Ecosystem Services: Linking Community Observations and Scientific Monitoring

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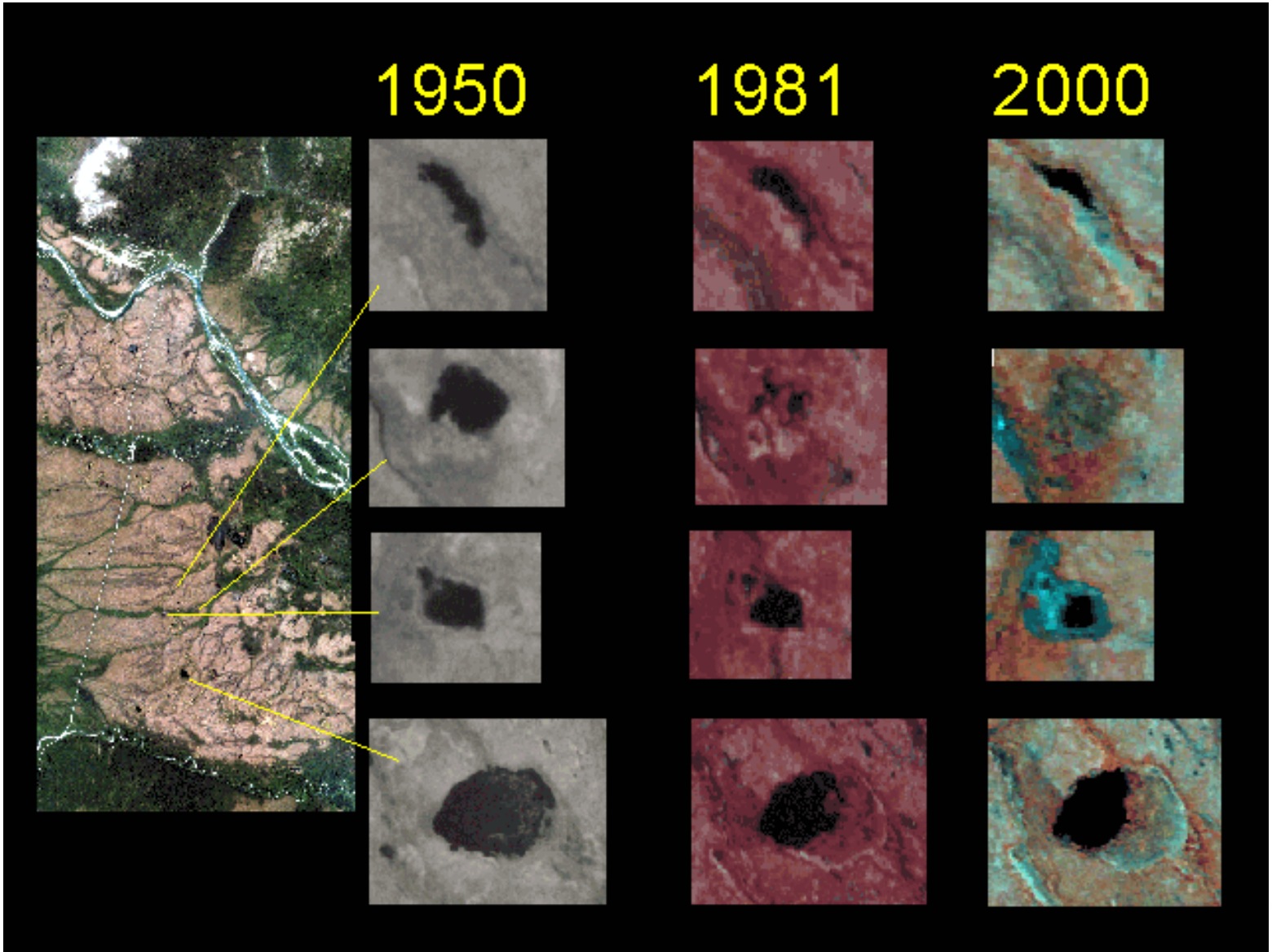
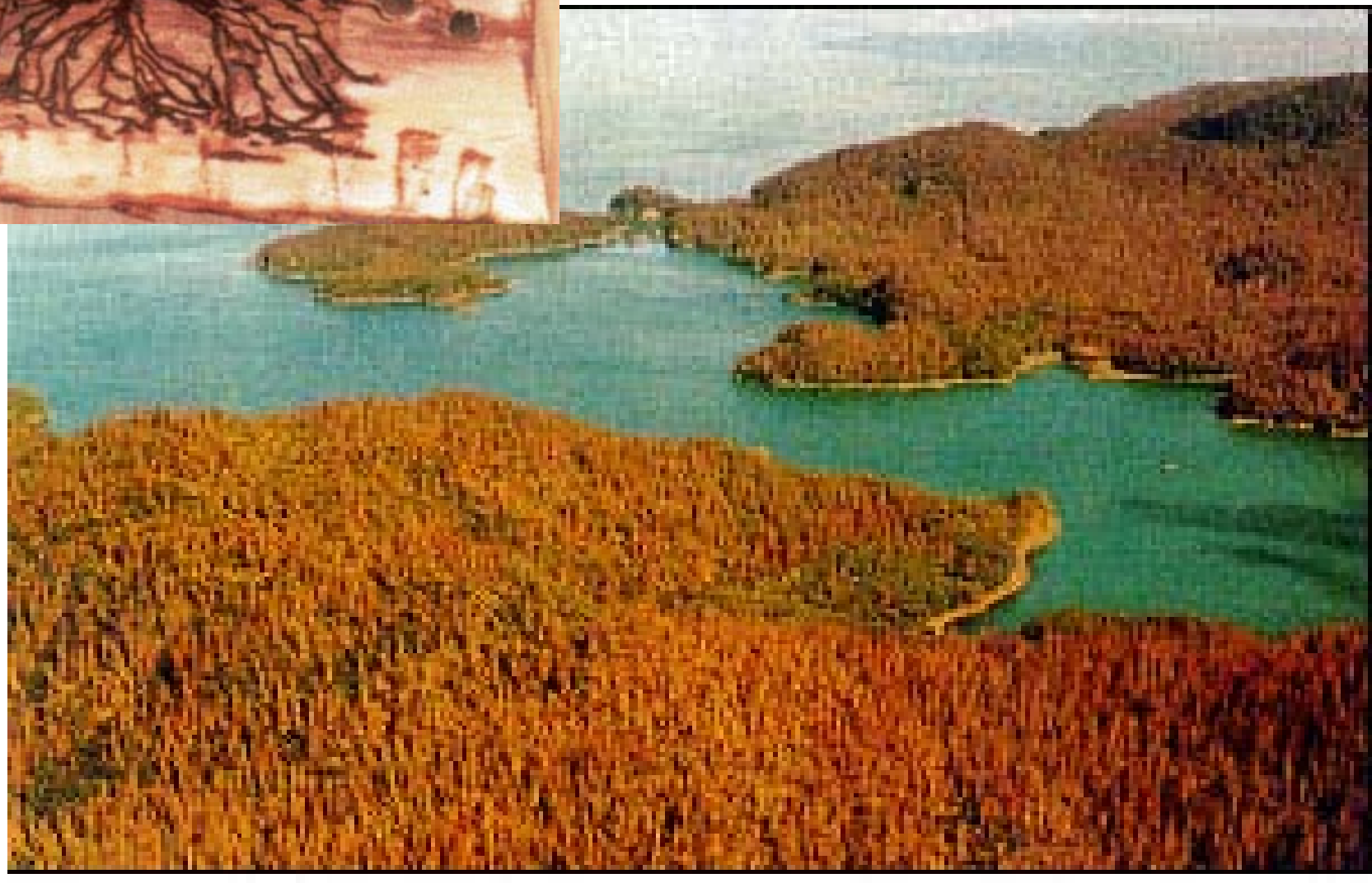
Ecological consequences:
The land is getting drier in places



