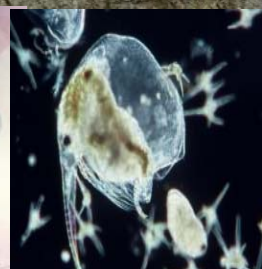
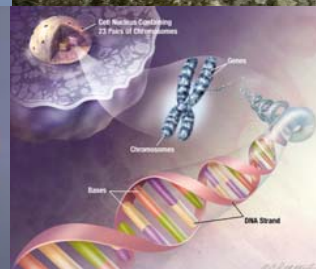


# *International Polar Year*

## *Arctic Freshwater Systems: Hydrology and Ecology*



# ***Arctic Freshwater Systems: Hydrology and Ecology***

**Principal Investigators:** Fred Wrona and Alain Pietroniro (EC)

**Co-Investigators:**

Bailey, Robert (UWO)

Baird, Donald (EC)

Beltaos, Spyros (EC)

Bonsal, Barrie (EC)

Carey, Sean (Carelton)

Culp, Joseph (EC)

Curry, Allen (UNB)

Davison, Bruce (EC)

Déry, Stephan (UNBC)

Granger, Raoul (EC)

Hayashi, Masaki (U of C)

Hicks, Faye (U of A)

Janowicz, Richard (Yukon Government)

Kent, Robert (EC)

Lesack, Lance (SFU)

McCauley, Ed (U of C)

McLennan, Donald (PCA)

Marsh, Philip (EC)

Perrie, William (DFO)

Peters, Daniel (EC)

Pomeroy, John (U of S)

Prowse, Terry (EC)

Quinton, William (Wilfred Laurier)

Reist, Jim (DFO)

Ross, Dale (EC)

Schertzer, William (EC)

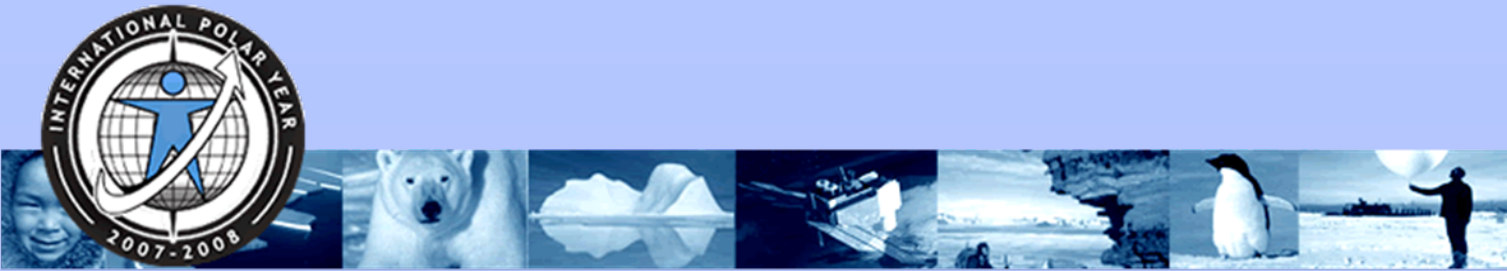
Soulis, Ric (U of W)

Spence, Chris (EC)

Tuominen, Taina (EC)

van der Sanden, Joost (NRCan)

Young, Kathy (York U)



# *International Polar Year (2007-2008)*



# *What is IPY?*

- The International Polar Year (IPY) is a large, multidisciplinary, international scientific and social research programme focused on the Arctic and Antarctic. Three International Polar Years have been held in the past 125 years: 1882-1883, 1932-1933, and 1957-1958. Previous IPYs have contributed to enormous advances in knowledge and understanding about the polar regions, including research on telecommunications, atmospheric and ocean science, and the aurora borealis, as well the negotiation of the Antarctic Treaty.
- IPY 2007-2008 will be an intense, internationally coordinated campaign of research that will initiate a new era in polar science, and will capitalize on modern technology to advance our knowledge of Arctic and Antarctic regions in ways which were not possible during previous IPYs.
- IPY 2007-2008 will include research in both polar regions and recognize the strong links these regions have with the rest of the globe. It will involve a wide range of research disciplines, including the social sciences, but the emphasis will be interdisciplinary in its approach and truly international in participation.
- The International Council for Science (ICSU) formally agreed to establish an International Polar Year in 2007-2008 and formed an International Planning Group to direct the development of an IPY programme.
- The World Meteorological Organization (WMO) agreed to co-sponsor the Polar Year with ICSU and contributed to the Planning Group activities in 2003-2004. In September 2004 the Planning Group completed its brief and handed over leadership of the Polar Year planning to the ICSU-WMO Joint Committee.
- **Dr Ian Allison** (Co-Chair of the IPY 2007-2008 Joint Committee)  
**Dr Michel Beland** (Co-Chair of the IPY 2007-2008 Joint Committee)

