

Government of
Northwest Territories

NWT Cumulative Impact Monitoring Program

2020/21 ANNUAL REPORT



To watch and understand the land so that it can be used respectfully forever.

NWT CIMP vision

Cumulative impacts are the combined effects that human activities and natural processes have on our environment. Monitoring cumulative impacts in the NWT is important because, over time, the results of many individual resource management decisions can lead to changes that may not have been expected.

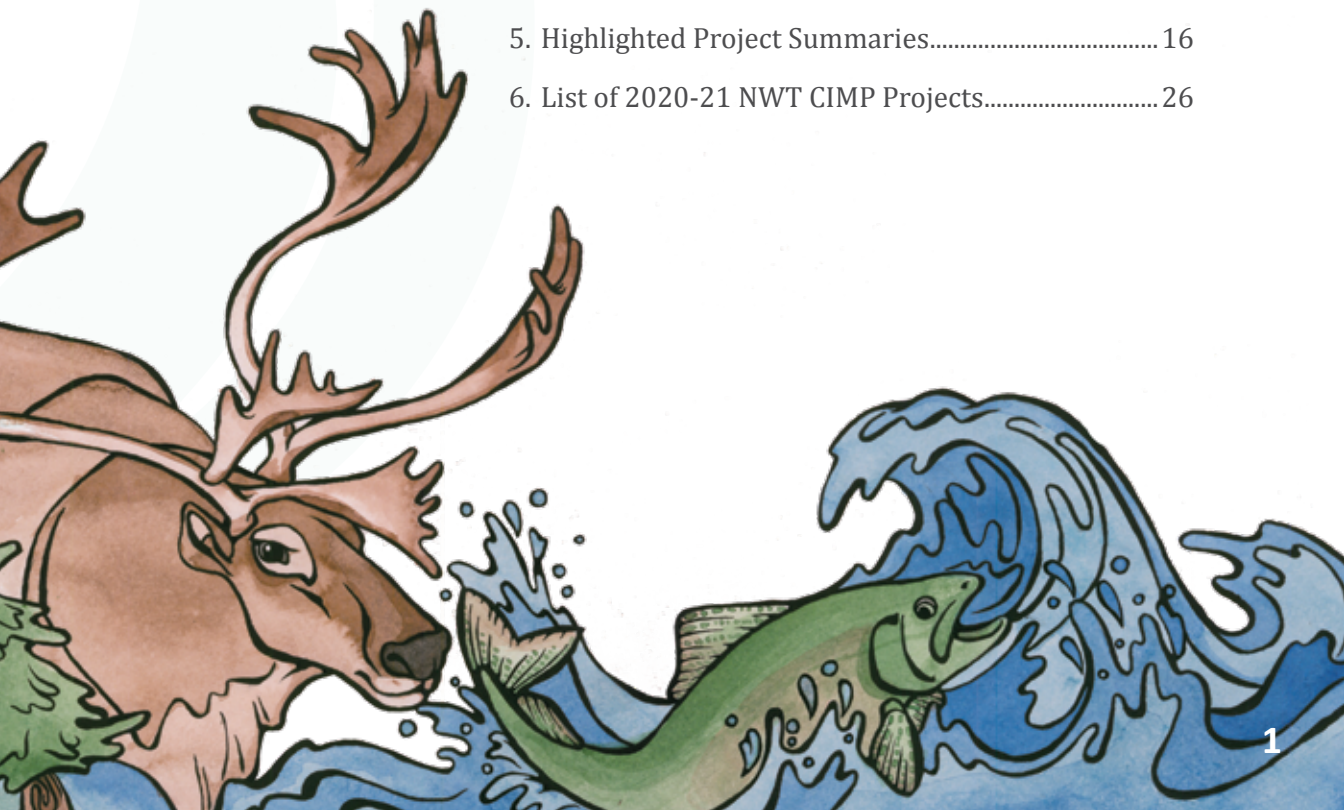
Cumulative impact monitoring is a legislative requirement in the NWT, and a key feature of the Gwich'in, Sahtù and Tłıchǫ land claim agreements, as well as Part 6 of the *Mackenzie Valley Resource Management Act* (MVRMA).

Cover Credit: Tawna Brown Photography, www.nwtarts.com



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PROGRAM AT A GLANCE

The Northwest Territories Cumulative Impact Monitoring Program (NWT CIMP) is a source of environmental monitoring and research in the NWT. The program conducts, coordinates, and funds the collection, analysis and reporting of information related to environmental conditions.

