

Arctic and Northern

●●● Newsletter 2024 – Issue 2



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Message from Program Director

As the Arctic and Northern Challenge program enters its third year, we are pleased to bring you an update on the extensive activities that were underway in year 2, between April 1, 2023 and March 31, 2024. The first highlight of the year was the launch of the National Research Council of Canada's (NRC) first-ever development grants program, providing financial support and time for Northern and Arctic organizations to engage prior to the development of a research proposal. During the development of the program, we heard time and again from Northern and Arctic organizations that the increasing demand for Northern-led research has led to challenges for thoughtful planning of research proposals, including last-minute requests for their participation, rather than co-development from the outset of research ideation. We hope that these grants will allow that to begin to change, and enable successful applicants an opportunity for more in-depth conversations for research planning and better future collaboration with the NRC's research teams.

It's hard to believe that the Canada-Inuit Nunangat-United Kingdom Arctic Research Programme (CINUK) projects have entered their third and final year! Significant effort was put into the development of this joint initiative, and we can see that the same is true of the projects themselves. Despite a host of trials ranging from the devastating wildfires last year to everyday, but very critical, logistical challenges that go hand-in-hand with field work, the projects greatly advanced during year 2. Teams have come together across research projects to leverage expertise, research and conversations with communities and partner organizations, which has been terrific to see. We look forward to sharing project outcomes in next year's newsletter.

The new program projects that stemmed from our first call for proposals are now underway as well, many with a first year of field work completed. This year's newsletter will highlight 5 of those projects, with more to follow next year. We hope you will enjoy reading about these projects and they spark interest with respect to your own regional, community or organizational research priorities.

Finally, don't forget about our next call for development grants, open now! General information can be found on our website. If you would like to receive the application package, please email us at NRC.Arctic&Northern-Arctique&Nord.CNRC@nrc-cnrc.gc.ca. We are looking forward to seeing your innovative ideas and where the NRC's research expertise can be of assistance, working collaboratively to address Arctic and Northern research priorities.

Update about our Program Advisory Committee

It has been a busy year for our Program Advisory Committee. The committee met twice, with the November 2023 session being held in person in Ottawa and the April 2024 meeting being held virtually. With Martin Loughheed's (Inuit Tapiriit Kanatami) change in responsibilities, members nominated and chose Karen Kelley (also from Inuit Tapiriit Kanatami) as the new co-chair. Welcome, Karen!

The committee had thoughtful and discerning discussions at both meetings concerning research ethics, development of meaningful key performance indicators for research programs, the launch and



subsequent management of our program's development grants, and heard about research highlights from the 16 program projects to date. The next year promises to have more opportunities for these engaging and valuable discussions, for which we are thankful for our committee's input and guidance.

The Canada-Inuit Nunangat-United Kingdom Arctic Research Programme (CINUK) enters its third year

Have you seen the CINUK film yet? If not, you should! An English version, as well as versions with French and Inuktitut subtitles are available at www.cinuk.org. Thank you to the United Kingdom Research and Innovation (UKRI) team for producing this fantastic glimpse into the 13 CINUK projects and for the project teams for sharing such lovely imagery of their project work. Shorter, project-specific films are coming soon, so keep checking back for their release on the CINUK website.

In November 2023, the project teams met in person in Cambridge, UK, for their 2nd annual scientific meeting, hosted at the British Antarctic Survey headquarters. Thanks to funding from UKRI, many project team members from across Inuit Nunangat were able to attend in person. Jean-François Houle, Vice-President of Engineering, NRC, delivered a keynote address as did Natan Obed, President, Inuit Tapiriit Kanatami (ITK) and Frances Wood, International Director, UKRI. A training event was also held, "How to be an ally in Inuit Nunangat: Governance, Science and Engagement." The training provided an overview of the National Inuit Strategy on Research, discussed effects of infrastructure deficits on research, the role of consensus-based decision making, communications and data management planning, amongst many other topics. The session was very well received and the NRC will be working with ITK to bring a similar training to a broader audience in the coming year.

