# The University of Alaska Fairbanks: A member of an Arctic GIS community

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**University of Alaska Fairbanks**

# The Arctic

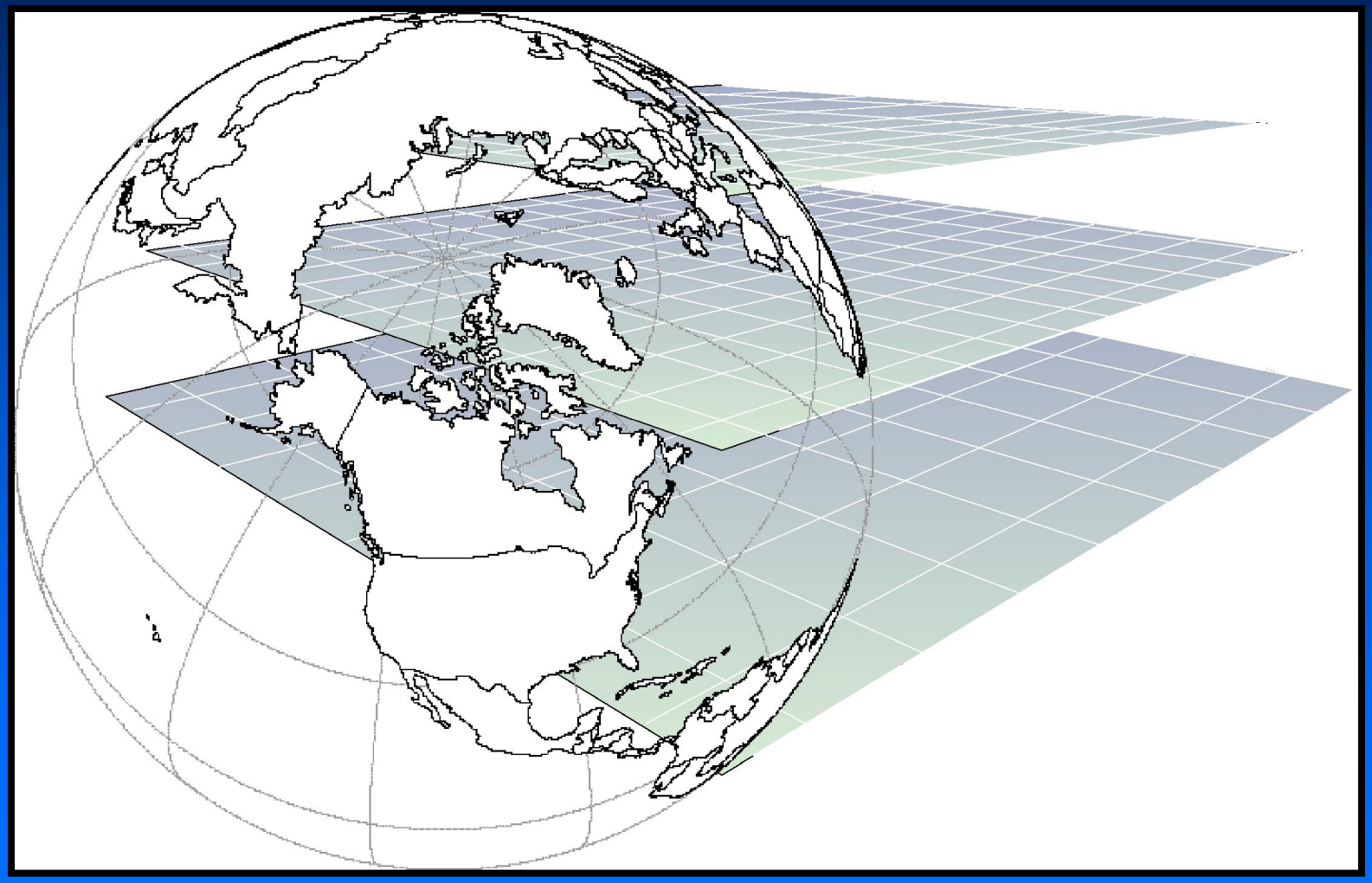
Bundy Fiord, Axel Heiberg Island

# Diversity of geospatial data

ARCSS Flux Study, Northern Alaska

# Many pieces to the global puzzle

# GIS: A means to bring the pieces together



# The University of Alaska Fairbanks:

# An Arctic GIS Network

- **A mechanism to help us integrate our diverse data, organizations, users and technological capabilities and share this among the arctic science and world communities.**

- **Such a network would promote collaboration and wide participation in discovering and sharing data and analysis capabilities, as well as finding other required services and new opportunities.**

