

Ecological and Societal Consequences of Warming in Alaska

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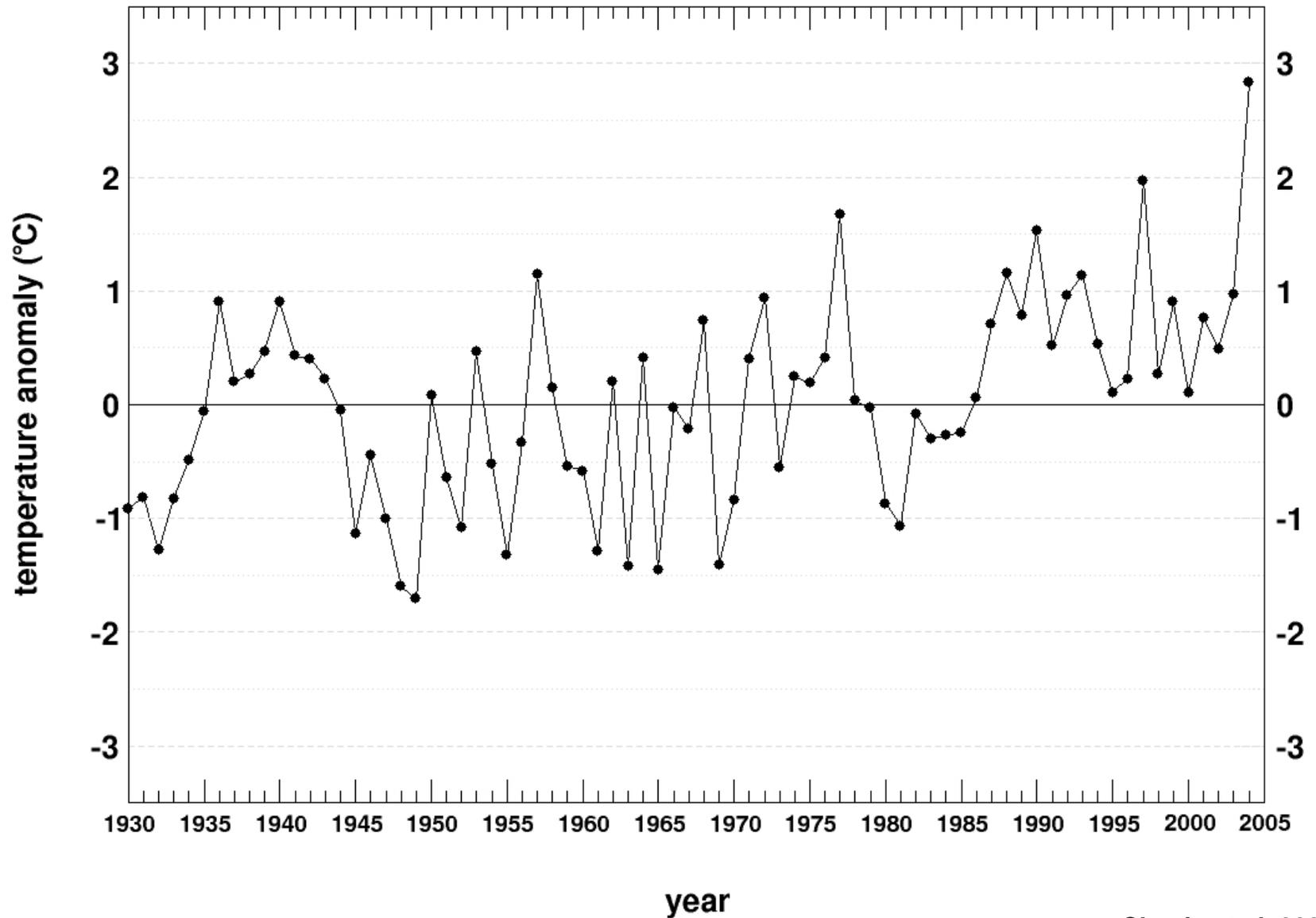
University of Alaska Fairbanks