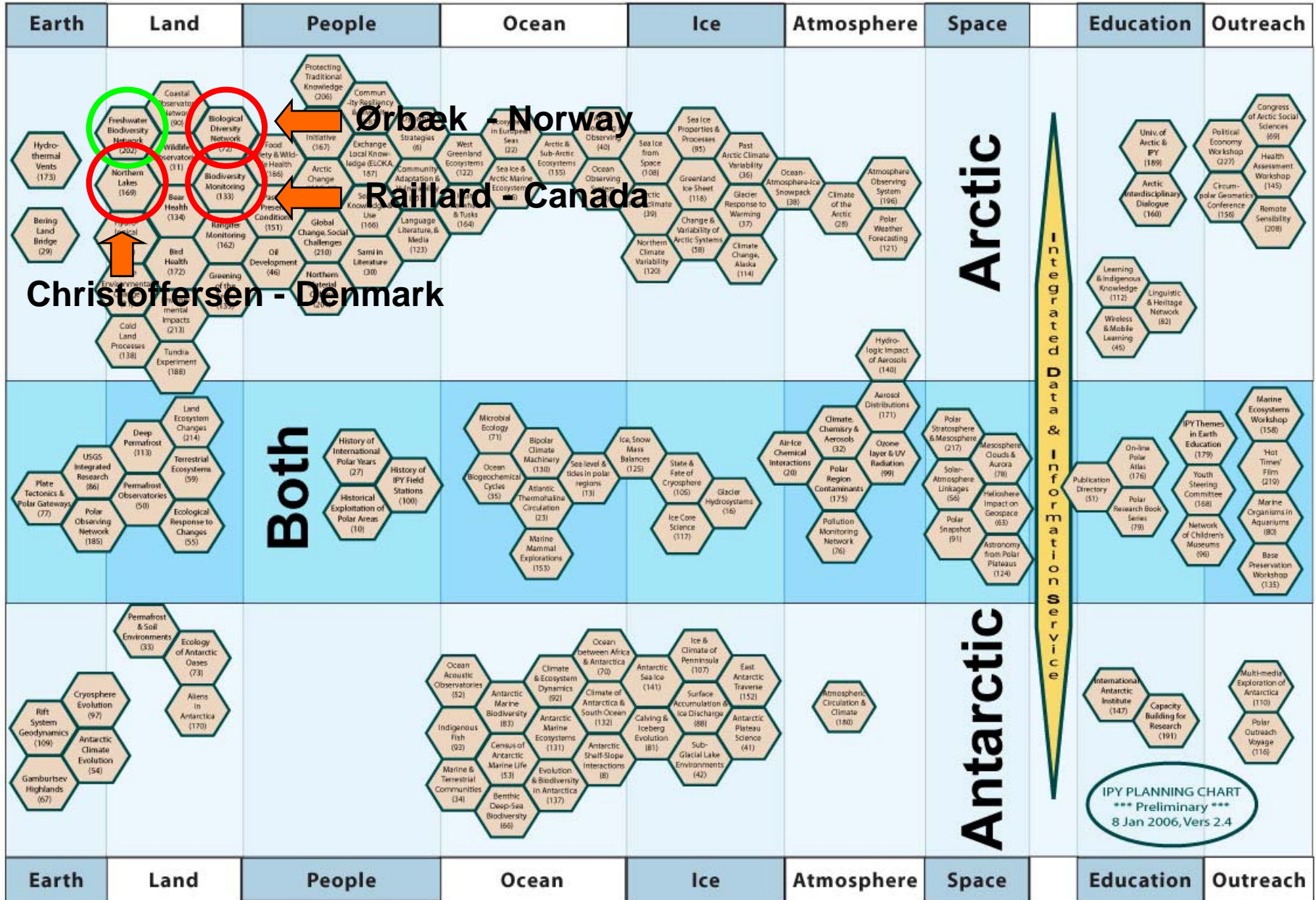
# ***International IPY Priority Themes***