# Three UAF subnodes interacting through geospatial information

**Northern Ecosystem Analysis and Mapping Laboratory (NEAML)**

**A proposed Arctic Geobotanical Atlas**

**AMAP Terrestrial and Freshwater Thematic Data Center**

**SynCon project**

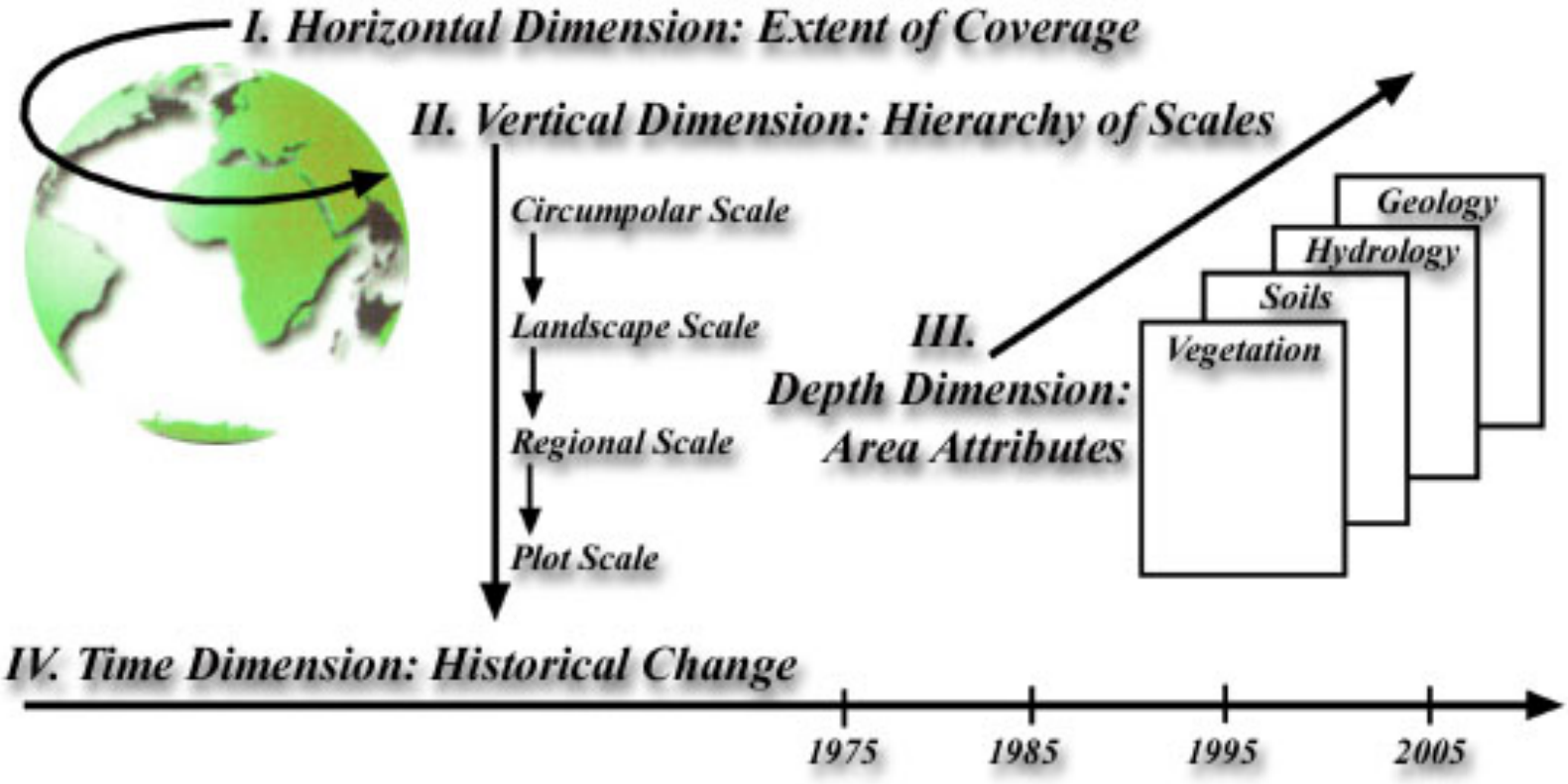
**Institute of Arctic Biology**

**Caribou project**

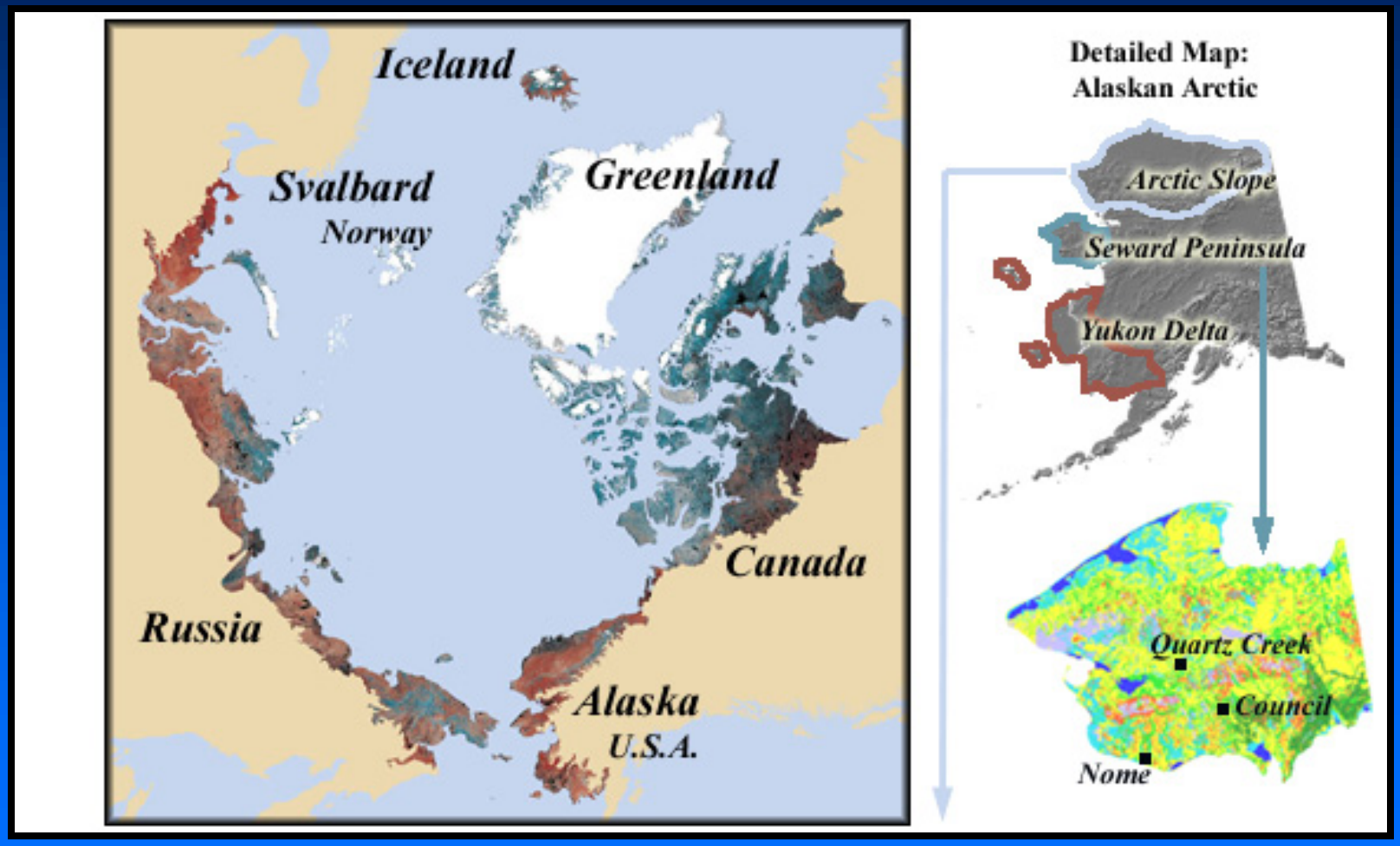
# A web-based
# Circumpolar Arctic Geobotanical Atlas


- **Collection of geobotanical maps and supporting documentation for the Arctic phytogeographic region.**
- **Fusion of three ongoing GIS efforts:**
  - **Circumpolar Arctic Vegetation Mapping project,**
  - **Kuparuk River basin geobotanical atlas,**
  - **Prudhoe Bay geobotanical atlas and cumulative impact studies.**

