Polar Knowledge Canada
Savoir polaire Canada

ADVANCING POLAR SCIENCE AND COLLABORATION

POLAR KNOWLEDGE CANADA

Report 2015–2017

Canada

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POLAR KNOWLEDGE CANADA

Advancing Polar Science and Collaboration
Polar Knowledge Canada: Report 2015–2017

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TABLE OF CONTENTS

Minister's Message 2

President's Message 3

About Polar Knowledge Canada 4

- **Our mandate**
- **A partner of choice**
- **Establishing POLAR in Cambridge Bay**

Harnessing Science and Technology to Address Arctic Challenges 8

- **Finding alternative, renewable energy sources**
- **Gathering information for northern sustainability**
- **Predicting and preparing for climate change impacts**
- **Improving northern infrastructure**

Translating Knowledge into Tangible Outcomes 14

- **Sharing and applying knowledge**
- **Building the next generation**

Board of Directors 19

Appendix 1: Projects funded by Polar Knowledge Canada's Science and Technology for the North program 20

Appendix 2: Projects funded by Polar Knowledge Canada's Polar Knowledge Application program 24

MINISTER'S MESSAGE

The Government of Canada is committed to renewing the relationship with Indigenous peoples, tackling the challenge of climate change, promoting economic development, and creating jobs. Polar Knowledge Canada (POLAR) is making great strides towards these broader priorities in the North, while strengthening Canada's polar science leadership.

As a science-based agency, POLAR's efforts involve both creating new knowledge and mobilizing science and technology activities, including undertaking and supporting the collection of baseline information, environmental monitoring, scientific research, and technology development to help address the challenges of climate change and strengthen the resilience of northern communities. Knowledge mobilization, outreach, and capacity building are also key areas of investment for POLAR. A major priority within the organization includes engaging Indigenous organizations and building capacity at the community level through training and participation in science and technology projects funded or carried out by POLAR.

POLAR is working to ensure that sound scientific knowledge informs decision-making in the North. POLAR can help foster science to support environmental protection, sustainable development, and the creation of jobs by investing in scientific research and by participating in Indigenous and Northern Affairs' design and construction process of the Canadian High Arctic Research Station (CHARS) campus to ensure alignment between the campus and POLAR's Science and Technology program.

Engagement is and will continue to be an integral part of POLAR's activities and it will help to create greater awareness of POLAR's mandate and polar science research and related opportunities. It will also initiate longer-term collaborations and partnerships. These partnering efforts have involved a high level of engagement with the Arctic and Antarctic scientific communities through technical workshops, roundtable discussions, conferences, and the development of agreements and project-specific initiatives to strengthen polar research.

The CHARS campus in Cambridge Bay, Nunavut, will provide a world-class hub for science, technology, and innovation in Canada's North. It will attract researchers from the world over and help to position Canada as an international leader in polar science and technology. Ultimately, it will help improve economic opportunities, environmental stewardship, and the quality of life of Northerners and all Canadians. POLAR will be headquartered at the CHARS campus once construction is complete, and will continue to ensure that staffing processes appropriately reflect commitments under the Nunavut Agreement. This facility will bring about major opportunities for Nunavut, including job creation and increased science and technology activity.

I am honoured to have POLAR as part of my portfolio and look forward to seeing it deliver on its very exciting mandate.

The Honourable Carolyn Bennett, PC, MP
Minister of Indigenous and Northern Affairs

PRESIDENT'S MESSAGE

As I meet with our key Canadian and international stakeholders in polar research, I am consistently gratified and rewarded by the positive impact Polar Knowledge Canada has already had on communities, researchers, and science organizations. Over the past 22 months, POLAR has made significant progress in creating new knowledge in all the priority areas established by our Board of Directors. Our Science and Technology team has begun to expand the baseline understanding of northern ecosystems; oversee research on alternative and renewable energy and on the impacts of changing ice, permafrost, and snow; and build partnerships to support improved design and construction of northern infrastructure. These partnerships will continue to create new knowledge that is needed by northerners, as the multi-year components of that research continue.

Consistent with the needs of an emerging new agency, we have been working to expand public awareness of POLAR with our current stakeholders and with additional new partners. We are helping to put northern research to work through knowledge products that inform decision-makers, support evidence-based policy development, and create greater Arctic and Antarctic awareness. We are also helping to build northern capacity through science camps and support to northern colleges and student employment.

The coming year will see POLAR continuing to partner with other federal departments and agencies in pursuit of Canada's objectives in areas such as understanding climate change, environmental stewardship, and open data. POLAR will continue to increasingly engage northern Indigenous communities to ensure its priorities, knowledge creation, and mobilization efforts align with their needs and to ensure Indigenous knowledge is respectfully incorporated in all that we do.

I look forward to seeing the results of a nation-wide public staffing initiative, as we welcome new employees at our headquarters at the Canadian High Arctic Research Station (CHARS) campus in Cambridge Bay, Nunavut. Central to this staffing initiative is our commitment to working towards our Inuit employment obligations under the Nunavut Agreement. Going forward, POLAR will continue to lead Canada as a northern nation through the creation and mobilization of polar science and technology knowledge and addressing the challenges of our dynamic polar regions and their people. This report outlines the work completed to date, from the establishment of POLAR on June 1st, 2015 until March 31, 2017.

David J. Scott, PhD
President & CEO

ABOUT POLAR KNOWLEDGE CANADA

Canada's federal agency to strengthen Canadian leadership in polar science and technology, Polar Knowledge Canada (POLAR) seeks to improve economic opportunities, environmental stewardship, and quality of life for Northerners and other Canadians. Based in Nunavut, POLAR brings together Indigenous and scientific expertise to create knowledge and help transform it into action on some of the urgent issues facing Arctic communities. POLAR also works to strengthen Canadian Antarctic research to increase Canada's leadership in polar science and technology.

OUR MANDATE

POLAR was established on June 1, 2015 through the *Canadian High Arctic Research Station Act*. The *Act* merged the mandate and functions of the former Canadian Polar Commission and the pan-northern Science and Technology Program associated with the Canadian High Arctic Research Station (CHARS) project of Indigenous and Northern Affairs Canada.

POLAR is Canada's primary point of contact within the circumpolar knowledge community. We fulfill a brokering role, strengthening connections between the Canadian and international research community and decision-makers, and facilitate collaboration and partnerships to address key knowledge gaps in polar regions.

