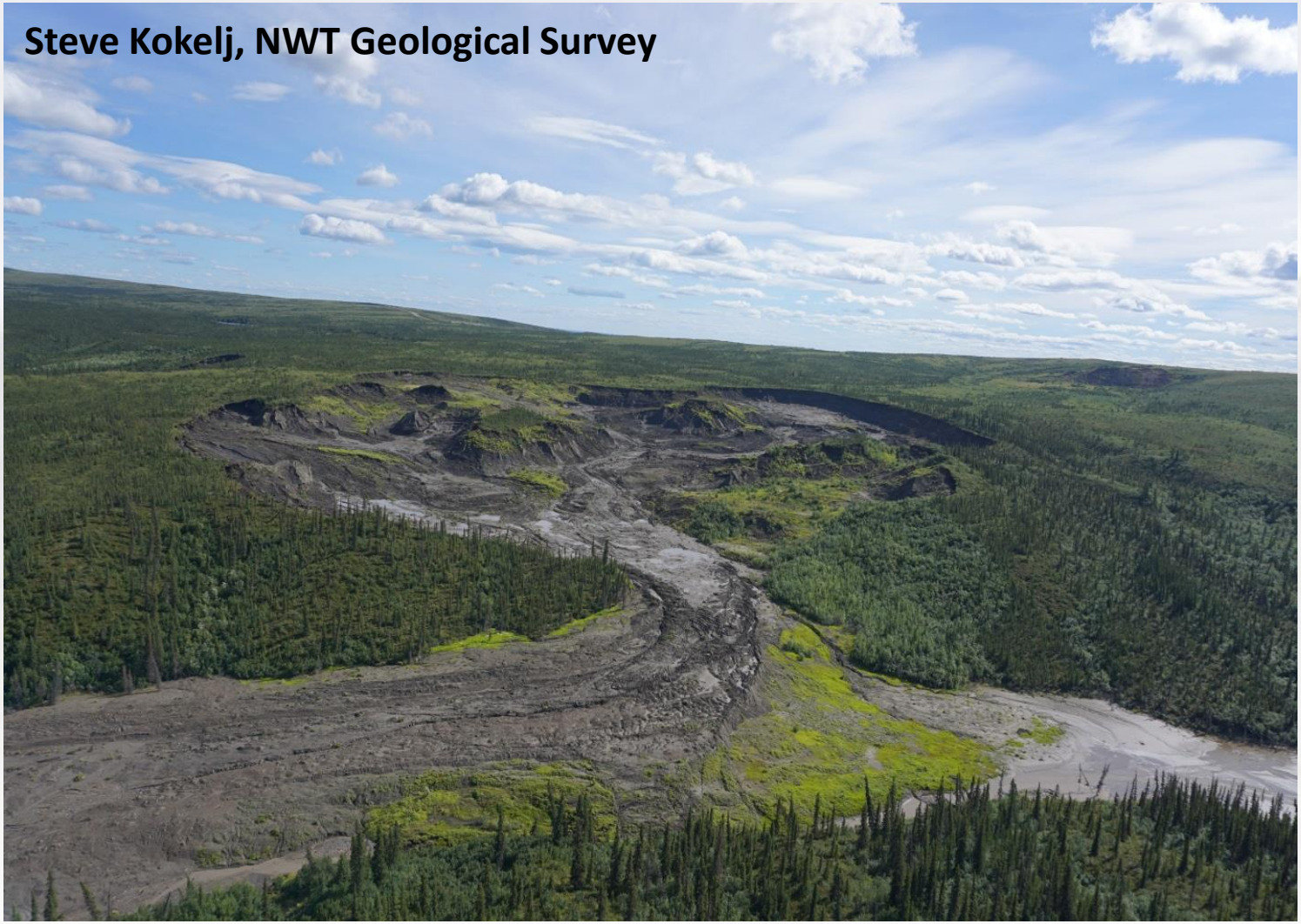
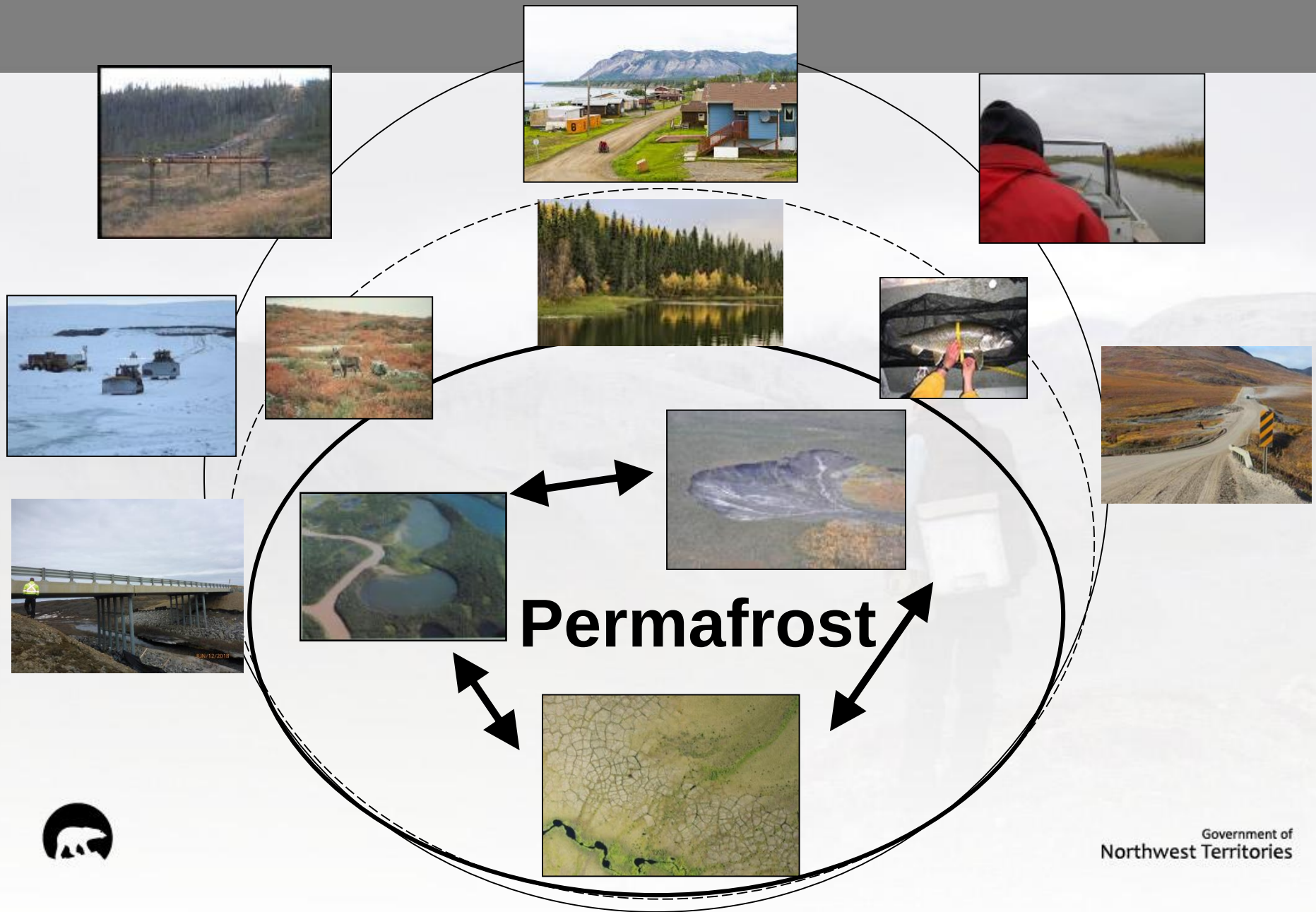
Permafrost and the NWT