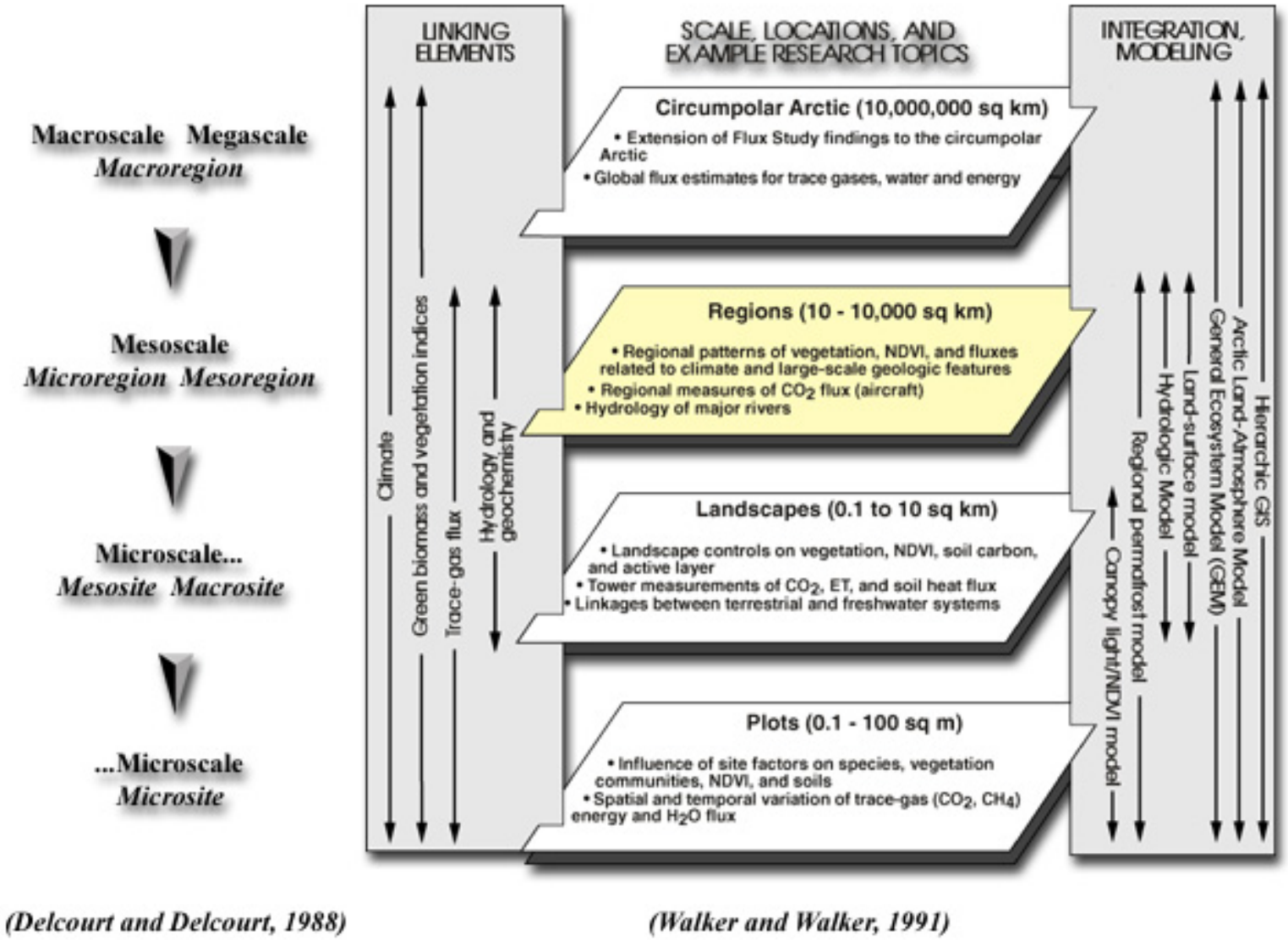
# The 4-Dimensional Framework of the Circumpolar Arctic Geobotanical Atlas



# The horizontal dimension: Location



# Vertical dimension: scale of maps



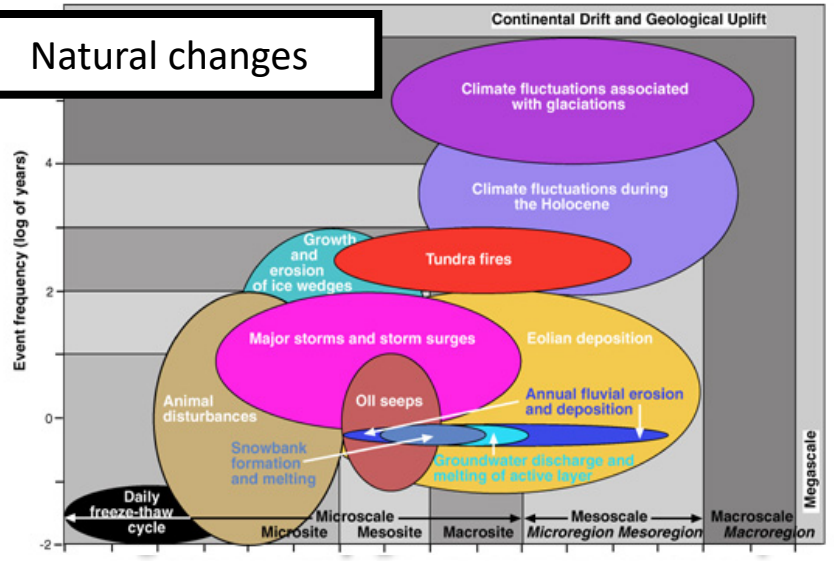

*(Delcourt and Delcourt, 1988)*

*(Walker and Walker, 1991)*

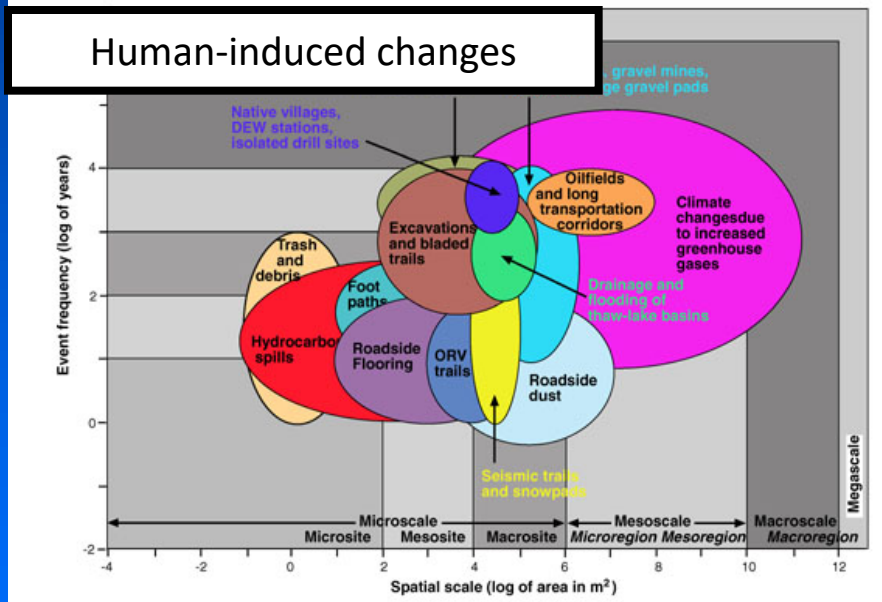
# Processes of change operate across many scales

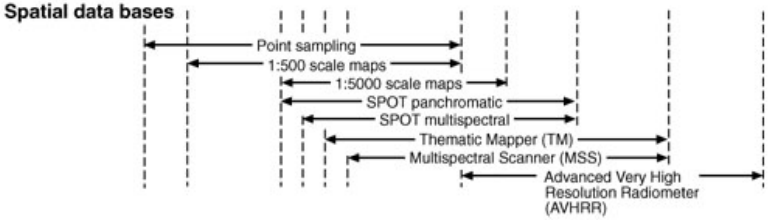
- Processes of change operate across a broad range of spatial and temporal scales.
- Require a broad range of map scales.