While many organizations monitor the NWT environment, NWT CIMP is mandated to understand cumulative impacts and environmental trends. We achieve this by conducting and funding the collection, analysis and reporting of environmental monitoring and research information. Funding is available through an annual call for proposals.

NWT CIMP is focused on cumulative impacts related to three valued components that decision-makers agree are of critical importance to the people of the NWT: caribou, water, and fish.

The goal of the program is to support resource management decision-making and sustainable development by improving our understanding of cumulative impacts. NWT CIMP considers all sources of knowledge, including Indigenous knowledge (IK) and scientific information.

The program promotes community-based monitoring and capacity-building associated with cumulative impact monitoring and research.

Monitoring results are available at nwtdiscoveryportal.enr.gov.nt.ca

PROGRESS ON OUR ACTION PLAN

NWT CIMP is guided by a five-year (2016-2020) Action Plan that includes four key activity areas:

1. Work with partners to understand key monitoring priorities.
2. Conduct, coordinate and fund cumulative impact monitoring, research, and analysis.
3. Communicate results to decision-makers and the public.
4. Facilitate the NWT Environmental Audit.



In 2020/21, the program made progress on all main activities in the Action Plan. Please read the following pages to learn more. Additional information is available at www.nwtcimp.ca.

Moving forward, a new five-year (2021-2025) Action Plan is underway.

1. WORKING WITH PARTNERS TO UNDERSTAND KEY MONITORING AND RESEARCH PRIORITIES

MONITORING PRIORITIES

We continued to work with partners to confirm and refine our monitoring and research priorities for **caribou, water, and fish** to ensure they continue to meet the needs of northern regulatory decision-makers. NWT CIMP also provided updates to regulatory boards on progress related to their research and monitoring priorities.



NWT CIMP-funded projects identified as being able to contribute to a future decision-making process: 100%.

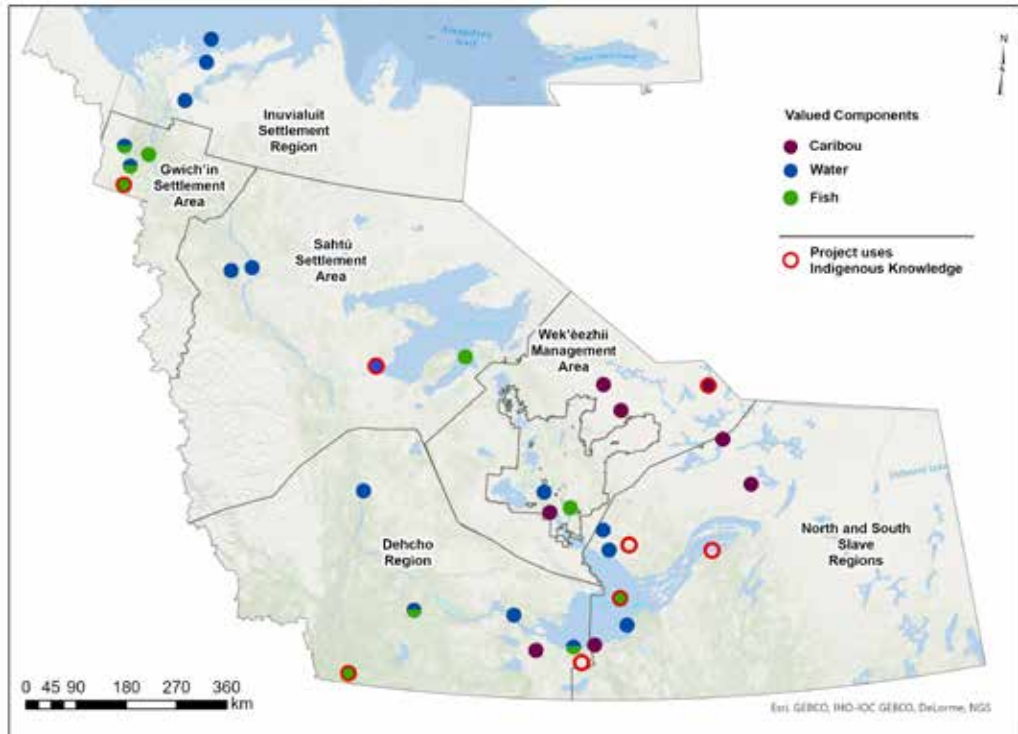
NWT CIMP STEERING COMMITTEE

NWT CIMP continued to engage and support its Steering Committee, including representatives of eight regional Indigenous governments, the Government of the Northwest Territories (GNWT), and several co-management boards. Despite COVID-19, the Steering Committee met virtually three times in 2020/21 to provide guidance on the overall program and 14 new project funding proposals.



