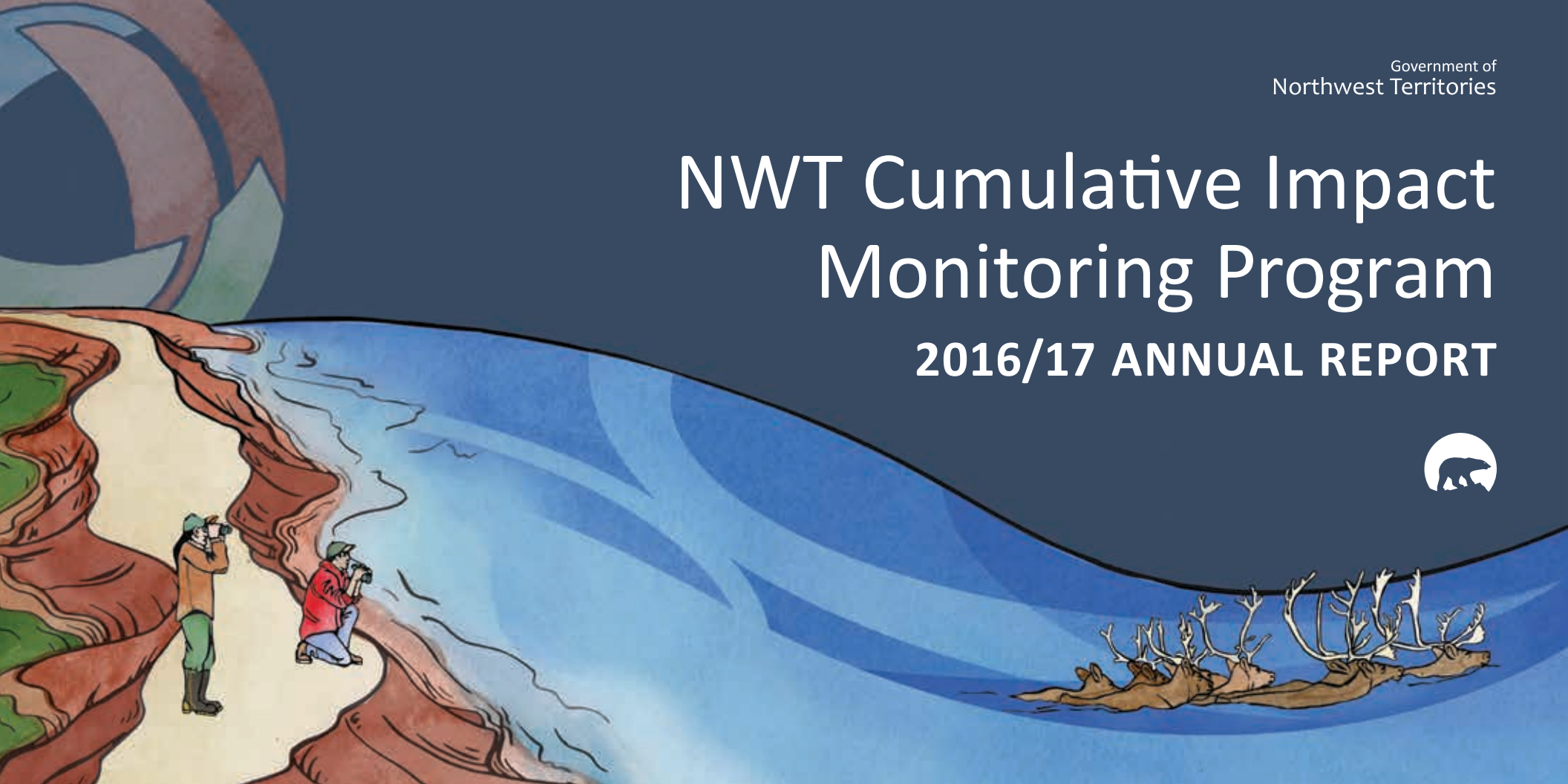


# NWT Cumulative Impact Monitoring Program

## 2016/17 ANNUAL REPORT



# PROGRAM AT A GLANCE

The Northwest Territories Cumulative Impact Monitoring Program (NWT CIMP) is an environmental monitoring and research program within the Government of the Northwest Territories' Department of Environment and Natural Resources. While many organizations monitor the NWT environment, NWT CIMP is mandated to understand cumulative impacts and environmental trends. NWT CIMP is currently 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 provide information to NWT regulators and the public that contributes to wise resource management decisions.

