




1

NTGS Permafrost Science Team

- Based out of Yellowknife and Inuvik
- NWT-wide permafrost monitoring
- Permafrost sensitivity and geohazards
- Develop permafrost capacity in the NWT
- Collaborate with Territorial, Indigenous, Southern and International partners



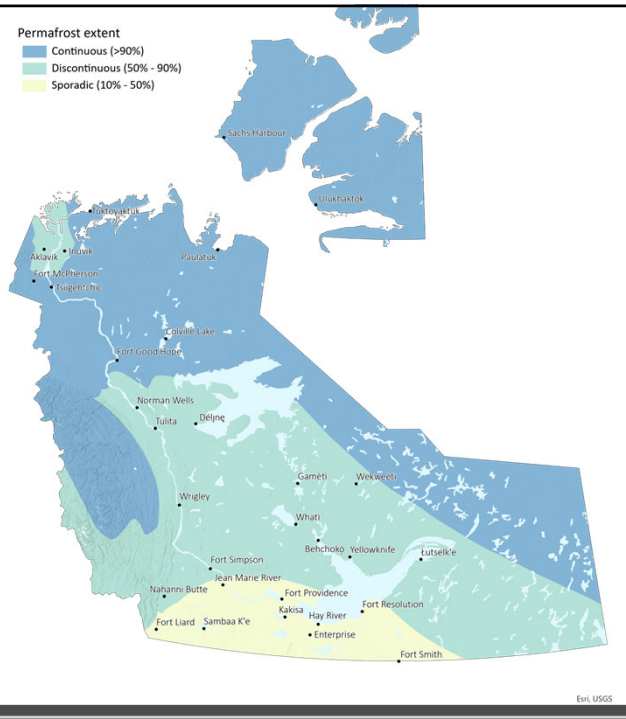
2

Permafrost in the NWT

Permafrost is ground (rock or soil) that stays frozen ($< 0^{\circ}\text{C}$) for 2 or more years

Permafrost provides a foundation for ecosystems, northern communities and infrastructure

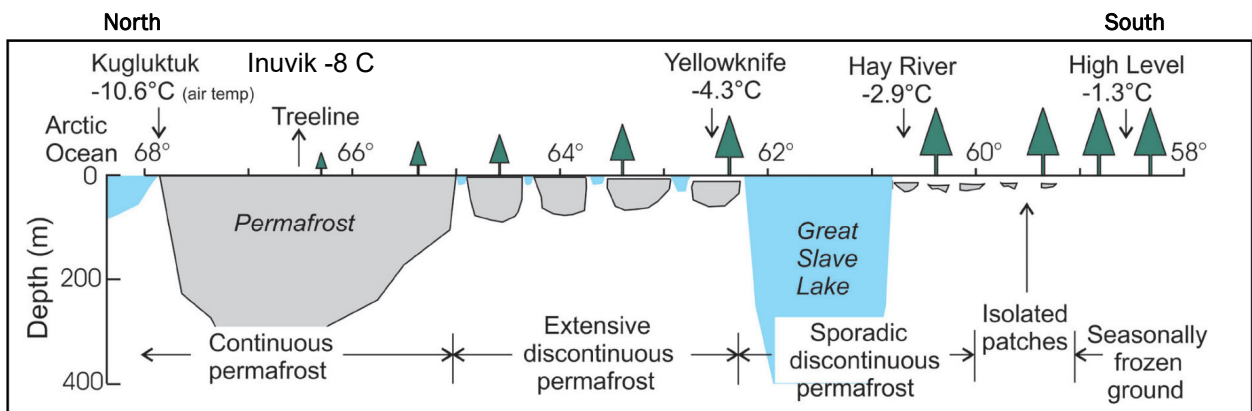
Permafrost thaw is a primary cause of climate-driven landscape change in the north



