Effects of climate change in the Northwest Territories

What did the demos tell us?

- What physical changes occurred?

- What chemical changes occurred?

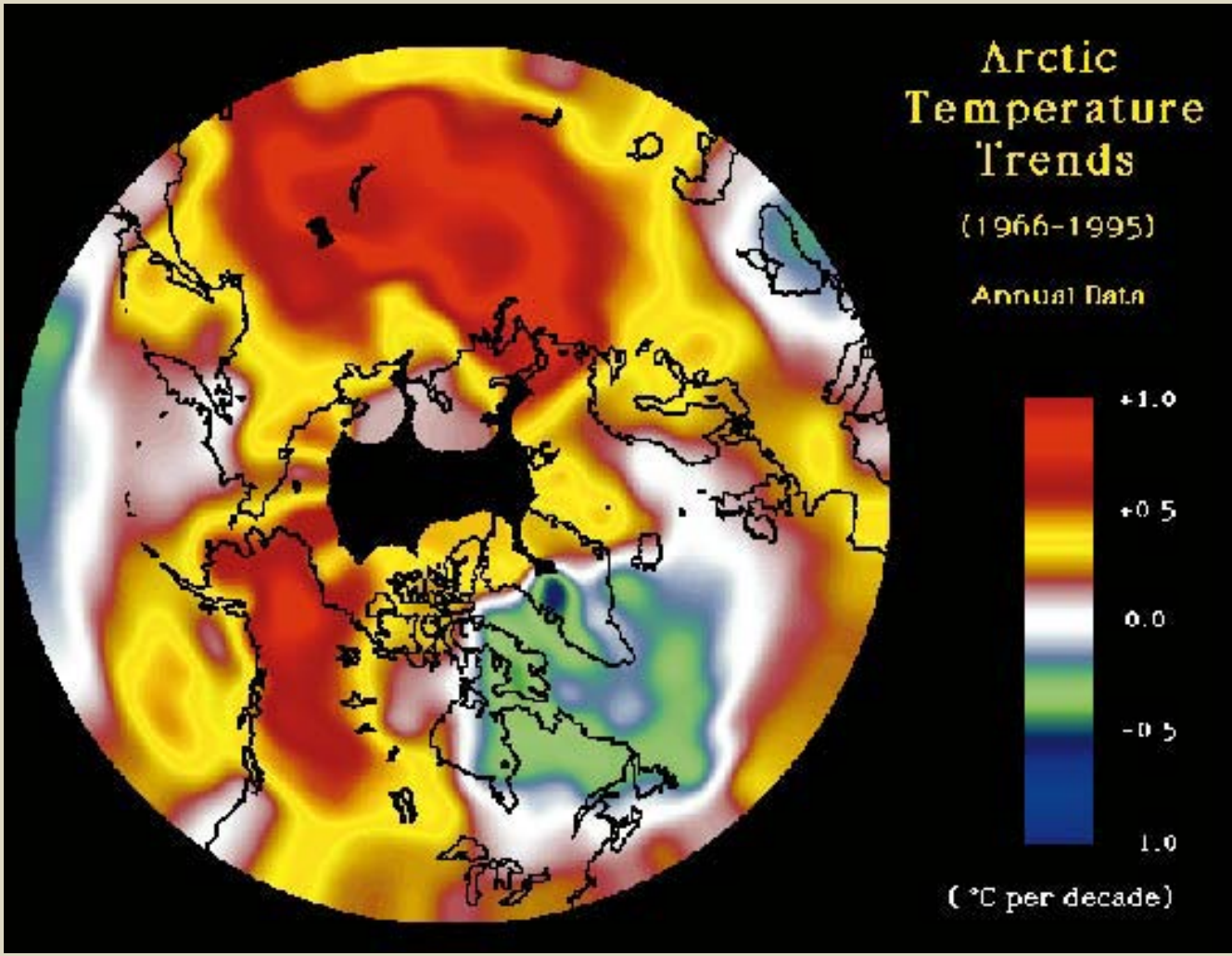
- How will climate change affect the North?
- What has already changed?

Rapid climate warming

Top Ten Warmest Years on Record

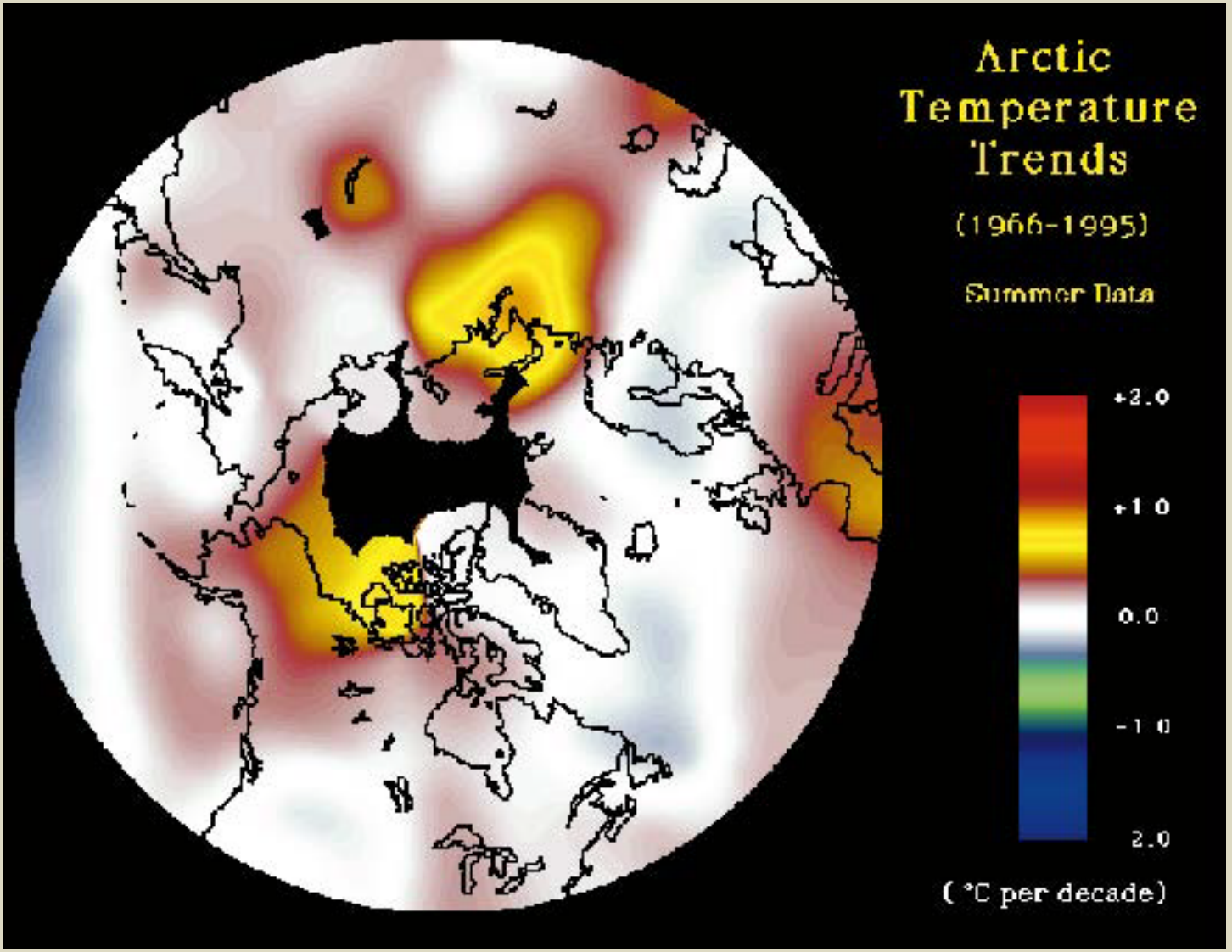
1. 2005
2. 1998
3. 2003
4. 2002
5. 2006
6. 2009
7. 2007
8. 2004
9. 2001
10. 2008

