Fieldwork Summary Report
License No. 17540 (NWT)

Permafrost Slumping and land-water connections on the Peel Plateau

Fieldwork and Progress: Summer 2024

Field Season: July 12 – August 2, 2024
Participants: Alyssa Deurwaarder (MSc student), Gabrielle Staszuk (undergraduate student), Dennis Semple (wildlife monitor; project 1), Steven Tetlichi (wildlife monitor; project 2) and Suzanne Tank (professor, University of Alberta)
Report Prepared by: Alyssa Deurwaarder and Suzanne Tank. **Contact:** suzanne.tank@ualberta.ca

Long-term research objectives

To understand how permafrost slumping increases the movement of carbon, nutrients and other water quality parameters from land to water and the effects of this transport on stream ecosystems and the global carbon cycle

Permafrost thaw slump (T), Willow River (B)

Sampling area

During our 2024 field work we sampled water and sediment from 28 location within the Willow River catchment near Aklavik (Figure 1) and two permafrost thaw slump sites along the Dempster highway west of Fort McPherson (Figure 2).

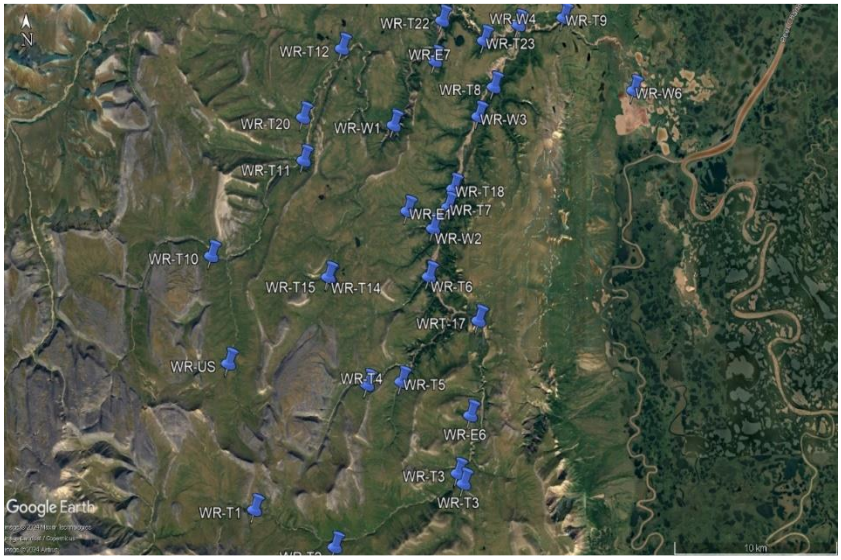

Figure 1. Sampling locations within the Willow River catchment., west of Alkavik. We sampled tributaries, along the main channel and within slumps.

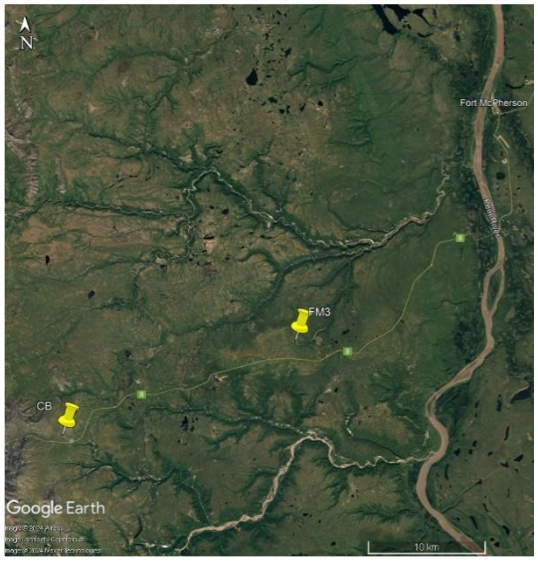

Figure 2. Permafrost thaw slumps sites near the Dempster Highway. Samples were taken upstream, within the slump and downstream.

Sample Collection

We are very grateful for support from the Ehdiitat Renewable Resources Council and the Tetlit Zheh Renewable Resources Council, who helped connect our group with community wildlife monitors to accompany us on all field days. We also thank the Aurora Research Institute staff in Inuvik, who provided logistical support including facilities for sample processing.

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Project 1, led by A. Deurwaarder, MSc: Variation in stream water quality in the Willow River watershed, and effects of permafrost thaw slumps.

Objectives	Importance
The amount and composition of organic carbon and nutrients varies naturally in streams depending on things like vegetation and rock type in the surrounding landscape. I am investigating what landscape factors affect this natural variation and how increased sediment input from permafrost thaw slumps may be overwhelming it. Additionally, I will look at how the composition of stream water changes as it moves downstream, and measure how much organic carbon and nutrient change can occur once sediments from thaw slumps are deposited downstream.	Understanding the influence that permafrost thaw slumping may have on natural variability within the Willow River catchment will help us to predict the extent of change in other streams that are affected by thaw. In addition, exploring the eventual fate of organic carbon and nutrients will help us to understand how carbon and nutrient processing may be changing and the implications this has on aquatic food webs and greenhouse gas emissions.

Progress

Water sample collection

In the summer of 2024, I collected water samples from 20 tributaries, 5 main stem locations and 3 thaw slumps to measure stream water across different landscape types and draining from diferent thaw slumps. I also collected sediment samples from main stem and slump sites to be used in an incubation experiment.

I am currently working on processing the samples I collected and aim to conduct my incubation experiment in summer 2025.

We plan to share results in person during future trips, and will also provide project updates via social media groups.

Willow River headwaters

Non-impacted vs. thaw impacted stream

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Project 2, led by Suzanne Tank: Monitoring of streams affected by thaw slumps near the Dempster Highway.

Objectives	Importance
Continuous monitoring allows us to see changes in water quality over time as permafrost thaw slumps grow or stabilize. These sites have been sampled for water chemistry at least once in most years since 2014. This data can be used to determine the longer-term impacts of permafrost thaw on stream ecosystems.	By tracking how thaw slumps affect the concentration of organic carbon, trace metals and nutrients in streams we can see how the effects of slumping might be changing as thaw slumps either grow or stabilize. This helps to understand the potential long-term impacts of these thaw slumps on stream ecosystems.

View of slump site FM3 from the Dempster

Close up of the FM3 headwall

View of slump site CB

Close up of the headwall at CB

Future work

We are working to develop a StoryMap which will be an interactive map that shows all of the sites we have visited in the past on the Peel Plateau, with photos of how sites have changed over time. We expect to be able to share the StoryMap in early summer 2025.