

Government of Canada Program for International Polar Year



Highlights and Achievements

 IPY·API
2007·2008 International Polar Year
Année polaire internationale
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Government
of Canada

Gouvernement
du Canada

Canada



Legend:

- Atmosphere and Weather Projects
- Land and Freshwater Ecosystems Projects
- Oceans and Ice Projects
- Coast Guard Vessel Transects
- People and Communities Projects
- Wildlife Projects
- Provincial/Territorial Capital Cities



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Introduction



International Polar Year (IPY) 2007-2008 has been the largest ever international program of coordinated, interdisciplinary science focused on the Arctic and Antarctic. Organized by the World Meteorological Organization and the International Council for Science, the official observing period for IPY took place over a 24-month period from March 2007 to March 2009. IPY involved conducting scientific activities in the Earth's polar regions to deepen the understanding of polar processes, global linkages and increase our ability to detect changes at the poles. IPY has also aimed to involve Arctic residents in research activities, attract and develop the next generation of polar scientists and experts, and capture the interest of the public. Valued at several billion dollars worldwide and involving more than 60 countries, over 200 international research networks, and thousands of researchers, IPY has been a significant and important scientific event. IPY 2007-2008 provided the opportunity for nations and researchers to collaborate, advancing our knowledge of the polar regions and critical scientific issues facing the globe.

As a major polar nation - with nearly one-quarter of the Arctic falling within Canada's boundaries, more than half of our coastline in the Arctic, and communities dotted throughout the region - Canada has played an important part in the global IPY initiative. This included research on human activities, societies, cultures and health as part of IPY 2007-2008, providing leadership for eight international science networks and collaborating with more than 240 researchers from 23 countries.

On a national scale, the Government of Canada Program for IPY has focused on two key priority research areas for the North: climate change impacts and adaptation, and the health and well-being of northern communities. IPY 2007-2008 was the largest investment of new funds the Government of Canada has ever made in northern science. Of the \$156 million invested in IPY by the Government of Canada, \$106 million supported 52 scientific research projects. The remaining \$50 million went to other major components of Canada's IPY Program which included logistics, emergency preparedness, research licensing, communications, training, capacity building, and data management.

Altogether, more than 1,900 Canadian researchers have conducted research funded by the Government of Canada Program for IPY at more than 100 locations across Canada's North, as well as on board five Canadian Coast Guard icebreakers. This work has been completed in collaboration with more than 1,800 Northerners, and more than 1,200 students and new researchers. Results from Canadian IPY science projects will be used to better comprehend sea ice and oceans, atmospheric and terrestrial systems, ecosystems, wildlife, human health and community well-being. This knowledge will inform policy, programs and practice both within Canada and abroad and contribute to a better understanding of the state of the polar regions.

The intensive program of research and discovery of IPY 2007-2008 will culminate in the IPY 2012 Conference *From Knowledge to Action* to be held in Montréal, April 22-27, 2012. This forum will bring the world to Canada and provide an opportunity to examine how IPY knowledge will be turned into global action. This will ensure that the legacy of IPY 2007-2008 extends well beyond its observing years.

This Report

The Government of Canada Program for IPY is nearing the end of the implementation of a six-year program. This report provides information about Canada's IPY program, as well as highlights achieved and important results to date.

This report includes key information about the scope of the science undertaken during IPY 2007-2008 by Canadian scientists funded through the Government of Canada's Program for IPY. It details the efforts to ensure the health and safety of Canadian and foreign scientists working in Canada's North during this intensive period of research. It highlights the training and capacity building initiatives for students, Northerners and early career scientists as well as the communications and outreach initiatives for raising awareness of IPY science and issues facing the North. Also discussed is the role of data availability, protection and storage, as well as initiatives focusing on research licensing and permitting in the North.



About International Polar Year


Over the past 125 years, three International Polar Years have taken place. During each of these initiatives, scientists from around the world came together to organize intensive scientific and exploration programs in the polar regions, resulting in important advances in knowledge about these remote regions of our planet. From laying the basic foundations of our understanding of global systems to launching the modern space age, the previous International Polar Years produced ground-breaking research and set the stage for many other international scientific collaborations such as the Antarctic Treaty.

IPY 2007-2008 built upon a long and distinguished legacy of international cooperation and scientific achievement. The official observing period for IPY 2007-2008 was designated as March 2007 to March 2009, to coincide with the 125th anniversary of the first IPY, the 75th anniversary of the second IPY and the 50th anniversary of the International Geophysical Year (IGY).





IPY 2007-2008



*The largest international program
of coordinated scientific research
and observations focused on the
Earth's polar regions.*

Following the passage of 50 years since the International Geophysical Year of 1957-1958, the international community came together through the World Meteorological Organization and the International Council for Science to begin the development of IPY 2007-2008 through the creation of the IPY International Joint Committee. This committee was responsible for overall scientific planning, coordination, and oversight of IPY 2007-2008. IPY was endorsed by numerous international bodies, including the Arctic Council and the United Nations Environment Program.

In performing its functions, the Joint Committee was supported by the **IPY International Programme Office**, hosted by the British Antarctic Survey in Cambridge, United Kingdom. The International Programme Office has worked closely with all national IPY committees, polar organizations, research institutes and the public. The work of the IPY Joint Committee and the International Programme Office was completed in June 2010 following the IPY Oslo Science Conference.



Canada's Preparations for IPY

A Canadian IPY Steering Committee (which later became the Canadian IPY National Committee) was formed in 2004 under the leadership of the Canadian Polar Commission, with representation from universities and colleges, territorial governments, federal government departments and agencies, research institutes, Aboriginal and northern organizations, and non-governmental organizations. The initial focus of the Committee was to promote and encourage interest in IPY across Canada, especially in the North.

The National IPY Committees were tasked by the International Joint Committee to work with the international community to develop the IPY international scientific themes. In Canada, the **Canadian IPY National Committee** was key to establishing support for Canada's participation in IPY and for making this important initiative known across Canada and throughout the North.

The **Canadian IPY Secretariat** at the University of Alberta in Edmonton was established in September 2004 to support the National Committee and Canada's participation in IPY, while linking the Canadian program to the international IPY community. It played a coordinating role for the many organizations and individuals involved in IPY in Canada and supported collaboration and communications among IPY researchers, Northerners and the international community. It acted as a liaison between IPY in Canada, IPY National Committees in other countries on behalf of the Canadian IPY National Committee and the IPY International Programme Office. It also provided a point of contact in Canada for information about IPY and led fund-raising efforts to engage contributions from other organizations.

In addition to facilitating partnerships at the international level, the work of the Canadian IPY Secretariat led to the initiation of the **IPY Youth Steering Committee** in Canada. This grew into the international IPY Youth Steering Committee and was the genesis of the Association of Polar Early Career Scientists (APECS), an organization focused on science and career development of students and young polar scientists.

A Coordinated Federal Approach

Within the Government of Canada, twenty-one federal departments and agencies contributed to the development of Canada's IPY program. They were led by the Assistant Deputy Minister Committee on Northern Science and Technology and a **Federal IPY Working Group** to develop a coordinated federal approach for Canada's participation in IPY. These efforts culminated in the announcement in September 2005 of a commitment from the Government of Canada for \$150 million in new funding for a six-year IPY program to run from 2006–2012. This funding, together with \$6 million of new funding from the Natural Sciences and Engineering Research Council of Canada (NSERC) for IPY Special Research Opportunity Grants, represents the largest new investment to date by the Government of Canada to support northern science. In addition, it is one of the largest new investments in IPY science among all participating nations.



Globalization in the polar regions

At the international level, Canada actively promoted the inclusion, for the very first time in an IPY, a research theme focused on changes in human health, society, culture and resources. With Circumpolar Human Societies identified internationally as an IPY theme, key knowledge gaps on the vulnerability, resilience, adaptability and sustainable development of northern communities will be filled, helping Canada to address the specific needs of the populations living in Canada's North.

Government of Canada Program for IPY

Indian and Northern Affairs Canada (now known as Aboriginal Affairs and Northern Development Canada) was chosen to lead the Government of Canada's Program for IPY because of its responsibilities for matters pertaining to Aboriginal peoples and the North and its role in coordinating Northern science for the Government of Canada. The multi-departmental Arctic science program was overseen by an **Assistant Deputy Minister Committee on IPY** which provided strategic direction for the Government of Canada Program for IPY, as well as policy and program decision-making. This committee was responsible for approval of decisions on the distribution of funds under the Canadian IPY Program. In addition to Indian and Northern Affairs Canada, the program was co-managed with five other federal departments: Environment Canada, Fisheries and Oceans Canada, Natural Resources Canada, Industry Canada (represented by the Natural Science and Engineering Research Council) and Health Canada. The chair of Canada's National Committee for IPY was an ex-officio member of the ADM Committee on IPY.

Support to the ADM Committee on IPY was provided by the **IPY Federal Program Office**. The office was established in December 2005 to coordinate an innovative, multi-sectoral and interdisciplinary Canadian program for IPY and administer the new funding. This included the development and implementation of IPY program components including science, logistics, training and capacity building, communications and outreach, data management, and licensing and permitting.

Program Scope and Components

The Canadian IPY Program has defined the "North" as all the land and ocean-based territory of Canada that lies north of the southern limit of discontinuous permafrost, from northern British Columbia in the west to northern Labrador in the east (see Figure 1).

Figure 1: The southern limit of discontinuous permafrost



The Government of Canada Program for IPY included six main components:

1. An innovative and multi-disciplinary science and research program

Forty-five science projects focused on climate change impacts and adaptation and the health and well-being of northern communities were selected for up to five years of funding between 2007 and 2011. Research conducted under this program was designed to complement existing Arctic research activities. Projects also had to be policy-relevant, include training and capacity building as well as communications and outreach initiatives.

2. Support for logistics to enhance emergency preparedness, health and safety measures

The goal of this program component was to ensure the health and safety of researchers and northern communities during the implementation of the Canadian IPY Program. To handle the anticipated influx of scientists to Canada's North, planning and operations for emergency preparedness, search and rescue, and security activities were undertaken. In addition, support was provided for enhancements to research facilities, equipment, and increased ice and weather forecasting to support IPY research projects.

3. Northern science capacity building

A range of initiatives have been undertaken to develop a new generation of polar scientists and to enhance the capacity of Northerners to participate in the science conducted in the North. In addition, IPY Northern Coordination Offices were organized within host organizations in four regions (Yukon, the Northwest Territories, Nunavut and Nunavik in Northern Quebec) to facilitate the involvement of Northerners in IPY, to provide guidance and support to researchers and to further enhance Northern capacity for research.

4. Communications and outreach

IPY 2007-2008 provided unprecedented communications and outreach opportunities that have informed and educated Canadians about Arctic science, raised awareness about Canada's North and the importance of the polar regions, engaged youth, and continued to build connections between northern and southern Canada.

5. Data management and archiving initiatives

This was an important component of the IPY program that aimed to ensure that the scientific knowledge and data generated from IPY projects are properly managed, stored and remain accessible while also protecting confidential and sensitive data and information. A data management plan was developed at the outset of IPY to ensure that new information gathered through IPY projects would be made widely and appropriately accessible over the short and long term.

6. Support to improve coordination of northern research licensing

Funding support was provided to licensing organizations in the North to assist with the increased demand for research licences and permits during IPY. A guide for Canadian and international researchers was prepared, outlining all the requirements and health and safety information needed to work in the Canadian Arctic. As part of the legacy of IPY 2007-2008, a research licensing initiative is underway for northern regulators, Aboriginal governments and organizations, and researchers to share best practices and explore possibilities for coordination in issuing licences and permits for Arctic research in Canada.

Collaboration and Partnership

As with previous IPYs, IPY 2007–2008 was built on a foundation of collaboration and partnership. The Government of Canada Program for IPY has worked with a wide range of stakeholders in order to accomplish its objectives.

In addition to those directly involved in Canadian IPY Program planning, governance and administration, other collaborators include: other federal departments and agencies, the IPY National Committee and the Canadian IPY Secretariat, universities and research institutes, territorial and provincial governments; Aboriginal organizations; northern communities; members of Canada’s scientific community, business and industry stakeholders. All have lent their expertise and efforts to various aspects of the IPY program including participating on IPY Review Committees, advising on proposals, and working to create support and enthusiasm for IPY in Canada and abroad.

Within the Government of Canada, collaboration involved maintaining close working relations amongst the six lead departments involved in IPY. In total, twenty-one federal departments and agencies have been involved in the development and implementation of IPY. Some important contributors include the Canadian Polar Commission, the Canadian Coast Guard, the Polar Continental Shelf Program (Natural Resources Canada), both the Canadian Ice Service and the Meteorological Service of Canada (Environment Canada), the Canadian Museum of Nature, the Canadian Museum of Civilization and Parks Canada.

Northern Canadians in International Polar Year

Northern Canadians have been actively involved in all aspects of IPY including the planning of IPY and the carrying out of IPY science, training and capacity building, logistics, as well as communications and outreach projects. Eight of the science projects were led by Northerners and all projects included strong involvement of individuals, communities and organizations from across the North. In total, over 1,800 Northerners and 215 students from Canada’s North have participated in IPY research projects.

All of Canada’s IPY science projects included training and capacity building initiatives, particularly for young Northerners, including Aboriginal community members. From researchers and field technicians, to guides and community liaison officers, Northerners participated in Arctic research at an unprecedented level during IPY 2007-2008. The four IPY Northern Coordination Offices, based in northern research-oriented organizations, played a large role in ensuring the active involvement of northern communities in this initiative.



Martin Lipman



Canada's IPY Science Program





Martin Fortier, ArcticNet

Multidisciplinary research focused on two of Canada's most important challenges for its northern regions: climate change impacts and adaptation, and the health and well-being of northern communities.

An interdisciplinary science program was central to Canada's IPY Program. Research projects funded through this initiative examined many components of Arctic ecosystems—from oceans and atmosphere, to snow, permafrost and ice, from vegetation and wildlife, to the people and communities who call the Canadian Arctic home.

The objective of Canada's IPY science program was to generate data and knowledge on polar regions—especially information on Arctic environments and communities—and to support science that is policy-relevant and useful at all levels of government and society, both nationally and internationally.



Canada's Investment in Northern Science

The Government of Canada Program for IPY dedicated \$100 million to support 45 research projects. In addition, the Natural Sciences and Engineering Research Council of Canada funded eleven IPY projects through a \$6 million Special Research Opportunity. Four of the projects have received funding from both the Government of Canada Program and NSERC for a total of 52 science projects and \$106 million for Arctic science.

Seeking Research Proposals

In 2005, the Indian and Northern Affairs Canada and other IPY lead departments worked with a wide range of Canadian and international organizations to develop a Call for Proposals. This included federal departments and agencies, the Canadian Polar Commission, research granting agencies, university researchers, northern and Aboriginal organizations, and the Canadian IPY Secretariat. The Call for Proposals was developed to solicit innovative and interdisciplinary proposals to address the two themes designated for IPY in Canada: climate change impacts and adaptation, and the health and well-being of northern communities. The active involvement of these organizations, particularly northern Aboriginal groups, was key to ensuring that the Call for Proposals reflected not only the federal science interests, but also the priorities of northern Canadians and the broader academic community. The Call for Proposals was issued on December 15, 2005. All proposals were required to have international endorsement by the International IPY Programme or be linked to internationally endorsed projects.

Interdisciplinary approaches using traditional knowledge and a mix of methods from the physical, biological, health and social sciences were encouraged. Each Canadian proposal was required to be relevant to the needs of northern communities, and to involve Northerners in the planning and implementation of the proposed research activities. Each proposal was expected to incorporate training and capacity building through the active engagement of students and northern communities. Inclusion of plans for data management, communications and outreach activities were also required.

The official observing period of IPY 2007-2008 was designated as March 2007 to March 2009, which encompassed two field seasons of intensive scientific activity. The majority of research activity occurred during the observing years; however, projects were able to request up to five years of funding through the Government of Canada Program for IPY to allow for field work, data analysis and communication of results.

By the deadline of March 10, 2006, 147 proposals (consisting of 116 climate change impacts and adaptation proposals and 31 health and well-being of northern communities proposals) were submitted with a total budget request of approximately \$342 million. Proposals came from colleges and universities, government departments and agencies, northern colleges and research institutes, museums and Aboriginal organizations.

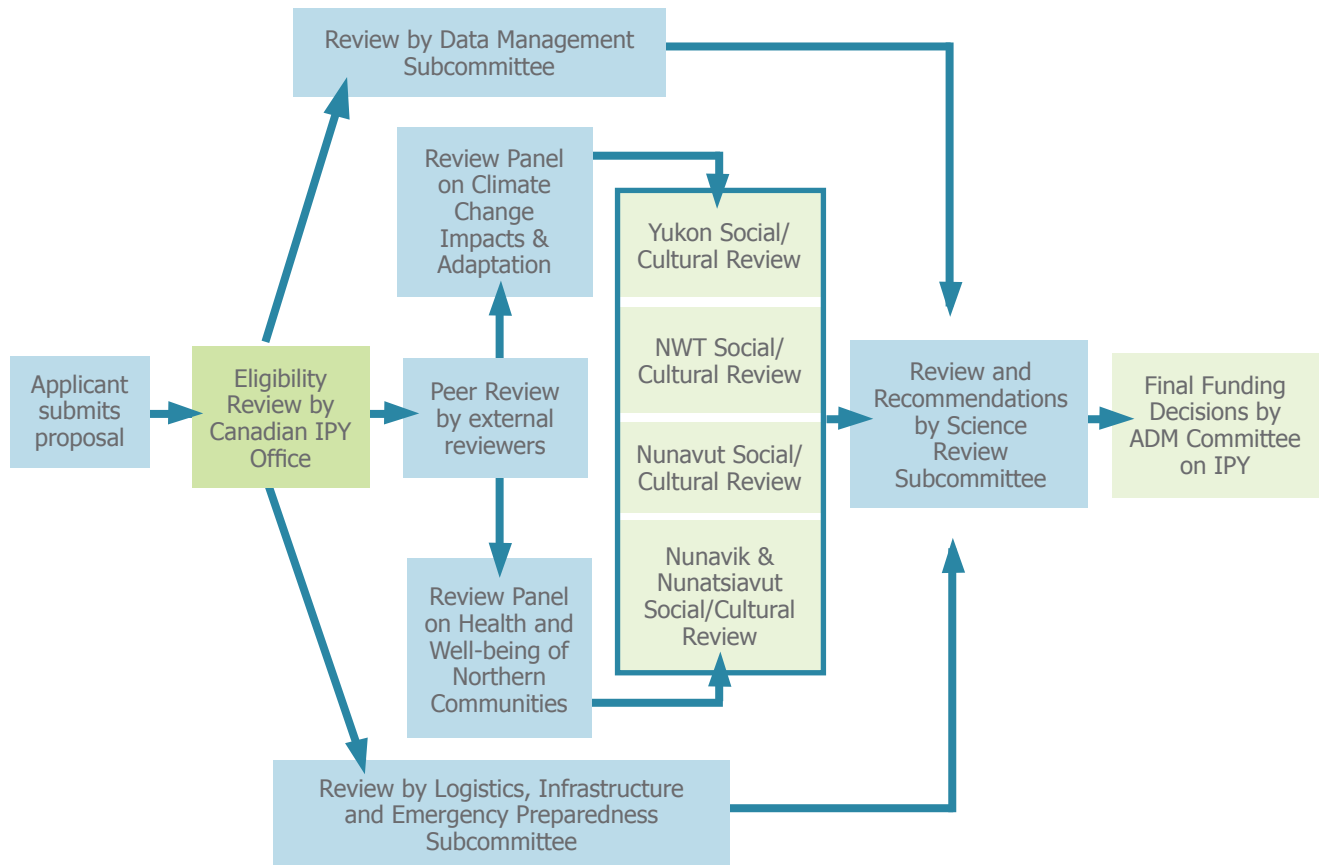
Proposal Review

Proposals were evaluated against criteria which included scientific excellence and policy-relevance to northern issues. Proposal selection occurred through a multi-stage review process and involved detailed reviews by external experts and two multidisciplinary panels, with final recommendations for funding made to the Government of Canada Program for IPY by the Science Review Subcommittee (see Figure 2).

Social and cultural reviews were completed in four northern regions: Yukon, Northwest Territories, Nunavut and Nunavik (northern Quebec). The purpose of these reviews was to obtain advice from Northerners on the relevance of the proposals to their communities, as well as look at the potential impacts and benefits of the proposed projects. The review process was also an opportunity to give input on the proposed use of traditional knowledge and the involvement of Aboriginal elders and northern students within these projects.

