



Warming Water and Cold-Water Fish

Many fish species that are harvested across the north need cool or cold water to live and thrive. What does a warming climate mean for these fish? And how can people prepare?

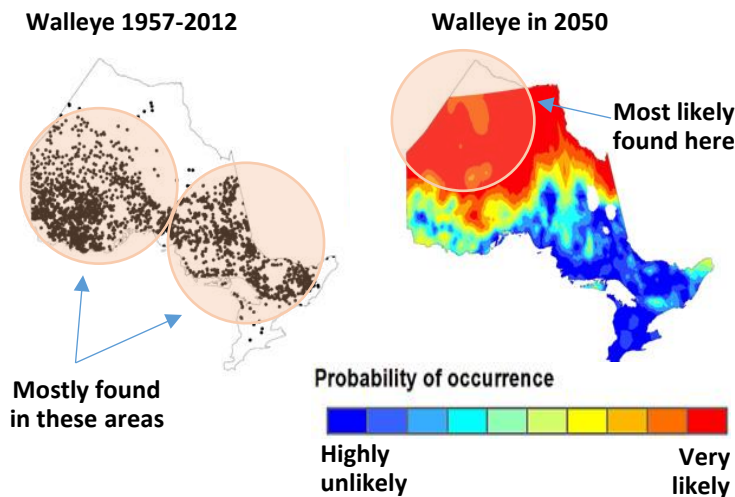
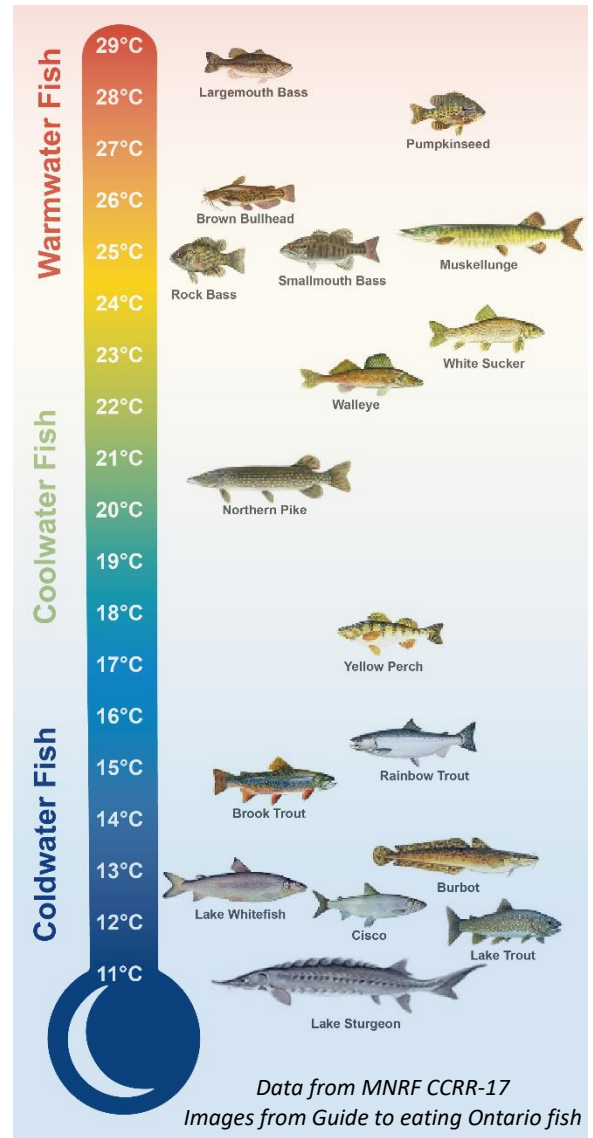
Why is water temperature important to fish?

Water temperature is important to fish because they are cold-blooded animals, meaning their body temperature depends on the temperature of the water surrounding them. Temperature influences many of their biological processes, like spawning and growth. Exactly what water temperature a fish prefers varies from species to species but, in general, fish in this region are categorized as either warm-water fish, cool-water fish, or cold-water fish.

What does climate change mean for cold-water fish?

Climate change is predicted to bring warmer temperatures across Ontario. This means that there will likely be fewer places where cold-water fish (like brook trout, cisco, and lake whitefish) can live, and they will be found less in the south as they thrive more in the north where cold water will remain. Cool-water fish (like walleye and northern pike) will be affected in the same way.

Warm-water fish (like smallmouth bass and rock bass) on the other hand, will likely be able to live in more Ontario lakes than they do now, and will be able to survive further north than they have before.



The maps show how the habitat range of walleye is predicted to shift as climate changes. These cool-water fish will survive better further north as water temperatures rise in the areas where they were found in the past.

What have people noticed? In First Nation communities across northern Ontario, people are already noticing warmer water in lakes and rivers. In northeastern Ontario, many communities say they've seen more bass, with bass being reported as far north as the James Bay coast.

