Monitoring and Research Results 2010-2015

CARIBOU

NWT Cumulative Impact Monitoring Program (NWT CIMP)

Government of
Northwest Territories

NWT CIMP-funded caribou projects in the NWT

Cover illustration by Trey Madsen

ISBN: 978-0-7708-0244-8

Recommended Citation:
Department of Environment and Natural Resources. Northwest Territories Cumulative Impact Monitoring Program (NWT CIMP). Monitoring and Research Results 2010-2015 Caribou. ISBN 978-0-7708-0244-8. Yellowknife, NT: Northwest Territories Cumulative Impact Monitoring Program, Department of Environment and Natural Resources, Government of the Northwest Territories, 2016.

September 2016

About the Northwest Territories Cumulative Impact Monitoring Program (NWT CIMP)

The Northwest Territories Cumulative Impact Monitoring Program (NWT CIMP) coordinates, conducts and funds the collection, analysis and reporting of information related to environmental conditions in the NWT. Its main purpose is to support better resource management decision-making and sustainable development in the territory by furthering our understanding of cumulative impacts. Based on the priorities of environmental regulators, co-management boards and Aboriginal organizations, the program has focused on caribou, water and fish since 2011.

NWT CIMP strives to place research and monitoring results in the hands of those who need it to make decisions. As such, the program focuses on reporting back to communities and to environmental regulators who can use the information to manage the land and water. This booklet of caribou monitoring and research is one way in which the program shares results. Other means include community presentations by researchers, regional results workshops, peer-reviewed publications and online through the NWT Discovery Portal.

NWT CIMP annually funds approximately 30 projects, providing $1.5 million to research and monitoring of cumulative impacts in the Northwest Territories. This publication provides high level summaries of the results from the caribou research and monitoring projects that were funded in 2010-2015 (see map on previous page).

For more information on the program, visit **www.nwtcimp.ca**. For NWT CIMP project results, visit **www.nwtdiscoveryportal.enr.gov.nt.ca** or email the principal investigator directly.

Contents

CIMP96

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Gwich'in harvest monitoring project

Purpose

To obtain accurate on-going community harvest estimates of the Porcupine caribou herd to assist in understanding population trends.

Key Findings

- Total reported harvest between June 01, 2012 and May 31, 2013 was 332 animals, including 280 males and 52 females/unknown sex.
- Gwich'in harvester participation rate was low at 44% of active harvesters for the same period.
- Based on the harvester participation rate, a total harvest estimate of 615 animals was calculated with a ratio of 522 males to 94 females/unknown sex. The margin of error is plus or minus 123.
- Greater participation from harvesters would result in a more accurate harvest estimate.

Porcupine caribou herd crossing a river.

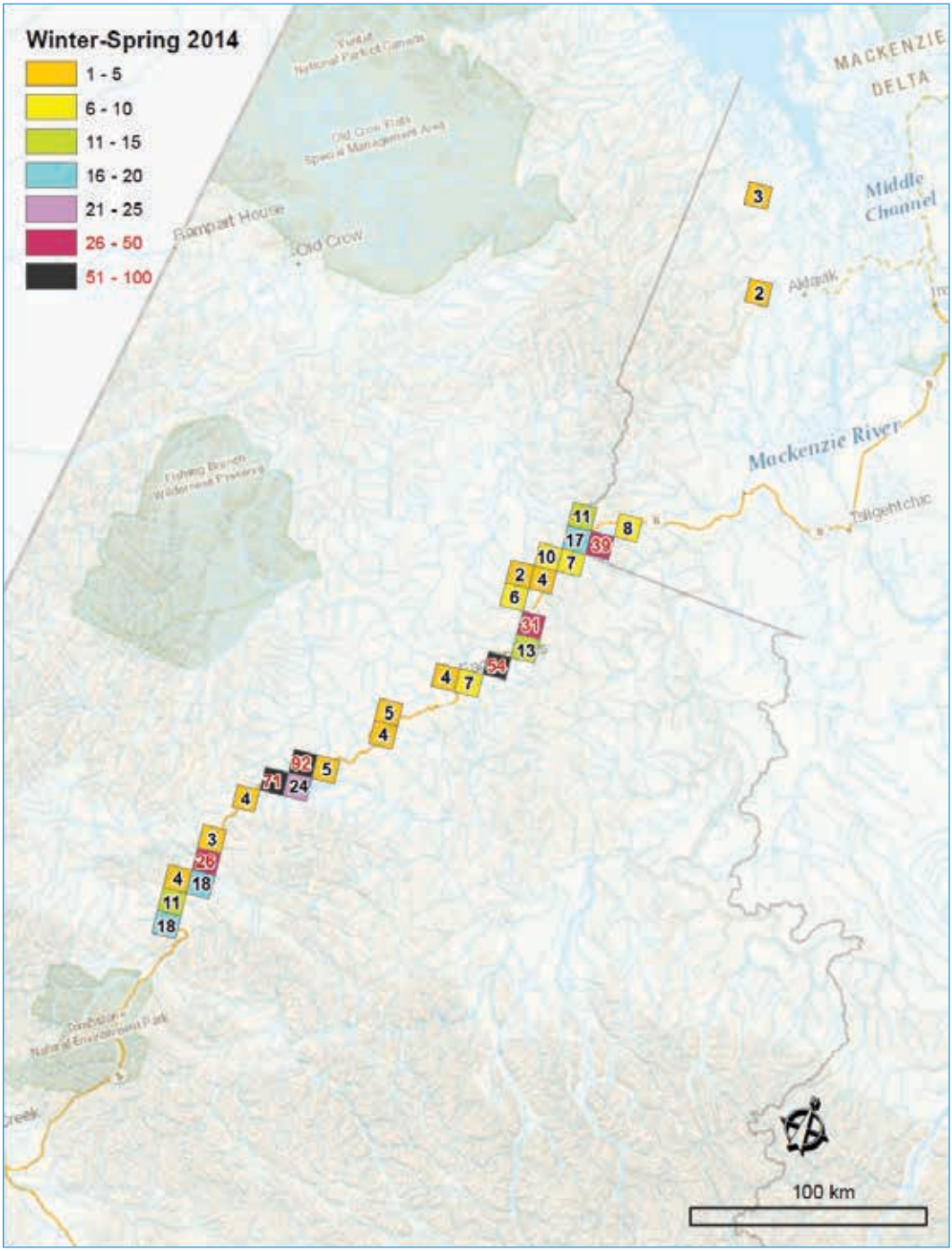

Figure 1: Location and number of harvest of Porcupine caribou for 2013-2014.

How does this project help in understanding cumulative impacts?

The determination of harvest estimate contributes to the understanding of overall caribou mortality, which is a key factor in determining population estimates and a necessary component of cumulative impact assessment.

CIMP113

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Moose and caribou health: Monitoring the emergence and impacts of winter tick (*Dermacentor albipictus*) in the Sahtú Settlement Area

Purpose

The objective of this research was to work with subsistence hunters to determine the occurrence of the winter tick, *Dermacentor albipictus*, among the moose and Barren-ground caribou in the Sahtú Settlement Area.

Key Findings

- Winter ticks were found in five of the 30 moose hides examined, as far north as Fort Good Hope. These results support the observation of a northern tick range expansion in recent decades.
- All 25 Barren-ground caribou hides examined in this study were negative for ticks, but lice (*Bovicola tarandi* and *Solenopotes tarandi*) were found on some individuals.
- A model was created to understand tick habitat suitability in the NWT. Using the model, maps were produced to predict changes in suitable tick habitat under future climate change scenarios.

Complete biological samples requested from hunters while harvesting for subsistence included hides, blood on filter papers, incisors, fecal samples, piece of liver, left kidney with fat and left metatarsus, with a tag containing information about hunter's name, collection date and hunting location. Photo: C. Kashivakura.