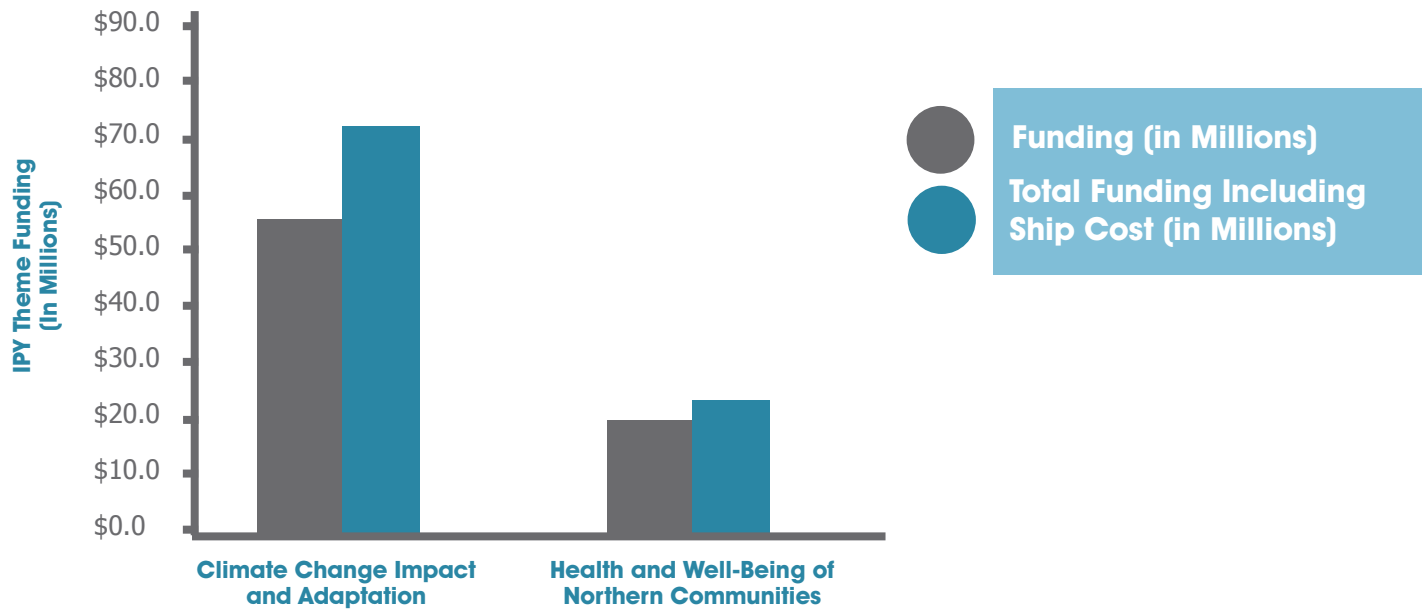
In addition, the IPY Subcommittees on logistics and data management were given the opportunity to evaluate proposals for the requirements from other areas of the IPY Program.

Figure 2: Government of Canada Program for IPY Science Proposal Review Process



The review of proposals was completed in December 2006 and 43 proposals were selected for funding by the Government of Canada Program for IPY. Following an analysis of knowledge gaps, the need for additional proposals on community resiliency and traditional knowledge was recognized. Through work with partners in the North, two additional proposals were developed to address this need.

Figure 3: IPY funding by theme: Climate Change Impacts and Adaptation and Health and Well-being of Northern Communities, with and without ship costs



Annual Progress Reporting

Science projects funded by the Government of Canada Program for IPY were assessed annually through progress reports submitted by each project's principal investigator. The purpose of the annual review was to ensure that projects were continuing to meet the objectives laid out in their original proposals especially as they related to research methods, northern community engagement, training and capacity-building, communications and outreach, and data management.

An external peer review was conducted by science and policy experts including academics, northerners and the Canadian IPY. These reviews were then used to provide feedback to researchers, a process which ensured that individual science projects were continuing to contribute to the overarching IPY goals.

IPY Researchers' Workshops

An important component of IPY was sharing research results, methods and ideas. Over the duration of the program, Canadian IPY researchers were invited to participate in four workshops to share experiences with the research community involved in IPY as well as other interested participants, including academia, government, media and other stakeholders. The series of workshops included lively discussions on: data management; strategies for successful community engagement; communications; integrating science into arctic policy; traditional knowledge; and, future polar research. These events raised the profile of the innovative methods used in IPY science projects, highlighted the importance of knowledge transfer and were excellent forums for sharing early research results. The networking and discussions among the workshop participants during these events helped to foster linkages between IPY projects and encouraged cooperation and collaboration between arctic researchers.

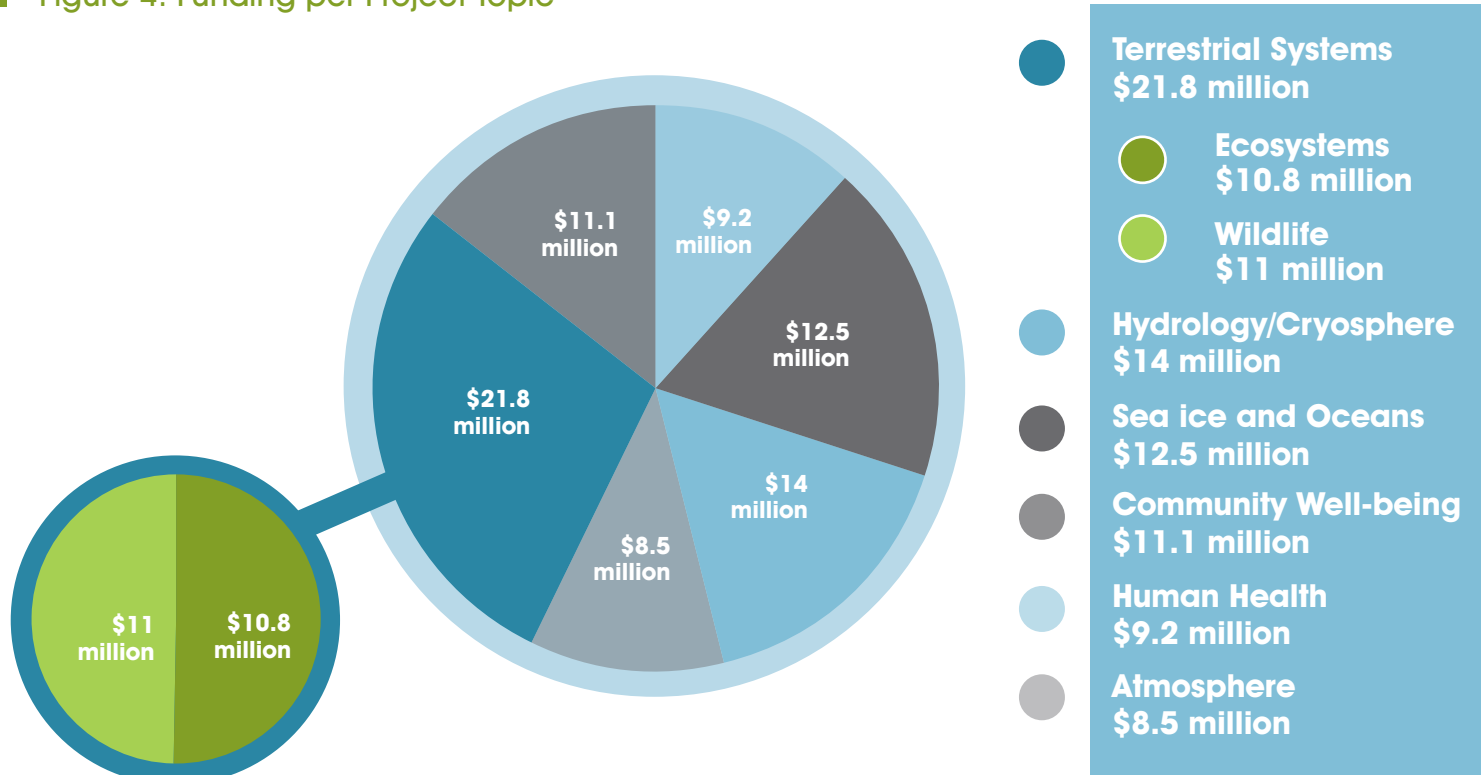
An Overview of IPY Canada Science

In total, the Government of Canada Program for IPY supported 45 research projects under six science themes: Sea Ice and Oceans, Hydrology and the Cryosphere, Atmosphere, Terrestrial Systems, Community Well-Being, and Human Health (see Table 1 and Figure 4). The majority of projects were multidisciplinary in nature. Approximately half of the projects encompassed both IPY themes of climate change impacts and adaptations, and the health and well-being of northern communities.

Table 1: Number of IPY Projects per Science Theme

Theme	Number of Projects
Sea Ice and Oceans	7
Hydrology/Cryosphere	5
Atmosphere	4
Terrestrial Systems	
Ecosystems	5
Wildlife	8
Community Well-Being	11
Human Health	5
Total	45

Figure 4: Funding per Project Topic*



*Excludes Ship Costs for research under Sea Ice and Oceans and Human Health. Ships costs for Sea Ice and Oceans research were an additional \$20.6 million and \$3.6 million for Human Health research.



Robert Mulders

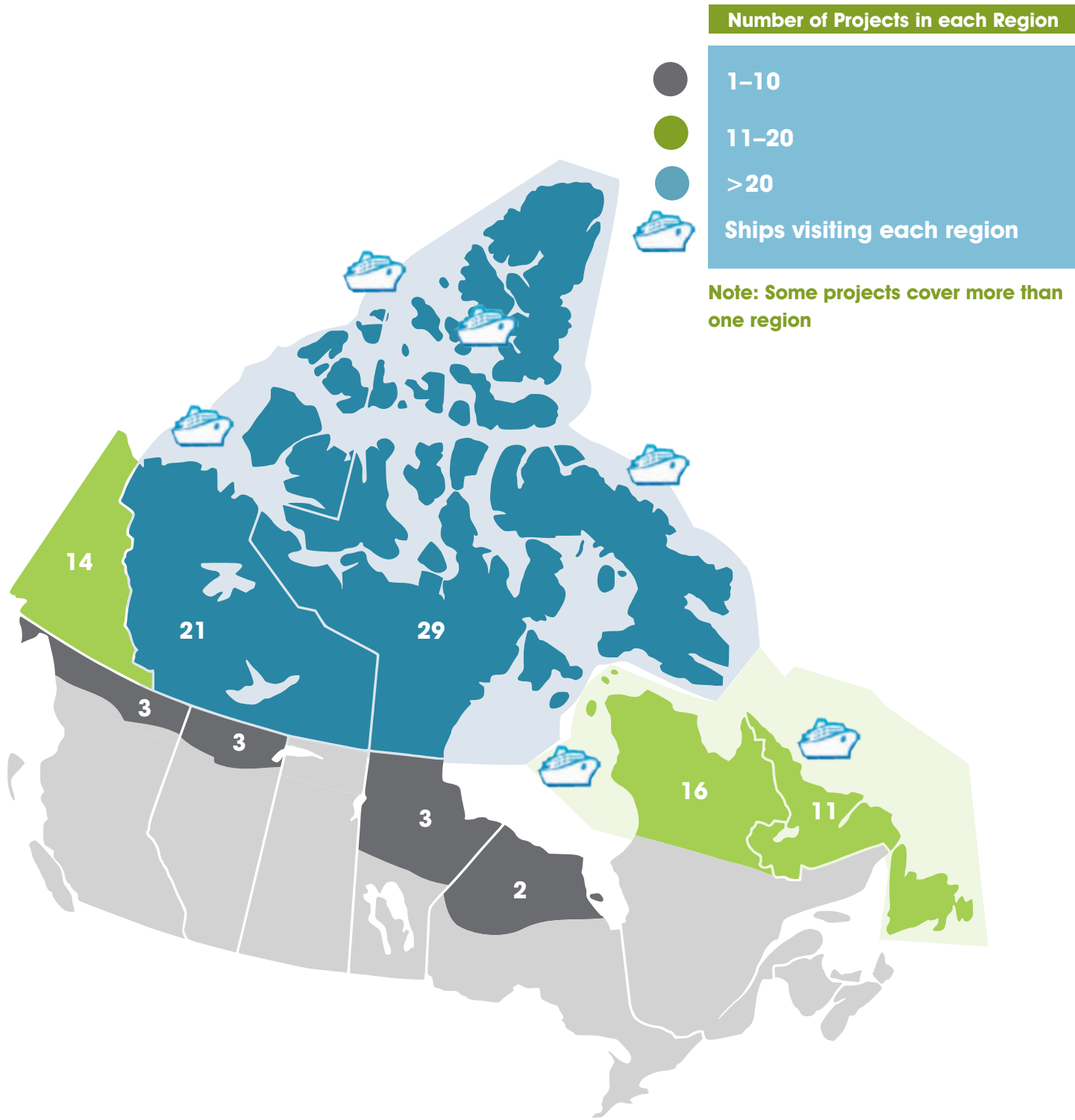
Projects were led by researchers from a range of different Canadian organizations (see Table 2). Several project teams included international experts (240 collaborators from 23 countries). As well, eight Canadian researchers led international IPY projects: Gilles Gauthier (Université Laval), Don Russell (Yukon College), Manon Simard (Makivik Corporation), Greg Henry (University of British Columbia), Fred Wrona (Environment Canada), Jim Reist (Fisheries and Oceans Canada); Hayley Hung (Environment Canada) and Sheila Greer (Champagne and Aishihik First Nations).

Table 2: Number of Projects per Organization Based on Project Lead Affiliation

Organization	Number
Universities/Colleges	23
Federal Department/Agencies	
Environment Canada	5
Fisheries and Oceans Canada	6
Public Health Agency of Canada	1
Natural Resources Canada	2
Canadian Museum of Civilization	1
Northern/Aboriginal Organizations	5
Territorial Government	2

As can be seen in Figure 5, IPY projects comprehensively covered Canada’s North. IPY researchers worked in all three territories, as well as Inuit regions in northern Quebec (Nunavik) and northern Labrador (Nunatsiavut), the northern regions of British Columbia, Alberta, Manitoba, Ontario and Newfoundland. The majority of projects completed research in more than one region. A subset of projects collected a portion of their data, in other countries including Alaska, Russia, Greenland and Pacific-rim countries.

Figure 5: Number of IPY Science Projects per Region.



IPY Canada Science: Project Descriptions

This section outlines the science projects undertaken as part of the Government of Canada Program for IPY, organized by the six science themes: Sea Ice and Oceans, Hydrology and the Cryosphere, Atmosphere, Terrestrial Systems, Community Well-Being, and Human Health. Some of the early results of these projects have been included in this report. It should be noted that the results described are a preliminary overview of the vast amount of data collected during the IPY field seasons and that further, in-depth conclusions are anticipated for years to come. It should also be noted that the principal investigators listed below led large research teams, some of which included hundreds of members including researchers, technicians, Northern field guides, students and international collaborators.

A full listing of IPY science projects and project descriptions can be found at www.ipy.gc.ca.

Sea Ice and Oceans

Canada is bordered by three oceans, making marine systems an integral part of the Canadian geography. More specifically, the Arctic Ocean is an important aspect of the Canadian North—a unique ecosystem characterized by low temperatures and the presence of ice during much of the year. To study the Arctic Ocean, researchers from seven IPY science projects looked at various aspects of ocean and marine systems using comprehensive surveys and system-based analyses.

Comprehensive Surveys

Two IPY science projects completed comprehensive surveys, looking at ocean and marine systems as a whole.

Canada's Three Oceans (C30)

Eddy Carmack

Fisheries and Oceans Canada

Project Team Members: 200*

Students: 34

Northern Students: 4

Project Locations: Canadian Archipelago;
Arctic, Pacific and Atlantic Oceans

Eddy Carmack (Fisheries and Oceans Canada) led the Canada's Three Oceans (C30) team. Using two icebreakers, 200 researchers gathered baseline information on the physical, chemical and biological structure of Canada's interconnected subarctic and Arctic waters. The survey found a warming Arctic Ocean from changing Atlantic and Pacific origin waters; changes to salt stratification and alkalinity from increased summer ice melt; evidence of shifting ocean currents; and increased acidification in the upper waters of the Canada Basin, plus related implications for foodwebs.

*All numbers in these boxes were derived from IPY Annual Progress Reports



Circumpolar Flaw Lead System Study (CFL)

David Barber
 University of Manitoba
 Project Team Members: 378
 Students: 109
 Northern Students: 9
 Northern Participants: 36
 Project Location: Beaufort Sea
www.ipy-cfl.ca

David Barber (University of Manitoba), who led the Circumpolar Flaw Lead System Study completed a comprehensive survey of an ocean flaw lead in the Beaufort Sea. A flaw lead is a natural opening in the sea ice that forms and persists throughout the winter. This project represents the first-ever overwintering of an icebreaker in a flaw lead, where ocean dynamics, climate, marine ecosystems, contaminants, carbon and nutrient cycles, and greenhouse gases were studied to determine the present state of these systems and how climate change is likely to affect them in the future. The project has demonstrated that the record low extent of sea ice observed during the summer of 2007, led to remarkable changes in the marine ecosystem of the Amundsen Gulf region.

System-Based Analyses

Five IPY science projects focused on oceans studied specific processes occurring in the Arctic Ocean and how climate change is affecting these processes. Two of these projects focused on ocean dynamics.

Ocean Currents of Arctic Canada (CAT)

Humfrey Melling
 Fisheries and Oceans Canada
 Project Team Members: 40
 Students: 7
 Project Location: Nunavut
www.mar.dfo-mpo.gc.ca/science/ocean/seaice/public.html

Humfrey Melling (Fisheries and Oceans Canada) and colleagues looked at ocean currents that flow through the Canadian Arctic Archipelago and how the freshwater influx affects Arctic marine systems. This work has led to the mapping of water volume, current speed and wind strength at various points in the archipelago. How these parameters change under different ice conditions was also examined. Specifically, they have found that water flows more quickly in conditions of drift ice versus fast ice, and thick multi-year ice is still common in the archipelago.

Impact of Severe Arctic Storms and Climate Change on Coastal Areas

William Perrie
 Fisheries and Oceans Canada
 Project Team Members: 31
 Students: 6
 Project Location: Beaufort Sea; Yukon and Northwest Territories

William Perrie (Fisheries and Oceans Canada) and colleagues evaluated how a dynamic ocean, in the form of currents, waves and storms, is affecting coastal environments through erosion and changes in sediments. Among the findings were that fall and winter seasons contain the strongest winds with wind directions mainly from the northwest or southeast. Historically, storm surge events tend to occur mostly in the late summer and early autumn in the Beaufort area. To provide information to coastal communities, this project has developed models that predict how severe weather may affect the Arctic coastline.





The chemistry of carbon and nutrient cycling and the presence and activity of trace elements (chemicals found at low concentrations) and gases in the Arctic Ocean were some of the topics explored by the remaining three ocean process-related IPY science projects.

Carbon Cycle in the Canadian Arctic and Sub-Arctic Continental Margin

Charles Gobeil

Université du Québec

Project Team Members: 8

Students: 1

Project Locations: Canadian Archipelago; sub-Arctic Pacific Ocean; Bering, Chukchi and Beaufort Seas; Baffin Bay; and Davis Strait

Charles Gobeil (Université du Québec) and colleagues investigated the continental margins of the Arctic Ocean, areas that are pivotal for carbon cycling. Along with providing an historical record from each of Canada's three oceans, the collection of sediment cores will determine the distinct characteristics of carbon cycling in the Arctic Ocean. The results of this project demonstrate strong regional contrasts in sediment accumulation rates, land-based versus marine sources, sequestration of organic carbon in the sediments, and in the overall chemical composition of the sediments along the North American Arctic margin.

Effects of Climate Change on Nutrient and Carbon Cycles in the Arctic Ocean (GEOTRACES)

Roger Francois

University of British Columbia

Project Team Members: 16

Students: 16

Northern Students: 1

Northern Participants: 2

Project Locations: Beaufort and Chukchi Seas

Roger François (University of British Columbia) and colleagues studied trace elements, important for carbon cycling, marine ecosystems, contaminants and climate processes, to determine how these elements act in an oceanic environment of low temperatures and sea ice. Early results indicate that seasonal melting of both first and multi-year ice could represent an important source of iron in the Beaufort Gyre, an ocean and sea ice circulation pattern in the Beaufort Sea.