## Natural changes



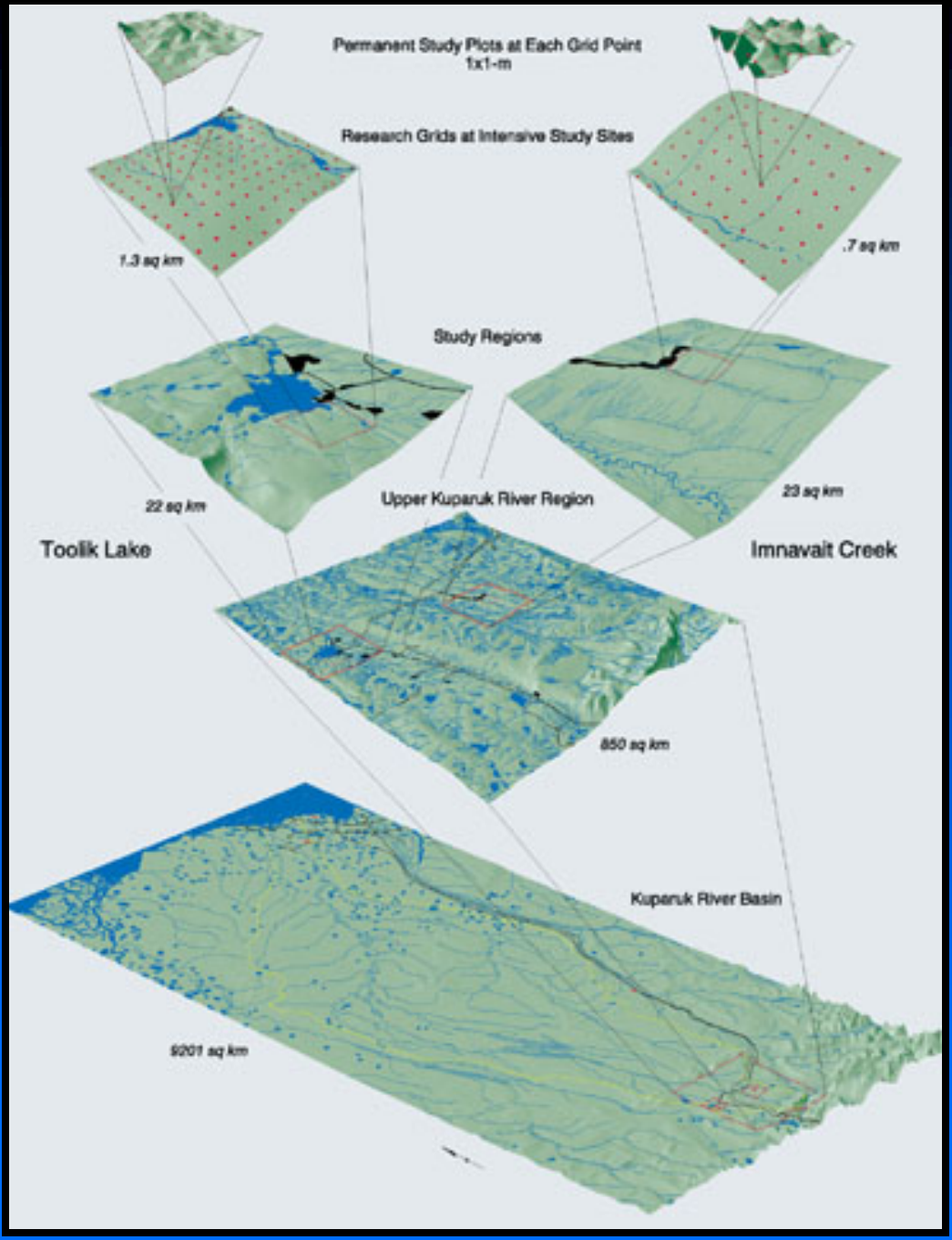

## Human-induced changes



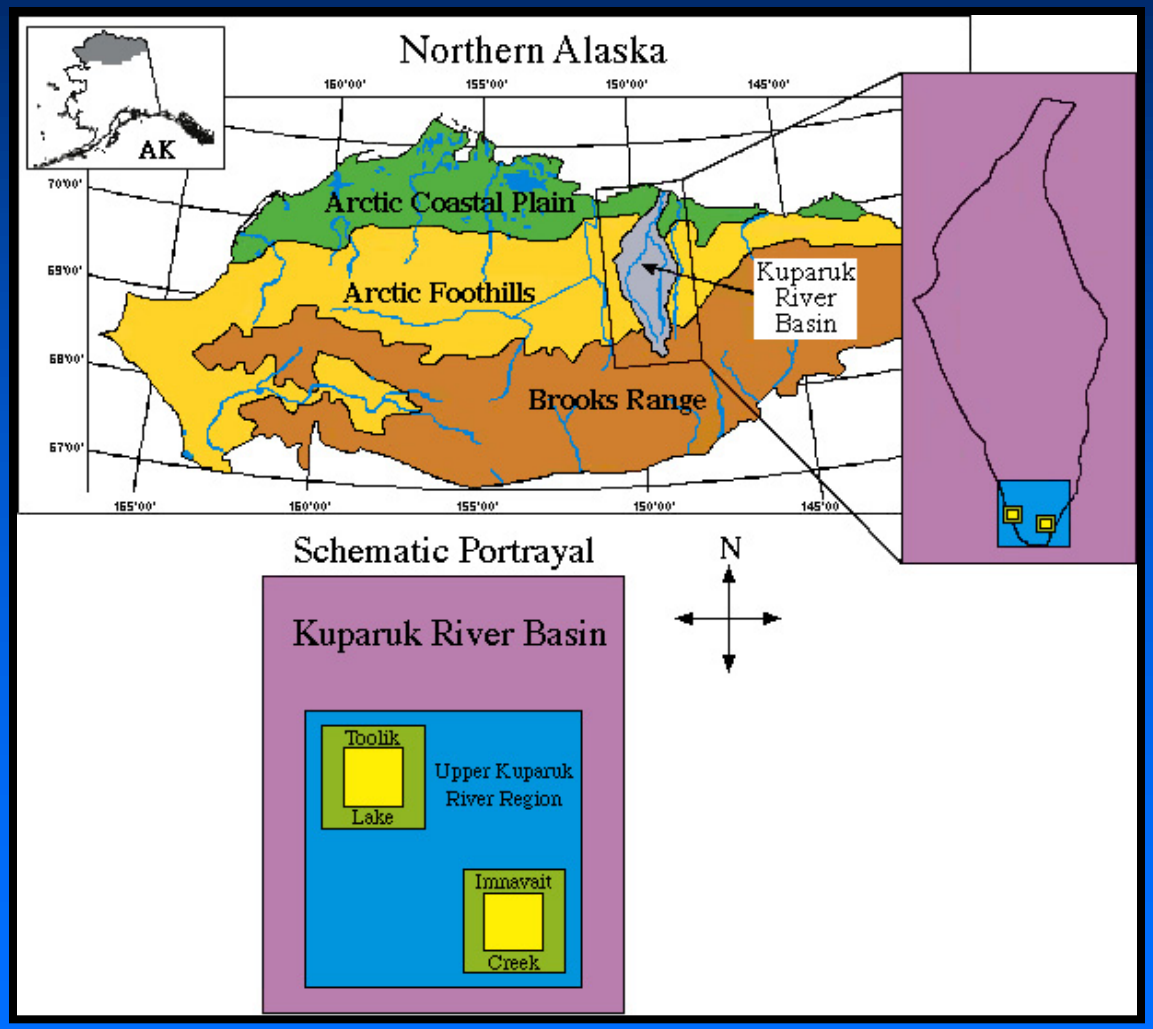



# Kuparuk River basin: hierarchy of map scales

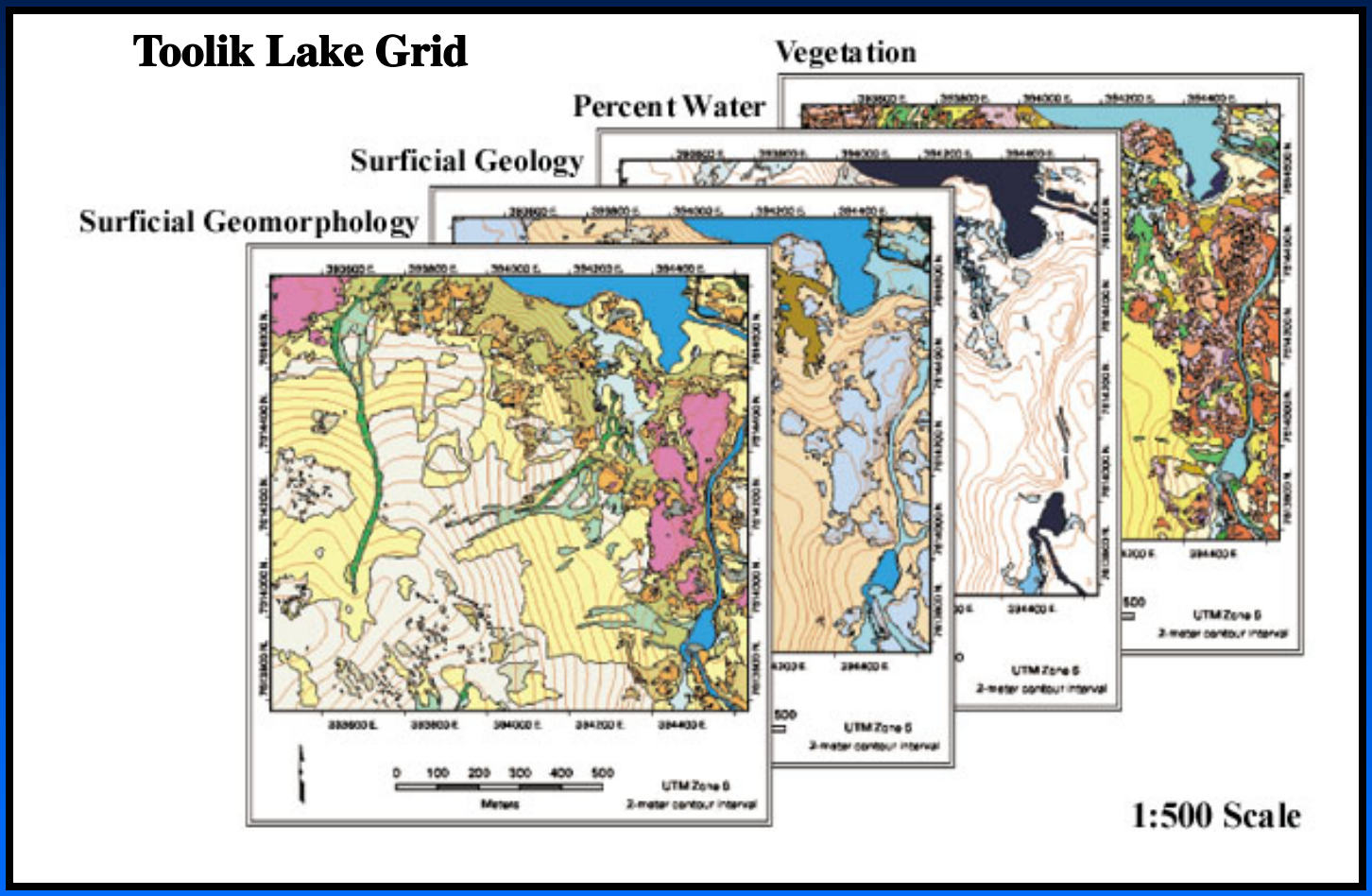