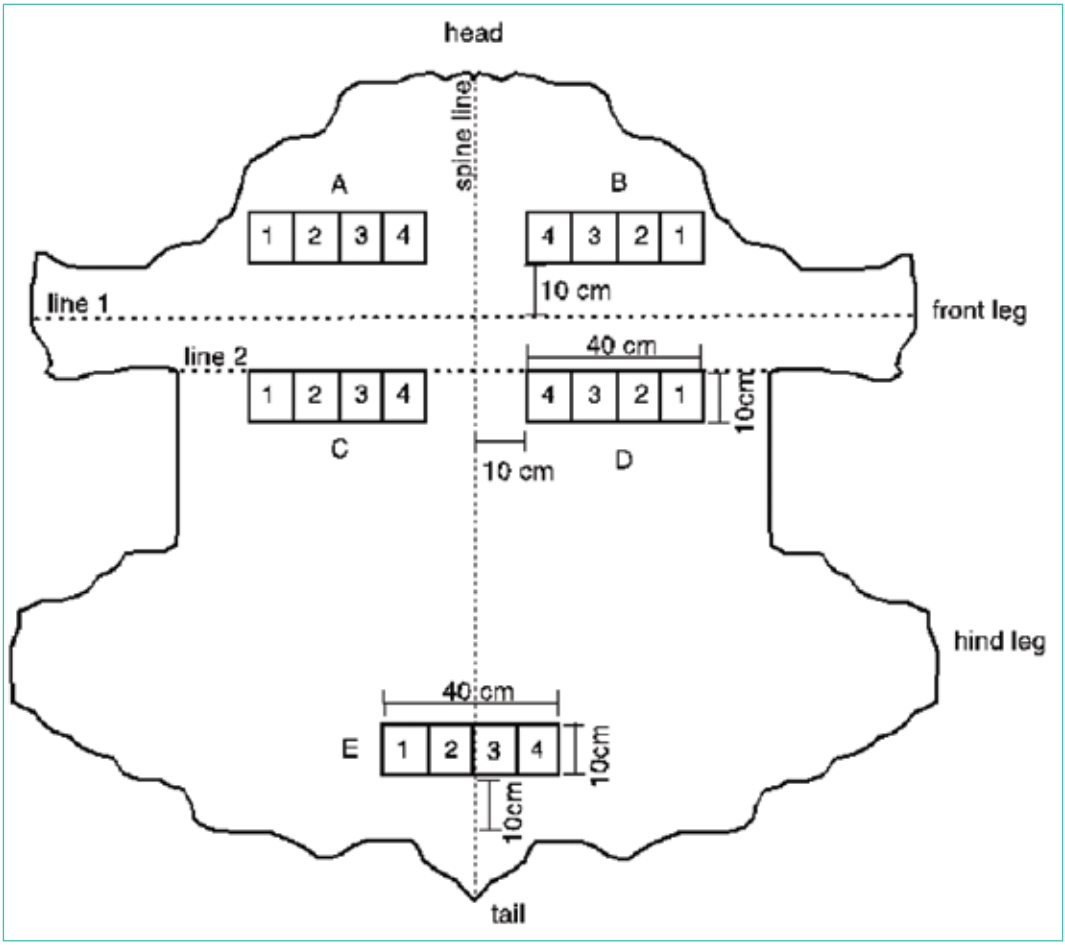

Figure 2: Method used for sampling moose and Barren-ground caribou hides. All sections (A, B, C, D and E) had a measurement of 10 x 40 cm (400 cm^2) and each of these sections was sub-divided in four subsections containing 4 quadrants of 100 cm^2, resulting in a total of 20 quadrants per hide. Sections A and B corresponded to the neck area, sections C and D to the shoulders area, and section E to the base of the tail.

How does this project help in understanding cumulative impacts?

This research provides new information about the impacts of climate change on winter tick occurrence in the Sahtú area by contributing both to baseline knowledge on current distribution and predicting future trends. The results also help evaluate the potential risk of tick infestation in Barren-ground caribou populations, which has not been documented in the NWT in the past.

CIMP158

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Dene mapping project repatriation and analysis: Understanding valued places at the intersection of caribou ecology and harvesting

Purpose

The purpose of this project was to provide historical socio-ecological and wildlife baseline data that can be used in conjunction with other data sources to better understand trends in caribou-harvester relationships in the Sahtú region, and trends in wildlife range and distribution.

Key Findings

- Baseline information was recorded during the 1970s and 1980s in a Mackenzie-Valley-wide traditional land use and traditional knowledge study.
- 564 trappers in 27 NWT communities between 1974 and 1976 (30% of all Dene and Métis trappers in the communities) were interviewed.
- 242 hardcopy interview maps in the Sahtú Settlement Area were digitized into a Geographic Information System (GIS).
- The main result of this project is traditional knowledge data and scanned maps now available to the Sahtú Renewable Resources Board and Sahtú communities.

Example of original traditional land use map. Photo: Sahtù Renewable Resources Board.

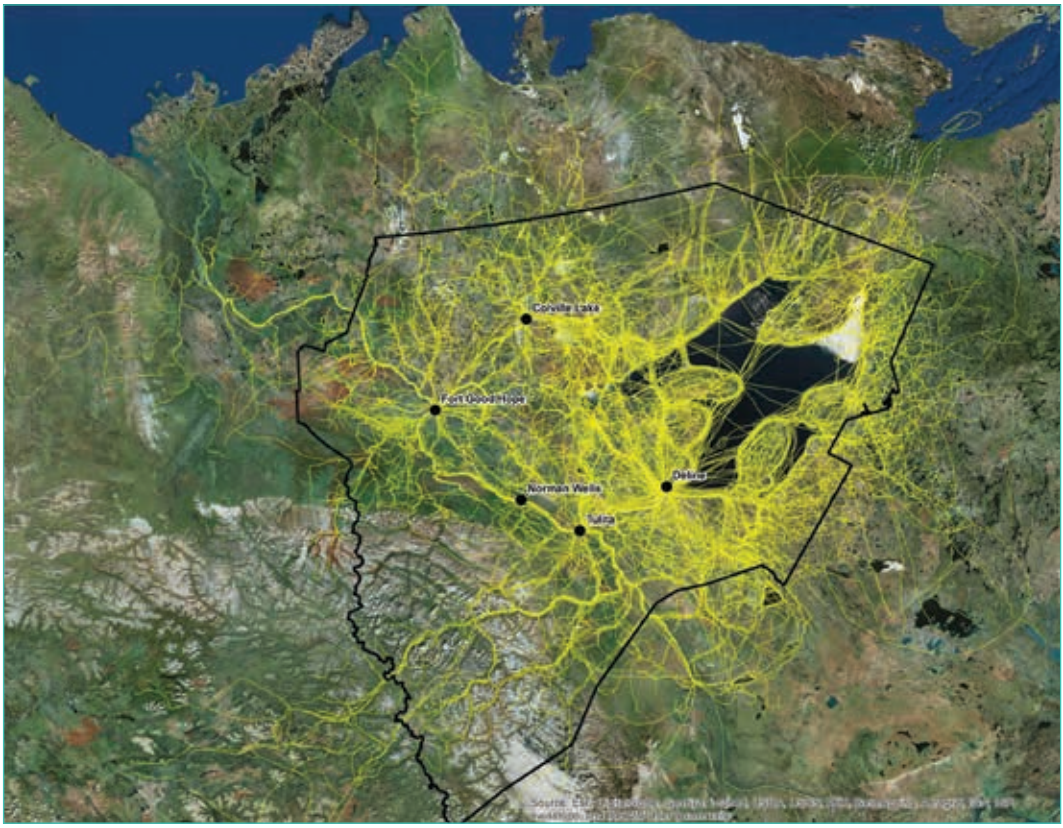

Figure 3: Map shows 8,149 trails used for 8,732 attributes (uses) by local harvesters within the Sahtú Settlement Area.

How does this project help in understanding cumulative impacts?

Analysis of harvesting, wildlife management and other topics will be enhanced through the availability of high-quality traditional knowledge baseline data. The dataset will be used for decision-making and research to understand socio-ecological trends for wildlife management purposes.

CIMP160

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Community-based monitoring of wildlife health phase 2: Stress and pathogens in a changing landscape

Purpose

To address gaps in knowledge on caribou and moose health, and contribute to a better understanding of cumulative impacts. Specific project objectives were to: (a) provide baselines of body condition, body size, pathogen diversity, exposure and intensity, and stress levels in Barren-ground and Mountain Woodland caribou and moose in the Sahtú Settlement Area; and (b) evaluate the use of hair cortisol and fecal cortisol and corticosterone as 'bio-indicators' of health by evaluating how these associate with other health indices of caribou health. A hunter-based monitoring approach was used to both increase knowledge exchange and local capacity for community-based monitoring.

Key Findings

- Documented body condition, body size, pathogen prevalence and intensity, and stress levels (as measured by hair cortisol and fecal cortisol and corticosterone) of Mountain Woodland caribou (first time) and Barren-ground caribou.
- Detected exposure to pathogens of importance for human, caribou and moose health, but seroprevalence for most pathogens was overall low.
- Detected exposure to two pathogens that were previously unknown in some (or all) of the caribou herds in the Sahtú; the bacterium *Erysipelothrix rhusiopathiae* (first time detected in Mountain Woodland and Barren-ground caribou) and the protozoan parasite *Neospora caninum* (first time detected in Mountain Woodland caribou, previously detected in Barren-ground caribou).
- No correlations between health indices and stress in caribou and moose were found; however, sample sizes were small and may have been inadequate to detect small effects.
- Community-based monitoring was a valuable approach to gather information on wildlife health, with the added advantage of integrating community members as active partners in the research process.

