



From the PI

Mark Myers, Principal Investigator
Alaska EPSCoR is hitting its stride.

“Alaska Adapting to Changing Environments (Alaska ACE)” just entered Year 3 of its 5-year life cycle. Our second year was a productive one, as we moved past the initial steps of organizing our research and began full implementation of the project. We’ve installed environmental sensors, gathered extensive LiDAR and remote sensing data, and compiled diverse environmental records from our test case areas, from historic stream temperature and discharge numbers to salmon harvests.

We’re now well into the second phase of the project, which centers on gathering social data. Researchers in our Southeast, Southcentral and Northern Alaska test cases have been compiling available information ranging from demographic trends to ecotourism market numbers. And they’re gathering current data through surveys and focus groups, asking carefully crafted questions about perceptions of climate change and the ways people respond to it.

This all sets the stage for the third and final phase of the project, which will focus on synthesizing these two data

A River Runs Through It Southcentral Test Case examines Kenai watershed

From a social-ecological systems (SES) perspective, the Kenai River watershed is a mess.

To be more specific, it’s a “messy SES:” an area subject to interacting social and ecological changes of different types, rates and scales. Temperatures and precipitation are changing, salmon numbers are in flux, recreational pressure from Anchorage is increasing, wetlands are shrinking, and spruce bark beetles and fires are impacting forests. The goal of Alaska EPSCoR’s Southcentral Test Case is to parse and quantify these changes affecting communities in the watershed – with a focus on hydrologic and landscape changes – and to better understand the ways in which residents of these communities perceive and adapt to them.

Alaska EPSCoR’s current project consists of five components, each of which will be highlighted in a newsletter:

1. Southeast Test Case
2. **Southcentral Test Case**
3. Northern Test Case
4. CIS Working Group
5. EOD Group



photo by Tom Moran/Alaska EPSCoR

UAA-Kenai Peninsula College Professor Alan Boraas, a Southcentral Test Case leadership team member, speaks at a test case meeting in Kenai in May 2014.

“We’re interested in how different elements come together, how they interact, what’s the relative importance of different components, and so we’ve got a view on hydrologic change, on aquatic ecology, on landscape change,

Written in the sand

A sandbox plus a projector equals fun - and learning, to boot.

That's the simple math behind the "Augmented-Reality Sandbox," a wildly engaging outreach tool developed by EPSCoR-funded technicians at UAF's Geographic Information Network of Alaska (GINA). The sandbox is effectively an interactive contour map: when people manipulate the sand into landscapes, an overhead projector translates their hills and valleys into colored topography projected on the sand. And when a user hovers their hand over the device, it is interpreted as a cloud and virtual rain drops onto the landscape, creating channels in the valleys.

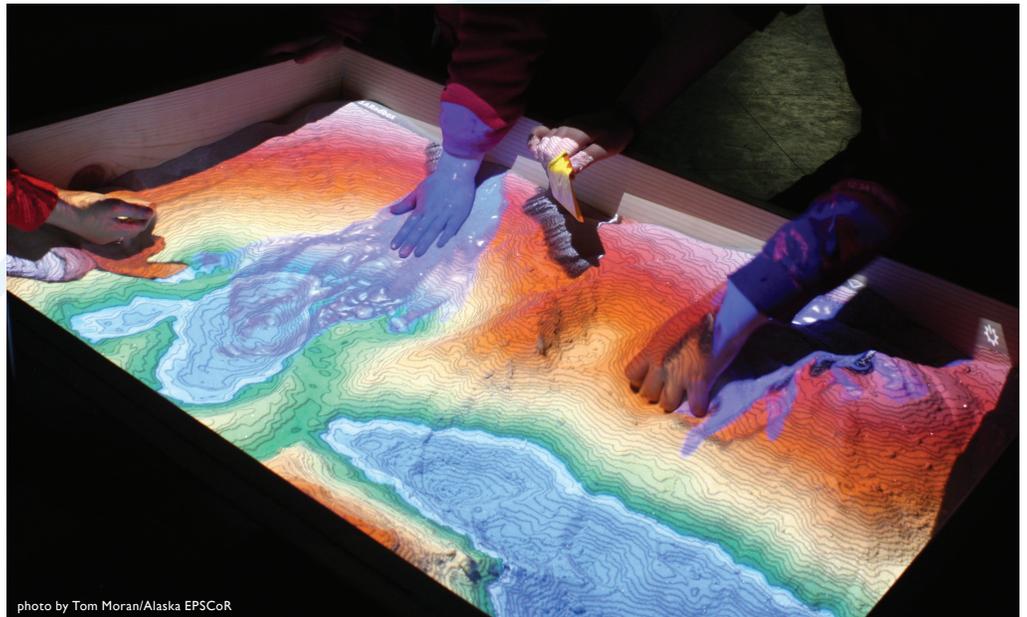
"You hand someone a flat paper map and try to teach that kid what those little lines mean on there - it's difficult," noted Greg Wirth, a GINA systems analyst who did most of the work on the project. "With this, they can actually see the hills, and they can move the hills, they can see how it gets remapped and they can see what those contour lines mean."

