problems, resulting in both a lower number of GPS locations than expected, and fewer observations when conducting field surveys due to problems with the VHF transmitters. In March 2007, 3 GPS were deployed in the Summit-Keele area. One GPS collar deployed in 2005 was recovered in 2007 after its pre-programmed release mechanism operated successfully, and we expect the lone remaining ARGOS collar to be released early in 2008. Recovered collars will continue be refurbished and re-deployed on boreal caribou along with newly purchased collars. The new GPS collars deployed in 2007 (with more collars deployed in 2008) will hopefully provide sufficient data to conduct an analysis of caribou response to industrial activity.

Productivity, fall composition, and recruitment surveys were flown in 2007. Overall, recruitment of boreal caribou in the Sahtu is slightly lower than the 30 calves/100 cows (a ratio which is used as an indication of a population that is stable to increasing). Earlier productivity (calving) surveys have provided estimates of 45- 60 calves/100 cows, estimates which also are lower than expected. Interestingly, one cow in the Summit-Keele region was spotted with two calves in June 2006, an occurrence that is considered to be rare.

Two types of parasites were recovered from fecal samples collected in March 2007 during captures of boreal caribou: Trichostrongylidae spp. (gastrointestinal nematodes), and *Eimeria* spp. (protozoan). The prevalence of *Eimeria* spp. is uncharacteristically high compared to previous surveys in the NWT, Yukon, and Nunavut. The high prevalence may be the result of the age of caribou sampled (where young caribou are more susceptible to infections by *Eimeria*) or boreal caribou in Sahtu may be a 'naïve host' population. This finding is interesting and deserves further investigation (Dr. S. Kutz, Faculty of Veterinary Medicine, University of Calgary).

A proposal provided to *Husky Oil Inc.* for a collaborative boreal caribou project in the Summit-Keele area is still under review. However, there continues to be positive discussions with both *Husky* representatives and their associated environmental consultants during community consultations for boreal caribou. Though there were no industrial activities during the 2007/2008 winter season, there is still potential for future collaboration(s). Further, collar data have provided ENR staff (Sahtu and Yellowknife) with details on distribution that has aided in ENR'S comments on proposals by *Husky* in the Summit-Keele Are. These data clarify what is defined as "areas of caribou occupancy" and have assisted in addressing information gaps in the proposals.

Enhanced vegetation classification using the enhanced Ducks Unlimited (DU) methods will provide greater classification accuracy for boreal caribou habitat use analysis via resource selection function analysis, as already completed in the Inuvik region. DU staff are continuing with analysis of selected LANDSAT TM imagery in the Mackenzie River Valley, and Sahtu-specific data have recently been obtained. Though sample size is still small, sufficient data now exist to define home ranges (both annual and seasonal) and to begin habitat use analysis. This work will continue through 2007/08. Recently, the ENR Sahtu office has hired a GIS Specialist, allowing quantitative analyses to finally commence. Current staff responsibilities and the lack of a qualified GIS specialist in-house have limited detailed analyses to this point.

Discussion / Conclusions:

- a. Describe how the results of this project will further knowledge of cumulative impacts.

Since developments in the Summit-Keele area are currently relatively minimal, there is an excellent opportunity to establish a rigorous experimental design to test these anecdotal observations. Such a study can examine 'before and after' effects using an 'exposure versus control' procedure. Cooperative research between industry and biologists will provide valuable information on the effectiveness of the company's mitigative measures, and will provide valuable "real-time" data on boreal woodland caribou responses to current innovative industry practices.

In Appendix 2 (Fish and Wildlife) of the Summit-Keele 2006 Drilling Program- EPP indicates that "caribou" are found throughout the development area. However, the "caribou" maps in Appendix 2 delineate mountain woodland caribou habitat and fail to show that the area is also habitat for boreal woodland caribou (see also ENR comments on Husky Oil Operations Ltd. 2006 Summit Creek Drilling Program application, October 2005). Two boreal woodland caribou radio-collared in the Summit-Keele area in March 2005 (1 satellite-tracked, 1 GPS-tracked) clearly indicate the development area is habitat for these caribou. Data provided by additional GPS-tracked radiocollars within and near the development area now provide a more appropriate definition of boreal woodland caribou habitat in the area while also allowing detailed study of any development-related impacts on caribou and the effectiveness of mitigative measures.

Informal discussions concerning this proposal occurred between the proponents and representatives of Husky Oil Operations Ltd. and Northern EnviroSearch Ltd. when they were present for community consultation meetings in the Sahtu. The commitment of Husky to act as

an industry leader in environmental stewardship (see Environmental Stewardship at <http://www.huskyenergy.ca/about/default.asp>) coupled with current and future activities in the Summit-Keele area allows a unique opportunity for a collaboration between industry, co-management boards, and biologists. Such a collaboration will provide not only good scientific data, but will also build on Husky's desire to minimize disturbance in their operations areas. Husky's assistance in caribou research in the Summit-Keele area will highlight a strong commitment to the Sahtu region and provide an example of how cooperative research can be achieved. We trust that productive discussions will continue, and that a mutually beneficial working relationship will be established.

- b. Describe how results of the project were communicated to the communities and other groups.

Updates on boreal woodland caribou studies in the Sahtu and activities related to the development of an NWT *Action Plan* and national *Recovery Strategy* have been given to all RRCs in the Sahtu and to the SRRB from the start of the project in March 2005 (PowerPoint format). These presentations will continue in 2008/09.

Location data have been used to provide comments and recommendations as part of the department's response to industry exploration permit applications. These data have assisted in defining areas where proposed activities and boreal caribou may overlap, and have assisted in discussions with industry and with regional staff addressing Environmental Impact Assessments.