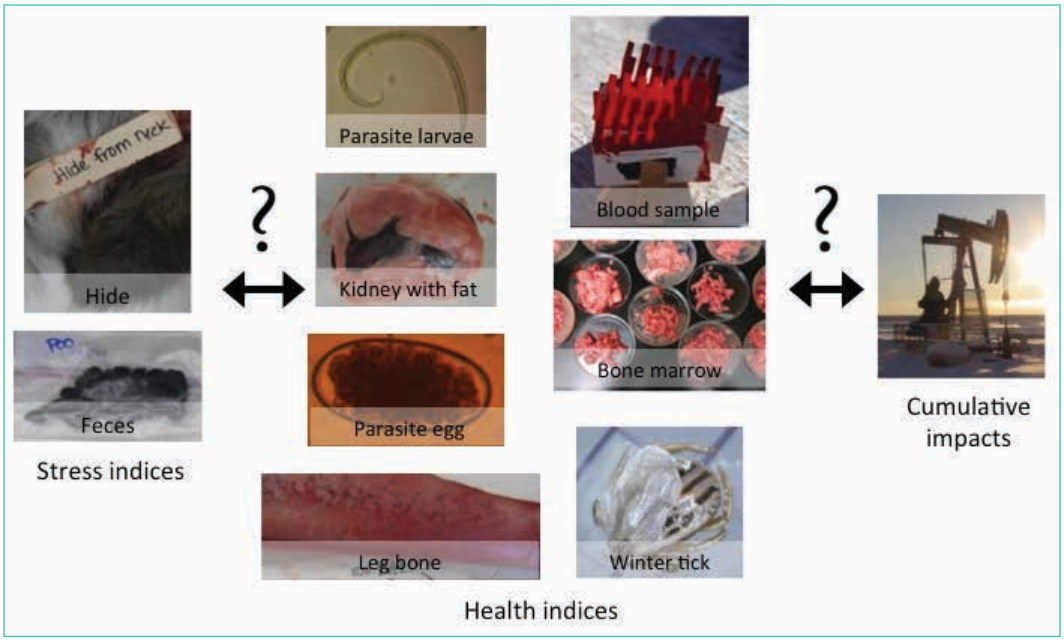

Figure 4: Using hunter-based collections of standardized health indices for caribou and evaluation of new tools for monitoring health (stress hormones on hair and feces), this project aimed to address gaps in knowledge on caribou health and thereby contribute to a better understanding of cumulative impacts. Photos: S. Kutz and A. Carlsson.

How does this project help in understanding cumulative impacts?

Establishing baseline health indices, of individuals and populations, is a critical first step for detecting changes in population health and monitoring cumulative impacts. This project documented body condition and the infectious disease and stress status of Mountain Woodland and Barren-ground caribou and moose over a three-year period. By using a community-based monitoring approach, this project has built capacity and a foundation for on-going long-term monitoring of cumulative effects; furthermore, the results generated can be used as a baseline from which to measure change.

Glucocorticoid levels in hair and feces may reflect the overall health status of an individual and, ultimately, the population, and may, thus, be a good cumulative measure of stressors that caribou have been exposed to. However, further work and larger sample sizes are needed to validate this approach for caribou and moose in this area.

CIMP162

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Multi-species monitoring using winter track surveys in the Sahtú Settlement Area

Purpose

To establish the basis for a collaborative, regionally-based, long-term wildlife snow track monitoring program. The key objective was to develop a wildlife tracking method that was easy to use and delivered robust information to resource managers for decision-making. The community of Tulita was the pilot study location.

Key Findings

- Field trials of the survey protocol and recording equipment were tested by snowmobile in groups of three or four during March 2015. Four routes were surveyed twice (total distance of 98 km).
- Three devices were used to record tracks by taking georeferenced photos: Garmin Oregon GPS w/digital camera, Olympus TG-3 digital camera w/GPS and Juniper Systems Archer[2] handheld computers equipped with the Trailmark™ data collection application. The Garmin and Archer[2] provided similar coordinates for the same track observations (on average within 4.2 m of one another), whereas the Olympus cameras appeared to provide inaccurate coordinates (generally >250 m from the same observations recorded with the Garmin and Archer[2]).
- The Trailmark™ data collection application included a series of 10 questions that provided a means to enter all relevant information about track observations in the field and to standardize the information recorded. Field crew members reported the Trailmark™ application to be user-friendly. Data collected was uploaded wirelessly to the Trailmark™ server at the end of each day.
- Tracks and sign from 10 different wildlife species were recorded. Caribou tracks were detected 11 times. Marten was by far the most frequently encountered species.

How does this project help in understanding cumulative impacts?

Assessment of different systems for wildlife tracking found the Trailmark™ system to be the most accurate and user friendly. This system can be recommended for use by industry wildlife monitors and others to generate robust information that can be used by resource managers including Environment and Natural Resources, Government of the Northwest Territories and renewable resource boards.

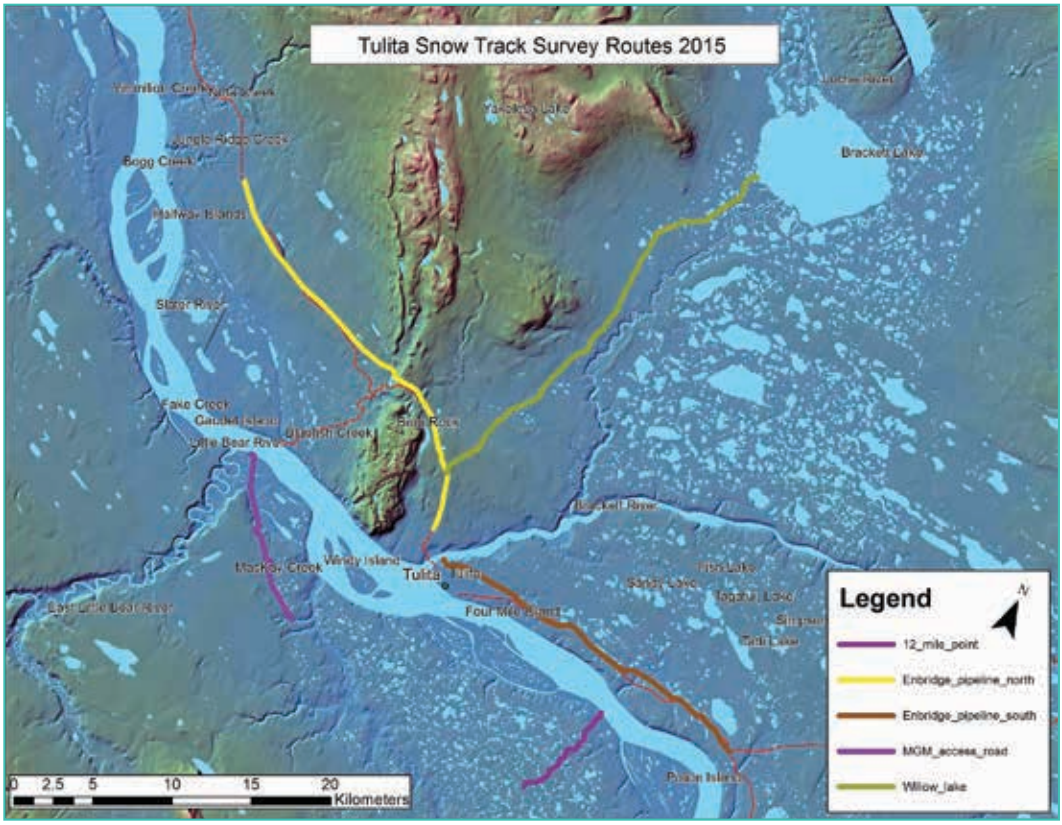

Figure 5: Routes surveyed for wildlife tracks during March 2015 in the Tulita area.

Species	Total Number of Track Observations	Number of tracks/km/day since last snow		
		Min	Mean	Max
Caribou	11	0.04	0.13	0.21
Fox	31	0.03	0.19	0.41
Lynx	38	0.03	0.10	0.25
Marten	113	0.07	0.26	0.63
Mink	10	0.02	0.05	0.07
Moose	42	0.03	0.12	0.31
Otter	3	0.01	0.03	0.05
Weasel/Ermine	10	0.01	0.04	0.06
Wolf	7	0.03	0.06	0.11
Wolverine	5	0.04	0.03	0.04
Grand Total	**270**			

Figure 6: Total number of track observations by species, and number of tracks observed per km per day since last snow, from two rounds of surveys conducted in March 2015 in the Tulita area.