Bottom line

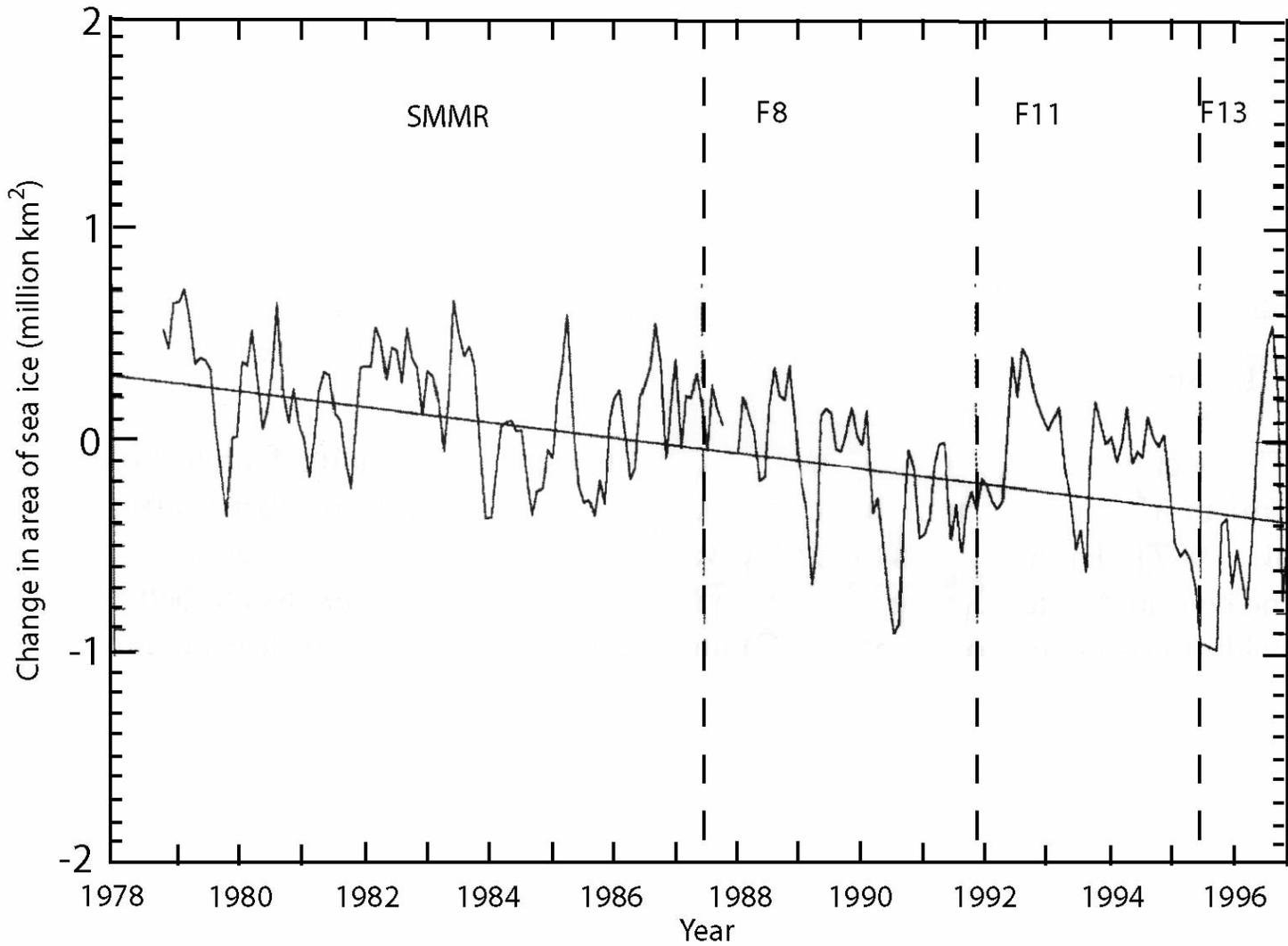
- Warming in Alaska will likely continue
- Important consequences for ecology and people of Alaska
 - Some effects positive, others negative
 - Some responsive to management actions
- UA now has mechanisms to quickly provide policy-relevant information
 - GINA, SNAP, ACCAP
 - Reducing climate-change impacts is now **THE** top research goal of many climate-change faculty
 - Change from even two years ago