Ocean Production of Trace Gases in the Arctic and their Impact on Climate (C-SOLAS)

Maurice Levasseur

Université Laval

Project Team Members: 45

Students: 19

Project Locations: Arctic and North Atlantic Oceans; the Canadian Archipelago

www.quebec-ocean.ulaval.ca/C-SOLAS/arcticsolas

Maurice Levasseur (Université Laval) and colleagues studied two key biogenic trace gases which influence climate in the Arctic Ocean in order to determine how changes in sea ice and ocean dynamics will affect their dynamics and impact on climate. Results showed that sea ice formation may represent a source of the greenhouse gas nitrous oxide (N₂O) during the Arctic fall and that production of the 'cooling' gas dimethylsulfide (DMS) occurs late in the season under ice-free conditions, in spite of the prevailing low temperatures and low biological activity. These results support model results predicting an increase in DMS emissions in a warmer Arctic.



Paul Vecsei

Hydrology and the Cryosphere

Freshwater studies in the North were an important component of Canada’s IPY research. Interspersed with innumerable lakes, rivers and other waterways, northern ecosystems are dominated by water in its various forms. To better understand the complexities of water across the Canadian North, five IPY science projects investigated water, snow, ice and permafrost.

Freshwater Systems

Two IPY science projects focused on defining the characteristics of freshwater systems and how changes to these systems affect the surrounding landscape.

Arctic Freshwater Systems

Fred Wrona
Environment Canada
Project Team Members: 17
Students: 5
Northern Participants: 6
Project Locations: Northwest Territories;
Nunavik; Nunatsiavut; Nunavut; Yukon
www.ec.gc.ca/api-ipy

Fred Wrona (Environment Canada) and colleagues undertook a project to determine the basic mechanisms and processes of Arctic freshwater systems with aims of measuring freshwater biodiversity, developing predictive models and establishing community-based monitoring programs. The project included the contributions of Parks Canada scientists to conduct freshwater inventories, and develop novel freshwater monitoring methods in Arctic national parks.

Measuring the Impact of Climate Change on Landscape and Water Systems in the High Arctic

Scott Lamoureux
Queen’s University
Project Team Members: 8
Students: 26
Northern Participants: 2
Project Location: Nunavut
geog.queensu.ca/cbawo

By using proxies of past environments and assessing current conditions, Scott Lamoureux (Queen’s University) and colleagues investigated how high arctic watersheds are being affected over time by climate change. This work determined what the consequences of changes in snow accumulation, rainfall and permafrost disturbance are for soil erosion, plants, organic matter composition, sediment and nutrient concentrations in rivers and lakes, and greenhouse gas emissions from the land and bodies of water.

Results from both projects showed that changes in permafrost are affecting sediment dynamics and ion concentrations in nearby rivers and lakes. As well, Arctic lakes were found to be more biologically productive than expected.

The Cryosphere

In its frozen state, water on the Earth's surface is collectively known as the cryosphere. Three IPY science projects investigated aspects of the cryosphere in an attempt to establish its current state and how changes in climate are affecting its distribution.

Variability and Change in the Canadian Cryosphere (Snow and Ice)

Anne Walker

Environment Canada

Project Team Members: 129

Students: 47

Northern Participants: 25

Project Locations: Northwest Territories; Nunavut; Yukon

www.ec.gc.ca/api-ipy

Anne Walker (Environment Canada) and colleagues provided the most comprehensive assessment of the Canadian cryosphere to date by using satellite data/images, field measurements and historical data records. This information was used to monitor tundra and alpine snow cover, seasonal frozen ground, lake ice, albedo (how much a surface reflects light), land cover and seasonality, snow melt characteristics over ice caps, sea ice fluxes through the Arctic islands, and river ice across the Canadian North. Among the project's findings were that climate analyses of recent variability in the cryosphere have revealed significant decreases in the volume and/or area of snow cover, glaciers and sea ice as a result of warming in the Arctic.

Permafrost Conditions and Climate Change

Antoni Lewkowicz

University of Ottawa

Project Team Members: 66

Students: 47

Northern Students: 7

Northern Participants: 36

Project Locations: Northwest Territories; Nunavut; Yukon

Antoni Lewkowicz (University of Ottawa) and colleagues focused on permafrost, ground that is consistently measured to be below 0°C and frequently contains ice. The aim of this work was to establish a strong spatial representation of current ground temperature and permafrost conditions across the Canadian North. An additional aim was to compare this work to past observations in order to determine how permafrost has changed over time. Results showed that there has been substantial warming of permafrost across the entire Canadian North in the last few decades and disappearance of permafrost in parts of the Yukon and northern British Columbia.

Environmental Change in the High Arctic from Snow and Ice Cores

Jocelyne Bourgeois

Natural Resources Canada

Project Team Members: 10

Students: 9

Northern Students: 2

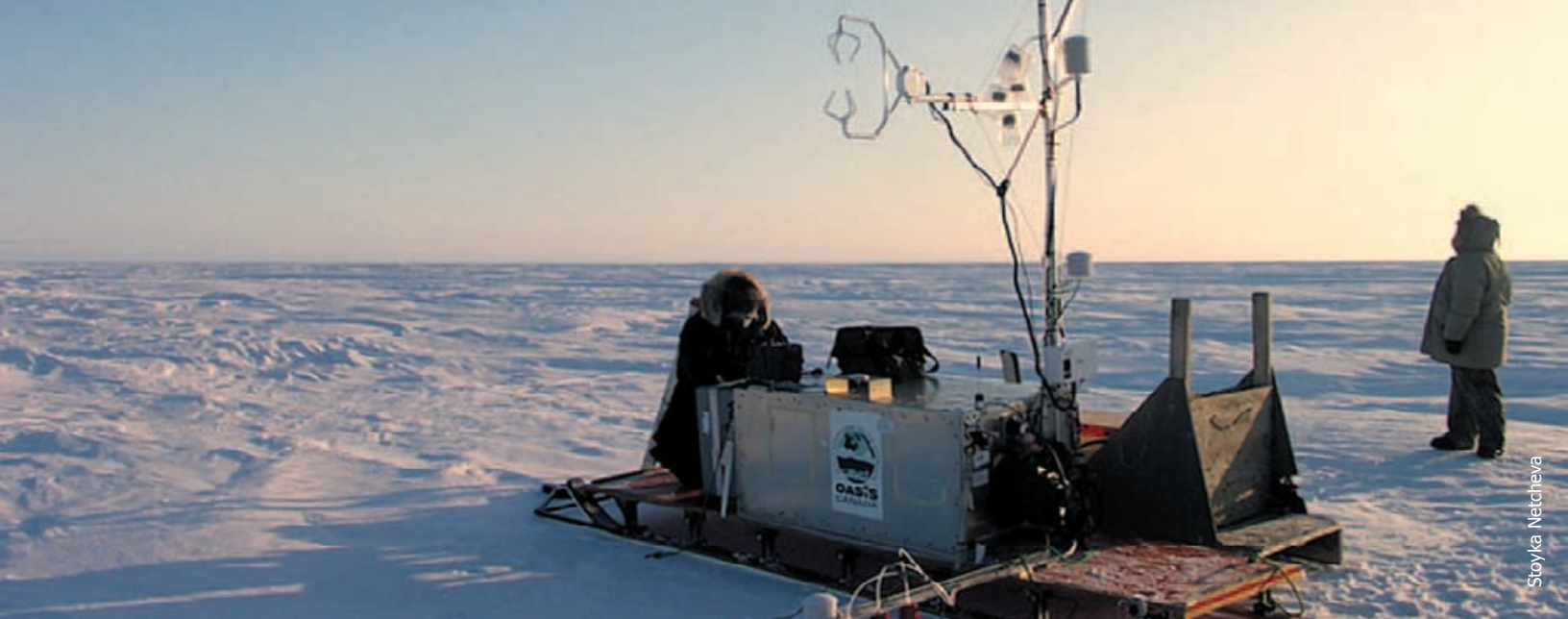
Northern Participants: 7

Project Locations: Ellesmere Island, Nunavut; Churchill, Manitoba; northern Greenland

ess.nrcan.gc.ca/ercc-rrcc/ipy_e.php

Jocelyne Bourgeois (Natural Resources Canada) and colleagues sampled snow and ice from circumpolar ice caps to measure levels of contaminants including sulphates, nitrates, mercury and other trace metals in the Arctic. These measurements were compared to similar surveys completed in the 1990s to determine how contaminant accumulations have changed over time. Findings include a decrease in air pollutants deposited in snow since the mid 1990s, with an increase in pollen levels in glaciers, and with increased summer melt over the same time.





Sroyka Netcheva

Atmosphere

Cold temperatures play a significant role in the atmospheric processes of the North. In this area, IPY research projects examined a number of factors like how temperature influences Canada's Arctic atmosphere and its related processes. Four IPY science projects contributed to the understanding of the Arctic atmosphere and associated climate/weather, including the impacts of climate change.

Atmospheric Research in the High Arctic

James Drummond
University of Toronto
Project Team Members: 37
Students: 12
Northern Students: 2
Northern Participants: 24
Project Location: Ellesmere Island, Nunavut
www.candac.ca

To gain a better understanding of the Arctic atmosphere as a whole, James Drummond (University of Toronto) and colleagues observed the atmosphere at some of the most northerly points in Canada. The Polar Environment Atmospheric Research Laboratory located on Ellesmere Island (Eureka, Nunavut) and related research sites provided a whole atmosphere laboratory that allows researchers to investigate all aspects of the northern atmosphere from ground level up to 100 kilometres above ground. This project has produced information on such atmospheric phenomena as rainfall, snowfall, water vapour, temperature, clouds and air particles.

Understanding Ozone and Mercury in the Air over the Arctic Ocean

Jan Bottenheim
Environment Canada
Project Team Members: 13
Students: 1
Project Location: Arctic Ocean
www.ec.gc.ca/api-ipy

Jan Bottenheim (Environment Canada) and colleagues focused on the atmosphere at ground level. Specifically, they studied a peculiar phenomenon that occurs every spring when the Arctic sun rises: the disappearance of ground-level ozone and mercury. Why this occurs and where these chemicals go remains unclear, but it is thought that factors such as sunlight, snow, ice and temperature changes are involved. Results indicated that the disappearance of ozone and mercury happens across the Arctic on a large scale at varying rates. Data suggested that this phenomenon may require very cold temperatures and that the disappearance of mercury may be linked to the presence of frost flowers (crystals of ice formed on sea ice when water vapour becomes a solid).

Intercontinental Atmospheric Transport of Pollutants to the Arctic (INCAPTA)

Hayley Hung
Environment Canada
Project Team Members: 28
Students: 4
Northern Students: 1
Northern Participants: 7
Project Locations: Alert, Nunavut;
Little Fox Lake, Yukon; Alaska; China;
Russia; Vietnam
[www.msc-smc.ec.gc.ca/arqp/incatpa/
incatp0_e.cfm](http://www.msc-smc.ec.gc.ca/arqp/incatpa/incatp0_e.cfm)

The atmosphere above Canada's North is intricately connected to, and affected by, processes occurring elsewhere in the world. Hayley Hung (Environment Canada) and colleagues investigated the global circulation of contaminants in the atmosphere. By tracking emission sources in Asia and pollutant pathways, the results of this project have provided a better understanding of how pollutants travel and become deposited in the Canadian Arctic. For example, levels of atmospheric mercury measured at Alert in Nunavut have changed over time and show a complex relationship with temperature and wind in the spring and summer.

Arctic Weather and Environmental Prediction Initiative (TAWPEPI)

Ayrton Zadra
Environment Canada
Project Team Members: 16
www.ec.gc.ca/api-ipy

While weather models can be used to effectively forecast weather patterns around the world, this technology has not been as well developed for northern climate systems. Ayrton Zadra (Environment Canada) and colleagues are applying what is known about atmospheric processes to develop weather forecasting models for the Canadian Arctic, one of which became operational in the spring of 2009. By incorporating the unique characteristics inherent to the Arctic into weather forecasting models, this project will contribute essential information to improve the health, safety and economy of northern communities through an enhanced ability to predict upcoming weather.



Dave Halpin



Terrestrial Systems

Changes on the Land

Geography and climate of the Arctic are unique, and northern terrestrial systems are distinct from those found to the south. For example, plants are smaller due to shorter growing seasons and harsher climates. There is also large variability among ecosystems across the North, making it difficult to produce a broad, coherent picture. To address this issue, five IPY-funded science projects took a comprehensive look at how changes, climate and other factors, are affecting specific characteristics of the land, including aspects of vegetation, soils, the treeline and the carbon cycle, among others.

By combining a variety of approaches, two of these projects are completing broad assessments of specific ecosystems.

Greg Henry (University of British Columbia) and colleagues assessed tundra ecosystems across the Canadian Arctic, while Shel Graupe (Vuntut Gwitch'in First Nation) and colleagues assessed ecosystems at the Old Crow Flats, a valuable and internationally recognized wetland in the Yukon Territory.

Climate Change Impacts on Canadian Arctic Tundra

Greg Henry
University of British Columbia
Project Team Members: 32
Students: 92
Northern Students: 18
Northern Participants: 450
Project Location: Canadian Arctic
www.geog.ubc.ca/itex/index.php

Through the examination of vegetation, soils, carbon dioxide exchange and traditional knowledge, Henry and colleagues completed an integrated assessment of the Arctic tundra, resulting in data that will be used in an ecosystem model to predict how the tundra may react to change. Under this program, Parks Canada scientists developed an innovative and cost effective approach to tundra mapping over the vast areas of Arctic national parks, which helps predict how national parks in the Arctic will change over time. This project also provided new information on Arctic flora, including important species range extensions.

Yeendoo Nanh Nakhweenjit K'atr'ahanahyaa: Environmental Change and Traditional Use in the Old Crow Flats, Yukon

Shel Graupe
Vuntut Gwitch'in First Nation
Project Team Members: 84
Students: 27
Northern Students: 11
Northern Participants: 43
Project Location: Northern Yukon

Graupe and colleagues combined traditional and scientific knowledge to gain an understanding of the dynamics of the Old Crow Flats. By combining the investigation of hydrological processes, past climates (through evidence from lake sediment cores and tree ring growth), hydrology, wildlife (moose and muskrat) and food security, the information gathered will prove relevant for the management of the valuable resources in this region.

Three IPY projects which analyzed the changing landscape were more focused in nature.

Impacts of a Changing Arctic Tree Line

Karen Harper
Dalhousie University
Project Team Members: 172
Students: 80
Northern Students: 11
Northern Participants: 76
Project Locations: Manitoba;
Northwest Territories; Nunatsiavut;
Nunavut; Ontario; Quebec; Yukon
pps-arctic.sres.management.dal.ca

The project led by Karen Harper (Dalhousie University) centred on changes being observed in the delimitation zone or treeline. Spanning the Canadian Arctic, this project recorded changes and mechanisms of change in tree and shrub distribution in relation to climate and disturbance. They found a large variation in treeline response to warming which is evident in some sites but not others.

Carbon, Microbial and Plant Community Dynamics in Low-Arctic Tundra

Suzanne Simard
University of British Columbia
Project Team Members: 17
Students: 9
Northern Students: 4
Project Location: Alaska
faculty.forestry.ubc.ca/simard/ipy/

Suzanne Simard (University of British Columbia) and Jagtar Bhatti (Natural Resources Canada) led projects that investigated different components of the carbon cycle of Arctic ecosystems. Simard and colleagues investigated the relationships between mycorrhizal fungi, soil microbes and tundra plants and tested how these will change with climate warming. They found that warming strongly alters soil bacterial and fungal communities, and that mycorrhizal fungi are critical drivers of Arctic ecosystem change as the climate warms. Their data suggest that warming will enhance the spread of shrubs and lead to increased decomposition of carbon stores in the Arctic tundra. Bhatti and colleagues examined the interactions between vegetation, soil and permafrost and how they affect carbon cycling and greenhouse gas emissions.

Changing Forests and Peatlands along the Mackenzie Valley, Northwest Territories

Jagtar Bhatti
Natural Resources Canada
Project Team Members: 14
Students: 9
Northern Students: 3
Northern Participants: 10
Project Locations: Mackenzie Valley,
from Northern Alberta to Inuvik,
Northwest Territories

Results from all five projects suggest that Arctic terrestrial ecosystems are very sensitive to warming temperatures. Data from these projects will be essential for predictive modelling of how these ecosystems will change over time. Traditional knowledge collected as part of these projects and information collected from community-based research show that changes in Arctic ecosystems are having effects on nearby communities. Overall, information on terrestrial systems is vitally important for understanding how Arctic ecosystems will change so that we can mitigate the impacts of this change on wildlife and humans.





Paul Vecsei

Wildlife

Within Arctic ecosystems, wildlife provide instructive examples of how life adapts to unique environmental conditions. Whether due to variations in climate or human development, there are a range of responses of Arctic wildlife to environmental change.

Eight IPY science projects were funded to research Arctic wildlife and related ecosystems. Two of these projects investigated large scale concepts; food webs and population dynamics in terrestrial and marine systems, respectively.

Impact of Climate Change on Tundra Wildlife

Gilles Gauthier

Université Laval

Project Team Members: 88

Students: 74

Northern Students: 19

Northern Participants: 68

Project Locations: Manitoba;
Nunavut; Yukon

www.cen.ulaval.ca/arcticwolves

For terrestrial wildlife and ecosystems, Gilles Gauthier (Université Laval) and colleagues looked at the predator-prey and plant-herbivore interactions on the Arctic tundra, as well as determining the direct and indirect impacts of climate change on biodiversity within these ecosystems. This was accomplished by measuring abundance, timing and success of reproduction, habitat use and wildlife diets for species like geese, small mammals, and avian and mammalian predators. To get a full picture, assessments of soils, plants and traditional knowledge relating to these species were also conducted. Results suggested that tundra predators may have the strongest influence on prey and food webs in terrestrial ecosystems, while plant-herbivore interactions may be most sensitive to climate change.

Effects of Global Warming on Polar Bears, Seals and Whales

Steve Ferguson

Fisheries and Oceans Canada

Project Team Members: 17

Students: 13

Northern Students: 5

Northern Participants: 35

Project Location: Hudson Bay

Work by Steve Ferguson (Fisheries and Oceans Canada) focused on marine mammals and ecosystems. Through the collection of biological samples from predator and prey species within the marine environment, a complete food web from nutrients and phytoplankton to marine predators was modelled. Among other results, this project found that Hudson Bay is moving from an ecosystem characterized by polar bears and seals to one dominated by killer whales. Based on the traditional knowledge collected, it was found that this shift is posing challenges for communities in securing traditional food sources and creating the need for human adaptation.

The remaining six IPY-funded wildlife science projects focused on specific Arctic species.

The species studied in these projects were polar bears (led by Elizabeth Peacock, Government of Nunavut), caribou and wild reindeer (led by Don Russell, Yukon College), seabirds (led by William Montevecchi, Memorial University), beluga (led by Mike Hammill, Fisheries and Oceans Canada), Greenland shark (led by Aaron Fisk, University of Windsor) and Arctic char (led by James Reist, Fisheries and Oceans Canada). These projects investigated a wide range of topics, including biodiversity, population dynamics, distribution and habitats, diet, general health, contaminant exposure and traditional knowledge related to the different species. Many of these species are sensitive to changes in sea ice cover and water temperature, both directly and indirectly, indicating that climate change will influence the future abundance and distribution of these species. For these projects, traditional knowledge was an important source of data about species patterns of movement and health over time.