The sandbox, one of only a couple dozen in existence, is based on a project by a faculty member at the University of California-Davis. GINA assembled it using open-source software, a standard personal computer, a Microsoft Kinect, and a projector, arrayed on a frame salvaged from a pickup truck ladder rack. Alaska EPSCoR financed the project as a way to raise the profile of EPSCoR's statewide research into landscape and hydrologic change, and to interest Alaskan students in the sciences.

"The sandbox lines up with our education and outreach activities, because we try to get the public engaged and interested in science, and it's a way that we can show them what we're doing," said Alaska EPSCoR Educa-

tion, Outreach and Diversity Manager Tania Clucas.

The sandbox was unveiled at a March 2014 surveying and mapping conference and was a huge hit, drawing large crowds and local media attention. At a second appearance at a public science event, the display was mobbed all day long. "That was an amazing thing for the children," Wirth said. "It was almost impossible to



Children using the Augmented-Reality Sandbox during the UAF Science Potpourri event in April 2014.

drag them away from it."

EPSCoR and GINA hope to build a more polished and mobile version to take to science fairs and museums, and potentially to build more sandboxes for use in Anchorage and across the state to teach K-12 students about geography, hydrology, geology, and related fields. EPSCoR and GINA are also brainstorming ways to realize the potential of the sandbox as a research tool.

"The sandbox by itself is a really neat thing, it's surprising, and its 'wow' factor is really nice," Wirth noted. "But what do you do with it then? How do you expand this, make it bigger so it can be used in more instances, say lava flows, water modeling, avalanches, glacial movements - whatever else we can come up with."♦

See video footage of the sandbox in action, as well as other Alaska EPSCoR videos, at www.youtube.com/user/AlaskaEPSCoR

The View from Above

Alaska EPSCoR is helping students at five Alaska high schools to reach new heights.

EPSCoR is collaborating with Alaska Upward Bound to run “The Modern Blanket Toss,” a program through which high school students perform experiments using unmanned aerial vehicles (UAVs). The goal of the project is to increase the students’ interest in science fields as they undertake projects that are useful to their communities.

“UAVs are intriguing, they’re exciting, they capture the students’ imagination and they’re cutting-edge,” said Alaska Upward Bound Director John Monahan, who is running the program. “They’re a fun leverage into getting the students exposed to STEM (science, technology, engineering and math) careers.”

The program, which is being funded by a three-year, \$750,000 National Science Foundation award, will involve approximately 75 students from high schools in Shishmaref, Bethel, Chefnak, Nikiski and Seward. Students will attend Upward Bound’s residential summer classes on the UAF campus, during which they will learn how to use the UAVs and receive science communication and leadership training. Experts with the Alaska Center for Unmanned Aerial Systems Integration (ACUASI) will help with the instruction, and students will take field trips to UAF’s Poker Flat Research Range. Sixteen students from four of the schools are enrolled in the program’s first cohort this summer.

“One of the projects taking place this summer is the class is mapping the UAF Frisbee golf course,” Monahan noted. “It will give them valuable experience they can put to use later on projects to help their own communities.”

All five schools will be provided with DJI Phantom quadrotor UAVs and smaller training UAVs, as well as GoPro cameras and GPS tracking devices. During the academic year, students – under the tutelage of Upward Bound personnel – will take part in lessons centered around the UAVs and engage in hands-on activities such as simulated search-and-rescues or charting sea ice.