CIMP165

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Evaluating diversity and spatial organization of caribou in the Sahtú region for management and environmental impact assessment

Purpose

Understanding how caribou populations are spatially structured on the landscape is a question of interest to managers, ecologists and indigenous harvesters. The main objective of the research project was to bring together traditional knowledge and non-invasive population genetics to understand the diverse ways that patterns of caribou variation are recognized, organized and interpreted in the Sahtú Region, NT.

Key Findings

- Genetic analysis of material from caribou fecal pellets provided evidence for caribou population differentiation that corresponds to the caribou types recognized by Dene people: Tǫdzı “Boreal Woodland caribou”, ʔekwę́ “Barren-ground”, and shúhta ʔepę́ “Mountain” caribou.
- These results strengthen the ability of managers to make decisions about distinctions between caribou types and insights into the evolutionary histories that contribute to the various forms.
- Indigenous languages provide an obvious place to ground research processes and build collaborations. Dene language can be used to strengthen people’s relationship with local ecosystems, create appropriate and unifying dialogue, and is an obvious place to build collaborations.

How does this project help in understanding cumulative impacts?

The results of this research project establish the degree of genetic differentiation of caribou populations in the Sahtú region. The baseline caribou genetic data on, for example, stress hormones, has the potential to be used to monitor the impacts of localized industrial projects. It is the first step towards delineating caribou population boundaries, which are required for accurate trend analysis.

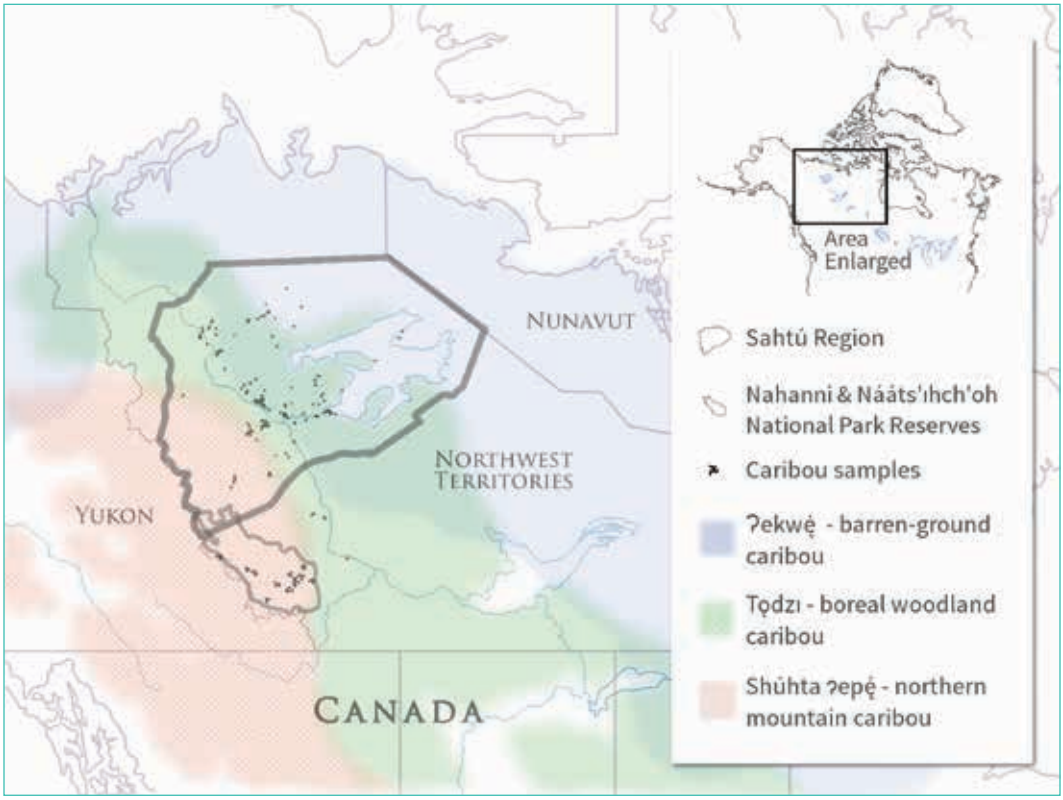

Figure 7: The Sahtú region of the NWT includes the overlapping ranges of three types of caribou: Tǫdzı (Boreal Woodland caribou), ʔekwę (Barren-ground caribou) and shúhta ʔepę (Northern Mountain caribou). Small black dots represent locations of caribou fecal, tissue and blood strip samples collected.

Dion Lennie, of Tulita, collects caribou fecal pellets in the Sahtú region. Caribou scat samples provide non-invasive genetic information that is used to analyze the connectivity and relationships between different caribou populations in the region. The research is dependent on the voluntary collection of scat samples by local hunters and trappers. Photo: J. Polfus.

CIMP40

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Boreal caribou monitoring in the Dehcho Region

Purpose

This project was initiated in response to requests from local First Nations who wanted to know more about the elusive Boreal caribou prior to proposed increases in industrial development. Long-term monitoring of population demography and dynamics over time is critical for addressing the national recovery strategy for Boreal caribou. Monitoring included calf production and survival, calving timing and fidelity, adult female survival, use of space, and animal health.

Key Findings

- Female boreal caribou can live to 17 years of age and can produce a calf at 16 years of age.
- Spring pregnancy is ≥92%; some females have successfully produced and reared calves in four consecutive years.
- Median home range size of adult female Boreal caribou is ca. 2,900 km^2.
- Remarkable individual consistency in calving dates, with the median calving date about two days later for animals residing north of the Mackenzie River versus those residing south of the Mackenzie River.
- There have been years of higher than average adult female survival and calf recruitment; however, the estimated population rate of increase over a 10-year period shows a slight decline.

Boreal caribou.

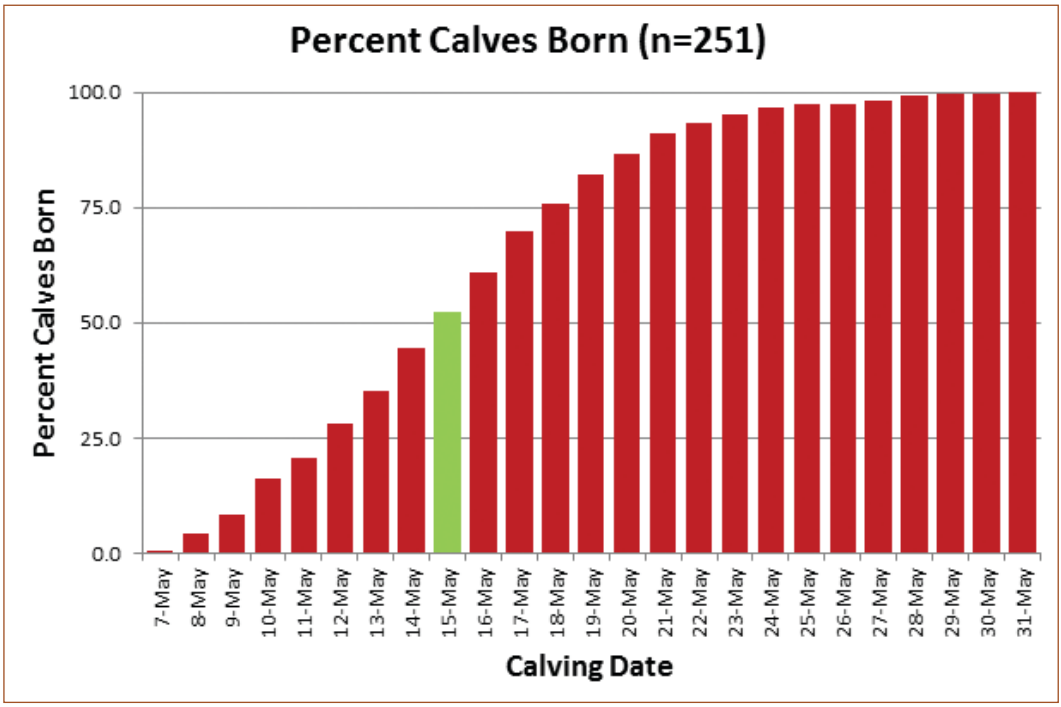

Figure 8: Shows the percentage of calves born on dates 7-31 May from years 2004-2014. A total of 251 calves were included in the analysis. The green bar represents the median date (or when 50% of the calves have been born).