**Cumulative impacts** are changes in the environment caused by human activities and natural processes that add up across space and time. 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 statutory requirement in the NWT, and a key feature of the Gwich'in, Sahtù and Tłı̨chǫ land claim agreements as well as Part 6 of the *Mackenzie Valley Resource Management Act* (MVRMA).

# PROGRESS ON OUR ACTION PLAN

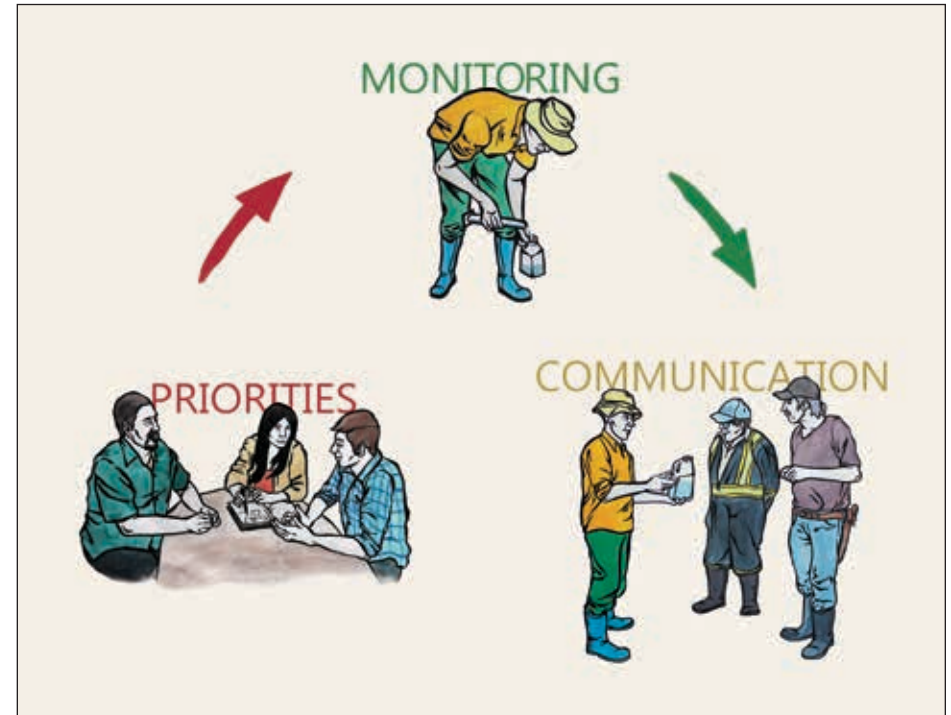
NWT CIMP is guided by a five-year (2016-2020) Action Plan that includes three key activity areas:

1. Working with partners to **understand key monitoring and research priorities**.
2. Coordinating, conducting and funding **environmental monitoring, research and analysis**.
3. **Communicating results** to decision-makers and the public.

In 2016/17, the program made progress on all main activities in the Action Plan. Read the following pages to learn more.