Alaska surface air temperature anomaly

Summer (JJA) : 1930 - 2004



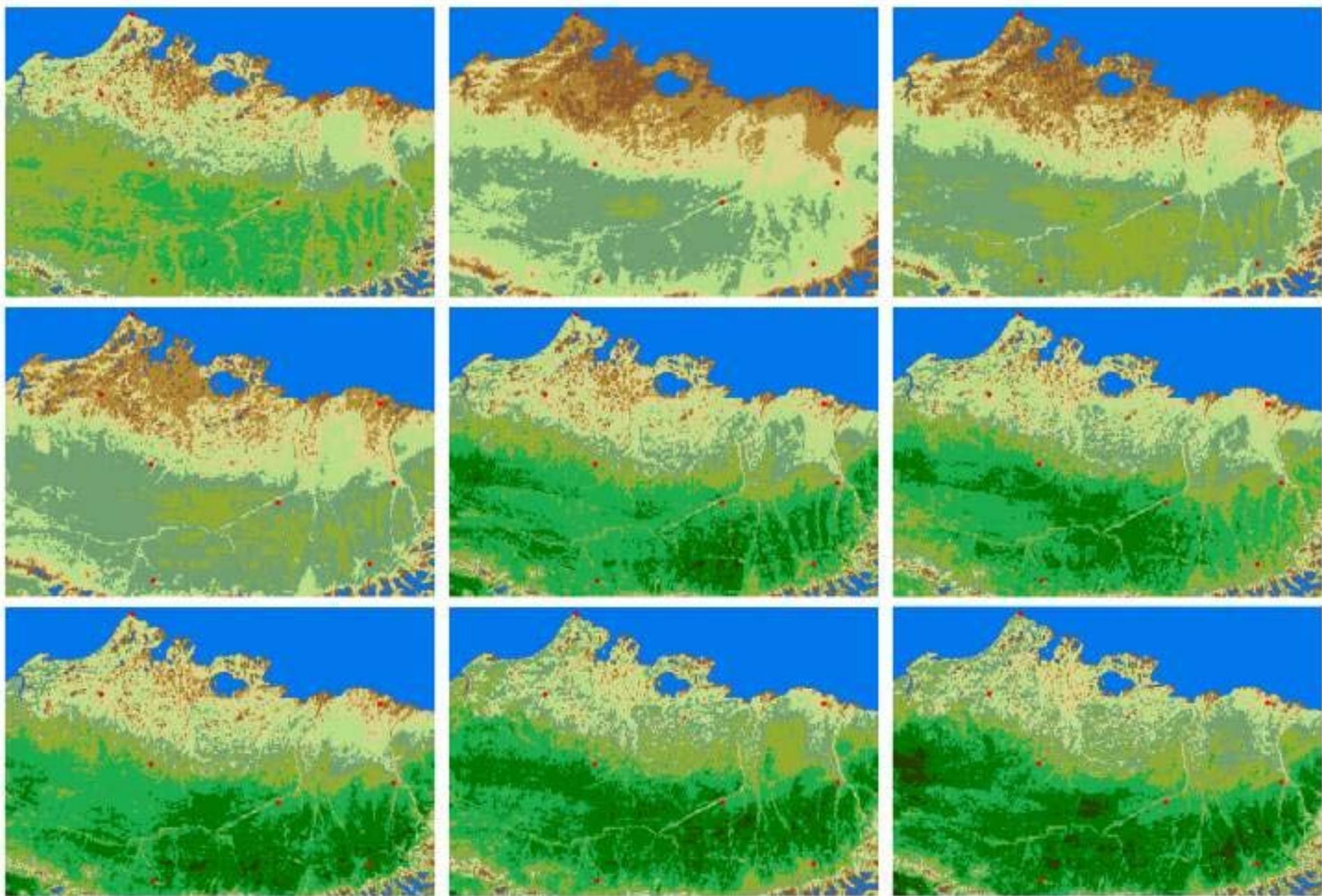
Sea ice is becoming less extensive



Ice-dependent sea mammals (and communities) at risk

New management challenges





Time Integrated NDVI
Epstein and Walker

91	92	93
94	95	96
97	98	99



1949