- Up to 8 scales of data available in the Kuparuk River region
- Plot to global scales
- Part of the Toolik Lake LTER and ARCSS ATLAS projects



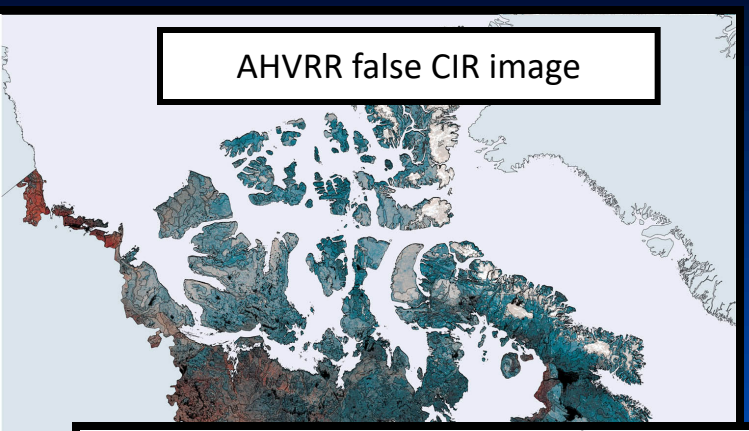
# Hierarchy of Databases for the Kuparuk River basin