**For program information:** [nwtcimp.ca](http://nwtcimp.ca)

**For monitoring results:** [nwtdiscoveryportal.enr.gov.nt.ca](http://nwtdiscoveryportal.enr.gov.nt.ca)







NWT CIMP Steering Committee,  
September 2016

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

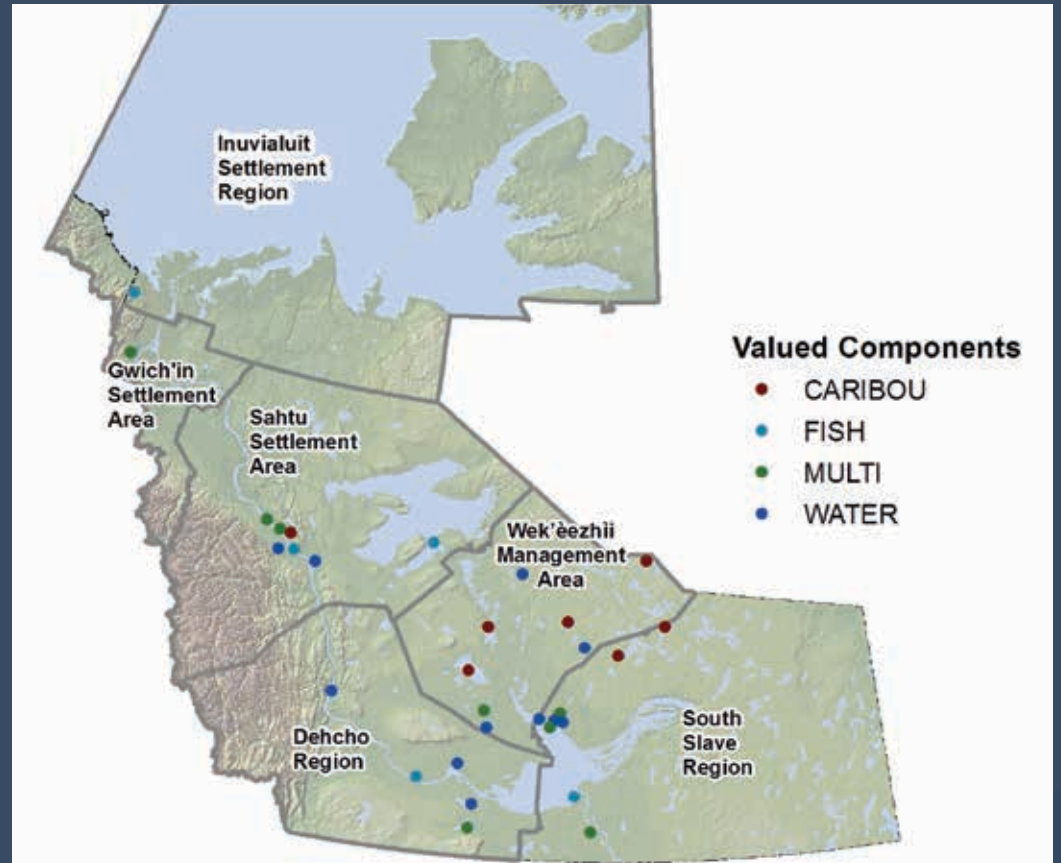
## MONITORING BLUEPRINTS

In 2016/17, NWT CIMP worked with partners to initiate two projects to better refine its priorities. The first project will help the program to understand key water monitoring data that regulators require to assess the cumulative impacts of developments. It will also help to determine what data is currently being collected and where there are gaps. The second project will explore the challenges of incorporating Traditional Knowledge in regulatory decisions and develop recommendations to address those challenges.

## STEERING COMMITTEE

NWT CIMP continued to engage and support its Steering Committee, including representatives of eight regional Aboriginal governments, the federal and territorial governments, and several co-management boards. The Steering Committee met three times to provide guidance on the overall program and 16 new project funding proposals.

## Map of 2016/17 NWT CIMP projects





## 2. COORDINATING, CONDUCTING AND FUNDING MONITORING, RESEARCH AND ANALYSIS

In 2016/17, the program generated a significant amount of new knowledge about caribou, water and fish. In total, 31 projects were supported throughout all regions of the NWT with \$1.8M of funding, supplemented by \$4.3M in leveraged partner funding. A complete list of NWT CIMP projects from 1999-2017 is available at [nwtcimp.ca](http://nwtcimp.ca).

