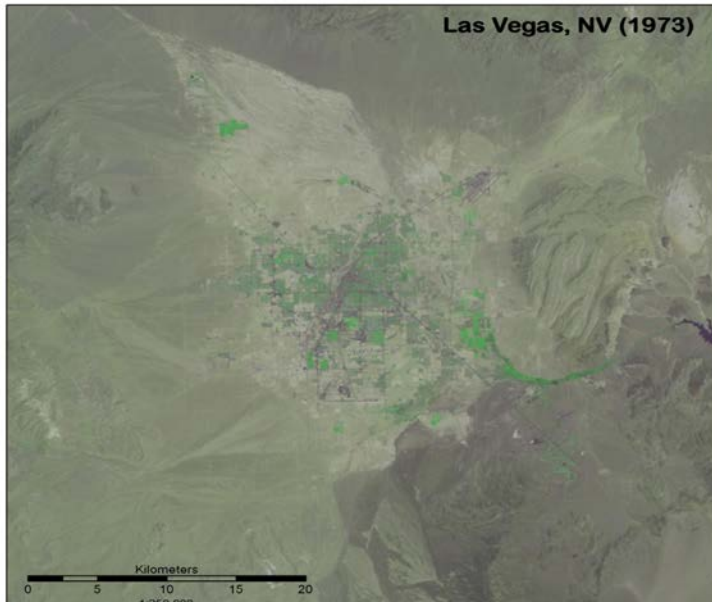
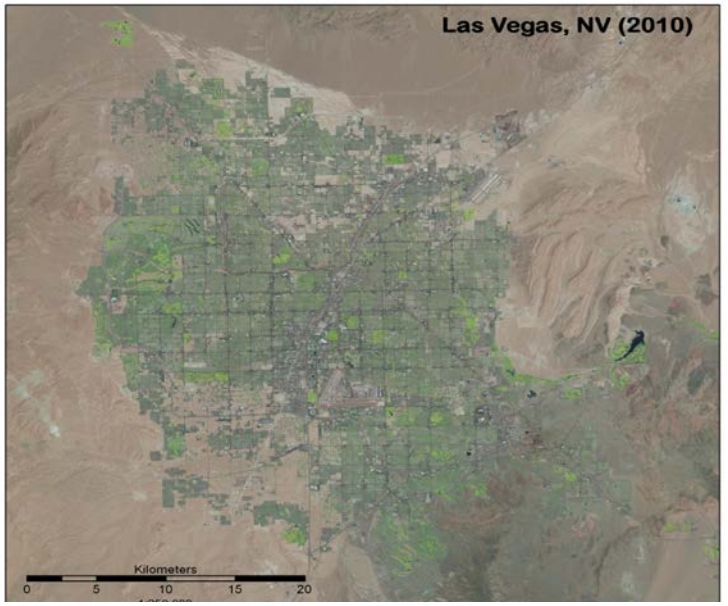
Re Thinking Management: Toward A Science of Social Ecological Systems

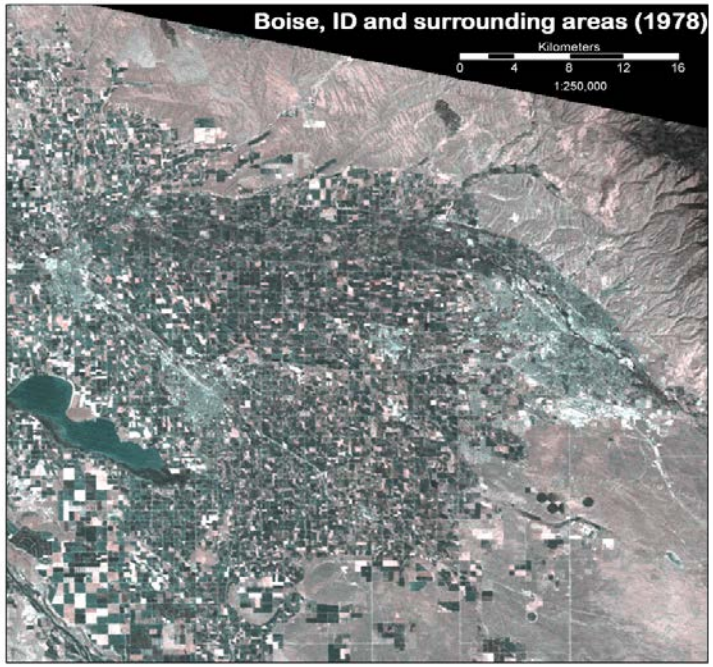
Lilian Na'ia Alessa
Director, Alaska EPSCoR
Center for Resilient Communities, U Idaho

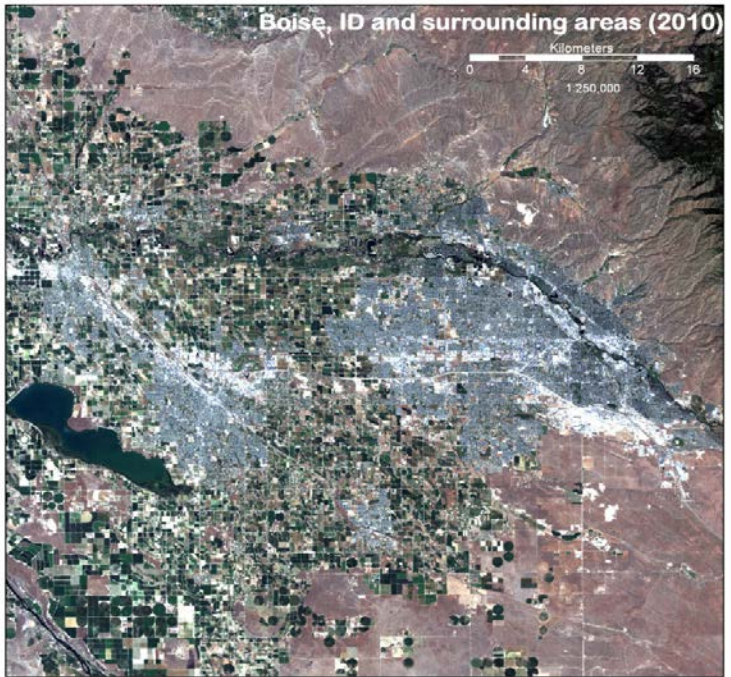
Census: Minority babies are now majority in United States

Human Values Drive Landscape Change









Landscape Change Affects Water

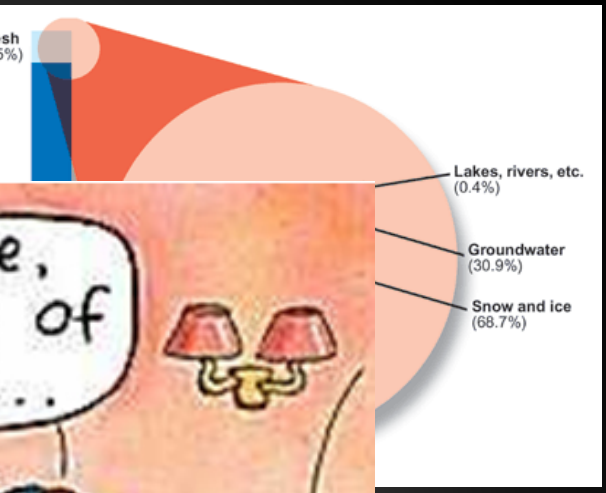
Over 90% of Arizona's riparian habitat is gone, probably forever.

(Final Report and Recommendations of the Governor's Riparian and Habitat Task Force. October 1990.)

About 1890, settlers began to occupy nearly all permanent streams and to use them in new ways. Riparian areas are still subject to many pressures.