- In what season?

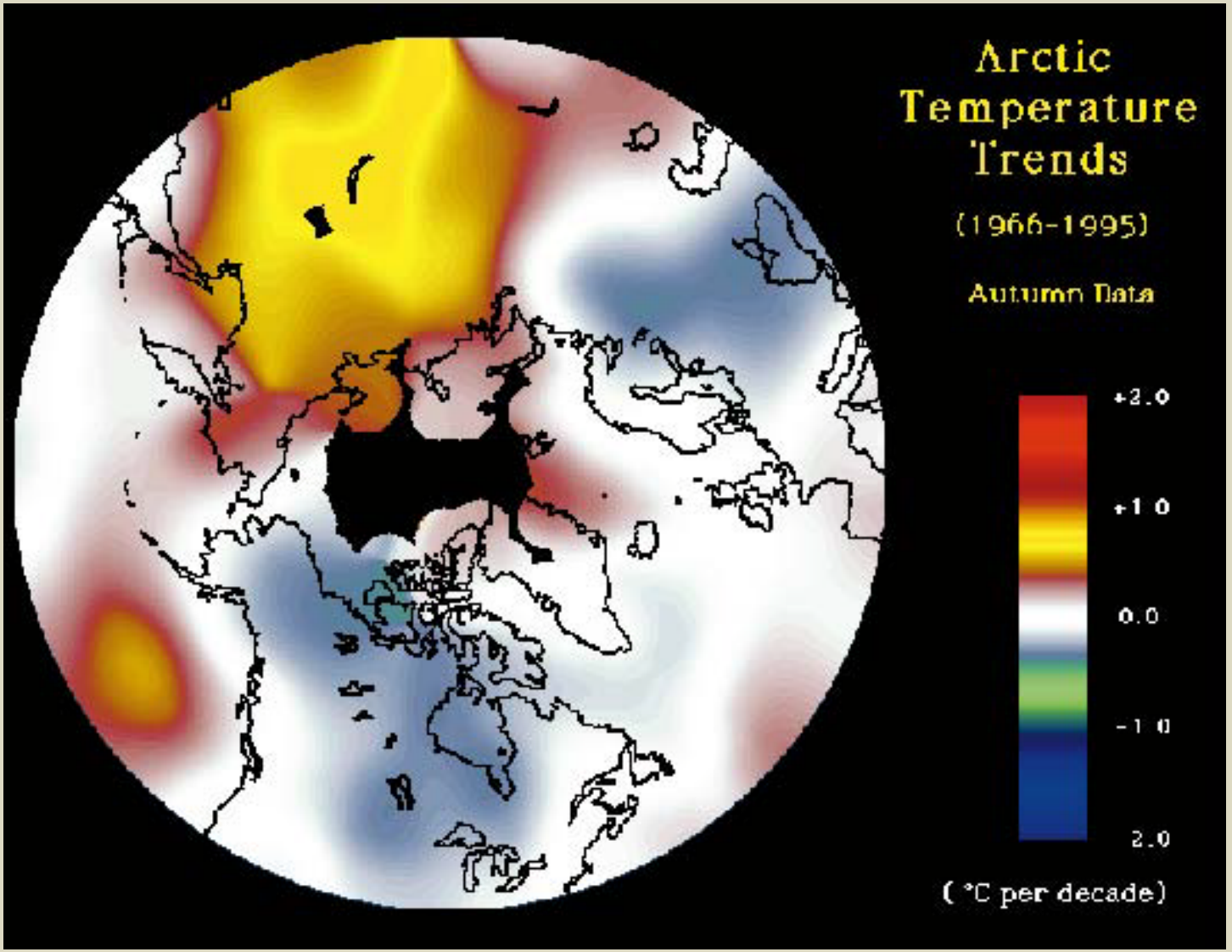


(Serreze et al. 2001)