A pilot UAV program began in Shishmaref High School in spring 2014, with funding from an EPSCoR Alaska Native Engagement Grant. A dozen students undertook controlled experiments with their UAV inside the school gym, learned how to operate (and to repair) the device and camera, and



Upward Bound instructor Charlie Parr and students (l to r) Bryan Sledge, Wally Flynn, Garrett Kairaiuk and Brittney Boney use a UAV to map the UAF frisbee golf course.

began a project to document beach erosion. There have been more than a few hiccups along the way, Monahan said: the harsh local conditions led them to modify the UAV with a stronger camera mount, more moisture protection, and larger control sticks to operate while wearing gloves. The group even lost one smaller UAV in a strong wind, leading them to curtail all outdoor use until the calmer weather of late spring and summer, and to step up indoor activities.

“We bought smaller copters with similar control patterns to the full-size UAVs, so they can practice a lot more inside the gym doing challenge courses that simulate flying conditions,” he said.

Such experimentation is the point of the project: “The Modern Blanket Toss” was funded as a pilot program, designed to determine whether UAVs and comparable devices can be used as educational tools on a wider basis. “The idea is that this program can model a project that could be replicated across the country,” Monahan said. “And not necessarily with UAVs but with some other technology, such as 3-D printers, it could be whatever else is exciting out there.”

Beginning in the fall, students will put their knowledge to use in local mapping projects, selected and designed based on student and community members’ input. Students will present their results at community meetings and other events, including a nationwide workshop during the final summer of the program in 2016. ◀

Southcentral Test Case

Continued from page 1

and importantly on human dynamics,” explained Andy Kliskey, head of the test case. “The Kenai Peninsula provides a very interesting place to look at that because of a number of different things that are going on.”

The test case focuses on the more than 20,000 residents scattered across the Kenai Peninsula communities of Kenai, Soldotna, Sterling, Cooper Landing, Moose Pass, and Seward. Salmon is the lifeblood of the area and also a key focus of the test case, Kliskey said. “There are six different salmon fisheries

Southcentral Test Case Leadership Team

Andrew Kliskey, U. of Idaho Professor of Natural Resources
Dan Rinella, UAA Term Assistant Professor of Aquatic Ecology
Jonathan Alevy, UAA Associate Professor of Economics
Alan Boraas, UAA-Kenai Peninsula College Professor of Anthropology
Sveta Stuefer, UAF Assistant Professor of Civil Engineering
Jamie Trammell, UAA Assistant Professor of Environmental Studies
Mark Wipfli, UAF Professor of Freshwater Ecology

followed by widespread and varied efforts to gather social and economic data, including local demographics and perspectives on climate change. Test case students and researchers have collated data on sex and age structure of each community since 1950



Southcentral Test Case researchers visit the Russian River during a test case meeting in May 2014.

that the Kenai River supports,” he noted, “and so it’s very important for subsistence, for sustenance, for jobs, as an economic element in the Kenai in the communities of Soldotna and Kenai, and also for some of the social values.”

The first phase of test case research was to gather data about environmental conditions in the watershed. This meant sorting through stacks of agency data on discharge rates and climate factors dating back as far as 1932, and assembling sensing data to measure changes in landcover and surface moisture. It also entailed installing or reactivating hydrologic sensors in the key Kenai tributaries of Russian River, Beaver Creek and Ptarmigan Creek, and partnering with local entities like the Kenai Watershed Forum and the Kenai Peninsula Borough to share data – including an agreement with the borough that led to a combined LiDAR mapping effort covering the entire Kenai Peninsula. “We really want to leverage the existing work and networks that these community partners have,” Kliskey said.

These first steps of test case research have been

and substantial datasets on sport fish licenses and salmon harvest numbers. These have been coupled with a study estimating future salmon production under different climate scenarios, and one using lake coring to determine salmon populations in the distant past (see sidebar.)

Another focus of the test case during its second year (2013-14) was compiling current information about local perspectives and perceptions. This included focus groups with community leaders, interviews

with members of the local Kenai’tze tribe to collect traditional ecological knowledge on environmental change, and – most significantly - a comprehensive survey mailed to households across the watershed.