3

Regional conditions that influence permafrost extent

- Permafrost is a condition of temperature



Modified from Wolfe and Kokelj, 2019

4

Local conditions that impact permafrost stability

- Vegetation
- Snow cover
- Water
- Ground ice



5

Snow, vegetation and permafrost

- Vegetation buffers changes in air temperature dampening the impact on permafrost
- Snow cover insulates the ground leading to warming temperatures and in some cases degradation



The Dempster Highway near the Yukon-NWT border. Photo: Brendan O'Neill

6

Water and permafrost



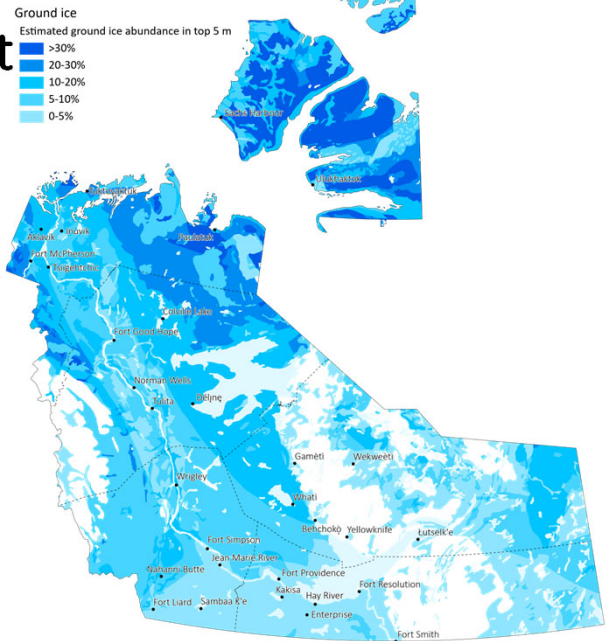
- Climate change leads to more rain in the fall that infiltrates into the active layer prolonging ground freezing presenting various challenges

