2022-12-14

NRI Annual Summary Report
ᓄᓇᕗᒻᒥ ᖃᐅᔨᓴᖅᑐᓕᕆᔨᒃᑯᑦ ᐊᕐᕿᒍᓕᒫᖅᓯᐅᑦ ᐅᓂᒃᑳᖅ

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Principal (ᐃᓚᓴᐃᔨᓄᑦ ᐊᖓᔪᖅᑳᖅ):
Kethra Campbell-Heaton (kcamp109@uottawa.ca)
Department of Geography, Environment and Geomatics, University of Ottawa
60 University Private
Ottawa, Ontario K1N 8Z4 Canada

Team Members (ᐱᙳᐊᖅᑎᐅᖃᑎᒌᑦ):

- Dr. D. Lacelle
- Dr. W. Pollard

Affiliation (ᐊᒃᑐᐊᓂᓕᒃ): University of Ottawa

Project Title: Instability of permafrost landscapes from climate change and the hydrological implications to Arctic watersheds.

ᐱᓕᕆᐊᑉ ᑕᐃᔭᐅᓂᖓ: ᓄᓇᐅᑉ ᐃᑭᐊᖓ ᖁᐊᖑᐃᓐᓇᐅᔭᖅᑑᑉ ᓄᓇᖓᑕ ᑕᐅᑦᑐᐊ ᓯᓚᐅᑉ ᐊᓯᔾᔨᖅᐸᓪᓕᐊᓂᖓᓂ ᐊᒻᒪ ᐃᒪᐅᑉ ᖃᓄᐃᓕᕚᓪᓕᐊᓂᖓ ᐅᑭᐅᖅᑕᖅᑐᒥ ᐃᒪᖃᕐᓂᐅᔪᓄᑦ.

Summary:
This summer (2022) we were able to conduct fieldwork in Nunavut. Fieldwork took place in Eureka, on Ellesmere Island. Logistical support for this work was provided by the Polar Continental Shelf Program (PCSP). Gear, camp supplies and personnel were chartered to and from the field site by PCSP. Work was completed from July 7 – 20th 2022, for a total of 14 days in the field, two persons conducted the work for a total of 28 days. This year field crew was K. Campbell-Heaton and B. Lauriol (D. Lacelle and W. Pollard both could not participate due to personal obligations).

Two streams were monitored using Solinst LevelLoggers. Three loggers were deployed in each stream and used to monitor water temperature, level, conductivity, and pH. Daily water samples were collected at each station. These samples were filtered using 0.45 µm cellulose filters and shipped back to the University of Ottawa for further analysis. These samples have already undergone oxygen isotope analysis, next the samples will be processed for dissolved organic carbon concentration, geochemical composition, and radiocarbon dated.

Preliminary results show that both streams are highly responsive to the daily weather changes. This year, Eureka received a high amount of rain for two straight days, this led to high water conditions and high sediment loads in both streams. Following the rain event, the stream water level declined quickly, with that, the conductivity increased. Permafrost input (ground ice melt) into these streams appears very minimal.

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Additional observations of the landscape include a new thaw slump “BL Slump” in Station Creek basin. This thaw slump is thought to have initiated this summer. Moreover, a significant amount of surficial degradation was observed within the active construction zone. A lot of thaw settlement was observed on the road shoulders and ditches. This is from heavy vehicles driving on these shoulders to avoid oncoming traffic or poor road quality. Unfortunately, this activity compresses the active layer (top 60cm of soil which freezes and thaws annually) and begins to thaw the top of the permafrost. This action can thaw pockets of ice within the surficial permafrost and lead to further degradation. Moreover, a large amount of sediment was removed within Station Creek Basin, likely for construction materials. This action exposed a network ice wedges (large, surficial massive ice) which then thawed and now all that remains are casts. Finally, this year we observed dandelions, this is the first we have seen them in the region. Unknown whether these are native horned-dandelion or the invasive southern species. This is something we will pay attention to this upcoming field season.

After this field season, we would like to make the following amendments to our research licence:

1. Begin collection of sediment samples. The region has a very high runoff rate, and the area of study is mainly composed of fine-grained silts and clays with high salt contents. We want to understand how much of this sediment is carried in runoff to these streams. These will be maximum 200g and 20-30 samples.
2. Begin collection of meteoric water samples (rain and snow). By collecting rain and snow samples from the region we can understand what proportion of water entering these streams is from rain or melted snow. From there we can determine if the remainder is from thawing ground ice. Samples will be collected like the stream samples.
3. Addition to field personal: Jacob Prest.

