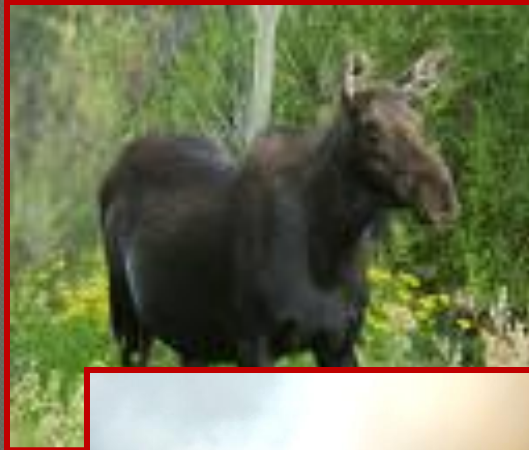


Resilience of Athabascan subsistence systems to Interior Alaska's changing climate



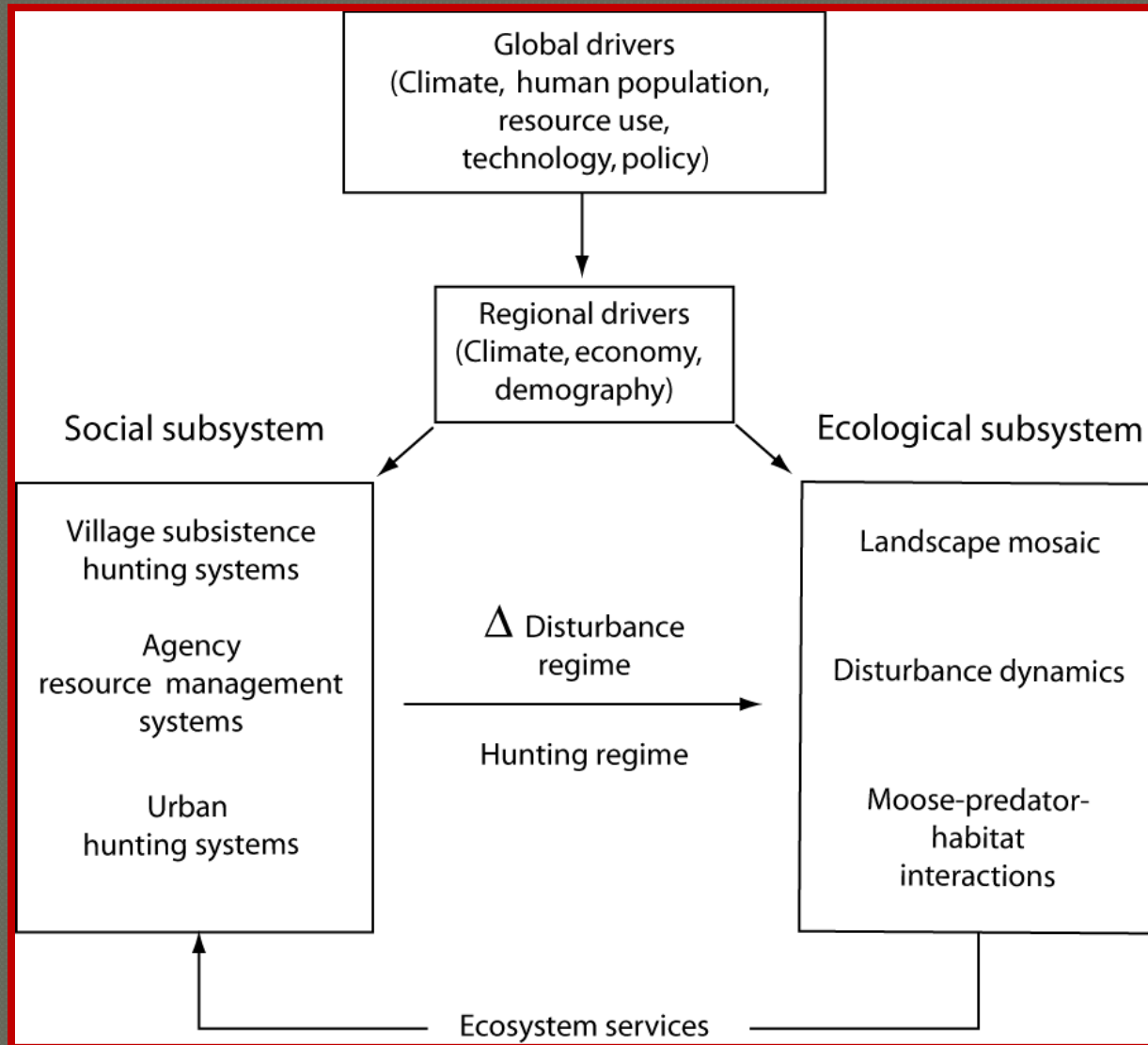
Shauna BurnSilver, Gary Kofinas, Todd J. Brinkman and Terry Chapin
University of Alaska Fairbanks