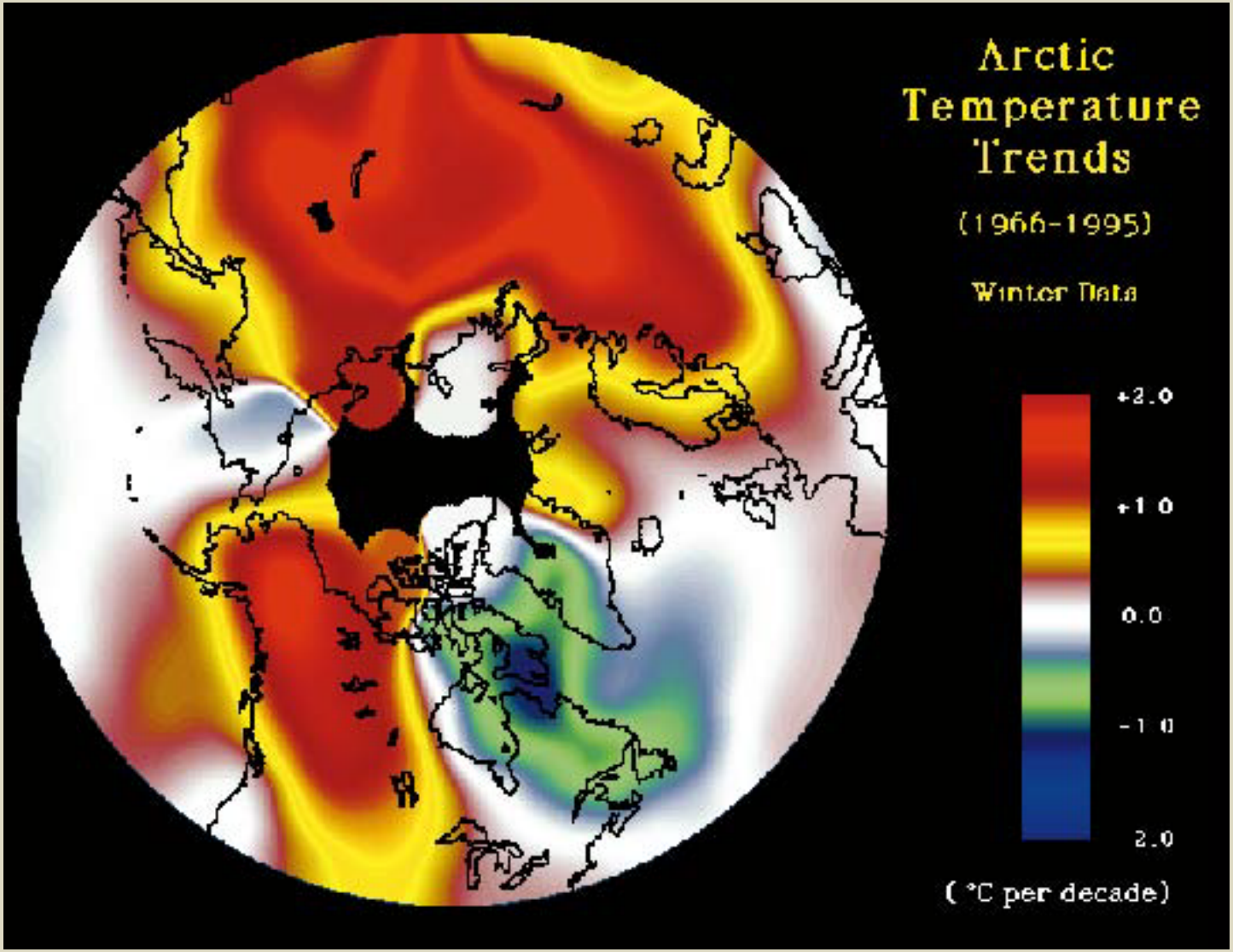
Summer


Arctic
Temperature
Trends
(1966-1995)
Summer Data
+2.0
+1.0
0.0
-1.0
-2.0
(°C per decade)

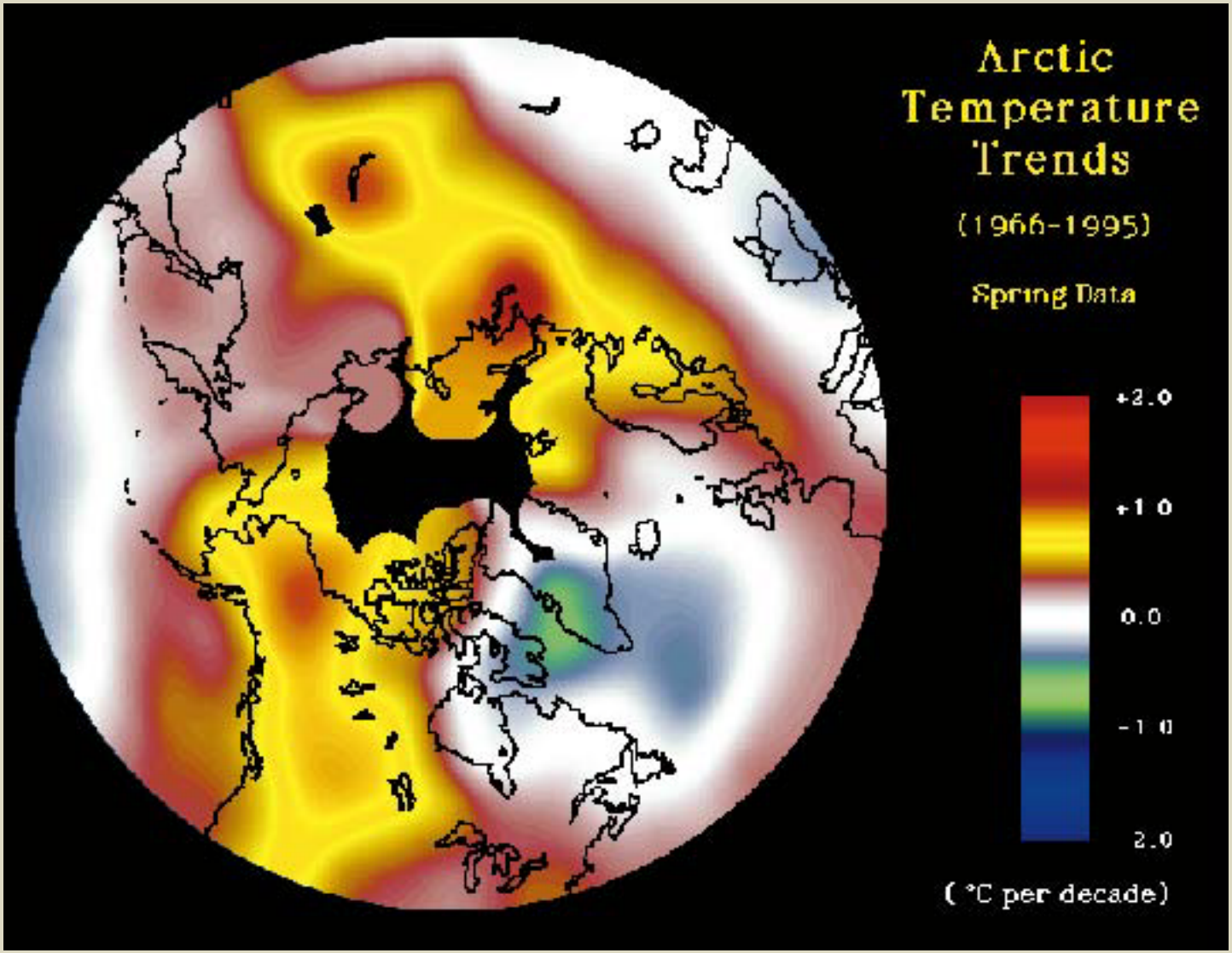
Fall


Arctic
Temperature
Trends
(1966-1995)
Autumn Data
+2.0
+1.0
0.0
-1.0
-2.0
(°C per decade)

