Climate Change and Harvesting Fish

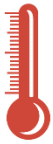
Fish are a staple in the traditional diet of many First Nations people, but climate change in the north is having an impact on this important group of animals.

How will climate change impact fish in northern Ontario?

With increasing air temperature, the lakes and rivers in Ontario are becoming warmer, and this can have a big impact on fish. Being cold-blooded, fish are directly affected by the temperature of the water that they're in. Water temperature can affect where fish are able to live, how they grow, and can even impact when they spawn. As climate continues to change, warmer lakes and rivers could mean:

- Fewer places where cool-water fish and cold-water fish can live (range contraction).
- More places where warm-water fish can live (range expansion).
- New invasive species that can live in warmer conditions.
- New fish diseases and parasites that can live in warmer conditions.
- A possible advantage for fish diseases and parasites already in lakes and rivers (many do better in warmer temperatures[1]).

Different species of fish need different temperatures of water to live, grow, and thrive. In Ontario, fish are categorized as:



Warm-Water Fish
Eg. Smallmouth bass, largemouth bass, & pumpkinseed

Cool-Water Fish
Eg. Walleye, northern pike, & yellow perch

Cold-Water Fish
Eg. Brook trout, cisco, & lake whitefish

Warmer air temperatures will also drive more evaporation from lakes and rivers and could cause water levels to fall. Lower water levels can change important fish habitat like spawning grounds and cold-water refuges and make it harder for fish to migrate or move from one place to another.

In lakes, the changes in water levels and increase temperature can lead to a deepening of the thermocline (the transition layer between hot water on the surface and cold water beneath) leaving less cold water for cold-water fish like cisco and trout.

Warm-water fish like smallmouth bass will likely become more common in the north as climate change makes lakes and rivers warmer

The predicted increase in extreme storms can have an impact on water quality. Heavy rain can carry contaminants and sediment into lakes and rivers impacting fish. The change in ice cover will also affect fish growth and survival.

What are people noticing?

Changes in fish have been noticed by people across the north. People say bass are becoming more common, especially in northeastern Ontario. Others have observed that spawning times have changed or become unpredictable. Important events, like the fish run, are sometimes missed by harvesters because they are now happening at unexpected times. Fish health is a concern for many, with people saying they've seen fish with sores, spots, bumps, or worms. Some people also say they find that the meat of harvested fish is softer than it used to be.

Cisco are harvested by many First Nations in the north. Cisco need cold water to live and thrive.

Climate change can also make it harder to harvest fish. Lower water levels can cut off traditional routes and limit access to fishing areas. A shorter ice-on season and ice that is thinner or poor quality is limiting travel and ice fishing. In some cases, these difficulties in harvesting have led to people in First Nations communities eating less fish than they used to.

How do we prepare?

Monitor

Fish monitoring

- What species are in the area
- Number of fish in the area
- When and where fish spawn
- Fish migration and movement
- Fish health

Monitoring allows us to gather information about the environment and the changes that are occurring. Monitoring can be done by environmental stewards, researchers, and community members, and can be guided by traditional knowledge. Community-based monitoring is when a community decides what to monitor and implements a monitoring program with or without a researcher as a partner. When community members gather information on their own it is sometimes termed "citizen science". Citizen science is a growing field due to the availability of apps and websites that make it easy to collect and share data, like Fish ON-Line (www.ontario.ca/page/how-use-fish-line) or iNaturalist (www.inaturalist.org). Citizen science is also a good way to engage people in environmental issues and encourage good stewardship.

Protect and restore fish habitat

Protect the places fish need to live and thrive, like cold water refuges, spawning grounds, near-shore areas, and migration routes. As the climate warms, the areas of cooler water that cool-water fish and cold-water fish need (called cold water refuges) are particularly threatened. Protect these areas by maintaining water levels, keeping shoreline vegetation to create shade, and making sure any cool water inputs (like groundwater springs or cooler tributaries) are uninterrupted.

Protecting spawning areas helps protect fish. Photo: Cooperative Freshwater Ecology Unit

Keep lakes and rivers healthy

Healthy lakes and rivers benefit all species, including fish. Keep the lakes and rivers in your area healthy by limiting pollution, protecting wetlands, and maintaining vegetation on the shoreline and in the watershed. Take steps to keep invasive species out of your area. Many invasive species, like zebra mussels or spiny water flea, are carried between waterbodies by people who unknowingly have them on their boats or fishing gear. One study that looked at lakes in northern Minnesota (including two that span the Ontario/Minnesota border) found that in lakes where zebra mussels or spiny water flea had invaded, walleye grew more slowly in their first year of life compared to walleye in lakes that didn't have those invasive species. Walleye in those invaded lakes were also smaller at the end of their first summer, lowering their chance of survival[2].

Make changes to harvesting

Many in the north have already had to make changes to when and where they harvest fish because of changes in climate. In winter, ice fishing might be delayed until the ice is safe to travel on. In summer, low water levels might mean shallower boats are needed, or motors need pivoting brackets so they can be quickly raised out of the water. Climate change might also mean making changes to the type of fish that are harvested, like shifting away from fish species that are under threat. Consider catching fish new to the area like smallmouth bass.

Want to know more? Check out the research mentioned in this write-up!

[1]Chetkiewicz, C., McDermid, J., Cross, M. & Rowland, E. *Climate Change and Freshwater Fish in Ontario's Far North*. (2012)
[2]Hansen, G. J. A., Ahrenstorff, T. D., Bethke, B. J., Dumke, J. D., Hirsch, J., Kovalenko, K. E., LeDuc, J. F., Maki, R. P., Rantala, H. M., & Wagner, T. (2020). Walleye growth declines following zebra mussel and Bythotrephes invasion. Biological Invasions, 22(4), 1481–1495. https://link.springer.com/article/10.1007/s10530-020-02198-5

UP NORTH ON CLIMATE
Climate Change Impact and Adaptation Study for the North of Ontario