Credit: Jamie Stevenson Photography

MAP OF 2020-21 NWT CIMP PROJECTS



2. CONDUCT, COORDINATE AND FUND MONITORING, RESEARCH AND ANALYSIS

NWT CIMP projects generated new knowledge about caribou, water, and fish. The knowledge generated focused on furthering our understanding of cumulative impacts and environmental trends in the NWT.

See Section 5 for highlighted projects that finished in 2020/21.

29 Projects

were supported across the NWT



8 Projects focused on caribou



6 Projects focused on fish



11 Projects focused on water



4 Projects focused on other topics related to caribou, fish or water



4 Projects were paused due to COVID-19.



4 Multiple valued components.



8 Projects that included IK collection/analysis



\$1.4M

in funding distributed by NWT CIMP, leveraged \$2.7M in partner funding.

SUPPORTING INDIGENOUS COMMUNITIES

This year, 13 projects were developed directly in response to community concerns, with eight of these being completed in 2020/21. CIMP199 and CIMP191 are highlighted in Section 5 as examples of projects that were initiated based on a community concern.

A complete list of all projects funded by NWT CIMP is available at www.nwtcimp.ca.

3. COMMUNICATING RESULTS TO DECISION-MAKERS AND THE PUBLIC

One key goal of NWT CIMP is to ensure environmental monitoring information, including all NWT CIMP-funded project results, is easily accessible to key decision-makers and the public.

The GNWT's first priority during the COVID-19 pandemic has been to prevent the spread of the virus and to protect communities. New policies were implemented including travel restrictions into the NWT. In response to the COVID-19 pandemic, some NWT funded researchers used alternative methods, such as virtual meetings, to communicate with decision makers and the public to ensure the continued dissemination of environmental monitoring information.

41 Communication Products

released for NWT CIMP-
funded research.



6 Peer-reviewed publications



5 Plain-language summaries



30 Reports



24

**Community presentations in
various formats to discuss project
results delivered by NWT CIMP-
funded researchers.**

SUPPORTING DECISIONS ABOUT THE ENVIRONMENT

NWT CIMP focuses on providing information to regulators and the public that supports effective environmental decision-making. Project leads are required to contact local decision-makers as part of the funding application process to ensure projects meet their needs. Several examples of projects that can contribute to northern environmental decision-making are below.

CIMP # <i>(report page #)</i>	Environmental Decision
CIMP141 <i>(page 16)</i>	The establishment of future standards for dust fall and airborne particulate matter in the NWT.
CIMP191 <i>(page 23)</i>	Mackenzie Valley Review Board’s environmental assessment of the Pine Point Mine Project.
CIMP199 <i>(page 20)</i>	Mackenzie Valley Land and Water Board, GNWT and Indigenous Government and Organizations water resource management decisions in the Dehcho region.
CIMP206 <i>(page 22)</i>	Fisheries and Oceans Canada fisheries management decisions for the conservation and sustainability of lake trout stocks.
CIMP208 <i>(page 17)</i>	GNWT Department of Environment and Natural Resources’ Bathurst Caribou Range Plan, the Wek’ézhìi Renewable Resources Board for caribou recovery, management, monitoring and mitigation decisions, and other future permitting and resource management decisions across the caribou range.

More information on each project is provided in Section 5.

COMMUNICATION WITH COMMUNITIES AND THE PUBLIC

One of NWT CIMP's key activities is encouraging two-way communication about monitoring and research projects directly with communities. All NWT CIMP project leads are required to engage with local communities or Indigenous governments and organizations prior to and during their project and to report their results directly to them.



Participants engage in discussions at the Sahtú Research Results Workshop in Tulita, 2019.

NWT CIMP hosts an annual, regional workshop to facilitate the sharing of project results and ideas. This workshop is an opportunity to bring together community members, regulators, government, and researchers to discuss results and provide feedback, and encourages the development of partnerships.

A results workshop for the Gwich'in and Inuvialuit regions was scheduled for January 2021. Unfortunately, this was cancelled due to COVID-19. Pre-recorded video presentations and abstracts are available at www.nwtcimp.ca.

