Government of
Northwest Territories

NWT Cumulative Impact Monitoring Program

2017/18 PROJECT RESULTS

Five NWT CIMP-funded caribou monitoring projects were completed in 2017/18. Detailed project results can be found by searching for the CIMP number on the NWT Discovery Portal (nwtdiscoveryportal.enr.gov.nt.ca).

SATELLITE MONITORING FOR ASSESSING RESOURCE DEVELOPMENT'S IMPACT ON BATHURST CARIBOU (SMART) (CIMP141)

Wenjun Chen, Canada Centre for Remote Sensing, Natural Resources Canada (wenjun.chen@Canada.ca)

The objective of this project was to understand the reason for the observed zone of disturbance to caribou around diamond mining activities in the Slave Geological Province. Researchers measured factors that could affect caribou senses, including the taste of forage, sight of mining activities and hearing of noise. Using remote sensing, changes in habitat condition in relation to the peak calving date of Bathurst caribou were also examined.

Results showed that the 'zone of road dust disturbance' and the affected caribou forage was about one kilometre from a busy mine haul road.

The 'zone of visual disturbance' was less than five kilometers from vehicles on a road, mining camp buildings and waste rock piles. Researchers could not determine the 'zone of disturbance' of noise and particulate matter because of high variability in the source of noises and particulate matter generated.

Remote sensing indicated the peak calving date was impacted by changes in habitat conditions. A delay of the start date of plant growing season in the previous year could result in a significant delay in the peak calving date in the current year.

USING TRADITIONAL KNOWLEDGE OF JEAN MARIE RIVER FIRST NATION ELDERS TO BETTER UNDERSTAND CHANGES IN THE BOREAL CARIBOU HABITAT (CIMP189)

Margaret Ireland, Jean Marie River First Nation (rmc@jmrfn.com)

This project documented the cumulative impact of permafrost thaw and wildland fire on boreal caribou habitat. Areas of boreal caribou habitat were identified using traditional knowledge, information from one-on-one interviews and scientific information gathered from existing datasets.

Project results showed the quality of boreal caribou habitat has decreased in 35 per cent of the boreal caribou areas identified within the study area, remained stable in 64 per cent of the boreal caribou areas, and increased in one per cent in the boreal caribou areas. Evaluation of the impact of wildland fire and permafrost degradation showed that the latter has a particularly high impact on boreal caribou habitat, with 88 per cent of boreal caribou areas affected. Wildland fire also had a significant impact, with 29 per cent of boreal caribou areas affected. Interview participants found that the current state of the boreal caribou habitat in the Jean Marie River area is of 'medium' quality, and continues to change.

Margaret Ireland (JMRFN) and Cyrielle Laurent (Yukon Research Centre) conduct a traditional knowledge interview with Billy Norwegian (JMRFN). (Credit: Yukon Research Centre)

ACHO DENE KOE FIRST NATION BOREAL CARIBOU TRADITION KNOWLEDGE AND CUMULATIVE IMPACTS QUALITATIVE ASSESSMENT (CIMP190)

Acho Dene Koe First Nation (867-770-4146)

The purpose of this project was to examine natural and human-induced impacts to boreal caribou within Acho Dene Koe First Nation (ADKFN) traditional territory. Impacts were observed for a number of ecological components, including habitat, migration routes, calving areas, food sources and water sources, and aspects of ADKFN culture, including hunting, transportation routes, habitation and gathering areas, and historic and named places.

Projects results found that although some herds of healthy caribou exist within ADKFN territory, boreal caribou face a range of disturbance threats from natural and human sources, including human development, contaminated sites, wildland fires and vegetation clearing. Geospatial analysis found that approximately 47 per cent of the study area is impacted by direct and indirect disturbance. Linear disturbance such as roads, pipelines and seismic lines pose a particularly significant risk as they allow predators easy access to caribou habitat. Threats to boreal caribou may in turn impact traditional cultural practices and values surrounding the caribou.

WHEN DO CARIBOU RETURN? IMPACTS OF WILDFIRES ON TǪDZI (CIMP169)

Jody Pellissey, Wek'èezhìı Renewable Resources Board (jpellissey@wrrb.ca)

This project documented Tłı̨chǫ knowledge about tǫdzı, or boreal caribou – in particular, the relationship between range use (preferred landscape and habitat) and wildland fire.

According to Elders, when forest fire destroys certain habitat that tǫdzı need for winter foraging or for cover from predators, tǫdzı move to a different area of their range. Usually, it takes 20 to 30 years for forage lichen to recover after a fire. However, tǫdzı may still use impacted areas as routes to other habitats if the forage has recovered sufficiently.

Elders found that tǫdzı have less range than they did in the early 1990s due to the annual occurrence of large, intense wildland fires. They also found that tǫdzı return to burned areas in summer, years before the habitat is sufficient for winter use.

BARREN-GROUND CARIBOU TRADITIONAL KNOWLEDGE MAPPING AND ANALYSIS (CIMP171)

Johanne Black, Yellowknives Dene First Nation (jblack@ykdene.com)

The purpose of this project was to use Yellowknives Dene First Nation (YKDFN) traditional knowledge to develop monitoring indicators to track and assess cumulative impacts on caribou.