Objectives

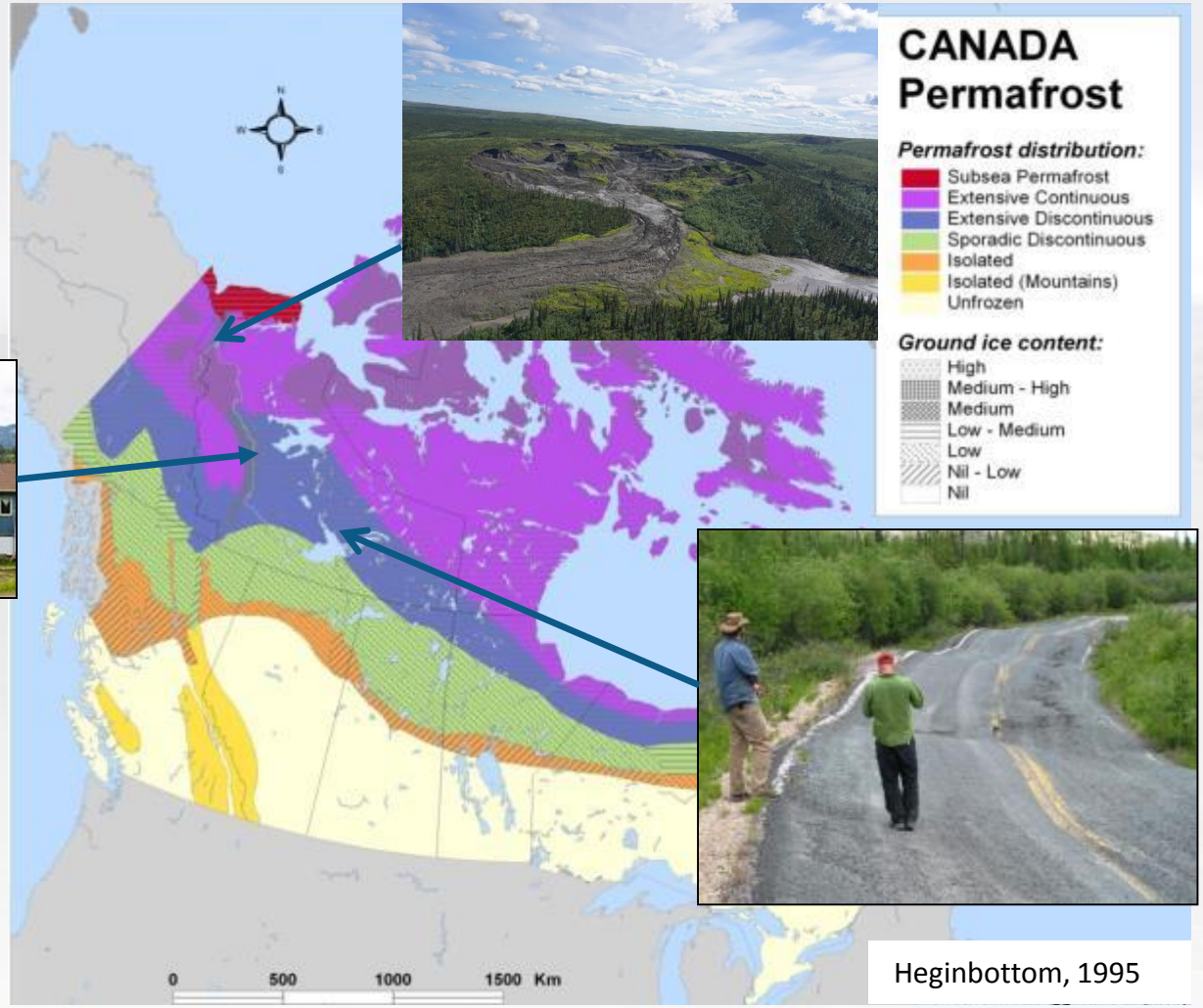
- Permafrost 101
- Why should we care?
- Challenges and opportunities