Credit: Aaron Tambour Photography, www.nwtarts.com



Artwork by Julia Pokiak.

COMMUNICATION PRODUCTS

NWT CIMP project results must be of high quality, useable and publicly accessible for effective decision-making. The program encourages the publication of project results in both peer-reviewed journals and plain language summaries.

ONLINE INFORMATION SOURCES

Information and knowledge generated by NWT CIMP is publicly available, except for some Indigenous knowledge information, as requested by Indigenous governments and organizations or communities.

Northern Environmental Research Bulletins

Program staff work with project leads to develop and publish plain language summaries of their projects. An archive of Bulletins is available at **www.nwtcimp.ca**.

Inventory of Landscape Change Web Viewer

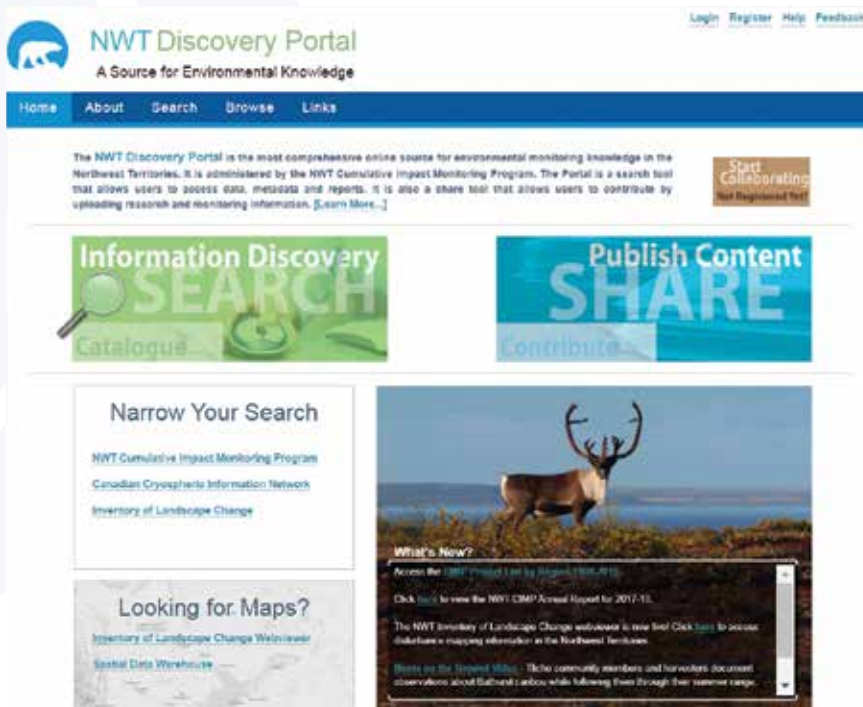
Comprehensive maps of human and natural disturbance for the NWT, such as roads and forest fires, are available online through the Inventory of Landscape Change Web Viewer at **www.nwtcimp.ca**. This web viewer is a powerful tool that can be used to explore cumulative impacts by layering disturbance maps. The human disturbance layers on the ILC are updated and are available for download. This year, updates included providing digitized disturbances within the Wek'eezhi' Management Area at a higher resolution. This work will be expanded to the rest of the NWT in 2021-22.

NWT Discovery Portal

The NWT Discovery Portal is the most comprehensive online source for environmental monitoring knowledge in the NWT. There is a wide range of information to meet the needs of various audiences, including scientific journal articles, plain language presentations, raw data, and maps:
nwtdiscoveryportal.enr.gov.nt.ca

The easiest way to find NWT CIMP project results is to consult the list of funded projects from 1999 to 2021 on the NWT Discovery Portal main page and then conduct a search using the NWT CIMP project number (e.g. CIMP197).

A list of current projects is available at the end of this report and a complete list of all NWT CIMP funded projects is available at www.nwtdiscoveryportal.enr.gov.nt.ca.