Impacts of Climate Change on Polar Bears

Elizabeth Peacock
Government of Nunavut
Project Team Members: 9
Students: 3
Northern Students: 1
Northern Participants: 5
Project Locations: Manitoba;
Nunatsiavut; Nunavik; Nunavut

Determining the Diet of the Greenland Shark in a Changing Arctic

Aaron Fisk
University of Windsor
Project Team Members: 15
Students: 5
Northern Participants: 2
Project Location: Nunavut

Beluga Tagging in the Arctic

Mike Hammill
Fisheries and Oceans Canada
Project Team Members: 10
Students: 4
Northern Participants: 5
Project Locations: Hudson and
James Bay; Nunavik

Monitoring the Impacts of Global Change on Caribou and their Link to Human Communities

Don Russell
Yukon College
Project Team Members: 55
Students: 12
Northern Students: 2
Northern Participants: 35
Project Locations: Northwest Territories;
Nunatsiavut; Nunavik; Nunavut; Yukon
www.carmanetwork.com

Climate Variability and Change Effects on Chars in the Arctic

James Reist
Fisheries and Oceans Canada
Project Team Members: 18
Students: 8
Northern Participants: 35
Project Locations: Northwest Territories;
Nunavik; Nunavut; Nunatsiavut
www.ipy.org/index.php?ipy/detail/arctic_biodiversity_of_chars/

How Seabirds Can Help Detect Ecosystem Change in the Arctic

William Montevecchi
Memorial University
Project Team Members: 24
Students: 24
Northern Students: 8
Northern Participants: 6
Project Location: Newfoundland; Nunavut
www.dogsbody.psych.mun.ca/ipy/IPY

These IPY projects provided information directly relevant to communities that depend on these species, or their prey, for food. Many of the projects' findings can be used in resource management and community-based monitoring networks. The IPY-funded wildlife projects are clearly contributing to the understanding of both ecosystem changes and food security for Northern communities.





Peter Dawson

Community Well-being

Historical Adaptations

The Arctic is one of the regions of the world where the effects of climate change are most evident. The impacts on inhabitants of this region has been an important theme of IPY 2007-2008. Past climate records show that the Arctic experienced many different climates which necessitated the adaptation of its people to change. Four Canadian IPY science projects looked at how Arctic societies have historically adapted to environmental change. The findings are contributing to an understanding of how communities in the past were resilient and able to adapt to change—information that can provide insight into community resilience and adaptation in the present.

Dynamic Inuit Societies in Arctic History

T. Max Friesen
University of Toronto
Project Team Members: 60
Students: 56
Northern Students: 48
Northern Participants: 61
Project Locations: Nunatsiavut;
Nunavik; Nunavut
www.ipy.utoronto.ca

Two IPY projects led by Max Friesen (University of Toronto) and Patricia Sutherland (Canadian Museum of Civilization), respectively, looked at the influence of societal and environmental factors on Inuit history. Results from both projects about early Inuit occupation of the eastern Arctic indicate that Inuit migration from west to east likely occurred due to a combination of changes in whale populations, interactions between diverse Aboriginal groups, and an early European influence on economy and culture. Several new archaeological sites were found and study of this evidence will help determine how Inuit may have acted in the face of change and opportunity in the past.

Climate Change and Inuit History in Arctic Canada

Patricia Sutherland
Canadian Museum of Civilization
Project Team Members: 32
Students: 11
Northern Students: 11
Northern Participants: 13
Project Location: Nunavut

Northwest Territories Ice Patch Study

Thomas Andrews
Prince of Wales Northern
Heritage Centre, GNWT
Project Team Members: 13
Students: 1
Northern Participants: 40
Project Location: Northwest Territories

In contrast, two projects led by Thomas Andrews (Prince of Wales Northern Heritage Centre) and Sheila Greer (Champagne and Aishihik First Nations), respectively, looked at historical change at a more local level. Andrews and colleagues studied ice patches in the Mackenzie Mountains to determine features of caribou population dynamics and biology, past hunting activities/technologies and ice patch development. Results showed that ice patches are rich depositories of archaeological artifacts, but are also changing in response to variations in climate. Several new ice patches were also marked for future study. Information from this project will provide information for managing caribou herds.

**Kwäday Dän Ts'inchi Discovery –
Expanding our Understanding of the
“Long Ago Person Found”**

Sheila Greer

Champagne and Aishihik First Nations

Project Team Members: 13

Students: 2

Northern Students: 2

Northern Participants: 14

Project Location: Northern
British Columbia

Greer and colleagues examined the remains of a young adult aboriginal male (named Kwäday Dän Ts'inchi, Long Ago Person Found) and associated artifacts originally found in 1999 in a glacier in northern British Columbia. Results showed that Kwäday Dän Ts'inchi belonged to a local clan within the nearby community.

All four projects have collected traditional knowledge and significantly involved surrounding communities in their IPY studies. As well, the project led by the Champagne and Aishihik First Nations was also able to link scientific and community-based knowledge throughout the investigative process.

Food Security and Water Quality

Northern communities are vulnerable to threats to food and water safety due to their remote locations, contaminants, and the harsh and changing climate. While several IPY-funded science projects looked at the different aspects of the health of communities, three projects specifically investigated issues around food and water security.

**Integrated Research on Arctic
Marine Fat and Lipids**

Eric Dewailly

Centre hospitalier de
l'Université Laval

Project Team Members: 21

Students: 8

Northern Students: 2

Northern Participants: 25

Project Locations: Northwest Territories;
Nunatsiavut; Nunavik; Nunavut

Country food, such as marine mammals and caribou, has been an important staple of Northerners' diets throughout time; however, both the characteristics and use of country food have recently changed. Eric Dewailly (Centre hospitalier de l'Université Laval) and colleagues looked at the diets of Northerners to determine how fat content, from both country and store-bought food, is affecting levels of disease in Northerners. Some results suggest that fat from country food can protect against heart disease and psychological distress. At the same time, hunters are reporting a change in the quality of fat found in marine mammals used for food. However, further work to understand the implications of this change is continuing.

**Engaging Communities in the
Monitoring of Country Food Safety**

Manon Simard

Makivik Corporation

Project Team Members: 26

Students: 3

Northern Students: 1

Northern Participants: 70

Project Locations: Northwest Territories;
Nunatsiavut; Nunavik; Nunavut

Manon Simard (Makivik Corporation) and colleagues studied food safety by looking at the presence of parasites in country food. By establishing local monitoring capacity and improving diagnostic tests for food safety purposes, Simard and colleagues developed a system to quickly identify the presence and levels of parasites in food being eaten by local communities. The results of this project are allowing communities to be more knowledgeable about preventing the transmission of certain diseases through the consumption of traditional foods.



Vicente Santiago



Constructed Wetlands for the Treatment of Wastewater in Arctic Communities

Brent Wootton
Fleming College
Project Team Members: 4
Students: 5
Northern Students: 1
Northern Participants: 8
Project Locations: Northwest Territories;
Nunavik; Nunavut
www.flemingcollege.ca/cawt

Water quality is also a concern of Northerners. As Arctic communities grow and become more urbanized, effectively treating wastewater has become a pressing concern. Brent Wootton (Fleming College) and colleagues developed a project to construct wetlands for sewage treatment and wastewater across the Canadian Arctic. Constructed wetlands are low maintenance, have low operational and energy requirements and provide a flexible and sustainable solution for wastewater treatment. Through collaboration with the United Nations Environment Programme and the University of Copenhagen, modelling software was developed to help Arctic communities set up and operate such systems. This initiative also included a training component to allow communities to independently manage a community-constructed wetland. As this modelling software was developed for cold climate wastewater treatment, it will be relevant to cold climate communities worldwide.

Community Resiliency and Adaptation

Northern communities are aware of the need to adapt to changes that are occurring due to changes in climate, the environment and society more broadly. However, the requirements and resources of communities are complex and variable, so responding to change can be difficult. Four IPY-funded science projects have looked at the interaction between the environment and society to determine the issues facing communities and some of the adaptations to various types of change.

Determining the factors that are important in the face of changes related to the climate as well as those linked to the well-being of communities, were studied by two IPY projects. Both projects used case studies and community-based research methods to look at communities across the North to determine how environmental and socio-economic changes shape sensitivity to threats, resiliency, and the ability to adapt.

Community Adaptation and Vulnerability in the Arctic (CAVIAR)

Barry Smit
University of Guelph
Project Team Members: 25
Students: 25
Northern Students: 5
Northern Participants: 44
Project Locations: Northwest Territories;
Nunatsiavut; Nunavut; Yukon.
www.uoguelph.ca/gecg/page.cfm/CAVIAR

Barry Smit (University of Guelph) and colleagues found that northern residents—in addition to concerns about the cost of living, employment and socio-cultural issues—are affected by climate change in terms of risks to infrastructure, food security and health as well as their use of sea ice for hunting and transportation. Adaptation strategies were found to be largely reactive, autonomous and financially constrained in nature. Local engagement of communities in this research project has facilitated awareness of the impacts of climate change on communities at multiple levels of policy making and management organizations. In addition, research partnerships across seven Arctic countries with this project have fostered Pan-Arctic lesson exchanges and valuable adaptation insights.

Arctic Peoples, Culture, Resilience and Caribou

Cindy Dickson

Council of Yukon First Nations

Project Team Members: 37

Students: 29

Northern Students: 20

Northern Participants: 120

Project Locations: Northwest Territories; Nunavut

www.ipycaribou.ca

Cindy Dickson (Council for Yukon First Nations) and colleagues investigated how culture, language, traditional knowledge/skills and governance/institutional arrangements support a community's response to fluctuations in access to and availability of a key local resource, specifically caribou. One observation that has emerged is that many communities have well-developed systems of learning, practice and governance related to environmental change.

Using different approaches, these studies examined the link between society and the physical environment. One project combined technology-enabled scientific observation with interviews to document traditional knowledge while a second project used traditional knowledge to describe how communities are reacting to climate change.

Inuit Sea Ice and Occupancy Project (ISIUOP)

Claudio Aporta

Carleton University

Project Team Members: 34

Students: 18

Northern Participants: 13

Project Locations: Nunavik; Nunavut
gcr.ccarleton.ca/isiuop

Claudio Aporta (Carleton University) and colleagues investigated the nature of sea ice use and occupancy and how this has changed over time. The aim of this project was to document and map sea ice knowledge in several communities in Nunavut and Nunavik (northern Quebec). Researchers examined seasonal sea ice conditions, extent and areas of sea ice use, nature and location of sea ice features, past and present ice routes, and Inuktitut place names in terms of how these characteristics are affected by social and/or climate change. Two technologies were developed as part of this project: a new, integrated Global Positioning Systems (GPS) that can be easily and affordably mounted on snow machines and sleds to track travel over sea ice; and an online, interactive atlas to feature and archive collected data. Examples of results include that knowledge of sea ice is linked to knowledge of other phenomena, like wind, and that changes in surrounding sea ice features are being noted and forcing changes to traditional sea ice routes.

Traditional Knowledge and Climate Change in Tr'ondëk Hwëch'in Traditional Territory

Allie Winton

Tr'ondëk Hwëch'in First Nation

Project Team Members: 13

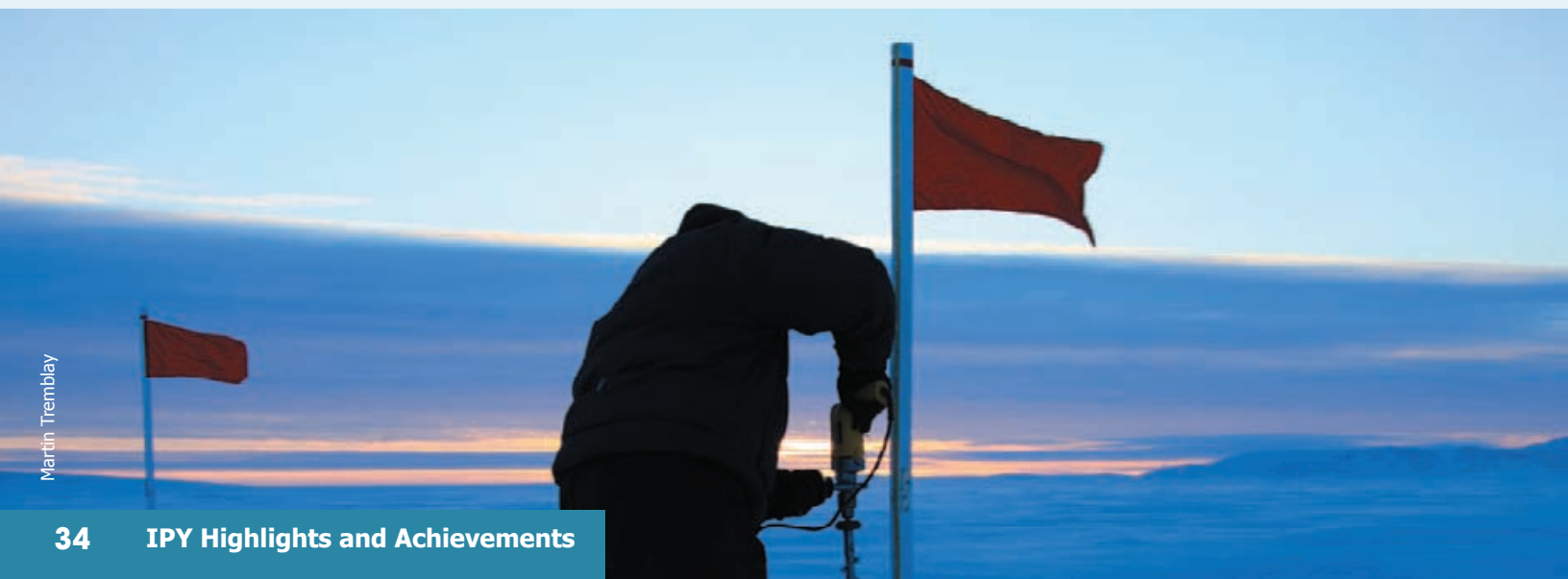
Students: 4

Northern Students: 3

Northern Participants: 50

Project Location: Yukon

Allie Winton (Tr'ondëk Hwëch'in First Nation) and colleagues in the Tr'ondëk Hwëch'in Traditional Territory interviewed community members to document traditional knowledge pertaining to climate change and its impacts on lifestyles of northern communities of the Yukon.



Economic development, particularly in the form of oil and gas activity, is also having an impact on several northern communities.

Impacts of Oil and Gas Activity on People in the Arctic (GAPS)

Dawn Bazely
York University
Project Team Members: 19
Students: 14
Northern Students: 11
Northern Participants: 300
Project Locations: Newfoundland and Labrador; Northwest Territories; Nunavik; Yukon
www.ipygaps.org

Dawn Bazely (York University) and colleagues investigated how the northern environment and communities are being affected by diverse pressures in both the short and long-term by oil and gas development. The team, through its various subprojects studied health, housing, governance and invasive species. They found that industrial development has impacted communities in many ways and that Northerners are aware of the challenges posed by adaptation in the context of rapid change. A key feature of this adaptation is that it will differ among local communities but will reflect inclusive, community-based processes.

Human Health

Health in northern communities has been an important part of Canada's IPY research. Studies were undertaken to develop new tools for education, counselling and treatment, to fill knowledge gaps, reduce the impacts of infectious diseases and establish baselines for the health of Northerners. The data derived from these projects will be used to develop and implement policies that address treatment and prevention of disease. As part of this research, four IPY science projects investigated several health-related issues in northern communities.

The prevalence and distribution of infectious diseases was the subject of three IPY research projects.

Addressing Viral Hepatitis in the Canadian North

Gerald Minuk
University of Manitoba
Project Team Members: 8
Students: 2
Northern Students: 1
Northern Participants: 4
Project Locations: Northwest Territories; Nunavut

Gerald Minuk (University of Manitoba) and colleagues investigated the distribution of the Hepatitis B virus (HBV) subtypes. Results showed that certain subtypes are associated with different rates of viral mutations and these in turn relate to different clinical outcomes. In the Canadian North, those infected with HBV tend to have a subtype which less often leads to cirrhosis and cancer than other subtypes. An educational, computerized Viral Hepatitis Database has been developed to help physicians and nurse practitioners in identifying, counselling and treating those infected with HBV.

Human Papillomavirus (HPV) in Northern Canada

Yang Mao
Public Health Agency of Canada
Project Team Members: 11
Students: 2
Northern Students: 2
Northern Participants: 40
Project Locations: Northwest Territories; Nunavut; Yukon

By sampling across the Canadian North, Yang Mao (Public Health Agency of Canada) and colleagues investigated the distribution and prevalence of Human Papillomavirus (HPV), a disease that can be highly associated with the development of cervical cancer. Aboriginal women have a higher risk of developing cervical cancer, yet there is limited information about HPV infection in Northern Canada. To fill the gap in knowledge, this project examined HPV infection in women in the Northwest Territories, Yukon and Nunavut to determine general prevalence rates, types of HPV, and risks associated with the development of HPV. The results of this study will be used to provide scientific evidence for policy makers and local public health workers to assist in the planning and implementation of cancer control programs.

Effectiveness of Vaccination against Respiratory Infections for Young Children of the Nunavik Region

Philippe De Wals
Université Laval
Project Team Members: 3
Students: 1
Northern Participants: 6
Project Location: Nunavik

In Nunavik, Quebec, Philippe De Wals (Université Laval) and colleagues evaluated the impact of a vaccination program for both pneumonia and influenza on respiratory infections and auditory problems in children. To date, 90 percent of children have been vaccinated against pneumococcus. Since the mass vaccination campaign began in 2002, infections against which the vaccines protect have disappeared and/or significantly decreased. However, other infections which the vaccines do not protect against have increased.

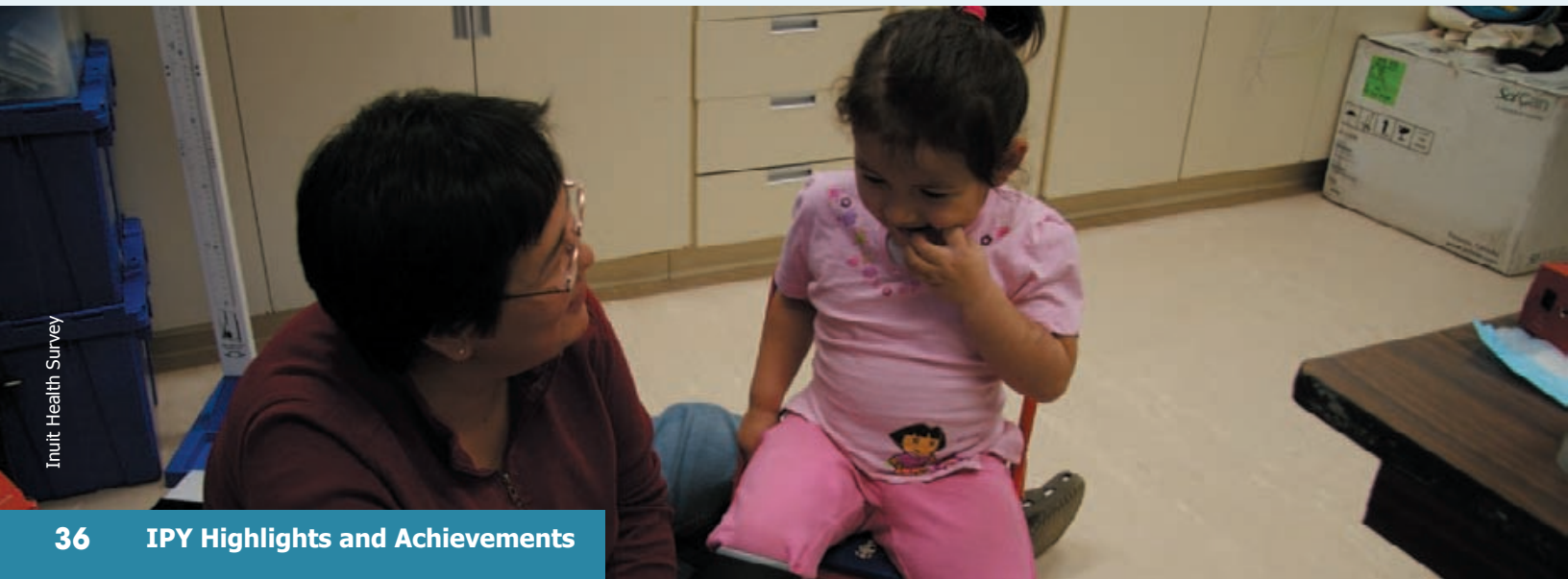
The results of these projects will provide important information on the effectiveness of vaccinations and treatments for infectious disease, potentially leading to the development of prevention strategies, not only in the Canadian North, but also for other parts of the world.

Inuit Health Survey: Inuit Health in Transition and Resiliency

Grace Egeland
McGill University
Project Team Members: 12
Students: 18
Northern Students: 1
Northern Participants: 84
Project Locations: Northwest Territories; Nunatsiavut; Nunavut
www.inuithealthsurvey.ca

The largest survey of Inuit health conducted to date was led by Grace Egeland (McGill University) and colleagues. This IPY study built on a health survey that was originally completed in Nunavik in 2004. By surveying Inuit residents in 36 communities in three Inuit Regions of Canada, the Inuvialuit Settlement Region, Nunavut, and Nunatsiavut, the Inuit Health Survey produced an overall baseline of the health of Northerners through the completion of two surveys, one on adult health and a second on children's health. The former assessed many aspects of health, including cardiovascular, metabolic, skeletal and mental health, diet, body composition and exposure to contaminants. The children's health survey examined nutritional status, food security, access to country food, and respiratory and ear infections. In addition, children were assessed for diet quality, height, weight, vision, skeletal health and contaminant exposure.