### SUPPORTING ABORIGINAL COMMUNITIES

This year, eight projects had a focus on Traditional Knowledge and 18 were developed directly in response to community concerns. Over 60% of the projects included training or work experience for community members.

### STANDARDIZING DATA, COLLECTION AND ANALYSIS

The use of consistent data collection and analysis protocols between projects is critical to the establishment of regional datasets that can be analyzed for cumulative impacts. In 2016/17, NWT CIMP introduced several standardized protocols for the collection of water quality and fish data that will be implemented in next year's projects. The program also introduced community-based water quality monitoring guidance in an effort to support standardization among the growing number of community-based monitoring projects in the NWT.

# SUPPORTING DECISIONS ABOUT THE ENVIRONMENT

NWT CIMP is focused 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.

The following are examples of how the results of seven NWT CIMP-funded projects were used this year to help make effective decisions about the environment.





## SEVEN NWT CIMP PROJECTS THAT SUPPORTED ENVIRONMENTAL DECISIONS IN 2016/17

Lead – Organization	Project Title	Environmental Decision
Kimberly Howland – Fisheries and Oceans Canada (CIMP127)	Long-term monitoring of Great Bear Lake fisheries and the aquatic ecosystem	<i>Species at Risk</i> Act decisions regarding cisco morphotypes in Great Bear Lake.
Xinhua Zhu – Fisheries and Oceans Canada (CIMP132)	Integrated eco-monitoring and assessment of cumulative impacts on Great Slave Lake fisheries ecosystems	Fisheries and Oceans Canada harvest quota decisions for Great Slave Lake.
Jennifer Fresque-Baxter – GNWT Environment and Natural Resources (CIMP145)	Implementing collaborative cross-NWT water quality monitoring to address the needs of water partners, focusing on cumulative impacts and community concerns	Land and Water Boards review available water quality data when making water license decisions.
Todd Slack – Yellowknives Dene First Nation (CIMP151)	Establishing a water quality dataset for cumulative effects assessment in the North Slave	KBL Environmental used the data in their Yellowknife area water license renewal.
John Chételat – Environment Canada (CIMP161)	Cumulative impacts monitoring of aquatic ecosystem health of Yellowknife Bay, Great Slave Lake	North Slave Métis Alliance comments on City of Yellowknife water license water withdrawal request.
Steve Kokelj – GNWT NWT Geological Survey (CIMP164)	Mapping permafrost disturbance and impacts to aquatic systems across the northern NWT	GNWT Department of Industry, Tourism and Investment lake drainage advisories in the Gwich'in Settlement Area.
Melaine Simba – Ka'a'gee Tu First Nation (CIMP184)	The Ka'a'gee Tu Atlas : Community-based monitoring of landscape change in Kakisa, NT	GNWT Department of Environment and Natural Resources discussions about a potential conservation area near Kakisa.

## Communication with communities

One of NWT CIMP's key activities is to communicate results to communities. As such, all NWT CIMP project leads are required to report their results to local communities. In 2016/17, NWT CIMP funded researchers made 30 community presentations throughout the NWT. In addition, NWT CIMP and the Tłı̨chǫ Government co-hosted a two-day workshop in January 2017 that gathered 82 Tłı̨chǫ community members, researchers, co-management boards and government representatives for a two-way exchange of information about monitoring and research in the Wek'èezhìi region. Community feedback on the workshop was positive.



Tłı̨chǫ elders at the 2017 Wek'èezhìi Region Environmental Research and Monitoring Results Workshop

### 3. COMMUNICATING RESULTS TO DECISION-MAKERS AND THE PUBLIC

#### ONLINE INFORMATION

NWT CIMP results are available online at the NWT Discovery Portal ([nwtdiscoveryportal.enr.gov.nt.ca](http://nwtdiscoveryportal.enr.gov.nt.ca)) with over 1,000 records posted. This year, NWT CIMP has committed to making all of its water quality data available online at the Mackenzie DataStream ([mackenziedatastream.ca](http://mackenziedatastream.ca)), an open access platform for sharing NWT water data. Substantial improvements for users have been made to the search and upload functions of both applications. Human and natural disturbance information is available online at the Inventory of Landscape Change Web Viewer ([nwtcimp.ca](http://nwtcimp.ca)).