**Shrub density has increased
(Altered caribou habitat)**

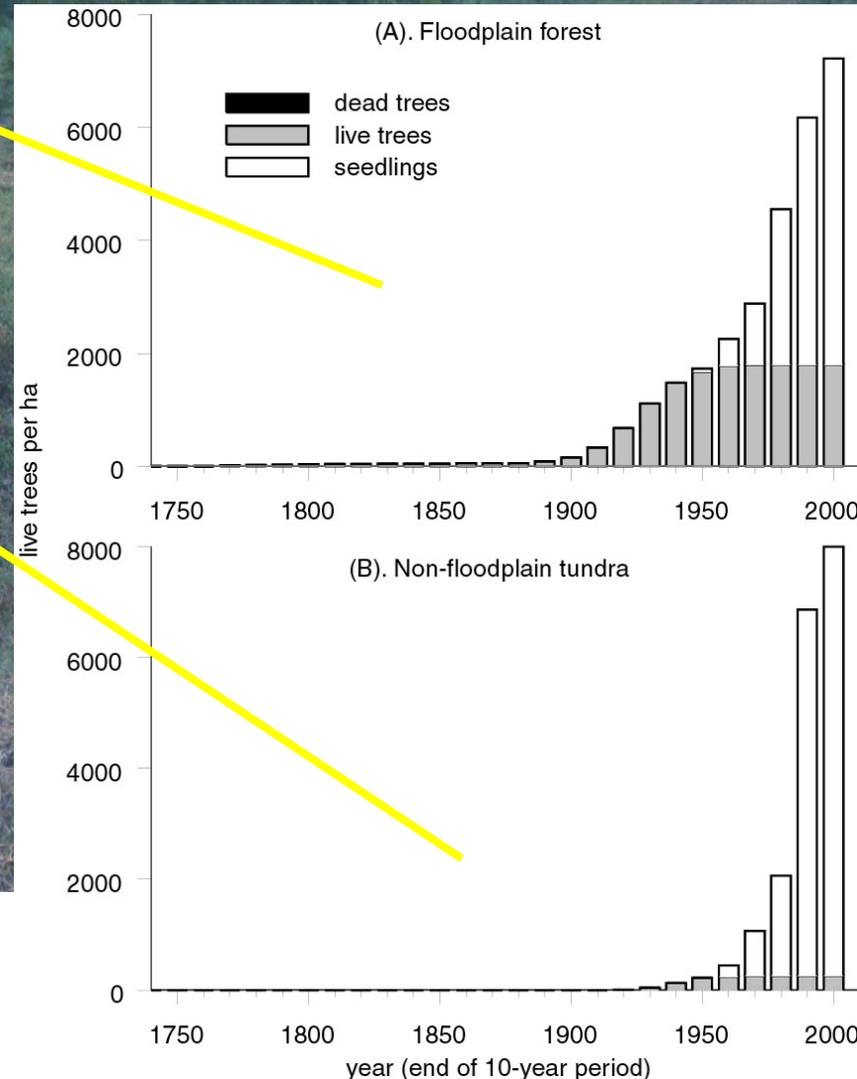
2000



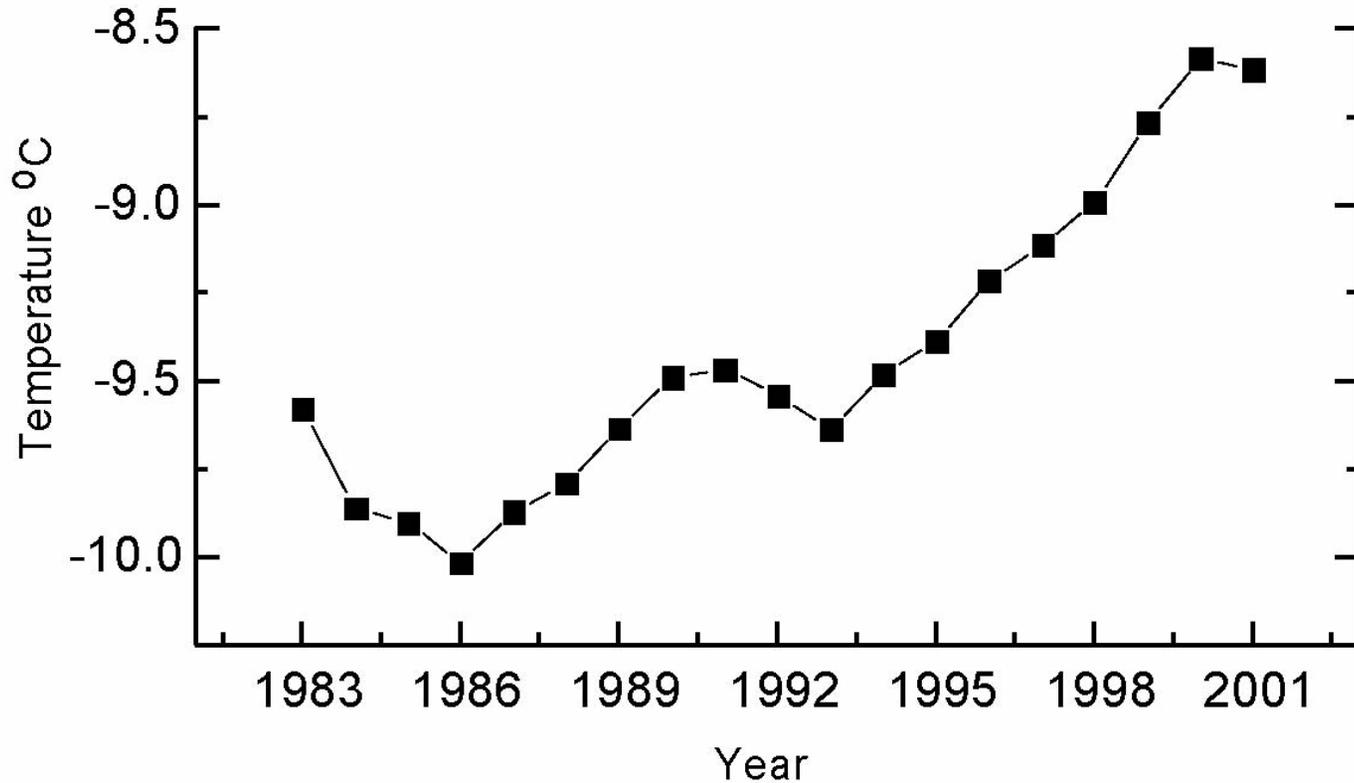
Sturm et al.

2001

Forests are expanding in some places (Changes in fire, winter travel, animals)



Permafrost is warmer (Medium-term infrastructure challenges)