Circa 1936: Forest Service, WA. Jackson

Circa 1914: Forest Service, W. Cline



W

Population Gro

US population will increase significantly (double over 100 years)

Less Water — More Water

EAO Energy Analysis Office
Understanding Energy Issues

Source: DOE/NETL (M. Chan, July 2002)

NREL National Renewable Energy Laboratory

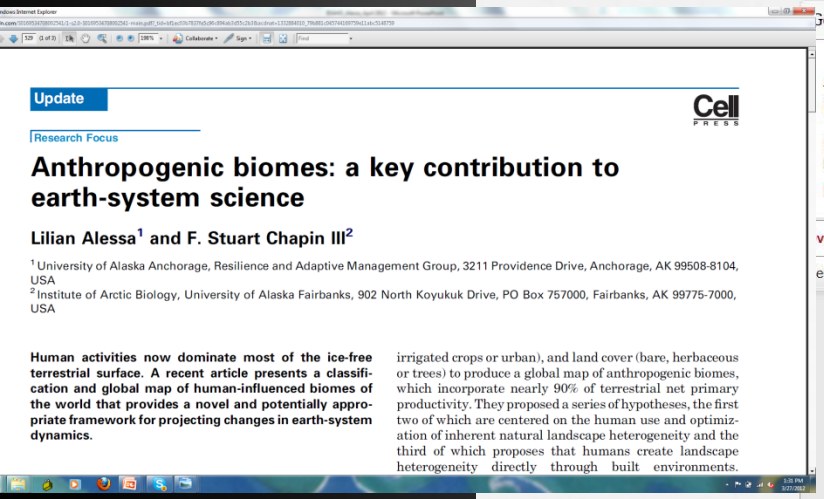

DRATS!
NEW!
FROM THE U.N. WORLD SUMMIT ON SUSTAINABLE DEVELOPMENT
INSTANT SUSTAINABLE DEVELOPMENT
Just add clean water!
JEFF PARKER ©2002 FLORIDA TODAY
caglecartoons.com

Social Ecological Systems

A social-ecological system consists of the interactions between a biogeophysical unit and its associated social actors and institutions. These interactions drive and respond to change.

Understanding Social Ecological Systems

- Observing change + Addressing scale (engaging communities) + Acquiring, Organizing and Synthesizing (AOS) data for social ecological science +
- Putting qualitative and quantitative information in a place-based context +
- Interoperability with other data=SES Science



Update

Research Focus

Anthropogenic biomes: a key contribution to earth-system science

Lilian Alessa[1] and F. Stuart Chapin III[2]

[1] University of Alaska Anchorage, Resilience and Adaptive Management Group, 3211 Providence Drive, Anchorage, AK 99508-8104, USA
[2] Institute of Arctic Biology, University of Alaska Fairbanks, 902 North Koyukuk Drive, PO Box 757000, Fairbanks, AK 99775-7000, USA

Human activities now dominate most of the ice-free terrestrial surface. A recent article presents a classification and global map of human-influenced biomes of the world that provides a novel and potentially appropriate framework for projecting changes in earth-system dynamics.

irrigated crops or urban), and land cover (bare, herbaceous or trees) to produce a global map of anthropogenic biomes, which incorporate nearly 90% of terrestrial net primary productivity. They proposed a series of hypotheses, the first two of which are centered on the human use and optimization of inherent natural landscape heterogeneity and the third of which proposes that humans create landscape heterogeneity directly through built environments.

MENDELEY

Sign up & Download | Sign in

Get Mendeley | What is Mendeley? | Papers | Groups

Papers | Search...

An "All Hands" Call to the Social Science Community: Establishing a Community Framework for Complexity Modeling Using Agent Based Models and Cyberinfrastructure

by L N Alessa, M Laituri, M Barton

Environmental Sciences › Ecology Papers

Save reference to library | Share

verview

elated research

Jassthe Journal of Artificial Societies and Social Simulation (2006)

Volume: 9, Issue: 4, Pages: 14

Find this paper at:

Abstract

To date, many communities of practice (COP) in the social sciences have been struggling with how to deal with rapidly growing bodies of information. Many CoPs across broad disciplines have turned to community frameworks for complexity modeling (CFCMs) but this strategy has been slow to be discussed let alone adopted by the social sciences communities of practice (SS-CoPs). In this paper we urge the SS-CoPs that it is timely to develop and establish a CBCF for the social sciences for two major reasons: the rapid acquisition of data and the emergence of critical cybertools which can facilitate agent-based, spatially-explicit models. The goal of this paper is not to prescribe how a CFCM might be set up but to suggest of what components it might consist and what its advantages would be. Agent based models serve the establishment of a CFCM because they allow robust and diverse inputs and are amenable to output-driven modifications. In other words, as phenomena are resolved by a SS-CoP it is possible to adjust and refine ABMs (and

Related Full-Text Papers for Free

Sign up to download and organize them across all your devices with Mendeley, for free.

Towards a Community Framework for Agent-Based Modelling

Marco A Janssen, Lilian Na'ia Alessa, Michael Barton, Sean Bergin, Allen Lee in *Journal of Artificial Societies and Social Simulation (2008)*

Save PDF to library | 16 readers

Using Community-Based Social Marketing Techniques to Enhance Environmental Regulation

Amanda L Kennedy in *Sustainability (2010)*

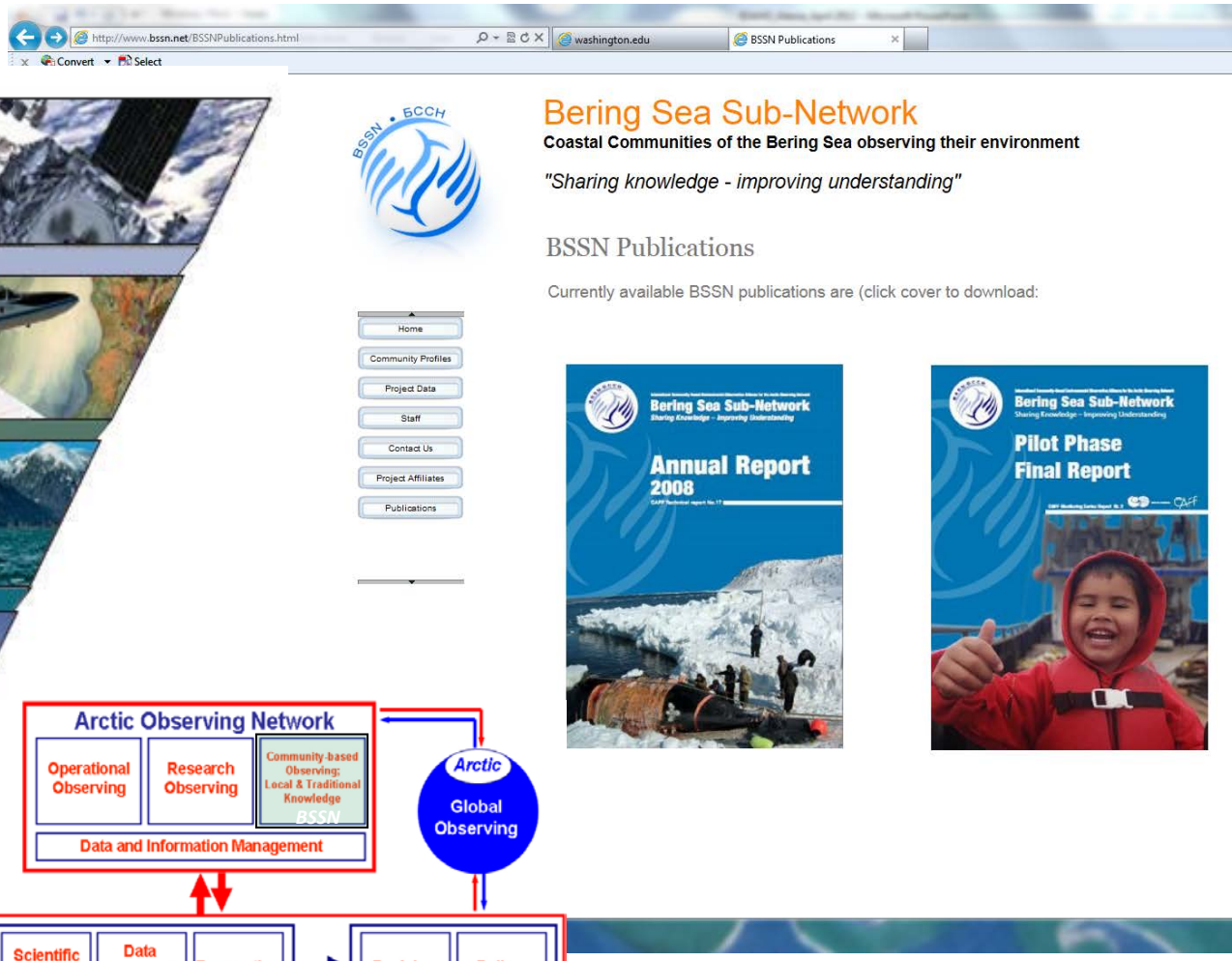
Save PDF to library | 3 readers

Sign up today - FREE

New Tools

Understanding This Place

Place-Based Local and Indigenous Knowledge: Observing Change for Domain Awareness