Findings of the Inuit Health Survey include that a majority of preschool children live in households that are considered food insecure, are overcrowded and where children are exposed to passive smoking. However, a majority of these households also reported a high degree of interaction with extended family, participation in traditional food sharing networks and banning smoking from the house itself. Preschoolers in Nunavut also reported high intake of traditional food, which was shown to provide adequate levels of several important dietary nutrients. While growth rates are normal, the risk for being overweight is higher than expected.





David Barber, ArcticNet

IPY science has covered a range of topics and issues relevant to Canadians both in the North and in other regions of the country. While the findings from IPY research are in the early stages of analysis and dissemination, it is evident that IPY in Canada has been successful in advancing scientific knowledge, understanding of the Arctic and the well-being of Northern communities. This research has contributed to the international program of research for IPY and to the training of early career scientists. It also increased the capacity for research in Canada's North and relevant knowledge for northern communities. The Government of Canada Program for IPY funded a large research program relevant to communities, governments and industry in Canada's North. With the interest and collaboration of Northerners and participants from across Canada and around the world, the many IPY studies are contributing new knowledge important to our understanding of climate change and the health and well-being of Northerners.


Highlights

- **52 research projects, including more than 212 sub-projects, were funded by Canada's IPY Program.**
- **Eight international IPY research networks were led by Canadians.**
- **More than 1,900 researchers involved in IPY science projects, including more than 240 international collaborators from 23 countries.**
- **More than 1,800 Northerners contributed to IPY science projects as researchers, technicians, field guides, etc.**
- **Valuable research opportunities and training provided to more than 1,200 students and early career scientists, including 215 students from Canada's North.**
- **33 of the 45 projects included traditional knowledge in their research.**
- **IPY Researchers' Workshops (held in 2007, 2008 and two in 2010) brought together the Canadian IPY research community to discuss findings and provide opportunities for networking and collaboration.**



Logistics for Health and Safety





*Ensuring the health and safety
of researchers and northern
communities during IPY and
enhancing northern research
infrastructure.*

Conducting research in some of the most remote areas of Canada's Arctic, often under harsh and variable conditions, involves complex logistics and requires special measures for health and safety. The Government of Canada Program for IPY recognized these special considerations, as well as the additional demands on infrastructure, people and resources related to an increase in the level of research activity in Canada's North for IPY 2007-2008.

Surveys with Canadian and international IPY projects were conducted between 2007 and 2009 to determine where, when and how many IPY researchers were expected in Canada's North. The tracking of IPY projects internationally was difficult as not all internationally endorsed IPY projects were funded, changes in project leads and their information were not always kept up to date, and there was a large amount of collaboration amongst projects. This meant that the results of these surveys were instrumental to inform and prepare northern organizations in Canada for IPY field seasons from 2007 to 2009 and to assess logistics, and health and safety needs.

Since 2007 there was a significant increase (30 percent) in the total number of scientific expeditions in the Canadian Arctic with over 1,900 IPY researchers working across the Canadian North at more than 100 research sites. Through three directed requests for proposals, Northern research and emergency preparedness organizations were eligible to apply for funding to enhance: staff during IPY field seasons; infrastructure, health and safety supplies; training and information, and emergency communications equipment.



Logistics, Infrastructure and Emergency Preparedness Subcommittee

The Logistics, Infrastructure and Emergency Preparedness Subcommittee was established in June 2006 for a three-year term. The goal of this Subcommittee was to provide advice and recommendations on the development and implementation of plans to coordinate and meet the logistics, infrastructure, security, health and safety, and emergency preparedness needs arising from IPY activities in Canada's North. These recommendations were used to develop the plan for IPY Logistics for Health and Safety.

Membership of this Subcommittee included experts with knowledge and experience in northern logistics and infrastructure issues, emergency preparedness, as well as land- and sea-based operations.

Northern Research Facilities

Canada's Arctic research facilities provide invaluable support to scientists working in the North. These facilities are located across Canada's North and offer year-round and seasonal support which include air and land transportation, communication and field equipment, accommodations, and expert advice. More information about Canada's northern research facilities and their locations is available through the Canada Polar Commission's website at www.polarcom.gc.ca.

A number of Canada's northern research facilities were built during the last IPY, the International Geophysical Year in 1957–1958, and this aging infrastructure is now 50 years old. In 2008, the Canadian Polar Commission released a report called *Beacons of the North: Research Infrastructure in Canada's Arctic and Subarctic*. Also in 2008 the Council of Canadian Academies released *Vision for the Canadian Arctic Research Initiative: Assessing the Opportunities*. These reports revealed that a majority of Canadian northern research facilities had not received funds to upgrade infrastructure and equipment in over 25 years, and that funding was needed to maintain this important but aging infrastructure in support of Arctic science.

To address this need, \$5 million in IPY funding supported investments in 18 northern research stations (see Figure 6). These funds have been used to:

- Renovate facilities to reduce energy costs and decrease the environmental footprint of the facility.
- Upgrade clothing, transportation, navigation and communications equipment;
- Provide additional twin otter and helicopter time for researchers.
- Hire and train 10 northerners as base camp managers, medical safety officers, and technicians.
- Develop accredited field assistant programs for 10 northern youth to receive training and field experiences with IPY researchers. Many participants have acknowledged their participation as a life-changing experience that allowed them to reconnect with the land and seriously consider careers in science.
- Establish an accredited Polar Bear Guide training program that incorporates Inuit traditional knowledge to train over 60 guides. These guides are now being employed by northern research facilities, science and mining camps, and by National Parks.

A complete listing of IPY logistics funding allocated to northern research facilities can be found at www.ipy.gc.ca.

This funding also complements the \$85-million dollar Arctic Research Infrastructure Fund that was announced by the Government of Canada in 2009, as part of its Economic Action Plan for renovations to Canada's aging northern research infrastructure. Twenty projects were selected for funding through this program. More information about these projects can be found at www.inac.gc.ca.

Figure 6: Locations of Northern Research Facilities Receiving IPY Logistics Funding



1	Aurora Research Institute (ARI) Aurora College Inuvik, NWT	11	Nunavut Research Institute Nunavut Arctic College Iqaluit, Nunavut
2	Alert Observatory Environment Canada Alert, Nunavut	12	Polar Continental Shelf Project (PCSP) Natural Resources Canada Resolute, Nunavut
3	Bylot Island Field Station Université Laval Bylot Island, Nunavut	13	Polar Environment Atmospheric Research Laboratory (PEARL) University of Toronto Eureka, Nunavut
4	Canadian Polar Commission Ottawa, Ontario	14	Quajisarvik Research Network The Nunavik Research Centre (Makivik Corporation), Centre d'études nordiques (Université Laval) and the Umiujaq field station (Makivik Corporation). Nunavik, Quebec
5	Centre d'études nordiques (CEN) Université Laval Nunavut and Nunavik	15	Sirmilik National Park Parks Canada Pond Inlet, Nunavut
6	Churchill Northern Studies Centre Churchill, Manitoba	16	Torngat Mountains National Park Parks Canada Nain, Labrador
7	Eureka Weather Station Environment Canada Eureka, Nunavut	17	Walker Bay Research Station Government of Nunavut Kitikmeot, Nunavut
8	Labrador Institute Memorial University of Newfoundland Goose bay, Labrador and Newfoundland	18	Yukon College Whitehorse, Yukon
9	La Peruse Bay University of Toronto Churchill, Manitoba		
10	McGill Arctic Research Station (MARS) McGill University Axel Heiberg, Nunavut		

Emergency Preparedness

Those conducting research on the land and water in the Canadian Arctic recognize that Search and Rescue (SAR) operations in the North can be delayed due to distance, response time and weather. Assistance may be as close as the nearest community or as far away as a southern Canadian city. The vast distances in the North also mean that SAR activities are time-consuming and expensive. Proper emergency preparedness by researchers and northern organizations is crucial for saving lives, time and limited resources.

An information guide entitled *Community, Licensing, Safety and Security: Information for IPY Researchers working in Canada's North*, was developed so that International and Canadian IPY researchers would be better prepared for working in the remote environments of the Canadian Arctic. The guide outlined recommended health and safety equipment, training, emergency contact information and additional medical insurance. This guide was distributed to the Canadian IPY project leads, the international IPY offices and is also available at www.ipy.gc.ca.



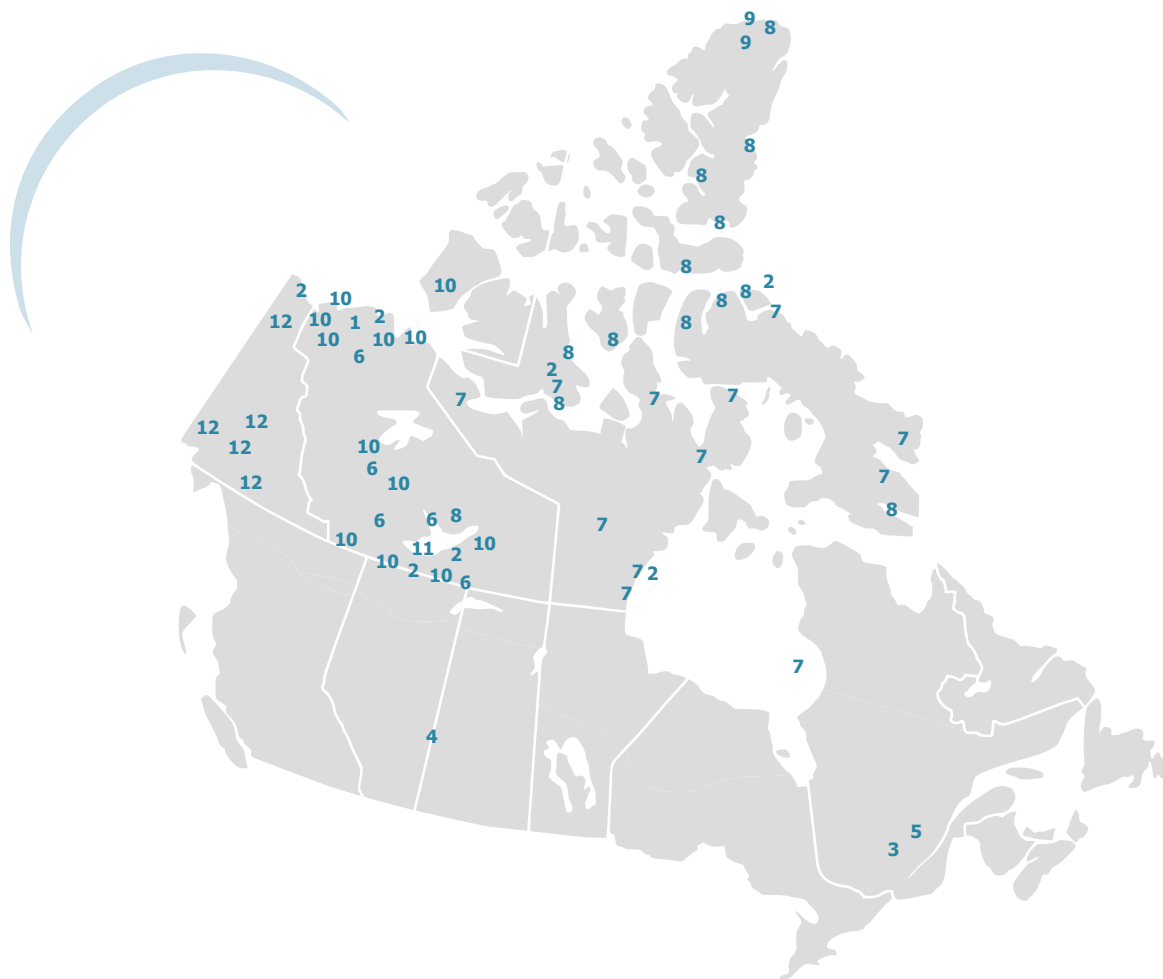
To support northern emergency preparedness organizations getting ready for IPY, over \$8.7 million in IPY funding went to 12 organizations (see Figure 7). Some examples of projects include:

- “Train the trainer” courses which took place across the North to train over 200 northern community volunteers in search and rescue techniques, use of communication and navigation equipment, and marine safety.
- Coordination amongst federal, territorial and community emergency preparedness groups in the North was improved through conferences, workshops and meetings.
- Enhancements to emergency communications and navigation equipment which included VHF radios/stations, satellite phones, Iridium pagers, GPS, laser flares and personal locator beacons.
- Ground search and rescue capabilities were improved through the purchase and testing of amphibious all-terrain vehicles in Nunavut.
- Remote site command posts were established, comprising of tents, heaters, generators, medical equipment and alternate communications that are designed, packaged and stored for efficient transport to an incident site.
- Additional emergency fuel caches were set up in the high Arctic during IPY.
- Historical sea ice information and enhanced near-real-time ice information was provided for 10 IPY marine-based research projects.
- The coverage and accuracy of Canadian Arctic weather models was improved and the frequency of the model runs for enhanced weather information was increased. These services were crucial for all field activities and search and rescue events in Canada’s North.

A full listing of IPY logistics funding allocated to emergency preparedness organizations can be found at www.ipy.gc.ca.



Figure 7: Locations of Emergency Preparedness Organizations Receiving IPY Logistics Funding



1	Aurora Research Institute (ARI) Aurora College Inuvik, NWT	8	Polar Continental Shelf Project (PCSP) Natural Resources Canada Resolute, Nunavut
2	Coast Guard Auxiliary (Central & Arctic)	9	Quttinirpaaq National Park Parks Canada Iqaluit, Nunavut
3	Meteorological Service of Canada Environment Canada Canadian Ice Service	10	Royal Canadian Mounted Police (RCMP) G Division Yellowknife, NWT
4	Meteorological Service of Canada Environment Canada Arctic Weather Centre	11	Yellowknife Search and Rescue Society City of Yellowknife Yellowknife, Northwest Territories
5	Meteorological Service of Canada Environment Canada Canadian Meteorological Centre	12	Yukon Emergency Measures Organization Yukon Government Whitehorse, Yukon
6	Government of the Northwest Territories Emergency Measures Office Yellowknife, NWT		
7	Government of Nunavut Emergency Measures Office Iqaluit, Nunavut		

The delivery of logistics funding to areas where it was needed most during the IPY field seasons helped to ensure the health and safety of researchers and communities in the North. No search and rescue response related to IPY was required in the Canadian Arctic during IPY 2007-2008.

This funding was intended to prepare northern organizations for IPY, but the enhanced infrastructure, equipment, ice and weather information, training and capacity building that resulted from this funding has created a tangible IPY legacy and made a lasting contribution to northern research facilities and improved emergency preparedness.

Highlights



- **18 northern research stations received IPY support to improve equipment and facilities, and provide training.**
- **More than 80 northerners were trained as base camp managers, medical safety officers, technicians, field assistants and polar bear guides.**
- **12 organizations received support from IPY to train over 200 northern community search and rescue volunteers.**
- **Coordination between federal, territorial and community emergency preparedness groups in the North was improved through conferences, workshops and meetings that were convened in preparation for IPY.**
- **Ground search and rescue capabilities were increased through the testing of amphibious all-terrain vehicles, development of remote site command posts, establishment of additional emergency fuel caches in the high Arctic, and enhancement of northern ice and weather forecasting.**





Training and Capacity Building





*Developing the next generation
of northern scientists and
enhancing capacity in the North
to carry out polar science.*

Important objectives of International Polar Year, both within Canada and internationally, were to engage and develop a new generation of polar scientists, and strengthen the role of northern research institutions and northern communities in polar science. To help achieve these objectives, all Canadian IPY-funded research projects were to involve students and promote northern participation and skills development. The Government of Canada Program for IPY established four IPY Northern Coordination Offices to assist Northerners to take advantage of opportunities presented by IPY and to provide information and support to Canadian and foreign researchers. In addition, thirteen independent training and capacity building projects were supported, as well as numerous IPY conferences and workshops.



Training and Capacity Building Projects

A Call for Proposals was issued in October 2007, for training and capacity building projects. A total of 77 proposals were submitted and, following a competitive, multi-stage review process, 13 projects were selected. Over \$2.2 million was allocated to these projects over three years. These projects focused on developing the skills, techniques and knowledge needed to carry out northern-based research and monitoring during and beyond IPY, and also offer students, youth, young researchers and Northerners opportunities to become involved in IPY projects. Some highlights include:

- For three years, 10 to 12 Innu First Nation members received training through the Environmental Guardians Program. This program, set up by St. Mary's University, Memorial University and the University of the Arctic, provided participants with technical training on how to identify and monitor climate change impacts on their ancestral lands.
- As part of its IPY Arctic Youth Expeditions, Students on Ice has provided youth aged 14 to 19 with the opportunity to travel in the Arctic aboard a ship along with a team of 30 scientists, educators, polar experts, leaders, artists, journalists, musicians and environmentalists. Support from the Government of Canada Program for IPY has enabled 10 students per year (2008–2010) to receive scholarships to participate in these 16-day educational expeditions.
- In August 2008, a field course was held by Yukon College to give 14 students hands-on experience collecting data on climate change impacts on birds and mammals for an IPY research project.
- A learning materials centre has been established by Nunavut Arctic College to bring together information on Traditional Inuit Knowledge and IPY research in Nunavut.
- The Circumpolar Young Leaders Program run by the International Institute for Sustainable Development has provided opportunities for five young Canadians aged 19 to 30 to work and learn about the environmental, social and economic challenges facing Canada's North and the circumpolar Arctic.
- The community of Déline in the NWT has set up its own weather station and is creating opportunities for training, skills development and hands on learning for local students and community members. The project has brought together elders and scientists and includes training in traditional knowledge collection techniques, as well as weather monitoring and data analysis.

A description of all training and capacity building projects can be found at www.ipy.gc.ca.





IPY Northern Coordination Offices

Starting in February 2006, four IPY Northern Coordination Offices (NCOs) were funded within established research-oriented organizations in four regions across the North. The host organizations were the Council of Yukon First Nations (Whitehorse, Yukon), Aurora Research Institute (Inuvik, Northwest Territories), Nunavut Research Institute (Iqaluit, Nunavut) and Nunavik Research Centre (Kuujjuaq, Quebec).

The IPY Northern Coordinators have been an integral part of the overall organization of IPY in Canada. They have coordinated local IPY events and celebrations, provided guidance and support to scientists carrying out IPY research, and facilitated the involvement of Northerners and communities in IPY activities. The IPY NCOs have been actively engaging young people, informing and educating the public and media about IPY, and creating energy and enthusiasm across the North about IPY.

In partnership with the IPY Federal Program Office, the IPY Northern Coordinators have organized regional workshops and consultation meetings, facilitated regional social and cultural reviews of project funding proposals, and disseminated vital program information (e.g. information related to emergency preparedness and funding opportunities) through their regional networks. IPY researchers from Canada and abroad were provided with information and logistical support from the NCOs for their research in many areas of the Canadian North. They have also been involved in the Canadian Arctic Research Licensing Initiative, IPY Film Festival, as well as undertaking various communications activities to share the results of IPY science with Northerners.

Nearly two-thirds of IPY research projects report that they have benefited from the assistance of the Northern Coordinators in aspects of planning and logistics, introductions to potential community partners, and advice on matters of local protocols, licensing and permitting, attracting local students and workers, and countless other details associated with carrying out a successful research program.

Most importantly, the IPY Northern Coordinators provided a link to the communities and people of the North. To assist Northerners in taking advantage of opportunities offered through IPY, the Coordinators worked with communities and organizations, providing advice and instruction on writing proposals, and helping to develop partnerships between Northerners and southern-based groups. The NCOs have played a vital role in involving Northerners in IPY and enhancing local capacity for science and research in the North.

A few highlights from the IPY Northern Coordination Offices include:

- Celebrations to launch IPY were hosted in conjunction with the Canada Winter Games in Whitehorse.
- The Nunavut IPY Coordinator worked with IPY scientists to produce educational materials to be published through the Learning Materials Centre at Arctic College in Iqaluit.
- Quarterly columns were published in Makivik magazine to raise awareness of IPY research activities in Nunavik.
- Exhibits from the United States Smithsonian Institute and Science North were set up in arenas and schools in over 16 communities in the NWT.

