

IISD Experimental Lakes Area and Climate Change

For the last 47 years, IISD Experimental Lakes Area (IISD-ELA) in Northwestern Ontario, Canada, has been collecting detailed data on our climate, stream and lake ecosystems, making our long-term dataset extremely valuable to understanding how climate change has, and will, influence our precious freshwater resources. Our research station is located in the boreal forest, which is the largest ecozone on our planet, and which plays a globally important role in carbon cycling and long-term storage.

To help you better understand some of our major climate change research findings regarding how climate change is and will be affecting our water supplies, here is a breakdown of some of what we have discovered so far:



OUR AIR IS GETTING **WARMER**

- **OUR AIR IS GETTING WARMER, AND THIS IS HAPPENING EVEN QUICKER IN NORTHERN TEMPERATE CLIMATES** (such as in the boreal forest, where IISD-ELA is located). Research from the site has found that, since 1969, mean annual air temperatures have increased by 0.42°C/decade at the facility in Northwestern Ontario, much faster than the global average (0.15-0.30 °C/decade).
- **RESEARCH ALSO REVEALS THAT AUTUMN AND WINTER MONTHS ARE WARMING MUCH FASTER THAN SUMMER MONTHS.**
- Over the next century, **WESTERN CANADA WILL BECOME DRIER AND EASTERN CANADA IS SET TO BECOME WETTER, WITH INCREASED PRECIPITATION.**



OUR LAKES ARE GETTING LESS **ICY**

- In many parts of the Northern Hemisphere, **RESEARCHERS HAVE DOCUMENTED SHORTER WINTERS AND A REDUCED DURATION OF ICE COVER.** They have also discovered that the duration of the winter period where lakes are ice covered is getting shorter and shorter over time.
- **THIS WILL CONTINUE TO HAPPEN.** Based on regional climate projections for Northwestern Ontario, the duration of ice cover is projected to decline by an additional 20–30 days by 2070.
- **WHY DOES THIS MATTER?** The duration of ice cover on lakes is important for winter roads into remote northern communities, and recreational activities such as snowmobiling and ice fishing. The duration of ice cover is also very important to a large number of physical, chemical and biological processes in lakes.



OUR LAKES ARE GETTING **DARKER**

- Across Europe and many parts of North America, there have been a growing number of reports that **LAKES ARE GETTING DARKER.** This is due to many factors, but the main reason is the increased addition of dissolved organic carbon (DOC) entering into our lakes through precipitation. If you have ever looked into a wetland or lake and seen the dark brown colour of the water, that is DOC.
- **IN EASTERN CANADA, CLIMATE PROJECTIONS SUGGEST THAT LAKES WILL GET DARKER, WHEREAS IN WESTERN CANADA, THEY WILL BE GETTING LIGHTER.** This is due to different rates of precipitation.
- **WHY DOES THIS MATTER?** Water clarity is an important feature of lakes, determining how much light and heat penetrate beneath the water surface, and what sorts of animal and plant life can live there.



OUR FISH ARE **SQUEEZING** INTO SMALLER HABITATS

- **LAKE TROUT ARE BEING SQUEEZED.** This happens because preferred habitat for lake trout gets squeezed between surface waters that are too hot and bottom waters where dissolved oxygen is too low. Increases in air temperature and the length of the summer period linked with climate change will place this important species at risk of local extinction in many lakes.
- **THIS WILL CONTINUE TO HAPPEN.** With increasing global temperatures, we can expect surface lake temperatures to increase as a result, which may start affecting the habitat available to lake trout. If these changes happen too quickly and the species is not able to adapt in time, it is likely that lake trout near the southern edge of their natural range will begin to disappear.



OUR FISH ARE GETTING **SMALLER**

- **LAKE TROUT ARE GETTING SMALLER.** Scientists at IISD-ELA found that the average length of an adult lake trout (from its snout to the fork in its tail) has decreased since records began all the way back in the 1970s.
- **HOW DOES CLIMATE CHANGE COME INTO THIS?** At IISD-ELA, the fish in our remote and pristine lakes are isolated from the potential effects from industrial activities, changes in land use and fishing pressure, making it much easier for us to resolve the effects of climate change on fish communities than in most other locations. Our data suggest that the decline in the size of lake trout over time is related to lengthening summer periods where these fish are stuck in deeper waters with reduced access to food.

About IISD Experimental Lakes Area

IISD-ELA, open since 1968 and comprised of 58 freshwater lakes and their watersheds, is a world-class, unique Canadian scientific research facility, and the only site in the world where whole-lake experimentation (essential for optimal, accurate freshwater research findings) is carried out.

IISD Experimental Lakes Area Inc. 111 Lombard Avenue, Suite 325, Winnipeg, Manitoba, Canada R3B 0T4


P: 1 (204) 958-7700 | F: 1 (204) 958-7710 | ELA@iisd.ca  [IISDnews](#)  [@IISD_ELA](#)  [@IISD_ELA](#)

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