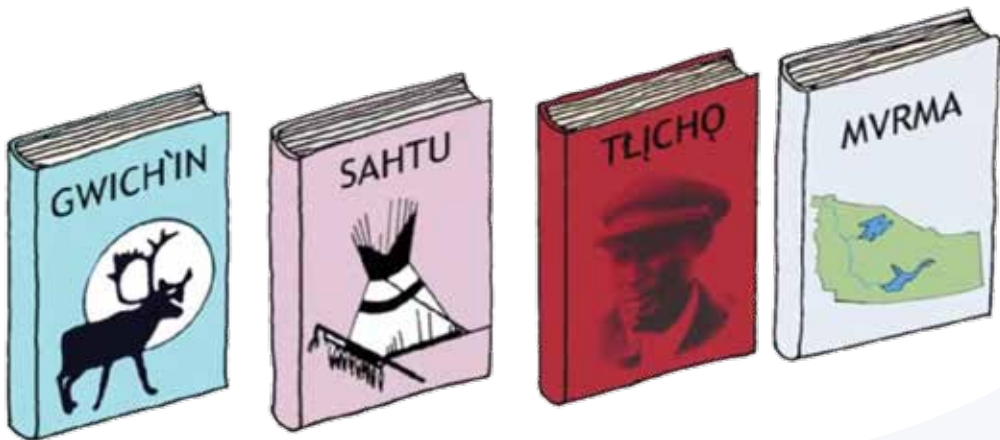


4. FACILITATE THE NWT ENVIRONMENTAL AUDIT

The NWT Environmental Audit is an independent review to assess the effectiveness of the regulatory regime, as well as the quality of environmental information and processes related to monitoring cumulative impacts. It is meant to check how well our regulatory system is working to protect the environment.

The Audit is an obligation of the Gwich'in, Sahtú and Tłıchǫ land claim agreements and a legislated requirement of the MVRMA. The Audit highlights both successes and challenges. A key purpose of the Audit is to consider the challenges and provide useful recommendations that will improve how the environment is managed.

The MVRMA requires an Environmental Audit to be completed at least every five years by an independent consultant.



2020 NWT ENVIRONMENTAL AUDIT

The 2020 NWT Environmental Audit was released in the fall of 2020.

The 2020 NWT Environmental Audit was conducted by a group of independent consultants guided by a steering committee of Indigenous, territorial, and federal government representatives.

NWT CIMP supported the completion of the 2020 Audit by facilitating the steering committee and community open houses.

This Audit focused on water quality and quantity information used to make decisions, as directed by the steering committee.

The Audit found the environmental regulatory system in the Northwest Territories has continued to improve since the last Audit in 2015. No new significant issues were identified, and there was progress in several areas identified in the previous Audit.

The next Audit is scheduled for 2025.

For more information visit this website:

www.enr.gov.nt.ca/en/services/nwt-environmental-audit

5. HIGHLIGHTED PROJECT SUMMARIES

Eleven (11) projects were completed in 2020/21; the results of nine of these projects have been highlighted below. Detailed project results can be found by searching for the NWT CIMP project number (e.g. CIMP197) on the NWT Discovery Portal (nwtdiscoveryportal.enr.gov.nt.ca).

CARIBOU FOCUSED PROJECTS

Data and knowledge integration for improved monitoring of cumulative impacts of mining development and climate change on the Bathurst caribou (CIMP141)

Wenjun Chen, Natural Resources Canada (wenjun.chen@canada.ca)

A combination of many natural and human factors may have contributed to the recent decline of Bathurst caribou populations. The project goal was to improve the understanding of the mechanisms responsible for disturbance impacts from resource development in the Bathurst caribou habitat. It did so by investigating how far the dust, visual and noise impacts from mining operations reach into caribou habitat.

This project developed a new approach providing quantitative estimates of airborne particulate matter around the Ekati and Diavik mines. This information will help establish future standards for dust fall and airborne particulate matter in the NWT.

However, other factors determine the zone of influence for Bathurst caribou such as noise disturbances which was found to range from 1.4 to 6.5 kilometers. This project provides relevant information and tools on the impacts of noise, dust and other mining disturbances on caribou which can be used in future environmental management decisions.



An example of a digital photograph used for quantifying the visibility of a truck on a mining road.

Credit: W. Chen

Assessing the disturbance responses of barren-ground caribou to industrial infrastructure (CIMP208)

Chris Johnson, University of Northern British Columbia (chris.johnson@unbc.ca)

This project studied the response of caribou to human activities associated with diamond mines and transportation infrastructure. This was done by testing levels of stress hormones in fecal samples, making behavioral observations, and analyzing GPS-collar location data.

Preliminary results showed that caribou spent less time feeding and more time walking when closer to the winter road and that caribou infrequently crossed the winter road when it was active. This suggests that when active, winter roads act as a semi-permeable barrier, restricting movements of caribou. Also, caribou reduced their foraging and expended additional energy when near winter roads.