Hinzman et al. 2005

Torre Jorgenson

Kenai bark beetle outbreak



Monitoring challenges facing Alaska

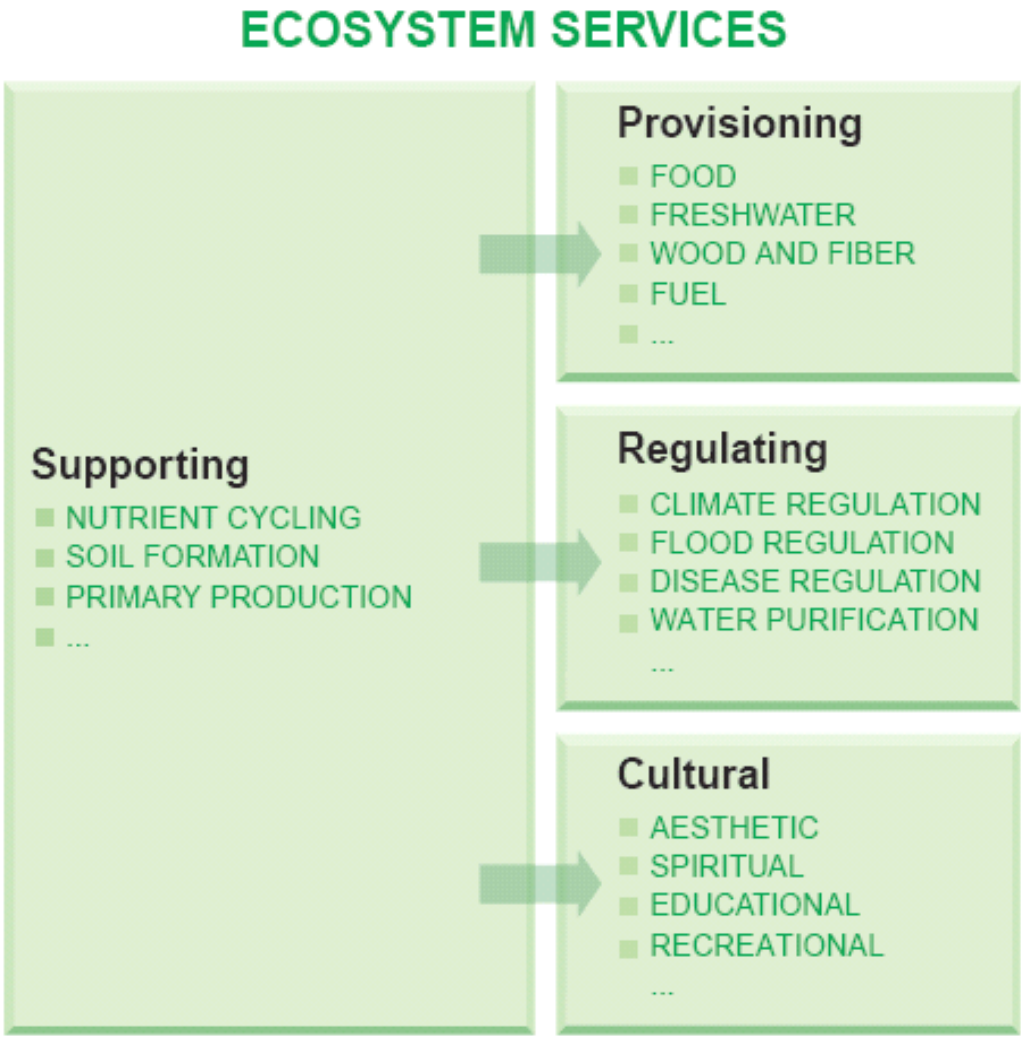
- Huge area
- Access is expensive and difficult
- Limited background data
- Complex changes require broad monitoring effort
- Societally important results are needed now

Potential approaches

- Include ecosystem services (ecological benefits to society) as an integral component of the monitoring
- Engage rural communities in monitoring efforts
- Link community monitoring of ecosystem services to rigorous scientific sampling of a few key variables at a few sites (agency monitoring).

Sustaining Ecosystem Services:

The benefits people obtain from ecosystems



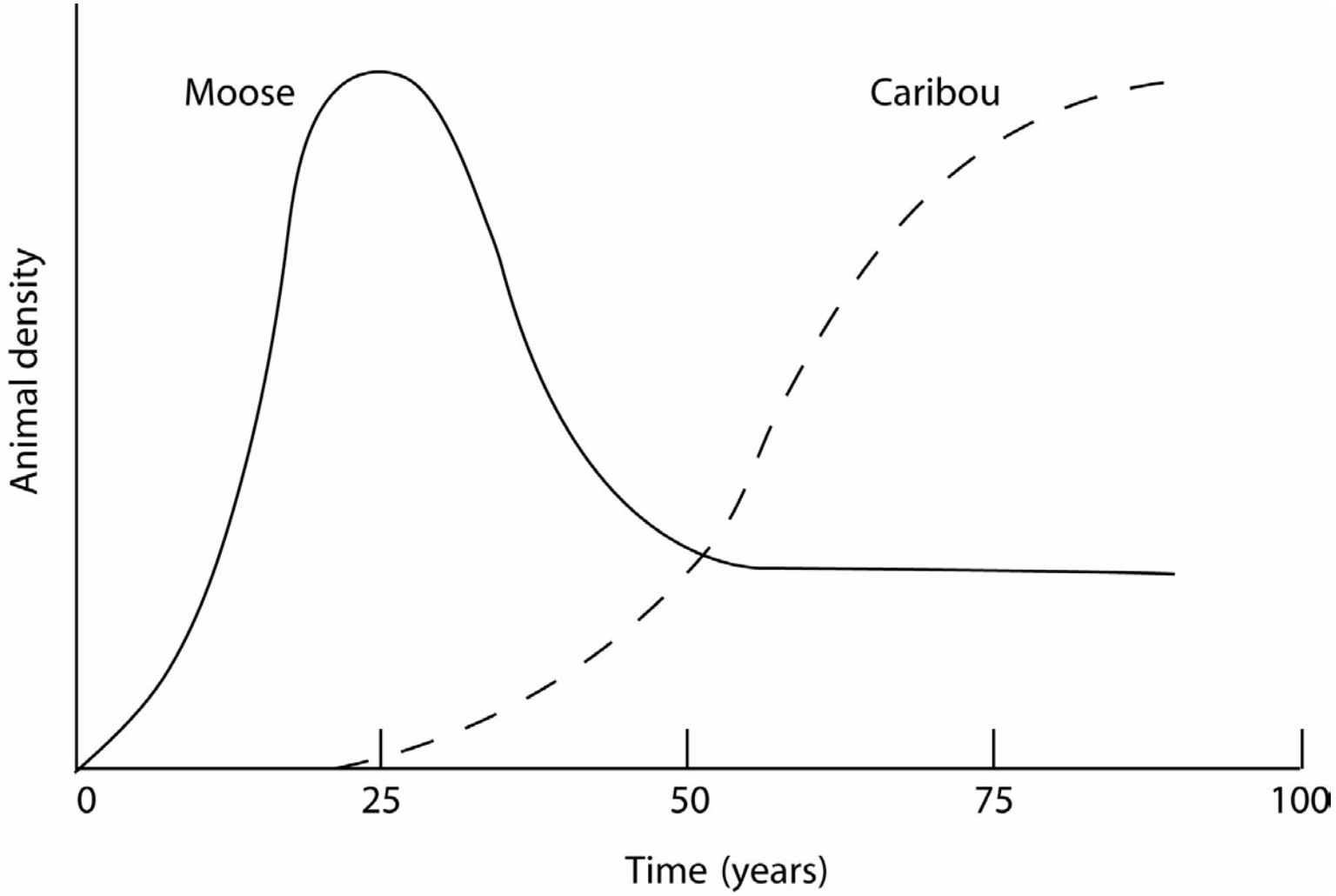
Millennium Ecosystem Assessment 2005

Subsistence is still an essential aspect of village life

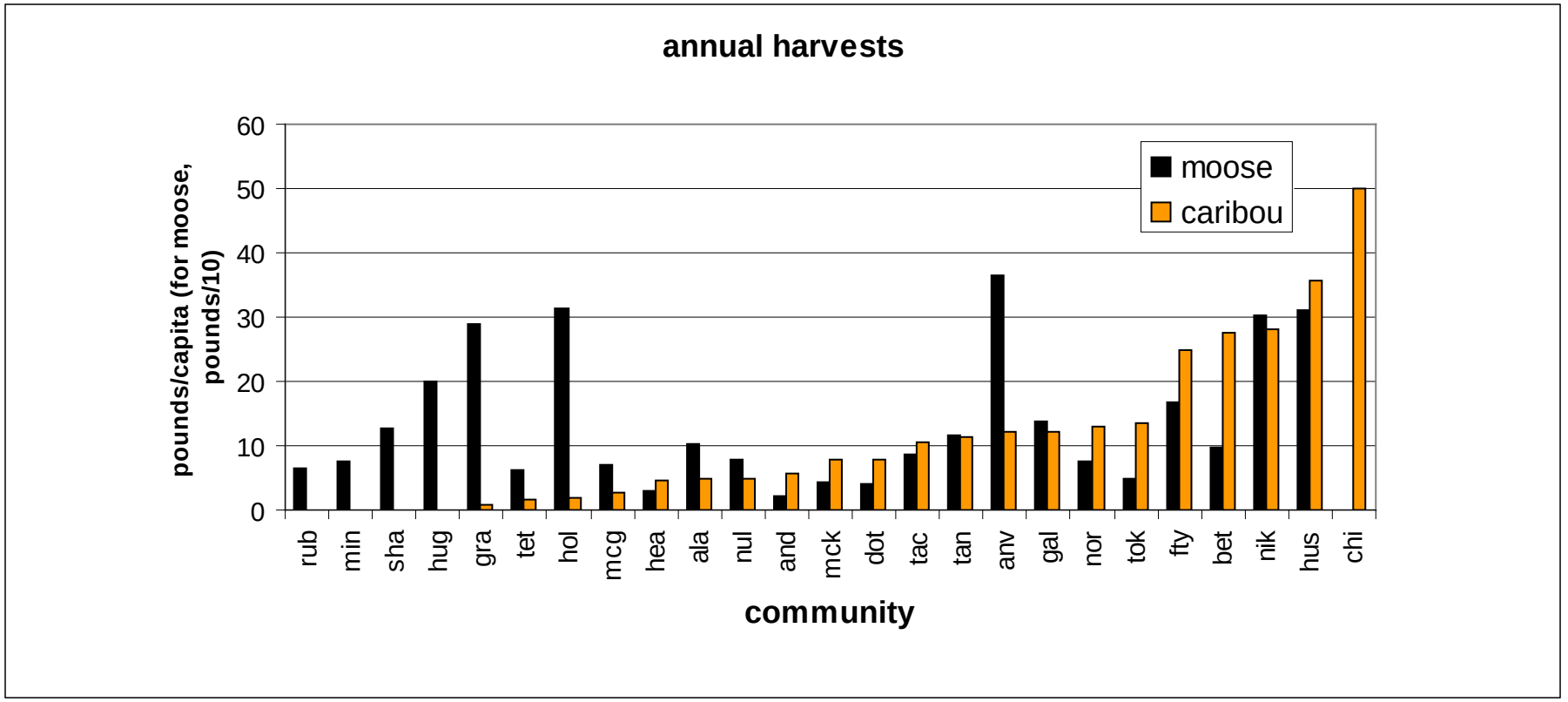
Rural communities have locations fixed by infrastructure

People's fine-scale relationship with fire has changed over time

- Pre-contact: Mobile family groups
  - People adjusted to fire regime
- 1950s: Consolidation in permanent settlements
  - Fire affects communities

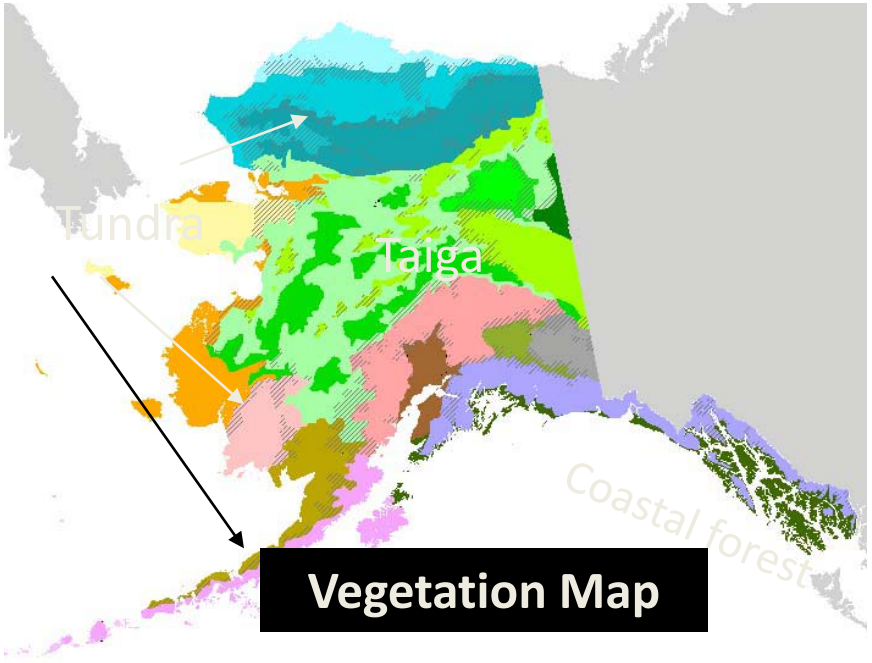

Moose
Caribou
Animal density
0
25
50
75
100
Time (years)

Communities differ in moose/caribou dependence

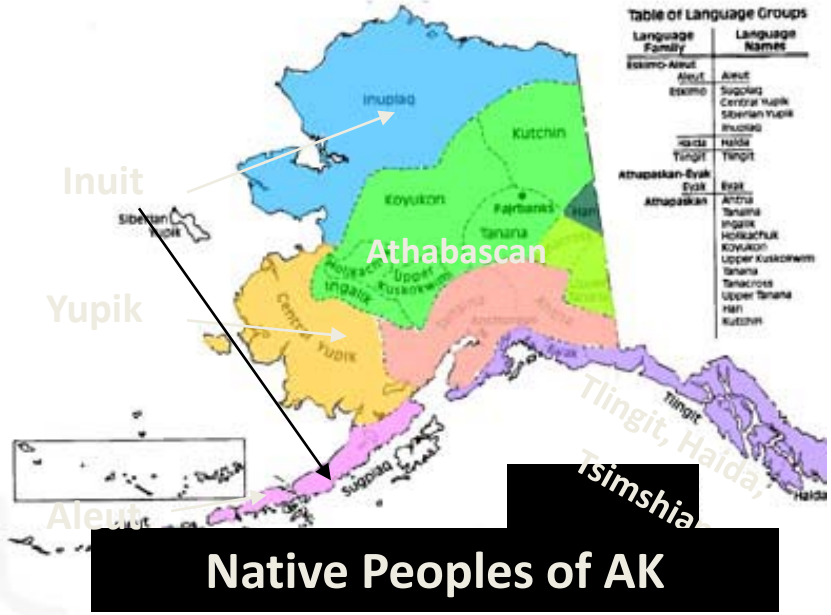


Close connection between ecology and culture

If we change ecology, what happens to culture?