How does this project help in understanding cumulative impacts?

Collection of time series data establishes baseline data and Boreal caribou population demographic rates that may then be associated with cumulative effects of landscape change and other variables.

CIMP50

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Spatial distribution of wolves on Bathurst caribou summer range

Purpose

The purpose of this study is to:
1) evaluate wolf den monitoring and pup survey for trend analysis;
2) investigate changes in spatial distribution of wolf den sites and pup survival; and
3) investigate wolf pup survival in response to the changing distribution and abundance of Barren-ground caribou.

Key Findings

- Wolf-caribou dynamics on the summer range of the Bathurst caribou herd were investigated. Caribou experienced a >90% decline in abundance over the study period (1996-2014).
- Movements of GPS-collared adult female tundra wolves were monitored, representing individual packs throughout the 2013-2014 denning periods. Using long-term data sets (1996-2012), behavioural and population responses of wolves to changes in abundance and range use patterns of caribou were investigated.
- Tundra wolves selected den sites in close proximity to the early- and late-summer seasonal ranges of the Bathurst caribou herd. These areas represent reliable concentrations of caribou over the greatest portion of the denning period, a time when wolves are restricted to den sites caring for new born pups.
- As the caribou numbers declined, the summer ranges of the Bathurst herd contracted north towards their calving ground and caribou remained farther from the summer territories of wolves for relatively longer portions of the denning period. Wolves did not respond behaviourally by denning closer to the retreating caribou.
- These changes in caribou distribution correlated with increases in den abandonment and lower pup recruitment, eventually leading to a decrease in wolf density. When caribou abundance was low, annual mean wolf pup recruitment was <2 pups/pack, suggesting that young-of-the-year were not replacing adult wolves in the population. It was estimated that wolf numbers declined by almost 50% over the study period (1996-2014) and that, currently, wolf density is estimated <4 wolves/1000 km2. These findings are consistent with other studies that report prey biomass as a key driver of wolf population dynamics.
- Movements of collared wolves suggested a complex migration/dispersal pattern that can extend beyond one caribou herd.

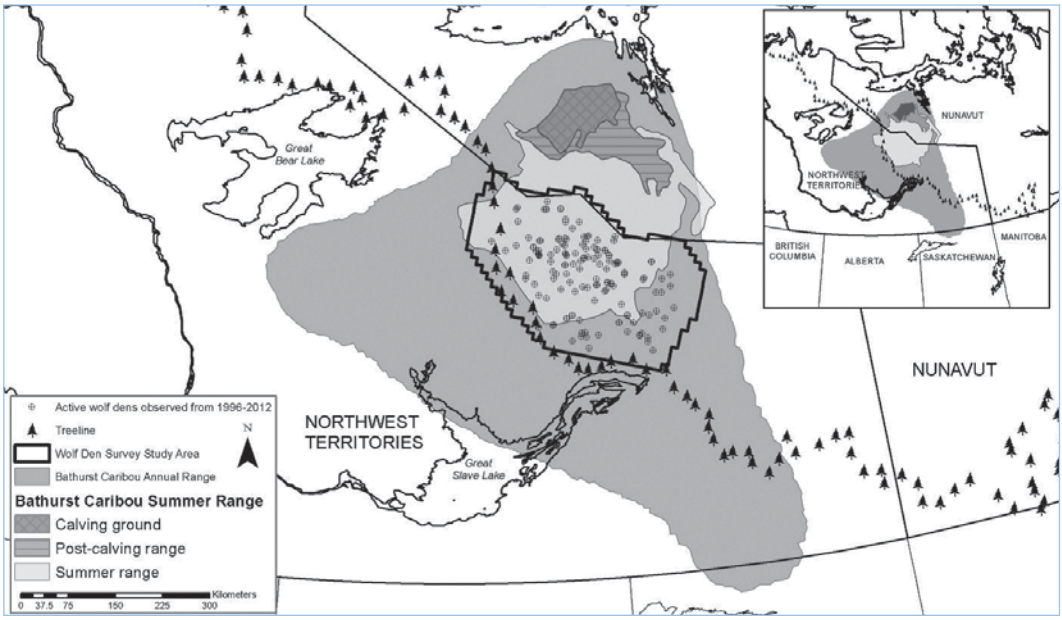

Figure 9: Study area for wolf den surveys on the summer range of the Bathurst caribou herd in the Northwest Territories, Canada. Active wolf dens (n = 303) were recorded during aerial surveys conducted in late May and early June 1996-2012. The annual home range (calving, summer and winter range) of the Bathurst herd is approximately 350,000 km^2. Range boundaries were delineated from locations of satellite- and GPS-collared caribou.

Adult wolf in the Lac de Gras area. Photo: M. Klaczek.

How does this project help in understanding cumulative impacts?

This study helps determine if current trend monitoring for wolves is an accurate reflection of how wolves are responding to changing caribou densities. Understanding the numerical response of wolves to changes in Bathurst caribou abundance and distribution is the first step in understanding the role of wolves in the population dynamics of migratory caribou. Overall, this information could contribute to an adaptive management plan for caribou recovery.

CIMP94

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Tłı̨chǫ Ekwo Nàowo: Traditional knowledge-based monitoring of the Bathurst caribou herd

Purpose

The objectives of this traditional knowledge monitoring project derive from Tłı̨chǫ elders' and harvesters' desire to communicate their knowledge of the Bathurst caribou and their habitat, and the numerous changes observed in the caribou. The project advances traditional knowledge research by applying a combination of storytelling, photo documentation and GIS mapping to acquire a detailed understanding of the cumulative impacts from natural and anthropogenic factors on the Bathurst caribou and their habitat over multiple years.

Key Findings

- A significant change in caribou migration routes, avoiding the mining operations surrounding Ekat'i (Lac de Gras).
- Numerous abnormal observations of caribou physiology and health.
- Tłı̨chǫ harvesters identified changes in caribou health, behaviour and migration routes as due to: (1) mining operations and development on caribou habitat; (2) former outfitting operations; and (3) improper human behaviour towards caribou.

Interview in Wek'weètì with Jimmy Kodzin and Rita Wetrade. Photo: P. Jacobsen.