It is anticipated that these results will inform the Bathurst Caribou Range Plan, including the Cumulative Land Disturbance Framework, as well as future permitting decisions and monitoring requirements for infrastructure occurring across the caribou range. The Wek'ézhèi Renewable Resources Board has stated that they may use project results in their processes for caribou recovery, management, monitoring and mitigation.

WATER FOCUSED PROJECTS

Impact of wildfire on northern stream ecosystems (CIMP174)

Michael Pisaric, Brock University (mpisaric@brocku.ca)

This project examined the cumulative impacts of drought and wildfire on lakes, streams, and forest ecosystems within the southern NWT. Major emphasis was placed on establishing the historical frequency and magnitude of fire and drought disturbances and the 'top-down' and 'bottom-up' controls that regulate them.



Examples of water samples collected.

Overall, the results of this project suggest that changes to stream and lake ecosystems are occurring. Decreases in stream flow have been linked to variation in atmospheric circulation, while fires were found to impact streams, but have minimal effects on lakes. It was also found that climate warming is directly causing changes to lake ecosystems, including increased primary production.

These results will provide information to decision-makers identifying management issues related to forest fires and drought-like conditions under changing climatic conditions.

Credit: M. Pisaric

Sahtú Benígodi: Traditional Knowledge of Great Bear Lake and its Watershed (CIMP198)

*Gina Bayha, Tsá Tué Biosphere Reserve Stewardship Council
(tsatue.biosphere@gov.deline.ca)*

This project compiled the history and stories from existing literature, studies, and other community initiatives, to create a comprehensive understanding of the historic conditions of the Tsá Tué Biosphere Reserve. An environmental baseline of Great Bear Lake and its watershed was created in the form of a traditional knowledge database.

The information compiled through this project will help to identify cumulative impacts of climate change and development in the biosphere. It will also help identify how future changes may affect the biosphere, offer guidance for future traditional knowledge and scientific studies, and inform resource development assessments.

Project results may be used by decision-makers to inform land use planning, climate change adaptation, food security planning, and contribute to broader regional resource management discussions and reviews.



Credit: Tawna Brown Photography, www.nwtarts.com

An integrated monitoring program for a forested boreal watershed with discontinuous permafrost: cumulative impacts on water quantity and quality from climate warming and anthropogenic pressures (CIMP199)

Oliver Sonnentag, University of Montreal (oliver.sonnentag@umontreal.ca)

This project carried out several studies in the Dehcho region focusing on various peatland functions. These studies measured the exchange of energy, water and greenhouse gases between the peatland and the atmosphere. Soil chemistry of forested peat was compared with that of burnt peat and water quality of creeks and lakes between Inuvik and northern Alberta were sampled to better understand how permafrost conditions influence water quality.

Results indicate that permafrost thaw in peatlands increases the rate of evapotranspiration and levels of coloured dissolved organic matter in creeks. With increased peatland thaw, there likely will be changes in downstream water quality which may impact drinking water and aquatic habitat for fish.

This project provides information about a changing environment that should be considered in water resource management decisions in the Dehcho region.

Credit: O. Sonnentag



Lauren Thompson deploying sensors for monitoring of water quality in Smith Creek, near Wrigley.

Changes in Water Within the Mackenzie Delta/Beaufort Region as Indicators of Aquatic Health (CIMP200)

Philip Marsh, Wilfred Laurier University (pmarsh@wlu.ca)

This project monitored the full water system at sites along the Inuvik-Tuktoyaktuk and Dempster Highways. The project used aerial photos and satellite imagery to monitor changes to lakes, as well as new instruments, such as a salt dilution system, water level sensors, and velocity gauges, to improve monitoring of streams.

Project results show a decrease in average snowfall, the length of the snow-covered season, and the depth and the amount of water stored in the snow, impacting spring runoff. Additionally, the number of lakes that drained per year since 2005 has greatly increased. These changes may have many impacts on people, infrastructure, and habitats downstream.

Improved knowledge gained from this project provides information about a changing environment that should be considered in water resource management decisions in the Mackenzie Delta/Beaufort Region. It also provided a new method to collect snow data over a large region, using drones.