ᓇᐃᓈᖅᓯᒪᔪᖅ:

ᐊᐅᔭᖅ (2022) ᓯᓚᒥ ᐱᓕᕆᔪᓐᓇᖅᓯᓚᐅᖅᐳᒍᑦ ᓄᓇᕗᒻᒥ. ᖃᐅᔨᓴᓚᐅᖅᑐᑦ ᔪᓐᑲᒥ, ᐊᐅᓯᐃᑦᑑᑉ ᕿᑭᖅᑖᓗᐊᓂ. ᐱᓕᕆᔾᔪᑎᓄᑦ ᐃᑲᔪᖅᓱᐃᔾᔪᑎᑦ ᑖᒃᑯᓄᖓ ᐱᓕᕆᐊᓄᑦ ᐊᑐᐃᓐᓇᕈᖅᑎᑕᐅᓚᐅᖅᐳᑦ Polar Continental Shelf–ᑯᓐᓂ (PCSP). ᐱᕐᑯᑎᑦ, ᐱᕐᑯᑎᑦ ᐊᒻᒪ ᐃᖅᑲᓇᐃᔭᖅᑎᑦ ᓵᑕᖅᑕᐅᓯᒪᔪᑦ PCSP–ᑯᓐᓄᑦ. ᐱᓕᕆᐊᖅ ᐱᐊᓂᒃᑕᐅᓚᐅᖅᐳᖅ ᔪᓚᐃ 7-ᒥ 20-ᒧᑦ 2022-ᒥ, ᑲᑎᕝᕕᒋᑦ ᐅᓪᓗᓄᑦ 14-ᓄᑦ ᓯᓚᒥ ᐱᓕᕆᓪᓗᑎᒃ, ᒪᕐᕉᒃ ᐃᓅᒃ ᐱᓕᕆᓚᐅᖅᑑᒃ ᐅᓪᓗᓄᑦ 28-ᓄᑦ. ᑕᒪᑐᒪᓂ ᐊᕐᕚᒍᒥ ᐱᓕᕆᖃᑎᖏᑦ ᐅᑯᐊᖑᓚᐅᖅᐳᑦ, K. ᑳᒻᐳᓪ–Hᐃᐅᑕᓐ ᐊᒻᒪᓗ B. ᓚᐅᕆᐅᓪ (D. Lacelle ᐊᒻᒪᓗ W. Pollard ᑕᒪᕐᒥᒃ ᐃᓚᐅᔪᓐᓇᓚᐅᙱᑦᑑᒃ ᓇᖏᓂᖅ ᐱᔾᔪᑎᒋᔭᒥᓂ).

ᒪᕐᕉᒃ ᑰᓚᕌᒃ ᐆᒃᑐᕋᖅᑕᐅᓚᐅᖅᑐᑦ ᐊᑐᖅᑲᑎᒃ 6–ᓂᒃ Solinst LevelLoggers, ᐱᖓᓱᑦ ᐊᑐᓂ ᑰᓚᕌᓂ ᖃᐅᔨᓴᖅᑲᑎᒃ ᐃᒪᐅᑉ ᐆᓇᕐᓂᖓᓂᒃ, ᐃᒪᐅᑉ ᓇᓃᓐᓂᖏᓐᓂᒃ, conductivity, ᐊᒻᒪᓗ pH-ᒥᒃ. ᖃᐅᑕᒫᑦ ᐃᒪᕐᒥᒃ ᖃᐅᔨᓴᒃᓴᓂᒃ ᑲᑎᖅᓱᐃᔪᖅᑲᖅᑦᑕᓚᐅᖅᐳᖅ ᑕᒪᐃᓐᓂ ᐊᑐᓂᑦ ᐃᓂᓂ. ᑖᒃᑯᐊ ᖃᐅᔨᓴᒃᓴᑦ ᓱᑦᔭᐃᒃᑯᑎᓕᖅᑕᐅᓚᐅᖅᐳᑦ 0.45 µm ᐃᔭᕈᕚᐅᔭᕐᓂᒃ ᓱᑦᔭᐃᒃᑯᑎᓂᒃ ᐊᐅᓪᓚᖅᑎᑕᐅᓪᓗᑎᒡᓗ ᓯᓚᑦᑐᖅᓴᕐᕕᒃᔪᐊᕐᒧᑦ ᐋᑐᐋᒥ ᖃᐅᔨᓴᖅᑕᐅᒃᑲᓐᓂᕐᑯᔭᐅᓪᓗᑎᒃ. ᑖᒃᑯᐊ ᖃᐅᔨᓴᒃᓴᑦ ᐊᑐᐊᓂᓚᐅᖅᑐᑦ ᐋᒃᓯᔾᔨᓐ–ᒥᑦ ᖃᐅᔨᓴᖅᑕᐅᕙᓂᒃᓯᒪᔪᑦ, ᑭᖑᓂᐊᒍᑦ ᖃᐅᔨᓴᒃᓴᑦ ᐱᓕᕆᐊᖑᓛᖅᑐᑦ ᓄᖑᑎᖅᓯᒪᔪᓄᑦ ᐸᐅᒃᓴᓄᑦ ᐱᑕᖃᑦᑎᐊᙱᓐᓂᖏᓐᓄᑦ, ᓄᓇᐅᑉ ᐃᓚᐅᕈᑎᒃᓴᖏᓐᓄᑦ, ᐊᒻᒪ radiocarbon ᐅᓪᓗᓕᖅᓯᒪᓪᓗᓂ.