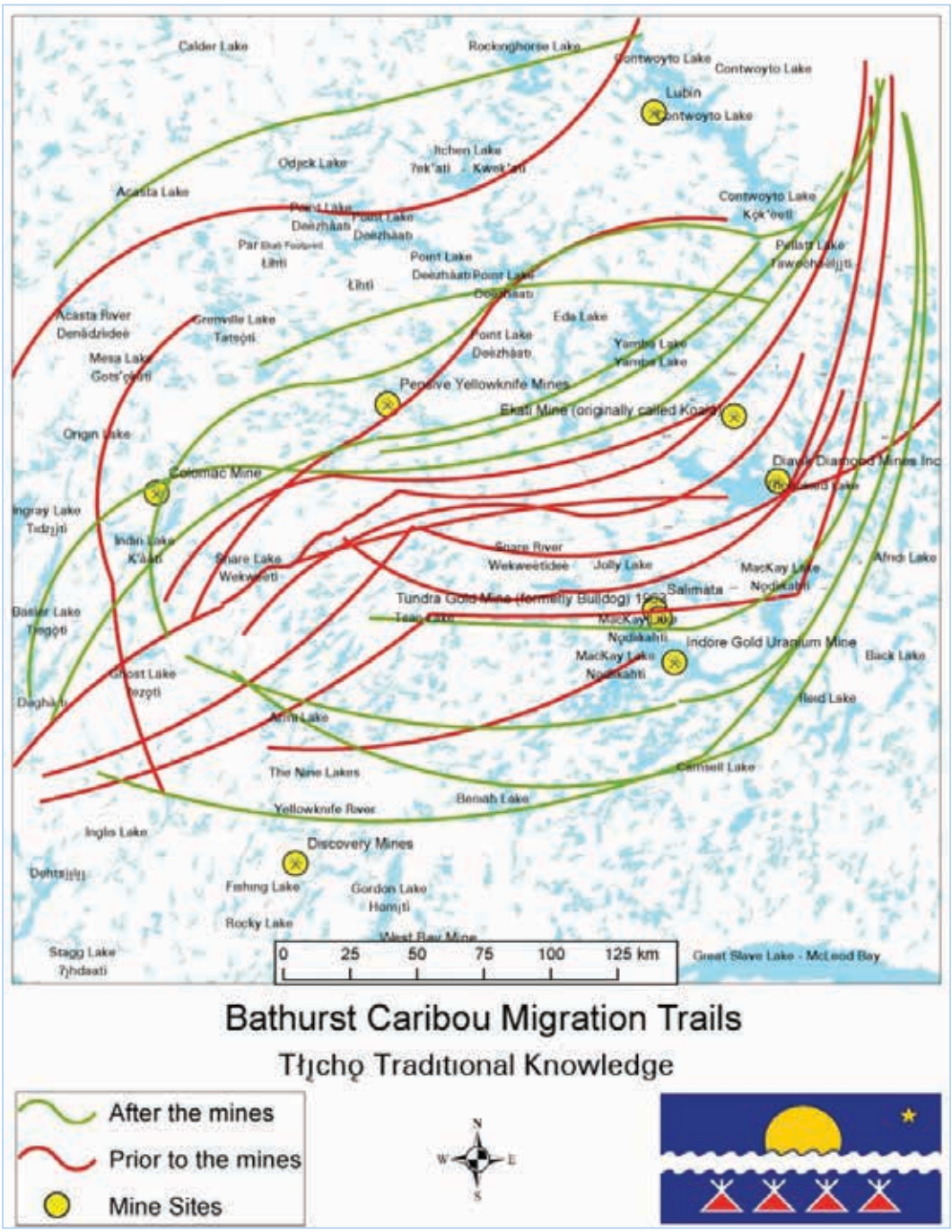

Figure 10: Map of Bathurst caribou migration trails based on Tłı̨chǫ traditional knowledge.

How does this project help in understanding cumulative impacts?

By sharing traditional knowledge about the condition of Bathurst caribou, this project documented changes in caribou herd health and migration routes. It has also demonstrated the importance of community- and traditional knowledge-based monitoring of the land to local Aboriginal people, and to wider regional and international audiences.

CIMP133

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Snowpack accumulation: Influence on caribou distribution, surface water chemistry and lake productivity

Purpose

To characterize the spatial and temporal variability of the snowpack in the winter range of the Bathurst caribou and determine if changes are related to climate change. Changes in the snowpack can impact caribou as they expend extra energy to dig through snow to access their main winter food source, lichen. Snowpack changes may also increase the predation efficiency of wolves. Therefore, a second objective of this study was to relate changes in the snowpack to changes in the distribution of the Bathurst herd. The snowpack was measured using an estimate of snow water equivalent (SWE) from satellite data, verified by field measurements near Wek'weètì.

Key Findings

- The winter range of the Bathurst caribou herd was compared between 1996 to 2005 (when herd numbers dropped from ~350,000 to ~150,000) and 2006 to 2014 (herd dropped from ~110,000 to ~15,000). From 1996 to 2005 the winter foraging range was located well inside the boreal forest; between 2006 and 2014 the herd shifted north, centred near treeline and into the lower tundra. In a meeting in 2014, trappers from Wek'weètì remarked that during the preceding 10 years there had been notable increases in ice lenses in the snowpack.
- The relationship between SWE and the location of collared caribou was quantified over the period of record. Between 1996 and 2005, when Bathurst herd numbers were still relatively high, there is no clear relationship between SWE and the location of collared caribou. However, between 2006 and 2014, when the caribou shifted to the treeline and tundra, they tended to spend more of the winter in areas of higher SWE.

Caribou of the Bathurst herd south of Wek'weètì, NT, April 2014. Photo: Michael English.

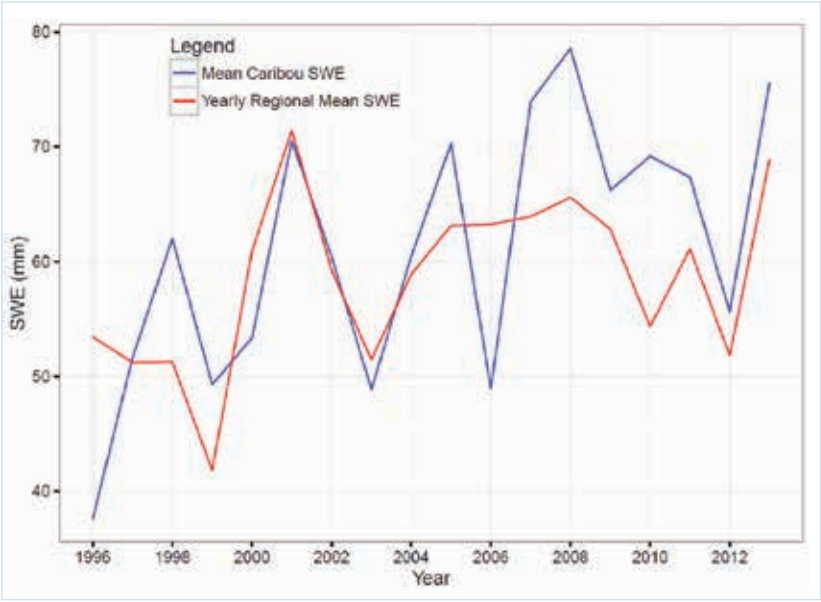

Figure 11: Annual mean SWE values for Bathurst caribou winter range (yearly regional mean) as well as annual mean caribou SWE. Caribou SWE was calculated by extracting SWE values from collared caribou locations and the corresponding daily SWE raster. The purpose of this extraction was to determine the average SWE on which caribou were located annually and to compare these values with the yearly regional mean SWE. This method of analysis effectively depicts annual average SWE values, along with annual caribou SWE, and determined years in which the collared caribou were located in higher than average SWE.

How does this project help in understanding cumulative impacts?

Using and coupling satellite data, weather data, collared caribou data and first-hand knowledge from hunters has helped increase understanding of changes to the annual snowpack and their relation to the winter ecology and survival of Bathurst caribou. This knowledge can contribute to a broader understanding of potential drivers influencing caribou populations.

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Tłı̨chǫ community-based monitoring of the Bathurst and Bluenose East caribou

Purpose

This project was intended to build capacity, and to train and educate hunters and students about how to monitor cumulative impacts on the Bathurst and Bluenose East caribou. A robust sampling methodology of key herd-health indicators for use by community members was developed.

Key Findings

- Bluenose East caribou sampled as part of this program tended to be in generally good body condition.
- Cows were in better condition than bulls, which is expected for the winter months when the samples were taken.
- Measures of body condition (kidney fat, back fat and bone marrow fat stores) increased in 2013 and 2014 compared to 2012.
- Pregnant cows tended to be in better body condition than non-pregnant animals.
- Development of the *Field Guide for Caribou Sample Collection* is a useful resource for future community-based monitoring.

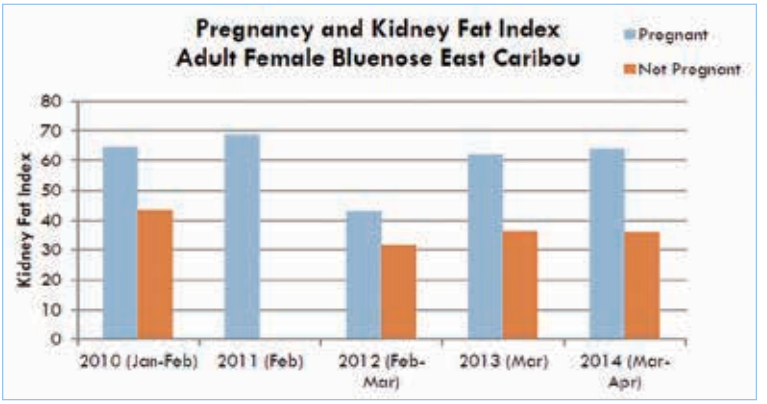

Figure 12: Pregnancy and kidney fat index in female Bluenose East caribou.

Elder Joe Zoe from Gamèti holding fat that lines the stomach. Photo: K. Garner.

Collection of samples. Photo: K. Garner.

How does this project help in understanding cumulative impacts?

This community-based monitoring program provides a way to establish baseline levels and track changes in a number of important indices of individual caribou and herd health. Body condition and pregnancy status can be influenced by a range of different biological, environmental and climactic factors. These caribou health and condition indicators can contribute to efforts to track and understand caribou productivity, survival and population trends, and possible underlying reasons for changes in birth and death rates of the caribou herd.

CIMP153

Years funded: 2

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CircumArctic Rangifer Monitoring and Assessment Network (CARMA) Knowledge to action: Developing and testing thresholds and monitoring for cumulative impacts on caribou

Purpose

This project used modeling tools to examine the vulnerability of and risks to caribou, with special emphasis on the Bathurst caribou herd. Herd-specific baseline data was developed to assess impacts of natural variability, including climate and projected climate change on migratory tundra caribou herds. As well, caribou-relevant climate indicators were developed, assessed and used to describe the effectiveness of monitoring and the range of natural variability of a herd's size.