POLAR's mandate is to:

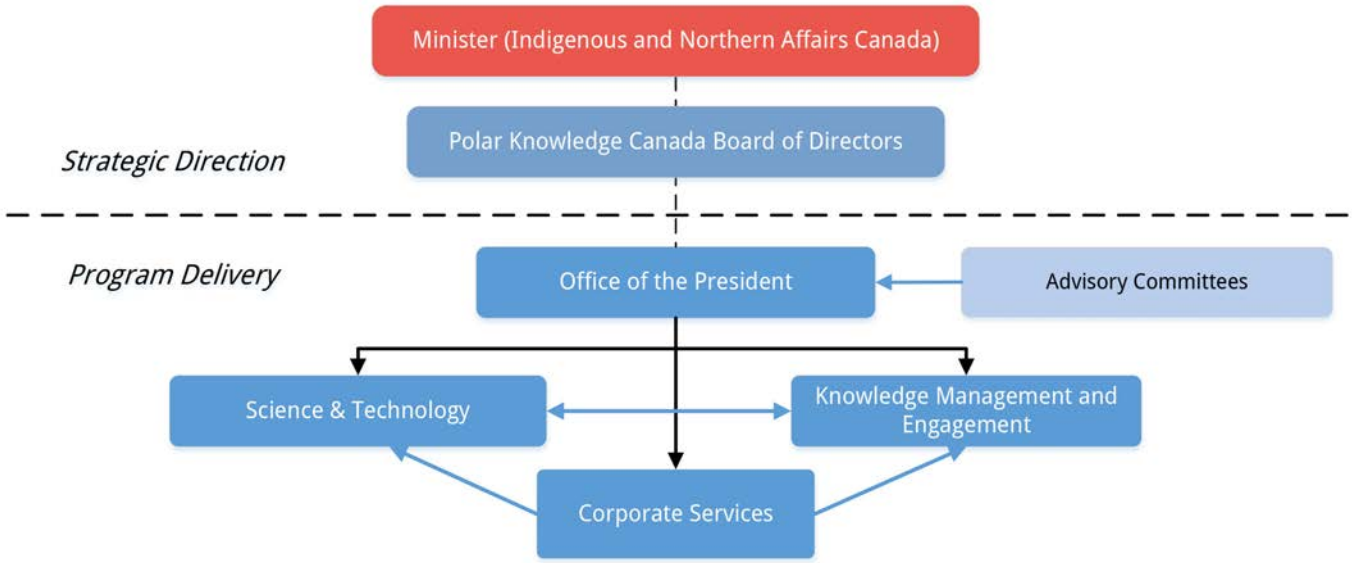
- advance knowledge of the Canadian Arctic to improve economic opportunities, environmental stewardship, and the quality of life for Northerners and all Canadians;
- promote the development and dissemination of knowledge of the Arctic and circumpolar regions, including the Antarctic;
- strengthen Canada's leadership on Arctic issues; and
- establish a hub for scientific research in the Canadian Arctic.

To carry out its mandate, POLAR:

- undertakes scientific research and develops technology in collaboration with partners;
- implements and supports partnerships in scientific research and technology development;
- promotes the testing, application, transfer, diffusion, and commercialization of technology;
- encourages integration across disciplines and activities;
- disseminates knowledge, including that produced by POLAR and by its partners;
- complements national and international networks of expertise and science facilities;
- facilitates the exchange of information between national and international stakeholders through workshops and meetings, and by being the lead contact for Arctic and Antarctic science and polar issues; and
- supports the next generation of polar scientists through activities such as science camps, college programs, internships, training, and summer employment.

POLAR brings together Indigenous and scientific expertise to create knowledge and help transform it into action

POLAR carries out these activities through its Science and Technology and Knowledge Management and Engagement programs. These operational units are supported by the Corporate Services Unit.



A PARTNER OF CHOICE

Given the large geographic scope of Canada's Arctic and the rate of change taking place in the region, partnerships are necessary for POLAR to deliver on its mandate. POLAR fulfills a brokering role, strengthening connections between Canadian science-based departments and agencies, Indigenous organizations, academia, and the private sector, as well as the international polar research community. POLAR also helps research organizations navigate the Canadian governance landscape, respect policies and procedures, and facilitate the inclusion of Indigenous knowledge.

POLAR collaborates with:

- Northerners (including Indigenous peoples, Indigenous organizations and governments, communities, and not-for-profit organizations), particularly in Cambridge Bay, where our headquarters is located
- Territorial and provincial governments
- Federal departments and agencies
- Academic institutions (universities and northern colleges)
- Private sector and industry
- International polar research organizations

ESTABLISHING POLAR IN CAMBRIDGE BAY

The Canadian High Arctic Research Station (CHARS) campus under construction in Cambridge Bay, Nunavut will become POLAR's permanent home once construction is completed in 2017. The CHARS campus will provide a year-round presence and complement the existing network of research facilities across Canada's North. Indigenous and Northern Affairs Canada (INAC) leads construction of the CHARS campus.

POLAR provided summer employment to five students in Cambridge Bay in 2016. The students supported field instrument installation, vegetation surveys and mapping, and freshwater and marine sampling. They also took part in capacity building and knowledge mobilization activities.

Construction of two triplex accommodation buildings, for use by up to 48 visiting scientists and researchers, was completed in early 2016. The Field and Maintenance Building, expected to be ready in spring 2017, will be used for staging and preparing field equipment, and for servicing POLAR's assets. This building will also serve as POLAR's initial offices on the CHARS campus.

The heart of the CHARS campus will be the Main Research Building. It will house state-of-the-art laboratories, offices for POLAR employees and visiting scientists, and multi-use spaces open to the public. The CHARS campus will be operational in time for Canada's 150th anniversary in 2017. Construction and site clean up will continue throughout the summer in Cambridge Bay, Nunavut and a grand opening ceremony is planned for later in 2017.

This year, POLAR undertook to staff positions in Cambridge Bay. Our first hires were recent graduates from Nunavut Arctic College, as well as experienced scientists and analysts from across Canada and beyond.

The Canadian High Arctic Research Station (CHARS) campus will become POLAR's permanent home once construction is completed in 2017

Reaching out to the community

POLAR has been operating in temporary offices in Cambridge Bay, Nunavut, supporting scientists whose research is based in the Kitikmeot region and engaging with the community. During the 2015–2016 research season, POLAR provided 850 days of support to researchers in Cambridge Bay. They included academic, non-profit sector, federal government, and international researchers, as well researchers funded by POLAR.

