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Theme 4 Hazards and impacts associated with permafrost thaw

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Theme 4 Hazards and impacts associated with permafrost thaw

2 PhD, 4 MSc, PIs and partners. PDF position is vacant!

Theme 4 Hazards and impacts associated with permafrost thaw

Range of permafrost hazards studied:

- Mass-movements
- Flooding and changes in water quality
- Contaminant mobilisation (mercury)
- Terrain and vegetation changes in traditional territories


P Roy-Leveillee


Erika Hille


Erika Hille

Hazard and vulnerability in PNet proposal

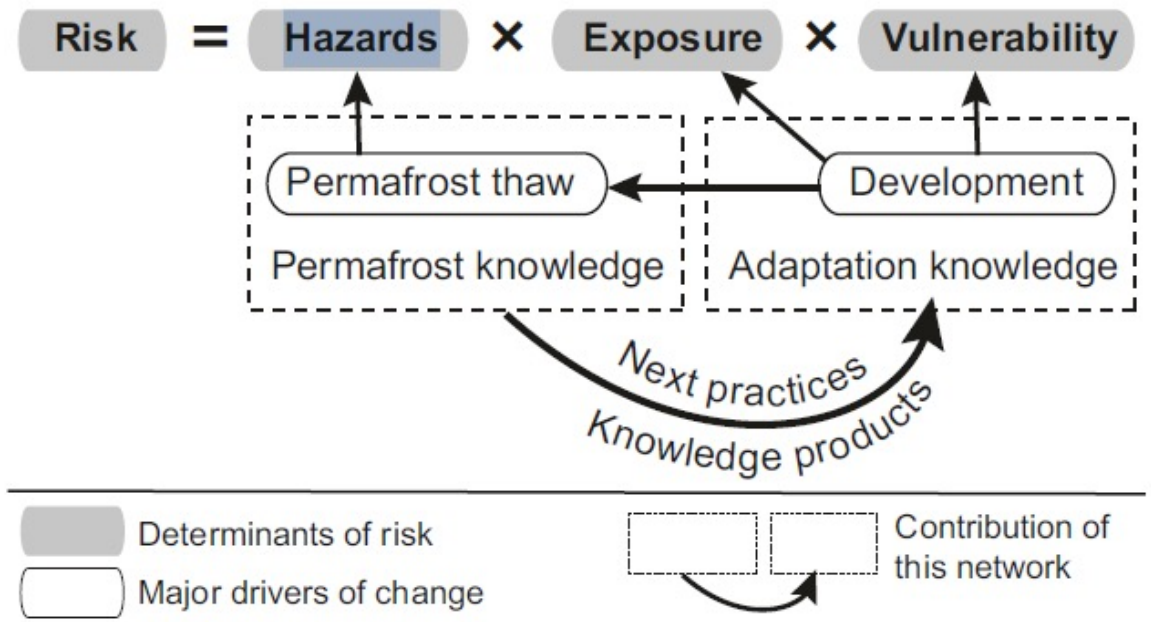

Figure 1. Permafrost thaw affects risk via hazards and exposure. Where driven by climate change, this is beyond our immediate control. Development affects exposure and vulnerability and can additionally change risk via permafrost thaw. Better permafrost and adaptation knowledge can reduce risk by enabling responsible development. Because of climate change, permafrost and adaptation knowledge must include future scenarios.

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What we contribute :

- Improved knowledge, detection, and prediction of hazards in ways that support stakeholders
- Better understanding of stakeholder needs in relation to research (past and future directions)

How we are connected to other themes:

- Integrate knowledge from themes 1-3
- Produce tools and knowledge that support theme 5

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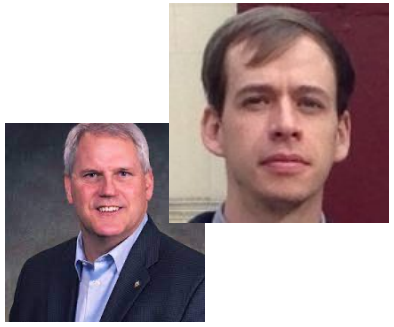
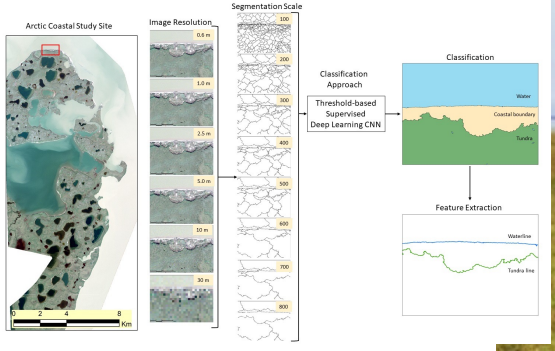
Slope Stability – coastal setting:

- Object-based classification and feature extraction along Arctic coasts completed and **published** (Andrew Clarke).
- Multi-temporal 2D and 3D geomorphic analysis based on Structure-from-Motion competed and **published**. (Andrew Clarke).



