Impacts of climate change on northern ecosystems

Climate change in northern regions is expected to be among the most rapid and extensive of any region on Earth. Climate change will have an impact on northern ecosystems. In some areas, these impacts have already been noticed. Some ecosystems may adapt to climate change by migration of species and changing species composition, and possibly by increases in overall productivity in ecosystems. Determining the impacts of climate change on ecosystems is no easy task. Ecosystems function through a complex series of interrelationships, and many of these relationships are influenced by climate, often in different ways. This bulletin describes some of the possible impacts of climate change on northern ecosystems in the Yukon and across northern Canada.

Species migrations

Ecosystems are predicted to shift northwards in latitude and upwards in altitude. For example, forested areas could increase and tundra areas decrease, with trees advancing up mountains and northward. This would mean a reduction of habitat for some plant and animal species and an increase in habitat for others.

All species within an ecosystem will not respond in the same way to climate change. Some plant and animal species are able to adapt much more rapidly to new conditions than others. Species that are more vulnerable to climate change include those with a narrow habitat range or those with a limited ability to survive outside of a narrow range of environmental conditions. Species at risk due to habitat loss or fragmentation will become even more vulnerable to extinction with the additional pressures caused by climate change.

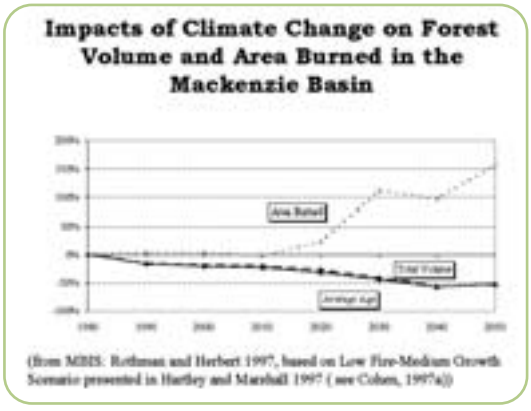
Forest, alpine and tundra ecosystems

On an ecosystem level, the predicted changes include a decline in the size and number of wetlands, increased fire frequency, and increased forest productivity. In Yukon forests, white spruce and lodgepole pine are likely to dominate, whereas black spruce is expected to diminish. In alpine and tundra areas, shrubs may come to dominate at the expense of smaller, seasonal plants. Southern plant species are also predicted to move into the Yukon.

We see that the lakes are rapidly turning into meadows.

Old Crow resident

cited from Arctic Borderlands Ecological Knowledge Co-operative's *2002 Community Monitoring Report.*



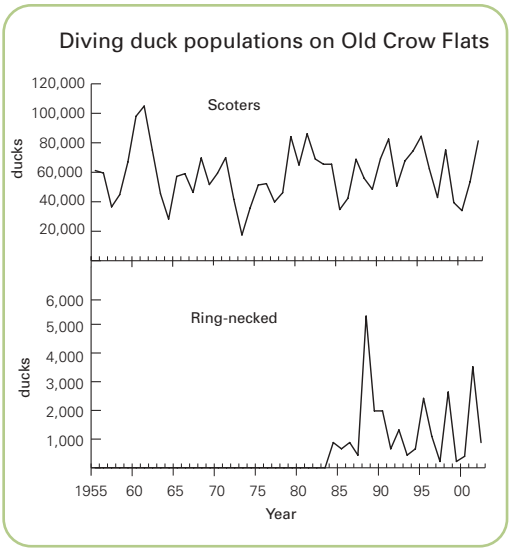
Graph Source: *Mackenzie Basin Impact Study.*

Wildlife

One of the chief climate change predictions for the Yukon is an increase in snow. Snow affects the movements, feeding, and reproductive success of grazing animals, such as moose and caribou. Long-term changes in snow are predicted to alter the distribution and abundance of grazing animals. Changes in the timing of spring are also important to these animals' survival, as this affects the availability of food during the calving season.

In some areas of the Yukon and NWT, mammals such as moose, whitetail deer, coyotes, and cougars are already being observed further north than usual. This may be related to effects of climate change further down the food chain. An increase in the number and types of plants available as a result of warmer temperatures may be attracting herbivores further north, and carnivores will follow the northward movement of herbivores.

Changes in the timing and location of food sources, an increase in parasites and insect-borne disease, and more insect harassment may lead to declines in some animal populations, such as caribou and muskox.



Graph Source: USFWS, Alaska, USA
Courtesy of Arctic Borderlands Ecological Knowledge Co-operative

Birds

Warming may extend nesting seasons, provide more food for young and decreasing chick mortality. However, delayed spring thaw may decrease the foraging ability of migrating birds. Old Crow Flats in northern Yukon is an important wetland both locally and internationally. In the past 20 years, populations of shoveler and ring-necked duck have increased, which could indicate that their breeding grounds have extended northward and that habitats on the Flats have become more favourable for these two species.

Freshwater ecosystems

Although warmer temperatures could bring increased productivity to northern lakes and rivers, deteriorating conditions in the oceans may offset this. Some freshwater species may increase due to greater productivity in warmer waters, while other species that prefer cooler temperatures may not survive in warmer water. In 1999, chinook salmon in the Yukon River were found to be carrying a parasite, *Ichthyophonus hoferi*, that had never before been seen in wild salmon. Salmon are cold-water fish, and during the summer of 1999, the water in the Yukon River might have been too warm for their liking, making it more difficult for the fish to fight off the disease.

In some areas, climate change may deteriorate fish habitats through changes in water flows and water quality. Where water levels are lower, especially in small steams, salmon may not be able to reach spawning grounds. Where warmer temperatures result in melting permafrost, landslides may occur along stream banks, increasing the sediment load in the water courses and altering the quality of fish habitat. In addition, melting ice releases organic material into streams, which can use up the available oxygen in the water that fish require for respiration.

Marine ecosystems

Climate change is expected to reduce the extent and thickness of sea ice in many parts of the Arctic and to cause it to break up earlier. In areas with extensive ice further north, climate change may be advantageous if it results in more areas of open water. However, where ice breaks up earlier, animals that are dependent on sea ice—including seals, walrus and polar bears—will be disadvantaged. Walrus and some seals (bearded, ringed, harp, and hooded seals) may lose the sea ice platforms they use for breeding, nursing pups, resting, and moulting.

Polar bears rely on ice to give them access to the seals that are their main source of food. In western Hudson Bay, ice break-up was on average two weeks earlier in the 1990s than in the 1970s, and these changing ice conditions may result in no polar bears residing in the Hudson Bay area within 50 years. The entire marine food chain depends on plankton and other microorganisms, the abundance of which may be affected by changes in the thickness and distribution of sea ice. This could have far-reaching effects on the marine ecosystem.

Research

Much research is underway in northern Canada to help understand the impacts of climate change on northern ecosystems. The Northern Climate Change Infosources Database (http://yukon.taiga.net/infosources/) contains a listing of research reports that are available, and the northern office of the Canadian Climate Impacts and Adaptation Research Network tracks projects that are currently underway http://www.taiga.net/c-ciarn-north/.

There were very few songbirds noticed. Even shore birds are hardly seen.

Aklavik resident

cited from Arctic Borderlands Ecological Knowledge Co-operative's *2002 Community Monitoring Report*.

Quotations used with permission. www.taiga.net/coop

Additional reading

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