Traditional knowledge was collected both by conducting interviews and by digitizing the YKDFN archive of barren-ground caribou traditional knowledge. Analysis of collected traditional knowledge revealed insights into historical changes over time and into potentially sensitive geographic areas. The project identified a set of traditional knowledge indicators for caribou, which include changes in patterns in migration, herd composition and health as well as abiotic, biotic and human interactions.

The digitized traditional knowledge is online for use at the community's discretion. YKDFN has released some of the information for public viewing through a public portal: http://ykdfn.trailmarkapp.com.

Two NWT CIMP-funded water monitoring projects were completed in 2017/18. Detailed project results can be found by searching for the CIMP number on the NWT Discovery Portal (nwtdiscoveryportal.enr.gov.nt.ca).

ESTABLISHING A WATERSHED FRAMEWORK FOR ASSESSING CUMULATIVE IMPACTS OF DEVELOPMENT (CIMP152)

Krista Chin, GNWT – Environment and Natural Resources (krista_chin@gov.nt.ca)

The goal of this project was to develop a framework for assessing the impacts of natural and anthropogenic disturbances on the health of aquatic systems in areas of potential oil and gas development in the Sahtú Region. Baseline monitoring included examining stream sediments, invertebrates and sediment cores, and measuring landscape disturbances.

Sediment cores collected from six lakes provided historical context and baseline information. Stream sediment and invertebrate samples showed varying concentrations of metals, demonstrating a broad range of natural variability. Measuring and characterizing the amount of disturbance currently on the landscape is still ongoing using remotely sensed imagery.

Local community monitors-in-training learning aquatic data collection methods.

THE INFLUENCE OF FOREST FIRES ON METAL DEPOSITION TO LAKES AND PEATLANDS IN THE NORTH SLAVE REGION, NWT (CIMP177)

John Chételat, Environment and Climate Change Canada (john.chetelat@canada.ca)

Wildland fire can introduce a significant source of metals into aquatic habitats through residual ash and fine particles, which can travel long distances through the air. This project looked at the impact of wildland fire on metal accumulation in lakes and peatlands in the North Slave Region.

Project results show that concentrations of metals in water and sediment of the study lakes were below or near Canadian Council of Ministers of the Environment guidelines for the protection of aquatic life. Measurements in water and sediment from study lakes in close proximity to recent wildland fires did not show evidence of recent major increases in metal concentrations. A large dataset was generated during the project and data analysis is ongoing to further evaluate metal accumulation in lakes and peatlands in relation to wildland fire events.

A peat core sample taken from a study site in the North Slave Region in 2016.

Three NWT CIMP-funded fish monitoring projects were completed in 2017/18. Detailed project results can be found by searching by CIMP number on the NWT Discovery Portal (nwtdiscoveryportal.enr.gov.nt.ca).

AN INVESTIGATION OF VARIABLE FISH MERCURY CONCENTRATIONS IN THE DEHCHO LAKES (CIMP154)

Heidi Swanson, University of Waterloo (hswanson@uwaterloo.ca)
George Low, Dehcho AAROM (geobarbgeo@hotmail.com)

This was the second phase of a five-year project. The objective was to investigate why fish mercury concentrations are lower on the Horn Plateau (Willow, Big Island) than in Mackenzie Lowland lakes (Ekali, Sanguez) of the Dehcho Region. Fish, invertebrates, water and sediment were collected from each of the four lakes.

Differences in the types of invertebrates and in the concentrations of mercury in those invertebrates appear to explain some of the differences in fish mercury. Differences in catchment biology, geology and chemistry also appear to affect the type and amounts of mercury delivered to catchment and lowland lakes.

Clockwise from top left: Elsie Lacorne, Shelley Lundvall, Heidi Swanson, Steven Nadlii, Joe Lacorne and Brian Branfireun. (Credit: H. Swanson)

INUVIALUIT MONITORING AND MANAGEMENT OF THE BIG FISH RIVER (CIMP183)

Kristin Hynes, Fisheries Joint Management Committee (kristin.hynes@gmail.com)

This project focused on addressing priorities of the Aklavik Hunters and Trappers Committee about the management and monitoring of Big Fish River Dolly Varden char. Elders and youth participated in a harvest monitoring program to build capacity, and develop traditional and local knowledge indicators for co-management decision-making.

The indicators focused on char health and condition such as general condition, presence of scarring and presence of parasites. Decision thresholds were developed for each indicator that categorized current status. The development of these indicators resulted in a more balanced approached to decision-making, equally incorporating both scientific data and Inuvialuit knowledge.

GENETIC STOCK IDENTIFICATION AND MIXED-STOCK FISHERY ANALYSIS OF INCONNU IN GREAT SLAVE LAKE (CIMP196)

Muhammad Yamin Janjua, Department of Fisheries and Oceans (Muhammad.Janjua@dfo-mpo.gc.ca)

The objective of this project was to establish baseline genetic data for inconnu stocks in Great Slave Lake where inconnu are harvested in subsistence and commercial fisheries. The majority of commercial fisheries occur in Buffalo River inconnu habitat areas.