Among community activities, staff held an open house and organized science camps to promote science education among local youth. Over the last two years, 28 camps have welcomed 218 participants.

POLAR also participated in regional activities, such as the Kitikmeot Regional Career Fair and Trade Show and the National Inuit Youth Summit Career Showcase.

- Kitikmeot Regional Career Fair: In September 2016, the Municipality of Cambridge Bay organized the Kitikmeot Regional Career Fair, with stops in Taloyoak, Gjoa Haven, Kugaaruk, Cambridge Bay, and Kugluktuk. The fair aimed to promote education and career opportunities and encourage residents to take advantage of business expansion and start-up opportunities. Participants included the Government of Nunavut, various federal government departments, the Nunavut Impact Review Board, and numerous private sector companies.

- Kitikmeot Trade Show: Every year POLAR and Indigenous and Northern Affairs Canada participate in the Kitikmeot Trade Show in Cambridge Bay. This was an excellent opportunity to review with participants the work POLAR has engaged in over the last year and share upcoming programming initiatives, as well as Indigenous and Northern Affairs' progress on the construction of the CHARS campus. Five POLAR representatives participated in 2017 along with representatives from Indigenous and Northern Affairs. During the Trade Show, POLAR's President David J. Scott met with key stakeholders, notably Senator Dennis Patterson (Nunavut) and the Premier of Nunavut, Peter Taptuna. Indigenous and Northern Affairs Canada and POLAR also hosted a sneak peek of the Main Research Building of the CHARS campus.

HARNESSING SCIENCE AND TECHNOLOGY TO ADDRESS ARCTIC CHALLENGES

Science and technology evidence-based policy is vitally important to tackling the challenges that Arctic communities face in Canada. Science and technology, in concert with traditional Indigenous and local knowledge, can help address the effects of climate change and other challenges.

The knowledge gained through scientific and technological research and training will support greater sustainable use of the Arctic's land and natural resources. Indigenous and Northern Affairs Canada, in collaboration with a wide variety of stakeholders, established four priorities for POLAR's 2014–2019 pan-northern science and technology program:

- finding alternative and renewable energy sources for the North;
- gathering baseline environmental information to prepare for northern sustainability;
- predicting the impacts of changing ice, permafrost, and snow on shipping, infrastructure, and communities; and
- catalyzing improved design, construction, and maintenance of northern infrastructure.

In 2015–2017, POLAR funded 32 projects through its Science and Technology for the North program (see Appendix 1).

CHARS EXPERIMENTAL AND REFERENCE AREA (ERA)

An Experimental and Reference Area (ERA) is being established surrounding the Canadian High Arctic Research Station (CHARS) campus and the Hamlet of Cambridge Bay, as a place where scientists using the facility can conduct detailed research on marine, freshwater, and terrestrial ecosystems in a safe and supported environment. The goal is to conduct inventories and to establish long-term monitoring projects that will inform future research and policy development.

Some instrumentation has already been installed, including a weather station, river flow gauges, eddy covariance towers to monitor carbon flux from the ground, and marine moorings. A wildlife health monitoring program has begun to take shape in the form of muskox studies, Arctic char monitoring, and arthropod sampling.

FINDING AND HARNESSING ALTERNATIVE, RENEWABLE ENERGY SOURCES

Northern communities are not connected to the large North American electricity grids, and most rely on local diesel generators for power. While diesel generation is reliable and responsive to demand, getting the fuel to remote communities, often inaccessible by road, is costly. Diesel generation also creates significant greenhouse gas emissions.

Alternative clean, renewable energy sources and technologies adapted to the northern culture and climate are needed to help reduce northern communities' dependence on fossil fuels. POLAR has been working with private sector and government partners to implement alternative and renewable energy technologies in the North, test and adapt these to extreme northern environments, and demonstrate viability and cost savings for the communities.

WHATÌ NWT BECOMES ITS OWN HEAT UTILITY

When the district biomass heating system comes online in Whatì, NWT in March 2017, it will allow the community to become its own heat utility. The wood pellet biomass boiler swill offset 38,000 litres of heating fuel annually, reduce 100 tonnes of greenhouse gas, and generate savings and revenue of approximately $40,000 per year.

POLAR contributed to the site preparation and building of the system for the first-ever biomass boiler in northern Canada. The system will initially heat four buildings in a community accessible only by ice road. This is the first phase of a larger project to heat additional buildings and use local, renewable wood chips as its main fuel.

In 2015–2017, POLAR funded projects that investigated the use of wood pellets to reduce the use of heating oil in community buildings in Whatì, as well as two solar demonstration projects in Inuvik, NWT. One will help offset diesel-generated electricity at the Inuvialuit Corporate Centre. The other is training Inuvialuit community members in the use of solar power for community freezers in off-grid camps, something that could enhance food security. In Sanikiluaq, Nunavut, a wind monitoring tower will provide data for potential future wind power development in the community.

Furthermore, solar panels have been integrated into the design of the Main Research Building on the CHARS campus and have been installed on the southern façade. Although these panels will produce less than 1% of the station's power, they will be used to facilitate testing of photovoltaics. The CHARS campus was designed not only to have researchers and scientists work in the laboratories, but also to allow for testing of various technologies.

GATHERING INFORMATION FOR NORTHERN SUSTAINABILITY

Indigenous peoples' knowledge of the Arctic is built on centuries of experience and close observation. For scientists, however, the Arctic is one of the least studied and understood regions of the planet. Both are concerned about the significant changes occurring, such as loss of sea ice, melting permafrost, and changing ecological systems.

Because of the Arctic's vast size, remoteness, and complexity, many gaps exist in the scientific understanding of the region. This is compounded by the region's diverse geography, climate, and economy. POLAR is working to fill those gaps, to

better understand how northern ecosystems function, how they might change under a changing climate and greater resource exploitation and economic activity, and what that means for northerners, Canadians, and the world.

CATALOGUING NEARSHORE ECOSYSTEMS

Shifting freshwater input, changes in upwelling and current regimes, fluctuations in water temperature and chemistry, increased human activity—all these affect the health and biodiversity of nearshore ecosystems.

To provide baseline information and document different nearshore ecosystems, habitats, and marine life in the Arctic, the Vancouver Aquarium Marine Science Centre, working with Polar Knowledge Canada and supported by community experts, launched Nearshore Ecological Surveys (NES) in 2015 and again in 2016.

Over the course of one month and 56 dives, the 2016 NES team visited 25 sites in the Cambridge Bay area: 176 species were recorded in a variety of habitats at a range of depths.