Winter

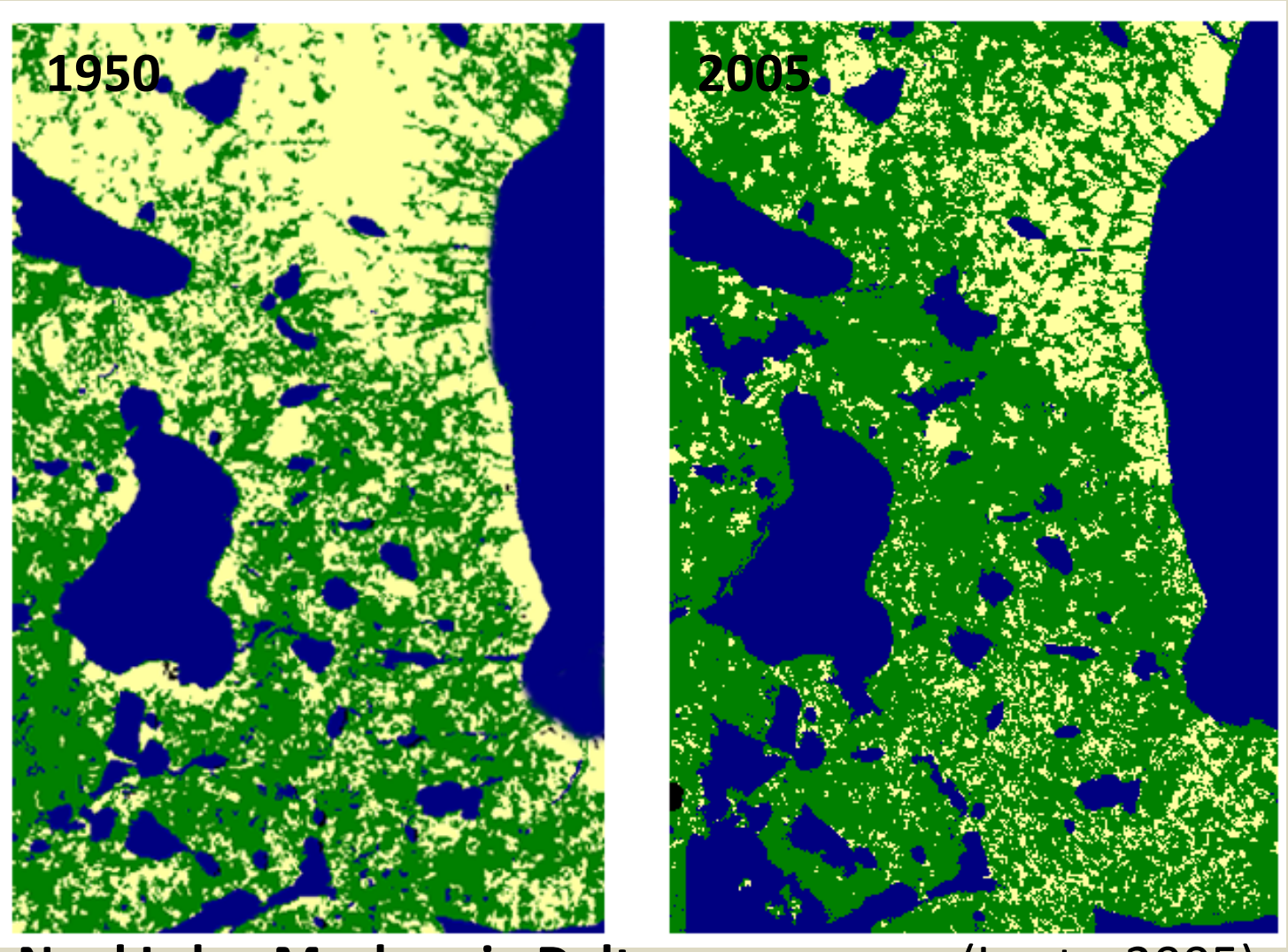

Arctic
Temperature
Trends
(1966-1995)
Winter Data
+2.0
+1.0
0.0
-1.0
-2.0
(°C per decade)

Spring


Arctic
Temperature
Trends
(1966-1995)
Spring Data
+2.0
+1.0
0.0
-1.0
-2.0
(°C per decade)

Vegetation zones likely to shift

Increasing shrubbiness



Noel Lake, Mackenzie Delta (Lantz, 2005)

Vegetation zones likely to shift

Ayiyak River, Alaska (Sturm et al. 2001)

Vegetation zones likely to shift

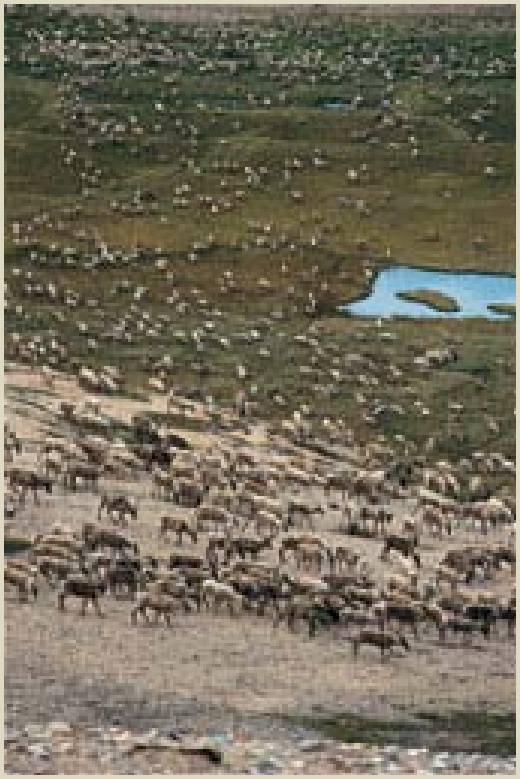
Kugururock River, Alaska (Sturm et al. 2001)

Vegetation zones likely to shift

- Thaw slumps as a shrub-source
  - What have you observed?