Permafrost and the NWT environment



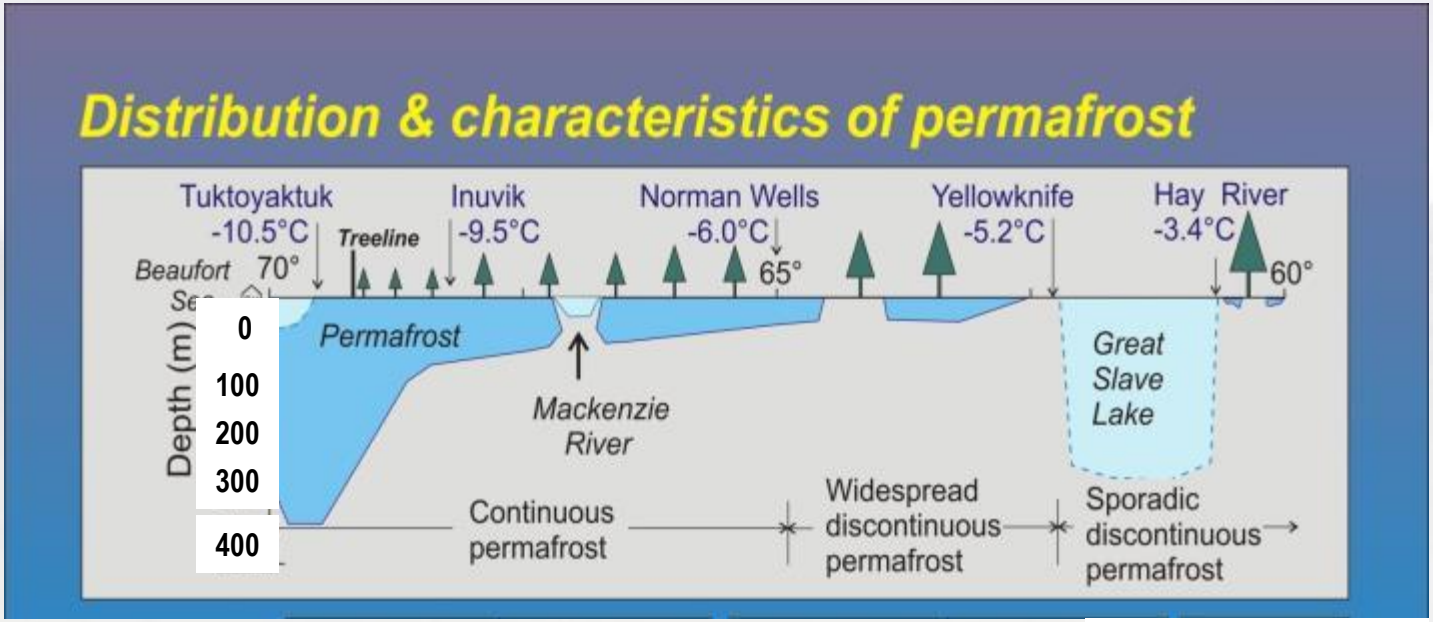
Government of
Northwest Territories

NWT is a permafrost Territory



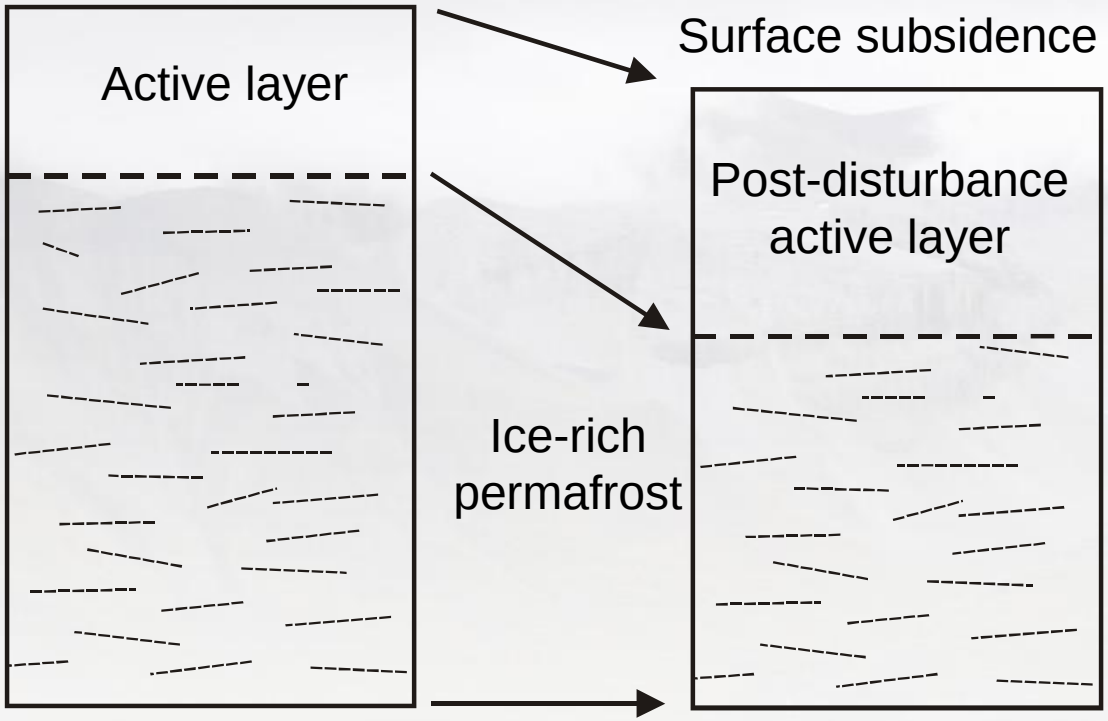
Heginbottom, 1995