Slope stability – inland:

- New student started in 2022 to work on the spatial prediction
- of thaw slumps (Kaithlyn Dietrich)



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Slope Stability – mountainous terrain and rock faces:

- Simulation of permafrost in heterogenous steep bedrock slopes project near complete (model workflow being applied to all western Canada). (Emily Stewart-Jones)
- New student started in 2022 for the analysis of temperature metrics related to permafrost thaw for past slope instabilities (Pia Blake)

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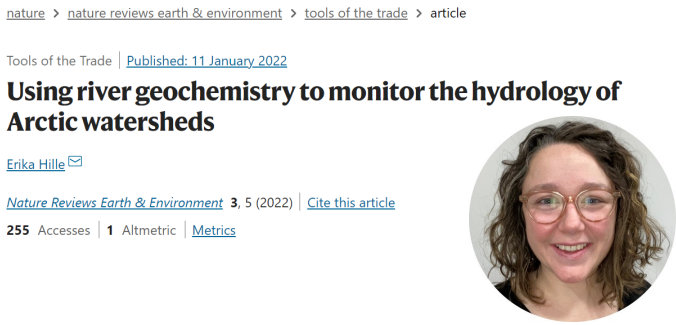
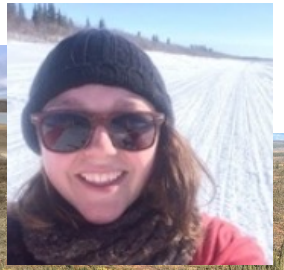
Water quality and contaminants:

- In NWT: data collection completed to explain spatial variability in the water chemistry of 11 peatland streams and the Miner River (Erika Hille)
- In HBL: Estimates of Hg storage reduced by factor 10 when calibrated with regional field data.
- Over 200 samples analyzed for MeHg, near 200 for microbial, etc (Adam Kirkwood)





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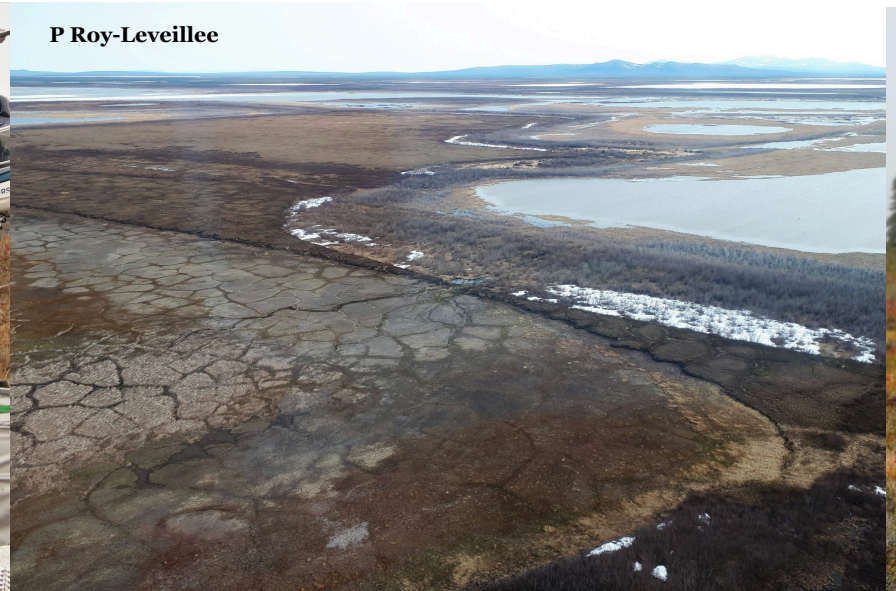
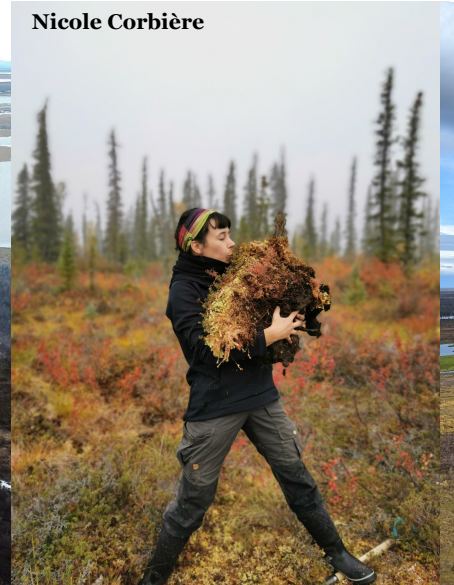
Evolution of lowland thermokarst:

- Collection of peat samples and permafrost cores completed in continuous permafrost lowland for the paleo-reconstruction of post-drainage basin evolution (Danielle Chiasson)
- **1 MSc position open/unfilled**





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Prioritization of thaw-driven hazards:

PDF position is now vacant.

Key milestones:

(1) stakeholder surveys and interviews to identify and prioritize thaw related hazards from a stakeholder perspective, and to assess the information produced by the permafrost research community against stakeholder needs and priorities;

(2) draft recommendation for next research practice in predicting and adapting to permafrost hazards

Key outcomes will focus on two elements: surveying the permafrost priorities of northern stakeholders and identifying how well these priorities are being met by the permafrost research communities. The PDF will also facilitate Theme 4-hosted panels/discussions on thaw related hazards, to co-produce an academic paper on the state of permafrost hazard assessment in Canada and a white paper on next practices in predicting and adapting to permafrost hazards.

Theme 4 Hazards and impacts associated with permafrost thaw

1. **How can we increase capacity for effective permafrost hazard assessment in Canada? Including collaboration, knowledge-sharing, and communication across disciplines and sectors.**
2. **What *cross-theme integrations* would be beneficial with Theme 4 to strengthen our contributions and mobilize our knowledge?**

A reminder out contributions are: a) Improved knowledge, detection, and prediction of hazards in ways that support stakeholders and b) Better understanding of stakeholder needs in relation to research (past and future directions).