In 2015–2017, POLAR supported 20 projects to improve information on how climatic, industrial, and other changes are affecting the region's land and marine flora and fauna. This knowledge could reduce risk for sustainable industry investment, help track the net benefits of a stronger economy, and provide management tools for decision-makers.

For example, the Bathurst Caribou Herd has been a critical food source for some Indigenous communities for centuries. The number of caribou has been dropping so much that the Government of Northwest Territories (NWT) has banned hunting of this animal. Working with territorial and Indigenous governments and organizations, and other key stakeholders, the NWT government is developing a plan to manage the Bathurst Caribou range and help prepare for any future changes to habitat.

In another collaborative project, involving the Vancouver Aquarium Marine Science Centre and POLAR, near-shore ecosystems in Cambridge Bay were surveyed to document ecological, topographical, logistical, and other details. This data will provide a baseline for future researchers and valuable information for the conservation and protection of these sensitive areas.

Other projects looked at long-term watershed monitoring and the impact of climatic changes and mining development on both people and ecosystems. See Appendix 1 for a full list of projects.

Being able to better estimate climate change impacts would inform measures to increase the resilience of northern communities

PREDICTING AND PREPARING FOR CLIMATE CHANGE IMPACTS

Rising temperatures are altering the Arctic coastline. Reduced sea ice and snow cover, thawing permafrost, and sea-level rise could bring about much larger changes, including coastal erosion, more frequent flooding of low-lying areas, and breaching of freshwater lakes.

Thawing permafrost could further shorten the season during which ice roads can be used, affecting the many communities that depend on these roads for the transport of food and other materials. Settling could also result as the permafrost layer thins, presenting engineering challenges to infrastructure such as roads, buildings, and industrial facilities.

Sea ice changes could also increase access to shipping routes and resources, with increased risks of environmental degradation.

Being able to better estimate the magnitude and rate of climate change and its impacts on ecosystems across the North would increase the ability of northern communities to adapt, ensure the safety and sustainability of shipping, and extend the lifespan of infrastructure.

MAKING WINTER TRAVEL SAFER

A community-academic-government-industry partnership, SmartICE is developing a near-realtime sea ice monitoring and information-sharing system that blends Inuit local and traditional knowledge with state-of-the-art technology to make ice travel safer. Thickness sensors, placed in the ice along routes that hunters have identified as potentially unsafe, send measurements to a website where they can be retrieved locally. Sensors have also been mounted on an ice sled to take measurements while travelling.

SmartICE not only contributes to community safety, but also facilitates local economic development and reduces costs for government services such as sea lift and emergency management. SmartICE was honoured with the 2016 Arctic Inspiration Prize, which recognizes research and projects that translate knowledge into action for the benefit of the people of the Canadian Arctic, and provided significant funding to continue to expand the project.

POLAR-supported projects are looking at various facets of the changing climate. For example, researchers are studying how changing climatic and permafrost conditions affect the flow and quality of water of the Apex River near Iqaluit to determine if the river could be a safe and sustainable water supply for the city.

The Sea-ice Monitoring And Real-Time Information for Coastal Environments (SmartICE) project combines scientific and local knowledge to monitor ice thickness on travel routes (see box: Making winter travel safer). Another collaborative project, led by Ocean Networks Canada, is improving the understanding of sea ice processes, especially those critical to Arctic transportation.

The full list of projects can be found in Appendix 1.

IMPROVING NORTHERN INFRASTRUCTURE

Many northern communities suffer from a lack of adequate housing and climate change is threatening existing housing and other infrastructure. As permafrost degrades, the ground sinks and damages housing, roads, airstrips, and waste management systems.

The problem is becoming more acute, as communities like Iqaluit expand and the Arctic warms faster than previously foreseen. City planners, engineers, architects, and Indigenous groups are seeking ways to improve adaptation to changing conditions in the North. Addressing the issue is a technical, cultural, financial, and environmental challenge.

POLAR is committed to advancing the knowledge base and increasing information exchange to improve the suitability and sustainability of housing in the North, and to developing more affordable options in remote communities.

COLLABORATING ON THE GROUND AND IN THE AIR

In June 2015, POLAR and the National Aeronautics and Space Administration (NASA) agreed to unite their strengths to study the vulnerability—and resilience—of Arctic ecosystems and society to environmental change: NASA's superb remote sensing capability, and POLAR's networks, northern connections, and on-the-ground capacity.

The collaboration involves aligning POLAR's science activities in the region with NASA's 8–10 year Arctic Boreal Vulnerability Experiment (ABoVE). Among planned activities are an Airborne Science Campaign (2017–2019) using six different high-tech sensors, flown on fixed-wing aircraft, to produce high-resolution radar, laser, and optical data on ground and water conditions.

This new data will greatly improve efforts to understand the changing environment in Arctic and Boreal regions and help validate satellite-based monitoring. It will also guide the development of local, national, and international adaptation strategies.

In February 2016, POLAR hosted a workshop to foster relationships among concerned parties. Participants included technical specialists from a range of disciplines, occupants and operators of private and public northern housing, and northern governments, to share knowledge and work collaboratively.

In addition, POLAR supported key housing experts as they gathered in Yellowknife in February 2017 to begin planning the Northern Community Housing Forum, to take place in Yellowknife on January 23–25, 2018. The forum will bring together individuals experienced with housing challenges in the North, including community members, local housing authorities, youth, scientists, health professionals, policy analysts, building engineers, maintenance operators, government, and research organizations. Together they will share information and develop a comprehensive way to approach sustainable housing in a holistic manner, putting community knowledge at the core.

POLAR also works to address other infrastructure issues within northern communities, including ways to improve waste and wastewater treatment. For example, POLAR established a team to identify partners to pursue emerging wastewater technologies appropriate for the North.

TRANSLATING KNOWLEDGE INTO TANGIBLE OUTCOMES

During the International Polar Year (IPY) 2007–2008, all Canadians had opportunities to learn more about our Arctic and its residents and the importance of the polar regions for the world. During IPY, polar countries around the world agreed to make a concerted effort toward advancing scientific understanding of the Arctic and Antarctic.

The closing IPY conference "From Knowledge to Action," held in Montreal in 2012, reiterated the importance of developing the North and conserving its environment for the benefit of local communities. It provided an opportunity to apply and disseminate the knowledge and IPY results from around the world and focus on next steps: translating knowledge into tangible outcomes.

POLAR has a unique role to play in advancing our collective understanding of polar environments by mobilizing current knowledge to address local and global concerns, such as climate change and adaptation, and by helping to train the next generation of polar researchers.