Permafrost thickness

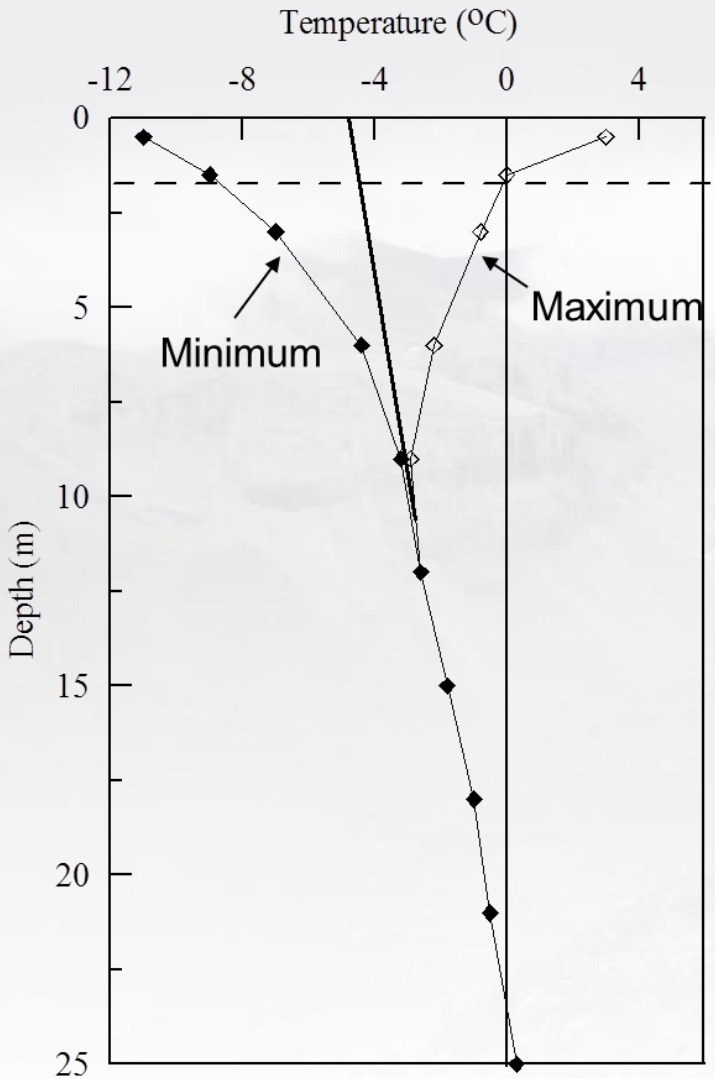


Adapted from S Wolfe, NRCan

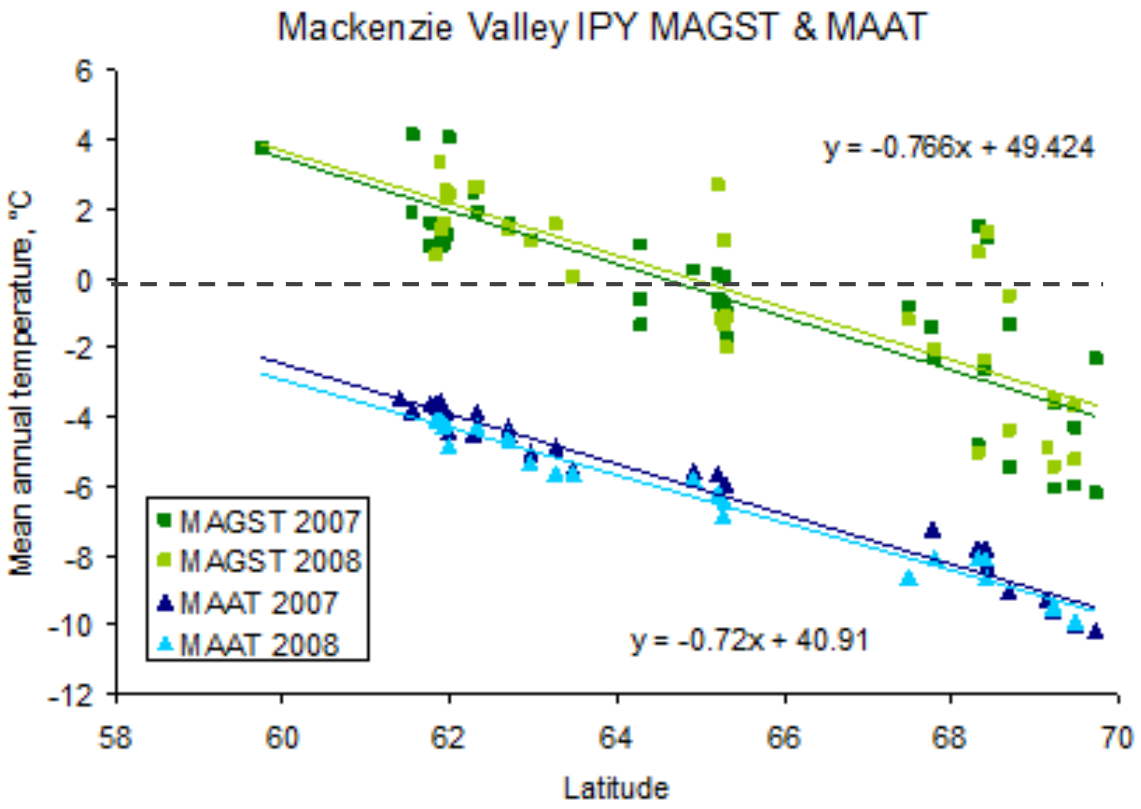
Active layer



Ground temperatures in permafrost