*Maps modified from: Van Zuiden, T.M., et al. (2016). Projected impacts of climate change on three freshwater fishes and potential novel competitive interactions. Diversity and Distributions, 22(5), 603-614

How can we prepare?

Identify and protect cold water refuges

When temperatures get too hot, cool-water fish and cold-water fish will seek out cooler water. In lakes, this can mean going deeper. In streams, it can mean finding spots called cold water refuges. Cold water refuges can occur in shaded or deeper spots, or where

cooler water is coming into the main channel through smaller streams or groundwater sources. Looking at maps or traveling the land can be useful for scouting areas where cold water refuges may be located. Local traditional knowledge might also give insight about where cooler water can be found. High tech methods, like remote sensing (using satellite, aerial, or thermal images to get information about the land) could also be used.

Once cold-water refuges are identified, they should be protected. Avoid taking water out of these systems, keep the trees and other vegetation that provide shade, limit development, and make sure tributaries and groundwater sources aren't blocked from entering the main channel. It's also important to keep nutrients, like those that come from fertilizer, septic systems, and household detergents, out of deep water lakes. These nutrients promote the growth of plants like algae that use up lake oxygen when they decompose, making less oxygen available for fish especially in winter. Some in-stream structures, like weirs, deflectors, and pools, may also be able to offer some temperature-related benefits to a stream or river.

Create or improve riparian areas

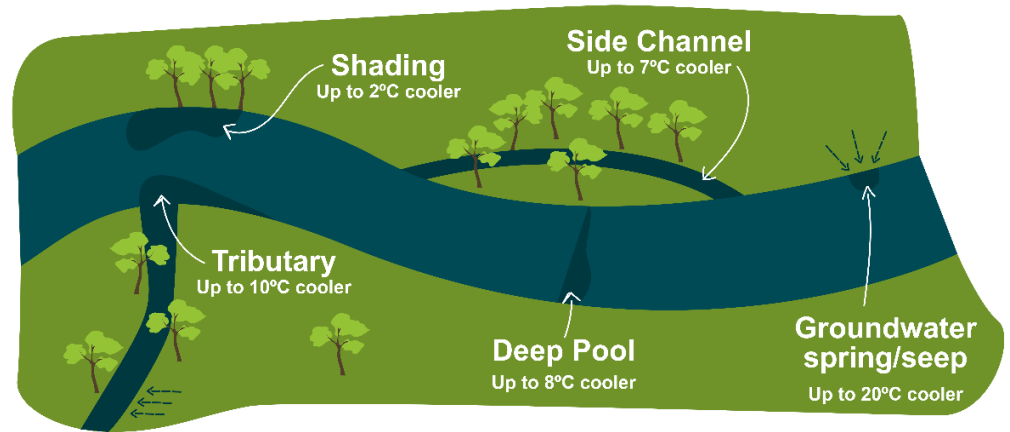
Shoreline vegetation (called riparian vegetation) provides shade allowing for cooler water. Riparian vegetation can be especially effective on smaller streams, like tributaries and side channels, because shading can cover a larger proportion of the water. The plants and trees of riparian areas should be protected. If there are few trees, consider planting some.

Protect migration routes

Whether it's for finding a cold water refuge, for spawning, or for moving northward as habitats change, fish have to be able to get from one spot to another. Protect fish migration routes and the waterways that connect lakes and rivers. Low water in rivers, streams, and creeks can also make it harder for fish to move between and within river systems. Avoid taking water out of these systems. In some cases, water control structures, like dams, could be useful in controlling water levels but fish ladders must be provided to allow fish movement.

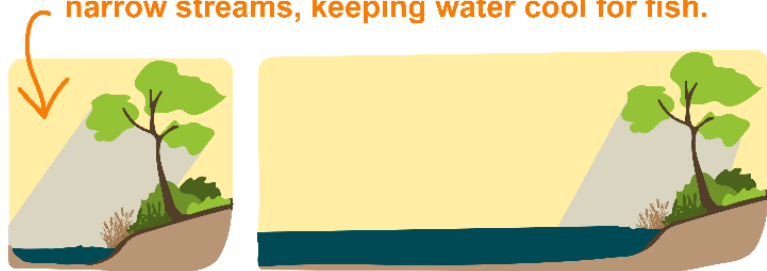
Cool and cold water fish will be challenged by the increasing temperatures predicted with climate change. Help them by protecting their habitat especially cold water refuges, riparian areas, and migration routes.

Read more https://files.ontario.ca/environment-and-energy/aquatics-climate/stdprod_088243.pdf



Areas of differing temperatures within a stream. 1 with cooler water shown as a darker colour. Graphic modified from Kurylyk, B.L. et al. (2014). Preserving, augmenting, and creating cold-water thermal refugia in rivers: concepts derived from research on the Miramichi River, New Brunswick (Canada). *Ecohydrology*, 8(6), 1095-1108.

Riparian area is most effective at shading narrow streams, keeping water cool for fish.



Water flows from the tributary into the main channel, providing cold water refuges in the larger river.