Government of Northwest Territories

Gwich'in Tribal Council

NWT Cumulative Impact Monitoring Program (NWT CIMP) Results Workshop: Gwich'in and Inuvialuit Regions

January 20 - 21, 2021

NOTE: Protecting our communities and preventing the potential spread of COVID-19 is GNWT's primary concern during this health emergency. Due to a sudden increase of cases in the NWT, this workshop was unfortunately cancelled at the last minute. All scheduled workshop participants received this abstract volume and copies of all presentations.

Abstract Volume

Cover Photograph

Alice and Ernest Vittrekwa sampling fish;
E. Hodgson

Compiled by M. Seabrook

Recommended Citation:
Seabrook, M. (compiler), 2021. NWT CIMP Results Workshop: Abstracts; Northwest Territories Cumulative Impact Monitoring Program, Inuvik, NT. NWT CIMP Abstract Volume 2021

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NWT Cumulative Impact Monitoring Program (NWT CIMP)

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NWT CIMP is a monitoring and research program that is administered by the Government of the Northwest Territories, Department of Environment and Natural Resources. It has an annual budget of approximately $1.5 million and a staff of 6. It produces some of the best, most credible science and traditional knowledge in the territory.

The purpose of the program is to support environmental decision-making by generating baseline, cumulative impact and environmental trend information. As you know, many other agencies share responsibility for environmental monitoring in the NWT. It is NWT CIMP's role to fill information gaps that prevent an understanding of cumulative impacts.

NWT CIMP is part of the Mackenzie Valley co-management system, being an obligation of settled land claims in the Northwest Territories and Part 6 of the Mackenzie Valley Resource Management Act. NWT CIMP operates in the Inuvialuit Settlement Region through a memorandum of understanding with the Inuvialuit Regional Corporation.

The program is advised by a Steering Committee of regional Indigenous governments and organizations. Land and Water Boards and the Review Board provide advice to this committee as observers. ENR and the Steering Committee endorsed the current 5-year Action Plan in 2016 and it is focused on meeting the needs of co-management boards. Collaborative efforts are underway for an updated Action Plan for 2021-2025.

NWT CIMP has three key activity areas related to monitoring and research:

1. The program works with key decision-makers, the Steering Committee and others to determine monitoring priorities;
2. NWT CIMP staff coordinate monitoring, research and analysis. We also provide funding to others to conduct relevant research and monitoring. Approximately 30 projects are funded per year, and about 10 of those are in their final year;
3. NWT CIMP staff communicate results to decision-makers and communities.

The program currently has three priority valued components that were chosen by a broad group of decision-makers in 2011 and reconfirmed by the Steering Committee in the new action plan. These priorities are caribou, water and fish.

The focus of this presentation will be to give participants a better understanding of NWT CIMP information and projects in the Gwich'in and ISR areas, and where to find NWT CIMP information and data.

Stream Bio-monitoring along the Inuvik-Tuktoyaktuk and Upper Dempster Highways

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Climate change poses a risk to biodiversity and aquatic ecosystem health in Arctic freshwaters. In streams along the Dempster and Inuvik-Tuktoyaktuk highways, ecological impacts of road development may be exacerbated by climate change through increased sediment inputs caused by road erosion, permafrost slumping, and changes in hydrology. Unfortunately, there currently exists large gaps in understanding the effects of road development in the Arctic. We have collaborated with environmental monitors throughout Inuvialuit Settlement Region and in the Gwich'in Settlement Area to collect data through a combination of water quality measurements, investigating sensitive bioindicators such as aquatic insects, measuring habitat characteristics, and measuring ecosystem function through organic matter breakdown. Here, we present an overview of our preliminary results aiming to understand the impacts of road development on stream health along the Dempster and Inuvik-Tuktoyaktuk-Highways. Our results underscore the importance of partnerships with monitoring groups in northern communities and programs like the Canadian Aquatic Biomonitoring Network to generate data for specific impact studies in Canada's Arctic.

How will fish in Gwich'in and Inuvialuit lakes respond to climate change?

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Climate change and other stressors have the potential to affect sensitive northern aquatic species, including reducing cold water habitat, and altering habitat quality through eutrophication ("greening") and brownification ("browning"). In addition, warming and road construction may encourage permafrost thaw, which can alter water quality and water quantity. We investigated the drivers of freshwater fish community health in Gwich'in and Inuvialuit lakes of the lower

Mackenzie River basin, one of the most rapidly warming regions of North America. To do this, we collected ecological data including lake morphometry, water quality, and fish community data from fifty lakes and derived several indicators of aquatic health including fish species richness, relative abundance, and the occurrence of three culturally important fish species. We found that water quality and lake size were important drivers of fish community health whereas relationships with temperature were negligible. Dissolved organic carbon (an indicator for lake browning) emerged as a particularly important driver of fish community structure, and fish community health steeply declined above a threshold point of 17 – 18 mg/L. We suggest potential mechanisms for these declines including light inhibition during summer and a reduced capacity for overwintering in smaller and murkier lakes that may experience faster oxygen depletion rates.