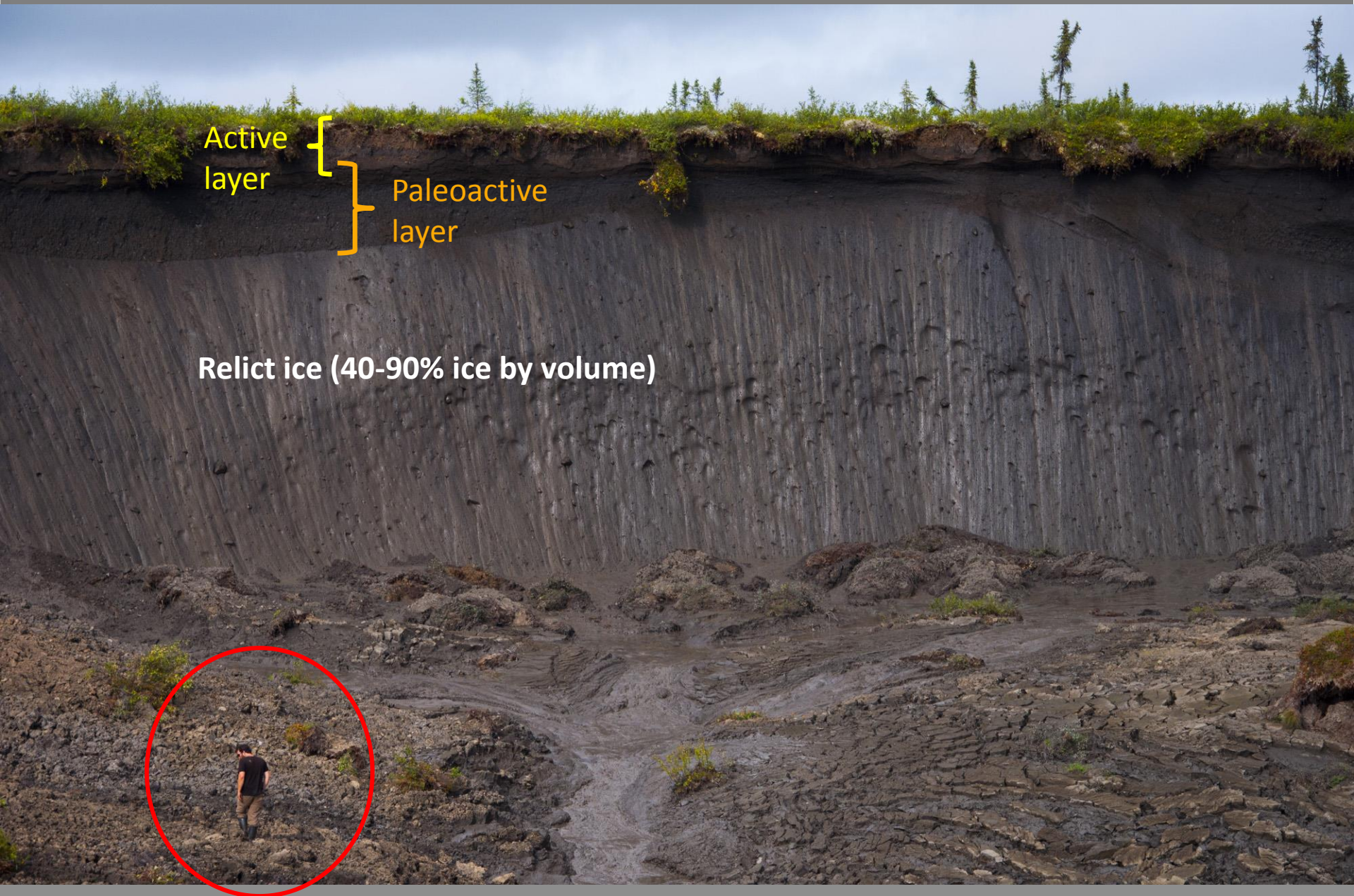


Relations between air and ground temperatures

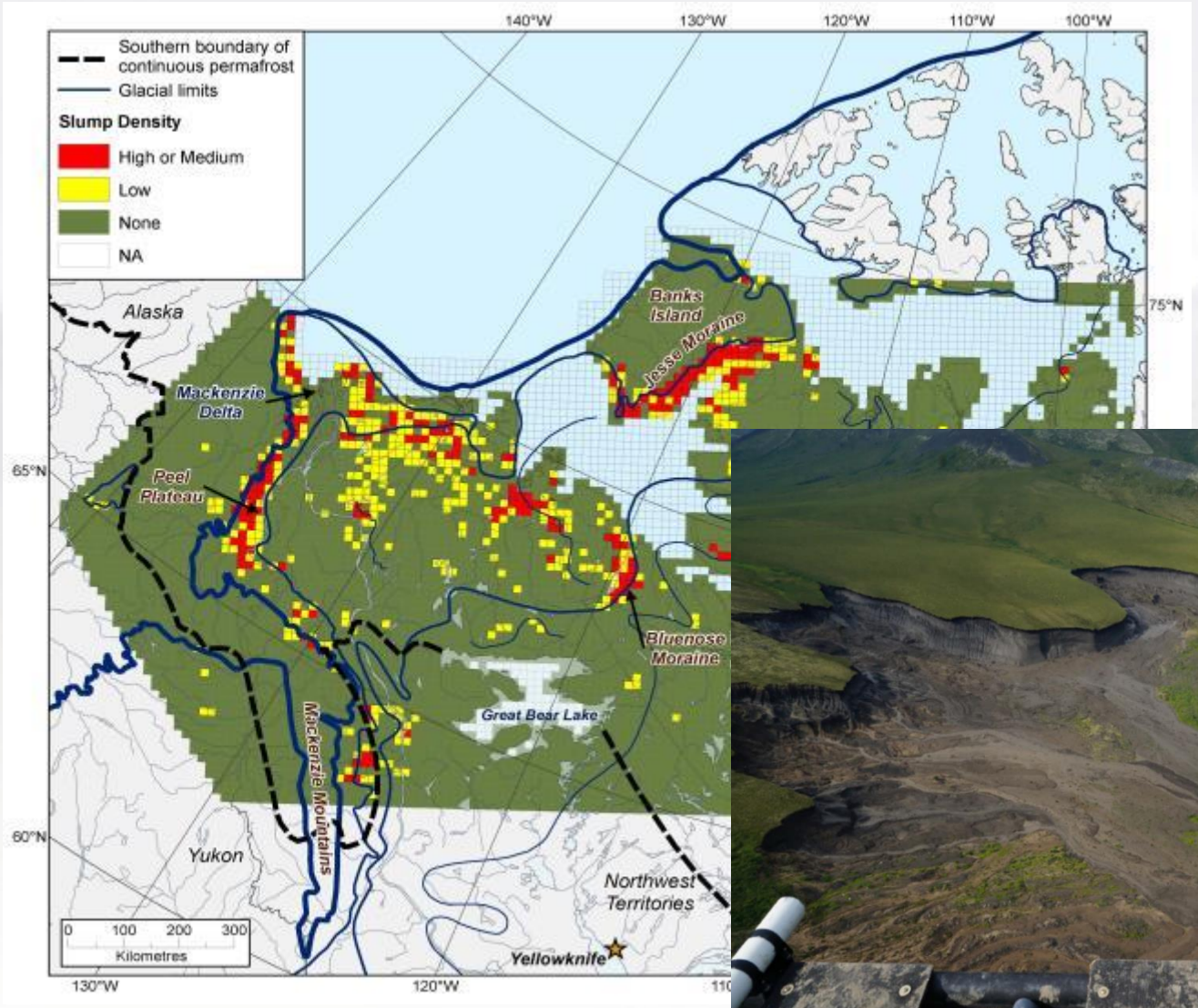


S. Smith, NRCan

Ice-rich permafrost

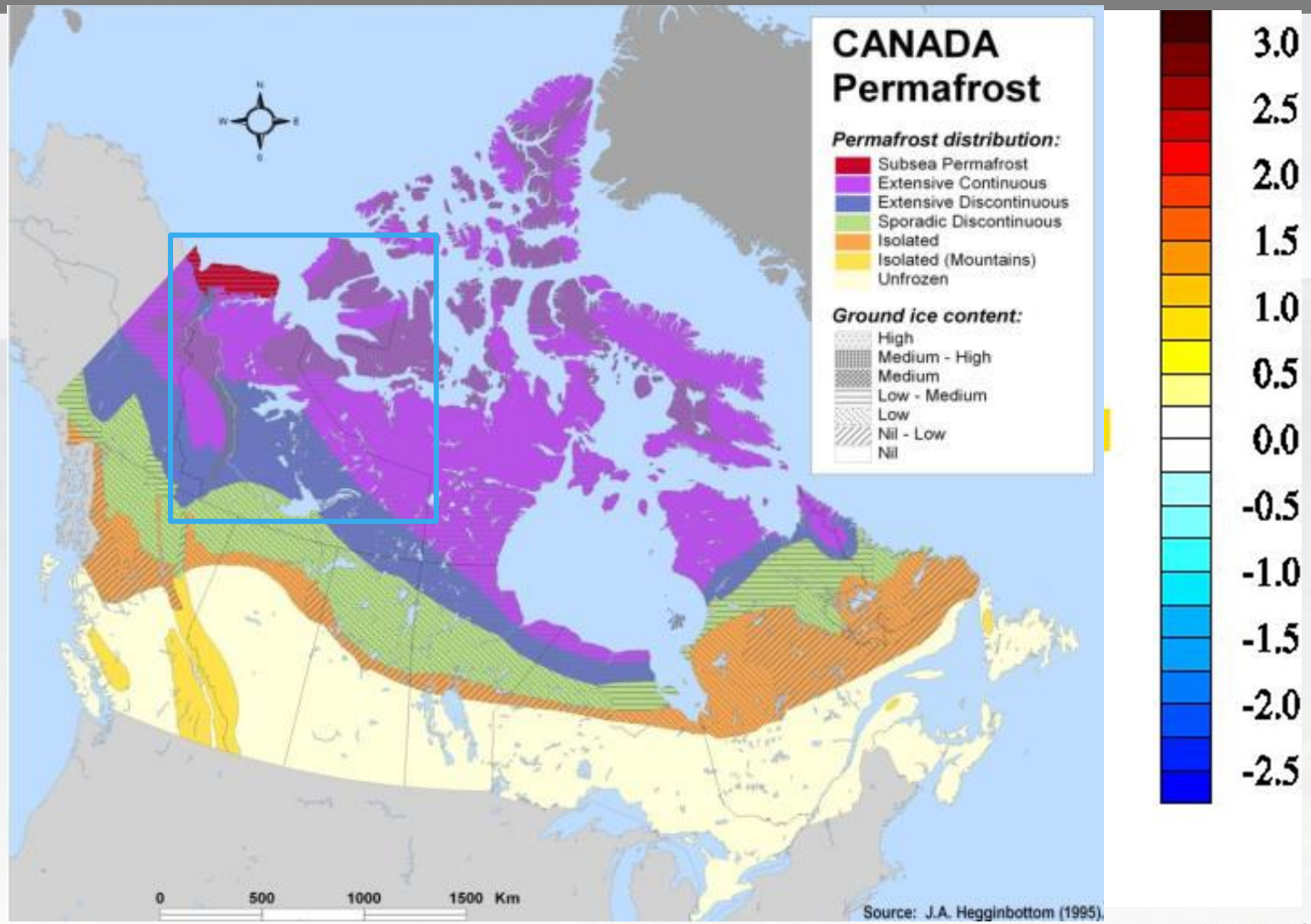