BSSN is funded by the United States National Science Foundation under cooporative agreement ARC-0856774. Any opinions, findings, conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation (NSF)

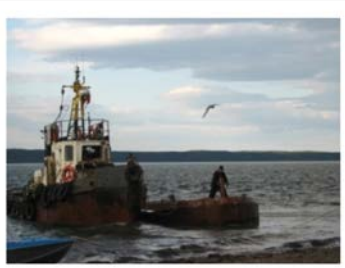
CHUKOTKA

ALASKA

Kanchalan

Gambell

Savoonga



KORYAK

Tymlat

Togiak

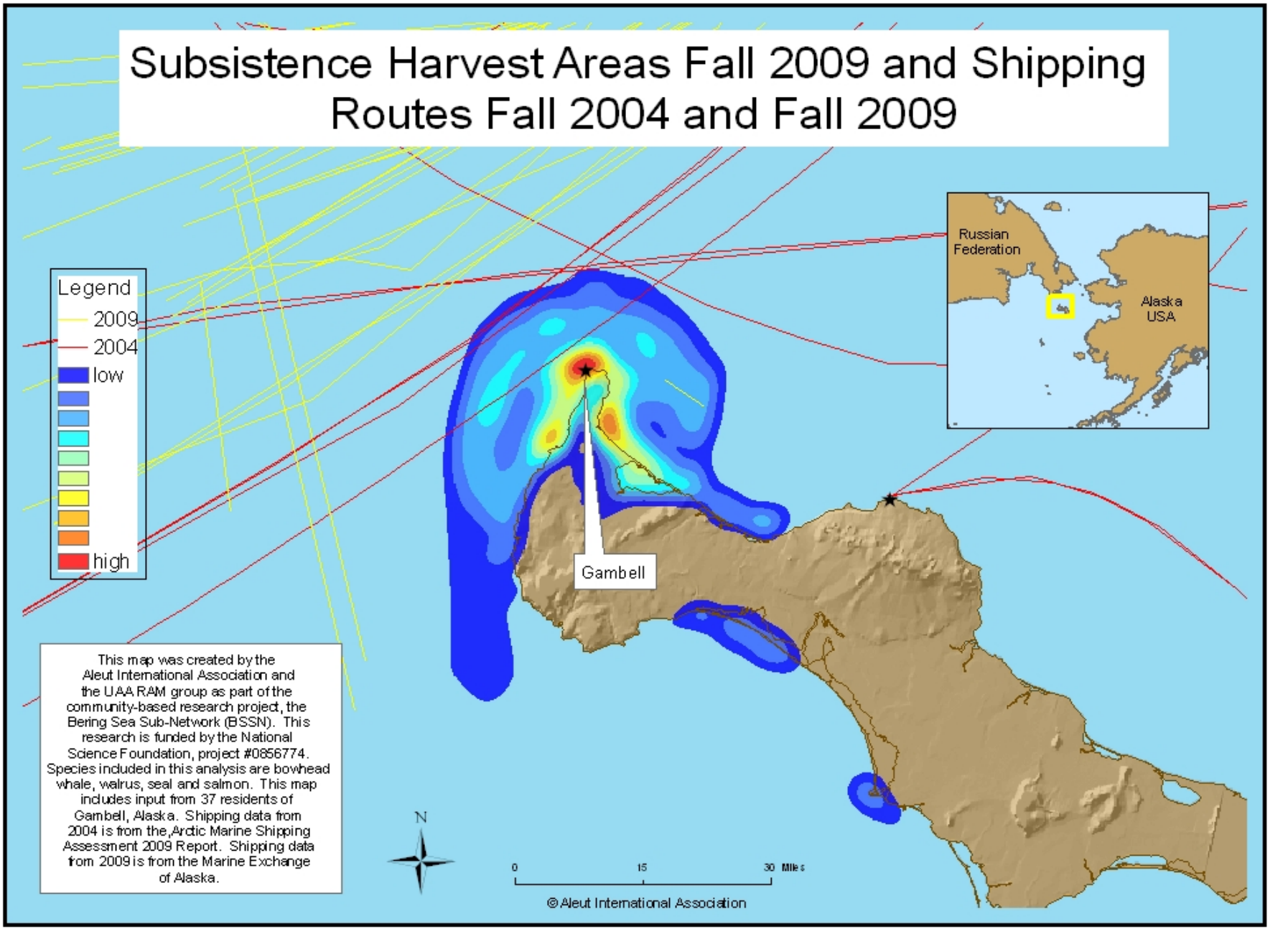
Sand Point

KAMCHATKA

Nikolskoye

St. George

Subsistence Harvest Areas Fall 2009 and Shipping Routes Fall 2004 and Fall 2009



Togiak: Change in Walrus Harvest

Subsistence Harvest Lifetime Use Areas for Pacific Walrus

Togiak

Area Density
low
high

Cape
Pierce

Hagemeister
Island

Round
Island
(Qayassiq)

N

0 5 10 20 Miles

This map was created by M. Fidel, as part of the Bering Sea Sub-Network (BSSN) research, funded by the National Science Foundation, ARC #0856774 and implemented by the Aleut International Association and the University of Alaska Anchorage, Resilience and Adaptive Managment group, BSSN gathers local observations of the environment and selected subsistence species in indigenous coastal communities around the Bering Sea. Directed sampling was used to identify and interview knowledgeable and active harvesters. This map includes input from 22 residents of Togiak, AK.