Support for Conferences and Early Career Scientists

The Government of Canada Program for IPY has provided support to a number of IPY science conferences and workshops, many of which have taken place in Canada's North. During IPY, a special emphasis has been placed on fostering the next generation of polar scientists through support for student and early career scientist activities and events. Some highlights include:

- IPY GeoNorth 2007 was the first international circumpolar conference on geospatial sciences and applications. It was held in Yellowknife, Northwest Territories, August 20–24, 2007. Representatives of eight Arctic circumpolar countries, (Canada, Denmark, Finland, Iceland, Norway, Russia, Sweden and the United States) came together to work toward a common Arctic Geospatial Data Infrastructure (ASDI).
- The 14th International Congress on Circumpolar Health was held July 11–16, 2009 in Yellowknife, Northwest Territories. Over 750 scientists, health-care professionals, policy analysts, government representatives and community leaders participated in the congress and shared health-related research findings and program successes to improve the quality of life for those living in circumpolar regions.
- Yukon College and the Association of Canadian Universities for Northern Studies hosted an international student conference in Whitehorse, Yukon in October, 2009. *Communities of Change—Building an IPY Legacy* was attended by over 225 participants and included 98 oral presentations and 26 poster presentations.
- The Association of Polar Early Career Scientists hosted the IPY International Early Career Researcher Symposium in Victoria, British Columbia December 4–8, 2009. This symposium was focused on career and skills development and was attended by 71 participants from 14 different countries. Topics covered included IPY science projects, community-based research, funding, policy issues, and science communications.
- The Oslo Science Conference held in Oslo, Norway from June 8–12, 2010, marked an important IPY milestone as researchers came together to share their research results. To ensure Canadian participation in all aspects of the conference, support was provided for 68 participants including 13 Aboriginal and northern participants and 21 students and early career researchers. Other participants from Canada, including teachers and the IPY Northern Coordinators were selected for their involvement in IPY science and training, communications and outreach projects.



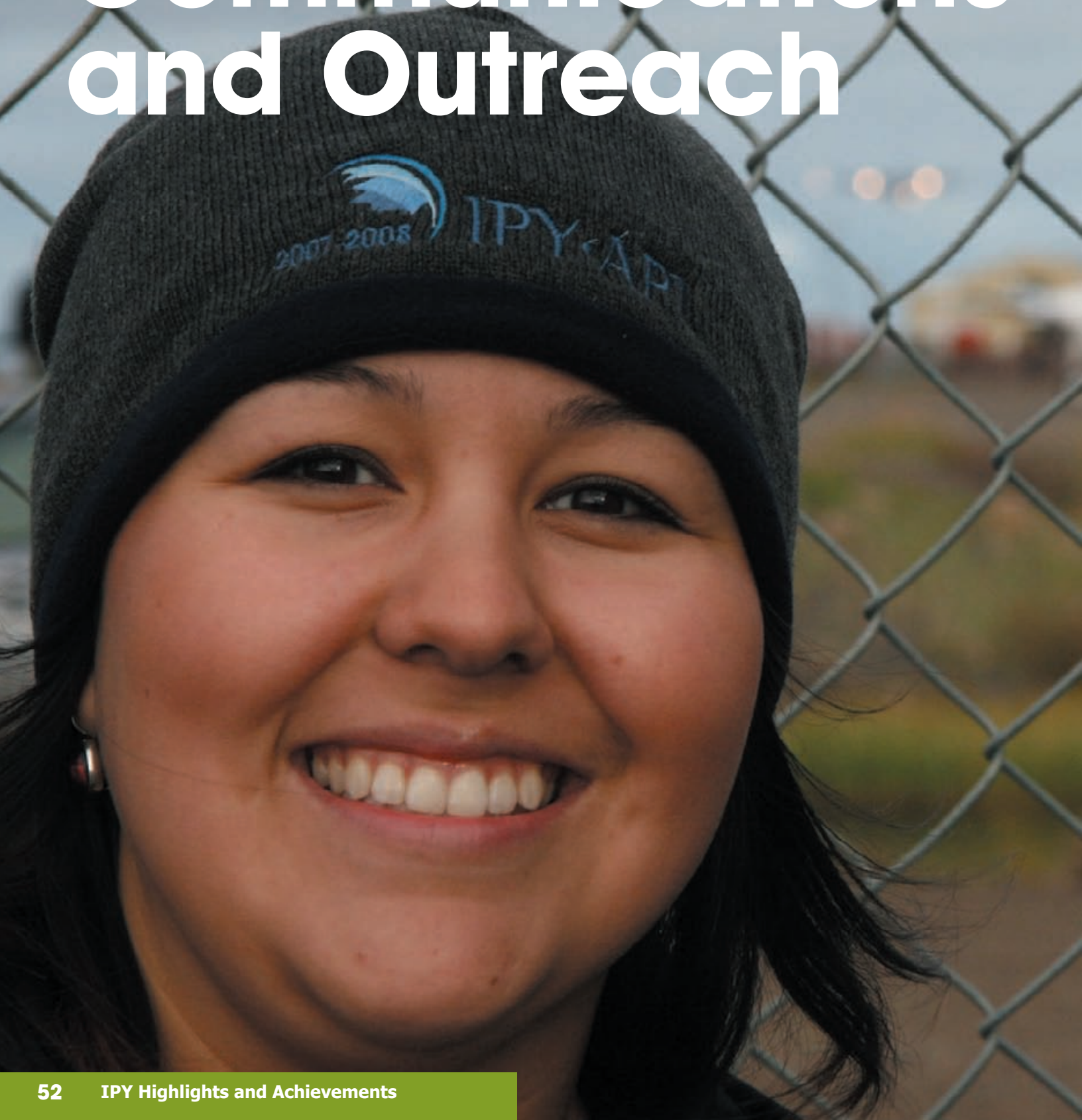
Highlights

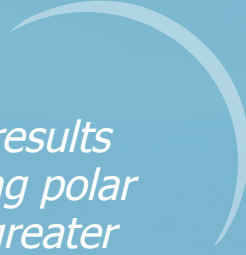
- 13 training and capacity building projects received over \$2.2 million in funding over three years through the Canadian IPY Program.
- Approximately 85 students and new researchers participated in IPY training and capacity building initiatives. Of these, more than 50 were northern students.
- Close to 120 Northerners participated in IPY training and capacity building initiatives.
- August 2–17, 2007, Students on Ice undertook its first IPY Youth Arctic Expedition and received support enabling 10 northern Aboriginal youth and high-school teachers from Yukon, Nunavut and Northwest Territories to participate. This successful expedition was funded for three additional years, 2008 to 2010, by Canada's IPY Program.
- Four IPY Northern Coordination Offices were established across the North and have made a significant contribution to the success of the Canadian IPY Program.
- Two-thirds of IPY research projects drew upon the information and support of the IPY Northern Coordination Offices.





Communications and Outreach





Sharing information and results of IPY research, promoting polar science, and fostering a greater awareness of Canada's Arctic, its peoples and the importance of polar regions in a global context.

International Polar Year 2007–2008 was a tremendous opportunity to communicate to Canadians about the Arctic and the important science and research taking place across the North. A myriad of communications and outreach projects were undertaken—some led by the Government of Canada Program for IPY and other federal departments and agencies, and others by organizations across the country, including the Canadian IPY Secretariat at the University of Alberta.

Highlights of activities led by the Government of Canada include ministerial events, news releases, websites, blogs, fact sheets, an IPY Film Festival, a circumpolar Arctic map, conference exhibits, live webcasts, promotional items and an IPY photo exhibit.

To complement this, the Government of Canada Program for IPY contributed to a number of creative and innovative communications and outreach projects led by organizations and individuals from across Canada, in particular from the North. Many of these projects were funded following a national Call for Proposals issued in October 2007. The Call had a special focus on youth and encouraging Northern students to learn about polar science and research. In total, 96 communications and outreach proposals were submitted. Following a rigorous review process, which included a northern regional review and a national review by an expert panel made up of communications professionals, northerners, writers and outreach experts, 21 communications and outreach projects were selected for funding. Government of Canada Program for IPY provided \$4.4 million over three years to fund these projects.

Highlights of the communications and outreach projects include IPY Arctic Radio, an IMAX film, museum exhibits, a regional atlas of the North, arts performances, a children's book, three live Inuit call-in TV shows and a youth time capsule.

In addition, the Government of Canada Program for IPY contributed to 11 other communications and outreach projects, including Youth Science Canada's Polar Innovation Week and IPY youth research grants and excursions, the creation of *Canada and the International Polar Year*, a new thematic section of the Canadian Geographic—Canadian Atlas Online, as well as an interactive map of IPY projects featuring photos and project locations and details, and the January–February 2010 issues of *Canadian Geographic* and *géographica* magazines.

A complete listing of IPY communications and outreach projects can be found at www.ipy.ca.



Events

Canadian IPY events have been central in spreading the word about the IPY Program in Canada, highlighting the science being undertaken, as well as delivering the communications and outreach objectives of the program. Canadian IPY events were kicked off on March 1, 2007, when International Polar Year in Canada was officially launched at a public event at the Museum of Civilization in Ottawa-Gatineau, coinciding with other international IPY events. The launch included cultural displays, speeches and presentations, and media activities. Both the Minister of Indian Affairs and Northern Development and the Minister of the Environment spoke at the event with an audience of over 200 people. Following the launch, ministerial events and public announcements of the 45 science research projects supported by the Government of Canada Program for IPY took place across Canada from June to September 2007. These announcements were made as part of events in Churchill (MB), Victoria (BC), Winnipeg (MB), Quebec (QC) and Iqaluit (NU), and were covered by local and regional media.

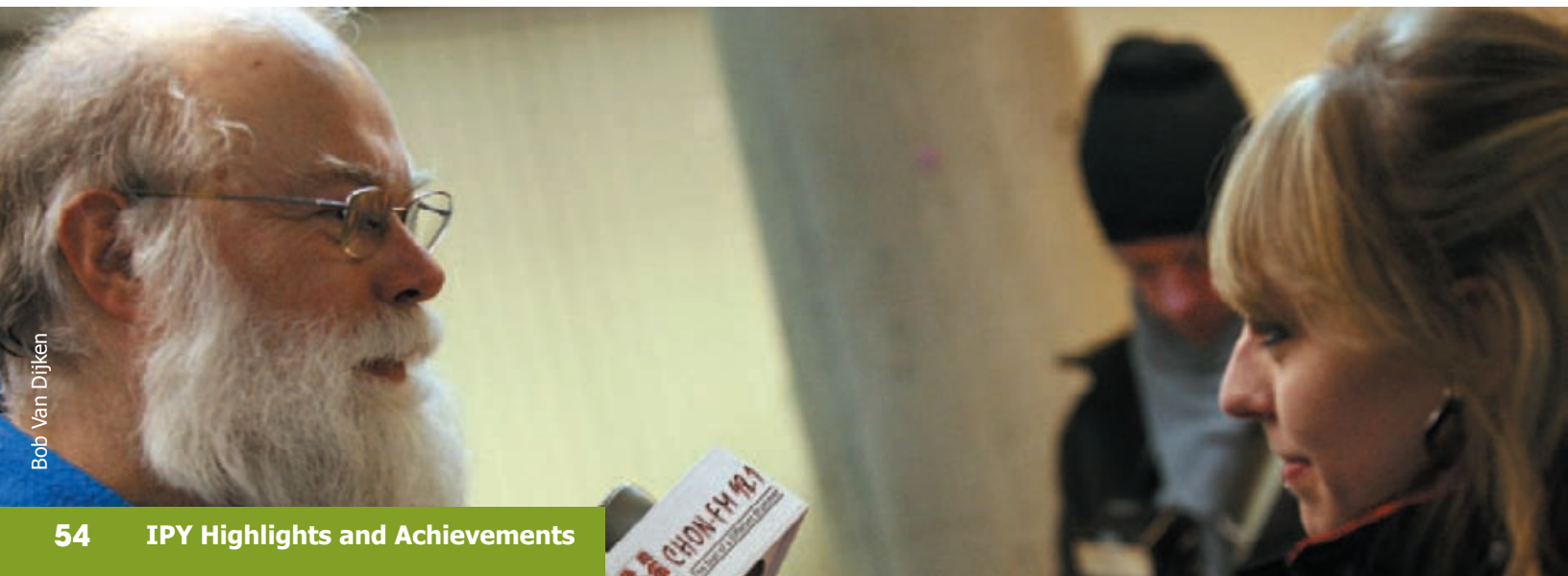
IPY Film Festival



Other special events to raise awareness about IPY and polar issues included the IPY Polar Days, a series of quarterly events organized by the IPY International Programme Office. The Polar Days were developed to raise awareness about particular aspects of the polar regions and engage educators and the media to learn more about polar research. Together, the Canadian IPY Secretariat at the University of Alberta and the Government of Canada Program for IPY took the lead in organizing and hosting the sixth international Polar Day in September 2008, called "People at the Poles." The event included live web and radio broadcasts featuring Canadian researchers and their projects, as well as the creation of school-based activities and materials for teachers and students. As well, Fisheries and Oceans Canada organized special Canadian events for the "Polar Oceans" Polar Day held in March 2009.

Together, the IPY Federal Program Office and the Canadian Film Institute hosted a three-day IPY Film Festival in Ottawa, September 28–30, 2009 at the Library and Archives Canada. The Minister of Indian Affairs and Northern Development, along with foreign dignitaries and other guests took part in opening night and viewed the IPY Photo Exhibit, *Arctic Vision*. The film festival featured a variety of films on the polar regions, including four films supported by the Government of Canada Program for IPY. Over 800 people took part in the film festival in Ottawa and the films are continuing to tour in Canada and abroad.

In February 2009, the International Council for Science and the World Meteorological Organisation hosted a celebration of IPY in Geneva, Switzerland. The celebration featured Inuit performers from the Nunavut Sivuniksavut, a college program based in Ottawa for Inuit youth, and a photo exhibit, both supported by the Government of Canada Program for IPY.



Bob Van Dijken

Exhibits

Museum exhibits and displays were an opportunity to educate and capture the interest of the public on IPY, Arctic science and Northern issues more broadly. Numerous exhibits have been supported as part of IPY in Canada. In 2007, Science North (a science centre based in Sudbury, Ontario) received support to develop two travelling exhibits: the *Ends of the Earth: From Polar Bears to Penguins* and *Arctic Adventure*. The Ends of the Earth exhibit features the polar environments and wildlife and the impacts of climate change. This exhibit has travelled all over North America and the United States since 2007 and will continue travelling into 2013. By early 2010 it had already been seen by over 350,000 people. *Arctic Adventure* has interactive exhibits on Arctic ecozones, iceberg and wildlife research, and life in the Arctic. It has travelled all over Canada—including to Iqaluit (Nunavut) and Kuujuaq (Quebec)—and was visited by over 24,000 people from 2007–2009.

In July 2009, the Emperor and Empress of Japan visited Canada and IPY funds were used to create exhibits at the Department of Fisheries and Ocean's Institute of Ocean Sciences in Sidney, British Columbia. The new museum-quality exhibits included dioramas and hands-on displays, a video presentation highlighting the ocean science work undertaken by the Department of Fisheries and Oceans during IPY. The Arctic circumpolar floor map was installed in the lobby of the Fisheries and Oceans' Institute of Ocean Sciences. The IPY project, Canada's Three Oceans, is prominently featured and the exhibits are open to the public.

Arctic Vision, a photo exhibit of images of Canadian IPY science has been traveling Canada and abroad. It has been shown in places like Ottawa and Victoria, as well across the North. It was also featured at the Oslo Science Conference, as well as in Geneva at an event for Arctic Parliamentarians.



Science North Arctic Adventure

Products and Educational Resources

From an Arctic circumpolar map and youth science awards, to interactive online resources and special magazine issues, a variety of products and educational materials have been developed to promote IPY in Canada.

In 2008, the Government of Canada Program for IPY worked with Natural Resources Canada's Atlas of Canada to develop an IPY Arctic Circumpolar Map. From the Boy Scouts, to members of the Canadian Senate, to students across Canada, thousands of maps have been distributed. In December 2009, the IPY map won an international award for the best thematic map at the International Cartographic Association's conference in Santiago, Chile.

To raise awareness of IPY and Arctic science amongst youth and educators, Youth Science Canada launched Polar Innovation Week, March 21–28, 2009, and announced a number of opportunities for awards of IPY youth research grants and Arctic excursions. A Polar Innovation website (www.polarinnovationweek.ca) was also developed which features a great collection of teacher resources to engage students in learning about the polar regions.



Circumpolar Map

In October 2009, the international IPY Education and Outreach Committee met in Edmonton. This three-day meeting was funded by the Government of Canada Program for IPY. In addition, support was provided to assist with the completion and printing of the Polar Resource Book, *Polar Science and Global Climate: An International Resource for Education and Outreach*. This book is targeted to help teachers and scientists to instruct students on polar science. It includes learning activities developed during IPY and guidelines for researchers on how to engage youth, particularly through classroom visits.

In December 2009, the Royal Canadian Geographical Society launched *Canada and the International Polar Year*, a new section in the Canadian Atlas Online (www.canadiangeographic.ca/atlas). The highlight of the IPY section of the Canadian Atlas Online is an interactive map which locates each of the 52 Canadian IPY science projects and provides background information, photos, videos and links. Also included is general information about IPY and the history of previous IPYs, classroom resources, games and quizzes.



Interactive Map



Canadian Atlas Online

In January 2010, Canadian Geographic produced special Arctic IPY issues of *Canadian Geographic* magazine and *géographica* (*Canadian Geographic's* French-language counterpart). These issues included articles on IPY science projects, the history of IPY and the future of Arctic science. Canadian Geographic complemented the issue with an expanded website www.canadiangeographic.ca/ipy-api. *Géographica* was inserted in *La Presse* (75,000 copies) and *Le Soleil* (25,000 copies) on January 7, 2010. Each issue of *Canadian Geographic* is read by over four million Canadians.



Canadian Geographic



Géographica

Fisheries and Oceans Canada produced a poster of the Canadian Coast Guard icebreaker *Louis S. St-Laurent*, showing the scientific and research activities that happen on board. With cut-away diagrams, the poster depicts science and technology as well as the lives of Arctic people and Arctic mammals and marine life. Viewers learn about how oceans work, sea ice and the impacts of climate change. Forty thousand copies were produced and distributed to youth ages 10 to 16 across Canada. The poster has also been incorporated into a display in the Water Gallery at the Canadian Museum of Nature in Ottawa, Ontario.



DFO Poster

Parks Canada is developing curriculum-linked lesson plans aimed at the high school level showing how Parks Canada scientists use satellite imagery to map and monitor Arctic national parks. There are three lesson plans that cover Parks in Space, Taking the Pulse of Arctic National Parks, and Field Activities.



Film and Television

The Government of Canada Program for IPY has supported the development of a number of film and television projects, from public service announcements, documentary films and children's television shows, to a special three-part live TV call-in show focusing on Inuit health and wellness.

Global TV in Calgary developed a series of eight one-minute public service announcements or vignettes to help raise awareness of International Polar Year science and research. The series covered topics from research on severe Arctic weather and ocean currents, to Inuit health and involvement of Northerners in IPY research. The vignettes were aired across Canada on Global TV and TVA from May to August 2009 and again on Global TV and Radio Canada from October, 2009 to January, 2010. The series was narrated in English by the eminent Canadian actor, Gordon Pinsent and includes some of Canada's top Arctic researchers. The video vignettes were shown a total of 2,540 times and were also posted on the web at both www.science.gc.ca and www.ipy.gc.ca.

Five documentary films have received support through the Government of Canada Program for IPY. One film, *Imiqutailaq: Path of the Arctic Tern*, tells the story of two young Inuk students from Grise Fiord, Canada's northernmost community who travel to the Antarctic as part of a Students on Ice educational expedition. This documentary has been shown at the COP-15 meetings in Copenhagen (December 2009) and at the Explorers Club Annual Film Festival in New York City (March 2009). *Arctic Odyssey—Journey to the Top of the World* is an IMAX film slated for completion in 2012 which will address the effects of climate change on the people, animals and landscape of the far North and celebrate the efforts of world-renowned Canadian scientists and researchers.