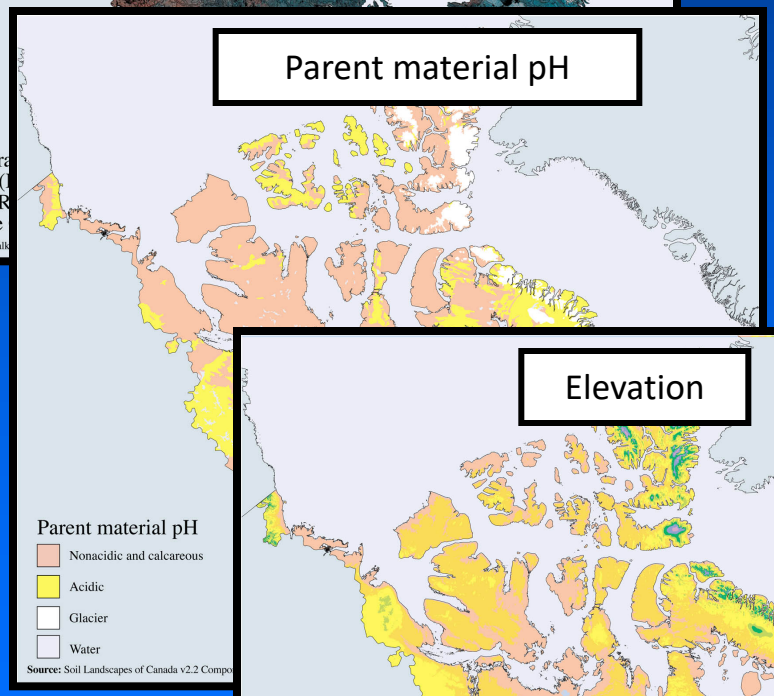


# Depth dimension: Map themes or attributes



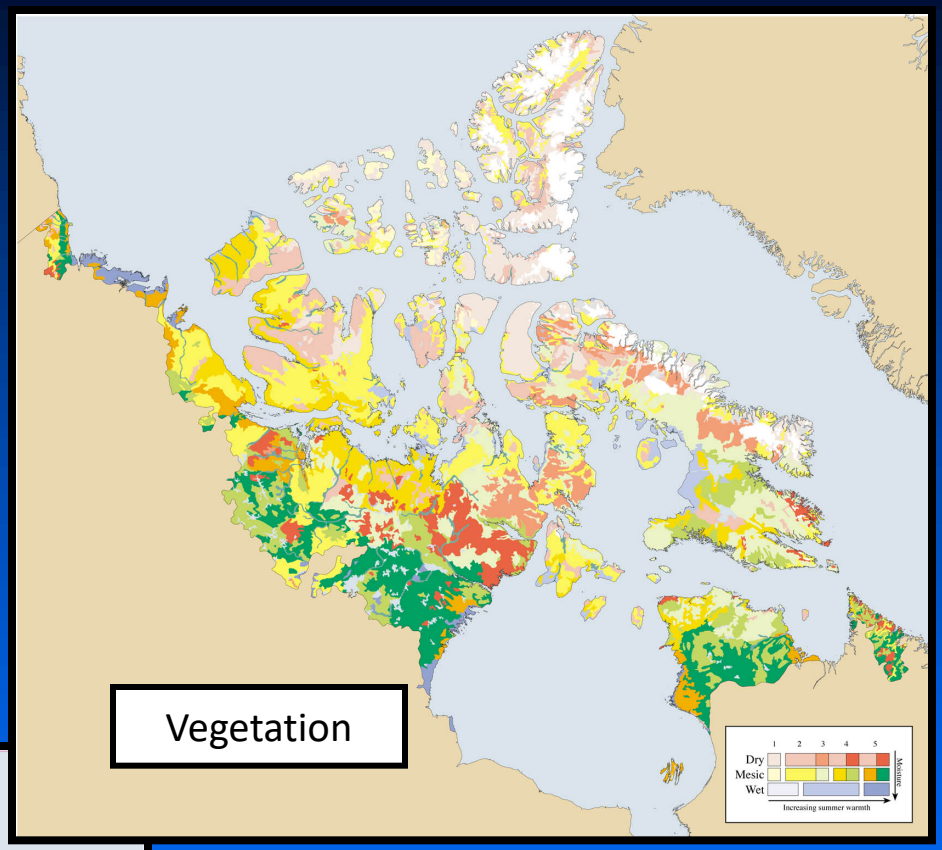
# Regional maps: Canada





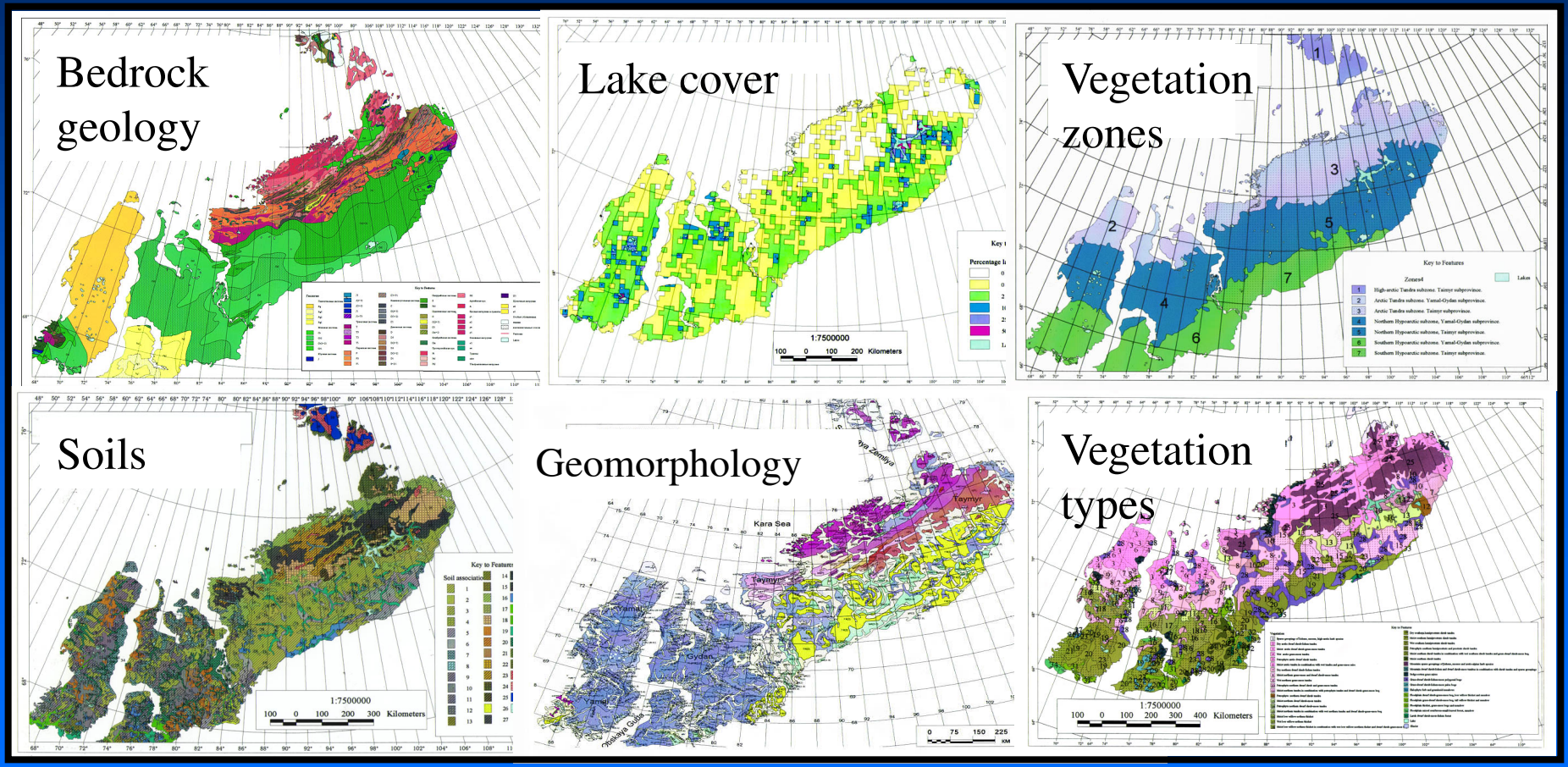





Gould and Raynolds, in prep.

- Component of the Circumpolar Arctic Vegetation Map