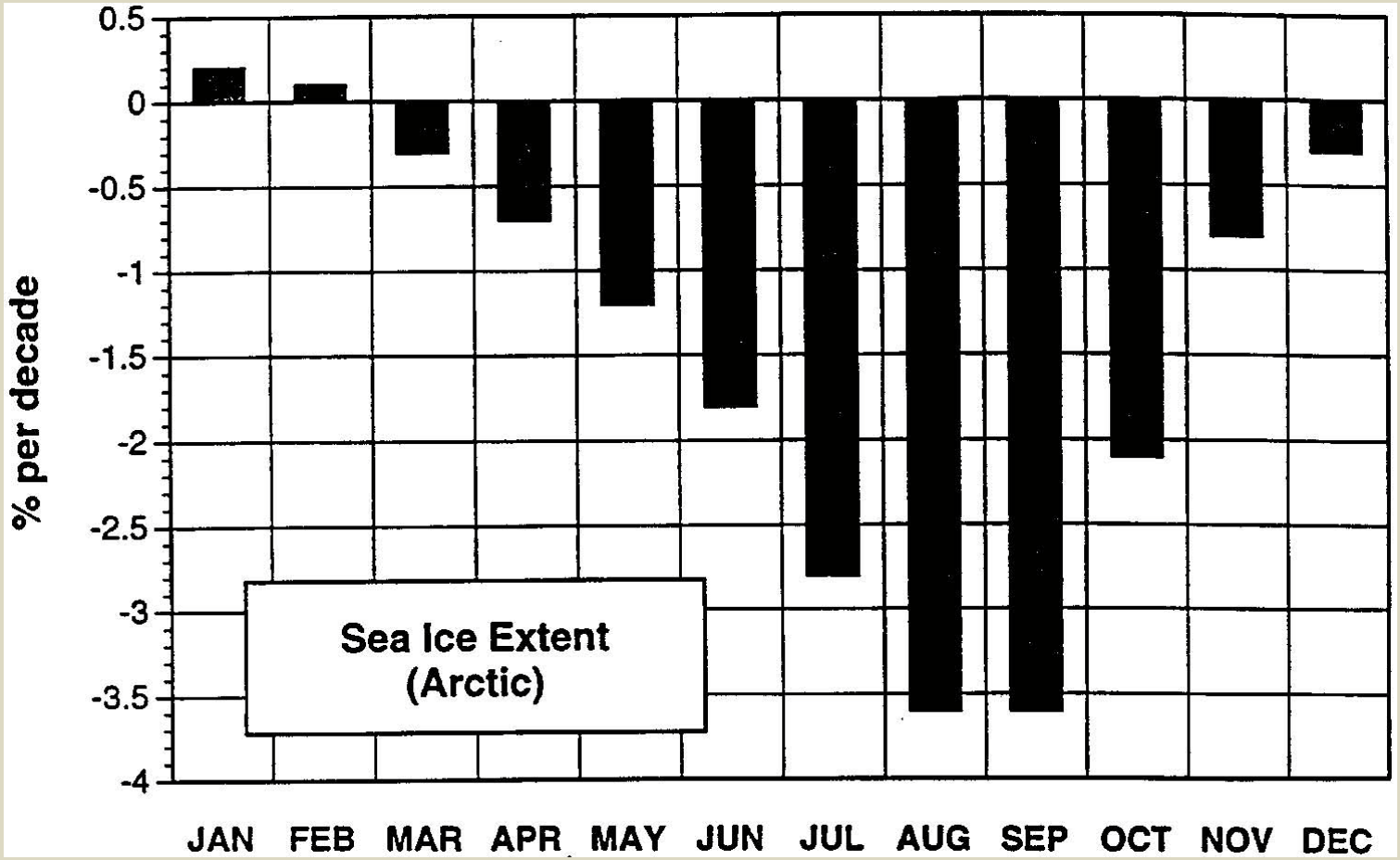
Change in the range and distribution of animals

- What have you observed?



Polar ice sheets melting

- Monthly trends in arctic sea ice extent 1979-1995



(Serreze et al. 2001)

Polar ice sheets melting

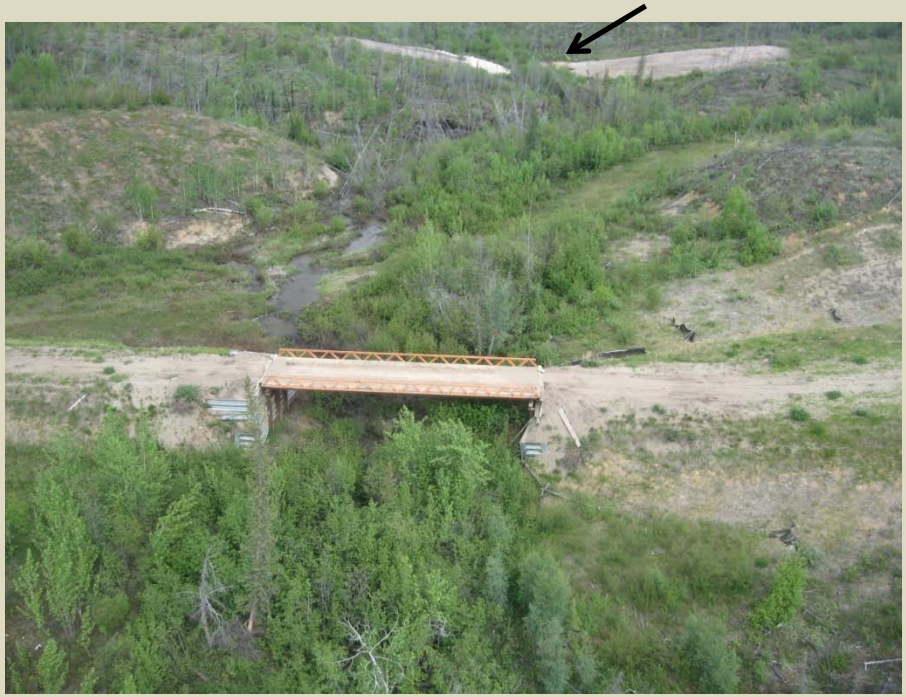
- Reduced sea ice cover
- More accessibility to communities and resources?