Some landscapes contain large volumes of ice

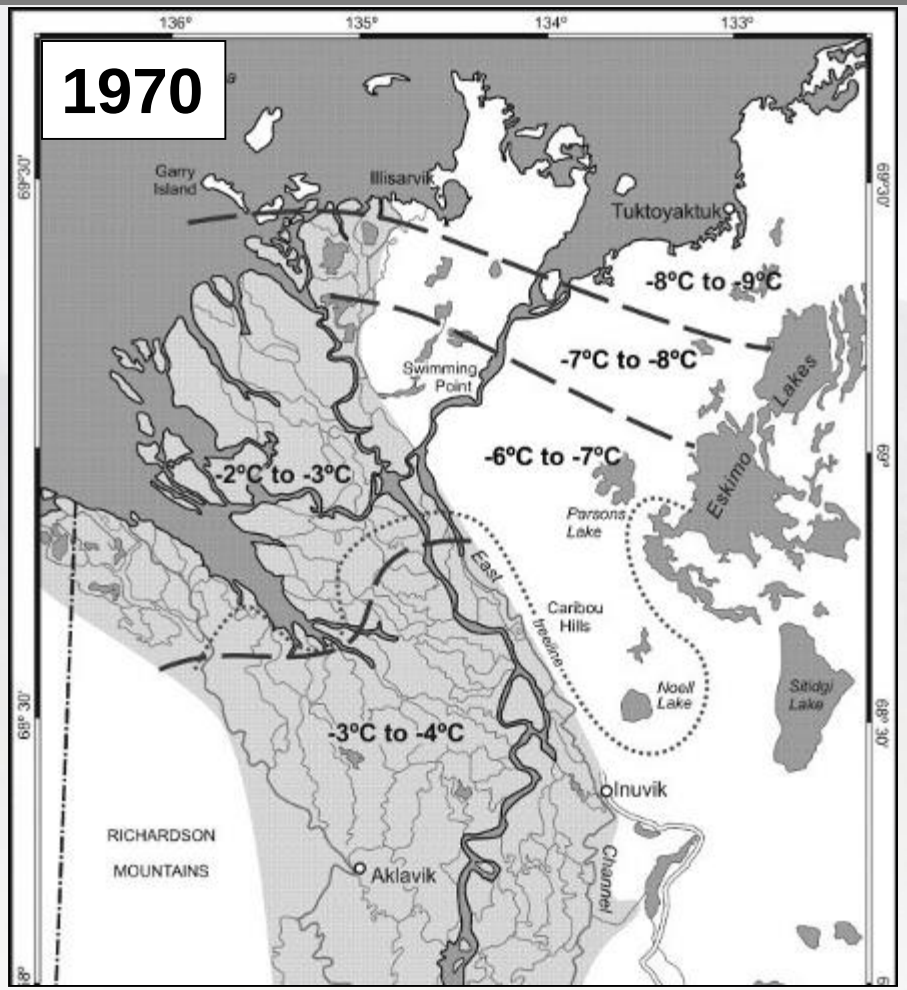


Climate warming and permafrost

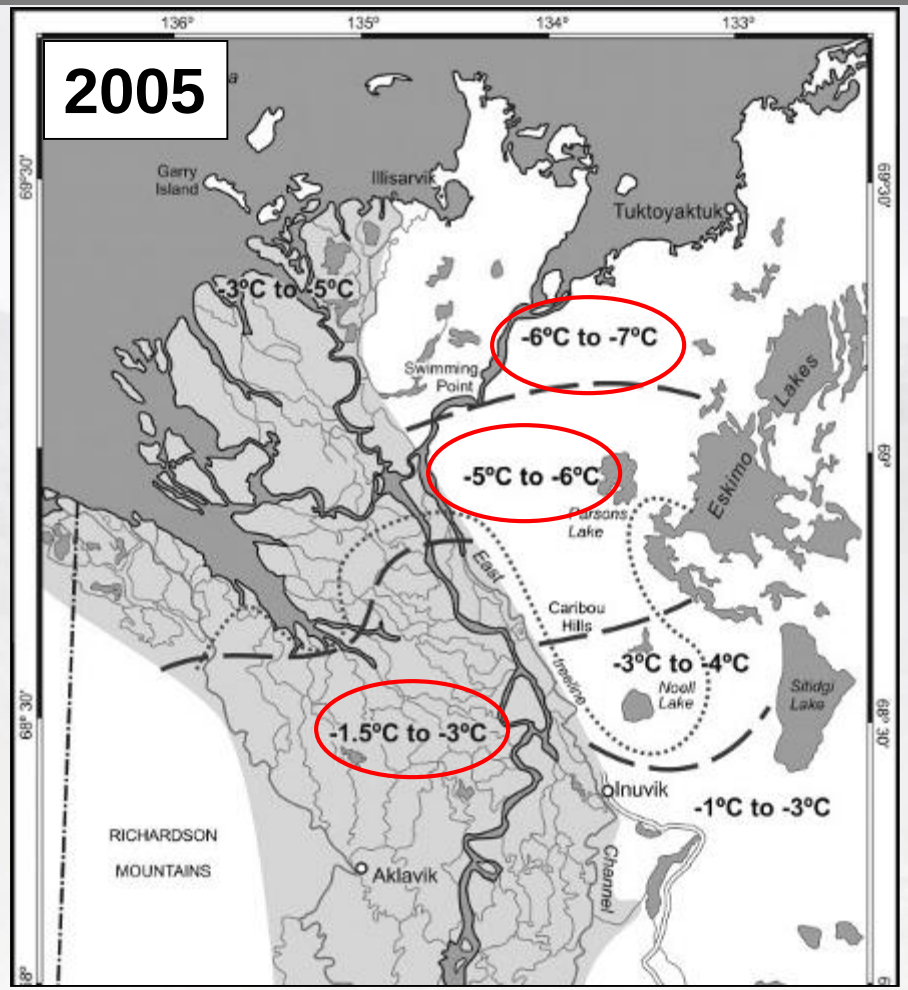
Warming air temperatures over the past 50 years