- 1:4.5M scale

# West Siberia and the Taimyr Peninsula, Russia




N. Moskalenko et al., in progress

# Derived maps: Northern Alaska

Horizontal structure

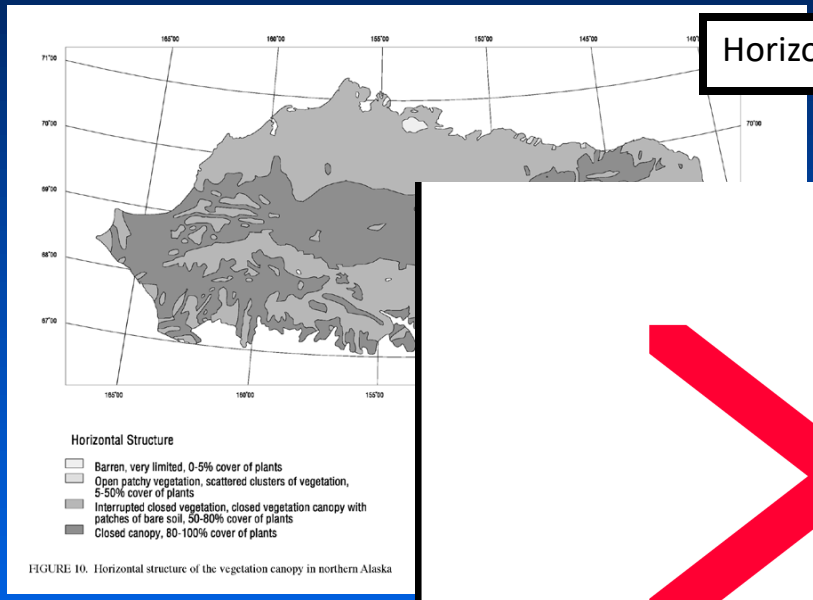
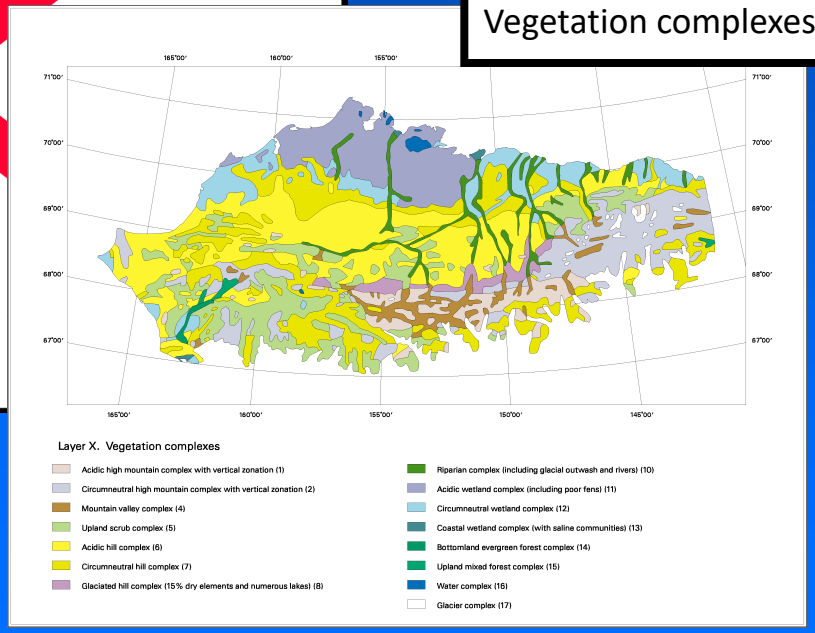