“The survey was basically intended to get an idea of values and experiences on the Kenai Peninsula,” said Sarah Wandersee, a test case postdoctoral fellow who took a lead role in the effort. “Questions were related to perceptions of the environment, such as whether people are seeing changes in fish or development, and connections to place, such as activities, what people really find important about this area, and why they came here and stay here ”

The data collected from these ongoing efforts are the first two pieces of the adaptation puzzle. The next step, Kliskey said, will be to analyze and synthesize the findings into useful models and other products. He said this effort will include geographic information systems approaches that can map important “hotspots” of change; systems models that link hydrologic and landscape change and

people's decision-making; and visualization techniques through which users can watch future scenarios unfold in a virtual environment.

These test case efforts represent a microcosm of Alaska EPSCoR's current research project as a whole, which is using a framework of three regional test cases to parse out the elements that contribute to the adaptive capacity of different types of communities – their ability to survive and thrive in the face of change.

Data from the Southcentral Test Case can be found in the Southcentral Alaska Science Catalog at southcentral.epscor.alaska.edu/

“The big lessons we want to take from this effort are, what are the important factors that contribute to the ability to respond to change

in the environment that are comparable here in the Kenai River watershed, that we might also see in the Southeast Test Case and the Northern Test Case,” Kliskey said. “And then, what are the factors that are unique to this place, to the Kenai River watershed, to the people of Soldotna, Kenai, Cooper Landing. Teasing apart the unique factors contributing to response to change and adaptation, versus the ones that are more universal.”●

Fishing for Clues

Molly McCarthy plans to tell a very long fish story.

The UAA Biological Sciences graduate student is using sediment cores from a pair of Kenai Peninsula lakes to estimate fluctuations in salmon abundance going back 2,000 years. The idea, she explained, will be to see how these numbers correspond to known long-term changes in climate.

“A lot of this test case focuses on landscape change and changes in climate, and changes in these systems, and this data will present what has happened over the last 2,000 years where there have been marked inclines in temperature, and also declines in temperature and precipitation,” she said. “Knowing that will help us kind of understand what might happen to these (salmon) systems in the future.”

McCarthy's methodology is based on two methods. First, certain groups of diatoms tend to be abundant during high salmon years, so she will track their levels in the cores. Second, and more significantly, sockeye salmon metabolize nitrogen at sea, then deposit it in the lakes when they die after spawning; this means that measuring the concentration of a specific nitrogen isotope in a layer of annual lake sediment gives an indication of salmon abundance for that year.

“If you have a ton of carcasses decomposing you have a really high nitrogen signal, and if you don't you have a lower nitrogen signal,” she said. “So that's what we're using.”

First, though, McCarthy needed sediment cores, which she had planned to retrieve from Upper Russian and Skilak lakes over the winter. She obtained the former in March in collaboration with a group of scientists from the University of Ghent in Belgium, who were retrieving cores of their own to study



Molly McCarthy with one of her research subjects.

earthquake history. The lakes have also piqued the interest of a Northern Arizona University researcher studying past climate regimes and a USGS tephrochronologist studying historic volcanic eruptions, all of whom have cooperated on the project. “Between all of us, we should have a really good understanding of what has been going on there,” McCarthy said.

The research partners came in especially handy when McCarthy discovered Skilak Lake hadn't frozen over for the winter; she was able to instead obtain a core sample extracted in 2012, with plans to supplement it through coring this coming winter. McCarthy took her cores to the National Lacustrine Core Facility at the University of Minnesota for analysis, and she and the other researchers are in the process of analyzing sediment layers and sporadic layers of tephra to turn the cores into year-by-year timelines. McCarthy can then use her twin methodologies to calculate salmon abundances at regular intervals and to develop a model to explain past abundances and, hopefully, to predict future ones.◆

Warming up to WAISC

If you're going to focus a science conference on warming, Kotzebue in April is an excellent place to do it.

Warmth was everywhere at this year's Western Alaska Interdisciplinary Science Conference (WAISC): in the mild blue skies overhead, in the snowmelt on the gravel roads, and in the waning pack ice on Kotzebue Sound, across the street from the hotel where 100-odd researchers and local residents gathered for the annual symposium. And global warming was front-and-center at the event, where the main topics of conversation were the effects of climate change on local ecosystems and residents.

"When we talk about science and we talk about global warming ... it's going to affect everything that we are as people," noted UAF Chukchi Campus Director Pauline Harvey in her opening remarks. "That's our livelihood out there in the waters, the seal, the walrus, the whale, the salmon, the sheefish, the trout, all of the ducks and geese and caribou. That's our food and that's our sustenance, and without that we're not who we are as Inupiat people."

