



# ECOLOGICAL STUDIES AND ENVIRONMENTAL MONITORING AT BYLOT ISLAND SIRMILIK NATIONAL PARK

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**G**lobal climate change is expected to have major impacts on the environment and living organisms, especially in the Canadian Arctic. Because these impacts may appear gradually through time, long-term environmental monitoring programs are essential to record these changes and understand the processes involved.

Since 1989, our team has been conducting ecological studies and environmental monitoring on Bylot Island, Sirmilik National Park. Over the years, we gathered important information on the terrestrial ecosystem of the island that offers an exceptional opportunity to start understanding the interactions between plants, herbivores and predators, and how their abundance may be impacted by the climate.



Fall migration route of Greater Snow Geese, from Bylot Island

## Ecosystem Monitoring

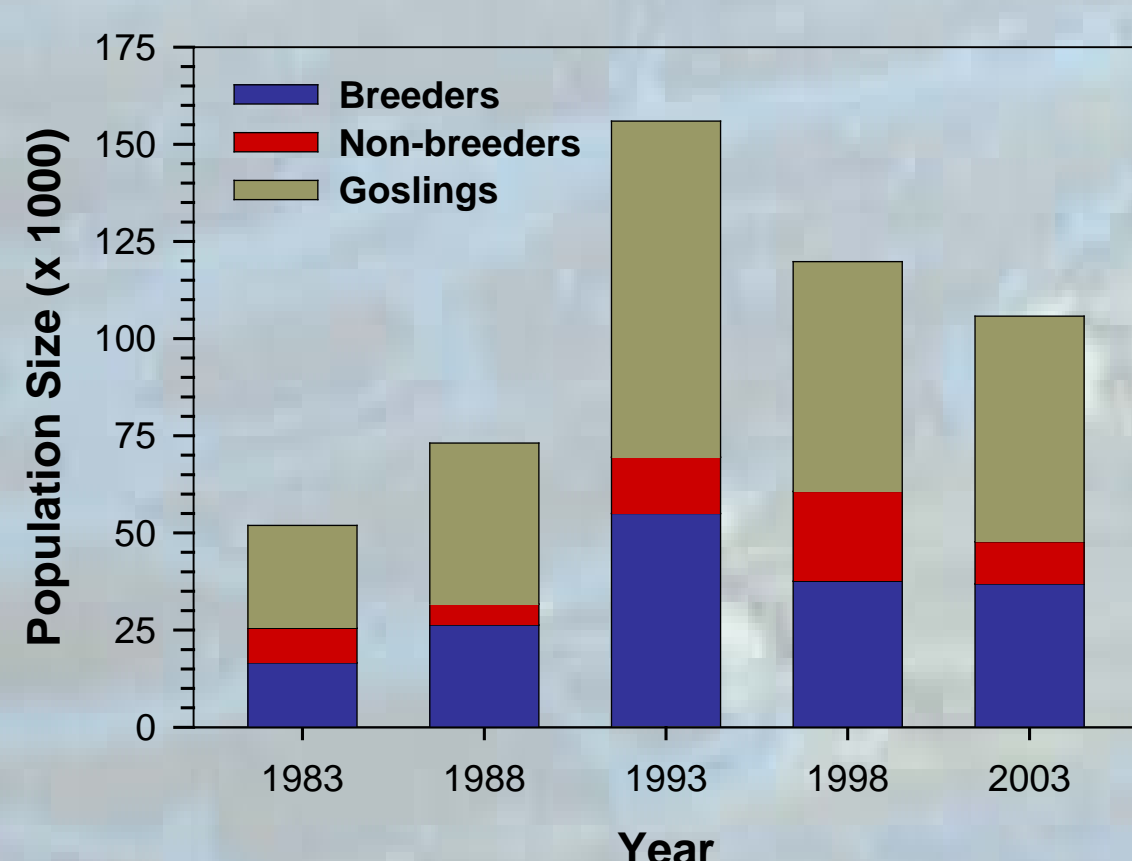
### The Greater Snow Goose and its Arctic Habitat

**T**he Greater Snow Goose is a large migratory bird that spends the summer in the Arctic where the tundra provides good conditions to nest and raise the goslings. The largest breeding colonies are found on Bylot Island. For the rest of the year, geese migrate to temperate areas 3,000 km further south.