Photos: T. Ensom

7

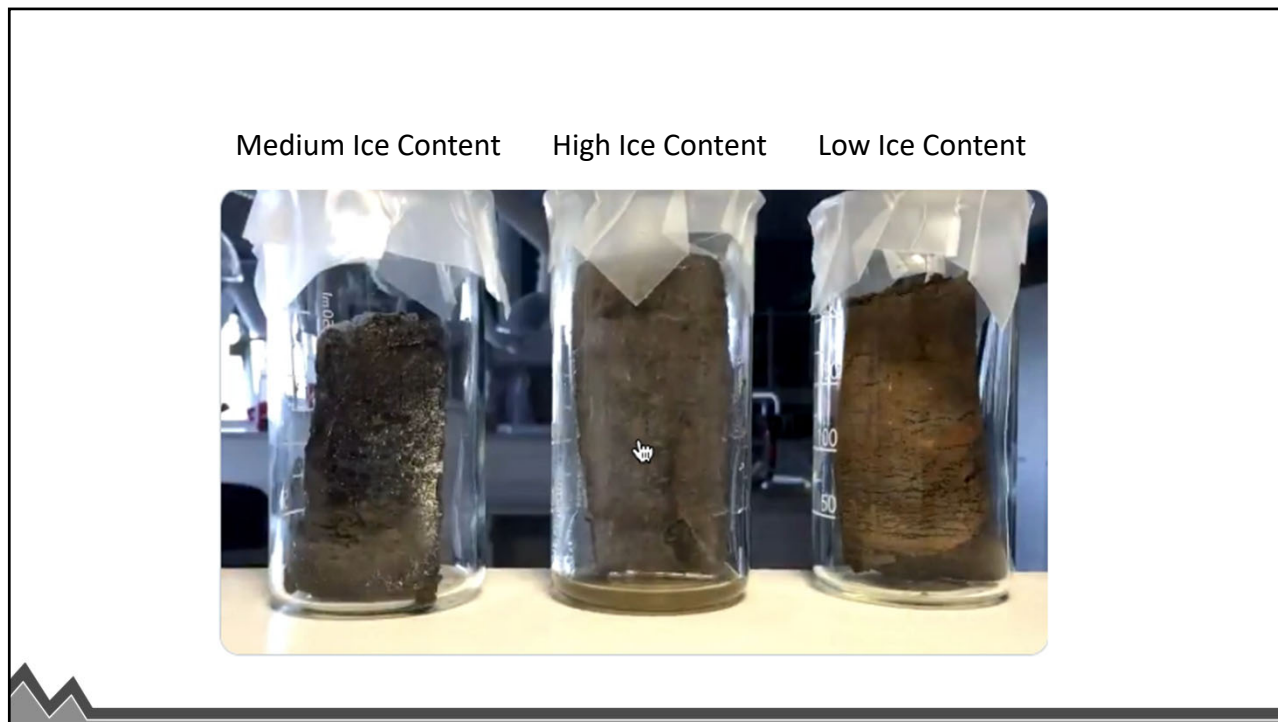
Ground ice and permafrost

- Ice content is the most important factor in terms of landscape change



O'Neill et al., 2018

8



9

Permafrost thaw

Climate change and/or changes in site conditions

Active layer

Ice-rich permafrost

Surface settlement

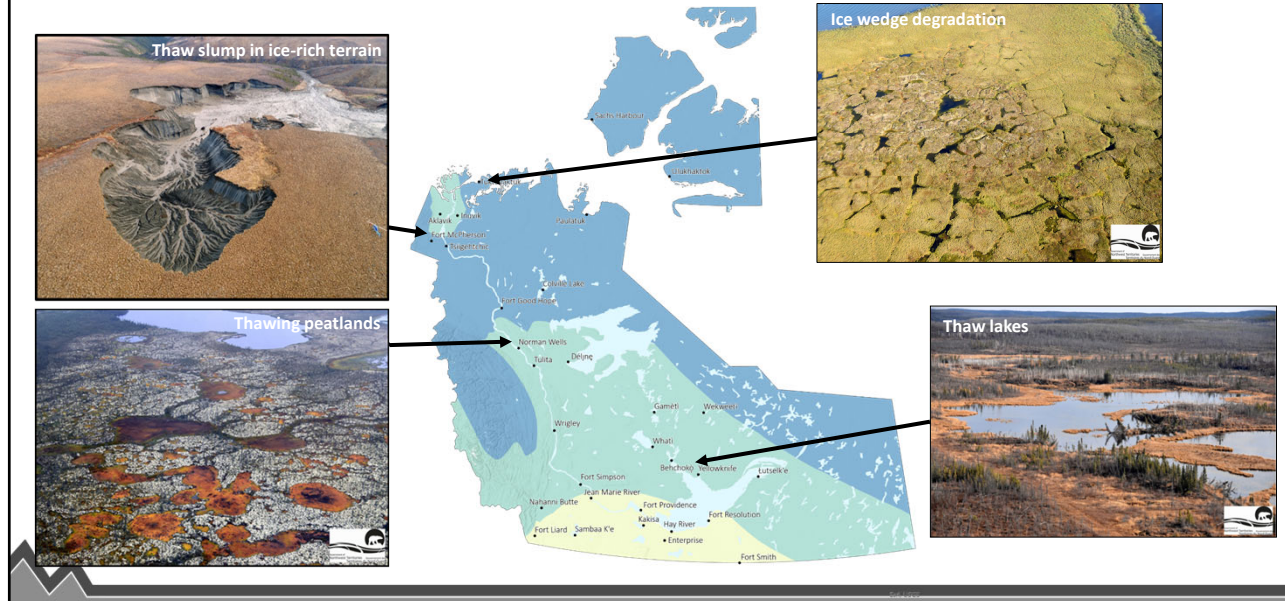
Active layer

Portion of the old Ingraham Trail

Sachs Harbour

10

Diverse response to permafrost thaw



11

Diversity in characteristics that describe the personality of permafrost

1) Permafrost landforms

2) Landslides

