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NWT Environmental Research Bulletin (NERB)

NWT Cumulative Impact Monitoring Program (NWT CIMP)

A source of environmental monitoring and research in the NWT. The program coordinates, conducts and funds the collection, analysis and reporting of information related to environmental conditions in the NWT.

NWT Environmental Research Bulletin (NERB)

A series of brief plain language summaries of various environmental research findings in the Northwest Territories. If you're conducting environmental research in the NWT, consider sharing your information with northern residents in a bulletin. These research summaries are also of use to northern resource decision-makers.

Why do fish mercury levels in Dehcho lakes vary so much?

In 2012, Dehcho communities approached researchers with several questions regarding fish mercury levels. People wanted to know why fish mercury levels were high enough in some lakes to warrant site-specific consumption advisories, whereas in nearby lakes the fish mercury levels were quite low. Since 2013, recent results have revealed that variability in fish mercury levels among lakes is driven by complex effects that begin in the catchment (an area where water is collected) and then cascade to water chemistry, affecting levels of mercury at the bottom of the food chain, and ultimately fish growth rates and fish mercury levels.

Why is this research important?

This research not only helps community members identify and understand the safest, healthiest sources of fish in the region, but also helps to understand how continuing environmental change could affect fish mercury levels through land-water-fish interactions and connections.

What did we do?

Over the last ~ 10 years, we have sampled community-prioritized lakes in the region to discover what drives the variability among lakes in fish mercury levels. Each summer, 2 lakes are chosen for intensive study. Dehcho Guardians and university researchers work for several weeks on the land and collect fish, water, sediment, invertebrates, and zooplankton. Researchers also characterized the land that water flows over to get to the lakes (i.e., catchments) using images from satellites.

What did we find?

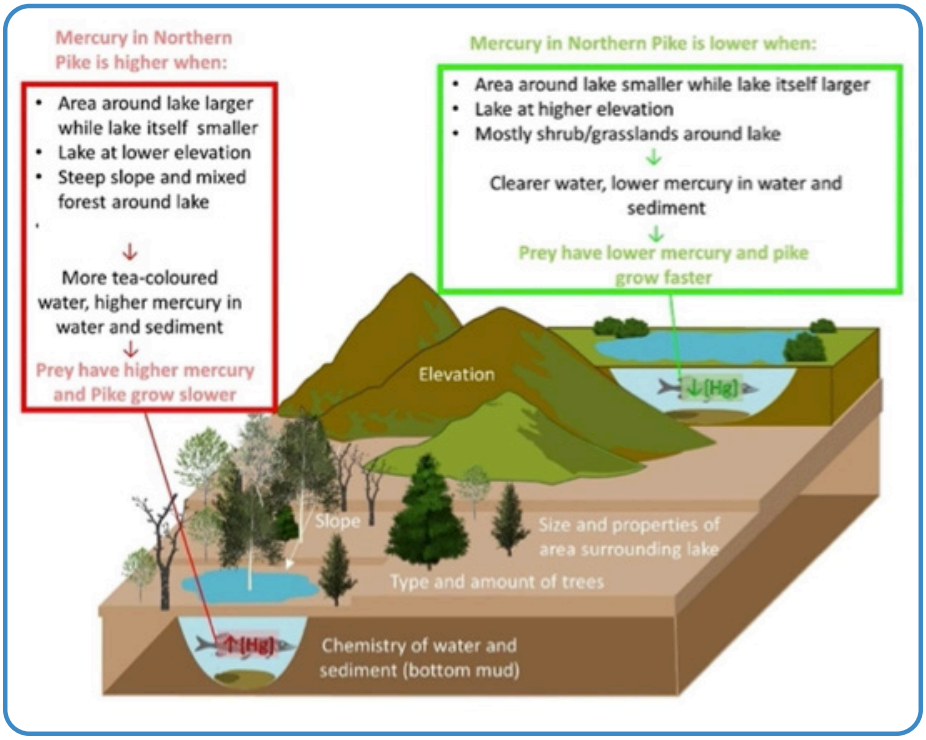
We found that among-lake variability in mercury levels in Northern Pike is driven by two primary variables: Northern Pike growth rate and levels of mercury lower in the food chain. These two variables are in turn driven by the amount of dissolved organic carbon (i.e., a lake with high dissolved organic carbon has a tea colour) in lakes and the amount of mercury in water and sediment. These water chemistry factors were ultimately driven by catchment characteristics that included the relative size of the catchment, the steepness of the catchment, and the amount of forest cover in the catchment (Moslemi-Aqdam et al. 2021, 2022).

What does this mean?

Northern Pike are more likely to have higher mercury levels in lakes with large, steep, forested catchments, and when water is more tea-coloured and fish grow more slowly. Any change that increases the amount of forest in the catchment or the amount of carbon (the tea colour) that enters lakes may act to increase fish mercury.

What's next?

The next phase will investigate what drives nutrient to mercury ratios in fish. We want people to feel confident choosing sources of wild-caught fish that are safe and healthy, and to understand why nutrient and mercury levels can be different among lakes.



(Credit: Bronte McPhedran and Mehdi Moslemi-Aqdam)

What is mercury?

Mercury is a naturally occurring element, like oxygen or carbon. Mercury that occurs naturally in catchments can enter lakes through weathering of rocks or melting of permafrost. Industrial activities, such as burning coal and gold mining, also result in mercury being released to the atmosphere, where it can travel long distances and eventually end up in northern catchments, soils, vegetation, and lakes.

Contacts

Heidi Swanson, University of Waterloo,
hswanson@uwaterloo.ca
Mike Low, Dehcho AAROM,
jmichaellow@gmail.com

NWT Cumulative Impact Monitoring Program (CIMP154)
nwtcimp@gov.nt.ca

Recommended Reading

Moslemi-Aqdam, M., Low, G., Low, M., Branfireun, B., Swanson, H.K. (**2021**). *Catchments affect growth rate of Northern Pike, Esox lucius, in subarctic lakes.* Aquatic Sciences 83(3): 1-14. doi.org/10.1007/s00027-021-00817-4

Moslemi-Aqdam, M., Baker, L., Baltzer, J., Branfireun, B., Evans, M., Laird, B., Low, G., Low, M., Swanson, H (**2022**). *Understanding among-lake variability of mercury concentrations in Northern Pike (Esox lucius): a whole-ecosystem study in subarctic lakes.* Science of the Total Environment https://doi.org/10.1016/j.scitotenv.2022.153430