1. To determine the present environmental status of the polar regions by quantifying their spatial and temporal variability.
2. To quantify, and understand, past and present environmental and human change in the polar regions in order to improve predictions.
3. To advance our understanding of polar - global interactions by studying teleconnections on all scales.
4. To investigate the unknowns at the frontiers of science in the polar regions.
5. To use the unique vantage point of the polar regions to develop and enhance observatories studying the Earth's inner core, the Earth's magnetic field, geospace, the Sun and beyond.
6. To investigate the cultural, historical, and social processes that shape the resilience and sustainability of circumpolar human societies, and to identify their unique contributions to global cultural diversity and citizenship.





# IPY CORE ACTIVITIES



Arctic

Antarctic

Integrated Data & Information Service

IPY PLANNING CHART  
 \*\*\* Preliminary \*\*\*  
 8 Jan 2006, Vers 2.4

Christoffersen - Denmark

Ørbæk - Norway

Raillard - Canada

Both

# *Canadian IPY*

- The Government of Canada (GOC) has dedicated \$150 million over six years to support and facilitate Canada's involvement in IPY.
- Funding will be used to conduct an innovative and multidisciplinary Canadian IPY programme.
- On behalf of the GOC, the IPY program is jointly managed by the Departments: Indian Affairs and Northern Development; Environment; Fisheries and Oceans; Health; Industry; and Natural Resources Canada. (Interdepartmental ADM steering committee established)

## Canadian IPY Steering Committee:

- was established in 2004 to provide leadership and promote interest in the International Polar Year across Canada,
- includes representatives from federal departments and agencies, universities, Aboriginal organizations, Northern communities, territorial and provincial governments, Northern research institutes and colleges, and others,
- a Canadian IPY Secretariat was established at the University of Alberta to support the Canadian Steering Committee and facilitate the planning and implementation of IPY in Canada.



# Highlights of Canadian IPY

- A **targeted science and research** program that **will build on and support existing programs, networks and facilities** to focus on two important challenges for Canada's northern regions:
  - ***climate change impacts and adaptation;***
  - ***the health and well-being of northern communities.***
- A **training** program to actively engage young scientists and Northern communities in on-the-ground training in science and research activities. This will lead to a new generation of polar scientists, particularly Northerners and Aboriginal peoples, to carry on strong northern research programs in the decades to follow.
- A **communications and outreach** program will focus on raising awareness of Northern and polar regions and issues, and celebrating northern, Aboriginal and scientific achievements.





# ***Other Legacies***

## **Canada as a Host**

- As a host polar nation, Canada will work to ensure basic facilities and services are in place to accommodate the influx of researchers to Canada's North during the peak IPY period of 2007 to 2009. IPY will bring opportunities to welcome many top international scientists and other visitors to Canada.

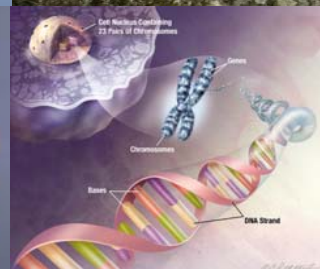
## **Community Involvement**

- IPY will involve northern residents in science and research planning and activities, through training programs, communications activities, and in the management and administration of the program.

*Canadian IPY*

# *Arctic Freshwater Systems: Hydrology and Ecology*

*Principal Investigators: Fred Wrona and Alain Pietroniro*



# ***Arctic Freshwater Systems: Hydrology and Ecology***

**Through integrated, multidisciplinary hydrological, climatological, and ecological field studies and laboratory analyses this research project will:**

- improve our process-level understanding of freshwater and nutrients flow to the Arctic Ocean**
- develop improved predictive models for freshwater and nutrient flux**
- develop a unique legacy database of freshwater biodiversity and related environmental information on Arctic freshwater ecosystems**
- develop and provide tools and capacity in northern communities for improved community-based monitoring and assessment of the status and trends of the health and integrity of Arctic freshwater ecosystems**



# ***Thematic Components – Arctic Freshwater Systems***

**Theme 1: Freshwater Flux and Prediction**

**Theme 2: Nutrient Flux and Prediction**

**Theme 3: Aquatic Ecosystem Hydro-ecology  
and Ecological Integrity**

**Theme 4: Community-based Capacity  
Building and Outreach**



# Theme 1: Freshwater Flux and Prediction

(Theme Leaders: Pomeroy and Pietroniro)

- Quantification of key hydrological/cold regions processes/parameters affecting freshwater flux to the Arctic Ocean.
- Validation and improved coupling of hydrological/land surface models to predict freshwater flow/flux to the Arctic Ocean.
- Improved assessment of the hydro-climatology of the Canadian Arctic.