In 2015–2016, the Knowledge Management sub-programs funded 18 projects, including national workshops. See Appendix 2 for a list of projects.

SHARING AND APPLYING KNOWLEDGE

Through its Knowledge Management and Engagement program, POLAR seeks to strengthen and coordinate partnerships and collaboration between researchers and help ensure that research results inform policies and programs.

From an initial focus on creating awareness through various communications products, POLAR's focus is shifting to synthesizing and communicating scientific information on the Arctic and Antarctic for the public, students, and policy makers, and leveraging collaborations with other organizations. For example, POLAR and Natural Resources Canada's Atlas of Canada and Polar Continental Shelf Program produced updated maps of the Circumpolar North and Antarctic in collaboration with Global Affairs Canada and the British Antarctic Survey.

In 2015–2017, POLAR supported nine projects to boost awareness of Arctic and Antarctic science and technology. These were as varied as offering awards for notable contributions to Arctic research, producing maps and guidebooks, and supporting data management services.

For example, POLAR partnered with Canadian Geographic's Education Program to produce circumpolar and Antarctic maps and education kits for schools across Canada. These will allow students to explore these regions from political, environmental, cultural, and geographical perspectives. In partnership with Canadian Geographic Magazine, POLAR is also developing and publishing a POLAR Blog featuring articles that highlight Canadian polar research.

A grant to the Kitikmeot Heritage Society allowed the society to produce a guide that provides Inuit and northern cultural context for researchers working in Cambridge Bay. The manual contains pertinent information on Cambridge Bay's past and present to encourage communication, understanding, and collaboration between researchers and the community.

A full list of Knowledge Management projects can be found in Appendix 2.

Opening the discussion

To facilitate discussion among key stakeholders supporting the advancement of polar science and technology, POLAR organized national workshops on topics such as ocean science, northern housing and infrastructure, coastal biodiversity, marine science, and Antarctic research. These included the following:

Understanding Ocean and Climate Interaction in the Arctic

With the University of Victoria and Ocean Networks Canada, POLAR held a workshop on ocean science in the Arctic in January 2016. The workshop aimed to identify important areas for advancing knowledge of the study of the interaction between oceans and climate and to find ways to improve collaboration.

Exploring the Challenges of Northern Housing

The Canada Mortgage and Housing Corporation, the National Research Council, and Natural Resources Canada partnered with POLAR to hold a workshop on northern housing challenges in February 2016. This workshop provided an opportunity to share knowledge with leading experts and colleagues on technical, risk and resilience, and socio-economic topics.

Monitoring Circumpolar Biodiversity

POLAR's Coastal Workshop for the Circumpolar Biodiversity Monitoring Program, held in Ottawa in March 2016, explored biodiversity monitoring efforts, issues facing biodiversity in Arctic coastal waters, and indicators for monitoring ecosystems. The workshop resulted in a draft Arctic Coastal Biodiversity Monitoring Plan.

Marine Science in the Kitikmeot Region

Research carried out in the last two years to increase baseline knowledge of the marine environment in the Kitikmeot, an area within the CHARS Experimental Research Area (ERA), has helped advance knowledge of environmental processes within the region. POLAR supports this research through targeted funding, logistics support, and travel, and by bringing together partners to enhance collaboration. A marine ERA science meeting, held in May 2016, helped develop a common understanding of research and program priorities.

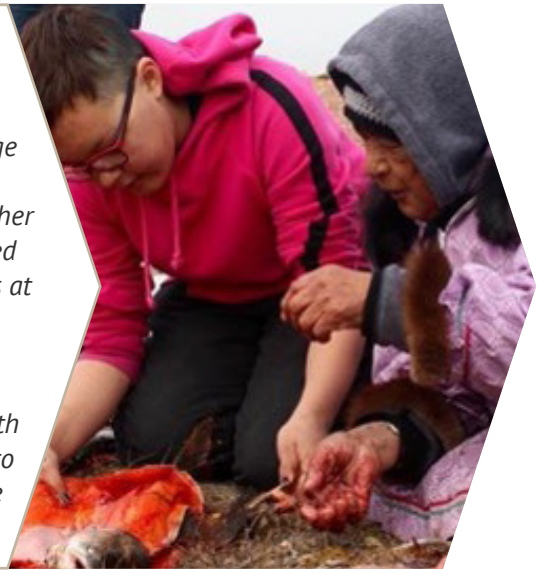
Antarctic Research

POLAR convened a Canadian Antarctic Research Workshop in Ottawa in October 2016 to explore opportunities to strengthen Canadian Antarctic research activities, including through the development of a Canadian Antarctic Research Program. Workshop findings will inform next steps for developing a program and other activities under POLAR's Antarctic mandate.

ELDER-YOUTH KNOWLEDGE SHARING CAMP

Arctic char is an important part of the diets of Cambridge Bay residents and a valued commercial resource. POLAR helped fund a 5-day knowledge sharing camp facilitated by the Ekaluktutiak Hunters and Trappers Organization to show how scientific and Inuit knowledge can work together to contribute to the long-term sustainability of the fish. The camp fostered communication, as elders and youth worked alongside fisheries scientists at the Ekalluk River during the char run in August 2016.

Camp participants viewed the experience as an excellent opportunity to engage with many age groups within the community, including Inuit youth and elders. The activities and results will be captured in a documentary to be produced by Artless Collective, a group of filmmakers from Yellowknife with strong ties to the Cambridge Bay community.



Building international partnerships

POLAR serves as Canada's primary point of contact within the circumpolar knowledge community, and is Canada's adhering body to the International Arctic Science Committee (IASC) and the Scientific Committee on Antarctic Research (SCAR). POLAR is also an observer of the Council of Managers of National Antarctic Programs (COMNAP). In addition, POLAR liaises with research organizations and institutes throughout the circumpolar world, providing guidance for multilateral scientific projects relevant to Canadian interests.