ᓯᕗᓪᓕᖅᐹᖅᓯᐅᑎᑦ ᖃᓄᐃᓕᖓᓕᕐᓂᕆᔭᖏᑦ ᑕᑯᑎᑦᑎᕗᑦ ᑕᒪᕐᒥᒃ ᑰᓚᕓᒃ ᑭᐅᓯᔪᓐᓇᑦᑎᐊᕐᓂᖏᓐᓂᒃ ᖃᐅᑕᒫᑦ ᓯᓚᐅᑉ ᐊᓯᔾᔨᖅᐸᓪᓕᐊᓂᖓᓄᑦ. ᑕᒪᑐᒪᓂ ᐊᕐᕌᒍᒥ, ᔪᓂᑲ ᐱᓪᓗᓂ ᒪᕐᑯᕐᔪᐊᖅᑐᒥᒃ ᒪᕐᕿᓐᓄᑦ ᐅᓪᓚᓐᓄᑦ, ᑖᓐᓇ ᐱᑎᑦᑎᓪᓗᓂ ᕐᑯᑦᑎᒃᑐᒥᒃ ᐃᒪᖓᑕ level ᐊᒻᒪ ᕐᑯᑦᑎᒃᑐᒥᒃ solute load ᑕᒪᒃᑮᓄᑦ ᑰᖕᓄᑦ. ᒪᕐᑯᓚᐅᖅᑎᓪᓗᒍ, ᑰᓚᕓᒃ ᐃᒪᖅ ᑲᑕᑲᐅᖅᑐᓚᐅᖅᑐᖅ conductivity ᐊᖏᓪᓕᒋᐊᖅᓱᓂ. ᓄᓇᐅᑉ ᐃᑭᐊᖓᓂ ᕐᑯᐊᖑᐃᓐᓇᖅᑐᖅ ᐊᐅᒃᐸᓪᓕᐊᓂᖓ ᑖᒃᑯᓇᓂ ᑰᖕᓂ ᒥᑭᑦᑐᑯᓗᖅᑰᔨᕗᖅ.

