

CLIMATE CHANGE & FISHING

Today's Trends & Tomorrow's Expectations

Observed trends across all nine Métis Nation of Ontario Regions

ENVIRONMENTAL CHANGES:

- Increased air + water temperature
- Decreased or increased snow + ice cover
- Increased rain + run-off
- Increased spring water levels
- Decreased summer water levels
- Increased algae blooms + vegetation

UNPREDICTABILITY:

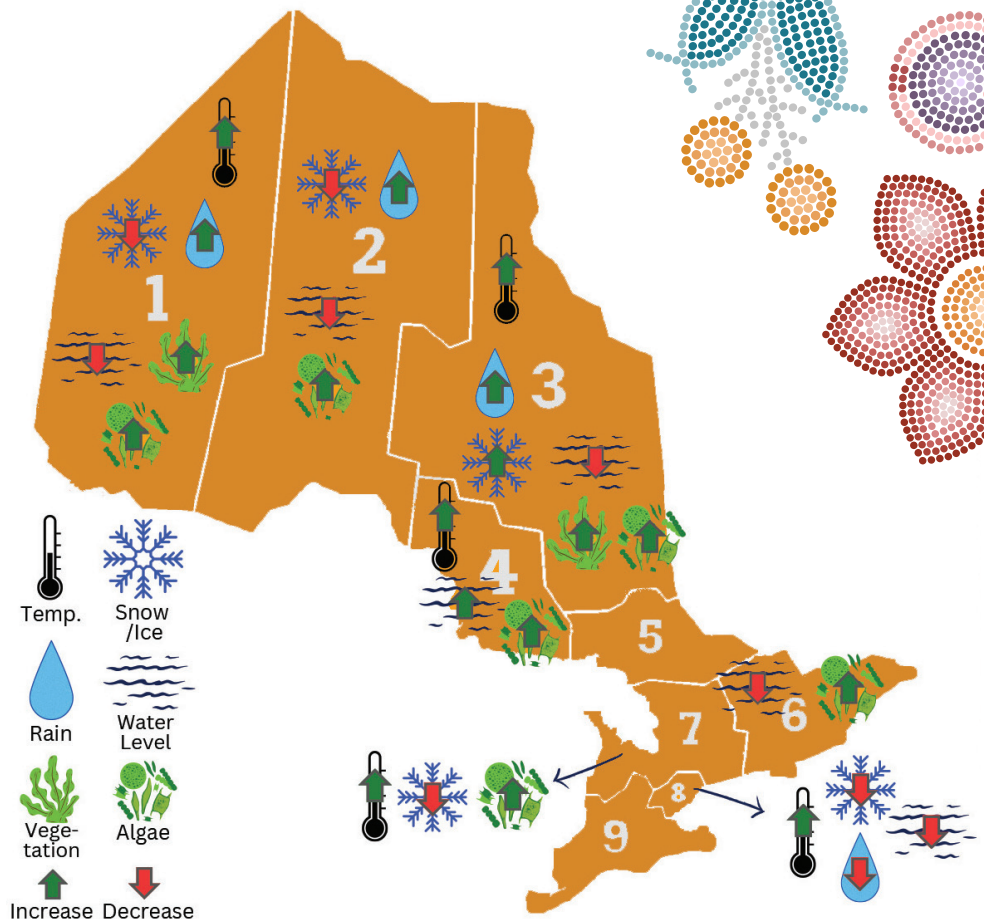
- Extreme weather fluctuations with variable annual conditions
- Air + water temperatures warming earlier and staying warm for longer
- Reduced winter + ice fishing opportunities

REGIONAL CHANGES:

- 86% of MNO Regions report declines in size of cool/coldwater fish in the north and coldwater fish in the south
- 43% of MNO Regions reported declines in number of cool/coldwater fish
- 43% of MNO Regions reported increases in number of waterbodies where fish are present
- MNO Regions in the north reporting increases in the number of warmwater species

OTHER IMPACTS:

- Walleye, whitefish and lake trout spawning later in the season
- Steelhead + salmon and spawning earlier in spring and later in fall
- Fish distribution is changing depending on water temperature + level



“Traditional wildlife cues that indicate when fish come up and spawn may no longer ring true”

-- Métis Knowledge Holder

DID YOU KNOW?^{1,2}

- Climate warming in Canada is **double** the world average
- Warming has increased the most in winter and spring and in northern regions

HOW WILL CURRENT CONDITIONS CHANGE OVER TIME AND ACROSS OUR LAND?