Athabascan region

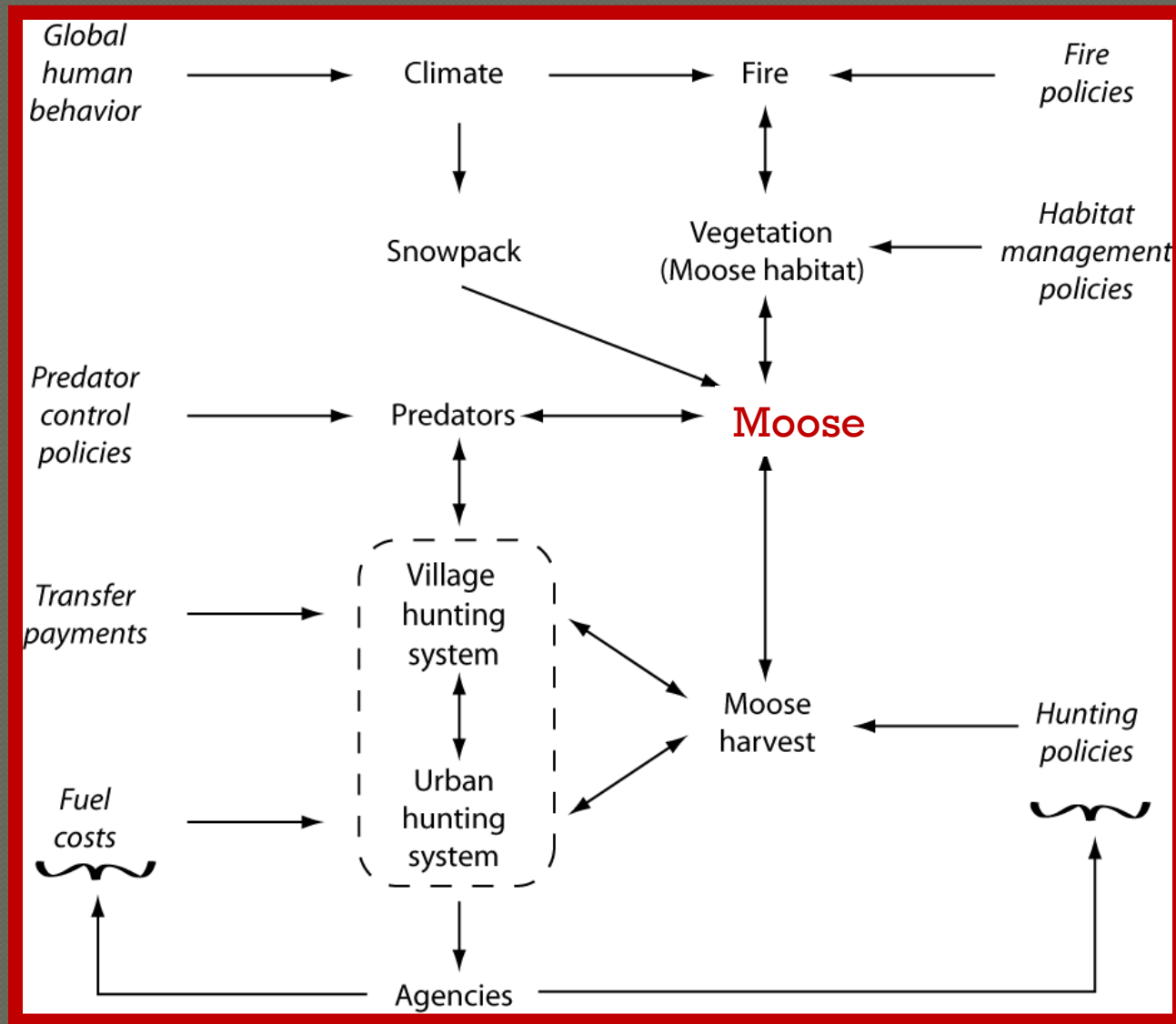


Paper authors: Gary Kofinas, F. S. Chapin III, S. BurnSilver, J. Schmidt, N. Fresco, K. Kielland, S. Martin, A. Springsteen and T.S. Rupp

