

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.

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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.

Changing hydrology in Baker Creek

There has been a recent increase in autumn rainfall in the North Slave Region. This change affects the amount of streamflow during the winter. More wintertime flow of water increases the likelihood of overflow in small streams and rivers. When the overflow freezes up, it creates an icing – also known as aufeis, naled, or kw'òò in the local Weledeh Yellowknives Dene dialect. Overflow events are thought to be triggered throughout the winter by periodic warming intervals.

Why is this research important?

Hydrological changes affect both water resources and terrain stability of northern environments. Given the numerous lakes and rivers in the NWT, hydrologic studies are important to northerners. For example, with winter streamflow and icing development, ice can block culverts or cover roads. This affects winter road safety and can cause diversion of streamflow in spring. This was the case at Baker Creek, which runs through the Giant Mine property near Yellowknife. In 2010-2011, late autumn rain caused streamflow to reinitiate in mid-winter. This produced overflow and icing development in the creek channel through the mine site.

What did we do?

We wanted to find out how changes in autumn rainfall and winter air temperatures affect icing formation at Baker Creek, as it is representative of the seasonal runoff patterns that occur throughout the North Slave Region. Daily meteorological data from the Yellowknife Airport were used to determine trends and changes in autumn rainfall and winter air temperatures over a 37-year record. Streamflow at Baker Creek, measured upstream of any stretches of the water course that have been altered, was used to calculate the total winter runoff.

The established relations were plotted to show how the winter runoff has changed with autumn rainfall through time. We also compared these results with the frequency and distribution of historical icing over a 28-year interval using satellite imagery and with the number of periodic winter warming intervals each winter.



Large icing that developed in Baker Creek, during the winter of 2010-2011, Giant Mine, North Slave Region, Northwest Territories. (Photo: P. Vecsei)

What did we find?

- Since 1997, an increasing trend in autumn precipitation towards rainfall over snowfall has emerged in this region.
- Average autumn rainfall for 1998-2012 is 33% greater than for 1984-1998.
- Winter runoff from several catchments, including at Baker Creek, has increased with autumn rainfall.
- More frequent periodic winter warming intervals, coupled with increasing autumn rainfall, can increase the likelihood of winter streamflow and icing formation.

What does this mean?

Autumn rainfall has increased in the North Slave Region, with a related increase in winter runoff since 1998. The effects of increasing autumn rainfall and winter runoff may influence icing development, permafrost stability, stream channel conditions, fish overwintering habitat and water chemistry, all of concern to water resource managers and users.



High winter flow of water in a stream typical of the North Slave Region. (Photo: C. Spence)

Contacts

Chris Spence
Research Scientist
chris.spence@canada.ca

or
NWT Cumulative Impact Monitoring Program
(CIMP140)
nwtcimp@gov.nt.ca

What is hydrology?

The branch of science concerned with the properties of the earth's water, especially its movement in relation to land.

What are icings?

Icings are sheet-like masses of layered ice that form over the winter by freezing of successive flows of water on the ground surface or on top of river or lake ice.

References and citations

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