FISH FOCUSED PROJECTS

Ecological monitoring of Lake trout in the Great Slave Lake (CIMP206)

Kim Howland, Department of Fisheries and Oceans (kimberly.howland@dfo-mpo.gc.ca)

This project compiled and analyzed existing harvest and monitoring data to assess spatial and temporal trends of lake trout populations and to improve stock assessment for evaluating the stock status.

Preliminary results show an increase in abundance and decrease in mortality rates, with stock status remaining in the cautious zone. The annual mortality is now within acceptable limits and comparable to lakes with limited fishing pressure. Continued rebuilding of abundance and decreasing trends in mortality rates will be dependent on how future lake trout catches are managed in Great Slave Lake.

Project results provide estimates of stock abundance and maximum sustainable yield. This information is used for establishing reference limits to ensure proper management of lake trout stocks for conservation and sustainability.



Credit: Tawna Brown Photography, www.nwtarts.com

PROJECTS EXAMINING TOPICS RELATED TO CARIBOU, WATER OR FISH

Watching the land: Knowing the cumulative impacts of change (CIMP191)

Patrick Riley, Kátł'odeeche First Nation (kfnenvironmental@katlodeeche.com)

This project established a community-based monitoring program to collect and analyze indigenous knowledge (IK) to inform regulatory and environmental management decisions being made by Kátł'odeeche First Nation and other agencies. The project increased community capacity by developing technical skills to document IK information for decision-making purposes and the mentoring of youth.

The initial phase of the project resulted in a set of IK-based environmental indicators that will continue be monitored over time. IK information related to berries, migratory birds, water, fish, caribou, fur-bearing animals, and moose was collected during the initial phase. This ongoing information collection and analysis by the KFN is increasing our understanding about environmental trends from an IK perspective.

Baseline and trend information from this project will provide information about a changing environment that should be considered in resource management decisions in the Dehcho and South Slave Regions.

Yellowknives Dene Cumulative Impact and Monitoring Framework (CIMP201)

Ryan Miller, Yellowknives Dene First Nation (ryanm@ykdene.com)

This project developed a framework to understand and manage regional cumulative impacts in the traditional territory of the Yellowknives Dene First Nation (YKDFN).

The project identified the relationships between impacts to ecological indicator species such as caribou, fish, water quality, land disturbance and social-cultural indicators of our way of life, such as land use practices, ethical behaviour towards one another, and intergenerational relationships.

YKDFN regards the cumulative effects framework as a necessary step to developing a “roads to resources” project-specific environmental assessment framework. The development of the Framework will enable YKDFN to participate more meaningfully in environmental assessment processes at various scales within the YKDFN traditional territory.

Credit: Aaron Tambour Photography, www.nwtarts.com



Artwork by Roxanne Harrison.

6. LIST OF 2020-21 NWT CIMP PROJECTS

CIMP#	Project Type	VC	Project Title	Lead Organization	Funding Year
CIMP94	TK	Caribou	Tłıchǫ Ekwo Nàowo: “Boots on the Ground” Bathurst Caribou monitoring program	Tłıchǫ Government	12 of 13
CIMP127	Science	Fish	Monitoring for impacts of harvest and climate change on Great Bear Lake aquatic system	Department of Fisheries and Oceans	9 of 12
CIMP132	Science	Fish and Water	Integrated Eco-monitoring and assessment of cumulative impacts of Great Slave Lake fisheries	Department of Fisheries and Oceans	10 of 12
CIMP141	Science	Caribou	Data and knowledge integration for improved monitoring of cumulative impacts of mining development and climate change on the Bathurst caribou (DAICI)	Natural Resources Canada	9 of 9
CIMP154	Science	Fish and Water	Understanding fish mercury concentrations in Dehcho lakes	University of Waterloo	On hold
CIMP174	Science	Water	Impact of wildfire on northern stream ecosystems	Brock University	4 of 4



CIMP#	Project Type	VC	Project Title	Lead Organization	Funding Year
CIMP185	IK	Other	Community-Based TK Monitoring – Monitoring for Better Decision-Making	łutselk'e Dene First Nation	4 of 4
CIMP186	Science	Other	NWT Permafrost Mapping Collective	NWT Geological Survey	1 of 3
CIMP187	Science	Caribou	Vegetation productivity and phenology across the Bathurst caribou range	Queen's University	4 of 6
CIMP191	IK	Other	Watching the land: Knowing the cumulative impacts of change	Kátł'odeeche First Nation	3 of 3
CIMP194	Science	Caribou	Recovery of boreal caribou habitat after forest fires	Deninu Kųę First Nation	On hold
CIMP195	Science	Fish	Community-based monitoring of whitefish in the lower Mackenzie River watershed	Simon Fraser University	4 of 5