**Thawing permafrost could increase CO₂/CH₄ release
(potential surprise:
more warming)**



Kenai bark beetle outbreak

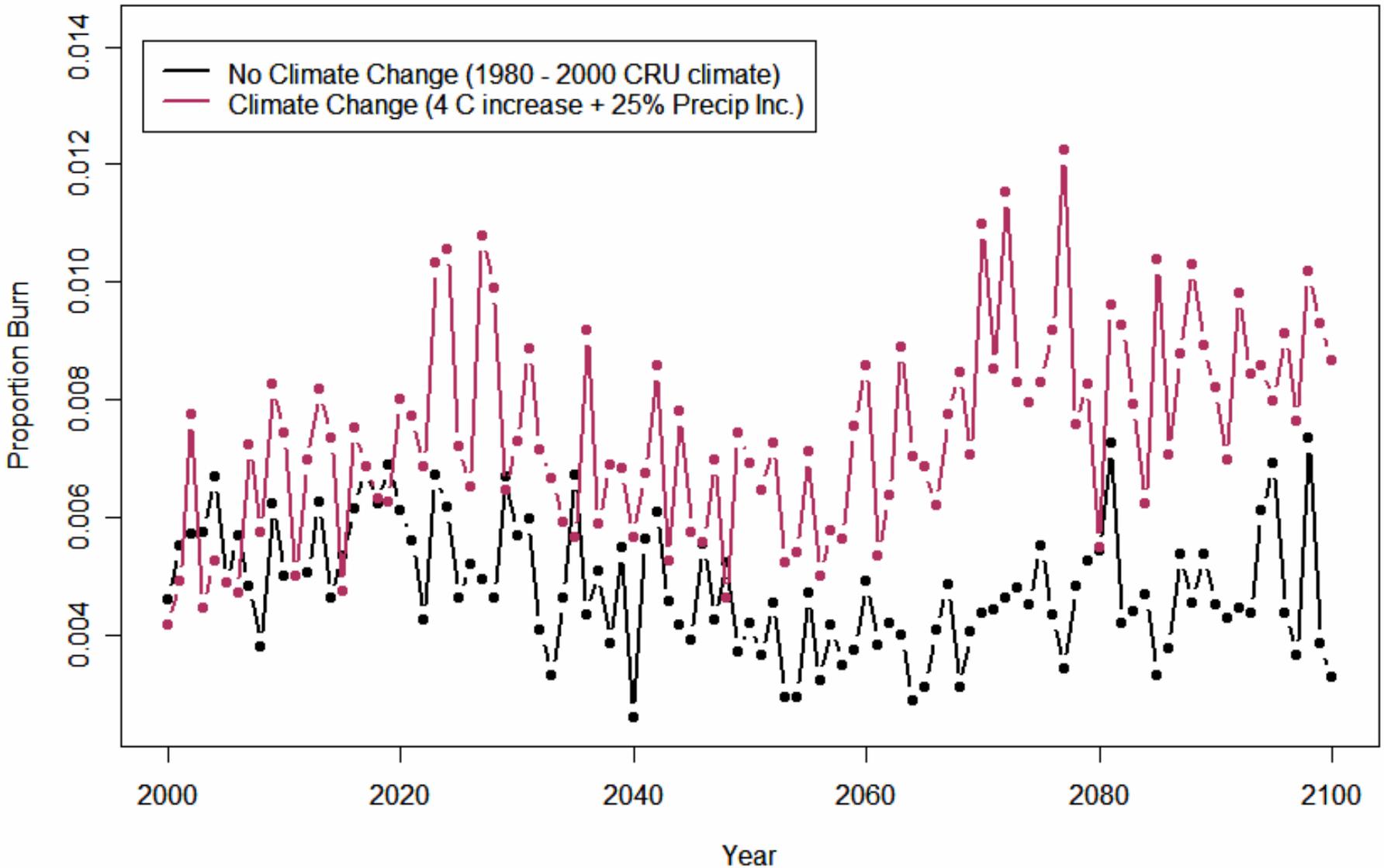


**Annual area burned in W. North
America has doubled
in last 40 years**



We can expect more wildfire

Proportion of Landscape Burn -- Average across 100 Reps



Wildfire options in 20-50 years?

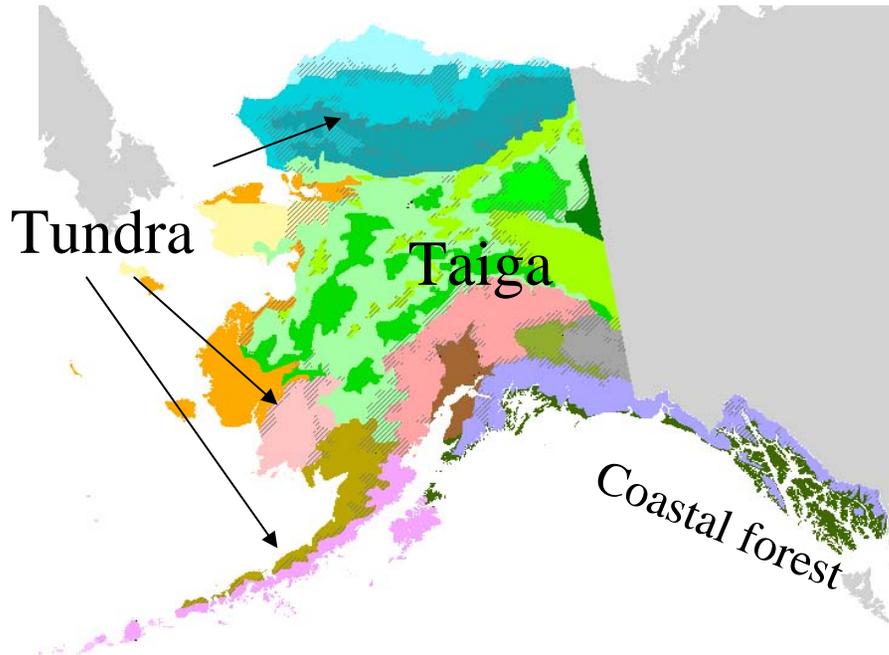
- Maintain same fire regime as today?
 - ~20-fold increase in cost
- Maintain current budget for suppression?
 - Reduce area protected despite rising population
- Change landscape pattern of fire?
 - Increase landscape heterogeneity: reduce risk of huge fires
 - Requires community engagement in fire planning

Community engagement: Search for co-management

- Fire suppression increases fire risk
 - Communities surrounded by late-successional fire-prone vegetation
- Fuel costs > \$6/gallon
 - Drives rural-urban migration
 - Threatens viability of rural communities
- Biofuel harvest to reduce fire risk
 - Ecologically sustainable (90% of communities)
 - Economically viable (>80% of communities)
 - 90% of costs retained locally as wages
 - Improved moose habitat near villages