3) Water features

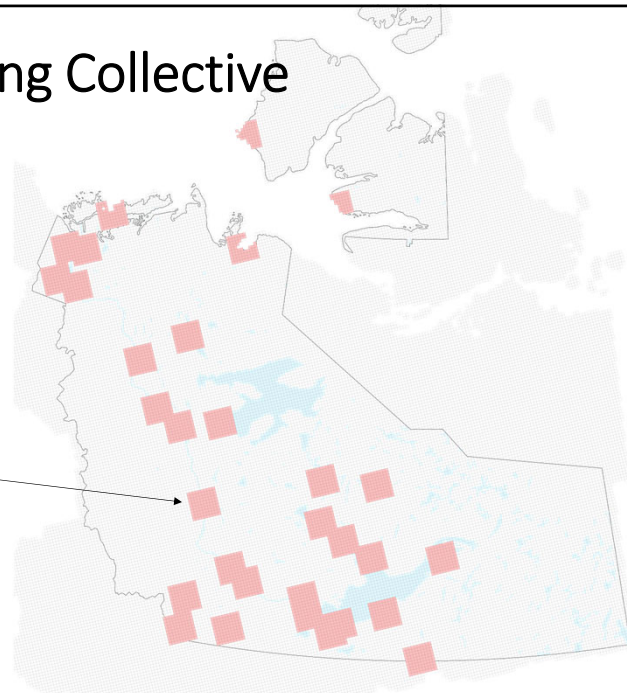


12

NWT Thermokarst Mapping Collective

- NWT-wide dataset
- Different ways to use the data

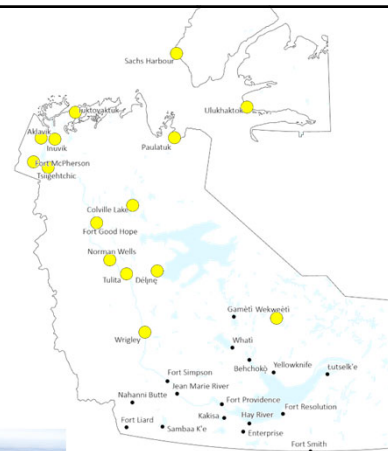
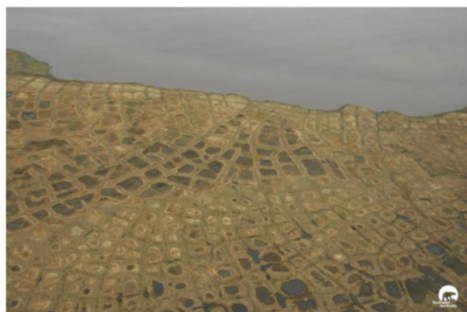
75 x 75 km area around communities



13

Permafrost landforms

- Landforms created by permafrost
- Ground ice
- Dynamic (natural and climate-driven)



14

Organic permafrost landforms

- Permafrost protected in peatlands
- Ground ice
- Degradation features

15

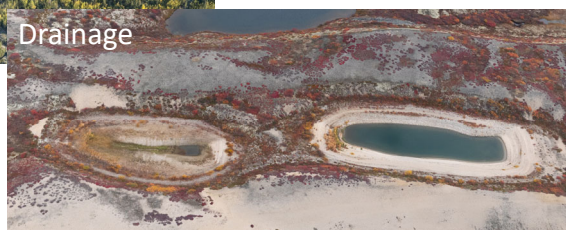
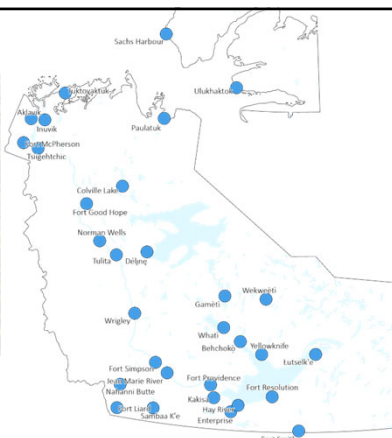
Landslides

