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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.

How slumps are impacting aquatic systems in the Gwich'in Settlement Area

Permafrost thawing in the form of thaw slumps is a major stressor on aquatic ecosystems. Slumps, a mass of rock layers and materials that move a short distance down a slope, can contribute vast amounts of debris into stream systems. The debris can greatly change the water chemistry, which in turn can have an effect on what lives in it. Benthic macroinvertebrates[1] (bugs), an indication of stream health, were negatively impacted with increased debris from thaw slumps.

Why is this research important?

The frequency and size of slumps in regions of ice-rich permafrost are expected to increase with continued climate change. Therefore, biological impacts of slumps are expected to increase for all animals exposed to slumping, including fish.

What did we do?

Using the Environment and Climate Change Canada Canadian Aquatic Biomonitoring Network (CABIN) protocol, we collected water and bug samples at 36 sites in the Stony Creek watershed in the Gwich'in Settlement Area. Sites sampled were either undisturbed (no slumps found upstream), mildly disturbed (one to two small slumps found upstream), or heavily disturbed (more than two slumps found upstream).

Image of a thaw slump showing direct debris input into a stream.

What did we find?

- Total suspended solids[2] (TSS) concentration, which is the cloudiness of the water, increased with increasing disturbance level.
- There was a very strong and significant negative relationship between invertebrate abundance and TSS concentration.
- Sites highly disturbed by slumps had significantly fewer macroinvertebrates[1] (bugs) than undisturbed sites.
- In general, a high concentration of TSS leads to a reduction of all invertebrates; it does not appear to target only certain types of organisms.
- With respect to community composition (types of bugs found at site), increases in both TSS and nutrient concentrations appear to be the cause of community differences in highly disturbed and undisturbed sites.

What does this mean?

This research is critical, not only because we need to have a better understanding of how these large-scale disturbances influence living things in streams, it also redefines baseline conditions. This is important when examining natural versus human-caused changes of water quality.

Image of a thaw slump showing debris.

What are benthic macroinvertebrates and total suspended solids?

[1]Benthic macroinvertebrates are organisms that lack a spine/backbone and are large enough to be seen with the naked eye. In this research, they are the bugs that live in the water.

[2]Total suspended solids (TSS) can be thought of as how cloudy the water is. TSS are the solid particles found in the water. Water becomes cloudier as the amount of suspended solids in the water increases.

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References and citations

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