Many of the CINUK teams are already thinking about what's next for their projects, whether that be advancing technological research, seeking new funding sources to advance existing research and how to broadly and effectively share their research results. Next year, we hope to be sharing how those results can be found and the impact the research will have in advancing climate change mitigation and adaptation methods in Inuit Nunangat and elsewhere.



Jean-François Houle, NRC VP of Engineering presenting at CINUK's annual science meeting.

NRC development grants

In November 2023, the Arctic and Northern Challenge program awarded 5 recipients with development grants as part of its first round of callouts. These grants provide resources for eligible Northern recipients to conduct community-level consultations to ensure local support for a project idea and to prepare for a research and development proposal in one of the program's themes: housing, water, food and health. Grants were awarded for the following project ideas:

- Northern Aircrete Domes Inc.'s project aims to evaluate the feasibility of a biogas plant utilizing food waste and sewage water.
- Northern Aircrete Domes Inc. will also be leading on a second project, which intends to establish a compact manufacturing facility for air-dried Aircrete, a lightweight and environmentally friendly construction material.
- The Nunavut Housing Corporation will be leading a project to engage residents, Inuit organizations, industry leaders, builders, developers and educational organizations on the development and integration of energy-efficient and other building technologies.
- The Government of Nunavut's Department of Health (Kitikmeot) will lead a project to establish reliable information, resources and published knowledge (traditional/research) regarding High Arctic traditional plant food production while seeking to cultivate preferred traditional plants and support food autonomy and food security.
- The City of Whitehorse will lead a project to procure, install and monitor sensors in chambers and water and wastewater pipes, to measure and record different parameters related to the condition of the pipes.

At the beginning of April 2024, we launched a second call for development grants. More information is available at nrc.canada.ca/arctic-northern-challenge-program. The deadline to submit a grant application is **October 4, 2024**.



Highlighting 5 program collaboration projects

We hope you enjoy reading about 5 of our new collaborative research projects. These collaboration projects bring together NRC research and technical staff (along with access, in many cases, to NRC research laboratories), with Northern and Arctic recipients, other research and academic organizations and industry partners to address Northern-driven research priorities in our 4 research themes: housing, health, food and water. More projects will be highlighted in next year's newsletter.

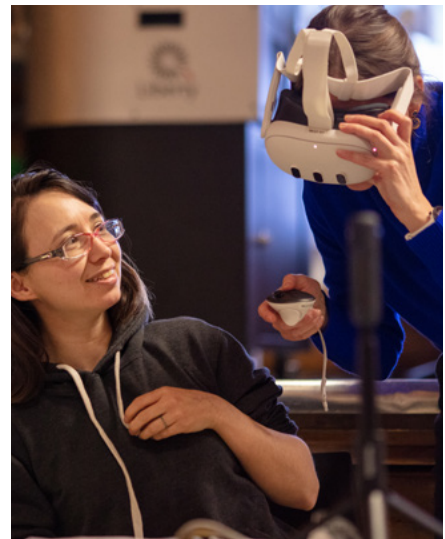
01 ArcVR

Connecting culture and land-based healing using virtual reality to support Inuvialuit mental health and well-being

The Inuvialuit Regional Corporation (IRC) and the NRC's Medical Devices Research Centre are collaborating to provide immersive virtual reality (VR) technology to Inuvialuit for wellness and cultural benefits for clients with limited access to the land for healing. This study will provide VR immersions to 1) determine possible mental health benefits for Inuvialuit for connections to the land and 2) test the effectiveness of VR technology as a potential wellness tool in the North.

What has been done to date:

This year, equipment was tested and purchased; an initial development environment was set up as a proof of concept and demonstration; knowledge transfer documentation was put together; and a comprehensive steering committee was formed. As well, a youth steering committee was inaugurated in February 2024 with representation from 5 out of the 6 communities involved in the project. The first task for the youth committee was to select cultural sites for the immersive virtual reality environment. Three out of the 6 sites have been selected. Reports from the project's elders show their optimism about the successful application of VR as a mental wellness tool in the region.



NRC staff exposing IRC staff and Inuvialuit youth to virtual reality during the inaugural steering committee meeting in Inuvik.