- High ground ice content
- Slope
- Increasing air temperature and precipitation

16

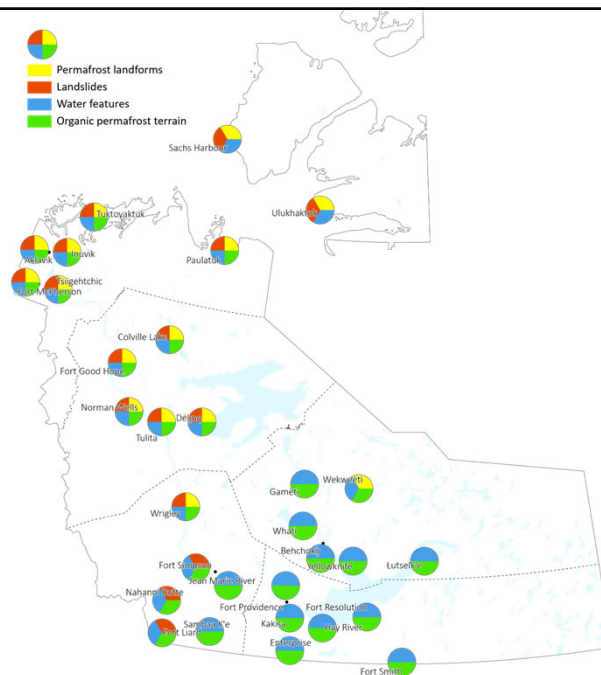
Water features

- Lakes and Ponds
- Expansion: Thaw lake
- Lowering: Drying/Drainage



17

Permafrost personalities



18

Summary

- Permafrost is variable and reflects regional and local conditions
- By better understanding this variability we can be more prepared for future change
- Must continue to work together and learn from one another



19

Mársı | Kinanāskomitin | Thank you | Merci | Hąj' | Quana |
Qujannamiik | Quyanainni | Máhsı | Máhsı | Mahsı

Ashley Rudy
(867) 767-9211 Ext. 63208
Ashley_Rudy@gov.nt.ca

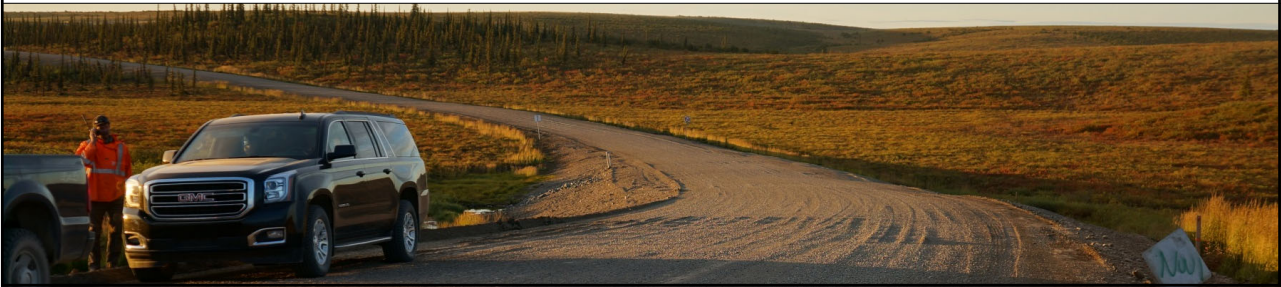
Niels Weiss
(867) 767-9211 Ext. 63218
Niels_Weiss@gov.nt.ca



20

Work in progress

- Surficial Geology mapping around communities
 - Collaboration with academic and industry
- Geotechnical data libraries
 - Important permafrost and geotechnical information in one place



21