Vegetation Map



Map of Native Peoples

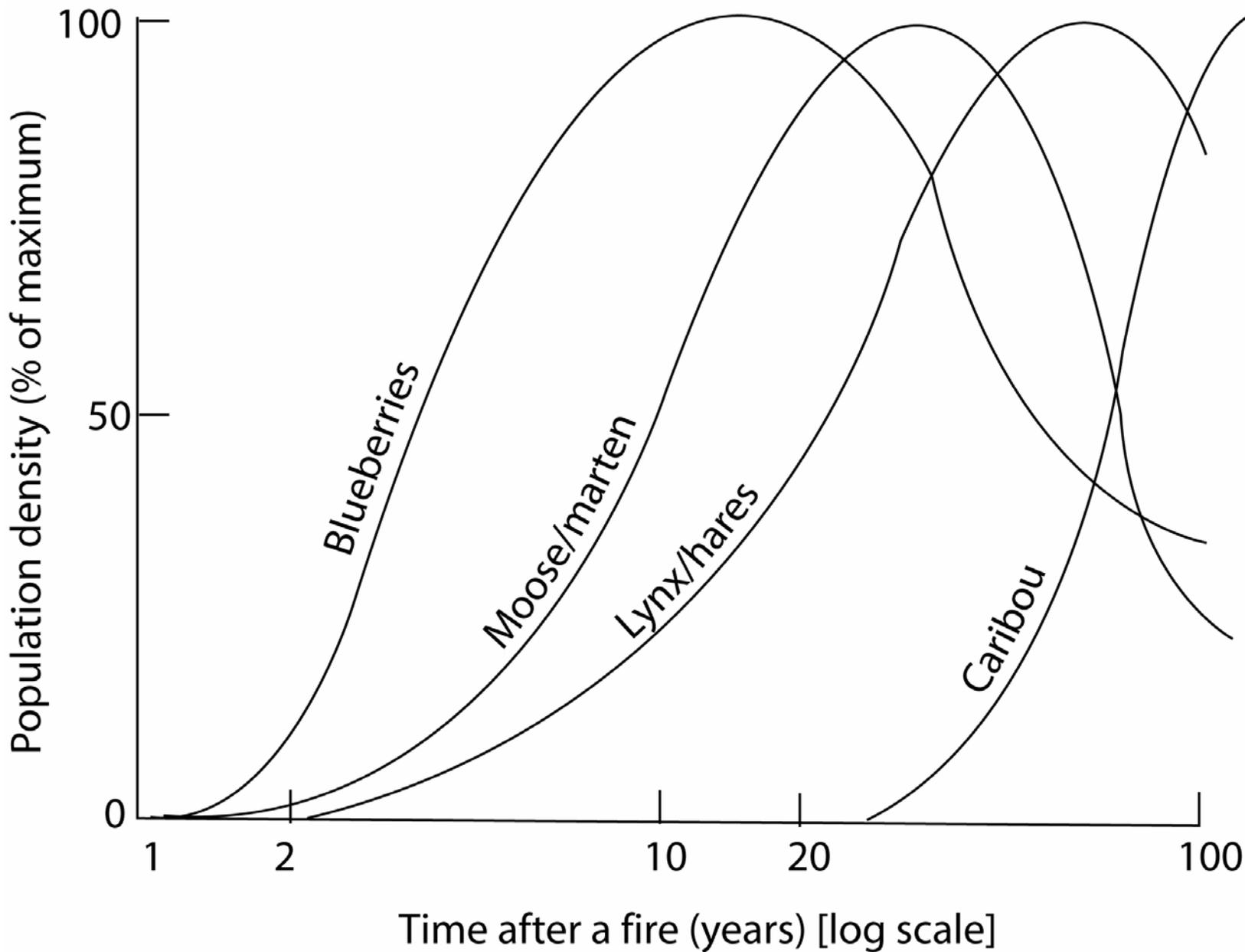


Melissa Chapin

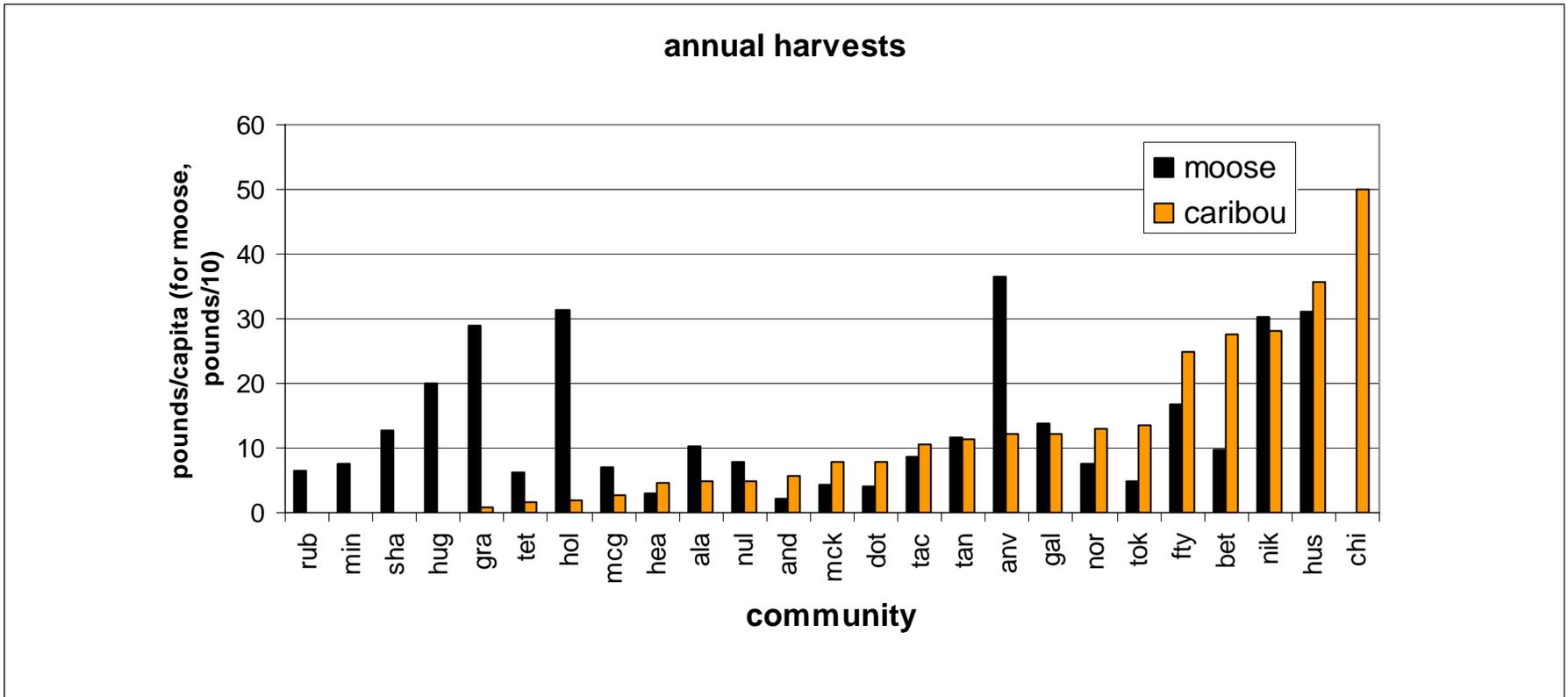
Tight linkage between ecology and culture