Vegetation Map



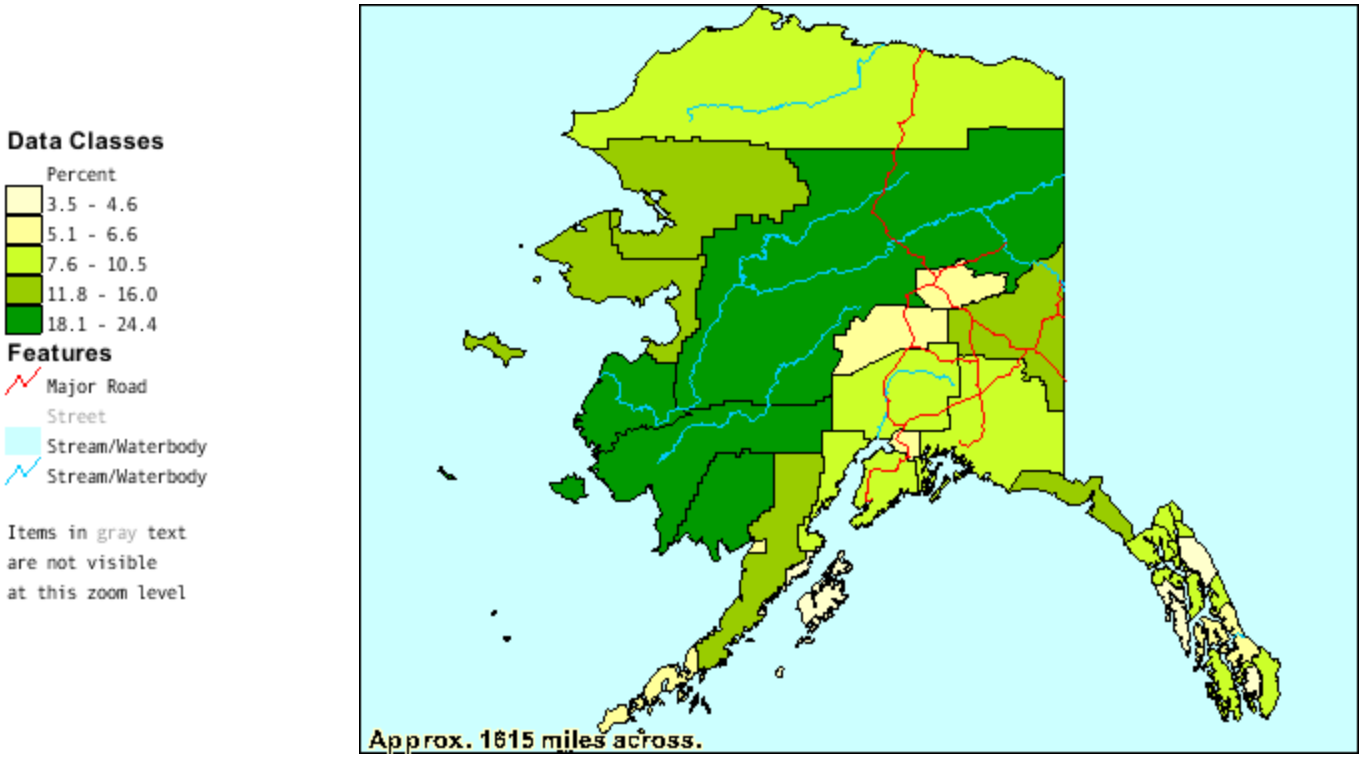
Native Peoples of AK

Mimi Chapin

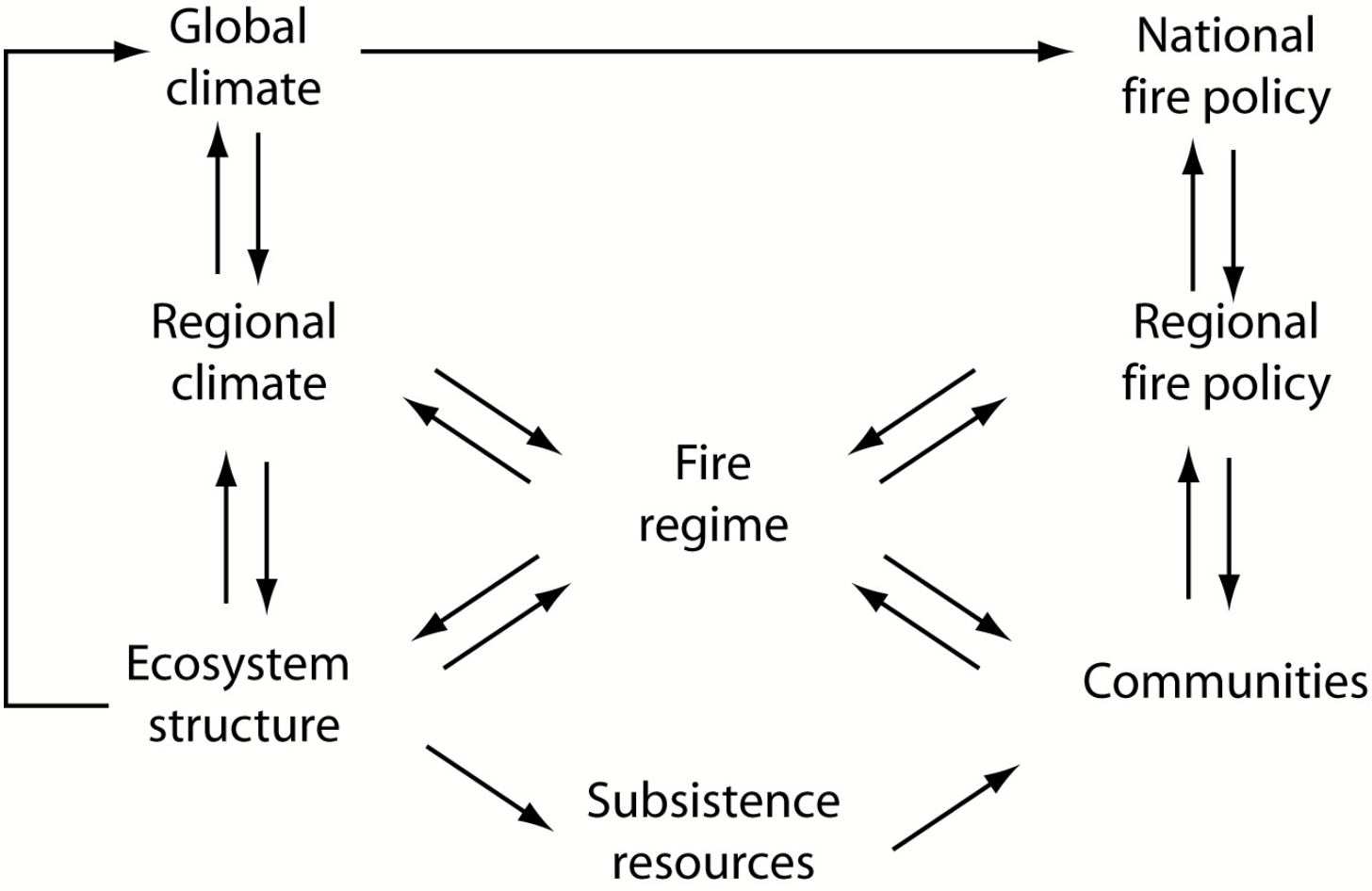
Understory Plants

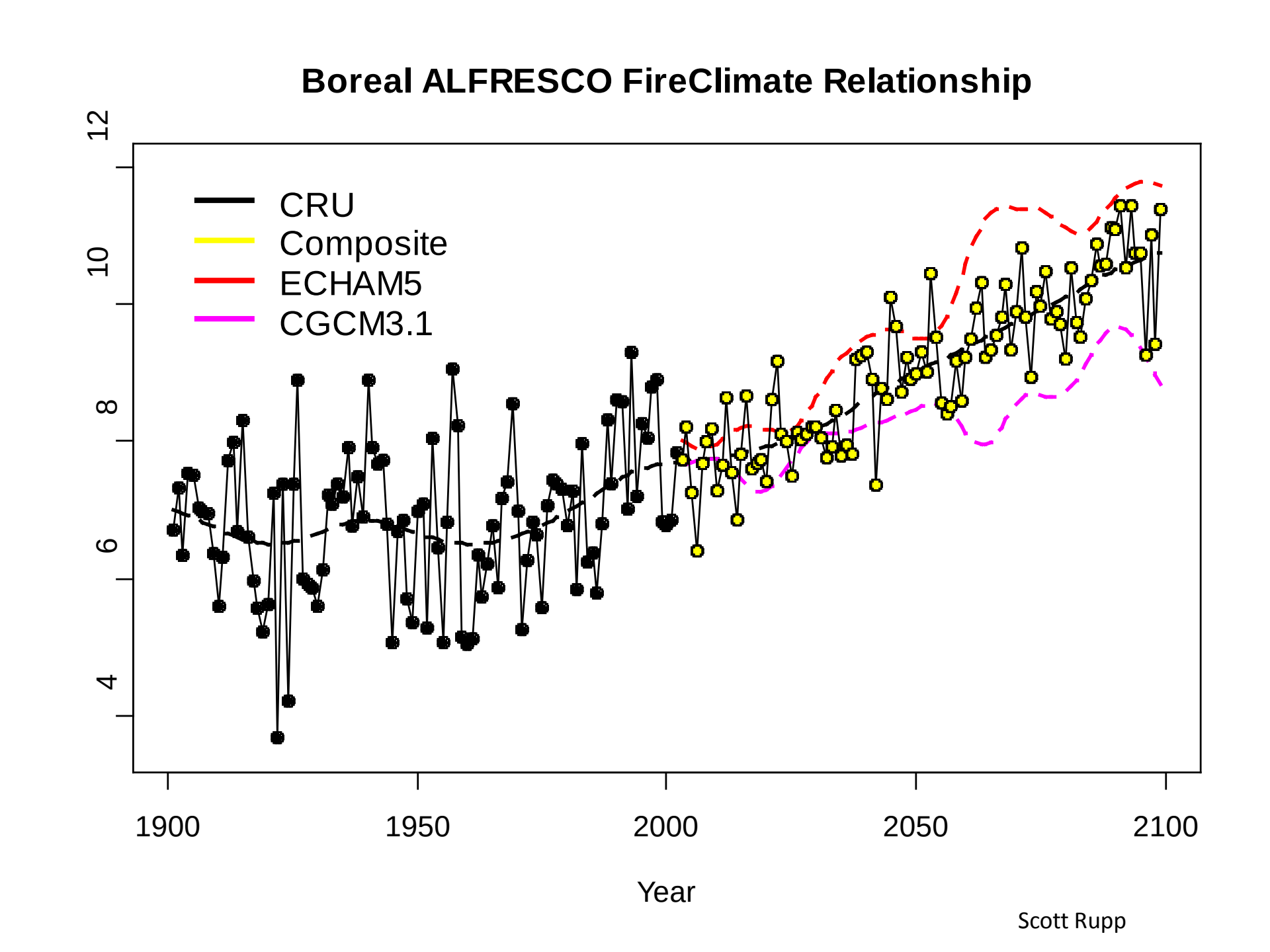
- *B*erries
  1. bog blueberry
  2. low-bush cranberry
  3. high-bush cranberry
  4. crowberry

Percent of Families Below the Poverty Level in 1999: 2000



U.S. Census, **TM-P069.**


Global climate