Parks Canada is producing a video entitled 'Science at the Top of the World' that features two 'ways of knowing' the Arctic landscape—the perspective of ecosystem scientists developing an ecological inventory and climate adaptation tool using satellite imagery and other digital tools, is contrasted with the perspective of Inuit guides and hunters in national parks, who see the same place through different eyes. Other video products include "webisodes" that supplement the film, and web clips for a YouTube type of broadcast that reflect the lighter side of life in the field.

Highlights

- **A national Call for Proposals was issued in October 2007 to encourage Canadians to develop creative and innovative communications and outreach projects to celebrate IPY— 21 communications and outreach projects were selected for up to three years of funding.**
- **Canada took the lead in organizing and hosting the sixth international Polar Day in September 2008, called "People at the Poles".**
- **A three-day IPY Film Festival was jointly hosted by the IPY Federal Program Office and the Canadian Film Institute in Ottawa in September 2009. More than 14 films were shown featuring IPY and the polar regions.**
- **The IPY circumpolar map won an international award for best thematic map at the International Cartographic Association's conference in Santiago, Chile, December 2009.**
- **Eight one-minute long IPY video vignettes aired across Canada 2,540 times on Global TV and TVA/Radio Canada from May to August 2009 and again October 2009 to January 2010.**
- **The special IPY Arctic issues of Canadian *Geographic* magazine and *géographica* were issued to newsstands and subscribers in January 2010.**



Data Management



Ensuring that IPY data and information is archived and made accessible, and supporting data management through capacity building.

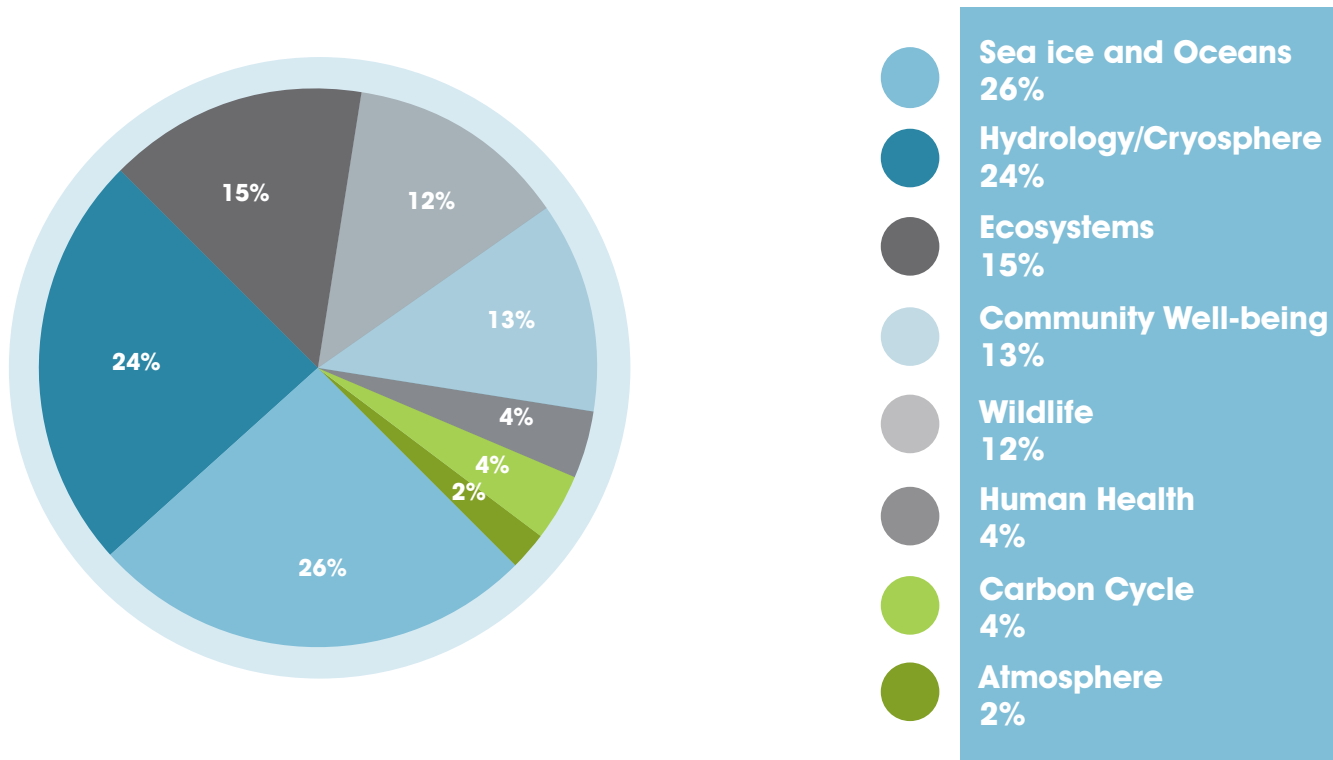
In previous International Polar Years, the focus was on the science and the collection of data, but rarely did the stewardship of these data become a priority. This situation is not unique to polar research, in fact it was quite common among all disciplines of science and research. The international organizers of IPY 2007-2008 wanted this program to be different, and the Government of Canada Program for IPY emphasized the importance of the effective management of data.

The Canadian IPY Program's goal with respect to data management is to ensure the long-term accessibility and availability of data collected or produced from IPY projects. Data generated by or developed in Canada through IPY research projects, and the metadata that describes it, will be archived, managed, and made widely and appropriately accessible for current and future use. These data and discovery-level information (metadata) will provide a stronger knowledge base for Arctic science and a basis from which to address policy and program needs. In addition, they will contribute to the formation of and action on strategic priorities for the North.

For an overview of the data sets generated by Canadian IPY science projects, please see Figure 8.



Figure 8: Proportion of Data Sets Generated From IPY Science Projects, By Discipline
Source: IPY Annual Reports 2008–2009



Data Management Subcommittee

The Data Management Subcommittee was established in June 2006 for a three-year term. The goal of this Subcommittee was to provide recommendations on the management of the data and information obtained through Canadian IPY projects and activities. This involved providing advice on the development of a data management plan for IPY in Canada based on the IPY International Data Policy, Government of Canada data management policies and other relevant guidelines. The Subcommittee also assessed the data management plans and costs of IPY science projects to ensure data management requirements would be met.

Membership of this Subcommittee was made up of subject-matter experts including data managers, data producers, data users, and experts in the privacy and legal aspects of data.

IPY Data Policy and Framework

The Canadian IPY Program requires IPY data be available fully, freely, openly, and in the shortest feasible time. Exceptions to the policy of full, free and open access include protecting the privacy of human subjects (e.g. in health studies), ensuring that the rights of traditional knowledge holders are not compromised, and protecting data when release may cause harm (for example, data that includes the nesting locations of endangered birds, or locations of sacred sites). The Canadian IPY Data Policy developed in May 2007 is an extension of the International IPY Data Policy and is consistent with Canadian federal government policies on data management. This Policy applies to all Canadian IPY projects; compliance with the Policy was a condition of funding for IPY projects.

A Data Management Framework was developed and implemented in January 2008. The Framework outlines the key areas for investment to support IPY data management. It provides direction for more detailed plans and forms a basis from which to work with government departments, academic institutions and other organizations in Canada and internationally.

Polar Data Catalogue

The Polar Data Catalogue is an online, searchable database of metadata. Also known as “discovery level” information, metadata is data and information about data or physical samples. Access to metadata records facilitates discovery and collaboration by providing researchers with a description about the location and content of specific data sets.

In 2007, an existing metadata portal, developed by the University of Waterloo, was adopted as the foundation for Canada’s IPY metadata catalogue. Based on 10 years of collaborative effort between ArcticNet, the Canadian Cryospheric Information Network and Fisheries and Oceans Canada, the ArcticNet Metadata Portal and Master Directory was already being used by some major Canadian IPY projects and had been validated through the activities of scientists in the natural, social and health sciences. All Canadian IPY projects now use the Polar Data Catalogue to house their metadata.

For the longer term management of IPY metadata, discussions are continuing with the lead departments and agencies for IPY and other Arctic science programs in Canada about their respective metadata. The feasibility of creating an overarching Arctic science metadata database where IPY metadata can be maintained is now being explored. Additionally, the International IPY Data Management Committee has expressed a strong interest in international use of the portal. This expanded use of the Polar Data Catalogue will be an important legacy of the Canadian IPY Program.



Paul Vescei

Canadian IPY Publications Database

The Canadian IPY Publications Database provides access to publications from the current and three previous IPYs. Physically located at the Arctic Institute of North America (AINA) at the University of Calgary, the database currently houses records for approximately 2,500 publications which include scientific papers as well as publications related to IPY education, outreach and communication projects.

The database is intended to capture all publications arising from Canadian IPY projects, as well as those from non-Canadian IPY projects that carried out research in Canada. Each record in the database contains a citation, an abstract, detailed subject and geographic terms, URLs for publications that are available on the Web, and standard library symbols for at least one library that provides interlibrary loan access to the publication. Where possible, the Publications Database will establish links with the Polar Data Catalogue (described above) to connect publications and metadata.

Both the international and Canadian IPY data policies require that IPY researchers report their publications to this system of databases. These publications will contribute significantly to the legacy of IPY. Discussions will be organized with AINA and the lead departments participating in IPY on the future management of the Publications Database to determine the long-term preservation and accessibility of the publications beyond 2012.

Observed Data

In addition to metadata and publications, observed data collected during IPY represent a valuable resource that will be of scientific value in the future. The Canadian IPY Data Policy therefore requires appropriate and secure preservation and stewardship of observed data. The IPY Federal Program Office has recently established an IPY Data Assembly Centre Network that will preserve and provide access to IPY observed data collected and/or generated from Canadian IPY projects. Particular attention is being paid to the long-term preservation and the provision of access to these resources in the future.

Leadership in International Data Management

The Canadian IPY program has provided support and leadership for international data management initiatives for IPY such as:

- Canadian representation on the International Data Management Subcommittee
- Establishment of a Canada–UK Memorandum of Understanding including a specific component on data management
- Current development of agreement on data sharing with the U.S.
- Hosting the International Data Management Subcommittee Meeting (September 29 to October 1, 2009, more detail below)



International Data Management Subcommittee Meeting

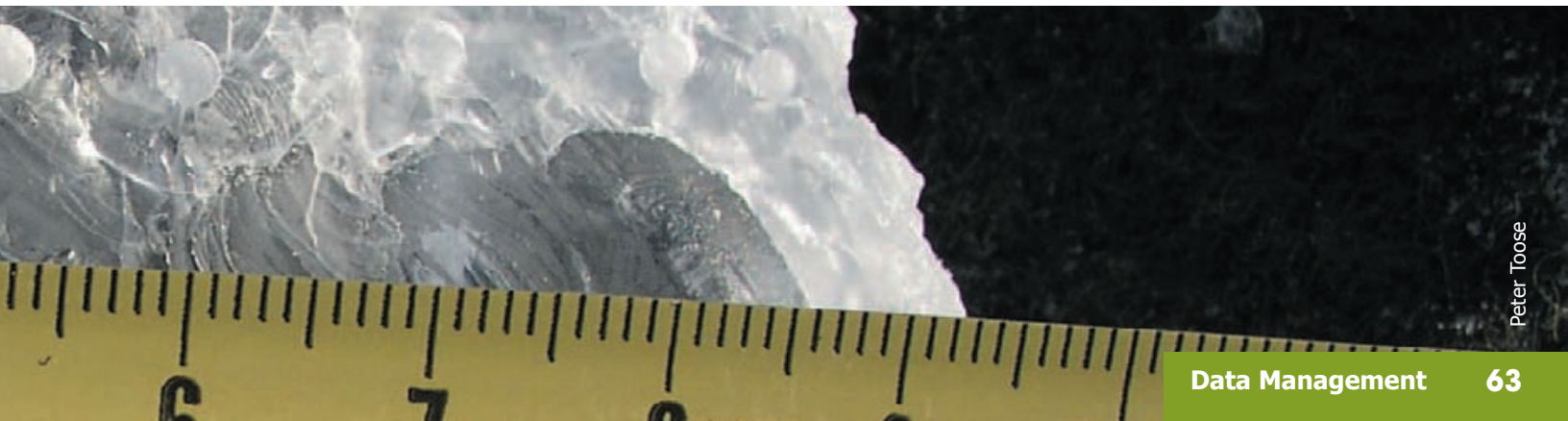
On behalf of the IPY International Programme Office, the Canadian IPY Program hosted a meeting of the International IPY Data Management Subcommittee, September 29 to October 1, 2009, in Ottawa. This meeting was attended by participants from 10 countries with active IPY programs as well as representatives from international Arctic and Antarctic science programs (e.g. Sustained Arctic Observing Networks) as well as global programs (e.g. World Meteorological Organisation).

The meeting focused on current and future polar data activities, as well as social sciences and traditional knowledge data and information management. Additional topics that were discussed included governance, sustainability of sharing and interoperability of IPY/Polar data, practical approaches to interoperability, archiving and preservation of IPY/Polar data, and defining the IPY data collection. These discussions provided the content for the State of Polar Data Report which was presented at the 2010 Oslo Science Conference.

The meeting was ideally timed to discuss issues of polar data management, as the focus of many IPY projects has now shifted to analysis and preservation of data.

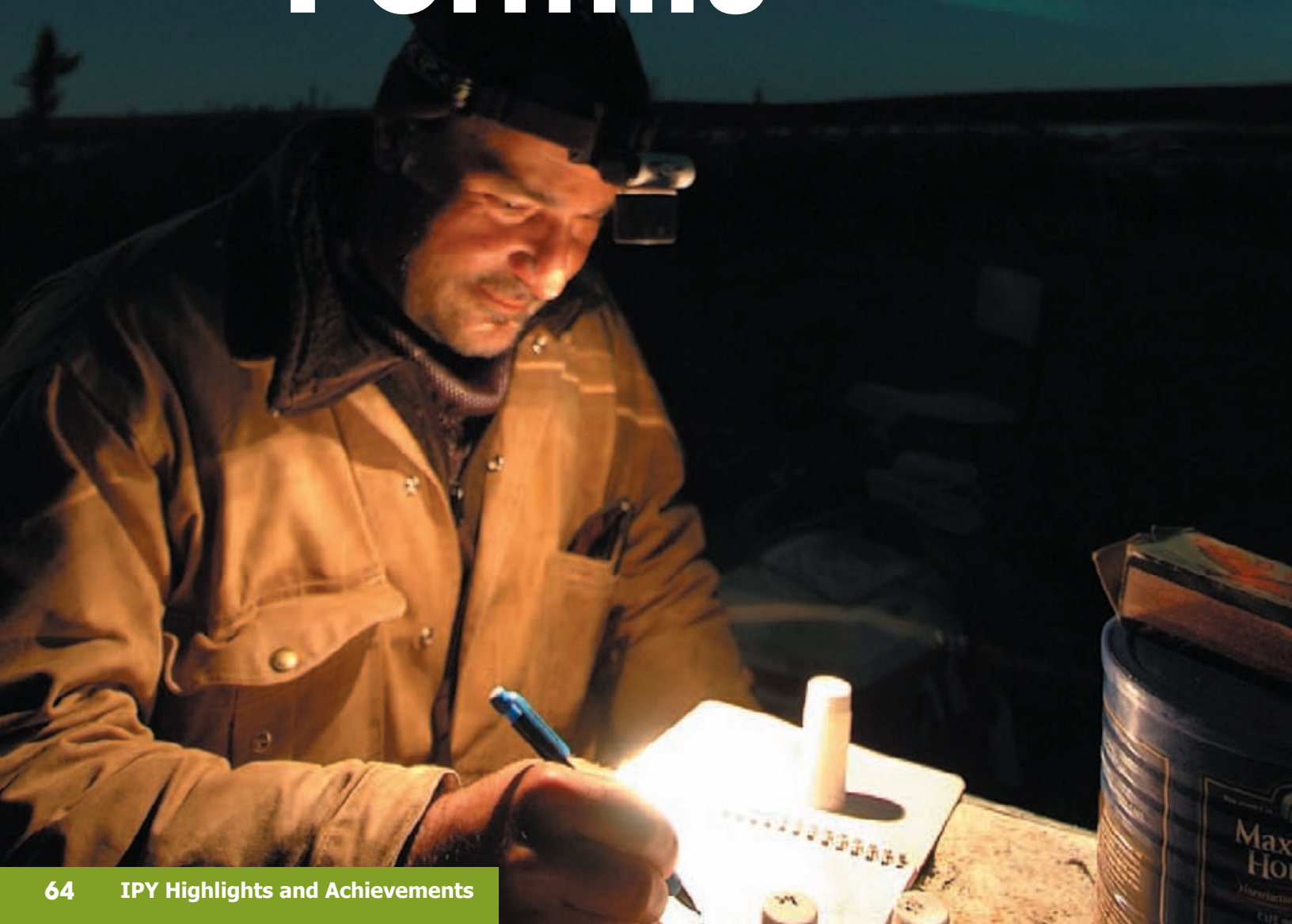
Highlights


- **Canada made one of the largest investments in data management of any country involved in IPY (4.7% of the total program).**
- **The Canadian IPY Publications Database currently contains more than 2,500 records.**
- **Polar Data Catalogue contains 420 IPY records. As of July 2009, 75% of IPY projects have recorded their metadata in the Polar Data Catalogue.**
- **All Canadian IPY science and research projects were required to include a data management plan that was evaluated by the IPY Federal Program Office.**





Research Licensing and Permits





Preparing IPY researchers for licence and permit requirements for conducting field work in Canada's northern regions; meeting the increased demands for research licensing during IPY; and, exploring possible efficiencies within the processes.

Scientific research licences, permits and other approvals are required for all research activities in Canada's North. These regulatory requirements are in place to ensure that the air, land, wildlife, water, people and historic sites of Canada are protected. In addition, customs tariffs, duties and work permits can sometimes be required for international researchers and their scientific equipment when coming to Canada.

Between 2007 and 2009, surveys of Canadian and International IPY projects were conducted to determine where, when and how many IPY researchers were expected as part of IPY. The results of these surveys were instrumental in informing Canadian Customs authorities and northern regulatory agencies of the demands that would be placed on them during IPY.



Enhancing Research Licensing Capacity

Northern research institutes in Nunavut and the Northwest Territories saw an increase in requests for research licences as a result of IPY. Over 1,900 IPY researchers have been working across the Canadian North at more than 100 research sites since 2007. Northern regulatory agencies and the Aboriginal organizations that review research applications were eligible to apply for funding to help manage the increased demand for research licences and permits during IPY. Funds were allocated to hire additional staff, hold additional community meetings, and pay for honorariums. Significant financial support was provided to research licensing organizations in the Northwest Territories and Nunavut.

Canadian Arctic Research Licensing Initiative

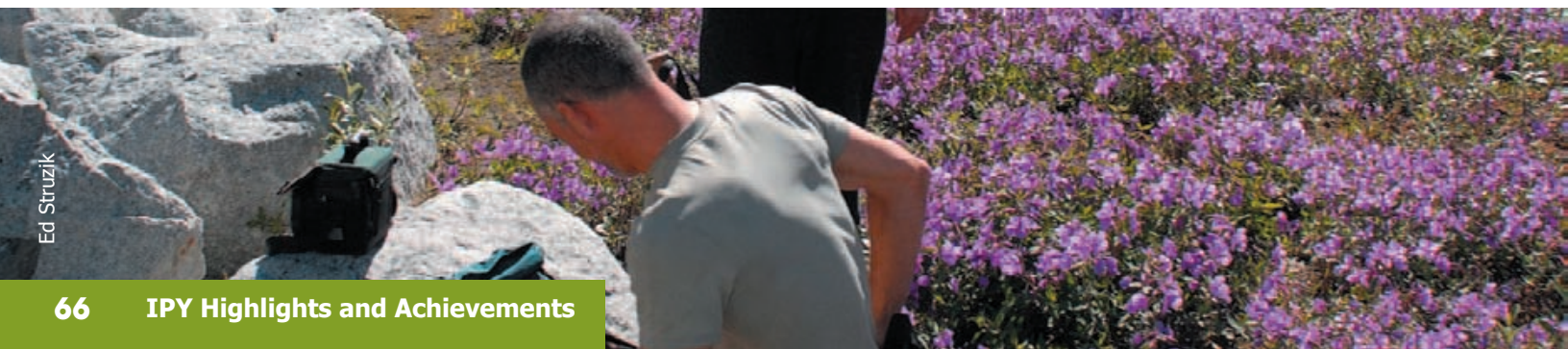
Research activities in the Canadian Arctic require a research permit. The licensing requirements for scientific research in Canada's North are covered by federal, territorial and Aboriginal land claim legislation that is evolving and therefore varies by location. Research licensing is a valuable process that encourages relationships between researchers and the northern communities that the research will take place in or near to. It also helps ensure scientific excellence, and the safety of northern people and the environment.