More extreme weather
Increased variability in precipitation

- Coastal communities vulnerable to storms

More extreme weather
Increased variability in precipitation

- Infrastructure design
- Your experiences?



Thawing permafrost
Infrastructure impacts

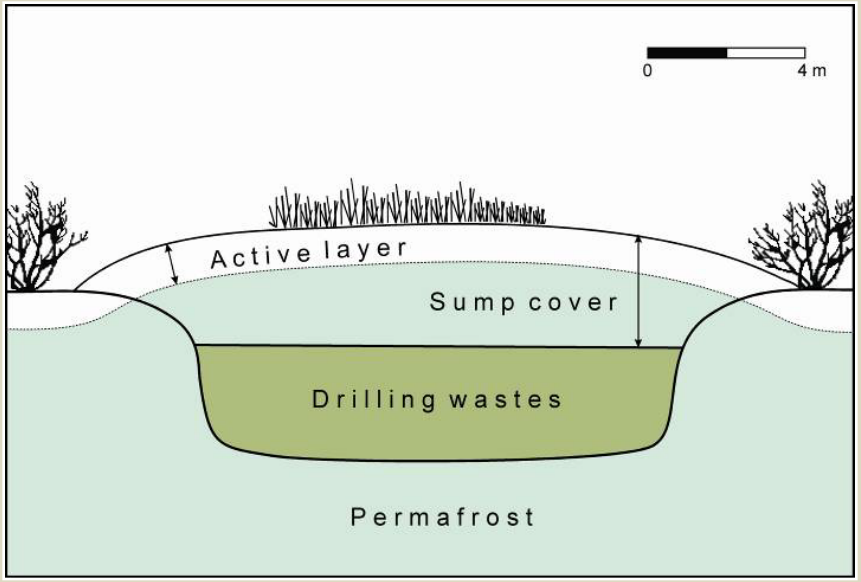
- Inuvik-Tuk highway

Thawing permafrost Infrastructure impacts

- Shortened winter road season

Thawing permafrost Infrastructure impacts

- Waste containment



Jenkins et al. 2008

Thawing permafrost Infrastructure impacts

- Community infrastructure
- Your experiences?

Summary so far…

- The climate is changing
- Development projects will be affected
- Adaptation is critical
- Adaptation requires understanding of change
- To understand change we need to monitor

What is environmental monitoring?

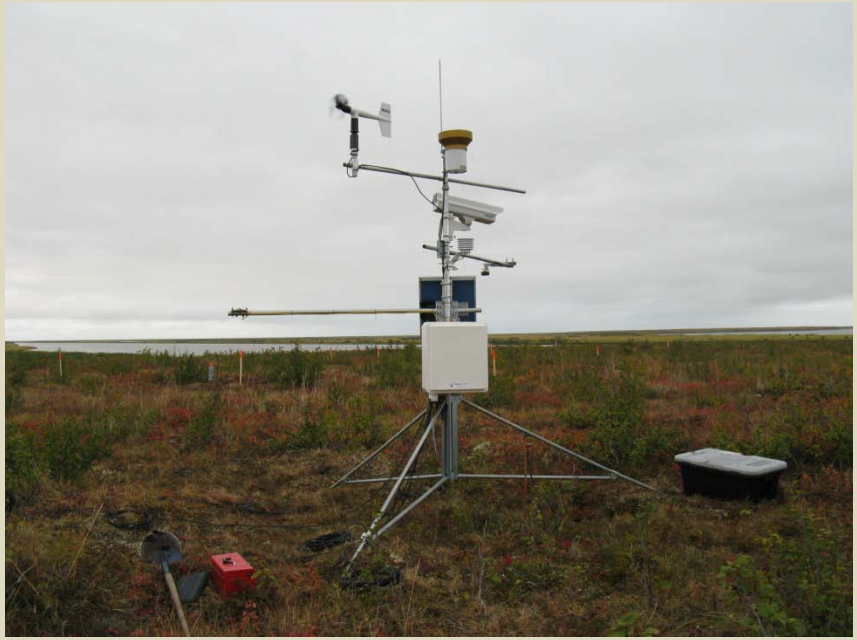
- A method to watch the environment
- Follows the scientific method
- Generally deals with long time frame

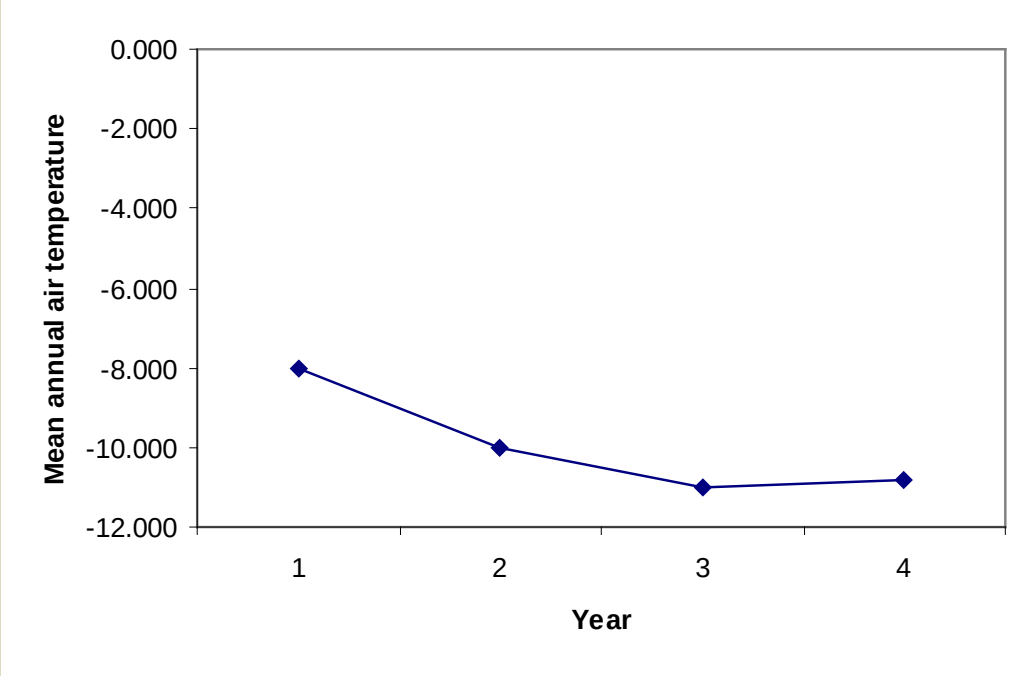
Why is monitoring important?