Subsistence Harvest Areas for Walrus September 2009 - August 2010

Togiak

Area Density
low
high

Cape
Pierce

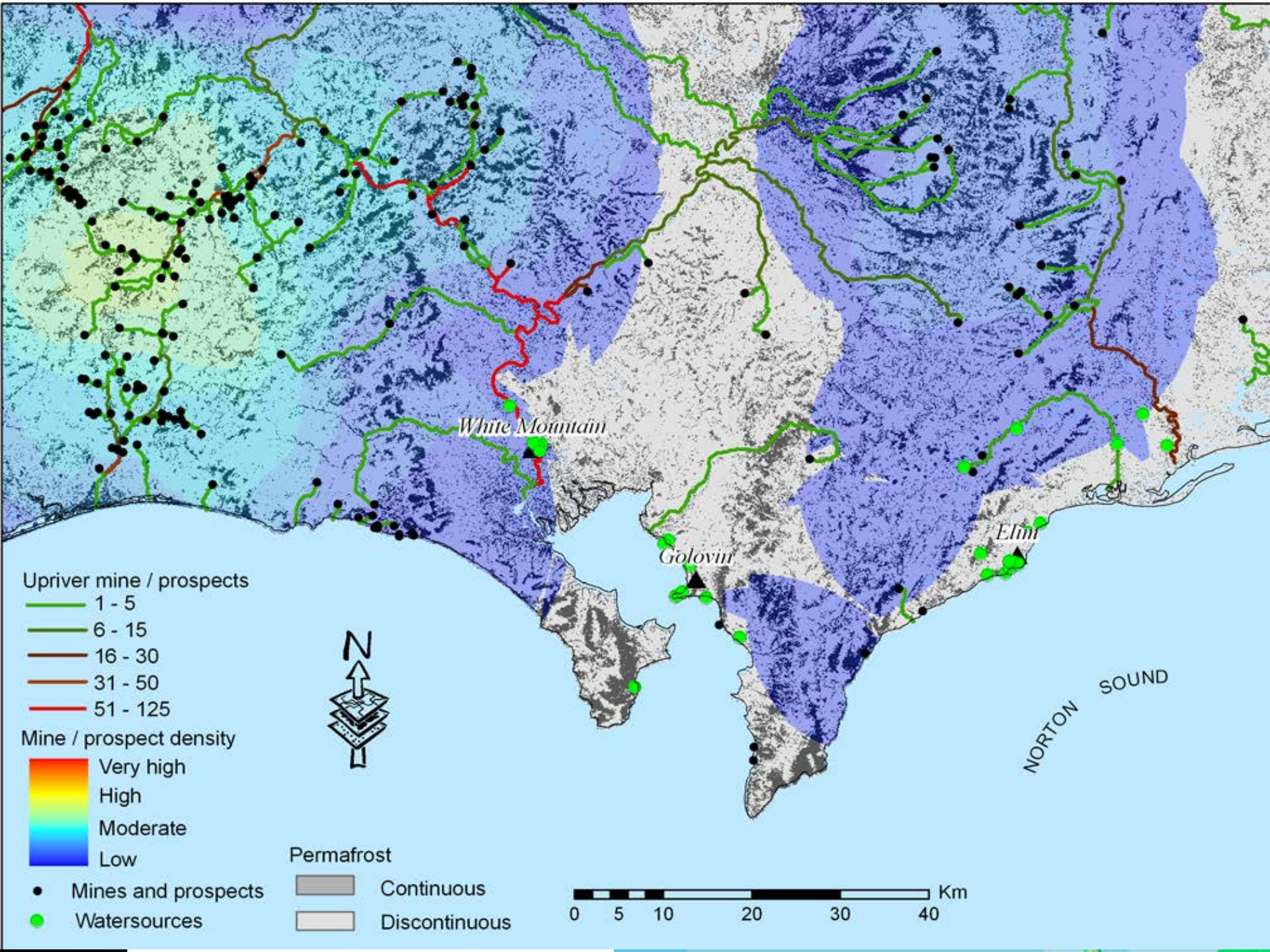
Hagemeister
Island

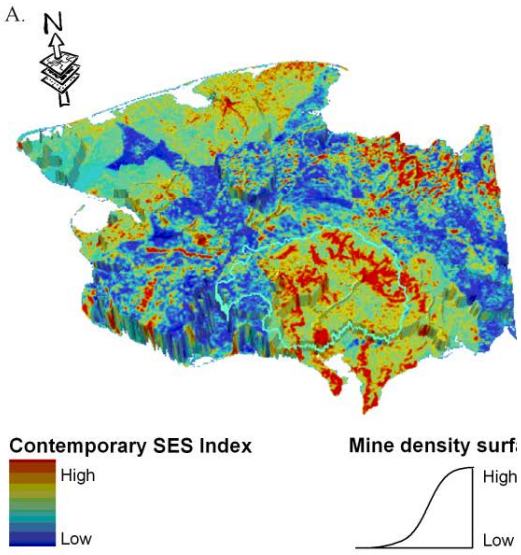
Round
Island
(Qayassiq)

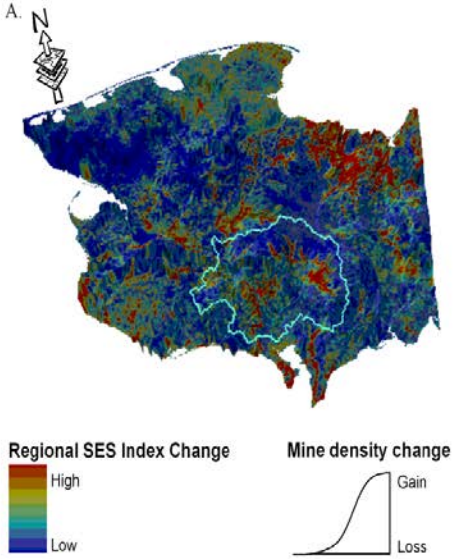
N

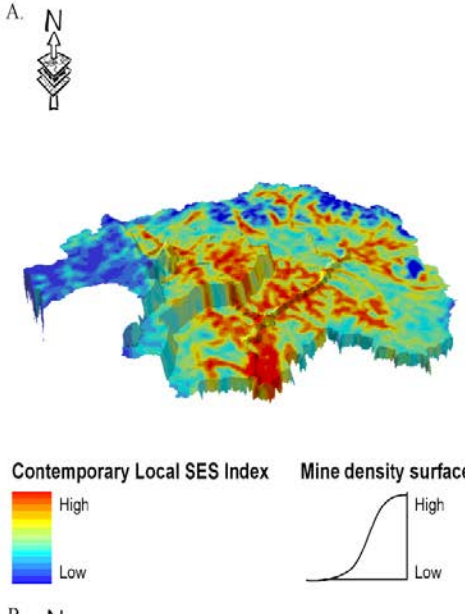
0 5 10 20 Miles

This map was created by M. Fidel, as part of the Bering Sea Sub-Network (BSSN) research, funded by the National Science Foundation, ARC #0856774 and implemented by the Aleut International Association and the University of Alaska Anchorage, Resilience and Adaptive Managment group, BSSN gathers local observations of the environment and selected subsistence species in indigenous coastal communities around the Bering Sea. Directed sampling was used to identify and interview knowledgeable and active harvesters. This map includes input from 11 residents of Togiak, AK.

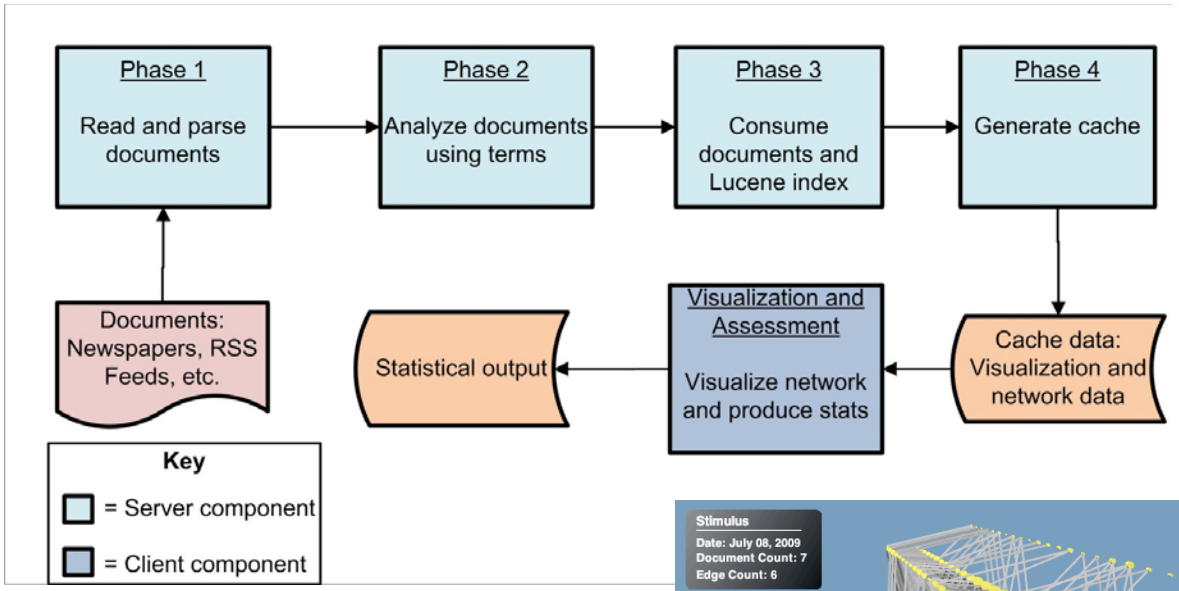

White Mountain
Golovin
Elim
NORTON SOUND
Upriver mine / prospects
1 - 5
6 - 15
16 - 30
31 - 50
51 - 125
Mine / prospect density
Very high
High
Moderate
Low
Mines and prospects
Watersources
Permafrost
Continuous
Discontinuous
N
0 5 10 20 30 40
Km

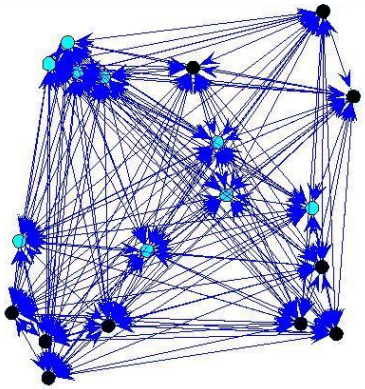

A.
N
Contemporary SES Index
High
Low
Mine density surf
High
Low
B.
N
Late 21st century SES Index
High
Low
Mine density surf
High
Low

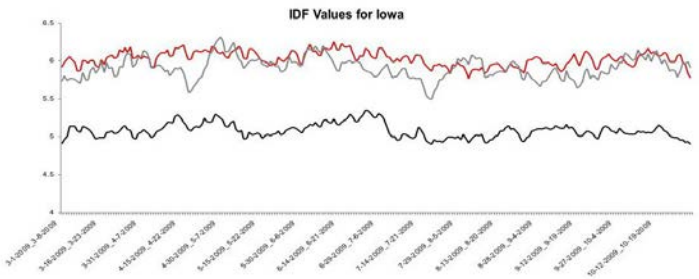

A.
N
Regional SES Index Change
High
Low
Mine density change
Gain
Loss
B.
N
Local SES Index Change
High
Low
Mine density change
Gain
Loss