Research projects that are large and complex in scope, geographic coverage and research team membership can often result in the need for several separate licences from various regions and levels of government in Canada. The complexity for applicants, as well as for regulators and Aboriginal organizations in reviewing and approving research licences was recognized during the planning and implementation of the large and multifaceted research projects of IPY.

Between 2009 and 2012, the IPY Federal Program Office is facilitating the Canadian Arctic Research Licensing Initiative (CARLI). This project is providing a unique opportunity for northern regulators, Aboriginal governments and organizations, and the research community to work together to:

- Build relationships, share best practices and improve communications and expectations about research licensing amongst northern regulators, Aboriginal organizations and researchers/industry
- Explore the possibilities for coordination in the application, approval and reporting processes within the current regulatory legislation, and (based on this)
- Develop projects and information that will benefit northern regulatory bodies, Aboriginal organizations, northern communities, and future northern science programs and activities.

A national Advisory Committee was established to provide advice and information on the issues and challenges in obtaining scientific permits across the federal, territorial and land claim settlement jurisdictions in the North. Committee members include representatives from northern regulatory organizations and community/Aboriginal organizations, Arctic science programs in Canada and northern research scientists. Representatives from the Nunavik (northern Quebec) and Nunatsiavut (northern Labrador) regional governments were also invited to participate as members of the Advisory Committee to learn about best practices and recommendations that may be helpful as Nunavik and Nunatsiavut as they are aiming to develop their respective licensing requirements.



The first phase of CARLI involved an up-to-date review of the existing research licensing application and approval processes in the Northwest Territories, Nunavut and the Yukon. This review included an assessment of the successes and challenges faced by regulators, communities and applicants, as well as some preliminary recommendations.

During early 2010, the results from the northern research licensing regional reviews were presented to northern regulators, Aboriginal/community organizations and researchers at workshops in order to identify gaps, prioritize recommendations, and discuss possible initiatives that could be implemented by 2012. A series of seven workshops and consultations took place across Canada. More than 100 stakeholders were included, with over 80 percent of these participants coming from northern Canada.

The priority recommendations emerging from the workshops were to clarify the process, and improve the accessibility of information when applying for Canadian northern research licences. The recommendations will be used to guide the development of web-based tools and guides for applicants, as well as resources for staff involved in the licensing process (e.g. training workshops, manuals).

Preparation for International IPY Participants

The IPY Federal Program Office worked with Citizenship and Immigration Canada and the Canada Border Services Agency to clarify the entry requirements for international researchers coming to Canada during IPY. One of the results of this work was the official recognition of IPY as an “international event” by the Government of Canada. This allowed certain customs tariffs and duties to be waived for foreign researchers. Also, international IPY researchers coming to Canada were not required to obtain work permits. It is estimated that over 240 foreign researchers from 23 countries came to Canada during IPY.

A guide entitled *Community, Licensing, Safety and Security: Information for IPY Researchers working in Canada's North* was developed for international and Canadian IPY researchers. The guide outlined customs and immigration requirements, the process for obtaining visas and work permits, guidelines for working with northern communities, and instructions on how to apply for research permits in northern Canada. This guide was distributed to the Canadian IPY project leads and the international IPY offices. It is also available online at www.ipy.gc.ca.

Highlights

- Northern regulatory agencies and the Aboriginal organizations that review research applications received funding to help manage the increased demand for research licences and permits during IPY.
- IPY launched the Canadian Arctic Research Licensing Initiative (CARLI) in 2009.
- A series of seven CARLI workshops and consultations took place across Canada in early 2010. More than 100 stakeholders were included, with over 80 percent of these participants coming from northern Canada.
- IPY was recognized as an official international event by the Government of Canada. This resulted in certain customs tariffs and duties to be waived for foreign researchers, and exempted international IPY researchers coming to Canada from the requirement to obtain work permits.



Next Steps



International Polar Year has provided the opportunity to examine the linkages between polar regions and global systems; undertake an intensive study of past, present and future changes in polar regions; develop new knowledge about polar ecosystems and biodiversity; assess the health and well-being of northern people and communities; and, investigate new frontiers and new directions in polar research. Through this, IPY has highlighted the interconnectedness between people and the poles, underscoring the importance of action and application of new knowledge.

In 2012, Canada will host the IPY "From Knowledge to Action" Conference, the third and final event in a series of polar science conferences affiliated with IPY which included gatherings in St. Petersburg, Russia in 2008, and Oslo, Norway in 2010. From April 22 to 27, 2012, the polar science community will convene in Canada, in Montreal, Quebec along with policy makers, academics, non-governmental organizations, government and industry representatives.

This conference will provide a valuable opportunity to reflect on the results of IPY 2007-2008 and pave the way for the implementation of this knowledge through policies, programs, public education and other important actions. It will stress the importance of the state of the polar regions and effectively conveying knowledge from IPY research to key audiences. There will be an emphasis on key issues facing polar regions and identifying appropriate and effective actions to address them. This will lead to a greater understanding of the changes and how they affect both the people of the North and global systems.

IPY 2007-2008 provided the world with 24 months of intensive research at the poles. The IPY 2012 Conference will be the opportunity to discuss how the knowledge generated through IPY science will be translated into actions for many issues and regions of the globe.



Conclusion



Paul Vescei

IPY 2007-2008 has been the largest-ever polar research program, valued at several billion dollars world-wide and encompassing more than 200 international projects led by thousands of researchers from over 60 nations. Canadian scientists led a number of the international projects and contributed to studies which addressed a wide range of physical, biological, social and health science topics along with traditional knowledge and community-based research. Canada's participation in this international program has seen extensive involvement of scientists, students, teachers, Aboriginal and non-Aboriginal northerners, international partners and collaborators world-wide.

Canada's IPY Program has made a major contribution to the international research that has been conducted as part of IPY 2007-2008. Now in various stages of completion and publication, this research is providing new knowledge and information on the physical, chemical and biological processes and changes, as well as the impacts on the human and social systems in the circumpolar Arctic. This IPY research is enhancing knowledge in many areas including climate and weather, sea ice, permafrost, vegetation and wildlife.

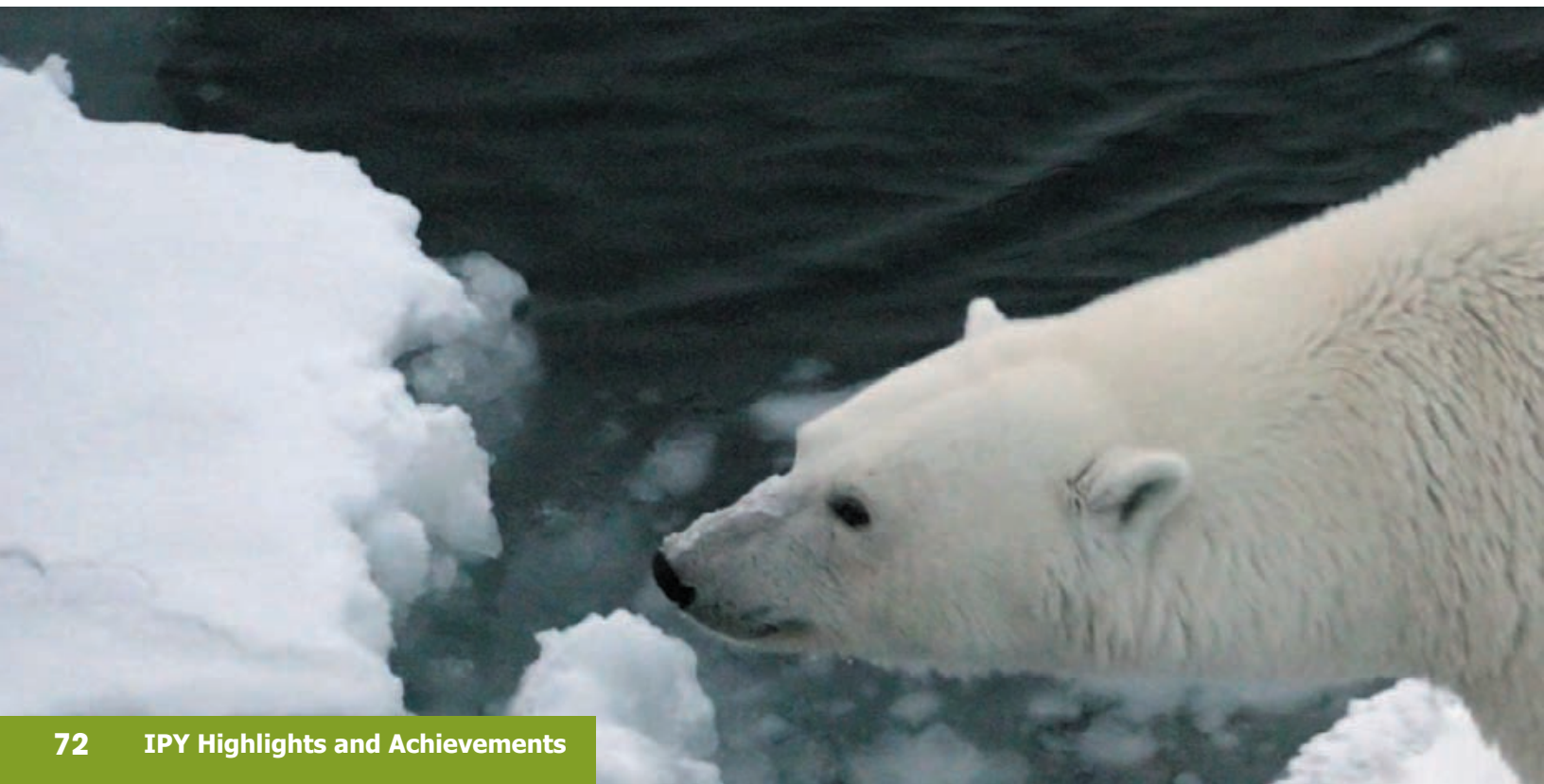


In addition to many research projects in the natural and physical sciences, funding was provided for research on culture, history and human societies in the circumpolar north, as well as studies of the vulnerability, resilience, adaptability of communities and sustainable development of northern regions. The collaboration with researchers from circumpolar countries has enabled Canadian researchers to map trends across international boundaries and better understand issues facing circumpolar peoples. This new knowledge and information is helping to address the issues faced by Canada's northern communities and is contributing to international assessments on the health and well-being of northern populations around the world.

Canadian scientists are contributing to an increased understanding of polar processes and their global linkages, along with new insights into the past, present conditions and changes that are occurring in the Arctic. The timing and focus of Canada's IPY research have been crucial, due to the significant changes in climate and the adaptation that is occurring in the polar regions. These changes have increased the urgency of the need for new knowledge and information on issues critical to Northern residents, circumpolar countries and global populations.

Capacity building and a focus on youth participation was an important aspect of Canada's IPY program. Young scientists and Northern communities were actively engaged in northern science and research activities. Coupled with much needed enhancements in northern research infrastructure and initiatives to provide better access to information, training, logistics and licensing for northern research, this has led to increased capacity for Northern science and research in the Canadian North. Closely linked to this priority was communications and outreach to raise awareness of Northern and polar regions and scientific issues, to ensure that IPY research is used by and benefits northern communities, and to celebrate Northern, Aboriginal and scientific achievements related to IPY.

Northern residents were actively involved in, and led a number of IPY activities from planning and coordination, to conducting scientific research projects, to delivering logistics, training, communications and research capacity building activities. This work was developed with extensive participation from Northern colleges and research institutes where scientists, technicians, and other trained individuals, both Aboriginal and non-Aboriginal. The traditional knowledge included in a large number of the Canadian IPY projects has added important observations and an increased understanding of the conditions and changes which northern peoples have brought together about the environment, the changes and the impacts on their way of life.



The major achievements to come from Canada's IPY Program include the innovative research results, products, new and augmented monitoring networks, data and information that will continue to support the development of programs, policy initiatives and other important applications such as ice and weather forecasts. More information on the results and application of IPY findings will be brought together in the upcoming IPY Science Report which will be a consolidation of Canadian IPY science results, as well as the IPY Program evaluation which will be conducted in 2011-12, the final year of Canada's IPY Program.

The Government of Canada Program for IPY in conjunction with the Canadian IPY National Committee and Canadian IPY Secretariat planned and delivered this horizontal science program, achieving a coordinated approach for Canada's participation in IPY and the successful organization of one of the largest, interdisciplinary, scientific programs conducted during IPY 2007-2008. This achievement was recognized in November 2010, when the Royal Canadian Geographical Society presented its 2010 Gold Medal to the Canadian International Polar Year National Committee for Canada's outstanding contribution to International Polar Year 2007-2008.

As the international community discusses the legacy of IPY 2007-2008, in Canada, the list is still being compiled. The legacy of IPY for Canada will continue to be assessed with contributions for many areas, and for years to come, including: the increased capacity of students and Northerners to undertake Arctic research and the new generation of polar scientists who will continue to build Canada's capacity for polar science for the future; community-based research and monitoring programs led by Aboriginal Northerners; the development of many research partnerships and networks, between world-renowned international polar experts, as well as between Aboriginal and northern organizations and southern-based researchers. Canada's IPY legacy includes other important achievements from the adoption of new data archiving policies and tools to preserve and ensure accessibility of IPY data for generations to come; to logistics and training to safeguard the health and safety of scientists and communities conducting research in the North; to improvements to the licensing and regulatory procedures for conducting scientific research in the Canadian Arctic.

International Polar Year 2007-2008 has been an important and successful program in Canada and around the world. The significance of the research undertaken as part of IPY will be further enhanced by the IPY 2012 Conference From Knowledge to Action which provides an opportunity to examine how IPY knowledge will be turned into global action. This will also be an opportunity for Canada and its international partners to increase awareness and understanding of the many complex issues facing the polar regions, allowing a significant legacy of science and discovery to extend well beyond the end of International Polar Year.





In November 2010, the Royal Canadian Geographical Society presented its 2010 Gold Medal Award to the Canadian International Polar Year National Committee in recognition of Canada's outstanding contribution to International Polar Year 2007-2008.

Acknowledgements

The IPY Federal Program Office would like to express its greatest appreciation to everyone who participated in International Polar Year 2007-2008 in Canada and to the many countries around the world that supported this initiative. The sheer size of this undertaking has meant that thousands have been involved from across Canada, and particularly the North as well as hundreds from other countries. The contributions of these dedicated individuals have helped make IPY a resounding success both within Canada and abroad.

We would like to give our sincere thanks to all of the principal investigators, project team members and collaborators; Aboriginal and Northern organizations; Northern community participants; university and college contributors; students; and, federal, provincial and territorial government employees who generously gave their time and efforts to this historic initiative.

In particular, the IPY Federal Program Office would like to mention the following individuals whose contributions to the program helped to shape IPY in Canada. Special thanks goes to:

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Social Cultural Review of IPY Science Proposals

Yukon

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Joline Huskey	Sarah Jerome	Lucy Kuptana	George Lafferty	George Low
Alana Mero	Catherine Pigott	Maria Storr	Billy Storr	Howard Townsend
Terry Woolf	Camilia Zoe-Chocolate			

Nunavut

Kowisa Arlooktoo	Jaypetee Arnakak	Alethea Arnaqua-Baril	Solomon Awa	Fiona Buchan-Corey
Leanna Ellsworth	Moshi Kotierk	Geraldine Osborne	Paul Quassa	Jamal Shirely
Abraham Tagalik	Mary-Ellen Thomas	Laakkuluk Williamson-Bathory		

Nunavik

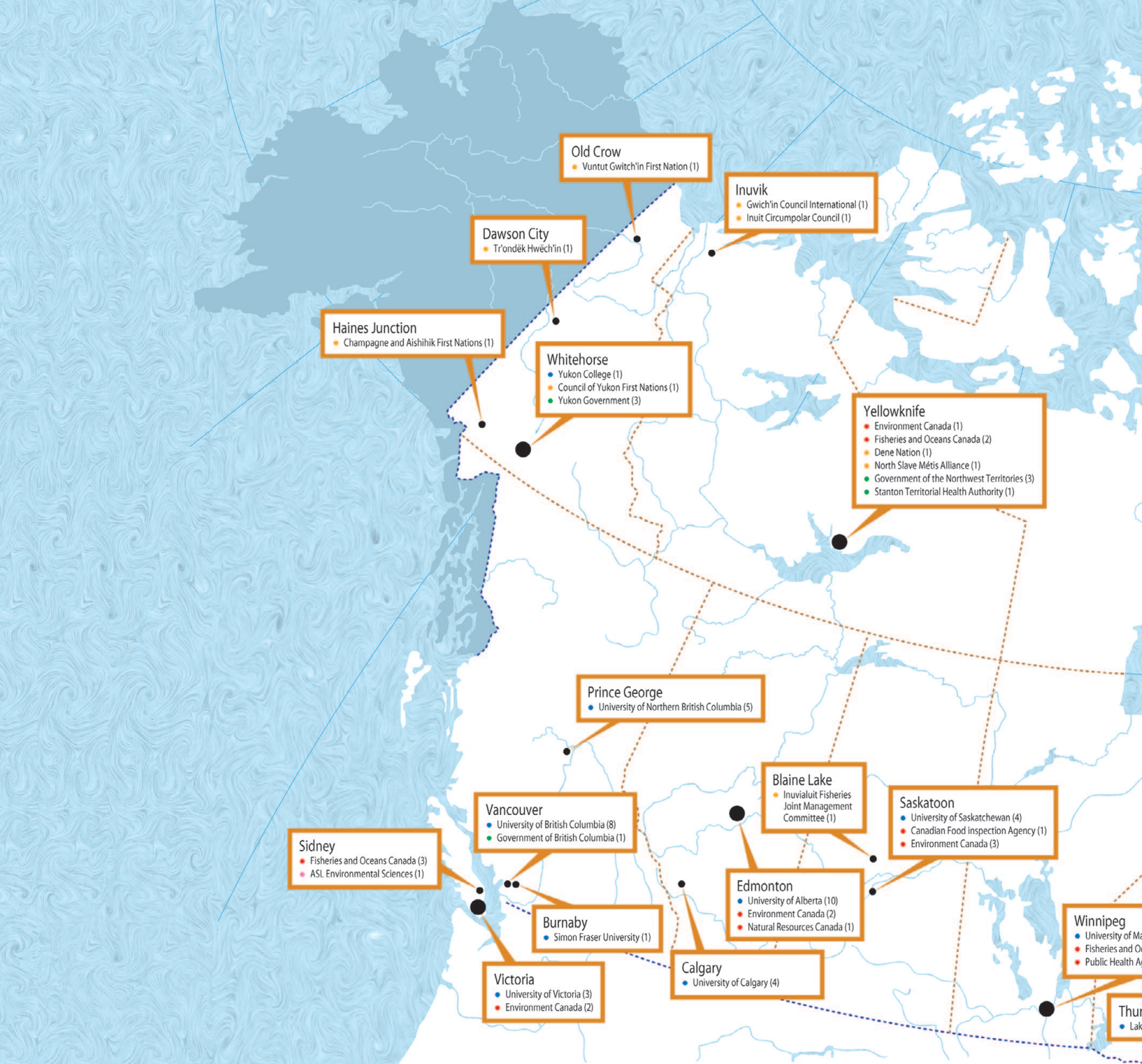
Tomassie Annanack	Julie-Anne Berthe	Nancy Dea	Barrie Ford	Aipili Qumaaluk
Caroline Weetaltuk				

Nunatsiavut

Jean Pierre Ashini	Keith Chaulk	Valerie Courtois	Mary Denniston	Sheila Downer
Anthony Jenkinson	Tammy Lampbourne	John Lampe	Bruce Moores	Krista Norman
Richard Nuna	Linda Nuotio	Sebastien Piwas	Ron Sparkes	Sabrina Sturman
Rex Turnbull	Derek Wilton			

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Georgina Lloyd	Jonathan Michel	Simon Smith	Bob Whittingham	Megan Williams



Legend:

- Universities and Colleges
- Federal Governments
- Aboriginal / Northern Organizations
- Provincial and Territorial Governments
- Other
- Provincial and Territorial Capital Cities
- Other Municipalities

Water
● Uni
● Will