Building international partnerships is a central part of POLAR's mandate. In 2015–2016, POLAR played a leadership role in the following:

- POLAR coordinated Canada's engagement in the White House Arctic Science Ministerial that was held in Washington, DC on September 28, 2016.
- POLAR signed Memorandums of Understanding (MOUs) and agreements with Iceland, Japan, and the U.S. National Aeronautics and Space Administration (NASA) in 2016. These partnerships will help strengthen international collaboration on Arctic research and attract scientists to work at the CHARS campus and surrounding regions.
- POLAR led Canada's delegation to the Arctic Council's Scientific Cooperation Task Force during the Canadian and U.S. chairmanships of the Arctic Council, to develop a legally-binding agreement to enhance science cooperation among Arctic states and other Arctic interested states.
- POLAR provides expertise to the Arctic Council's Sustainable Development Working Group's Arctic Remote Energy Networks Academy (ARENA) initiative, which builds clean energy capacity in communities.
- POLAR participated in discussions regarding Antarctic science issues at the Antarctic Treaty Consultative Meeting in Sofia, Bulgaria in June 2015 and in Santiago, Chile from May 23 to June 1, 2016.

Through the 2013 Galway Statement on Atlantic Ocean Cooperation, Canada, the European Union, and the United States agreed to strengthen cooperation on Arctic, ocean, and marine science and research. As Canada's co-chair for the Galway implementation Arctic working group and National Contact Point for Canada–EU cooperation in Arctic research, POLAR helps coordinate the participation of Canadian Arctic research stakeholders in Horizon 2020 projects and other Galway-related initiatives.

BUILDING THE NEXT GENERATION

POLAR places great emphasis on inspiring, motivating, and supporting northern youth to continue their education and pursue a career in science and technology, or in industries that operate in the Arctic. Its capacity building activities include training, outreach, and employment opportunities that support and advance the next generation of polar researchers.

In December 2015, POLAR launched a Canada-wide staffing process to fill positions in Cambridge Bay, with preference given to individuals self-identifying as Inuit under the Nunavut Agreement. POLAR has also prioritized summer student hiring and provides support to Nunavut Arctic College's Environmental Technology Program (ETP) in Cambridge Bay. POLAR is also participating in the Inuit Learning Development Project (ILDP), which is designed to provide Inuit with practical work experience to prepare for potential careers in the public service.

POLAR delivered camps to youth in Cambridge Bay on subjects that included science, technology, engineering, and math. Funding to organizations like Actua ensured that engagement with northern youth in such activities increased, and that science and technology was promoted across northern communities. POLAR also administered the Northern Scientific Training Program, which supports early career researchers enrolled in graduate programs.

A full list of capacity building projects can be found in Appendix 2.

Recognizing excellence

To encourage leadership and excellence in northern science, and to help foster the next generation of polar science professionals, POLAR administers awards to recognize contributions by both students and experienced scientists.

Northern Science Award

The Northern Science Award recognizes an individual or group that has made a significant contribution to knowledge and understanding of the Canadian North and, in the spirit of International Polar Year (2007–2008), recognizes the transformation of knowledge into action. Laureates receive the Centenary Medal and a cash award of $10,000.

In 2015, the award was conferred on ***Louis Fortier*** in recognition of his leadership and his innovative approach to research. Fortier is a marine biologist at Université Laval and Scientific Director of ArcticNet.

In 2016, Queen's University limnologist ***John Smol*** received the award for his long record of leadership and contributions to the North and its people.

Student Awards

The names of George Hobson, Malcolm Ramsey, Robert McGhee, and Eric Dewailly are renowned and distinguished in Arctic natural and social sciences research. POLAR annually offers awards of $1,000 in each of their names to outstanding Northern Scientific Training Program recipients.

In 2016 those awards went to:

- George Hobson Memorial Award to Ashley Dubnick (University of Alberta) for work on the project "Characterizing the biogeochemistry of microbial community structures of subglacial environments."
- Malcolm Ramsay Memorial Award to Myriam Labbé (Université Laval) for work on the project "Diversité et dynamique des virus aquatiques du Grand Nord canadien dans un context de changements climatiques."
- Robert McGhee Award to Dorothée Dubé (Université Laval) for work on the project "La ferme de Svalbaro à l'époque médiévale et postmédiévale : reconstitution de l'environnement et des modes de vie islandais grâce à l'application de l'archéoentomologie."
- Eric Dewailly Memorial Award to Alexandra Sawatzky (University of Guelph) for work on "Building local & indigenous systems (Building LINKS): Community-led environment & health surveillance for adaptation."

BOARD OF DIRECTORS

Polar Knowledge Canada is a Departmental Corporation, reporting to the Minister of Indigenous and Northern Affairs. A nine member Board of Directors approves the organization's science and technology plan, annual work plans, and budget. All Board members are appointed by Order-in-Council to hold office for terms not exceeding five years, and are eligible for re-appointment for a second term of office. Members of the Board of Directors hold office on a part-time basis.

The Board reports directly to the Minister of Indigenous and Northern Affairs Canada, through the Chairperson.

PART-TIME APPOINTEE	APPT/EXPIRY DATE
Chairperson	
Boudreault, Richard Montréal, Quebec	2015-07-28 2020-07-27
Vice-Chairperson	
Cournoyea, Nellie J. Inuvik, NWT	2013-11-07 2016-11-06
Members	
Gannicott, Robert A.* Yellowknife, NWT	2015-06-01 2016-08-03
Hik, David S. Edmonton, Alberta	2015-06-01 2016-11-06
Huebert, Robert Calgary, Alberta	2015-06-01 2015-12-12
Jean-Louis, Maxim Jacques Sudbury, Ontario	2015-06-01 2015-12-12
King, Janet E. Ottawa, Ontario	2015-06-18 2020-06-17
Nightingale, John West Vancouver, BC	2015-06-01 2015-12-12

*Deceased August 3, 2016

APPENDIX 1

PROJECTS FUNDED BY POLAR KNOWLEDGE CANADA'S SCIENCE AND TECHNOLOGY FOR THE NORTH PROGRAM

Strategic Priority: Alternative and Renewable Energy for the North

PROJECT	DETAILS	CONTACT
Whatí Biomass District Heating System	Biomass District Heating System, which will provide wood pellet heat to four community buildings, reducing the community's heating oil consumption and carbon footprint.	Lisa Nitsiza, Community Government of Whatí
Sanikiluaq Wind Energy Project	Wind monitoring tower to assess the local wind resource prior to future wind farm development on the site.	Sheldon Nimchuk, Qikitaaluk Business Development Corporation and Sanikiluaq Development Corporation
Inuvialuit Regional Corporate (IRC) Centre Renewable Energy Project	Solar demonstration project on the IRC Centre to offset diesel-generated electricity through the production of clean electricity.	Jiri Raska, Inuvialuit Regional Corporation
Inuvialuit Community Economic Development Organization Renewable Energy Project	Solar demonstration project on the community freezer that includes a training program to enable Inuvialuit to learn about solar installation for off-grid camps.	Jiri Raska, Inuvialuit Community Economic Development Organisation