The Alaskan boreal forest: A social-ecological system



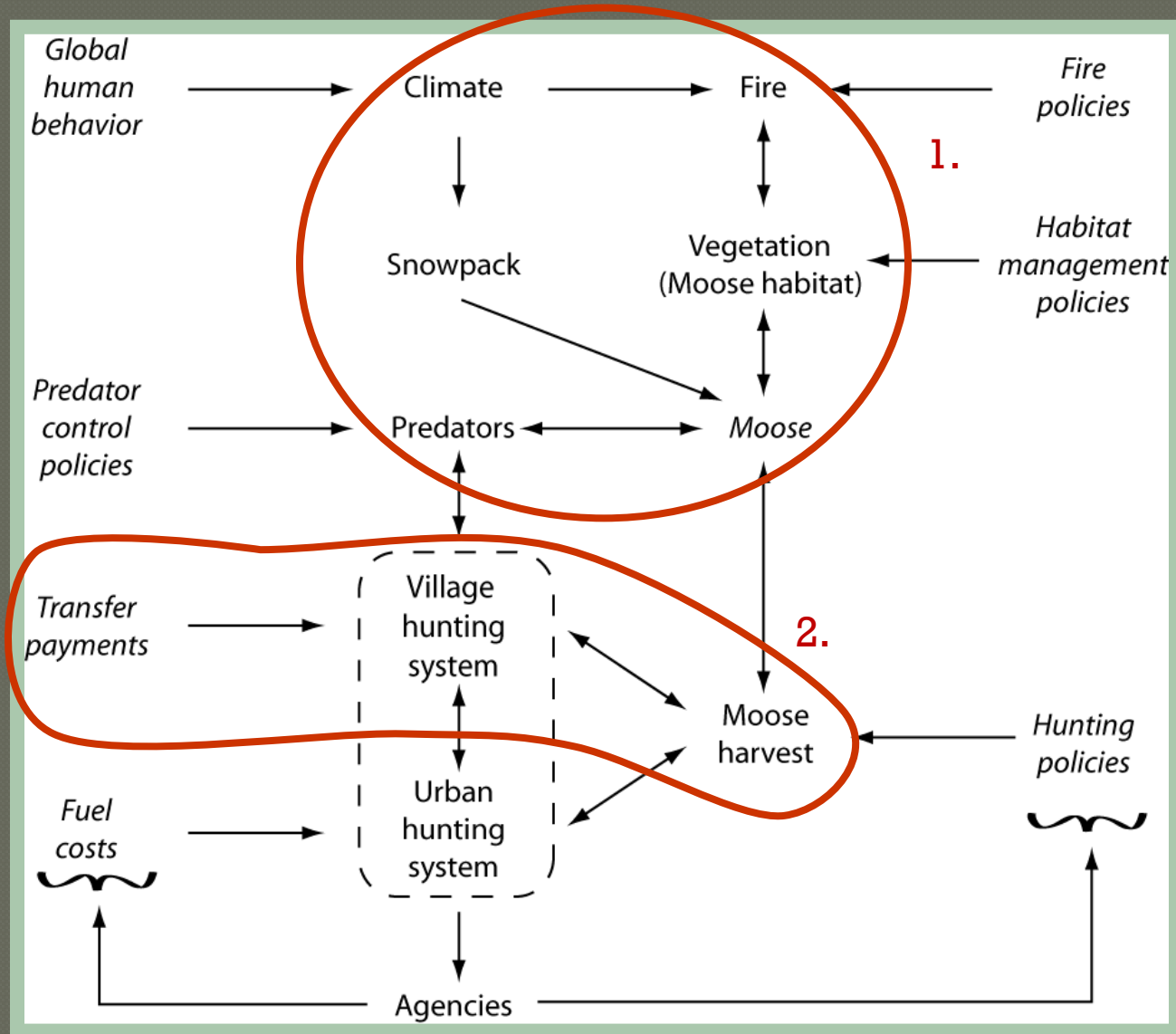
Key system components



Take home messages:

- Ecosystem services related to moose are affected by a suite of biophysical and social variables
- Change in ecosystems and eco-services is best understood through an integration of local knowledge and science
- Social responses to ecological change are affected by more than the flow of resources
 - economic, cultural and institutional aspects of the system also drive responses
 - including the role of urban hunting (competition).
- Resilience? There are opportunities for sustaining subsistence systems through adaptation of current resource management strategies and new political institutions

Ongoing critical questions



1. IPY - Ecosystem Services Project

Future climatic and ecological conditions
will be quite different



- How will these environmental changes affect the availability of wildlife that hunters depend on? [Key Species]

supply + location + access = Availability



Document the status and trends of the hunting system

- For each critical species (Ex. Moose)
 - When does most moose harvest occur?
 - What factors affect timing of harvest?
 - How are moose distributed around the landscape (location)?
 - What factors affect distribution?
 - How do you access your hunting areas?
 - What factors affect access ?
 - What is the current size of the moose population around Venetie?
 - What factors affect supply?

Location: Moose

During October and November, moose begin to move to higher elevations and congregate in groups in the valleys of foothills.

Cooler temperatures and snow may initiate migration before calving in June.