ᖃᐅᔨᓴᖅᑕᐅᒃᑲᓂᖅᓯᒪᔪᑦ ᓄᓇᐅᑉ ᑕᐅᑦᑐᐊ ᐃᓚᖃᖅᐳᑦ ᓄᑖᒥᒃ ᐊᐅᒃᐸᓪᓕᐊᔪᒥᒃ "BL Slump"-ᒥᒃ ᐃᓂᒥ Creek basin-ᒥ. ᑕᒪᓐᓇ ᕐᑯᐊᖑᐃᓐᓇᖅᑐᖅ ᐊᐅᑉᐸᓪᓕᐊᓂᖓ ᐱᒋᐊᓚᐅᖅᑐᖅ ᐊᐅᔭᐅᓚᐅᖅᑐᖅ. ᐊᒻᒪ ᓱᓕ, ᐊᖏᔪᐊᓗᖕᒥᒃ ᖄᖑᓐᓇᖅᑐᒥᒃ ᐱᐅᔪᓐᓃᖅᐸᓪᓕᐊᔪᒥᒃ ᖃᐅᔨᔭᐅᔪᖃᓚᐅᖅᐳᖅ ᓴᓇᕝᕙᐅᔫᑉ ᐃᓚᖓᓂ. ᐊᐅᒃᐸᓪᓕᐊᔪᑦ ᓄᓈᓪᓚᑦ ᖃᐅᔨᔭᐅᓚᐅᖅᐳᑦ ᐊᖅᑯᑎᒃᑯᑦ ᑐᐃᒃᑯᑦ ᐊᒻᒪ ᒥᓱᒃᑕᒃᑯᑦ. ᑖᓐᓇ ᐅᕐᑯᒪᐃᑦᑐᓂᑦ ᓄᓇᓯᐅᑎᓂᑦ ᐃᖏᕐᕋᔪᓂᑦ ᑖᒃᑯᓄᖓ ᑐᐃᓐᓄᑦ ᐊᖅᑯᑎᑦᑎᐊᕙᐅᕐᑯᓇᒋᑦ ᐊᖅᑯᑎᑦᑎᐊᕙᐅᖏᓐᓂᕐᓴᒨᓗᓐᓂᑦ. ᐊᐃᑦᑖᖑᒐᓗᐊᕐᓕ, ᑖᓐᓇ ᖃᓄᐃᓕᐅᖕᓂᐅᔪᖅ ᖄᖓᓄᐊᖅᑎᑦᑎᕗᖅ (ᕐᑯᓛᓂᑦ 60cm ᐃᔾᔪᒥᑦ ᕐᑯᐊᖅᐸᒃᓱᓂ ᐊᐅᒃᐸᒃᓱᓂᓗ ᐊᕐᕿᒍᑕᒫᑦ) ᐊᐅᒃᐸᓪᓕᐊᓕᖅᐸᒃᓱᓂᓗ ᓄᓇᐅᑉ ᖄᖓᓂᑦ. ᑖᓐᓇ ᐱᓕᕆᐊᖑᔪᖅ ᐊᐅᒃᓯᕈᓐᓇᖅᑐᖅ ᓯᑯᓂᒃ ᓄᓇᐅᑉ ᐃᑭᐊᖓᓂ ᕐᑯᐊᖑᐃᓐᓇᐅᔭᖅᑑᑉ ᐃᓗᐊᓂ ᐊᒻᒪ ᓯᕈᖅᐸᓪᓕᐊᒃᑲᓂᓕᕐᓗᓂ. ᐊᒻᒪ ᓱᓕ, ᐊᖏᔪᑲᓪᓚᖕᒥᒃ ᑭᓂᖅᑐᒥᒃ ᐹᖅᓯᔪᖃᓚᐅᖅᑐᖅ ᑕᐃᑲᓂ Creek Basin-ᒥ, ᓴᓇᔭᐅᓂᕐᒧᑦ ᐱᕐᑯᑎᓄᑦ. ᑖᓐᓇ ᐱᓕᕆᐊᖑᔪᖅ ᓴᖀᑎᑦᑎᓚᐅᖅᐳᖅ ᐱᓕᕆᔾᔪᑦ ᑐᓴᐅᒪᖃᑦᑕᐅᑎᖃᑎᒌᒍᑎᓂᒃ ᓯᑯᓂᒃ ᖃᐅᓯᖅᑐᓂᒃ (ᐊᖏᔪᖅ, ᓯᑯᕐᔪᐊᖅ) ᐊᐅᒃᐸᓪᓕᐊᓕᖅᓱᓂ ᒣᓇᓗ ᓴᐅᓂᖏᑦ ᓴᙲᑦᑑᓪᓗᑎᒃ. ᑭᖑᓪᓕᖅᐹᒥ, ᑕᒦᓂ ᐊᕐᕿᒍᒥ ᑕᑯᓚᐅᖅᑐᒍᑦ ᕿᑐᙵᕆᐅᖅᑐᓂᒃ, ᑖᓐᓇ ᓯᕗᓪᓕᖅᐹᖑᓪᓗᓂ ᑕᑯᓯᒪᔪᕗᑦ ᕿᑎᕐᒥᐅᓂ. ᖃᐅᔨᒪᔭᐅᙱᑦᑐᑦ ᑖᒃᑯᐊ ᐊᓪᓚᑦ ᓇᒡᔪᖏᑦ ᐅᖁᓄᓐᓂᑦ ᖃᓪᓗᓈᑦ ᓄᓇᖏᓐᓃᙵᖅᑐᑦ. ᑕᒪᓐᓇ ᐅᔾᔨᕆᑦᑎᐊᕐᓂᐊᖅᑕᕗᑦ ᑕᒪᑐᒪᓂ ᐊᕐᕌᒍᒥ ᐊᒡᒋᖅᑐᒥ.