- Understand current conditions
- Measure change
- Distinguish between impact of climate change vs development

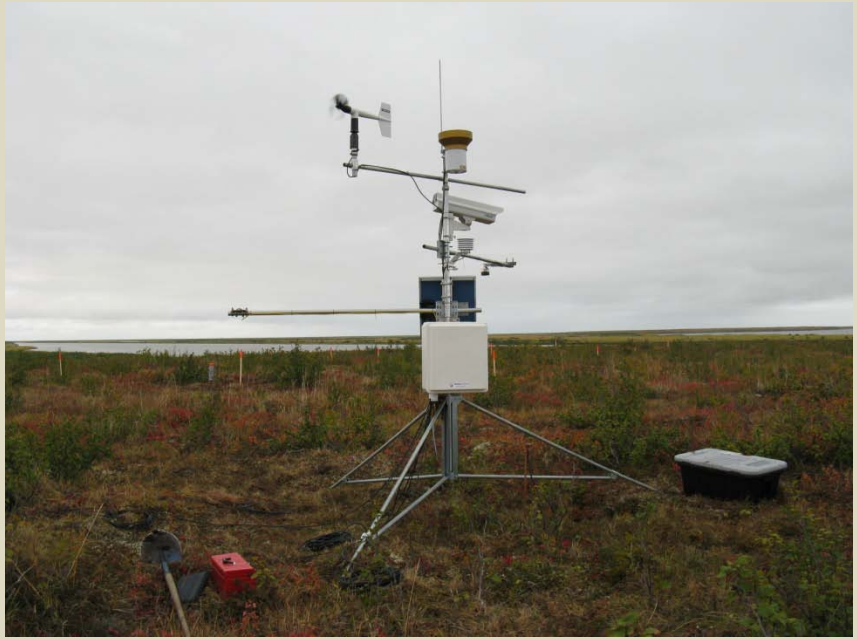
Why is long-term monitoring important?

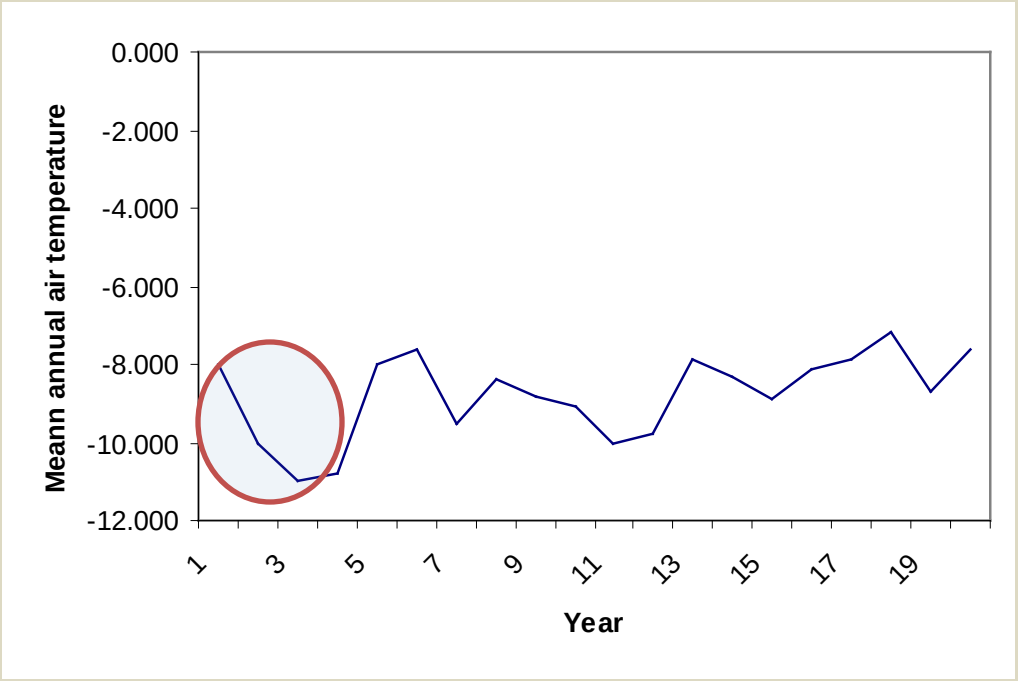
What is the trend?