A.
N
Contemporary Local SES Index
High
Low
Mine density surface
High
Low
B.
N
Late 21st century local SES Index
High
Low
Mine density surface
High
Low

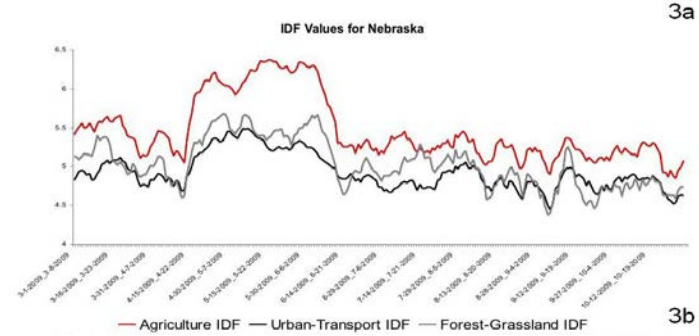
Acquiring, Organizing and Synthesizing (AOS) Social Science Data: AIDA



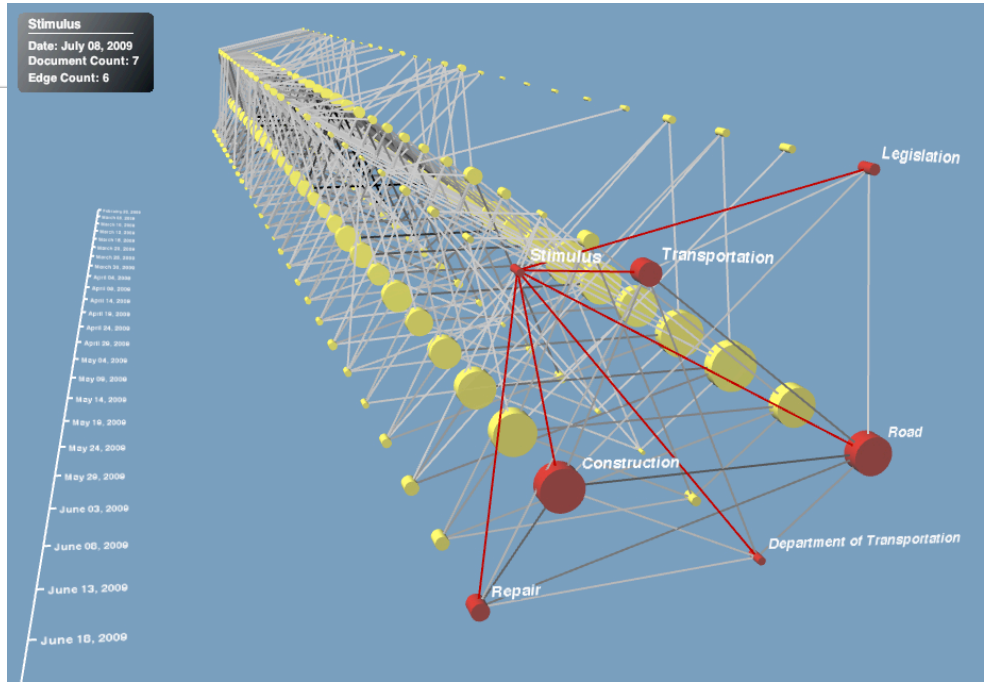


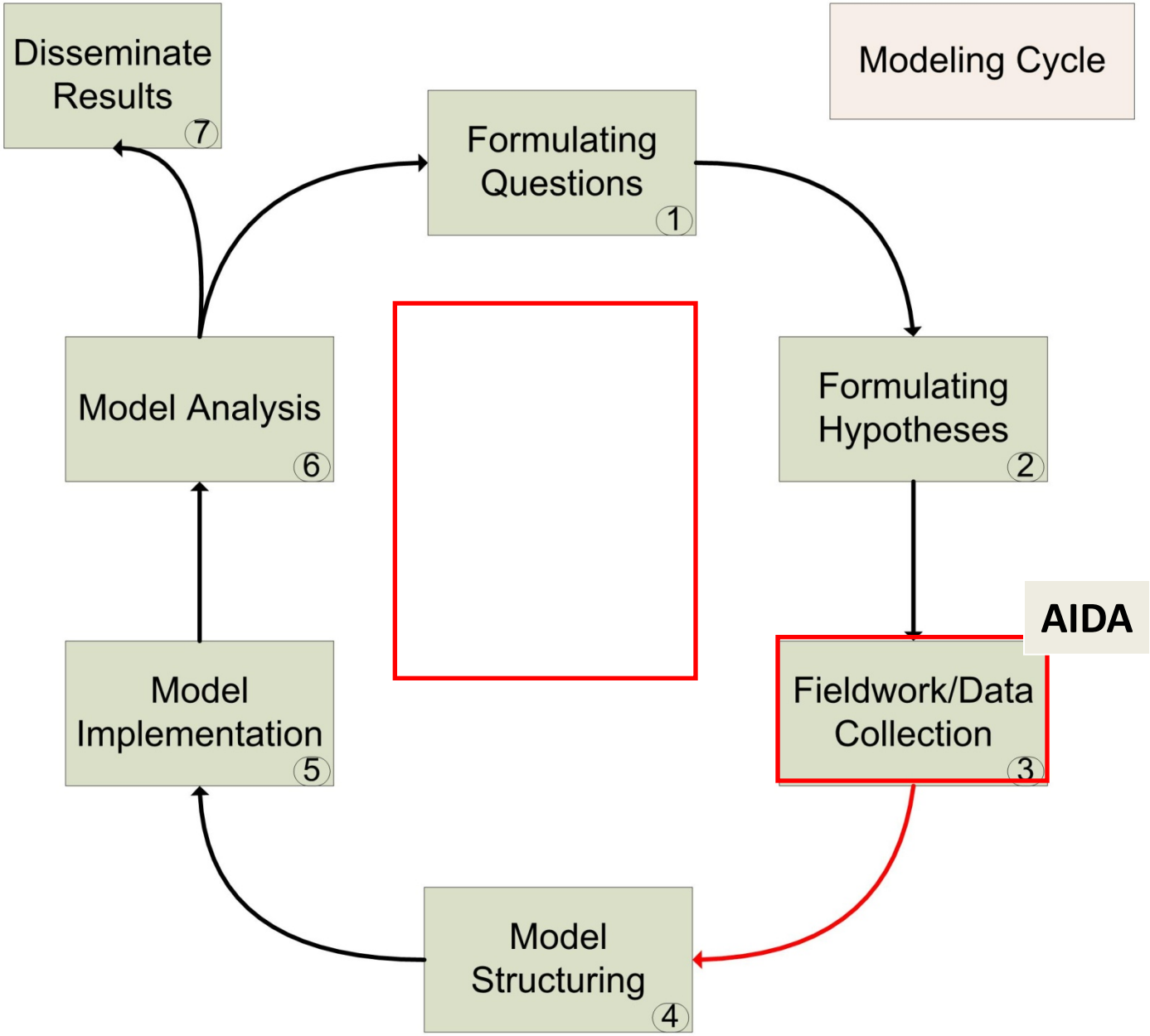


3a

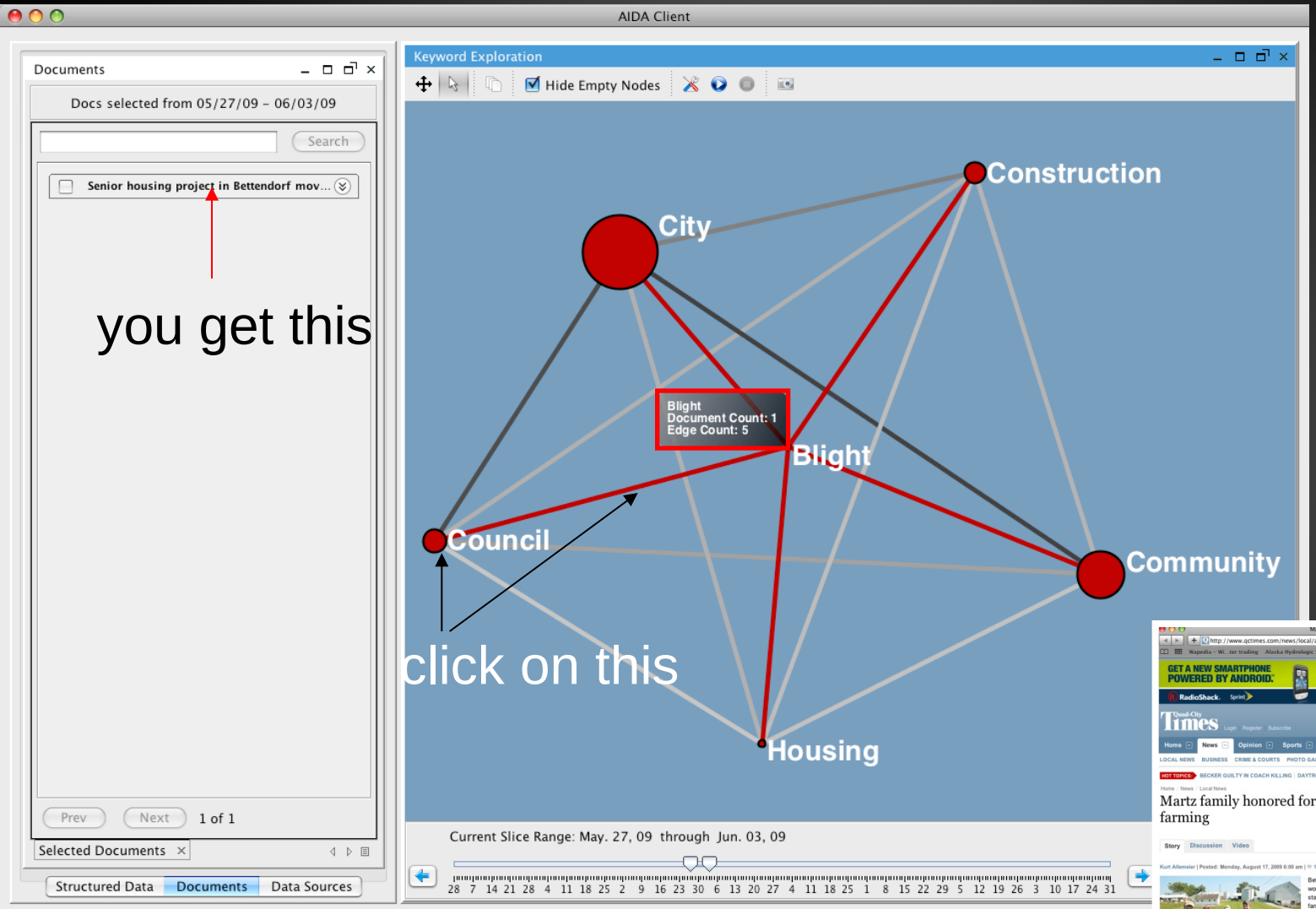


3b




Modeling Cycle
Disseminate Results
7
Formulating Questions
1
Formulating Hypotheses
2
Fieldwork/Data Collection
3
AIDA
Model Structuring
4
Model Implementation
5
Model Analysis
6

Finding Relationships



Mapping Values

ELSEVIER

Available online at www.sciencedirect.com
ScienceDirect