Key Findings

- An integrated model for assessing cumulative effects and possible management approaches for caribou was developed.
- Initial modeling results emphasized the importance of establishing causality by selecting suitable indicators for the Zone of Influence of development projects as the size of the Zone of Influence strongly influenced caribou trends in abundance.
- Working with the Bathurst Range Planning Team, evaluated baseline, current, low future and high future development scenarios with respect to movement, encounters within the ZOI, costs with respect to body size and condition of cows and calves, and relative effects at the population level, scenarios were further evaluated with respect to climate variability and harvest policy at various starting population sizes and mortality levels.

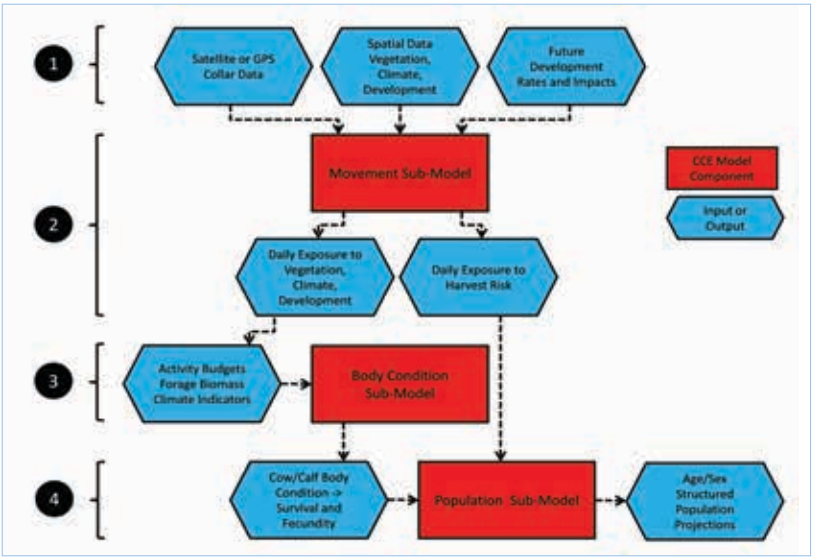

Figure 13: The Caribou Cumulative Effects (CCE) model framework has sub-model components in red squares and sub-model inputs/outputs in blue hexagons.

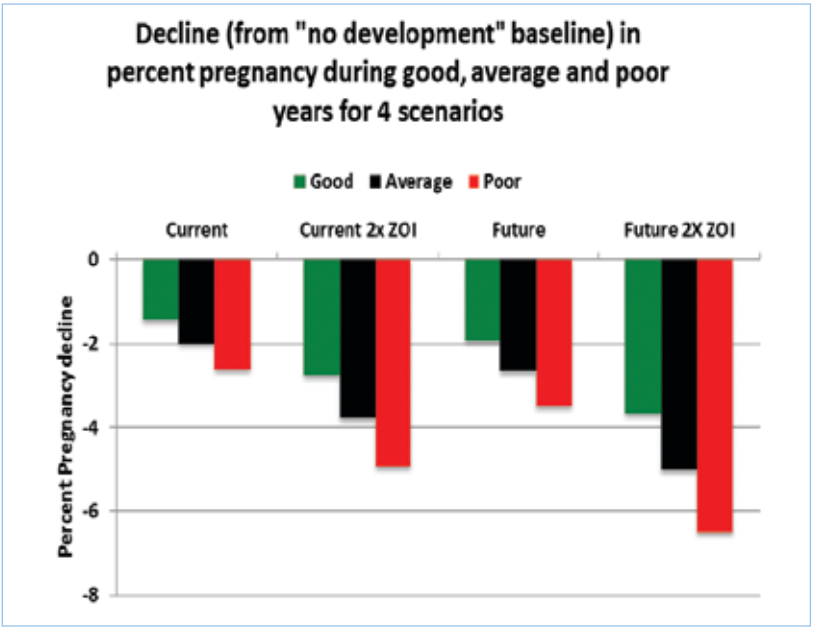

Figure 14: Model results for percent decline in pregnancy for four (4) development scenarios under variable environmental conditions.

How does this project help in understanding cumulative impacts?

This model integrates caribou movements across the landscape with development. The model scales up from the energy and protein costs of environmental variation and human activities to how they affect productivity (pregnancy and calf survival) and population size. This allows researchers to assess vulnerability of the Bathurst herd and the risks it faces as the landscape changes. Further, it provides the tool to assess the effectiveness of mitigation measures and management actions.

CIMP141

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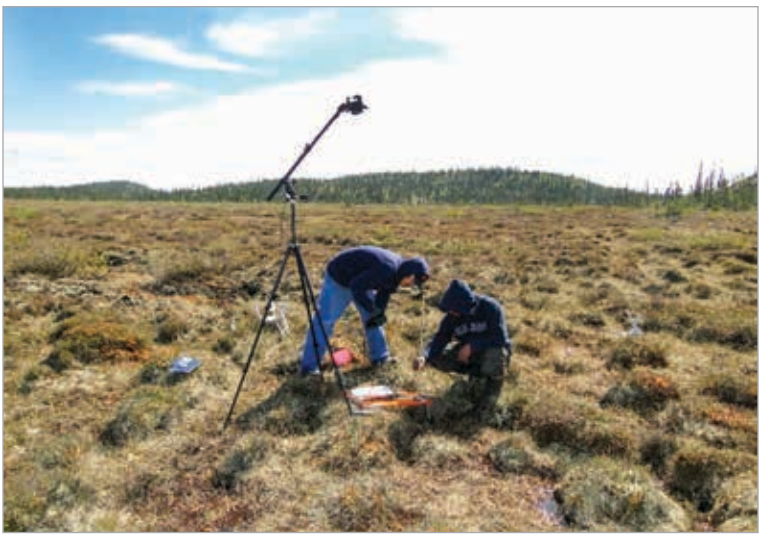
Baseline monitoring of Arctic vegetation and snow changes over the Bathurst caribou habitat using satellite remote sensing and community-based field observations

Purpose

The purpose of this project was to examine Bathurst caribou habitat, especially forage availability and quality in the summer range, using remote sensing and community-based vegetation monitoring data to assess the impacts of these habitat indicators on caribou productivity – for example, calf:cow ratios and survival rates.

Key Findings

- The integration of satellite remote sensing and community-based vegetation monitoring represent one of the most cost-effective approaches for monitoring caribou habitat
- Early summer and late fall were two of the most important periods in terms of habitat impacts on Bathurst caribou from 1985 to 2012, with poor summer range forage conditions contributing to the low late winter calf:cow ratios.



Roy Judas (right) and Brian Kodzin (left) of Wek'weètì, NT, conducting community-based vegetation monitoring in 2013. Photo: W. Chen.

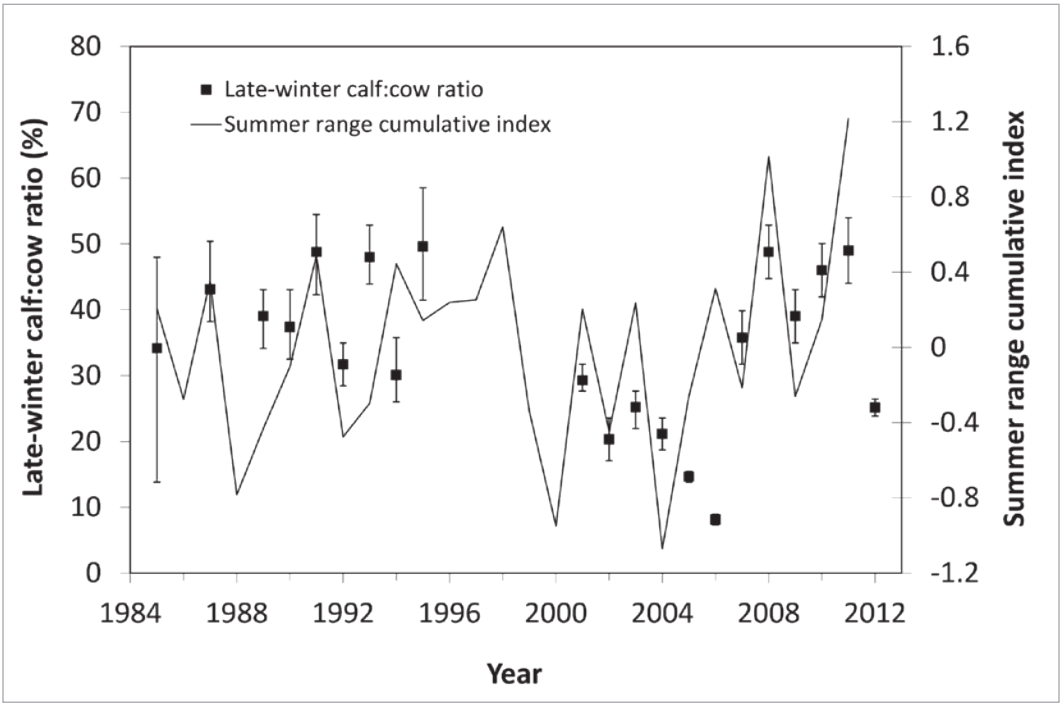


Figure 15: Inter-annual variations in the late-winter calf:cow ratio and the summer range cumulative index from 1985-2012.