Since the 1960s, snow geese have seen a dramatic increase in their population size. Increased use of farmlands that provide unlimited high quality food during the winter is largely responsible for this population growth. Surveys conducted every 5 years show that the population of the island has also increased. From 1983 to 1993, the number of adult geese breeding on the island more than tripled. After 1993, which was an exceptional year for reproduction, the population has remained stable or declined slightly through 2003.



Photo by Austin Reed CWS/SCF



Size of the Greater Snow Goose population on Bylot Island

The reproductive success of Bylot Island snow geese greatly varies from year to year, in part due to spring weather. In years of late snowmelt, many geese avoid breeding because not enough time will be left to complete reproduction before the fall migration. Moreover, geese that lose their nest to egg predators will not attempt to re-nest.

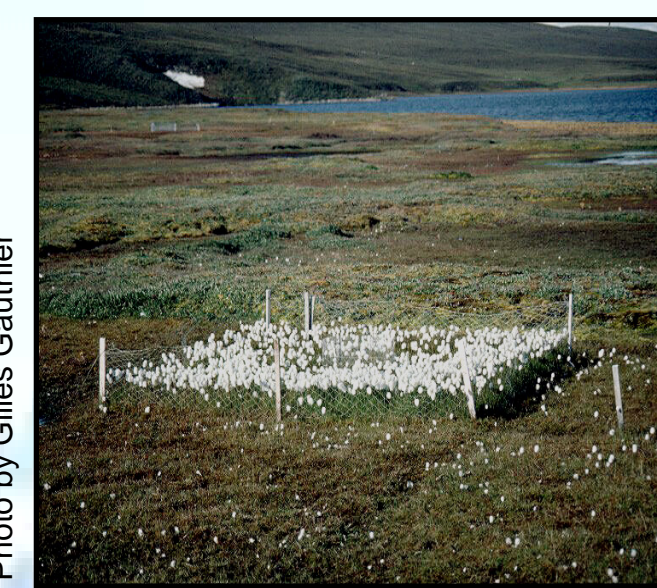


Photo by Gilles Gauthier

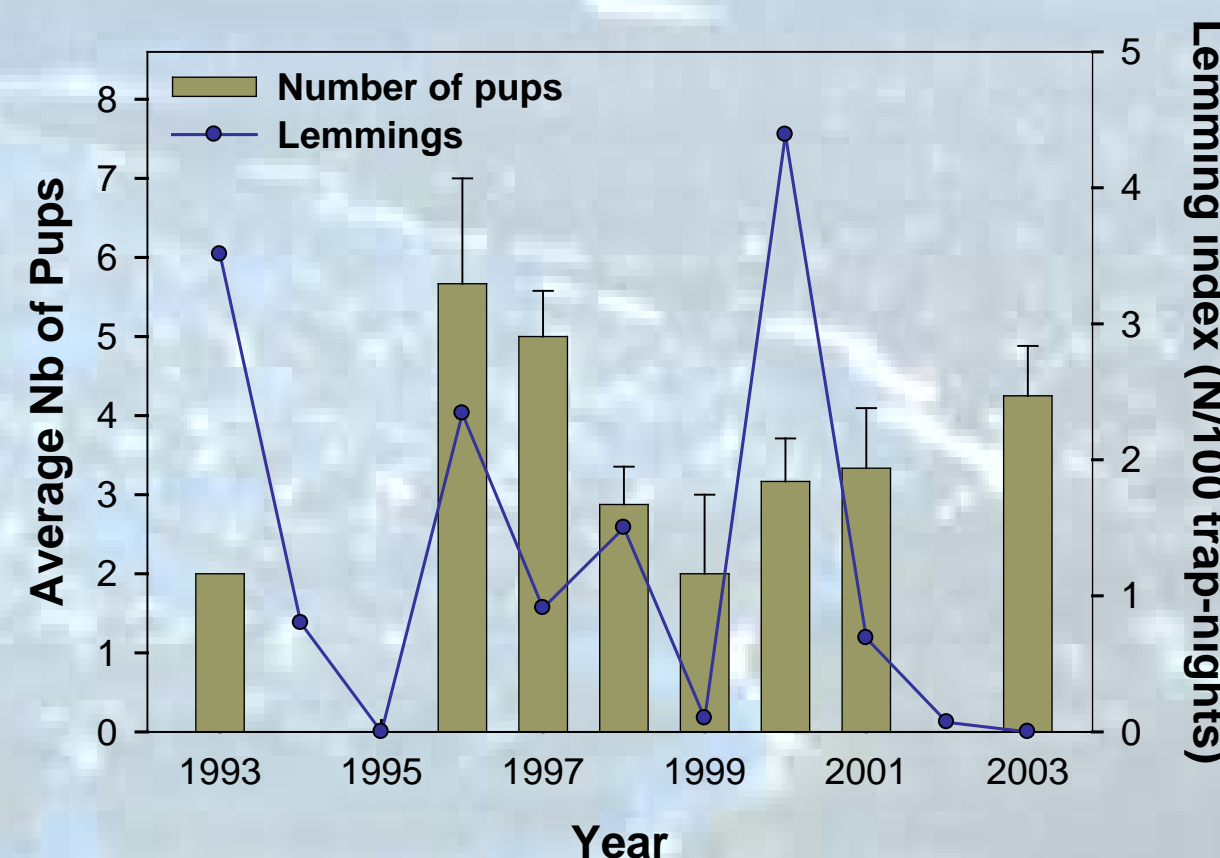
A concern about the expanding goose populations is that if they become too numerous, geese may destroy their Arctic habitat by eating all the vegetation. To study the impact of goose grazing on the vegetation, every year we compare plant growth within and outside small cages where geese cannot feed. Goose grazing is intense on Bylot Island as geese ate more than half of the annual plant growth of wetlands in some years. For the moment, plants are still able to grow back new foliage in the following year, and we see no signs of permanent damages to the vegetation.