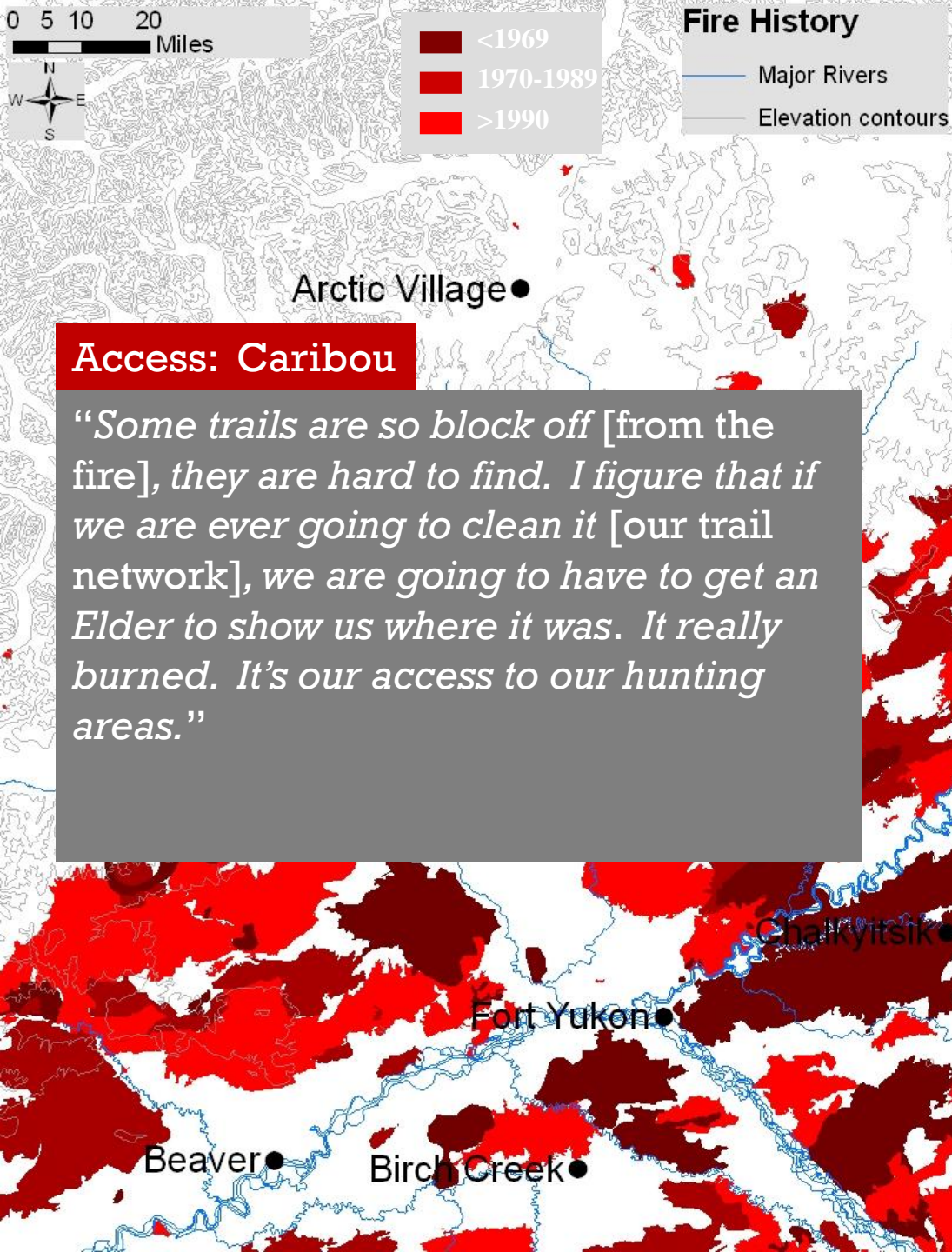


Bulls and young cow moose without calves also begin feeding on aquatic plants in lakes as the quality of willow leaves declines along the rivers.



In March and April, moose move toward the rivers to take advantage of the arrival of abundant and nutritious willows

Venetie



Location: Moose/Caribou

Moose/Caribou:

1. Fires are avoid thought to initially displace hunters suggested that moose, but caribou don't come as far within a few years. of the burns to
2. Most hunters agreed, fires were good for moose.

Access: Moose and Waterfowl

