

Freshwater Resources of the Eastern Canadian Arctic

Summary

Project Leader

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Freshwater lakes and wetlands are abundant in the circumpolar Arctic, and still more freshwater is present in the form of glaciers and ice shelves. These freshwater environments provide many essential services including habitats for aquatic wildlife, drinking water for northern residents, and hydroelectricity. Inuit communities and northern scientists have increasingly observed that these resources are highly vulnerable to ongoing climate change. This project extends our observations on lakes and wetlands at key sites in the eastern Canadian Arctic, to identify and measure aquatic indicators of environmental change in the past and present. These studies are allowing us to make assessments of future changes in northern freshwater ecosystems to help guide the formulation of environmental management and monitoring policies. We are continuing our research on lakes, ice shelves and contaminants along the northern Ellesmere Island coastline based out of Ward Hunt Island Observatory, where we work with Parks Canada to develop facilities, indicators and protocols for long term monitoring. This coastline lies at latitude 83°N, at the northern limit of Nunavut and thus North America, and it is characterized by many climate-sensitive aquatic ecosystems that are highly dependent on ice. Discharge from glaciers also contributes to iceberg flux, which is important for shipping. We are extending our research to wetlands by assessing the snow storage and melt patterns in Polar Bear Pass on Bathurst Island (75°N). This Wildlife Sanctuary is composed of a mosaic of lakes and ponds, and seasonal snowmelt is considered the most important source of water to this wetland. The resultant models and understanding should be of broad application to arctic wetland wildlife habitats that have begun to respond strongly to climate change. Permafrost thaw lakes are a prominent component of northern wetland ecosystems, and we are working at several sites including Bylot Island (73°N) and Kuujjuarapik (55°N), to determine the environmental factors that control their ecosystem metabolism and net production of greenhouse gases in the present and future. This ArcticNet research is in collaboration with the Discovery Frontiers program ADAPT (Arctic Development and Adaptation to Permafrost in Transition), which involves 15 laboratories across Canada. We are analyzing sediment cores from northern waters in the Foxe Basin region (65-70°N), as well as on both sides of Hudson Bay, to assess the natural climate variability in arctic and subarctic Canada, and to identify regional variations in climate sensitivity. Additionally, we are documenting past climate changes in the eastern Canadian subarctic by way of an extensive network of tree-ring analysis sites. Finally we are developing and applying new DNA-based techniques to assess the diversity and function of microscopic life in lakes and wetlands and to develop state-of-the-art molecular indicators of climate responses by northern aquatic ecosystems. We are contributing our findings and expertise on Canadian arctic water resources to the ArcticNet IRISs, Canadian and panArctic climate impact assessments (for example, the SWIPA report), government agencies such as Transport Canada and the Canadian Wildlife Services, and circumpolar initiatives such as the 'Arctic Freshwater Synthesis' under the auspices of the International Arctic Science Committee (IASC). Furthermore, we will document past climate change in the eastern Canadian Subarctic by means of a vast network of millennial dendroclimatic series.

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