Strategic Priority: Baseline Information to Prepare for Northern Sustainability

Monitoring of small mammals and their predators in the Canadian Arctic	Using small mammals and their predators to track vital ecosystem components and evaluate the effects of factors like changing snow conditions or local resource development.	Gilles Gauthier, Département de biologie et Centre d'études nordiques, Université Laval
Baker Lake Aquatic Cumulative Effects Monitoring Program–Phase 1 Methods Development	Establishing the methods for long-term watershed monitoring in Baker Lake, Nunavut, to gauge the cumulative effects of further mining activities combined with potential effects of climate change.	Luis Manzo, Kivalliq Inuit Association
Health of Fisheries Resources (Arctic Char) in the Lower Coppermine River	Collecting life history data from Arctic char, collecting biological samples for analyses of heavy-metal contaminants collecting water quality samples from the Lower Coppermine River.	Cam Stevens and Barbara Adjun, Golder Associates Ltd. and Angonatit Niovikuia Ltd. (Kugluktuk)

PROJECT	DETAILS	CONTACT
Enabling Community Well-Being, Self-Monitoring for Yukon First Nations	Using social determinants of health to assess the impact of a potential mining project in the Dawson Range (Yukon) on Little Salmon/Carmacks First Nation and nearby communities.	Ben Bradshaw, Department of Geography, University of Guelph
Shrub Monitoring in Canada's Arctic	Improving methods for monitoring and analyzing changes in shrub cover in the Mackenzie Delta, and in the area affected by the Inuvik to Tuktoyaktuk Highway.	Joe Acorn, Environmental Management – Stantec
Monitoring Land Surface and Permafrost Conditions along the Inuvik–Tuktoyaktuk Highway Corridor	Developing baseline maps of the corridor and monitoring the changes of land cover and drainage conditions using satellite images, aerial photos, and field observations.	Yu Zhang, Canada Centre for Remote Sensing, Natural Resources Canada
Geoscience Tools for Supporting Environmental Risk Assessment of Metal Mining	Assessing the cumulative effects of natural and human-driven changes, on the transport and fate of metals and health of regional ecosystems in areas of high resource potential in the Canadian North.	Jennifer Galloway, Research Scientist, Geological Survey of Canada
Bathurst Caribou Range Plan	Using traditional, local and scientific knowledge to develop a Bathurst Caribou Range Plan, working collaboratively with Territorial Governments, Aboriginal Governments and Organizations, the industrial sector and public organizations.	Karin Clark, Wildlife Division, Department of Environment and Natural Resources, Government of the Northwest Territories
Community-based monitoring for aquatic invasive species in the Canadian Arctic– preparing for increased shipping	Developing community-based monitoring that will allow for early detection of aquatic invasive species (AIS) and characterization of baseline coastal marine biodiversity.	Kimberley Howland, Department of Fisheries and Oceans, Central and Arctic Region
Resource development, marine shipping and Arctic wildlife: a model of public-private partnership to address potential environmental impacts	To inventory and predict seabird and fish use of marine sites relevant to proposed shipping routes in Hudson Strait and north Baffin Island.	Grant Gilchrist, Research Scientist, National Wildlife Research Centre, Environment and Climate Change Canada.
Biological indicators to monitor aquatic ecosystem health in NWT communities	Using biofilms and zooplankton to assess the impacts of resource development, municipal wastewater, and climate change on freshwater environments near NWT communities.	Erin Kelly, Environment and Natural Resources, Government of the Northwest Territories

PROJECT	DETAILS	CONTACT
Fire in the Arctic: The interactive effects of landscape, hydrology, and permafrost change on aquatic ecosystem health	Tracking the effects of fire, a natural process increasing in the north, on aquatic ecosystems. The work is work will be based from two established NWT monitoring sites.	Suzanne Tank, Department of Biological Sciences, University of Alberta
Cryosphere, vegetation, and freshwater monitoring in the western Canadian Arctic	Documenting the state of the cryosphere, vegetation, and freshwater using field observations from long-term research and remote sensing.	Philip Marsh, Department of Geography and Environmental Studies, Wilfred Laurier University
Community-Based Monitoring Projects to Contribute to Terrestrial Biodiversity Monitoring Assessments	Using community-based monitoring and traditional knowledge to produce baseline information for evaluating and tracking impacts of climate change on human and ecological systems.	Eva Kruemmel, Inuit Circumpolar Council Canada
Community-Led Environment & Health Surveillance for Adaptation	Developing a community-based environment–health surveillance and response system in Rigolet, Nunatsiavut; and a systematic and standardized survey on environmental health outcomes.	Sherilee Harper, Department of Population Medicine, Ontario Veterinary College, University of Guelph
Tłı̨chǫ Aquatic Ecosystem Monitoring Program	Conducting community-based contaminants-related research, including the collection of fish, water, and sediment samples, and observations using both Tłı̨chǫ and scientific knowledge to address the question: "Are the fish safe to eat and is the water safe to drink?"	Jody Pellissey, Executive Director, Wek'èezhìı Renewable Resources Board, Yellowknife NWT
Consolidating the State of Knowledge on Caribou Health to Enable Tracking of Trends in a World Under Change	Baseline research on pathogen prevalence and stress levels in order to track changes over-time and evaluate impacts of environmental change on Caribou health.	Susan Kutz, Faculty of Veterinary Medicine, University of Calgary
Nearshore Ecological Survey (NES) 2016	Documenting different nearshore ecosystems, habitats and marine life around Cambridge Bay, and generate a report that will serve as the beginnings of a marine ecosystem catalogue.	Jeremy Heywood, Vancouver Aquarium Marine Science Centre

PROJECT	DETAILS	CONTACT
Kitikmeot Region Marine Science Study	Multi-disciplinary, integrated oceanographic exploration of Coronation Gulf, Queen Maud Gulf and Chantrey Inlet area to provide a baseline description of its geochemistry, biology and physical oceanography.	Adrian Schimnowski, Arctic Research Foundation
Churchill Marine Observatory	Collection of ecological data at a variety of nearshore locations and shipping lanes in the Churchill River estuary, Hudson Bay and Hudson Strait.	David Barber, Faculty of Environment, Earth, and Resources, University of Manitoba

Strategic Priority: Predicting the Impacts of Changing Ice, Permafrost, and Snow on Shipping, Infrastructure, and Communities