Rural communities have locations fixed by infrastructure



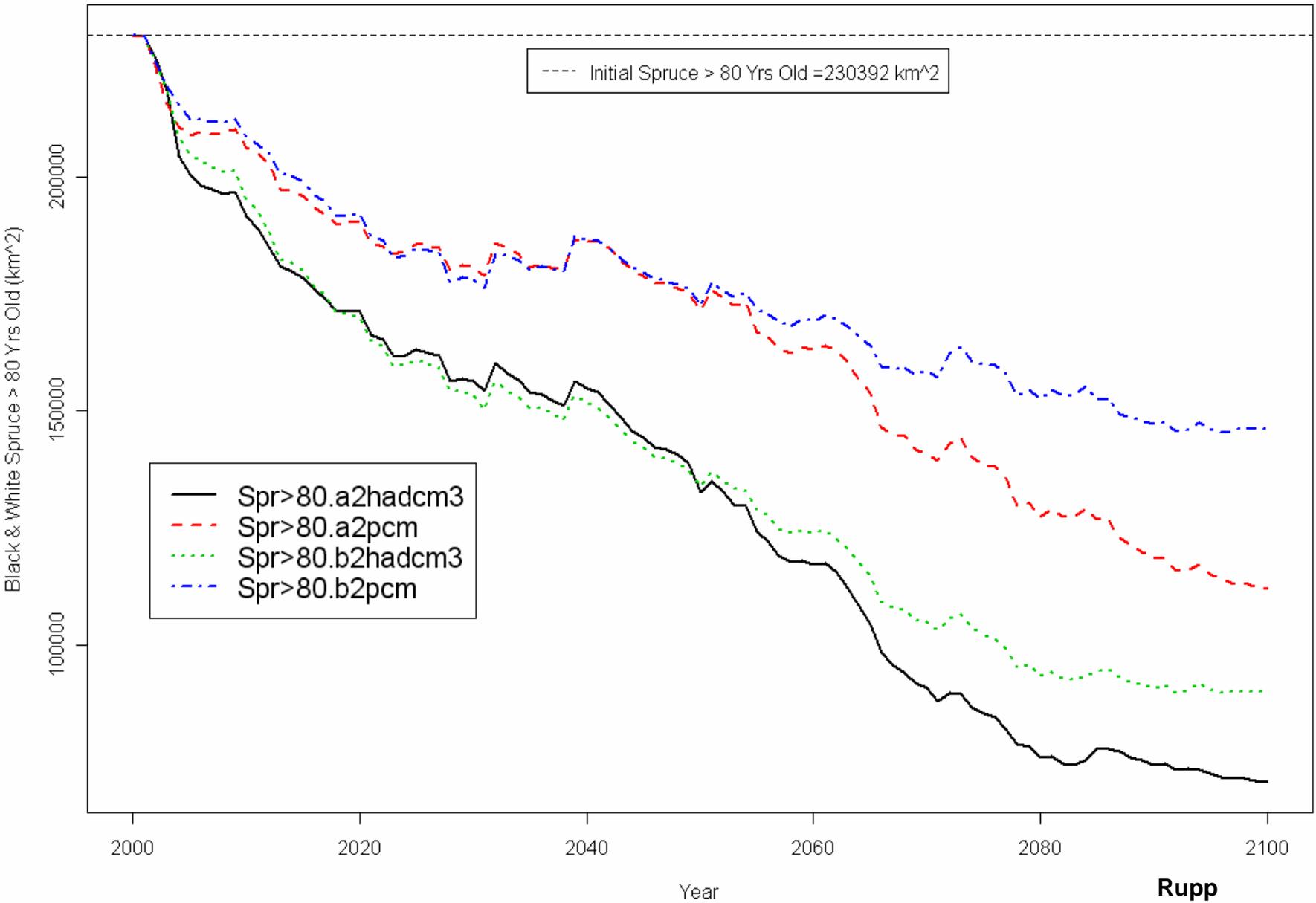


Communities differ in moose/caribou dependence



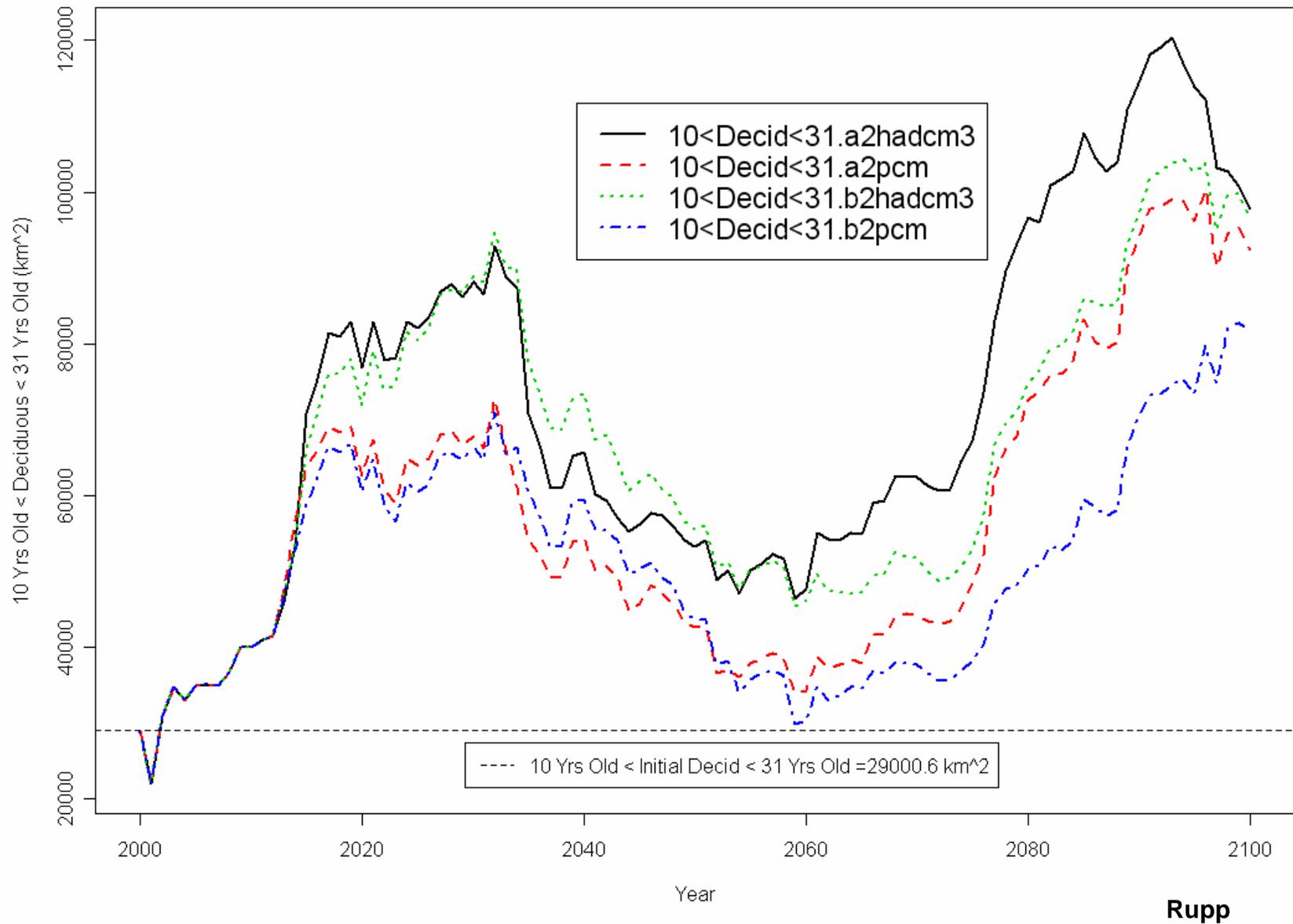
Caribou Habitat

Caribou Habitat (Spruce Stand Age > 80)



Moose Habitat

Moose Habitat (10 < Decid Stand Age < 31)



What other issues?

- Develop protected areas and community quotas for an arctic marine fishery?
 - (that doesn't exist)
- Opportunities for winter tourism?
- Game ranching in areas of grassland?

How can UA help Alaska?

- What are the recent and current conditions?
 - GINA
 - Geographic Information Network of Alaska
- What are the likely future conditions?
 - SNAP
 - Scenarios Network for Alaska Planning
- What do Alaskans need to know for decisions?
 - ACCAP
 - Alaska Center for Climate Assessment and Policy

Bottom line

- Warming in Alaska will likely continue
- This has important consequences for ecology and people of Alaska
- UA now has mechanisms to quickly provide information relevant to the problems
 - SNAP, ACCAP, GINA