Here is what the scientists say:

Air Temperature:

Summer temp. increases by 1-4°C by 2050 + 3-6°C by 2100
 Winter temp. increases by 2-7°C by 2050 + 3-10°C by 2100
 Warming greater in the North

Water Temperature:

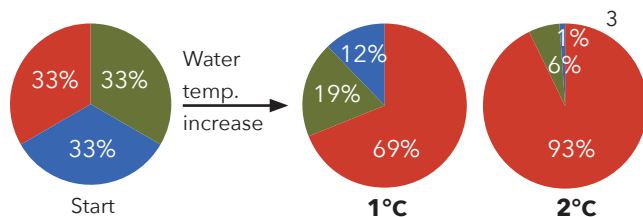
Great Lakes increase by 2-3°C by 2050

Precipitation:

Increase in extreme precipitation events across Ontario

Water Levels:

Fluctuates around lower average,
 Great Lakes -1.4 to +0.4m by 2100



FISH DISTRIBUTION ^{2, 3, 4, 5}

Coldwater species (15°C; Trout & Whitefish): range reduced, northward contraction

Coolwater species (24°C; Walleye & Perch): variable range shifts northward

Warmwater species (28°C; Bass): range expanded northward

SPECIFIC PROJECTIONS:

Smallmouth Bass occurrence rate increase by 260% & 306%, **Walleye** decline by 17% & 22% and **Cisco** decline by 20% & 26% by 2050 & 2070. Bass co-occurrence increase by 10% with Walleye and 20% with **Lake Trout** by 2050 with Bass reducing the abundance of both species as well as **baitfish**. Walleye-Bass co-occurrence decline by 0.3% in South and increase by 20% in Central and 68% in North while Walleye-Cisco increase by 14% in North by 2070. Lake Trout habitat reduced by 30% by 2100 with 60% reduction in South & East, and a 30% increase in Northwest regions within the Métis Nation of Ontario.

CHANGES CAN LEAD TO:

Reductions in quantity and quality of fish habitat including increased stratification periods, nutrient cycling, algae blooms, contaminant loads, summer kill events, habitat fragmentation, reduced deep water oxygen & reduced and disturbed littoral zones.

POTENTIAL FISH RESPONSES:

Shifts in habitat use, increased energy requirements, changes in competition & predator prey interactions, changes in growth, changes in reproduction & overwinter survival (depending on food availability and species).



DID YOU KNOW? ^{2, 3, 5}

- Over the last 30 years warmwater sportfish in ON have shifted their range northwards by 12.5 - 17.5km/decade
- Some species expected to expand range 500 - 600km North
- 27 species potential to move North into Canada from the USA via Great Lakes

REFERENCES:

1. Collingsworth et al. 2017. Climate change as a long-term stressor for the fisheries of the Laurentian Great Lakes of North America. Rev. Fish. Biol. Fisheries. 27:363-391.
2. Dove-Thompson et al. 2011. A summary of the effects of climate change on Ontario's aquatic ecosystems. OMNR CCRR-11.
3. Van Zuiden et al. 2016. Projected impacts of climate change on three freshwater fishes and potential novel competitive interactions. Diveristy Distrib. 22:603-614.
4. Minns et al. 2009. Regional projections of climate change on Ontario lake trout (Salvelinus namaycush) populations. OMNR CCRR-14.
5. Sharma et al. 2009. Quantifying the potential effects of climate change and the invasion of smallmouth bass on native lake trout populations across Canadian lakes. Ecography. 32:517-525.