# Theme 2: Nutrient Flux and Prediction

## (Theme Leaders: Lesack and Marsh)

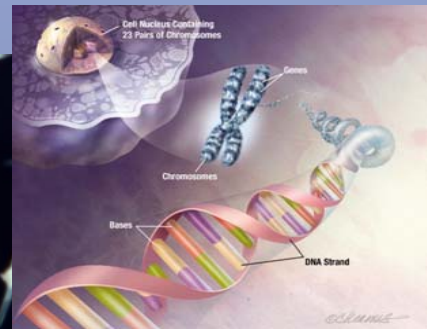
- Develop an improved hydraulic model of river-flow and water levels in the Mackenzie Delta considering break-up and ice-jam flooding.
- Assessment of the role of lakes in storing water, and in affecting nutrient dynamics.
- Quantify and predict nutrient fluxes into the Delta and seasonal dynamics of nutrient fluxes to the Beaufort Shelf.

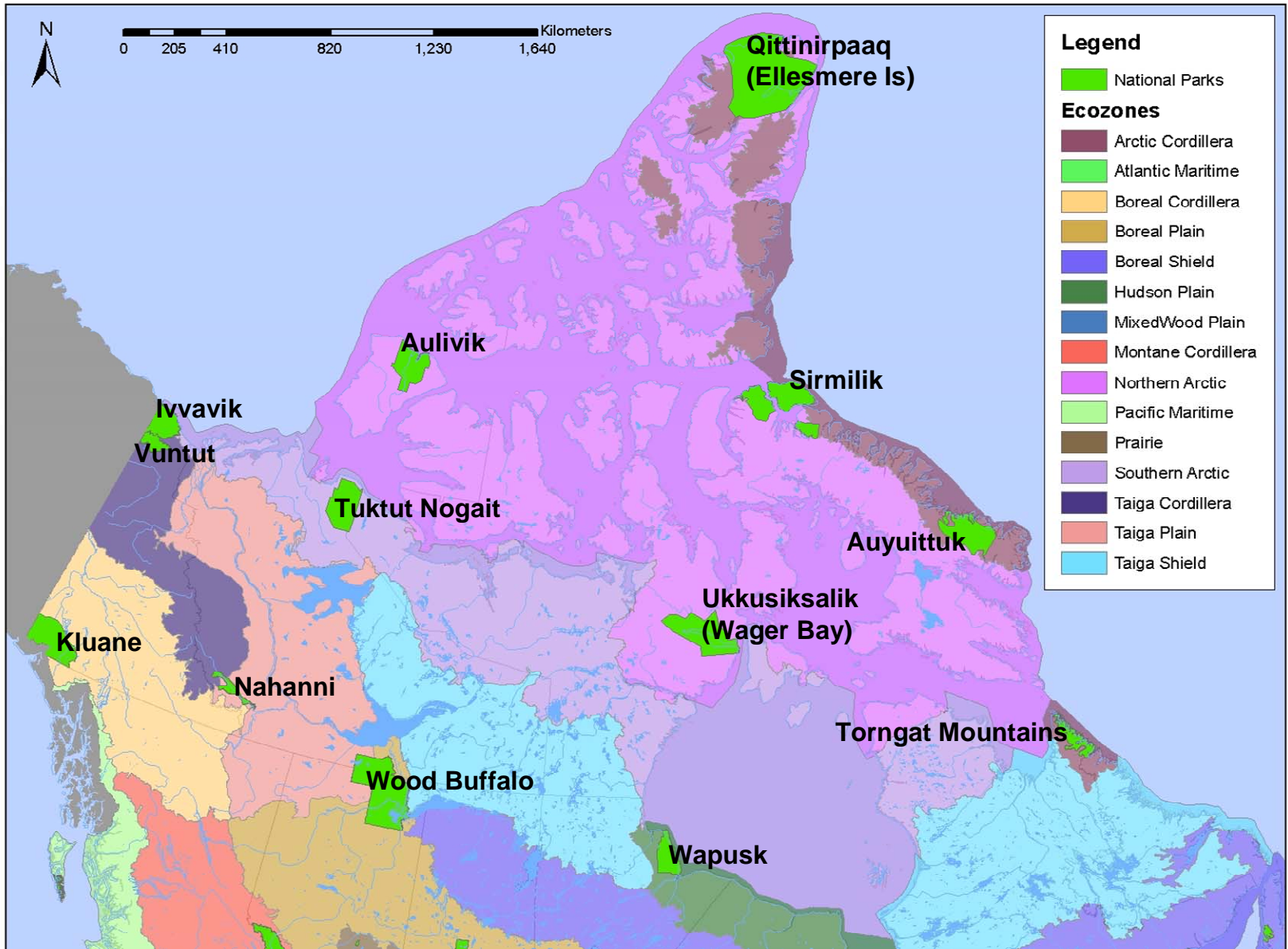


# Theme 3: Aquatic Ecosystem Hydro-ecology and Ecological Integrity

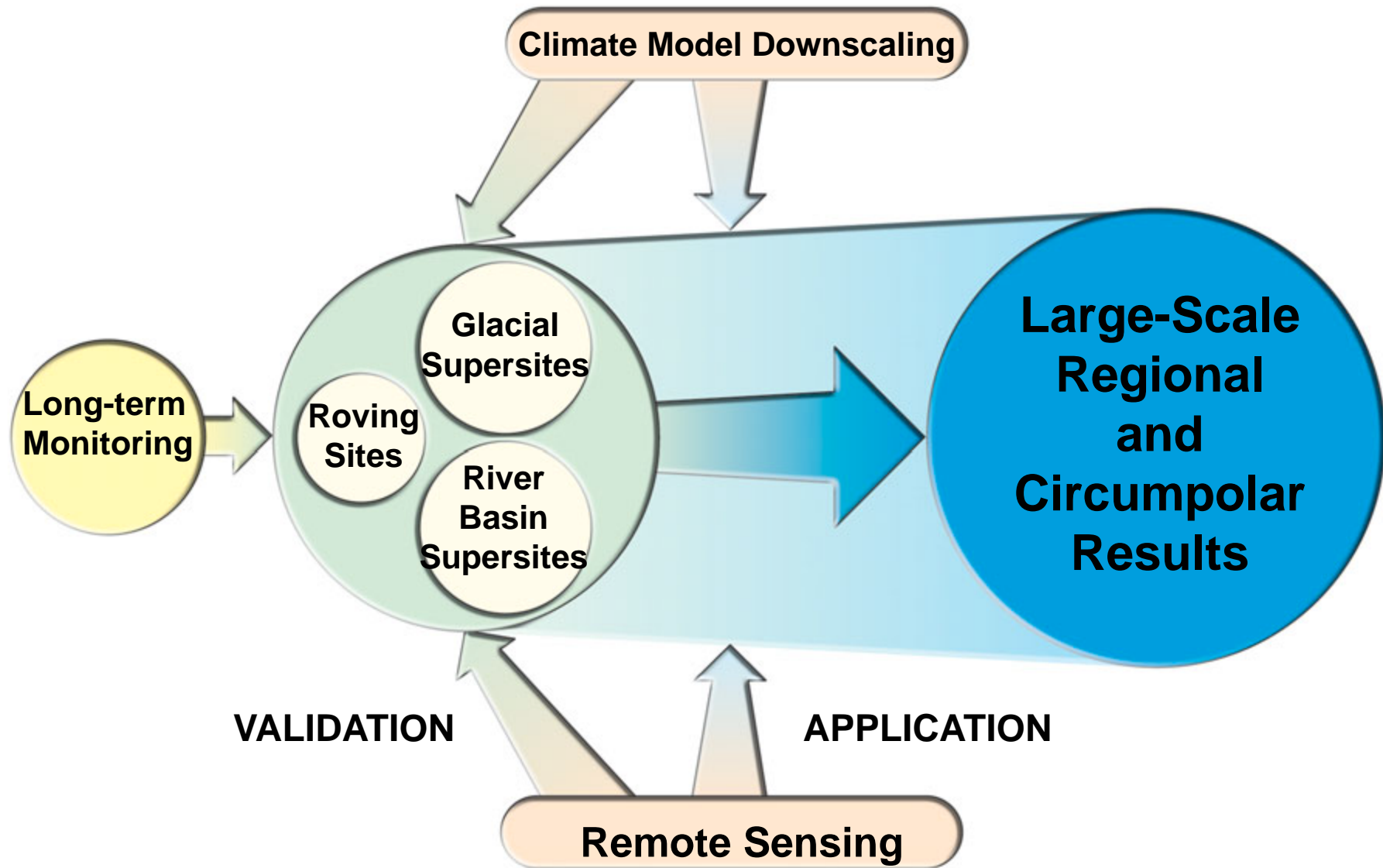
(Theme Leaders: Wrona and Culp)