FIGURE 10. Horizontal structure of the vegetation canopy in northern Alaska

Biomass

Vegetation complexes

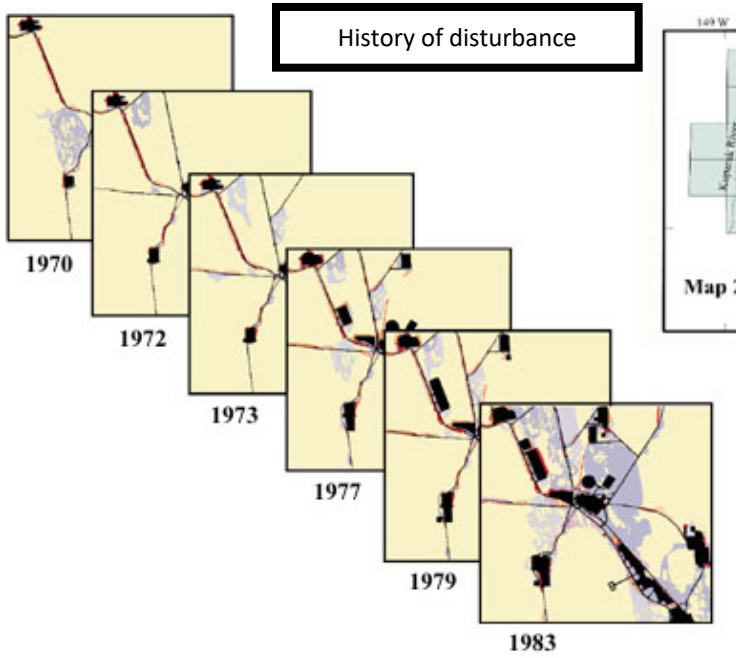


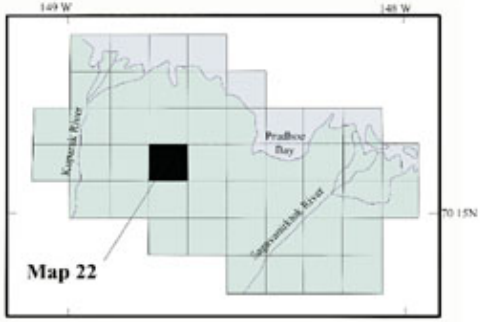

- Maps based derived from look-up tables
  - Maps derived from models

Walker 1999

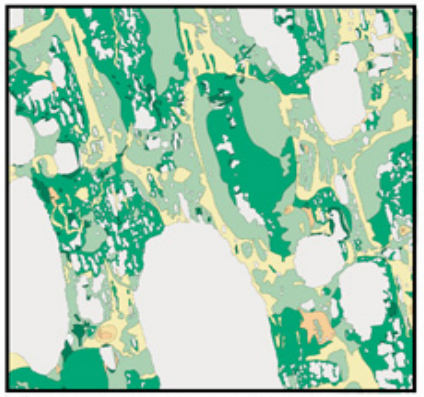
# Time dimension: Historic changes

History of disturbance

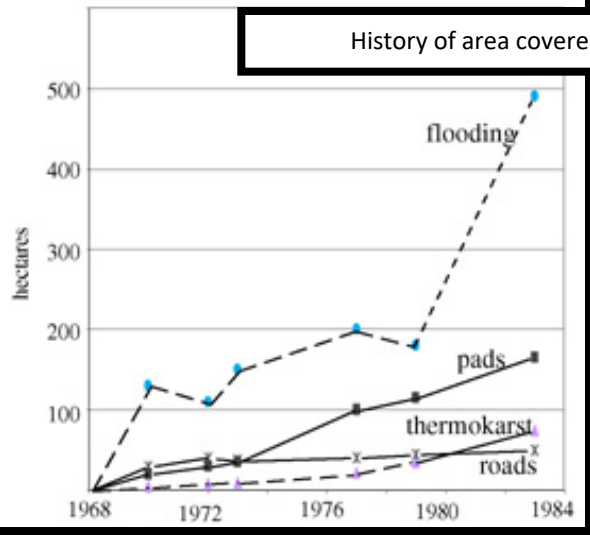



Predevelopment vegetation



History of area covered by four disturbance types

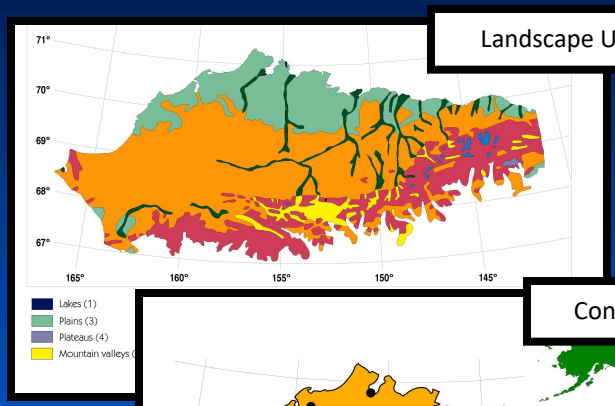



- 1:6000-scale mapping of the Prudhoe Bay Oil Field
- Cumulative impacts of oil field development

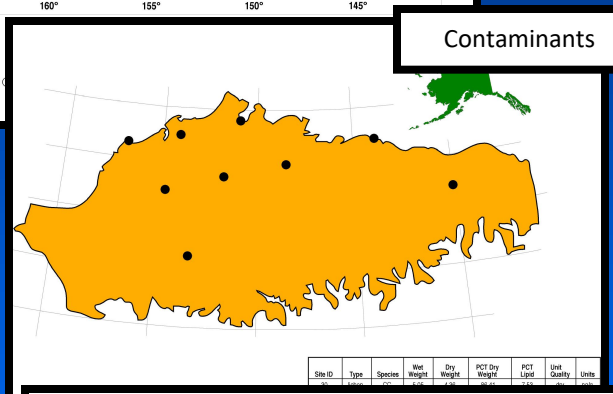
# Circumpolar Arctic Geobotanical Atlas

# GIS is key tool for answering scientific and societal questions

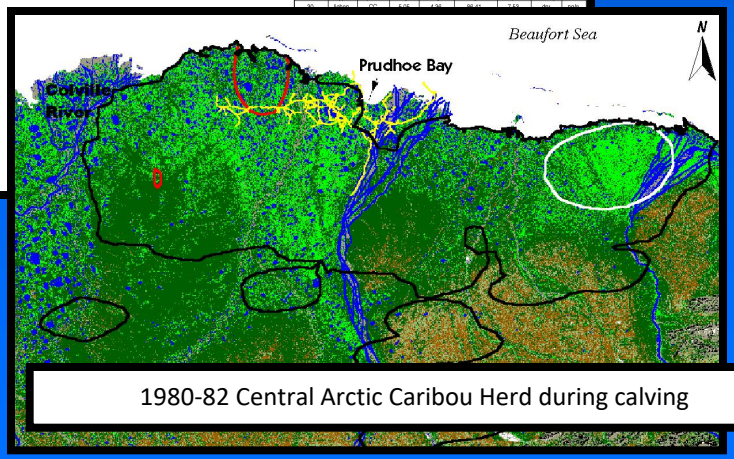
Societal concerns regarding caribou




Landscape Units



Contaminants




1980-82 Central Arctic Caribou Herd during calving

## For example:

- Is there a relationship between vegetation, water cover, topography and caribou calving success?
- Is the distribution of atmospherically-transported contaminants controlled by the Arctic Front? And are levels of contaminants related to phytogeographic subzones?
- Is there any danger from contaninants in eating caribou hunted during the migration of the Central Arctic Herd?

# Some key issues for an Arctic GIS Network

- Participation
  - How to involve the community in the process?
  - What defines a valuable member?
  - What technology is required to be a useful participant?
- Resources
  - Resources for research and education.
  - Resources for operations: data system development and infrastructure.
  - Long-term commitment and support.
- Data issues
  - Distributed vs. centralized data holdings.
  - Catalogs and/or measurements.
  - User services.
  - Security and access.
  - Publishing and sharing.
  - Effectiveness metrics.