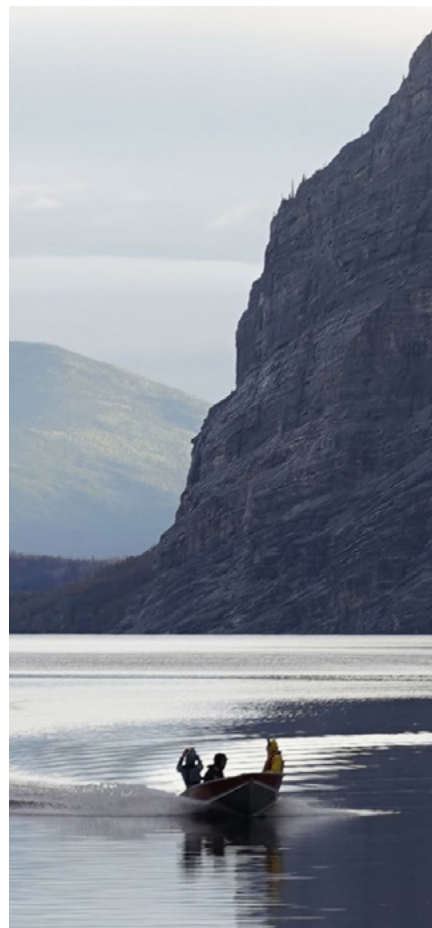
02 DehchoCyano

Monitoring cyanobacteria and cyanotoxins in freshwater resources of the Dehcho region

Algal blooms have been reported by community members and Dehcho Aboriginal Aquatic Resources and Oceans Management Indigenous Guardians in several lakes in the Dehcho region, which has generated increased concern about the presence of cyanotoxins in our aquatic ecosystems. This Dehcho First Nations-led project focuses on characterizing cyanobacteria and cyanotoxins in lakes throughout this region in the Northwest Territories. Project team partners include researchers from the NRC's Biotoxin Metrology group (BTM) in Halifax and academic researchers from Wilfrid Laurier University and Dalhousie University. A combination of sampling approaches is being used in lakes during the open water season. The project team is developing a long-term monitoring strategy for the region, and developing local capacity for sampling and analysis. Findings will be shared with other Northern groups interested in establishing similar monitoring programs.

What has been done to date:

In the first year of the project, 15 lakes (14 via float plane and 1 via road) were successfully sampled for water. Frozen filters were sent to Dalhousie University for DNA extraction and analyzed. Results from Year 1 indicate that toxin-producing cyanobacteria are present in several lakes, and results are informing sampling priorities and training plans for Years 2 and 3. In the open-water season of 2023, 3 Guardians were trained in sample collection and in January, advanced training was successfully conducted with 1 Dehcho Guardian at Wilfrid Laurier University and at field locations.



Sampling in the Dehcho region, NT.

03 Rapid Retrofits, Healthy Homes

Partially fabricated rapid retrofits

The need to improve the energy performance of northern homes and to decarbonize the building sector is high, yet progress has been slow due to cost, disruption and lack of skilled labour in many Northern communities. As Northerners strive to achieve energy efficiency goals, the health and well-being of home occupants must be considered. What is needed is a scalable retrofit methodology that prioritizes efficiency, cost and occupant health. Earthrise Building Services Inc. is working with the NRC's Construction Research Centre to employ a community-focused and data-driven approach to implementing residential deep-energy retrofits while ensuring adequate ventilation and superior indoor environment quality.

What has been done to date:

The focus for the first year was on retrofitting 5 homes (with new windows, doors, siding, insulation, or ventilation systems) during the summer of 2023. The project team procured state-of-the-art 3D capture technology to create digital twins of these homes, enabling the precise design of mechanical systems and exterior retrofit solutions. Contracts with First Nations contractors were prioritized, and 2 of the 5 homes were successfully retrofitted (addressing heating systems, insulation, air sealing and ventilation). In collaboration with the Champagne and Aishihik First Nations (CAFN), an additional 19 homes for retrofits were added to the project, expanding upon the original scope and providing a broader basis for analysis. The tender for the upcoming summer projects was issued in February 2024 and funding from this project has enabled Earthrise Building Services to hire 2 additional staff, both of whom are young early career Northerners. The project has also attracted additional funding opportunities to advance the goal of driving high-quality retrofits in more Northern communities.