How does this project help in understanding cumulative impacts?

As changes in summer range conditions precede the caribou net productivity – that is, late-winter calf:cow ratio – by two years and even longer for that of caribou abundance, timely annual monitoring of these variables could help to anticipate likely population trends in the herd.

CIMP146

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Succession and regeneration response on seismic lines with respect to ecology, disturbance factors and time

Purpose

The main objective of this project was to improve the understanding of vegetation succession and regeneration on seismic lines with respect to ecology, disturbance factors and time. A secondary objective was to assess the extent of disturbance that adversely affects Boreal caribou. The long-term goal of the project has been to assess the ability to calculate and project impacts of landscape disturbances over time, and to estimate when lines can be removed from disturbance maps.

Key Findings

- Preliminary analysis resulted in 15 vegetation community groups being recognized along the recovering seismic lines. A more in-depth analysis is ongoing.
- Time since linear disturbance had greatest effect on vegetation similarity, but it had little effect on depth to permafrost and vegetation cover for lichens, mosses, graminoid (grass) and deciduous shrubs.
- Seismic lines underlain by shallow permafrost demonstrated slow recovery processes, mostly due to increased graminoid cover.
- Only 40% of studied seismic lines have regrown their initial vegetation cover or have the potential for recovery in the future.
- Of the seismic lines that did recover, it took at least 20 years for the five most common species to re-establish.
- A set of standardized monitoring protocols were developed to use in future seismic regeneration work.

One of the studied seismic lines in the Sahtú region with early signs of recovery, classified to the Ledum Community Type. Seismic lines in this community can recover effectively if the peaty soils are not disturbed and the surrounding forest is on the same successional trajectory as the line. Photo: Polster Environmental Services Ltd.

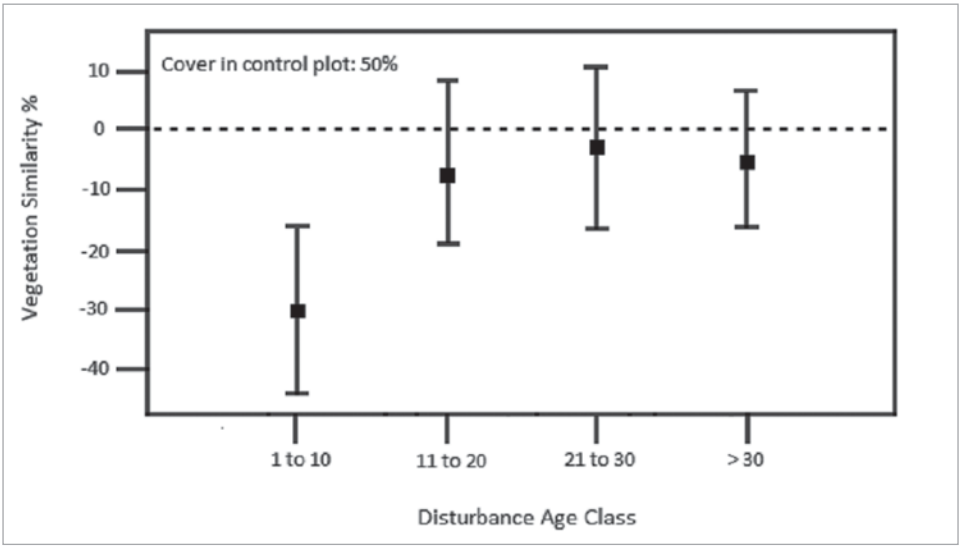

Figure 16: Relationship between Vegetation Similarity Index and disturbance age class for a forested site with 50% cover of common species in the control plot. Points indicate average values for each age class and error bard indicate the 95% confidence intervals. (Source: EDI Environmental Dynamics Inc.)

How does this project help in understanding cumulative impacts?

This project will increase our knowledge on vegetation regeneration rates and patterns for various types of disturbances across different habitat types and environmental conditions in the NWT.

CIMP163B

Years funded: 1

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Bathurst caribou seasonal range analysis

Purpose

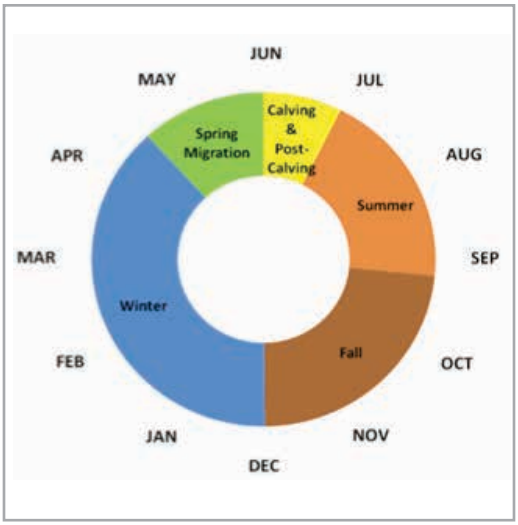
This project analyzed caribou satellite and GPS location data from 1996 to 2014 to develop seasonal and annual ranges for the Bathurst caribou herd. These ranges are being used to inform the development of the Bathurst Caribou Range Plan by indicating range use during five seasons (spring migration, calving/post calving, summer, fall and winter), areas more heavily used in those seasonal ranges (core range) and how range use has changed from 1996 to 2014.

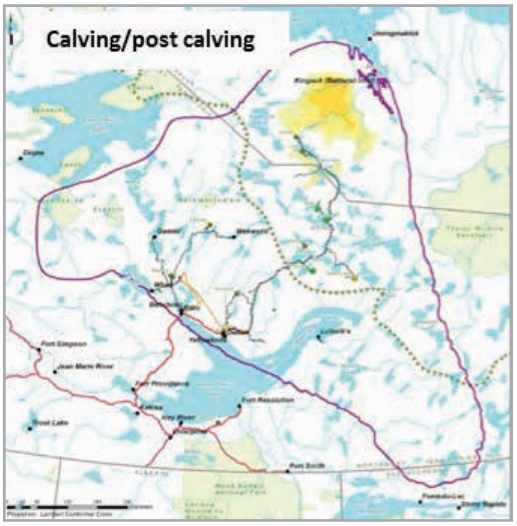
Key Findings

- Ranges and core ranges have been identified for each of five caribou relevant seasons and the overall annual distribution of the Bathurst caribou herd.
- The winter range and the overall annual range for the Bathurst herd contracted from 1996 to 2014.

How does this project help in understanding cumulative impacts?

Identifying core seasonal and annual ranges helps us understand caribou use of space through time and forms a base from which to compare future changes. These ranges can also direct management approaches to those areas that might be considered more important – that is, core – parts of the range. Lastly, seeing how range use changes through time allows for further investigation into factors that might be correlated with range use such as fire and other natural disturbances, human and industrial developments, and caribou population size.





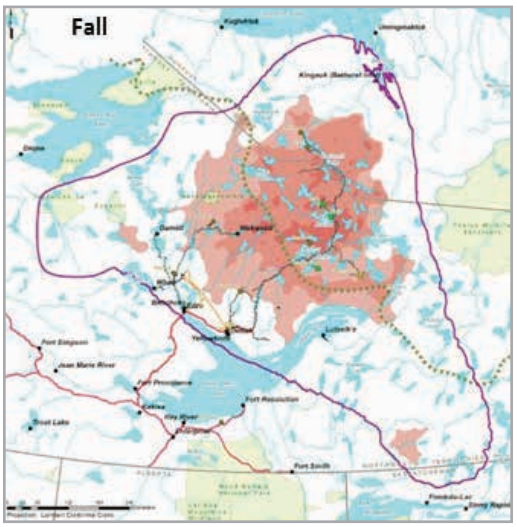


Figure 17: Seasonal and core ranges of the Bathurst caribou herd derived from satellite and GPS location data collected from 1996 to 2014. Ranges are 99% utilization distributions – that is, 99% of locations fall within shaded area – while core ranges are 95% utilization distributions.

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