Permafrost is warming

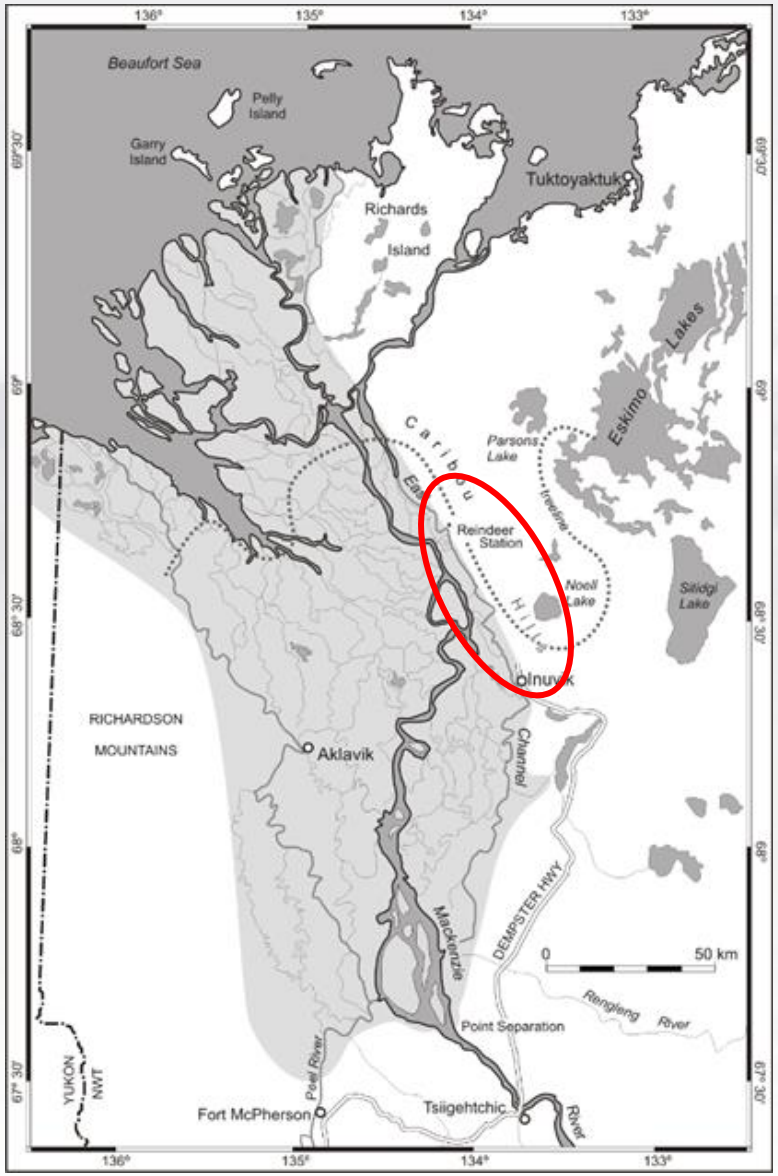


Mackay, 1974; GSC



Burn and Kokelj, 2009; PPP

Increasing late season precipitation and land sliding



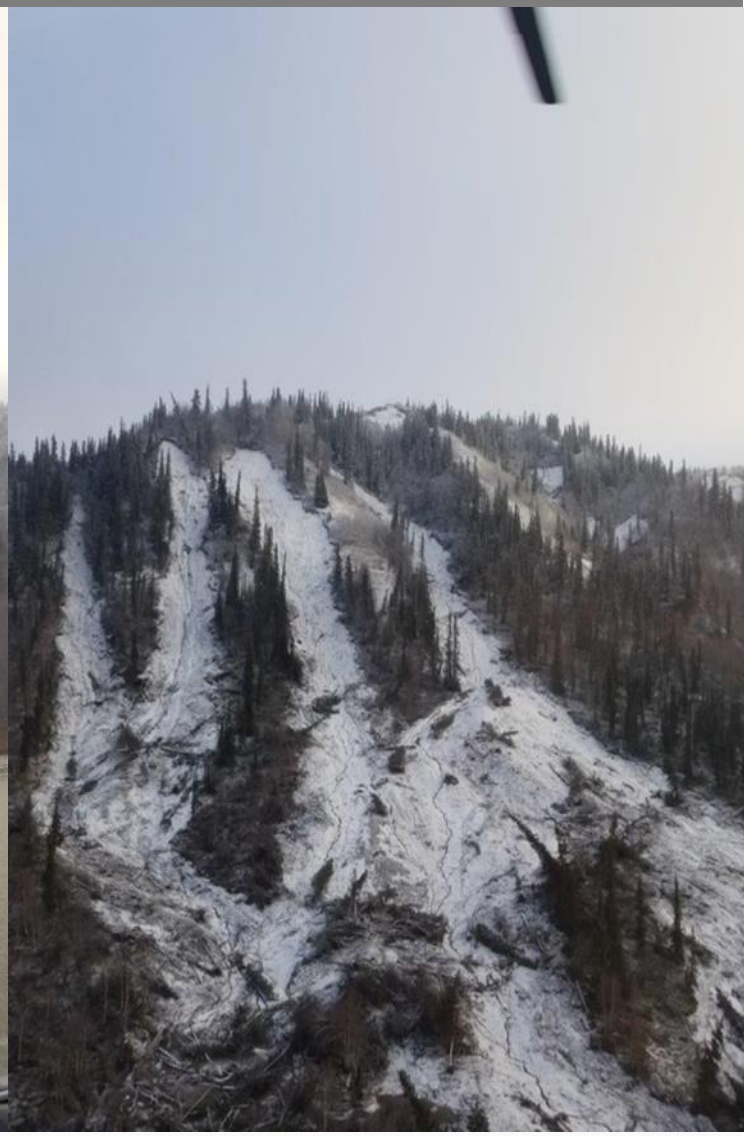
Government of Northwest Territories

Increasing fall precipitation
20 landslides in **fall 2009**

Government of
Northwest Territories

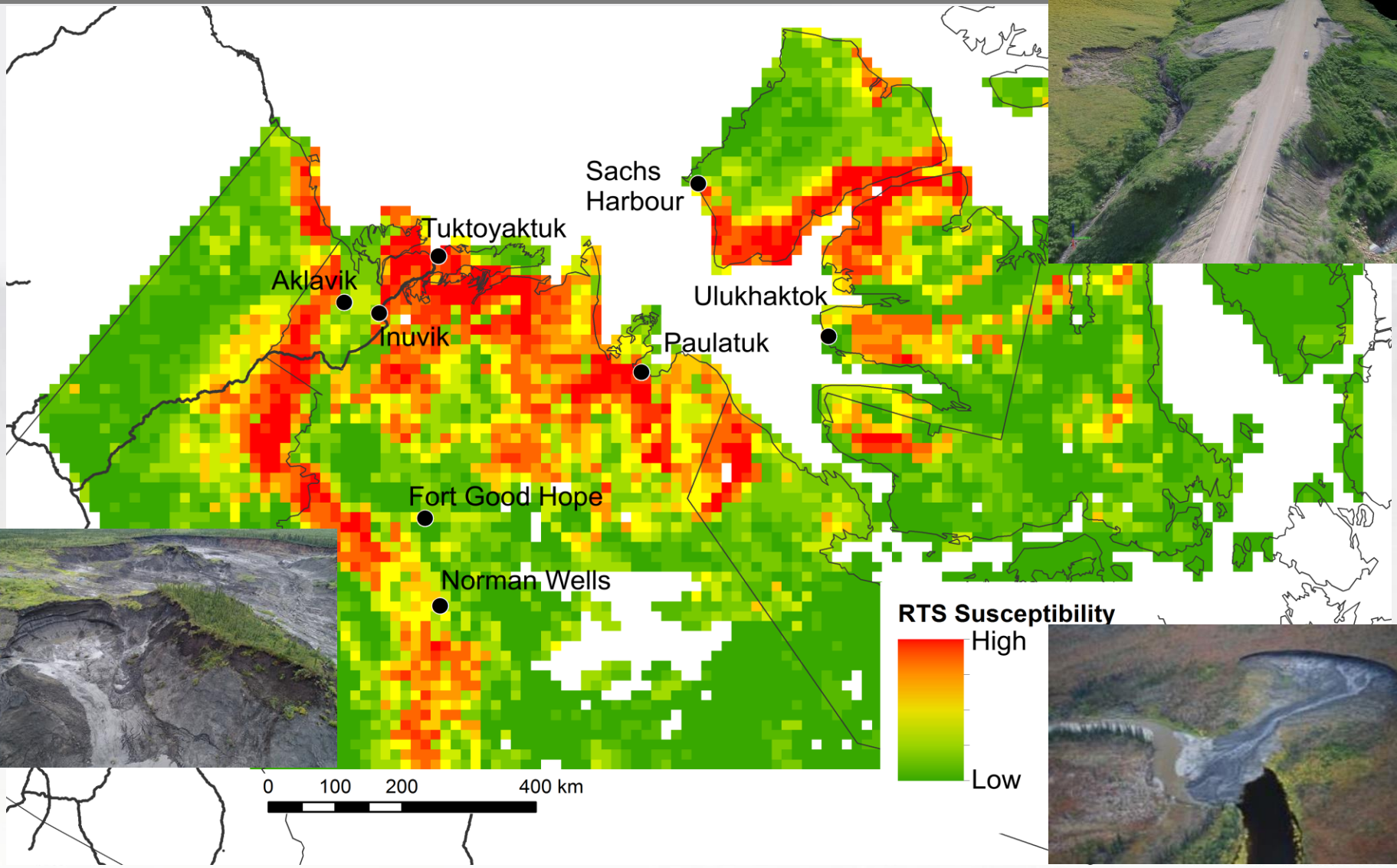
Fall 2017

100 landslides occur after heavy rains



Reindeer Station landslides occur after heavy rains, September 2017

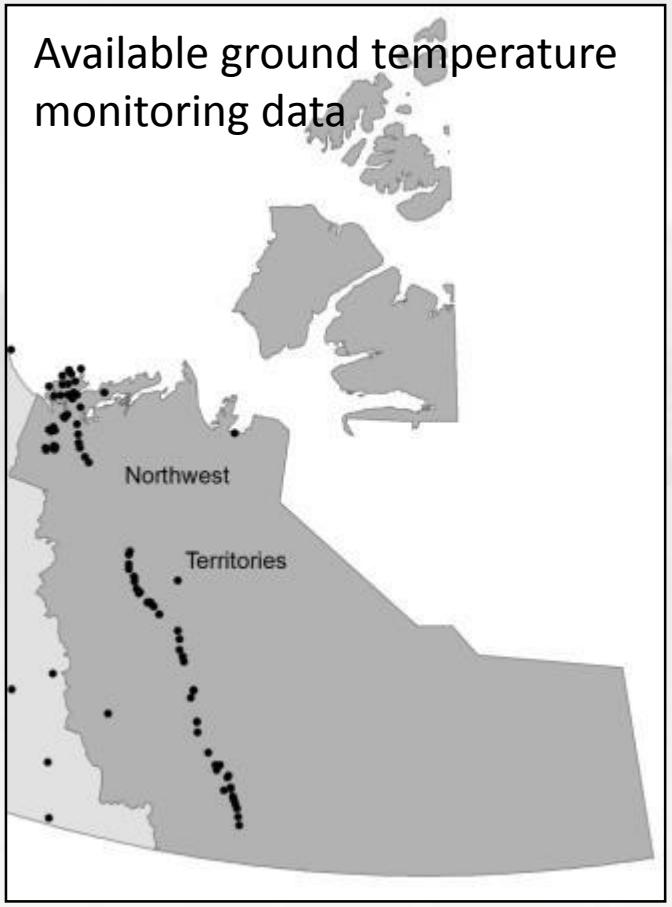
Geohazard risk maps are increasingly important for safety of residents and for planning infrastructure

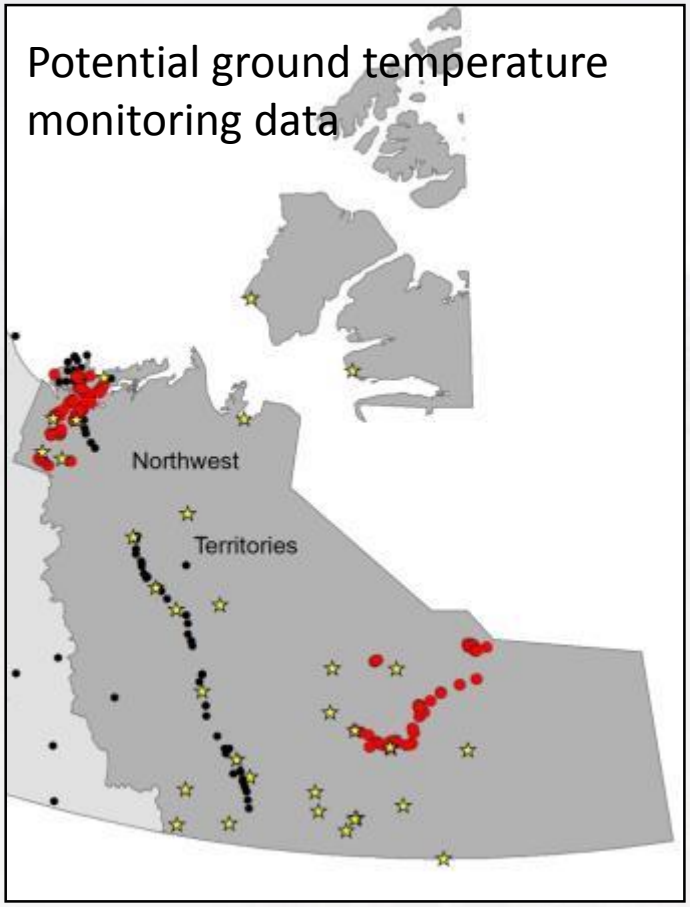


Rudy et al., NWT Geoscience Forum, 2017

Landscape responses

Increasing value of permafrost geotechnical, ground temperature and geohazard data





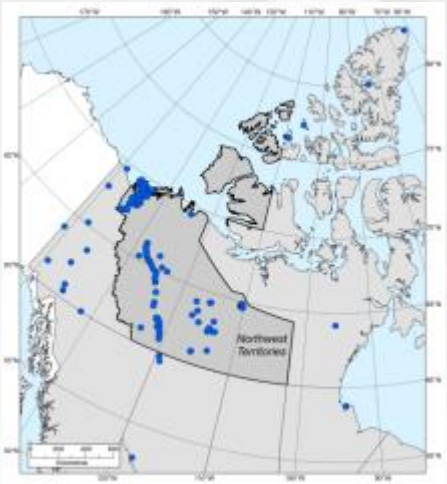
Monitoring, analysis, informed decisions and adaptation

Summary

- Permafrost is the geological manifestation of climate and provides foundation for billions of dollars of northern infrastructure and ecosystems
- The state of permafrost is being altered by climate warming
- Some permafrost landscapes are inherently susceptible to change
- Consider uncertainty and anticipate encountering conditions without precedent

