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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.

Dramatic changes to the waters of the Inuvik region, NWT

The Inuvik region has vast water resources that support large populations of wildlife and are important to communities of the Mackenzie Delta region. However, the effects of rapid climate warming on the waters of this area are not fully understood. We monitored all aspects of water at sites along the Inuvik – Tuktoyaktuk Highway (ITH), including two streams in the area. We found unexpected changes in streamflow and lake drainage, presented below.

Why is this research important?

Water is important for the social, cultural, and economic well-being of residents, and for sustaining healthy aquatic ecosystems and wildlife. In collaboration with the Inuvialuit Fisheries Joint Management Committee, we studied the impacts of climate change on local waters.

What did we do?

- We monitored climate, snow, streamflow, and lake levels at sites along the ITH and Dempster Highway. We also collected detailed water and climate information at Trail Valley Creek (TVC; Figure 1), 50 km north of Inuvik, and at Havikpak Creek, near the Inuvik Airport. We now have 30 years of high-quality water data at both locations.
- We used air photos and satellite images to assess changes to lakes (Figure 2 & 3) since 1950 from Inuvik north to the Beaufort Sea, and between the Mackenzie Delta and Husky Lakes.

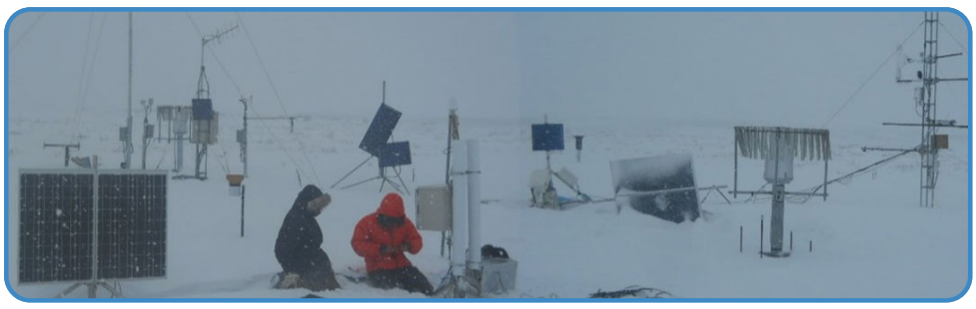

Figure 1: One of six water, weather, and snow measurement stations operated by Wilfrid Laurier University at TVC and Havikpak Creek. Data from one of the stations shown in this photo is available in real time from Environment and Climate Change Canada here. (Credit: P. Marsh)

What did we find?

- *Snowfall and snowpack size are decreasing.* On average from 1958 to present, snowfall, snow depth, and snow water equivalent (the amount of water stored in the snow and available for runoff in the spring) decreased by approximately 15%.
- *Snowmelt is earlier, but peak streamflow is later.* From 1958 to present, the snow-covered season shortened by 5 days. Spring snowmelt is now occurring earlier, yet the resulting snowmelt runoff is now occurring later. This delay is likely due to changes in climate, permafrost, vegetation, and snow cover. On-going studies are exploring the roles of these and testing methods to predict streamflow.
- *There are more instances of lake drainage now than in the past.* From 1950 to 2000, the number of thaw lakes that rapidly drained each year decreased by one third. Since 2005, the number has increased by three times.

What does this mean?

- Smaller snowpacks, a shorter snow-covered season, and potentially, lower springtime streamflows (later and lower), will have negative impacts on winter-time travel over the land, and on plants and animals that use the winter snow cover.
- Increasing lake drainage is of great concern. It impacts ecosystems and extremely high discharge as lakes drain poses a risk to downstream people and infrastructure.

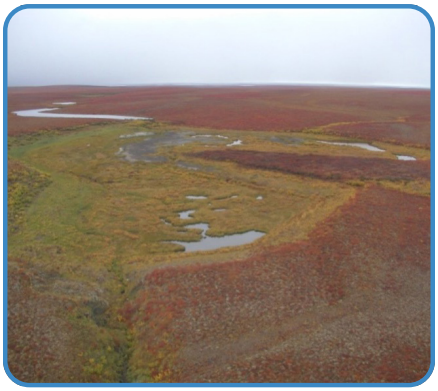

Figure 2: Drained thaw lake basin located in the TVC watershed. It emptied in 1989. (Credit: P. Marsh)

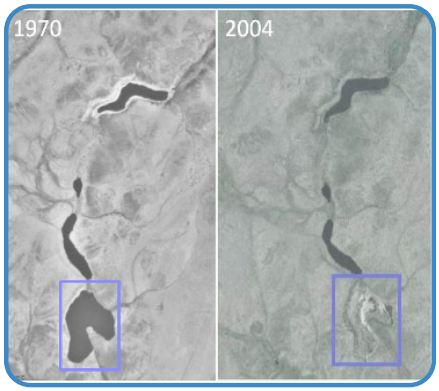

Figure 3: Images of the drained lake shown in Figure 2 before (1970) and after (2004).

What's next?

Future research is focussing on answering: What is driving an increase in lake drainage? Will lake drainage further increase in response to continued climate warming? If so, what can be done? How will streams and lakes change in the future?

What are thaw lakes?

Thousands of local lakes were formed by thawing of ice-rich permafrost, during a warm period thousands of years ago. The remaining permafrost around the lakes prevented the lake water from draining away. However, when that ice-rich permafrost thaws, the lakes are prone to rapid drainage, usually within a day and results in large flooding and change from lake ecosystems to terrestrial ecosystems.

Recommended Reading

Marsh, P., E. Wilcox, and N. Weiss. **2020**. Collapsing permafrost is transforming Arctic lakes, ponds, and streams. *The Conversation*. https://theconversation.com/collapsing-permafrost-is-transforming-arctic-lakes-ponds-and-streams-128519

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