National fire policy
Regional climate
Regional fire policy
Fire regime
Ecosystem structure
Communities
Subsistence resources


Boreal ALFRESCO FireClimate Relationship
CRU
Composite
ECHAM5
CGCM3.1
12
10
8
6
4
1900
1950
2000
2050
2100
Year
Scott Rupp

Measurement of climate feedbacks:

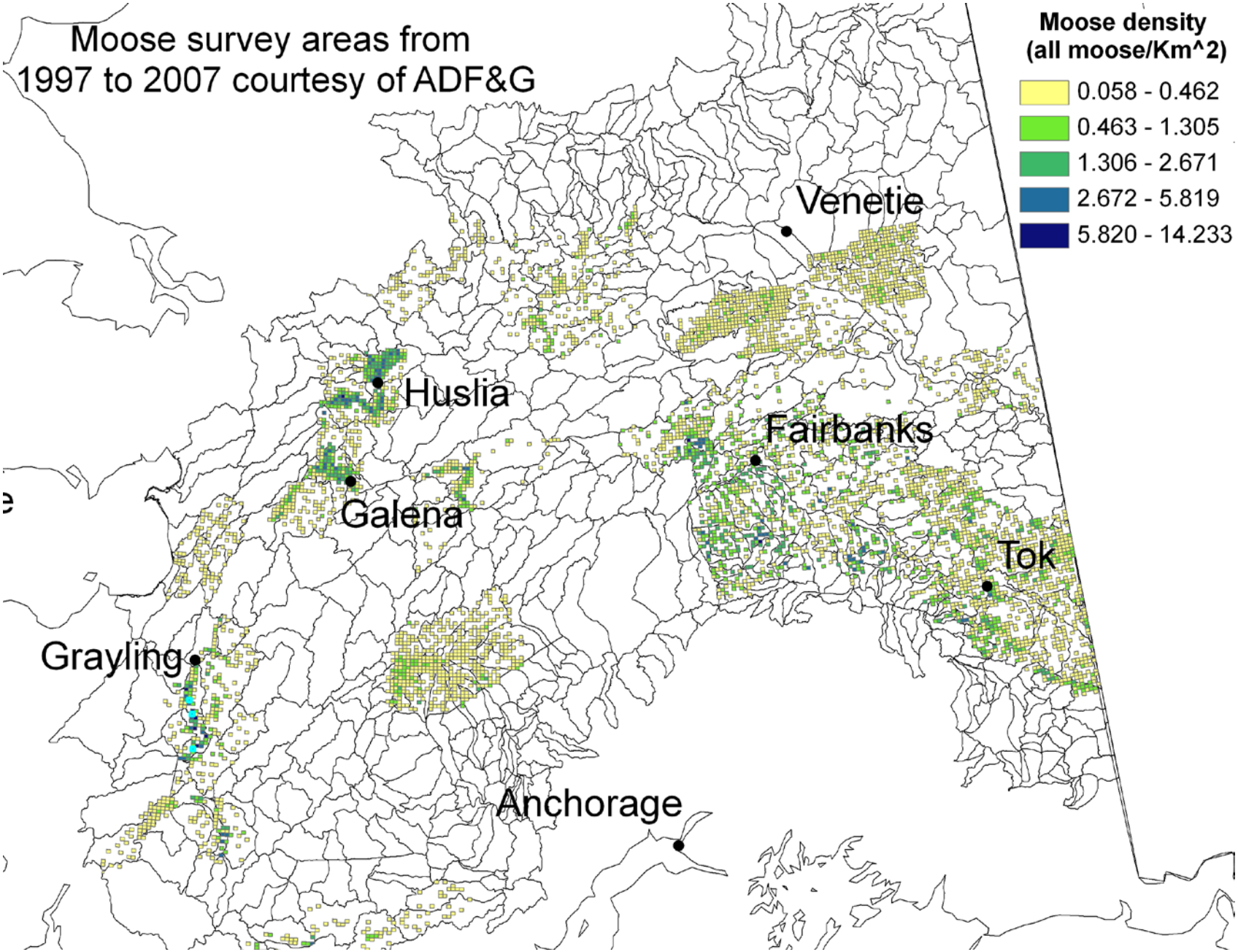
- **Less C storage**
  - **+ feedback**
- **Less energy absorbed**
  - **- feedback**

