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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.

Contaminants along the Tibbitt-to-Contwoyto winter road

Remote mining operations in the Northwest Territories and Nunavut are linked by a 600 kilometre winter road from Yellowknife to the tundra. Each year, thousands of truckloads of fuel, equipment and other supplies are hauled up the road (Figure 1). Communities have voiced concerns about whether diesel emissions from trucks are a significant contributor of contaminants to the lakes along the road. To help address these concerns, a study measured metals and polycyclic aromatic compounds (PACs) in snow, water and lake sediment. The study found that the highest levels of contaminants were measured in lakes in forested areas, and that forest fires may be a more important source of contaminants to winter road lakes than vehicle traffic.

Figure 1. Heavy vehicle traffic on the Tibbitt-to-Contwoyto winter road. (Photo: J. Zheng, Natural Resources Canada).

Why is the research important?

Due to cold temperatures, transport trucks are kept idling when not in use, which contributes to a steady output of diesel exhaust. The chemicals released have the potential to be deposited on the snow and, during the spring melt, enter lakes and rivers. This research began in order to address concerns raised by the Yellowknives Dene First Nation about the potential for accumulation of contaminants from traffic in this pristine environment. We wanted to determine if diesel emissions from trucks added contaminants to the lakes along the winter road.

What did we do?

In March 2014, we collected snow, water and sediment from nine lakes along the winter road as well as five lakes around Yellowknife (Figure 2). The samples were measured for metals and PACs. We collected samples from a heavily-used lake where trucks idle continuously and other lakes off the main winter road that receive less traffic. Samples from lakes around Yellowknife were also collected to determine how the amount and type of metals and PACs compared between the winter road and an urban centre.

What did we find?

- Snow samples from Yellowknife contained PACs that were not found along the winter road. This is probably because Yellowknife has more emission sources. PAC concentrations from water and sediment were similar for both Yellowknife and the winter road lakes.
- Along the winter road, the boreal forest sites had the highest levels of PACs and metals in snow and water, and the tundra (high and low subarctic ecozones) sites had the lowest.
- The high levels of PACs in the snow in the forested areas most likely came from fires.

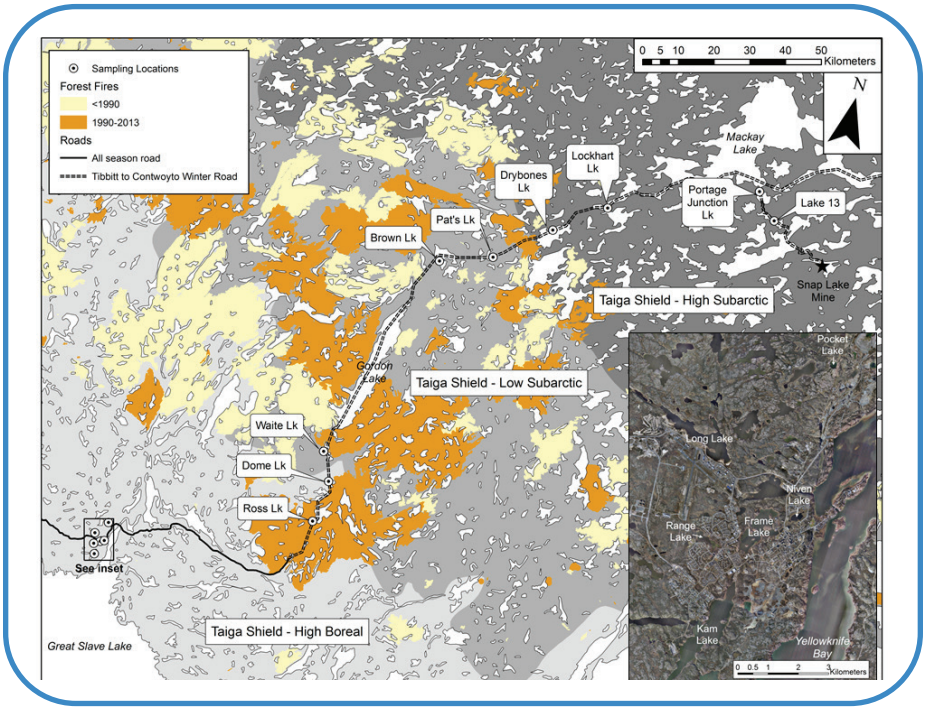

Figure 2. Map showing the location of the Tibbitt-to-Contwoyto winter road and the study lakes samples. The Yellowknife study lakes are shown in the inset.

What does this mean?

Wildfires are likely a more important natural source of contaminants such as PACs to lakes along the Tibbitt-to-Contwoyto winter road, and trucks contribute relatively low levels of PACs and metals to the lakes. The study highlights that it is important to measure contaminants in the snowpack, which records contaminants deposited during the winter season, while water and sediment integrates emission sources across seasons and years.

What are Polycyclic Aromatic Compounds (PACs)?

PACs are chemicals that occur naturally in coal, crude oil, and gasoline. They also are produced when coal, oil, gas, wood (including trees), garbage, and tobacco are burned. The chemicals from these sources can form small particles in the air and then fall onto the land and water. PACs can be harmful to human health.

A related study: contaminants in snow along the winter road

A related study carried out by Geological Survey of Canada, Natural Resources Canada in March 2012, collected snow samples from 37 sites along the winter road and near the former Tundra gold mine. The study found generally very low levels of metals. The highest concentrations or levels (especially for arsenic, lead, strontium and zinc) were found near the Tundra gold mine. This suggested that some metal contaminants are present in the soil and they are redistributed even in winter.

This study agrees that road traffic along the winter road likely has only a small impact on metal content of the tundra-taiga snowpack, and that other factors are more important: in this case, proximity to the former gold mine.

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Recommended Reading:
Zdanowicz, C., Zheng, J., Klimenko, E. and Outridge, P. 2017. Mercury and other trace metals in the snowpack across the subarctic taiga-tundra ecotone, Northwest Territories, Canada. *Applied Geochemistry* 82: 63–78.

Recommended Reading

Korosi, J.B., Eickmeyer, D.C., Thienpont, J.R., Palmer, M.J., Kimpe, L.E., Blais, J.M. 2016. Assessing the contribution of combustion-derived contaminants to a remote subarctic environment from traffic on the Tibbitt to Contwoyto winter road (Northwest Territories, Canada). *Science of the Total Environment* 553: 96–106.

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