Mapping landscape hazards in Yukon for community climate change adaptation planning

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NCE has provided a range of climate change services to Yukon since 2000, related to:

- **Adaptation** (community climate change adaptation plans, vulnerability assessments, hazard mapping, and mainstemming...)

- **Education and outreach** (Climate Change for Decision Makers, regular online newsletter distributed across Canada, lecture series...)

- **Mitigation** (Whitehorse Green Guide, Advisor for YG Climate Change Action Plan and emission targets...)

- **Climate Change Information and Mainstreaming Program**
Yukon permafrost distribution

Source: Bonnaventure et al., 2012

Source: Smith et al., 2010

Careful planning required to adapt to permafrost change in Yukon
Hazards mapping for adaptation planning

Ensuring relevancy through meaningful community engagement

- Support of initial proposals
- Local community coordinators
- Field site selection – invitational meetings, open houses
- Opportunities for school involvement, fieldsite tours
- End-of-project celebration
- Targeted communication products
What are hazards?

SURFICIAL GEOLOGY
- Landslides/mass movements
- Slumps
- Cracking

PERMAFROST
- Thaw
- Settlement, subsidence
- Ponding

HYDROLOGY
- River flooding
- Groundwater
- Water availability
Hazards mapping in Burwash Landing and Destruction Bay
Approach

**DESK-BASED**
- Existing mapping, airphotos
- Existing geophysics, reports
- Community consultation

**FIELD-BASED**
- Surficial geology mapping
- Ground penetrating radar
- Electrical resistivity tomography
- Permafrost coring, borehole drilling

**ANALYSIS**
- Grain size distribution
- Ice and water contents, permafrost properties, settlement potential...
Future environmental change

Climate projections

Permafrost probability models
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Copper Joe 1
1 m beside quad path, deforested stripe, thin organic layer, shrubs and spruce

Depth (cm) | Lithology | Cryostructure | Description
---|---|---|---
10 | Silty fine sand mixed with organic matter, roots and gravel
20 | Sand and gravel

Copper Joe 2
Forest, 30 m from BH1, 5 cm moss cover, spruce and shrubs

Depth (cm) | Lithology | Cryostructure | Description
---|---|---|---
10 | Brown sandy silt mixed with organic matter and taphra
20 | Grey-blue sandy silt
30 | Gray-blue sandy silt with oxidation stains, rootlets and microspheres. Cryostructure porous, invisible.
40 | Cryostructure microeliricular.
50 | Sand with small gravel. Cryostructure microeliricular.
60 | Grey-brown sandy silt. Cryostructure microeliricular.
70 | Sandy silt with gravel (Diameter up to 10 cm)
80
90
100
110
120
130
140

Copper Joe 3
Forest fire zone, clear w/ some burned wood, shrubs, <1 cm organic cover

Depth (cm) | Lithology | Cryostructure | Description
---|---|---|---
10 | Brown sandy silt mixed with organic matter and taphra
20 | Grey-blue sandy silt
30 | Grey-blue sand with gravel (Diameter of 1 to 3 cm)

Resistivity Profile (closer to lake, across lots 21-24)

Resistivity Profile (phase II, across lots 51 and 32)

GPR Transect 030
Red line for power pole, had to go over willow and shrubs, moisture in ground, loess

GPR Transect 031
Power line near lot 50, too many shrubs to pull GPR any further
Burwash Landing and Destruction Bay landscape hazards map
Mayo landscape hazards map

- Classification reflects local conditions
- Tailored to each community
Bringing results to communities

- Bingo!
- Invitational meetings
- Maps in public places
- Formal ‘thank you’
- Posting on community Facebook pages, websites
- GIS layers on Geomatics Yukon
- End-user workshop
- CBC & local radio coverage
- Lay report/hazards 101
- Hazards comic
Research Partners and Funders