#### INNOVATIVE COMMUNICATION PRODUCTS

NWT CIMP encourages the publication of project results in both peer-reviewed journals and plain language summaries. In 2016/17, the program generated 26 peer-reviewed publications and 57 reports. Program staff worked with project leads to develop and publish 10 plain language summaries of current projects. These Northern Environmental Research Bulletins, which are now a funding requirement of NWT CIMP, have been widely distributed to communities, researchers and decision-makers. A short, informational video about the program was developed and translated into French and four Aboriginal languages. The bulletins and videos are available at [nwtcimp.ca](http://nwtcimp.ca).

Government of  
Northwest Territories

# NWT Cumulative Impact Monitoring Program

## 2016/17 PROJECT RESULTS





Three NWT CIMP-funded caribou monitoring projects were completed in 2016/17. Detailed project results can be found by searching for the CIMP number on the NWT Discovery Portal ([nwtdiscoveryportal.enr.gov.nt.ca](http://nwtdiscoveryportal.enr.gov.nt.ca)).

## WILDLIFE TRACKING IN THE SAHTÚ SETTLEMENT REGION (CIMP162)

*James Hodson, GNWT Environment and Natural Resources ([james\\_hodson@gov.nt.ca](mailto:james_hodson@gov.nt.ca))*

The objective of this three-year project (2014-2017) was to design and test a wildlife track monitoring program that could be used by communities, industry and others to produce information for wildlife managers about the abundance and distribution of mammals in a region.

Tracking was conducted by youth and elders from Tulít'a and Norman Wells along existing trails and seismic lines. In the final winter of the project, the Tulít'a Renewable Resources Council took a lead role in coordinating the field work.

Twelve wildlife species were identified in three years of tracking, with marten, moose and lynx being the most common. Results were used to determine the level of effort that would be required to detect a significant change in wildlife distribution. In the future, the program could be rolled out in other communities and with industry to monitor regional changes in wildlife distribution.



Jonathan Yakeleya (left) and William Horassi recording a fox track using the Trailmark™ mobile data collection app near Tulit'a, NT.



# MODELING CUMULATIVE IMPACTS ON BATHURST CARIBOU (CIMP153)

*Don Russell, CircumArctic Rangifer Monitoring and Assessment Network (drussell@yukoncollege.yk.ca)*

Decline of the Bathurst caribou herd has been a significant concern for communities and wildlife managers for the last decade. Over the past four years, this cumulative impacts model has been used in the Bathurst Caribou Range Planning process to assess the effects of different real and potential future development, harvest and climate scenarios. The exploration of different scenarios allows participants in the planning process to understand the consequences of various actions and to identify the most important drivers of population change.

A user-friendly version of the model is now accessible to decision-makers and the public at [www.cariboumodel.ca](http://www.cariboumodel.ca).



Bathurst caribou (Credit: Environment and Climate Change Canada)

## COMPILING A TERRITORY-WIDE VEGETATION DATASET (CIMP 122)

*Nancy Kingsbury, Environment and Climate Change Canada*

Information on vegetation is important for informing the assessment of cumulative effects on caribou since habitat is a key factor for population health. The objective of this one-year project was to develop a single, consistent NWT vegetation dataset that can be used to assess spatial and temporal trends in vegetation composition and abundance.

A standardized template for vegetation data was developed and a dataset was compiled that integrated five data sources from six distinct regions of the NWT. Spatial analysis showed some interesting differences in vegetation across the NWT, including low overall plant cover with abundant shrubs in the east and high plant species diversity in the mountains. Because there were no repeated measurements of vegetation over time it was not possible to analyze temporal changes. NWT CIMP will continue to solicit further data contributions to make the dataset more robust and useful for comparisons over time.