IPY Ecosystem Services project

- Approach
  - Communities define ecosystem services of concern (e.g., moose, berries, fire risk)
  - We project changes in habitat and accessibility
  - Communities develop climate-change adaptation plans
- Collaboration
  - Wildlife biologists and fire managers
  - Communities

Services identified by villages

- Wainwright
  - Walrus, ring seal
  - Caribou, fish
- Venetie
  - Moose, caribou
  - Salmon
  - Firewood, berries


Moose survey areas from
1997 to 2007 courtesy of ADF&G
Moose density
(all moose/Km^2)
0.058 - 0.462
0.463 - 1.305
1.306 - 2.671
2.672 - 5.819
5.820 - 14.233
Venetie
Huslia
Fairbanks
Galena
Tok
Grayling
Anchorage

Projected wildlife changes
(e.g., moose)

- Document historical relationship between climate, habitat, and moose
  - Basis for “rules” that predict moose distribution
- Projected changes in climate and wildfire
- Projected changes in habitat and moose distribution
- Rules that predict hunter harvest
  - Distinguish between local and non-local hunters
    - Changes in traditional use areas
  - e.g., distance from road/river, transport mode

Examples of moose-habitat rules

- Climate unfavorable to moose
  - Summer > 23F (-5C); Winter > 57F (14C)
  - Snow >70 cm
- Moose habitat choice
  - Move into burns if moose density high (average distribution pattern)
  - Select habitat if snow <70 cm (seasonal variation in distribution)
- Moose prefer relatively recent burns
  - 11 to 25 years
- Moose favor edge habitat and unburned patches within a burn
- Hunter behavior
  - Concentrate near roads and rivers
  - Influence of weather (e.g., warm fall, early snow) on harvest level
  - Influence of gas price/employment on harvest level


Arctic Borderlands
Ecological Knowledge Co-op
Welcome

Goals of the Coop

- Monitor and assess ecosystem changes
- Use/encourage use of science- and local knowledge-based studies
- Improve communications and understanding
- Foster capacity-building and training opportunities

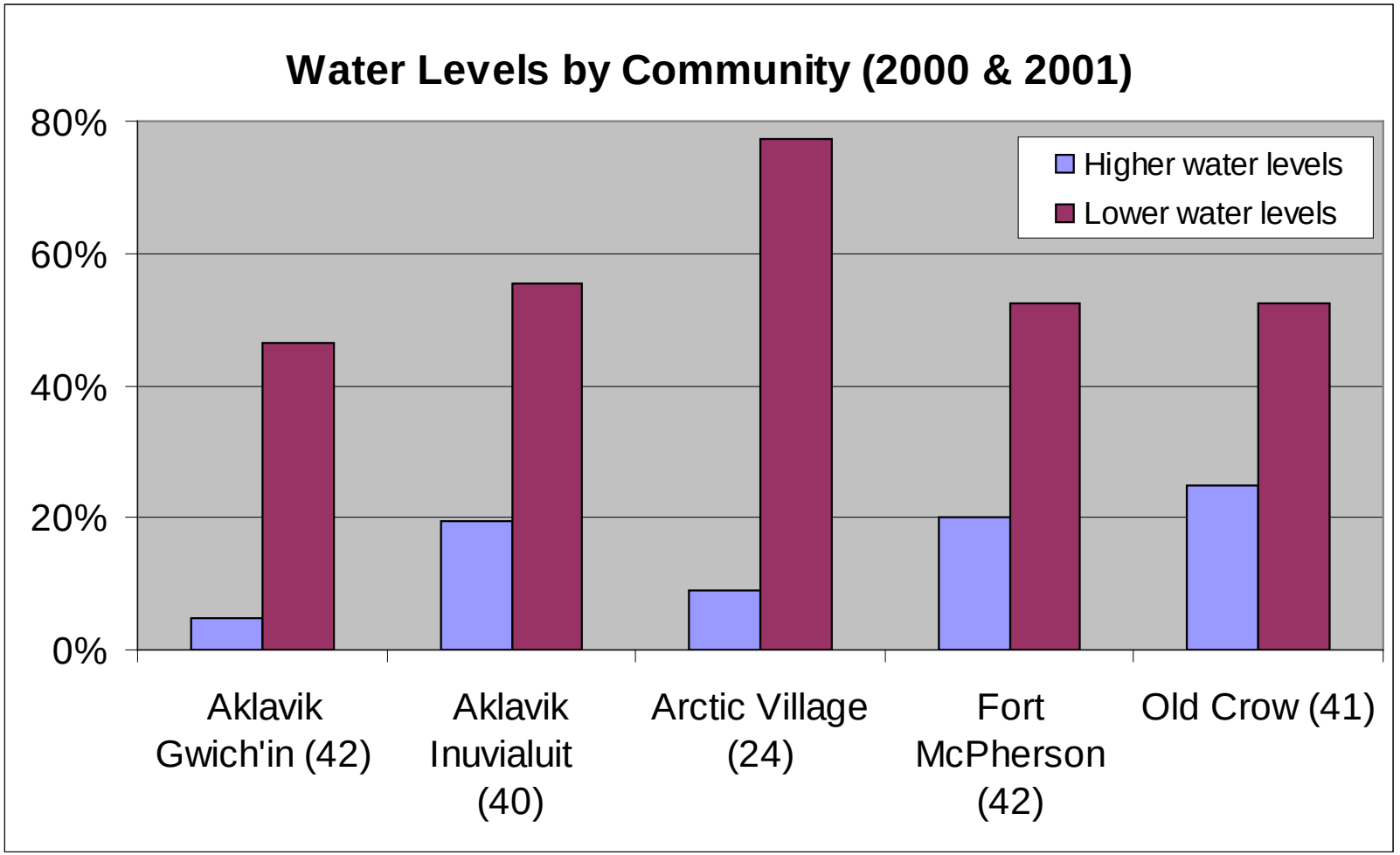
Participating Communities

Community	Years Participated	# Experts Interviewed
Aklavik Gwich'in	1996-2007	178
Aklavik Inuvialuit	1996-2007	216
Old Crow	1996-2007	253
Fort McPherson	1996-2007	220
Arctic Village	2000-2007	136
Inuvik Gwich'in	2003, 2006, 2007	35
Inuvik Inuvialuit	2003, 2005-2007	74
Tsiigehtchic	2003, 2004, 2006, 2007	75
Tuktoyaktuk	2003-2007	85
	Total	**1270**