Water levels, frequent changes of the river channel, and river width were identified as the key factors affecting boat access.

Boats and ATVs are mainly used for access from late May to late September.

"The Chandalar is a wicked little river. It deters from one channel to the other. I don't care how good you are. It's a battle... It is a changing and challenging river."

In the Spring, ice jams and flooding can prevent access to waterfowl hunting areas



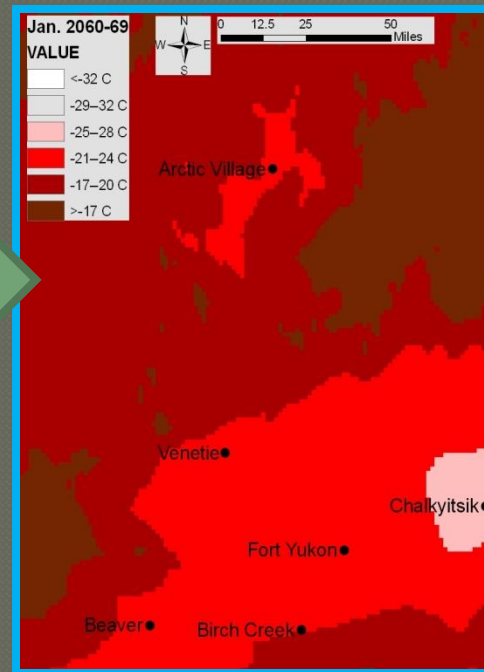
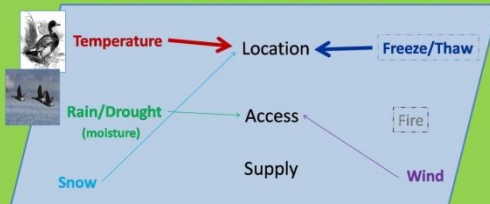
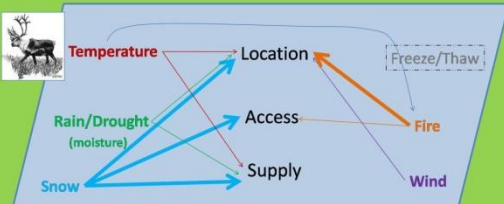
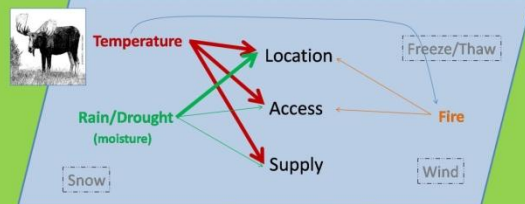
○ Venetie