Bog cranberry





Four NWT CIMP-funded water monitoring projects were completed in 2016/17. Detailed project results can be found by searching for the CIMP number on the NWT Discovery Portal ([nwtdiscoveryportal.enr.gov.nt.ca](http://nwtdiscoveryportal.enr.gov.nt.ca)).

## MONITORING DISSOLVED ORGANIC CARBON IN WATER (CIMP167)

*Sherry Schiff, University of Waterloo ([sschiff@uwaterloo.ca](mailto:sschiff@uwaterloo.ca))*

A warming climate has the potential to release dissolved organic carbon (DOC) stored in permafrost into the surrounding environment, with possible impacts to aquatic health. One of the implications of higher levels of DOC in water is potential changes to drinking water treatment. The purpose of this three-year project was to understand how a warming climate could influence DOC quantity and quality in the NWT.

Water was collected from lakes, ponds, creeks and subsurface peat water at three sites along a latitudinal gradient from Yellowknife to Wekweètì and Daring Lake. Baseline DOC conditions were analyzed using long-term geochemical records of the Yellowknife, Cameron and Marian rivers.

Results of the sampling showed the highest DOC concentrations in subsurface environments compared to surface samples. DOC concentrations were higher at Yellowknife than the other locations. DOC concentrations in the NWT were higher than similar hydrologic environments in southern Ontario. Analysis of the long-term river data revealed a dynamic DOC baseline that may represent the response of northern watersheds to a changing climate and permafrost degradation.



Dr. Michael English carrying samples for dissolved organic carbon from two lakes near Wekweëti, NT. (Credit: P. Aukes)



# UNDERSTANDING THE HYDROLOGY OF THE SNARE RIVER (CIMP179)

*Murray Richardson, Carleton University (murray.richardson@carleton.ca)*

The objective of this one-year project was to improve our understanding of stream flow in the Snare River, a watershed that is representative of other North Slave watersheds and is important for local power generation. A specific objective was to test the effectiveness of an annual, end-of-winter snow survey that has been used by resource managers for many years to predict stream flow in the following spring and summer.

The analysis showed regional differences in snow accumulation in the Snare River basin. North of treeline tends to have more snow, with higher variability in snow depth and density, compared to south of treeline. Modeling of the environmental data showed that prediction of spring and summer stream flow in the Snare River could be improved. Carleton University plans to continue this work by refining snow survey locations in the basin.



Mike Palmer and Shawne Kokelj conducting snow surveys in the Snare River basin, March 2016. (Credit: M. Richardson)

# MAPPING PERMAFROST DISTURBANCE AND IMPACTS ON AQUATIC SYSTEMS (CIMP164)

*Steve Kokelj, NWT Geological Survey (steve\_kokelj@gov.nt.ca)*

This three-year project mapped permafrost disturbances and their impacts to aquatic systems throughout the zone of continuous permafrost in the NWT. Remotely sensed imagery was used to develop geospatial datasets of disturbances such as thaw slumps, drained lakes and sediment deposition. These data layers are available on the NWT CIMP Inventory of Landscape Change Webviewer ([nwtcimp.ca](http://nwtcimp.ca)). Stream water quality was also sampled on eastern Banks Island and the Peel Plateau, two areas of the NWT currently experiencing significant permafrost disturbance.

An analysis of the data showed that the most intensive thaw slumping was occurring in glacial deposits across northwestern NWT. These disturbances increase sediment flux and geochemical concentrations in surface water to impact thousands of streams and lakes and hundreds of kilometres of coastline in northern NWT. Baseline water quality conditions are changing dramatically in many watersheds of the NWT.



Thaw slump in the Gwich'in Settlement Area.



# DETECTING THE EFFECTS OF WILDFIRES ON STREAMS (CIMP180)

*Suzanne Tank, University of Alberta (suzanne.tank@ualberta.ca)*

During the summer of 2014, southern NWT experienced an unprecedented high wildfire season. This one-year study aimed to quantify the immediate effects of wildfire on southern NWT streams. Water quality samples were taken in the summer of 2015 and 2016 from 50 catchments across the Dehcho, Wek'èezhì and North Slave regions, with a variety of landscape characteristics.