Using a more expansive regional water quality database of 203 lakes, we observed potential supporting evidence for the effects of warming and new road development on increased lake browning (increases in dissolved organic carbon) and eutrophication (increases in total phosphorus concentrations), with possible consequences for declining fish habitat in this region. Together, these results highlight the potential vulnerability of fishes that rely on the numerous small and shallow lakes that dominate rapidly warming permafrost landscape.

Boreal caribou habitat selection analysis and mapping to support range planning in the NWT

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This project aimed to better understand how land-cover type, fire and human habitat disturbance influence seasonal habitat selection patterns of boreal caribou in the NWT, and to generate predictive habitat selection maps to support boreal caribou range planning. Location data collected from >300 adult female boreal caribou collared between May 2002 and March 2018 were used in Resource Selection Function (RSF) models to assess habitat selection during 7 seasonal activity periods and on a year-round basis. Caribou generally showed higher selection for younger burns (<10 years old) and older burns (>30 years old) and avoided middle-aged burns (11–30 years old). Selection for burns by caribou in the NWT appeared to be strongest

during the snow-free seasons, followed by increasing avoidance of burns less than 40 years old from early to late-winter. Caribou generally selected areas further away from major roads and other disturbances such as well pads and cutblocks, but occurred closer to settlements than expected. Caribou avoided areas with high densities of seismic lines during the snow-free season, but the opposite trend was observed during mid- to late winter. The habitat selection models and maps from this project are now being used in range planning, fire management, environmental assessments, and to forecast future landscape suitability for boreal caribou under climate change.

Community-based fisheries monitoring in the lower Mackenzie River watershed

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Rapid environmental change in the Arctic raises numerous concerns for ecosystems, natural resources, and human ways of life. Robust monitoring is essential to adaptation and management in the face of these challenges, and community-based monitoring (CBM) programs offer a strong approach for monitoring wildlife species by highlighting local knowledge and resources, ensuring that questions are locally-important, and informing natural resources conservation and management. This presentation describes a CBM program in the Gwich'in Settlement Area (GSA), focused on łuk digaii (broad whitefish; *Coregonus nasus*). This species a key subsistence fish for Gwich'in people throughout the rapidly-warming Mackenzie River Delta, and continued access to fishing practices is important to food security for communities in this region. However, it is uncertain how watershed changes affect łuk digaii abundance, timing, and migration patterns, all of which have consequences for subsistence harvest. A collaboration between Gwich'in resource boards, Gwich'in community members, and researchers, our program identifies fish life history characteristics that represent vulnerabilities to climate change, and creates a dataset that can measure changes in fish population attributes over time. Results to date show a high degree of migration diversity among łuk digaii in this watershed, which indicates a reliance on multiple changing habitats but may also confer resilience to the population and human fishing practices

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Mapping permafrost thaw across the Northwest Territories

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Permafrost thaw is the main cause of climate-driven landscape change in the north and has a major effect on ecosystems and infrastructure. Understanding the distribution of thaw-sensitive terrain is critical to predicting the future state of the environment and water resources of the Northwest Territories (NWT), and for planning community and infrastructure adaptation. Currently, no observationally-based maps describing the distribution of landforms indicative of sensitive terrain cover the entire NWT. The NWT Thermokarst Collective Project was initiated in 2019 to create a collaborative partnership of permafrost experts from across Canada to develop methodologies to identify and map thermokarst and permafrost landforms across the NWT. The mapping involves assessing 2017 Sentinel-2 imagery and inventorying features by classifying a 7.5 x 7.5 km grid system following theme-specific mapping rubrics and a supporting spatial database.

Over the past year, the project has developed mapping protocols and geodatabase structure completed mapping around 33 NWT communities, and advanced community engagement through geospatial workshops and field validation. Implementing this project has involved data acquisition, database management, the training of several mappers, and maintenance of an ongoing and rigorous QA/QC process, and has advanced in a COVID-restricted work environment. The project has also resulted in the first systematic aerial inventory and characterization of thaw-sensitive permafrost terrain for NWT in summer 2020 which assessed over 13,000 km of flight lines and compiled over 3,000 permafrost landform observations. The mapping project has fostered collaboration and knowledge exchange amongst scientists, communities, and northern organizations, and it is providing an information base to support community climate change adaptation and modeling of sensitive permafrost terrain.

Changes in Water Within the Mackenzie Delta/Beaufort Region

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Water, including snow, freshwater ice, lakes and streams, is a critical component of the Mackenzie Delta region, affecting all aspects of this environment, including of course caribou and fish. In this presentation I will focus on the area to the east of the active Mackenzie Delta. Study sites extend along the Dempster and Inuvik to Tuktoyaktuk (ITH) highways from Ft. McPherson to Tuktoyaktuk, crossing the Arctic treeline. In this talk I will focus on two multi-decadal research observatories: the Havikpak Creek site near the Inuvik Airport and the Trail Valley Creek site 50 km to the north along the ITH. I will outline our advances in: water monitoring sensors and methods; decreases in all aspects of snow and related streamflow; and the recent increases in rapid drainage of lakes. Finally, we will talk about the need for ongoing monitoring and related water research, and the urgent need to develop next generation water models to develop scenarios of future climate impacts of climate change on the snow and water of the region.