MOOSE	Temperatures	Rain & Drought	Snow	Freeze up /Thaw Date	Fire	Wind
Location	<p>↑temperatures = ↓moose activity & response to calls during rut *moose try to stay cool.</p>	<p>*Lake too flooded, moose to get to weeds on bottom. *If dry, move to wetter areas. *If wet, more habitat available.</p>	<p>*Avoidance of crusty, deep, and hard pack snow ⊙↓snow = later migration ⊙Avoid north side of mountains because of windblown hard pack.</p>	<p>*Later freeze delays migration. *Earlier thaw brings moose down sooner</p>	<p>*Burns displace moose, but use areas more within a few years. *Big fire, big effect. *start using it 2-3 years</p>	<p>*Stronger wind in winter is avoid, and moose like wind when insects are around.</p>
Access	<p>* ↑temp = ↑willow = obstructed travel</p>	<p>⊙↓ rain = shallower and less navigable river *More rain reduces ATV access (ex. around Big Lake).</p>			<p>*Burns block trails, and create thick understory *Rough ground is hard on machines *Better visibility during first few years. *Big fire blocks all trails.</p>	
Supply	<p>* ↑temp = ↑willow = ↑ forage= ↑moose</p>		<p>⊙↓snow = ↓insulation Changes in snow depth changes efficiency of predators- ⊙more snow= less wolf predation. ⊙Too much snow, bad for young moose.</p>		<p>* ↑fire = ↑forage = ↑moose ⊙↑understory = bears more efficient predators</p>	

Next Steps for ES Project:

Local understandings + Best science

Conceptual Diagrams: "Most Important" Environmental Factors Affecting Species Availability



Scenarios of future availability

Ex: Environmental thresholds

2. Representing Interior & Northern Livelihoods

Cash Economy
(\$\$\$)



Measures

- Income (\$)
- Expenses (\$)

Subsistence Economy
(Lbs)



Measures

- Harvest (lbs)
- Engagement
 - hunting freq.
- **Sharing**
- **Cooperation**



Mixed Livelihoods



Well-being
Resilience
???

ADFG Community Harvest Database

% of Sample Harvesting			Year												
		1983	85	93	94	95	96	97	98	99	2000	01	02	04	05
Beaver	Fish		71												
	Non Salmon			X		X	X								68
	Salmon					X	X								
	Large Mammal		87	X	X	X	X								
	Caribou														
	Moose														
Venetie	Small Mammal		83	X	X	X	X								
	Birds		84	X	X	X	X				56				
	Vegetation		48												
	Fish					X		X							
	Non Salmon														
Huslia	Salmon														
	Large Mammal			X	X	X	X	X							
	Small Mammal			X	X	X		X							
	Birds			X	X	X		X			68				
	Vegetation														
Huslia	Fish														
	Non Salmon	66													
	Salmon	43													
	Large Mammal	79							68	62		58	35		
	Caribou							16	58	30			53		
	Moose							57	57	49			55		
Huslia	Small Mammal	79													
	Birds	75													
	Vegetation	96													

X's = lbs
harvested

#'s = % of pple.
who
harvested
and lbs

ADFG Community Harvest Database

X = surveys of lbs
harvested

#'s = % Difference
between
use vs.
harvest



Sharing & Trading
(social institutions)

% Change Using/Harvesting			Year													
		83	85	93	94	95	96	97	98	99	2000	01	02	04	05	
Beaver	Fish		71													
	Non Salmon			X		X	X									
	Salmon					X	X									
	Large Mammal		87	X	X	X	X									
	Caribou															
	Moose															
	Small Mammal		83	X	X	X	X									
	Birds		84	X	X	X	X									
	Vegetation		48													
Venetie	Fish															
	Non Salmon					X										
	Salmon															
	Large Mammal			X	X	X	X									
	Small Mammal			X	X	X										
	Birds			X	X	X										
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	Moose															
	Small Mammal	79														
	Birds	75														
	Vegetation	96														