Landscape and Urban Planning 85 (2008) 27–39

LANDSCAPE AND URBAN PLANNING

www.elsevier.com/locate/landurbplan

Social–ecological hotspots mapping: A spatial approach for identifying coupled social–ecological space

Lilian (Naia) Alessa [a,1], Andrew (Anaru) Kliskey [a,*,1], Gregory Brown [b]

[a] *Resilience and Adaptive Management Group, Department of Biological Sciences, University of Alaska Anchorage, 3211 Providence Drive, Anchorage, AK 99508, USA*

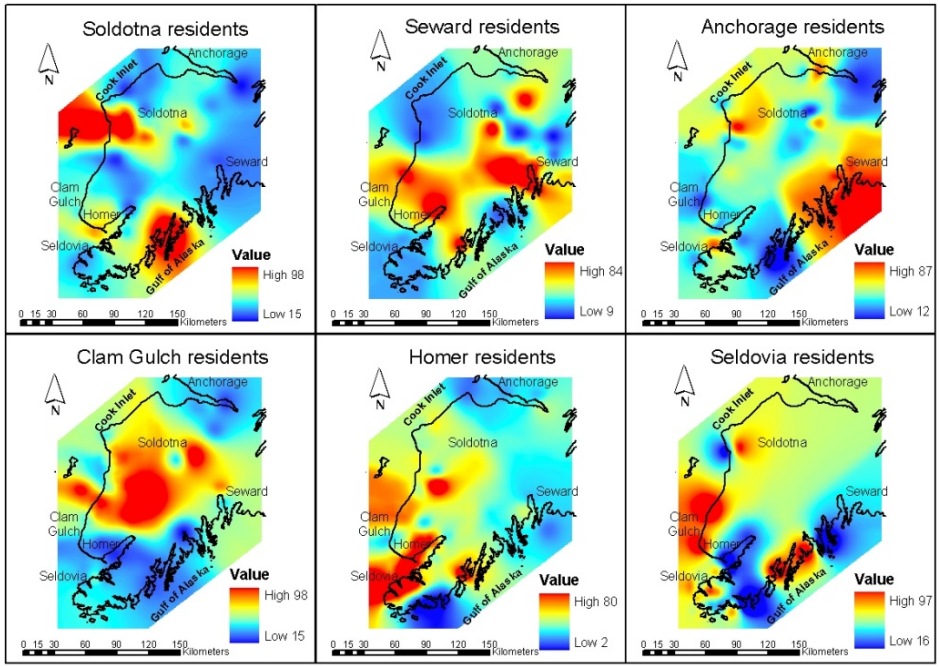
[b] *Recreation and Outdoor Studies Department, Green Mountain College, Poultney, VT 05764, USA*

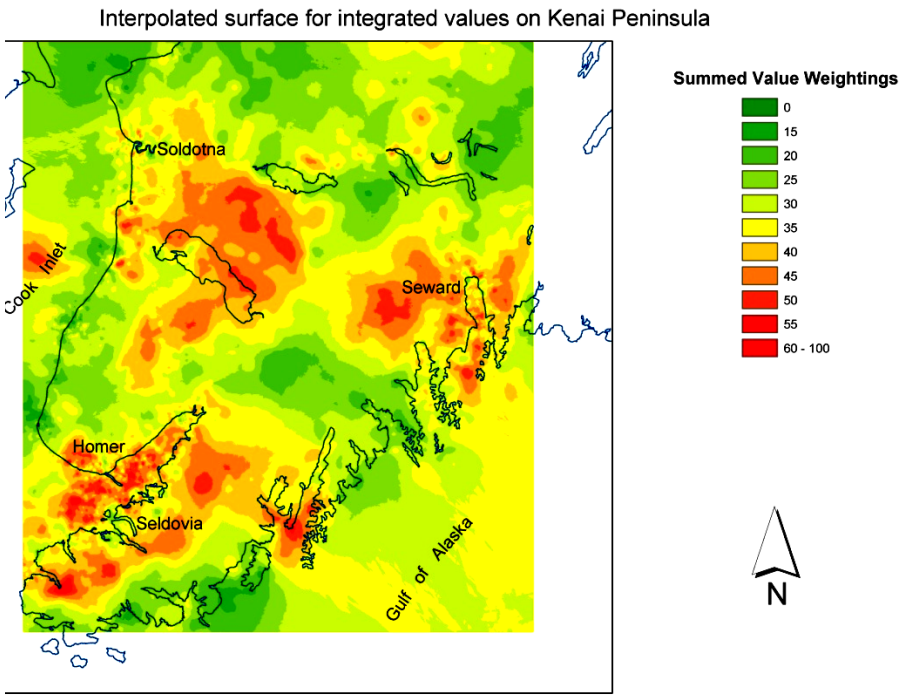
Received 22 August 2007; accepted 3 September 2007
Available online 29 October 2007