Environmental Monitoring Through Science Outreach	Training northern students to monitor water quality and sea ice break-up.	Rick Armstrong, Nunavut Research Institute
Safe Passage: Sea Ice Research for Arctic Resource Development and Northern Communities	Improving understanding of coastal sea ice processes critical to Arctic transportation using existing coastal observation and modelling programs. The data and model improvements will be linked to the Canadian Ice Service for broad access.	Richard Dewey, Ocean Networks Canada
SmartICE Pond Inlet: a sea ice information service to support local decision-making	Improving sea ice information and improved forecasting services for Pond Inlet. It builds on a prototype monitoring system developed for coastal Labrador communities. The project deploys in-situ and mobile sea ice thickness sensors in areas where Inuit travel and the ice is known to be dangerous.	Trevor Bell, Geography Department, Memorial University of Newfoundland
Hydrological and water quality monitoring, research and training in the Apex River watershed, Iqaluit, Nunavut	Understanding and predicting of the freshwater supply in the Apex River, under consideration as a supplementary source of drinking water for Iqaluit.	Murray Richardson, Department of Geography and Environmental Studies, Carleton University

APPENDIX 2

PROJECTS FUNDED BY POLAR KNOWLEDGE CANADA'S POLAR KNOWLEDGE APPLICATION PROGRAM

Strategic Priority: Knowledge Management

PROJECT	DETAILS	CONTACT
University of Waterloo, Polar Data Catalogue	Data management services for POLAR's Science and Technology Program.	Polar Knowledge Canada
Arctic Inspiration Prize	Participation in Arctic Inspiration Prize, which honours substantial contributions to Arctic research and the transformation from knowledge to action.	Arctic Inspiration Prize
Guidebook for Research with Nunavut Communities, Cambridge Bay Edition	Development of a guide that provides Inuit and northern cultural context for researchers working in Cambridge Bay, Nunavut.	Kitikmeot Heritage Society
Northern Science Award	The Northern Science Award honours a meritorious contribution to northern science, in the spirit of knowledge to action.	Polar Knowledge Canada
Sustainable Development Technology Canada (SDTC)	Polar Knowledge Canada support to SDTC Call for Proposals for Clean Technology.	Sustainable Development Technology Canada
Pembina Institute	Polar Knowledge Canada and Pembina Renewable Microgrids Conference.	Polar Knowledge Canada
Canadian Network of Northern Research Operators (CNNRO)	Development of a strategic plan for CNNRO.	Canadian Network of Northern Research Operators
Circumpolar and Antarctic Maps	In partnership with Canadian Geographic Education, wall maps of Circumpolar North and Antarctica distributed to educators across Canada; giant floor maps and corresponding educational kits available to schools.	Polar Knowledge Canada
The Polar Blog	In partnership with Canadian Geographic Magazine, series of short articles highlighting Canadian polar research.	Polar Knowledge Canada

National Workshops

WORKSHOP/PROJECT	DETAILS	CONTACT
Ocean Science in the Arctic Workshop (January 21 2016, Ottawa, Ontario)	Workshop held in partnership with the University of Victoria and Ocean Networks Canada to identify key areas to advance the study of the ocean/climate nexus and enhance collaboration.	Polar Knowledge Canada
Collaborative Action on Northern Housing Infrastructure (February 25 2016, Ottawa, Ontario)	Workshop held in partnership with Canada Mortgage and Housing Corporation, National Research Council, and Natural Resources Canada to address northern housing challenges.	Polar Knowledge Canada
Canadian Antarctic Research Workshop (October 3–4, Ottawa, Ontario)	Workshop to explore opportunities to strengthen Canadian Antarctic research activities and provide a better understanding of the Antarctic, global systems, and polar linkages.	Polar Knowledge Canada

Strategic Priority: Outreach and Capacity Building

Core funding for Association of Canadian Universities for Northern Studies (ACUNS)	ACUNS promotes the advancement of northern studies through scholarships, conferences and collaboration.	Association of Canadian Universities for Northern Studies
George Hobson Memorial Award, Malcolm Ramsay Memorial Award, Robert McGhee Award, Eric Dewailly Memorial Award	Awards to outstanding Northern Scientific Training Program recipients. These awards are named for distinguished Arctic researchers in the natural and social sciences.	Polar Knowledge Canada
Polar Knowledge Canada Scholarship	Awarded to an outstanding doctoral student. This year biologist Jennifer Provencher received the scholarship.	Association of Canadian Universities for Northern Studies
Science camps in the North	Science Camps run by Actua engaged youth from the Kitikmeot Region of Nunavut in science, technology, engineering, and mathematics (STEM).	Actua
Polar Inspiration Grants	This Students on Ice project supports initiatives led by their alumni that benefit a community, area or region in the Canadian Arctic.	Students on Ice
Nunavut Arctic College Environmental Technology Program	Support for the Nunavut Arctic College Environmental Technology Program in Cambridge Bay, Nunavut.	Nunavut Arctic College

PHOTO CREDITS

Front cover

St Elias Mountains in the Yukon – Peter Johnson
Water – Angulalik Pedersen
Long Point bloom – Johann Wagner

Minister's message

Arctic Fireweed flowers and hikers – Johann Wagner

Page 4-5

Greiner Lake Island Panorama– Johann Wagner
Polar bear – Angulalik Pedersen

Page 6

Aerial view of Cambridge Bay – Natural Resources Canada
POLAR Summer students – POLAR
School children – Actua

Page 7

CHARS at night – Angulalik Pedersen
Kitikmeot Trade Show – Matilde Tomaselli
CHARS – Christine Leroy

Page 8

Water – Angulalik Pedersen
ERA instrument – Johann Wagner

Page 9

Water – Angulalik Pedersen
Ermine – Johann Wagner

Page 10

Water - Angulalik Pedersen
Kyakers – Angulalik Pedersen

Page 11

Icebergs – Angulalik Pedersen
SmartICE sled – SmartICE

Page 12

Aerial view of Cambridge Bay – Natural Resources Canada

Page 13

Long-tailed Jaeger – Johann Wagner
Helicopter – Angulalik Pedersen

Page 14-15

Muskox – Johann Wagner

Page 16

Children at Elder-Youth Knowledge Sharing camp – Jennie Knopp

Page 17

Inuksuk –Angulalik Pedersen
Elder-Youth Knowledge Sharing Camp – Jennie Knopp
Children of Cambridge Bay – Actua

Page 19

CHARS ERA from Mount Pelly, Cambridge Bay – Johann Wagner