2000 census

Beaver:

- \$8,441 per capita income
- 17.9% unemployment
- 11.1% below poverty

Venetie:

- \$7,314 per capita income
- 36.2% unemployment
- 36.2% below poverty

Huslia:

- \$10,983 per capita income
- 18.3% unemployment
- 11.8% below poverty

2000 census

Beaver:

-\$8,441 per capita income

-17.9% unemployment

-11.1% below poverty

Venetie:

-\$7,314 per capita income

-36.2% unemployment

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Huslia:

-\$10,983 per capita income

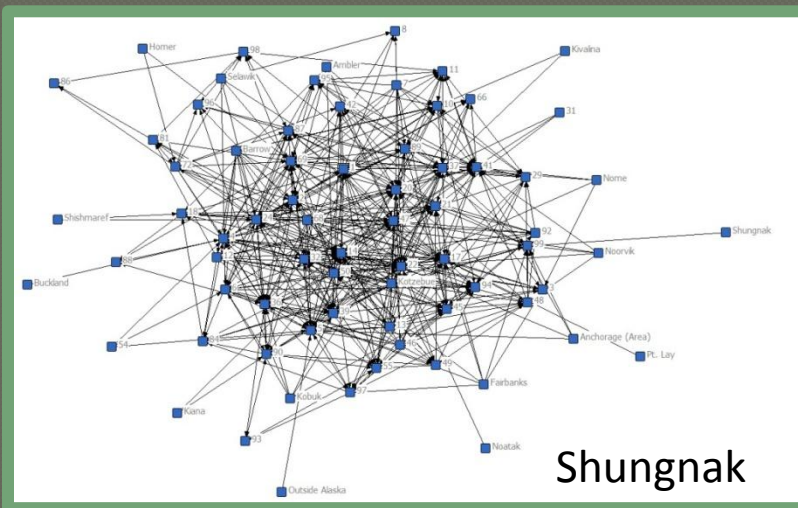
-18.3% unemployment

-11.8% below poverty

The MMS Sharing Project - Questions

- How does the household level integration of cash and subsistence activities contribute to adaptive capacity?
- What is the role of social relationships in contributing to well-being and the ability to adapt/cope?

1. Whole Network sample of 3 villages - social and economic data



2. Identify how *resources come into households:

- Own hunting
- Cooperative hunting (shares)
- Shares for helping
- Gifts
- Trading

*Resources: food, cash, equipment

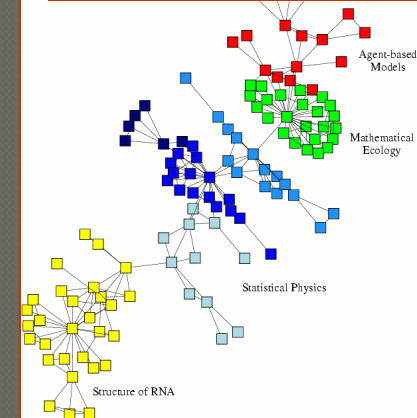
We will have a very rich dataset

Economic: earned wage income (\$)
unearned income (transfer payments) (\$)
no. months employed/yr. (mos.)