Genetic samples were taken from Inconnu collected from Buffalo River, Yates River, Slave River, Taltson River and Marian River, to determine discreet, genetically distinct stocks. Inconnu from Marion Lake are genetically different from those from Slave River. Samples from the mouth of the Buffalo River indicate the presence of two or more stocks. This information on Inconnu stock discrimination provides an ability to understand Great Slave Lake commercial catch stock structure and an important basis for future fisheries management decisions. Detailed analyses are in progress.

Four other NWT CIMP-funded monitoring projects examining cumulative impacts were completed in 2017/18. Detailed project results can be found by searching for the CIMP number on the NWT Discovery Portal (nwtdiscoveryportal.enr.gov.nt.ca).

UNDERSTANDING THE REGIONAL VARIABILITY IN SOIL GEOCHEMISTRY IN AN AREA IMPACTED BY LEGACY INDUSTRIAL ACTIVITY (CIMP168)

Heather Jamieson, Queen's University (jamieson@queensu.ca)

Previous studies on water and lake sediment in the Yellowknife area have provided evidence that historic roaster emissions from activities at Giant and Con Mines impacted areas beyond the mine leases. However, little information about the impact on soil had been collected beyond the lease boundaries. The objective of this project was to investigate concentrations of arsenic and other elements in soils around Yellowknife and to identify whether arsenic in soils is from a natural geologic source or from past industrial activities. Over 400 soil samples were collected from undisturbed locations within 30 kilometres of Yellowknife over two years. Sampling targeted four distinct terrain units, including outcrop soils, forest canopy soils, forest canopy outcrop soils and peatland soils.

The results of this study are consistent with previous studies. Arsenic concentrations are highly variable at the local scale, and even between field duplicates. This is likely due to the uneven distribution of arsenic-rich minerals in the soil samples. Distance and direction from former ore roasters, soil depth, elevation and terrain type all influence total arsenic concentration. To date, 87 of the soil samples have been examined for arsenic speciation and 70 of these samples were found to contain arsenic trioxide, indicative of roaster stack emissions. Work on arsenic speciation is ongoing and final results will be reported when available.

LONG-TERM NWT CLIMATE CHANGE PROJECTIONS TO SUPPORT MINE CLOSURE DESIGN (CIMP182)

Brian Sieben, GNWT – Environment and Natural Resources (brian_sieben@gov.nt.ca)

The purpose of this project was to develop long-term climate projections for the NWT, which could be used to provide guidance on mine closure design, including the long-term stability of permafrost for containing mine wastes and tailings.

Global climate model projections of temperature and precipitation were used to create local projections of climate into the year 2100-2300 range at an 18 kilometre land resolution for three levels of atmospheric greenhouse gas concentration. The new climate projections and land cover information were used with a permafrost model to generate possible scenarios of ground temperature. A Climate Scenarios Explorer tool was developed to allow users to view temperature and precipitation at mine sites up to the year 2300. Maps of the temperature and precipitation projections are available to download.

NSMA COMMUNITY-BASED TK MONITORING – MONITORING FOR BETTER DECISION-MAKING (CIMP185)

Shin Shiga, North Slave Métis Alliance (shin.shiga@nsma.net)

Indigenous community researchers and northern regulatory boards struggle in their efforts to incorporate traditional and local knowledge (TK) into resource monitoring and decision-making. This project explored needs and challenges in documenting and applying TK in resource decision-making processes.

Results found that underlying challenges include:

- differing definitions of TK and expectations of use,
- inclusiveness of including TK in the decision-making process,
- combining the different methods and processes used for TK research versus scientific research, and
- principles of ownership, control and access to TK.

The project determined community-based monitoring (CBM) could provide unique opportunities for the gathering and integration of TK through cumulative impact monitoring and management. CBM allows for development of innovative methods for considering TK alongside other science-based knowledge systems, and presents opportunities for overcoming challenges to incorporating TK in decision-making.

THE KA'A'GEE TU ATLAS: COMMUNITY-BASED MONITORING OF LANDSCAPE CHANGE IN KAKISA, NWT (CIMP184)

Melaine Simba, Ka'a'gee Tu First Nation (kaageetu_envcoord@northwestel.net)

The objective of this project was to develop an innovative web map, built from community concerns about the impacts of both climate change and development, on the health of the land. The 'Ka'a'gee Tu Atlas' was constructed for use by the community. Its purpose is to collect data layers from various sources that contain information on traditional land uses, culturally significant places as well as environmental information and development locations.

The Atlas provides a baseline for future monitoring initiatives to record how the land has changed over time. Identified community concerns included water levels and availability, land subsidence and slumping, land use from future and planned development, access to land and harvester safety.

Mapping and sharing stories of important places on the landscape with Elders as part of a youth camp in Kakisa. (Credit: A. Spring)