- Synoptic assessment of freshwater biodiversity and ecological integrity in relation to latitudinal gradients, and development of a unique legacy database of freshwater biodiversity (including geo-referenced and genetically bar-coded specimens) and related environmental information on Arctic freshwater ecosystems.
- Hydro-ecological sensitivities/responses of *lentic* ecosystems to climate variability and landscape perturbations.
- Hydro-ecological sensitivities/responses of *lotic* ecosystems to climate variability and landscape perturbations.









Major Components of ICARPII Study Approach (Prowse et al. 2005)

# Theme 4: Community-based Capacity Building and Outreach

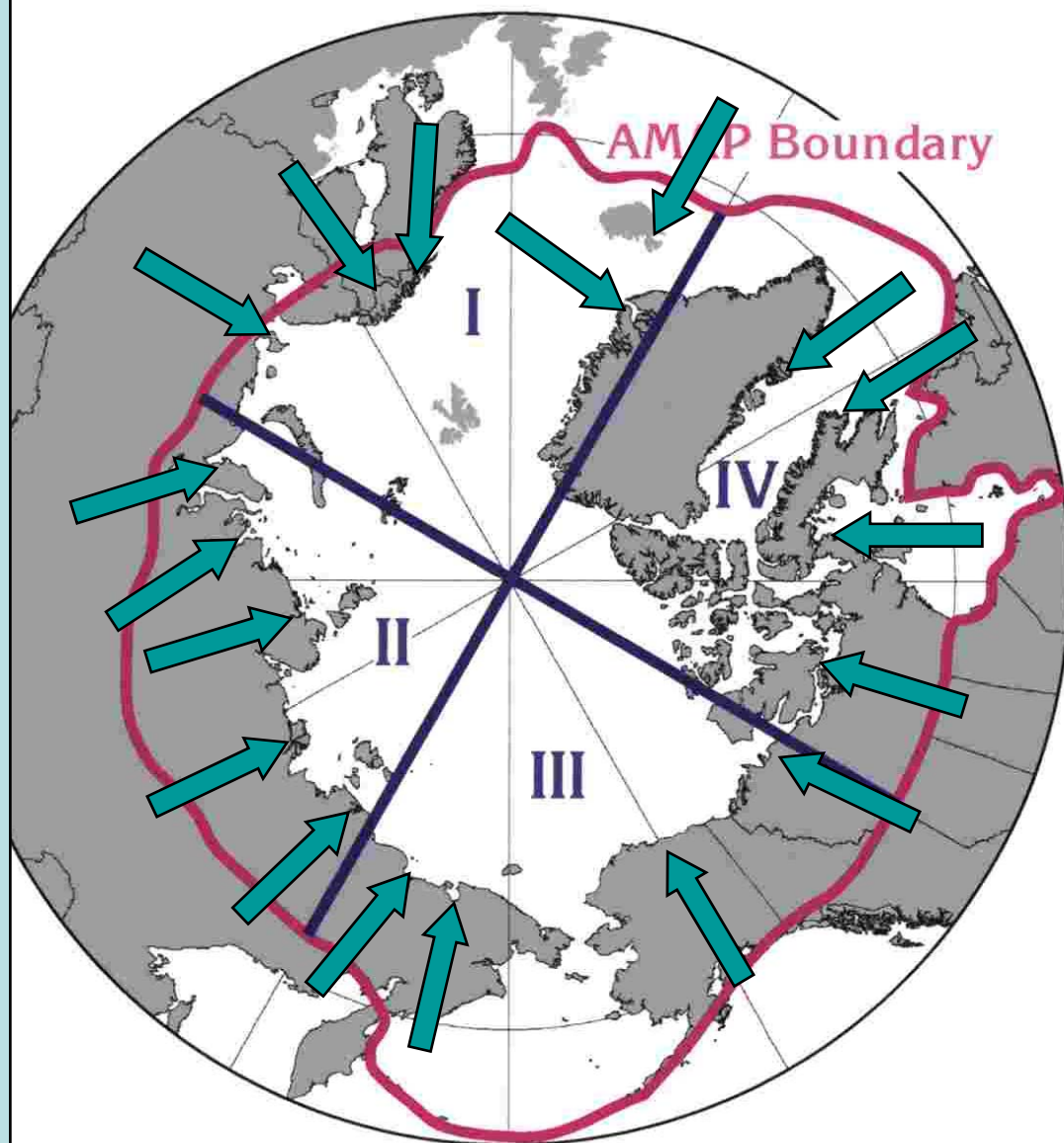
(Theme Leaders: Kent and Spence)