Example homes receiving deep energy retrofits to reduce GHG emissions by over 80%

04 ArcticChar

Enabling better management and monitoring of a critical food fish in Kugluktuk, Nunavut

Arctic char from the Coppermine River are a critical food source for the community of Kugluktuk, Nunavut. This project builds on existing relationships and aims to answer questions from Inuit regarding movements of fish in the Coppermine River and Coronation Gulf. In a collaboration led by Kugluktuk Hunters and Trappers Organization (HTO) and involving researchers from University of Waterloo, Fisheries and Oceans Canada, and the NRC's Ocean, Coastal and River Engineering Research Centre, existing acoustic telemetry infrastructure are being capitalized to answer questions about fish migrations and habitat use. Results will be used by Inuit fishers and managers to advance community-based fishery management (timing of harvest, harvest locations) and local understanding of how climate may affect the fishery. Equipment moorings will be assessed and improved through NRC collaboration, to facilitate year-round research in Arctic fluvial systems.

What has been done to date:

Inuit researchers and their partners worked together to track 56 char and tag an additional 13 char. The team maintained an array of 70 receivers that record transmissions from tagged fish in Coronation Gulf and the Coppermine River. Early results show that water temperature, water level and daylight affect fish when they migrate into the Coppermine River. Tagging data is being used to learn if char return to the same river to overwinter or if they move among different rivers in Coronation Gulf. In the past, it has been difficult to track fish overwinter because equipment moorings in the Coppermine River would break during freeze-up and break-up of river ice. In February 2024, an underwater robot with a camera was used to monitor the moorings under the ice in the Coppermine River, which should enable fish tracking throughout the winter and lead to answers of community questions about char overwintering and habitat use.



Augering through ice on the Coppermine River, NT.

05 PangWAS

Planning the future of water supply in Pangnirtung

The issue of water source availability is recognized as a major concern throughout the North. In the past 4 years, the City of Iqaluit has faced 3 water emergencies, 2 of which pertained to source availability. Its reservoir, Lake Geraldine, was not sufficiently recharged with adequate volume to ensure water supply through winter. Other communities rely on rivers fed by glaciers, and glacial retreat due to climate change, which means source water is increasingly precarious, as can be seen in Grise Fjord. Thawing permafrost is expected to impact surface water sources in, as yet, uncertain ways. Some studies indicate that surface lakes could disappear as permafrost thaws since water would seep deeper into the ground, forming larger taliks. In studying the Duval River, this project, led by the Hamlet of Pangnirtung with support of the NRC's Construction Research Centre, will establish an approach that could be adopted by other Nunavut communities seeking information about the future viability of their traditional surface water sources.

What has been done to date:

This year the project team focused on equipment selection and procurement, identifying the measurement point in the Duval River and installing velocity, depth and water quality probes into the river. The project also held its first stakeholder engagement session. Day 1 consisted of an in-person meeting with 10 elders and 3 high school students, followed by a visit to the Duval River. Day 2 saw the NRC addressing the Hamlet Council and mayor, followed by a celebration for the entire community. The project was also introduced to the wider community via radio broadcasts in both Inuktitut and English. In addition, the NRC presented the project at the annual Northern Territories Water and Waste Association Annual Conference in Yellowknife, with a representative from Pangnirtung in the audience.



Data acquisition system used to register water quality and flow data from the Duval River in Pangnirtung.

Let's bring your vision to life

At the NRC, our research centres offer specialized applied research and services across many disciplines. The multi-disciplinary nature of the NRC links Arctic-based engineering and applied science activities to key sectors, including health, food systems, transportation, infrastructure, the environment, renewable energy and safety. Our unique expertise and comprehensive tools and facilities combined with high ethical standards make us an ideal partner to support your vision. If you would like further information or if you are interested in partnering on research projects, please contact us. We are excited to discuss your ideas and to help you solve your most challenging research problems.



For all program enquiries, please contact,
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nrc.canada.ca/arctic-northern-challenge-program