Credit: Aaron Tambour Photography

CIMP#	Project Type	VC	Project Title	Lead Organization	Funding Year
CIMP197	Science	Fish and Water	How will fish communities in Gwich'in and Inuvialuit lakes respond to climate change?	Wilfrid Laurier University	4 of 4
CIMP198	IK	Water	Sahtu Benígqdi: Traditional Knowledge of Great Bear Lake and its Watershed	Tsá Tué Biosphere Reserve	2 of 2
CIMP199	Science	Water	An integrated monitoring program for a boreal forest watershed with discontinuous permafrost responding to climate warming and increasing anthropogenic pressures	Université de Montréal	3 of 3
CIMP200	Science	Water	Changes in Water Within the Mackenzie Delta/Beaufort Region as Indicators of Aquatic Health	Wilfrid Laurier University	3 of 3
CIMP201	IK	Other	Yellowknives Dene Cumulative Impact and Monitoring Framework	Yellowknives Dene First Nation	3 of 3
CIMP203	IK	Fish	Traditional Knowledge Study on Fish within the Acho Dene First Nation Traditional Territory	Acho Dene Koe First Nation	1 of 1
CIMP204	Science	Water	Fate of heavy metals in sewage disposal facilities and cumulative impacts on downstream aquatic systems	Dalhousie University	On hold
CIMP205	Science	Caribou	Identifying habitats that influence body condition and fitness of adult female boreal caribou in the southern Northwest Territories	GNWT - ENR	2 of 3

CIMP#	Project Type	VC	Project Title	Lead Organization	Funding Year
CIMP206	Science and IK	Fish	Ecological monitoring of lake trout in Great Slave Lake	Department of Fisheries and Oceans	2 of 2
CIMP207	Science	Caribou	Cumulative Effects Assessment of Four Barren-ground Caribou Herds in the NWT	Wek'eezhi Renewable Resource Board	1 of 3
CIMP208	Science	Caribou	Assessing the disturbance responses of barren-ground caribou to industrial infrastructure	University of Northern British Columbia	2 of 2
CIMP209	Science	Water	Nutrient and contaminant status in the wetlands of the Slave River Delta	University of Saskatchewan	2 of 3
CIMP210	Science	Water	Development of a Biological Monitoring Program to Detect Change in Stream Health Along the Dempster-Inuvik-Tuktoyaktuk-Corridor	Wilfrid Laurier University	2 of 3
CIMP211	Science	Fish and Water	Impacts of Permafrost Thaw Slump Extent, Severity and Persistence on Stream Biotic Health	Wilfrid Laurier University	1 of 2
CIMP212	Science	Water	Investigating the seasonality of subarctic lakes in changing climate using satellite & field data	Wilfrid Laurier University	1 of 3
CIMP213	Science	Water	Impacts of a 1999 storm surge event on Mackenzie Delta ecosystems	York University	On hold
CIMP215	Science	Water	Aquatic ecosystems in the Fort Good Hope area as indicators of environmental change	Institut national de la recherche scientifique	1 of 3
CIMP216	Science	Water	Hydrocarbon-derived compounds (anthropogenic and natural) in water bodies in the Sahtu	Environment and Climate Change Canada (ECCC)	1 of 3

CIMP#	Project Type	VC	Project Title	Lead Organization	Funding Year
CIMP217	Science and IK	Fish	Impacts of permafrost degradation on luk dagaii habitat in the Peel River Watershed	University of Victoria	1 of 3
CIMP218	Science	Fish	Clues in the water: Detecting populations and spawning migration of Inconnu (<i>Stenodus leucichthys</i>) in river systems around Great Slave Lake	Department of Fisheries and Oceans	1 of 2
CIMP219	Science	Caribou	Cumulative effects of fire, permafrost, and human development on caribou habitat and recovery	Wilfrid Laurier University	1 of 3



Credit: Anna Coles

CONTACT INFORMATION

For program information: www.nwtcimp.ca

For monitoring results: **NWT Discovery Portal**

For more information, please email us at: www.nwtcimp.ca

For more information on the artists and NWT Arts Program,
please visit: www.nwtarts.com

Illustration Credit: Trey Madsen