- Community-based aquatic biomonitoring programs – training and implementation.
- Acquisition and incorporation of TK into aquatic ecosystem monitoring programs.
- Community outreach.



# Idealised Locations for Community-based Programme for Monitoring Climate Change Effects on Arctic Char

- 18-20 sites globally; 4-5 within each ACIA region
- located ~65-70°N
- located near communities and fished by local people
- focus on Arctic char and on lacustrine type to minimise complexity
- additional monitoring of local sea-run populations would be ideal if possible
- lead researcher/contact in each country/region would set up and maintain community liaison
- basic parameters monitored would be common to all sites
- basics monitored annually; periodic intensive monitoring every 5 years
- paralleled by research programme within each country
- monitoring results integrated with research results periodically



## ***Ties with other IPY Projects***

Arctic Freshwater Systems: Hydrology and Ecology ties in with other Environment Canada IPY projects: (a) the Brunet TAWEPI IPY (to make use of its high resolution (15 km) gridded meteorological data over the Arctic); and (b) the Walker State and Fate of the Cryosphere IPY (to take advantage of improved knowledge of cryospheric processes for hydrological and ecological modeling purposes).

In terms of linkages to other Canadian IPY projects, this project links in with the Reist et al. (DFO) Arctic Char Proposal to assess ecological biodiversity and integrity of arctic freshwater ecosystems and food webs.

In terms of other International IPY projects, the proposal links to Arctic-HYDRA (Iceland), the Circumpolar Biodiversity Network (CBMP), Northern Lakes (Denmark), and the Biological Diversity Network (Norway).



# ***Arctic Freshwater Systems: Relevance to IPY Priority Themes***

- ✓ 1. To determine the present environmental status of the polar regions by quantifying their spatial and temporal variability.
- ✓ 2. To quantify, and understand, past and present environmental and human change in the polar regions in order to improve predictions.
3. To advance our understanding of polar - global interactions by studying teleconnections on all scales.
- ✓ 4. To investigate the unknowns at the frontiers of science in the polar regions.
5. To use the unique vantage point of the polar regions to develop and enhance observatories studying the Earth's inner core, the Earth's magnetic field, geospace, the Sun and beyond.
- ✓ 6. To investigate the cultural, historical, and social processes that shape the resilience and sustainability of circumpolar human societies, and to identify their unique contributions to global cultural diversity and citizenship.

## **ADDRESSES CANADIAN IPY PRIORITIES:**

- Science for climate change impacts and adaptation
- Health and well-being of northern communities



# *To Sum Up*

Through integrated, multidisciplinary hydrological, climatological, and ecological field studies and laboratory analyses, this research project will: (i) improve our process-level understanding of freshwater and nutrients flow to the Arctic Ocean, (ii) develop improved predictive models for freshwater and nutrient flux, (iii) develop a unique legacy database of freshwater biodiversity (structure and function) and related environmental information on Arctic freshwater ecosystems and (iv) develop and provide tools and capacity in northern communities for improved community-based monitoring and assessment of the status and trends of the health and integrity of Arctic freshwater ecosystems.

The themes and objectives of this project are relevant and will contribute to International IPY Priority Themes (1, 2, 4 and 6), and will also address Canadian IPY priorities.

The results will provide useful information to governments, industry and northern communities for making informed decisions at the regional, national and international levels.



*Thank You*