Abstract

This paper advances the concept of a coupled social–ecological system (SES), where human and biophysical systems are closely linked, to examine and explain variations in landscape values perceived by people in their region. In this paper, we describe an approach that allows the mapping of SES by linking survey research with geographic information systems (GIS) to provide spatial representations of social and ecological system convergence. Using survey data that measured landscape values from multiple communities on the Kenai Peninsula, Alaska, we identify geographical areas where both human-perceived and physically measured ecological values overlap and are referred to as social–ecological "hotspots". Community landscape values, collected as point data, were used to generate point density maps to produce hotspot surfaces for each value. These value surfaces were spatially cross-correlated with other communities' value surfaces and with an ecological map layer (net primary productivity) to demonstrate social–ecological mapping. Moderate spatial cross-correlation coefficients were found between most landscape values by community with 18 hotspot surfaces pairings exhibiting strong positive spatial cross correlations. Moderately significant, positive linear relationships were found between per-

Mapping Values





Modeling Consequences

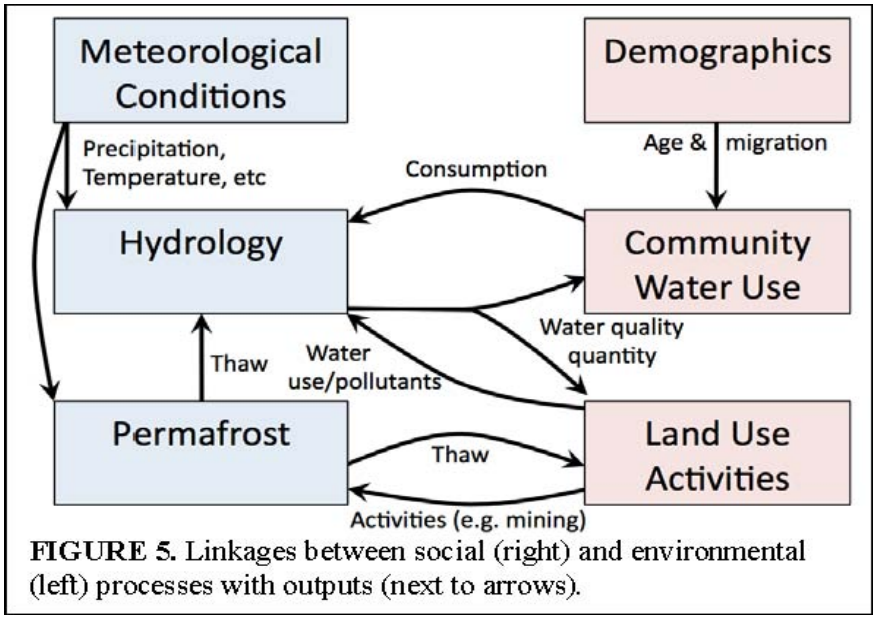
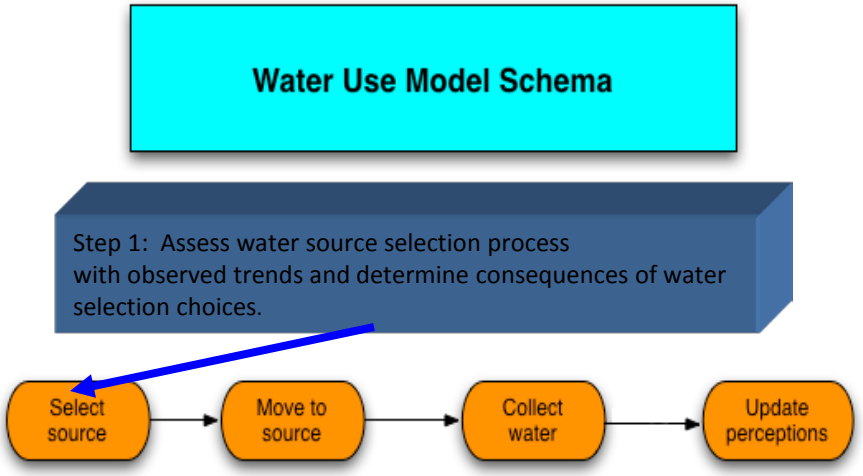
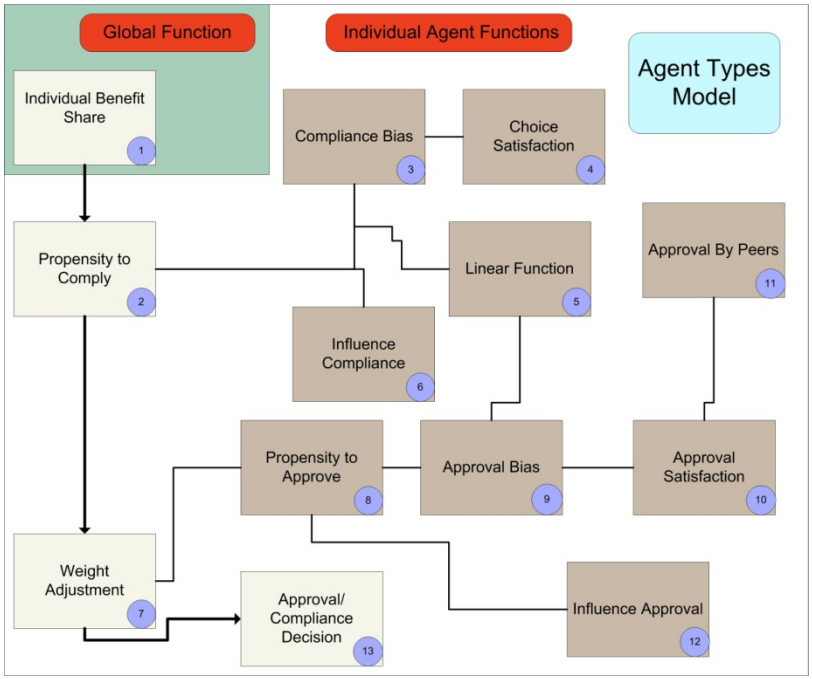


FIGURE 5. Linkages between social (right) and environmental (left) processes with outputs (next to arrows).





Decision Support

Environmental Management (2008) 42:523–541
DOI 10.1007/s00267-008-9152-0

The Arctic Water Resource Vulnerability Index: An Integrated Assessment Tool for Community Resilience and Vulnerability with Respect to Freshwater

Lilian Alessa · Andrew Kliskey · Richard Lammers · Chris Arp · Dan White · Larry Hinzman · Robert Busey

Received: 25 April 2007 / Accepted: 12 May 2008 / Published online: 17 June 2008

Abstract People in the Arctic face uncertainty in their daily lives as they contend with environmental changes at a range of scales from local to global. Freshwater is a critical resource to people, and although water resource indicators have been developed that operate from regional to global scales and for midlatitude to equatorial environments, no appropriate index exists for assessing the vulnerability of Arctic communities to changing water resources at the local scale. The Arctic Water Resource Vulnerability Index (AWRVI) is proposed as a tool that Arctic communities demonstrated in three case study communities/watersheds in Alaska. These results highlight the value of communities engaging in the process of using the AWRVI and the diagnostic capability of examining the suite of constituent physical and social scores rather than the total AWRVI score alone.

Keywords Arctic · Freshwater · Index · Resilience · Vulnerability

Decision Support

Why Use AWRVI?

- Fresh water is one of our most critical resources.
- It is designed to be used specifically in the Arctic's varied and unique environment.

Who Developed AWRVI?

Researchers from the Resilience and Adaptive Management Group, the Water and Environmental Research Center, the Institute of Northern Engineering, and the International Arctic Research

How Do I Access AWRVI?