### Predators and Other Animals of the Island

**A**rctic Foxes are the main terrestrial predators on Bylot Island. Even though foxes can feed on a large array of food items including goose eggs, their favoured prey are small rodents, the lemmings. Lemmings' population undergo large cyclical fluctuations and, every 3 to 4 years, they become very numerous before crashing down. When lemmings are abundant, many foxes breed and produce large litters. When lemmings are scarce, foxes have to rely on alternative prey and thus heavily turn to goose eggs for food.



Photo by Nicolas Lecomte



Average Arctic Fox litter size in relation to lemming abundance

Another important lemming predator is the Snowy Owl, a common bird of the tundra. However, this large northern owl only breeds on Bylot Island in years of high lemming abundance, and is virtually absent on the island in other years.

### Climate Trends in the North Baffin Area

**C**limate variables have been long recorded by Environment Canada in Pond Inlet and Nanisivik. Since 1994, we also installed meteorological stations on Bylot Island to record climatic variables.

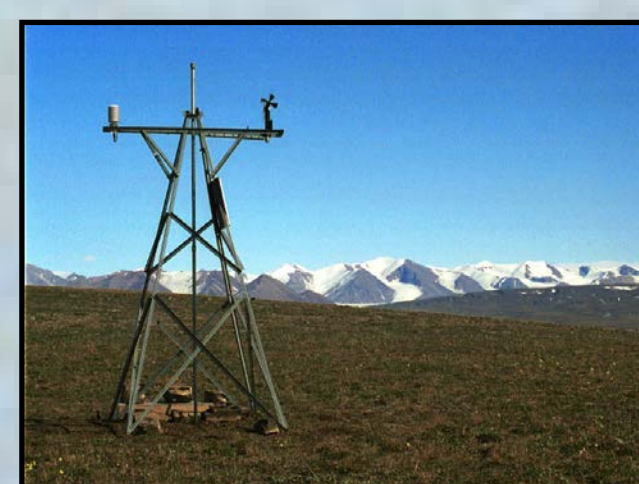
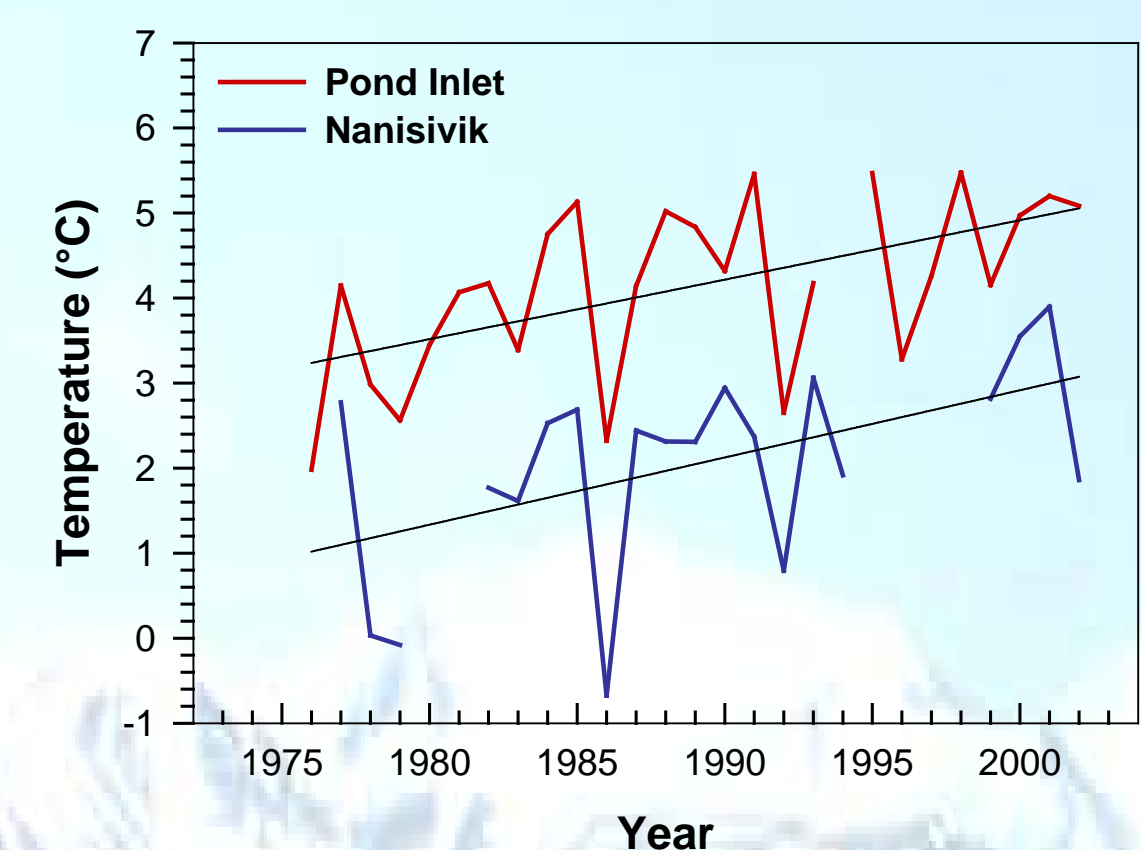


Photo by Denis Sarrasin

Analyses of long-term data show that air temperatures in Pond Inlet and Nanisivik have been steadily increasing in recent decades during the summer, though not in winter. Average summer temperatures have increased by 1.8°C and 2.0°C over a 25 year period for Pond Inlet and Nanisivik, respectively. Since air temperature on Bylot Island is very similar to that of Pond Inlet, warming trends are also occurring on Bylot.



Summer air temperature in Nanisivik and Pond Inlet, 1976-2002

### The Influence of Climate on Plants and Animals

**U**nderstanding climatic effects on living organisms is critical to predict the consequences of climate changes. However, these effects are multiple and very complex.

Our project is part of the International Tundra Experiment (ITEX), a research network that seeks to identify the response of Arctic plants to environmental changes. We found that the reproductive cycle and growth of several plants is affected by temperature. For instance, purple saxifrages flower earlier in warmer years and plant growth in wetlands is enhanced in years when the month July is warm.



Photo by Catherine A. Gagnon

Animal species are also influenced by climate variables. For example, Greater Snow Geese and Lapland Longspurs, two ground-nesting species, lay their eggs later in years of late snowmelt, and fewer geese attempt to breed in those years.

### Conclusions

**C**ontinuing long-term environmental monitoring is critical for understanding how the Bylot Island ecosystem will respond to climate changes. Our long-term ecological monitoring program offers a unique opportunity to elucidate some of the links between the climate, plants and wildlife.

### Acknowledgements

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For More Information: <http://www.cen.ulaval.ca/bylot/>

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