Changes in stream water chemistry associated with wildfire, including increases in total nitrogen, total phosphorus and dissolved organic carbon, were detectable, but relatively weak when measured at stream outlets. The effect of fire on stream water chemistry was most pronounced in the first freshet event post-fire. Since the 2015 and 2016 summer seasons were relatively dry, further work could help to understand how southern NWT streams respond to wildfire in wet years.

Samson Mengistu measures discharge in a wildfire-affect stream near Whatì, NT. (Credit: S. Tank)



Three NWT CIMP-funded fish monitoring projects were completed in 2016/17. Detailed project results can be found by searching for the CIMP number on the NWT Discovery Portal ([nwtdiscoveryportal.enr.gov.nt.ca](http://nwtdiscoveryportal.enr.gov.nt.ca)).

## MONITORING THE GREAT SLAVE LAKE ECOSYSTEM (CIMP132)

*Xinhua Zhu, Fisheries and Oceans Canada ([xinhua.zhu@dfo-mpo.gc.ca](mailto:xinhua.zhu@dfo-mpo.gc.ca))*

The purpose of this continuing seven-year project is to improve our understanding of Great Slave Lake and its fisheries by monitoring fish populations and associated environmental variables such as zooplankton, temperature and turbidity. This information and traditional knowledge will assist Fisheries and Oceans Canada to manage the Great Slave Lake commercial fishery.

Sampling was undertaken each summer from 2011 to 2016 in each of the six management areas of the lake. A total of 24 fish species were identified, dominated by three types of whitefish (lake whitefish, least cisco and lake herring). Statistical analysis showed that the stability and functionality of the fish community is associated with changes in depth, temperature and turbidity. A baseline of fish populations and associated environmental conditions has now been created from which to assess future changes.



# MONITORING THE GREAT BEAR LAKE ECOSYSTEM (CIMP127)

*Kimberly Howland, Fisheries and Oceans Canada (kim.howland@dfo-mpo.gc.ca)*

This ongoing six-year project was initiated to collect standardized baseline information for Great Bear Lake on water quality, zooplankton, forage fish and harvested fish. The information will be used by Fisheries and Oceans Canada and the Sahtú Renewable Resources Board to make fisheries management decisions.

Comparisons of recent water quality data with historical information from the 1960s show there has been a significant increase in summer water surface temperatures associated with a warming climate. This is expected to have cascading effects on organisms and, ultimately, users of the lake. Sampling demonstrated that lake trout was by far the most dominant species, followed by cisco, with southern areas of the lake tending to have a greater variety of species. Monitoring will continue, with the community of Délne taking on more responsibility for the monitoring of local environmental conditions.

Bobby Modeste and Louise Chavarie sampling lake trout at Russel Bay in Great Bear Lake. (Credit: C. Gallagher)





# UNDERSTANDING IMPORTANT FISH HABITAT IN THE SLAVE RIVER DELTA (CIMP166)

*Karl-Erich Lindenschmidt, University of Saskatchewan (karlerich.lindenschmidt@usask.ca)*

One of the major challenges for assessing cumulative effects on fish and other aquatic animals is linking these effects to local conditions in the river. This three-year project combined three tools: geospatial modeling, isotope tracers, and traditional and local knowledge (TK) to predict and evaluate important habitats for fish and other animals in the Slave River Delta.

The data revealed many similarities between the literature and TK about fish species. Both stated that inconnu move from delta channels and Great Slave Lake into the Slave River to spawn, moving as far upstream as Fort Smith, NWT, in the fall. TK also revealed connections between Slave River inconnu populations and those in the adjacent Taltson River. A bathymetric map of the delta was developed that can be used to confirm suspected changes in depths.

Victor Mandeville of Deninu K'ue First Nation collecting insect samples for isotope analyses. (Credit: T. Jardine)