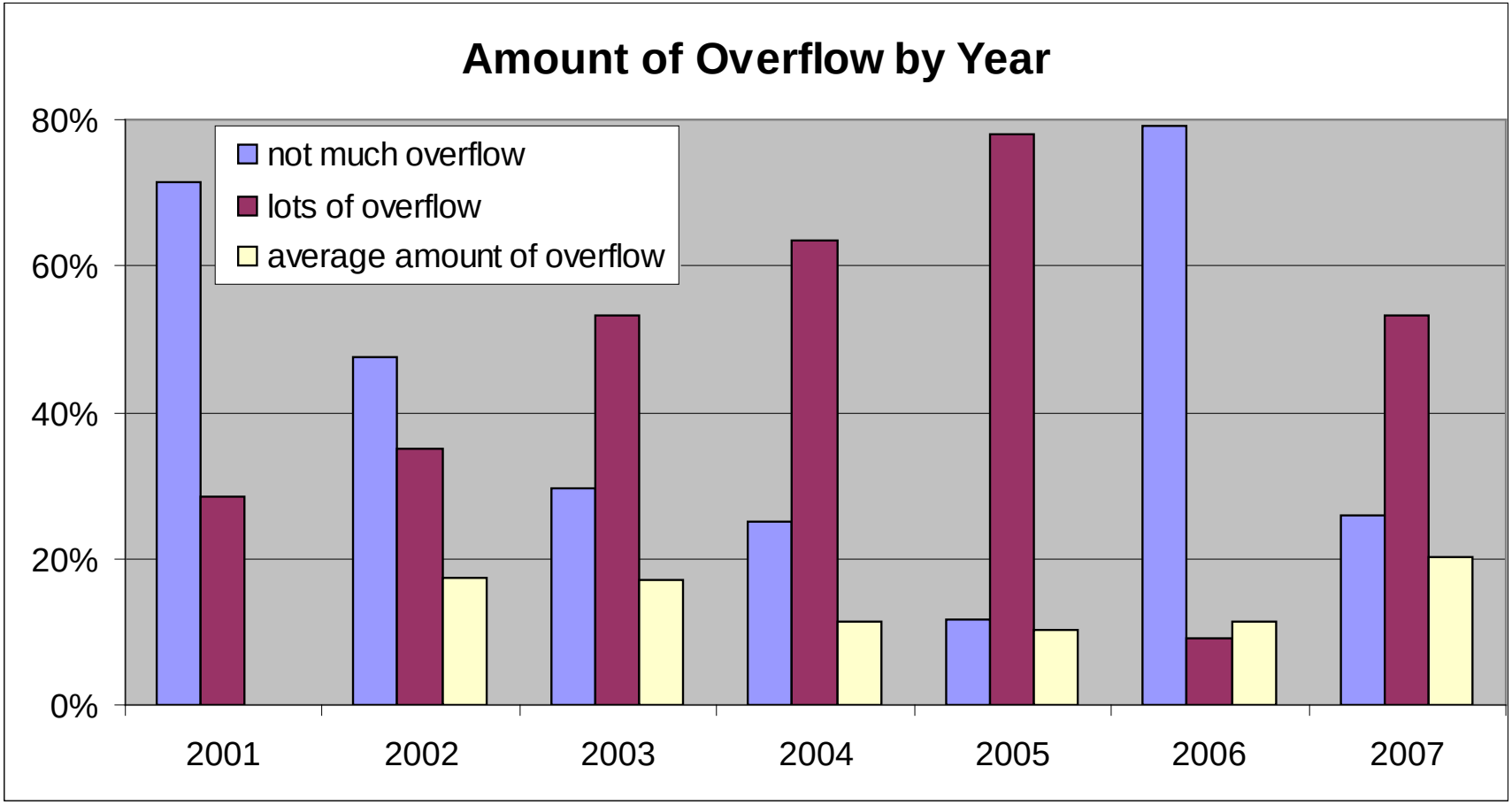
Topics Covered through Community-based Monitoring Program

- **Local Experts**
  - Age categories
  - Time on the Land
  - Language Use
  - Lifetime and annual area travelled
- **Comments on the Co-op**
  - Suggestions for the program, for questions
  - Information needs
  - Evaluation
- **Weather, General Environment**
  - Unusual weather
  - Conditions at different times of the year
  - Freeze-up and break-up timing and conditions
  - Effect of weather on animals and on people getting out on land
  - Changes in plants
  - Permafrost changes
- **Berries**
  - Meeting needs for berries
  - Quality, amounts, what affected berry crops
- **Fish**
  - Important species
  - Fish quality, including livers, parasites
  - Fish runs: numbers, timing
  - Meeting needs for fish
- **Caribou**
  - Migration and movement patterns
  - Availability to communities and meeting needs
  - Body condition (seasonally)
  - Unusual observations
  - Sightings of groups - locations and timing
  - Calves and calving conditions
  - Observations of predation and disease
- **Other animals**
  - Hares, lynx, bears, wolves, wolverine, moose, muskoxen, ground squirrels, muskrats, marine mammals, waterfowl, other birds, insects
  - Trapping and furbearers: reasons why trapping is good/bad, fur quality, furbearer numbers
  - Other observations on animals
- **Observations**
  - Culture change
  - Hunting and fishing
  - Employment and economy
  - Environment (in general)
  - General observations
  - Levels of different types of human activities and impacts on environment

Have you noticed changes in the water levels of your region? (2000 & 2001)



