

# Climate Change and Northern Transportation

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## Presentation Overview

- Introduction
  - Northern Canada and the NWT
  - Impact of Climate Change on the North
  - Permafrost Primer
- Case Studies
  - Highways & Airports
  - Winter Roads and Ice Crossings
  - Northwest Passage



## Romantic view of the North...



## ...the reality



# NWT Transportation System

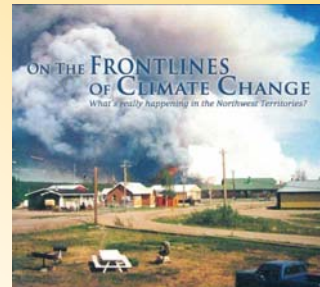
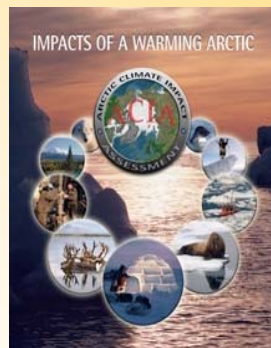


# Climate Change in the North

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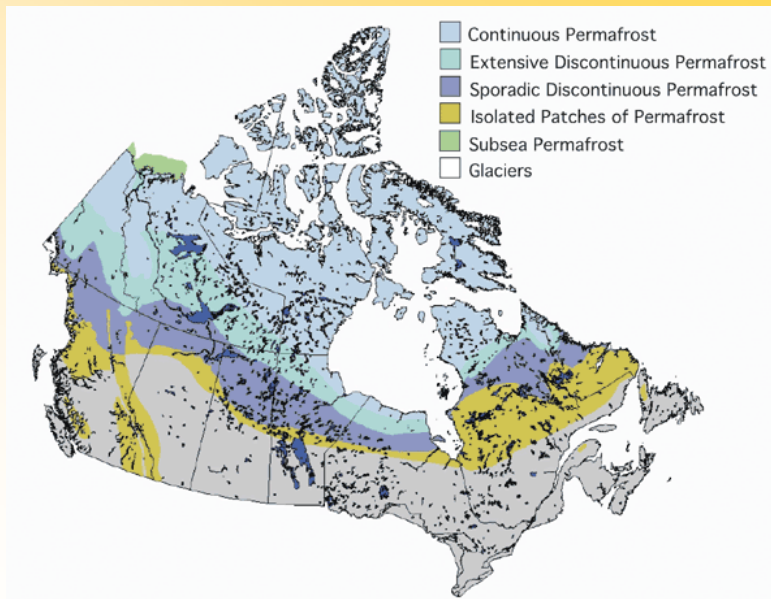
## Polar regions (Arctic and Antarctic)

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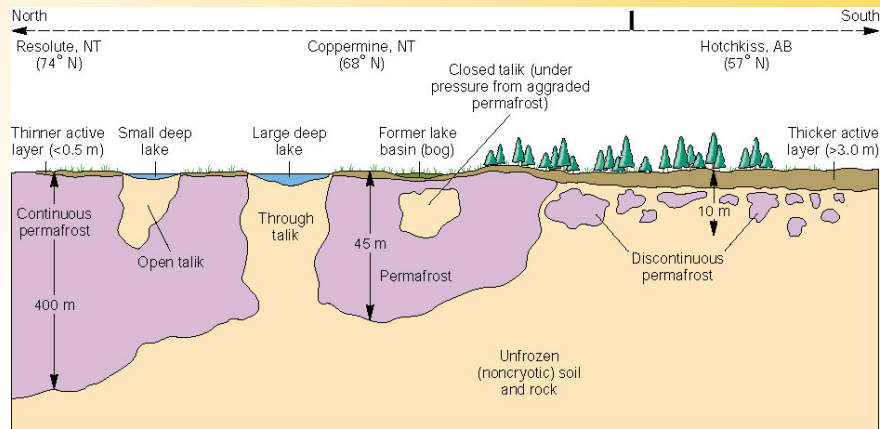
# Permafrost

Any soil that remains frozen for a minimum period of two years is considered permafrost



# Permafrost

## Yellowknife NT



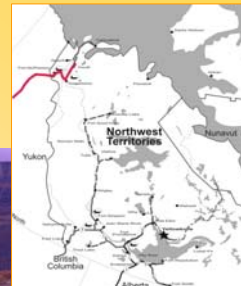
# Permafrost Degradation



## Permafrost Detachment Failure



## Dempster Highway



# Dempster Highway

Construction of road embankment over permafrost terrain impacts thaw-sensitive foundation soils

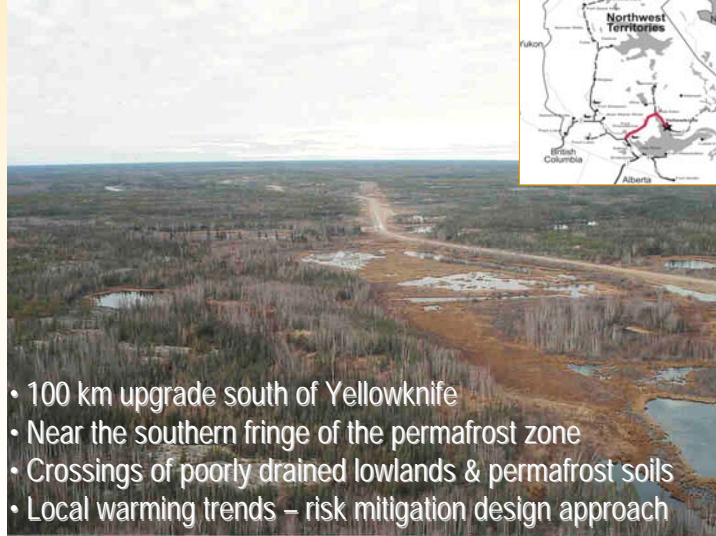
Roadbed failure due to subgrade warming may occur more frequently in periods of climate warming