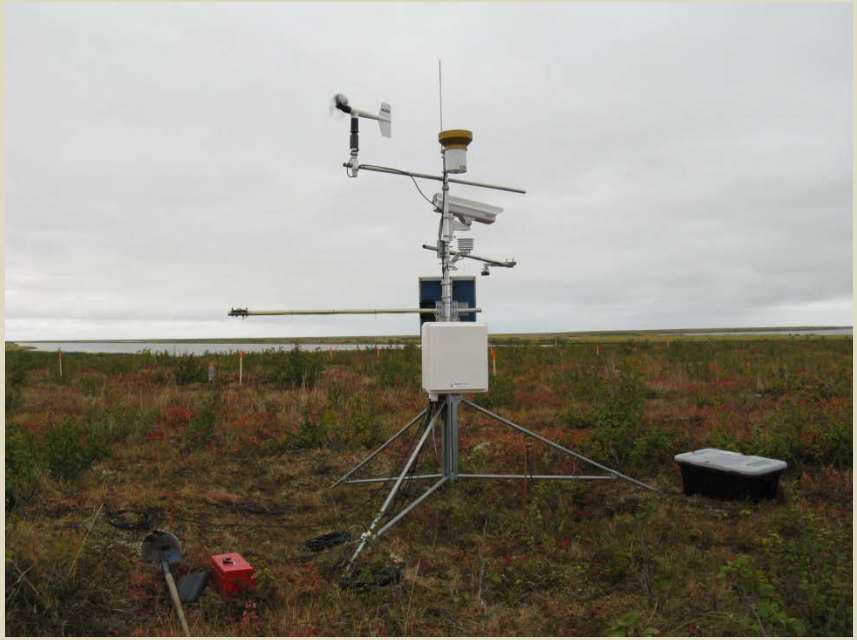


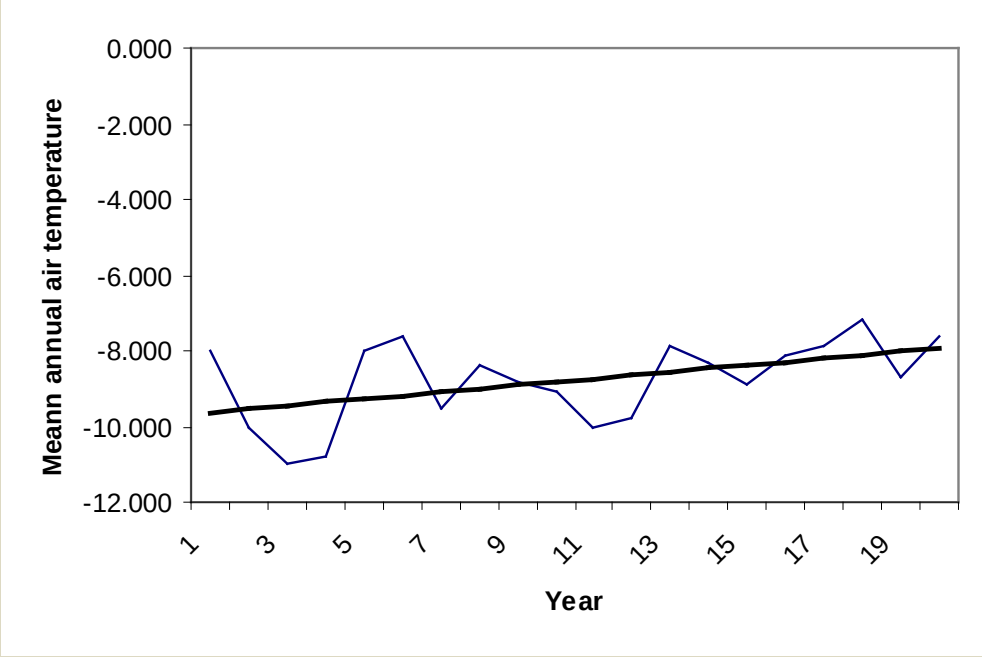
Why is long-term monitoring important?

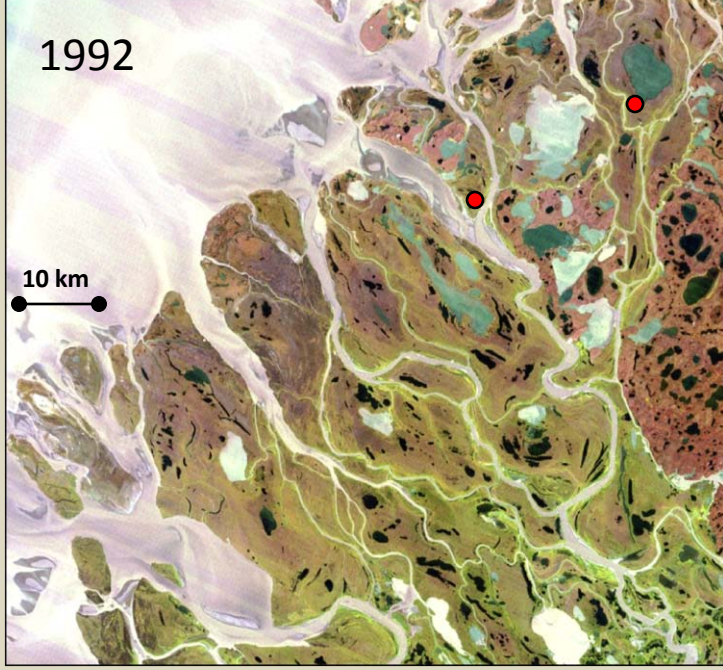




Why is long-term monitoring important?



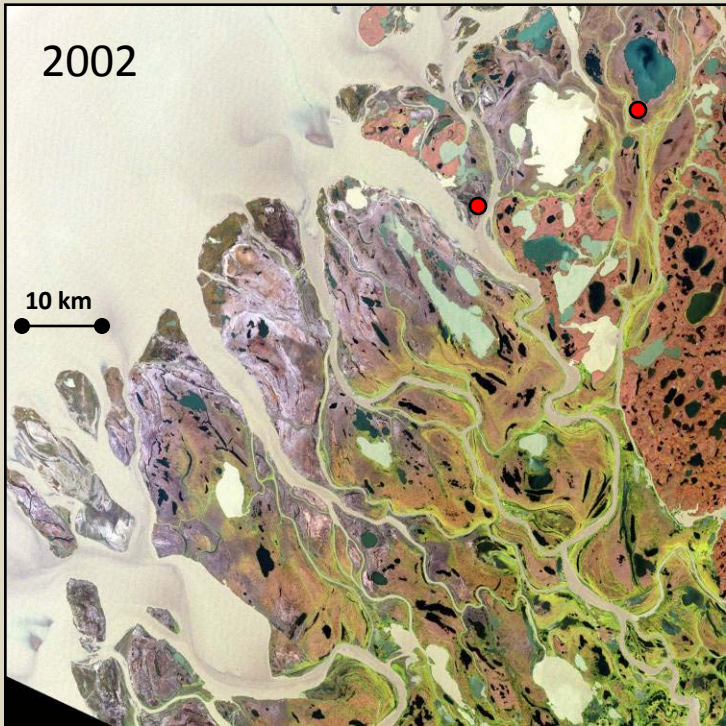




Example of TK/science integration

- Storm surge in fall of 1999
- Extensive salt kill (~10,000 ha)

- Local observation helped date the event and provided context to the issue



Summary: Climate change impacts in the NWT

- Impacts particularly relevant to northern development:
  - Rapid climate warming
  - More extreme weather
  - Thawing permafrost

- Infrastructure should be designed with climate warming in mind

- Long-term monitoring can be used to assess change