Integrating Arctic Research: perspectives from the Canadian (High) Arctic

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Integrating Arctic Research

- Social system
- Natural environment
- Built environment

NSF – Navigating the New Arctic: looks a lot like a Canadian program - ArcticNet
Integration needs and examples: Canadian Arctic

• Greening of the High Arctic: potential, evidence and constraints
  – Will vegetation change be as rapid as predicted at large scales?

• Integrating Inuit knowledge/science
  – Environmental change monitoring, reciprocal education and berries
The setting

• Canadian High Arctic land area = 1.25 M km²
  18 % of total circumpolar tundra

• ~50 % of tundra area in Canada has < 50 %
  plant cover (polar barrens)

• Areas for vegetation development: Greening
  of the High Arctic

• Marginal environments

• Still recovering from last continental glaciation
Simplistic regional gradients

Temperature gradient
(30º latitude & 10º temp)

Vegetation cover

Soil organic matter

Nutrient stock

Unoccupied space

Lithological constraints

Geological & topographic influences - *cross-cutting* (regional and local scales)
Current vegetation

Predicted vegetation: 2050
Change in biomass (index) of a mesic heath community
Resolute, Nunavut: typical polar desert landscape
Topography and tundra plant communities

- 1. Dry exposed ridges
- 2. Mesic zonal sites
- 3. Wet meadows
- 4. Snow beds
  - a. well-drained, early-melting
  - b. poorly-drained, late-melting
- 5. Streamside sites

Prevailing wind

Semi-permanent snow drift

Stream channel
Influence of substrate
GA = ∑BDF + ∑ER

Very few or no plants
DRIVING FORCE < RESISTANCE

Some plants, discontinuous cover
DRIVING FORCE ≥ RESISTANCE

Many plants, full cover
DRIVING FORCE > RESISTANCE

SUCCESION

RETROGRESSION
Experimental warming effect on phenology
Home site advantage in a migration experiment for an Arctic species
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Iqaluit Berry Productivity 2009-2017

Productivity (g/m²)

- Blueberry
- Crowberry
- Cranberry

Data for the years 2009 to 2017 shows fluctuations in productivity for each berry type.
Integrating Arctic Research

Integration must be dynamic and reciprocal