# Dempster Highway



# Yellowknife Highway



- 100 km upgrade south of Yellowknife
- Near the southern fringe of the permafrost zone
- Crossings of poorly drained lowlands & permafrost soils
- Local warming trends – risk mitigation design approach

# Yellowknife Highway



## Adaptation Strategies

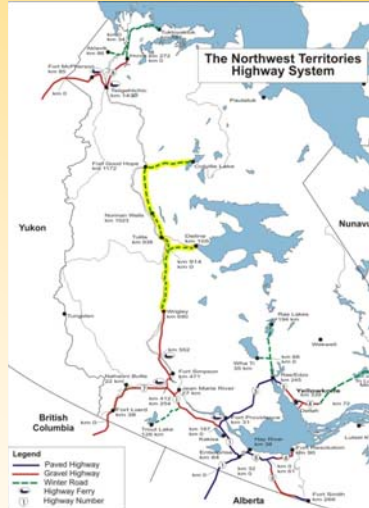


- Manage predicted settlements using common design principles
- Enhance winter heat extraction from the ground
- Open-graded rock embankment materials
- Selective use of insulation within the embankment
- Reflective surface treatments

## Winter Roads



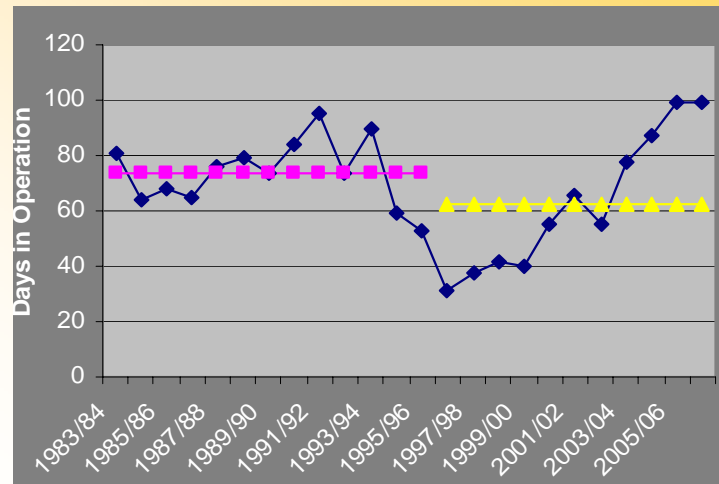
# Mackenzie Valley Winter Road



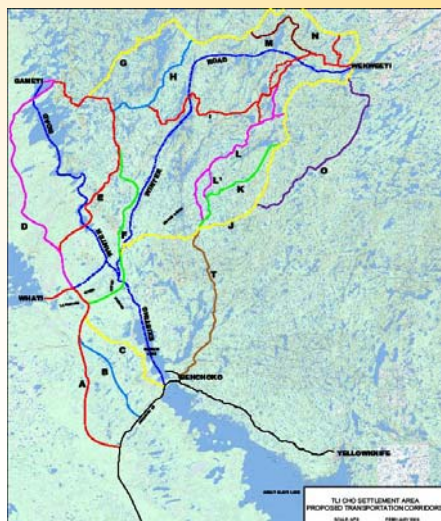
# Mackenzie Valley Winter Road



## Operating Season

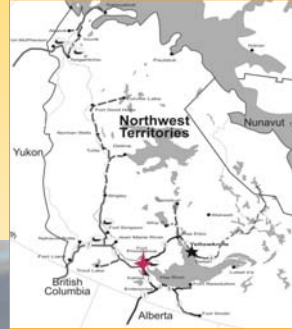


## TliCho Road Corridor Study

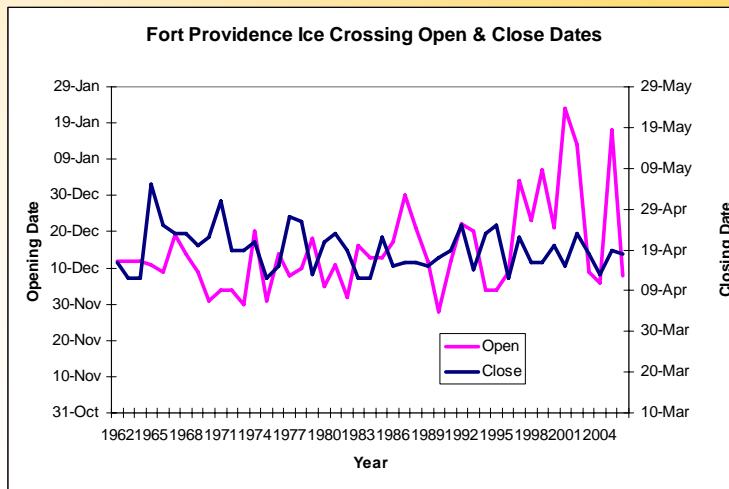


- First Strategic plan with climate change as a central issue
- A good example of a 'no regrets' option

# Mackenzie River Crossing



# Ice Bridge Opening





## Deh Cho Bridge



# Northwest Passage



## What are we doing?

- Incorporate climate change in all decisions
- Inventory critical infrastructure
- Adopt risk-based approaches to decision making
- Improve communications
- Implement monitoring technologies
- Share best practices
- Reevaluate design standards
- Develop partnerships

Question?