ᓄᓇᒥᑦ ᖃᐅᔨᓴᕈᑎᑦᑕ, ᐅᑯᓂᖓ ᐋᖅᑭᒋᐊᕆᔭᒪᔪᑦ ᖃᐅᔨᓴᕐᓂᕐᒧᑦ ᐱᔪᓇᐅᑎᑦᑎᓂᑦ:

1. ᓄᐊᑦᑎᕙᓪᓕᐊᓕᕐᓗᑎᒃ ᖃᐅᔨᓴᒃᓴᓂᑦ. ᓄᓇᐃᑦ ᐊᕕᒃᑐᖅᓯᒪᓂᖏᑦ ᕐᑯᕝᕙᓯᒃᑐᒻᒪᕆᐊᓗᖏᒃ ᐃᖏᕐᕋᓂᖃᖅᐳᑦ, ᐊᒻᒪᓗ ᖃᐅᔨᓴᕐᕕᐅᓂᖓ ᐃᓗᓕᖃᓪᓗᐊᑕᖅᐳᖅ ᐃᒍᓇᕐᓂᒃ ᐊᒻᒪᓗ ᒪᕐᕋᓂᒃ ᑕᕆᐅᖃᕐᔪᐊᖅᑐᓂᒃ. ᑐᑭᓯᐅᒪᔪᒪᓪᓚᑦᑕ ᖃᓄᑎᒋ ᑖᓐᓇ ᑭᓂᖅᑎᖅᑕᐅᕙᖕᒪᖕᒫᑦ ᑰᓚᕓᓄᑦ. ᑖᒃᑯᐊ ᐅᓄᕈᖅᑲᕐᓂᐊᖅᑐᑦ 200g ᐊᒻᒪ 20-30 ᖃᐅᔨᓴᒃᓴᓂᒃ.
2. ᑲᑎᖅᓱᐃᕙᓪᓕᐊᓕᕐᓗᑎᒃ ᐃᒪᕐᒥᐅᑕᓂᒃ ᖃᐅᔨᓴᒃᓴᓂᒃ (ᒪᓂᕋᕐᒥᒃ ᐊᒻᒪ ᐊᐳᑎᒥᒃ). ᒪᕐᑯᒃᑯᑦ ᐊᒻᒪ ᐊᐳᑎᒥᑦ ᖃᐅᔨᓴᒃᓴᓂᑦ ᓄᐊᑦᑎᓗᑕ ᐊᕕᒃᑐᖅᓯᒪᔪᓂᑦ ᑐᑭᓯᔪᓐᓇᖅᑐᒍᑦ ᖃᓄᑎᒋ ᐃᒪᖅ ᑰᒃᑰᕐᒪᖕᒫᑦ ᒪᕐᑯᖕᒥᑦ ᐊᐅᒃᓯᒪᔪᒥᓪᓗᓐᓂᑦ ᐊᐳᒻᒥᑦ. ᑕᐃᑲᙵᑦ ᖃᐅᔨᔪᓐᓇᖅᐳᒍᑦ ᐊᒥᐊᒃᑯᖓ ᐊᐅᒃᐸᓪᓕᐊᔪᒥᑦ ᓯᑯᒥᑦ. ᖃᐅᔨᓴᒃᓴᑦ ᑲᑎᖅᓱᖅᑕᐅᓂᐊᖅᑐᑦ ᓃᕐᓗ ᑰᓚᕓᑦ ᖃᐅᔨᓴᒃᓴᑦ.
3. ᐃᓚᓗᒍ ᓯᓚᒥ ᓇᖏᓂᖅ: Jacob Prest.