Summary

- Information on permafrost temperature and geotechnical properties is critical for design and mitigation
- Assessing geohazards and risk related to permafrost thaw is critical for public safety and for informed design
- Monitoring can inform mitigation and future design
- Managing this information is a foundational activity



Government of Northwest Territories

Summary

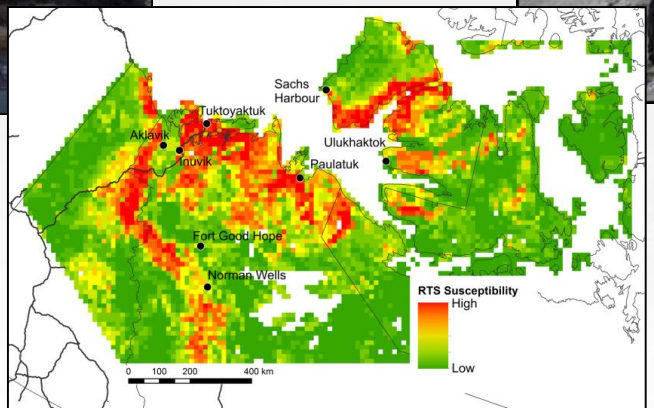
- Expect surprises, consequence of a poor knowledge base will be bigger and more costly surprises

- Resilience – build in flexibility and develop multiple options to deal with change and uncertainty

- There is no formal permafrost monitoring or data management systems, or teams in place to monitor, analyze and report

Summary

- Permafrost has emerged as the critical knowledge base to inform climate change adaptation
- Training and capacity is required – Invest in people
- Northern Challenges - Solutions with Northerners – Northern Capacity



Current status?

- Are we able to make informed decisions?
- Are we able to assess risk to infrastructure and human health?
- Are we able to provide an information base that supports planning, adaptation, innovation, development and a resilient Territory?

Thank you