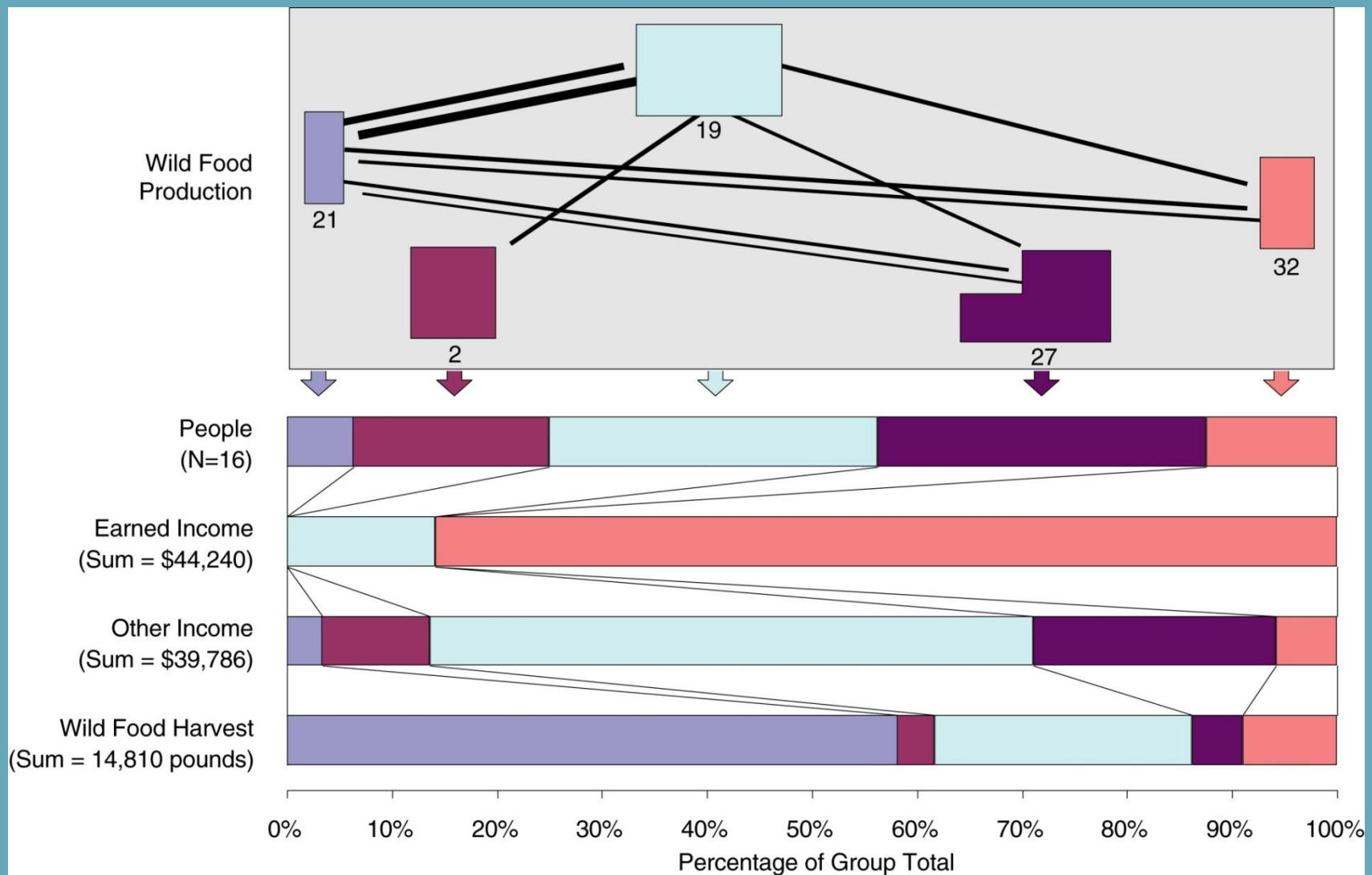
Demographic: hh maturation stage (1-5)
hh size (labor) (No. people)
No. of dependents (elder/young)

Subsistence: access to equipment (high/med/low)
lbs per hh -own effort
lbs per hh -received from others
diversity of resources (total No. accessed)
food security (Value 1-10)

Social Network: Centrality of hh
Size of productive subgroup (No. HHs)
Number of ties (#)
Multiplexity of ties (No. types of ties)



How can social network analysis help us to understand the mixed economy better?





IV. Coupled Social-Ecological Dynamics for Interior Alaska

Tasks:

- Identify the suite of services most critical to sustainability in interior Alaska.
- Identify past trajectories and rates of change and likely future changes in critical ecosystem services.
- Model the interaction of ecological, economic, cultural, and demographic conditions affecting participation in subsistence.
- Conduct institutional analysis to identify the role of policy in affecting the effects of changing ecosystem services.
- Through partnerships with communities, identify conditions that facilitate innovation in future human adaptation and transformation.

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