University of Alaska Anchorage
3211 Providence Drive
Anchorage, AK 99508

Phone: 907-786-1136
Fax: 907-786-1314

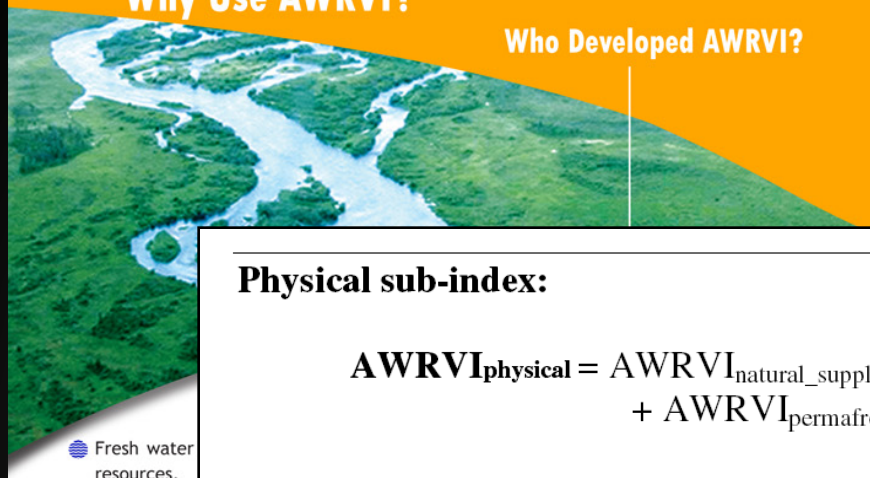
Summary of AWRVI indicators:

Sub-index	Component	Indicator
AWRVI Physical	Natural supply	Precipitation
		Surface water storage
		River runoff
	Municipal supply	Reservoir and well yield
		Treatment technology
		Hydraulic gradient
		Water source diversity
	Quality	Water quality
		Upstream development
	Permafrost status	Permafrost distribution
AWRVI Social	Information capacity	Land tenure
	Sensitivity to change	Community values
		Social network diversity
		Perception of change

Arctic Water Resource Vulnerability Index:

$$\mathbf{AWRVI} = \mathrm{AWRVI}_{\mathrm{physical}} + \mathrm{AWRVI}_{\mathrm{social}}$$

Why Use AWRVI?



- Fresh water resources.
- Being able to water that important as process.
- Cumulative be assessed port and con
- It provides a access wate potential vu conditions.
- It is designed to be used specifically in the Arctic's varied and unique environment.

Who Developed AWRVI?

3211 Providence Drive
Anchorage, AK 99508

Phone: 907-786-1136
Fax: 907-786-1314

Physical sub-index:

$$\mathbf{AWRVI_{physical}} = AWRVI_{natural\_supply} + AWRVI_{municipal\_supply} + AWRVI_{water\_quality} + AWRVI_{permafrost} + AWRVI_{subsistence\_habitat}$$

Constituent sub-indices:

$AWRVI_{natural\_supply}$ = f (precipitation, surface water, river runoff)

$AWRVI_{municipal\_supply}$ = f (yield, source diversity, treatment technology, hydraulic gradient, permafrost risk)

$AWRVI_{water\_quality}$ = f (upstream modification, water quality testing)

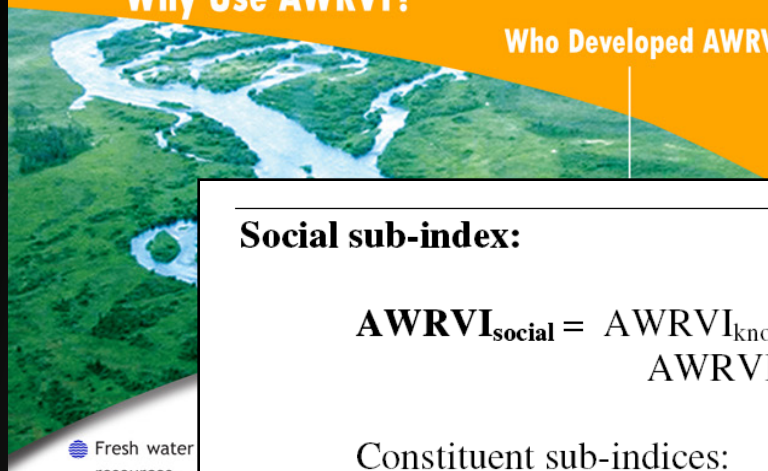
$AWRVI_{permafrost}$ = f (permafrost distribution)

$AWRVI_{subsistence\_habitat}$ = f (aquatic habitat, terrestrial habitat)

Summary of AWRVI indicators:

Sub-index	Component	Indicator
	Natural supply	Precipitation
		Surface water storage
		River runoff
		Reservoir and well yield
		Treatment technology
		Hydraulic gradient
		Water source diversity
		Water quality
		Upstream development
		Permafrost distribution
		Aquatic subsistence habitat
		Terrestrial subsistence habitat
		Traditional knowledge
		Education
		Residency
		Community wealth
Social	capacity	Land tenure
	Sensitivity to change	Community values
		Social network diversity
		Perception of change

Why Use AWRVI?



Who Developed AWRVI?

- Fresh water resources.
- Being able to water that important as process.
- Cumulative be assessed port and con
- It provides a access wate potential vu conditions.
- It is designed to be used specifically in the Arctic's varied and unique environment.

3211 Providence Drive
Anchorage, AK 99508

Phone: 907-786-1136
Fax: 907-786-1314

Social sub-index:

$$\mathbf{AWRVI_{social}} = AWRVI_{knowledge} + AWRVI_{economic} + AWRVI_{information\_capacity} + AWRVI_{sensitivity}$$

Constituent sub-indices:

$AWRVI_{knowledge}$ = f (traditional knowledge, Western knowledge, residency time)

$AWRVI_{economic}$ = f (community wealth)

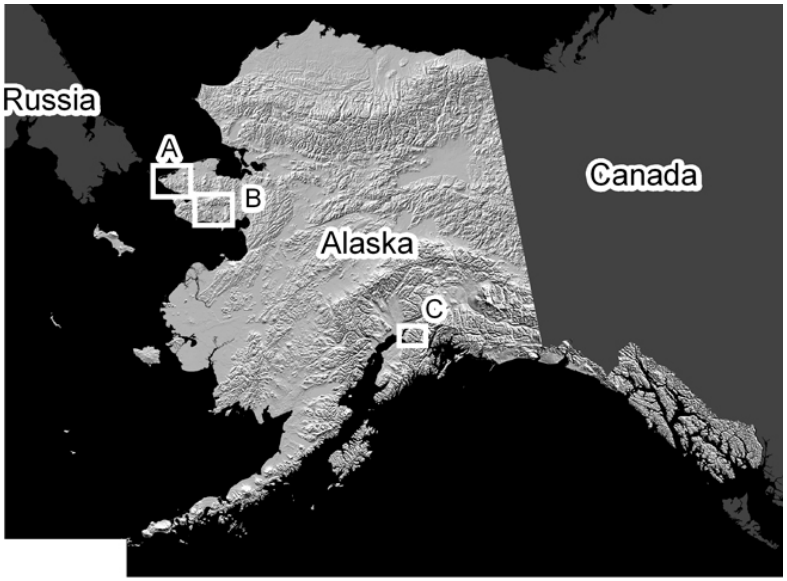
$AWRVI_{information\_capacity}$ = f (land tenure)

$AWRVI_{sensitivity\_change}$ = f (subsistence values, social network diversity, perception of change)

Summary of AWRVI indicators:

Sub-index	Component	Indicator
	Natural supply	Precipitation
		Surface water storage
		River runoff
		Reservoir and well yield
		Treatment technology
		Hydraulic gradient
		Water source diversity
		Water quality
		Upstream development
		Permafrost distribution
		Aquatic subsistence habitat
		Terrestrial subsistence habitat
		Traditional knowledge
		Education
		Residency
		Community wealth
Social	capacity	Land tenure
	Sensitivity to change	Community values
		Social network diversity
		Perception of change

AWRVI = 0.41 LDS = 0.04 Physical = 0.27 Social = 0.54

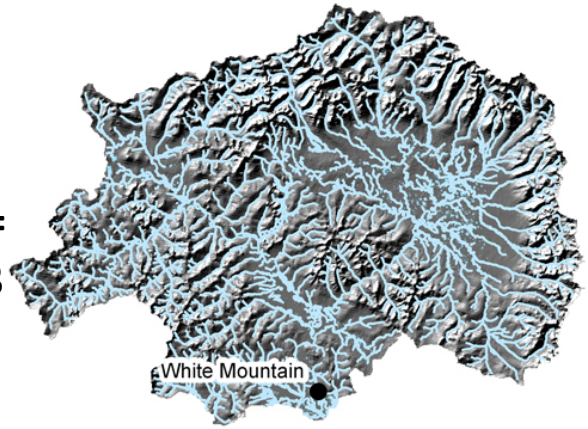


N

0 10 20 30 40 50 I

A. Wales

AWRVI = 0.48 LDS = 0.04 Physical = 0.33 Social = 0.63



0 10 20 30 40 50 Kilometers

B. White Mountain

AWRVI = 0.74 LDS = 0.04 Physical = 0.72 Social = 0.77

0 10 20 30 40 50 Kilometers

C. Eagle River

White Mountain, Alaska