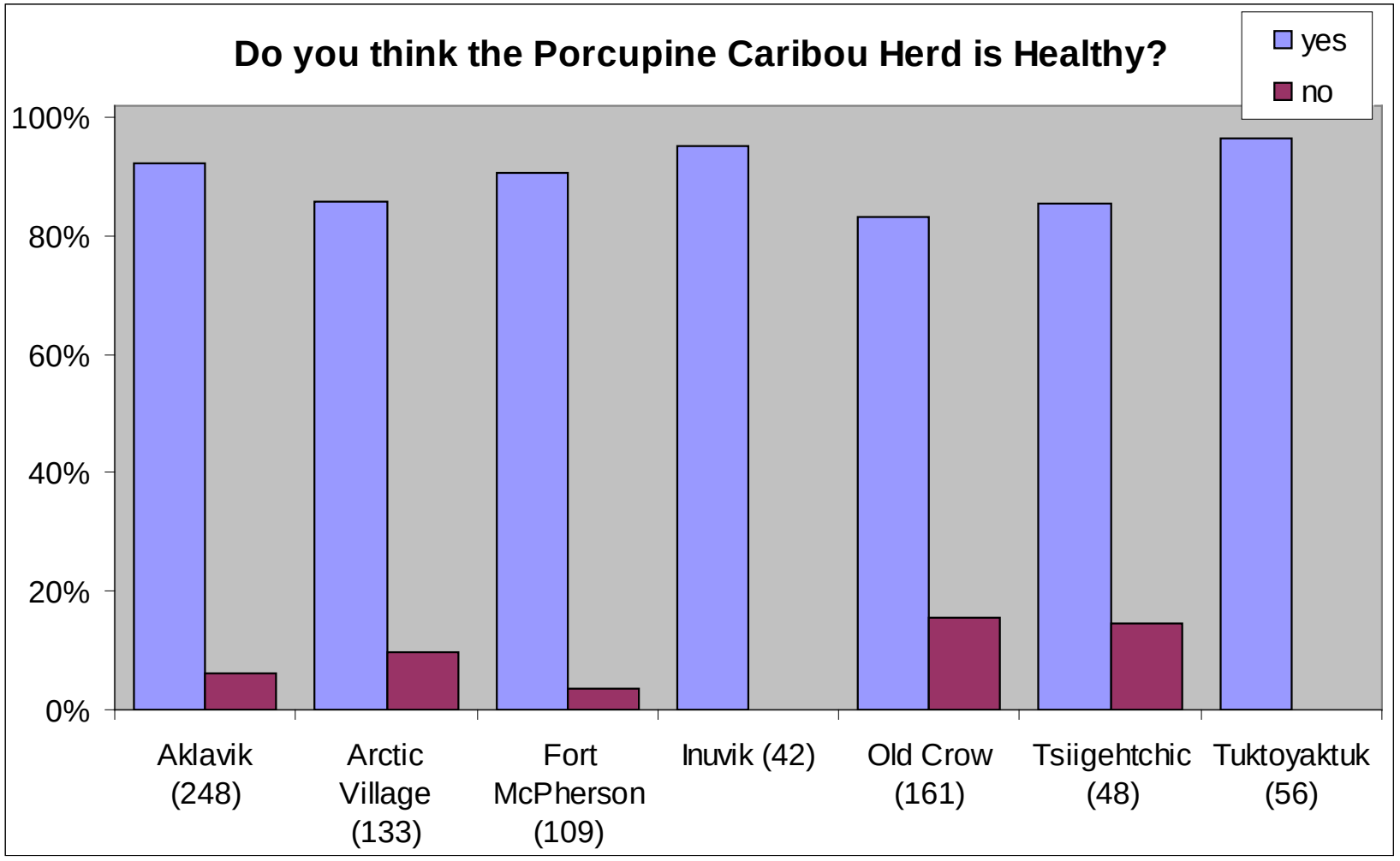
How has the overflow been this year?



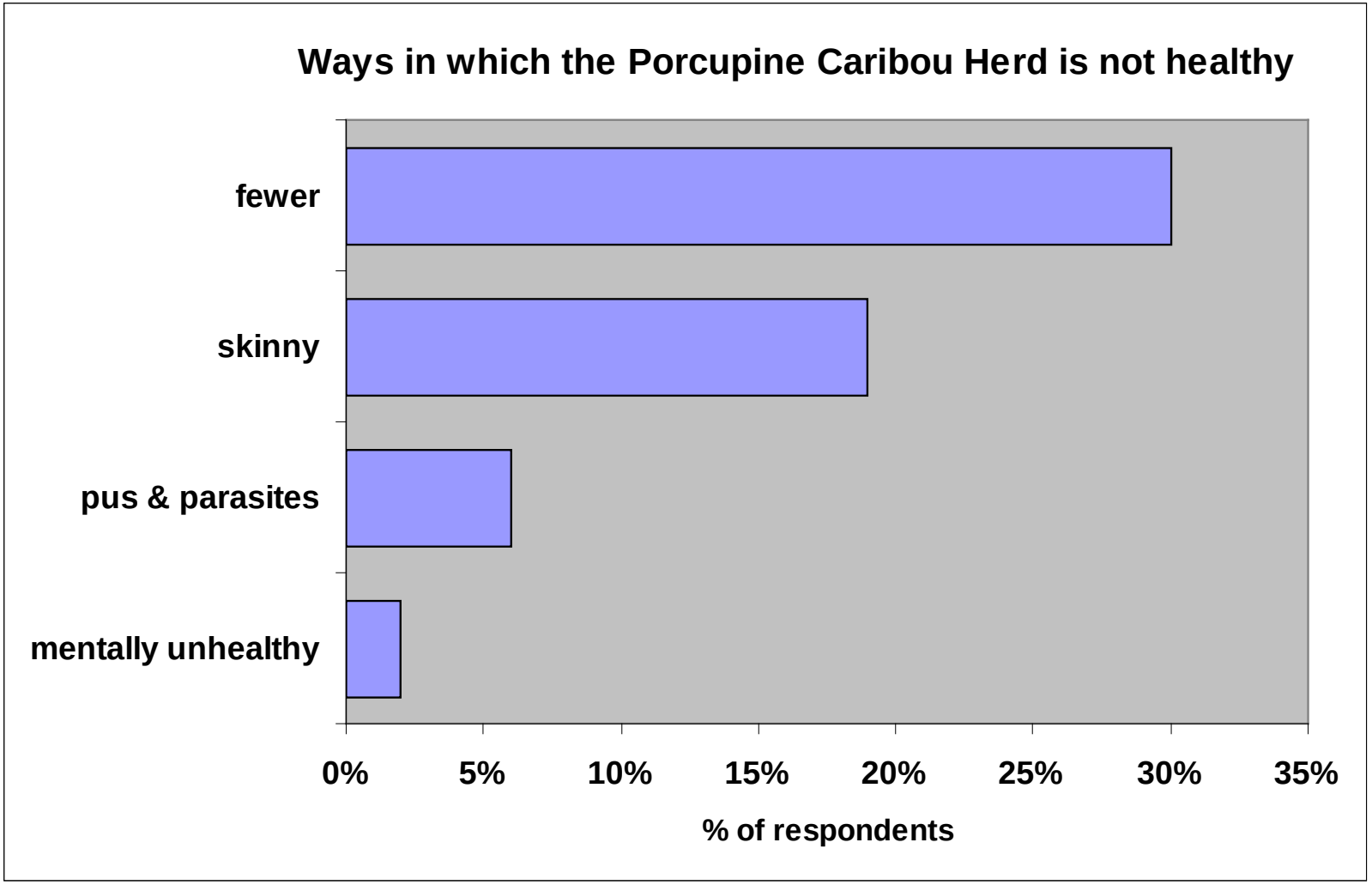
Comments about Overflow
2006-07

- None because not enough snow to cause overflow (Arctic Village)
- Hardly any this fall because hardly any snow (Inuvik Gwich'in)
- Some overflow on lakes even when no snow because maybe global warming, maybe permafrost bottom is still warm; water coming from under banks (Aklavik Gwich'in)

Health of the Porcupine Caribou Herd (by community)



How is the PCH unhealthy?



Alaskan wilderness will change

- Climate and disturbance regime
- Biodiversity and species composition
- Subsistence use
  - Intensity of use
  - Type and technology of use
- Use by non-residents
  - Increased human population density
  - Reductions in global wilderness
- Importance of non-use

Community monitoring method

- Local interviewers,
- Questionnaire designed with community interviewers,
- “Local experts” chosen by local orgs.,
- Honoraria for contributors,
- Follow-up community meetings for internal review,
- Hard copy reports and database management.

Partnership

Five Local Communities

Native Organizations

Federal, State & Territorial Agencies

Co-management Bodies

Universities, Research Institutes