WAISCs have been held in rotating Western Alaska communities since 2008, but 2014 marked the first visit to Kotzebue. Entitled "Science of a Cold Place in a Warming World," the conference centered on two lengthy sessions dedicated to ecology, environment and climate change, talks by local Native elders, and a keynote address by UAF Professor Emeritus Terry Chapin on "Linking Science to Action in a Warming Arctic."

"We are looking basically at the effects of global warming on the communities of western and rural Alaska, so what happens to subsistence food, what health effects people are encountering due to global warming, what weather effects they are seeing," said Anshul Pandya,

Assistant Professor of Biomedical Sciences at the UAF Chukchi Campus and chief organizer of the event.

Terry Chapin, who was attending his first WAISC, said he was impressed by the science efforts being undertaken in the region, especially by Alaska Natives. He also said he appreciated the setting of the conference, which both brought research to local audiences and

enabled academics from Fairbanks and Anchorage - himself included - to experience the local conditions.

"Seeing breakup happening early, having a chance to go out and jog for whitefish and hearing that those are earlier than they usually are, just gave me a sense of climate change on the ground, boots on the ground," he said. "That's how you feel it, and that's how you get to empathize with

the issues that are involved."

Alaska EPSCoR has supported WAISC since its inception, principally by providing travel grants for students and faculty members to attend the conference. In 2014 Alaska EPSCoR funded attendance by Chapin and seven other UA students and faculty, who presented on topics ranging from the neurobiology of hibernation in arctic ground squirrels, to the use of aquariums as biology teaching tools, to the extent to which wolves use salmon as a food resource. UAF graduate student Lisa Strecker, who is studying the economics of dog teams versus snowmachines in Kamchatka, Russia, said the conference was a great opportunity to learn about the region and to hear from researchers across disciplines.

"I got lots of interesting input from different people," she said. "That's why it's great to go to interdisciplinary conferences - I had great discussions and great input, and it was definitely worthwhile coming here."●



Alaska EPSCoR travel grantee Doug Causey discusses his entry in the poster session at the 2014 Western Alaska Interdisciplinary Science Conference.

EPSCoR People

New faculty hires

Alaska EPSCoR has now funded the addition of three new faculty members to the UA system: UAS Assistant Professor of Forest Ecosystem Ecology Brian Buma (who was profiled in the Fall 2013 newsletter); UAF Assistant Professor of Civil and Environmental Engineering Srijan Aggarwal; and new UAF Institute of Biology (IAB) hire Todd Brinkman.

Aggarwal began work at UAF in fall 2013. He holds a Bachelor's in Civil Engineering from the Indian Institute of Technology in Delhi, India, and an M.S. and Ph.D. in Civil Engineering from the University of Minnesota, and also worked at UMinn as a postdoctoral fellow and research associate. His research interests are in the area of environmental biotechnology, specifically efficient water and wastewater treatment and biofilm processes.

Brinkman was hired this spring and will begin work with the IAB in the fall. He received his B.S. from Minnesota State, his M.S. from South Dakota State, and his Ph.D. from UAF, and most recently worked as a Research Assistant Professor with the Scenarios Network for Alaska and Arctic Planning at UAF. His position will assist the Northern Test Case and will focus on the human dimensions of wildlife management.



Aggarwal



Brinkman

Supported faculty at UAA

In addition to EPSCoR's UA faculty hires, the Southcentral Test Case is providing salary support for one upcoming and two recent UAA hires to assist the test case in key fields:

- Jamie Trammell is a landscape ecologist interested in modeling landscape change with a focus on integrating socioeconomic and biophysical drivers.
- Martin Cenek is a computer scientist with an interest in constructing simulations that incorporate the interface between social and environmental systems.
- Matt Reeves is a hydrogeologist whose interests include climate change, integrated modeling, and groundwater.

UAF graduate student cohort

Alaska EPSCoR is collaborating with the UAF Graduate School to train a cohort of UAF Ph.D. students in social-ecological systems (SES) science. Members of the group have been largely drawn from the ranks of mid-level career professionals looking to gain expertise in integrative science and in SES fields.

EPSCoR is providing an academic "home" for these interdisciplinary students and is supporting research process classes, SES seminars and workshops, guest speakers, and travel funding. Cohort activities began in fall 2013 with a weekly seminar for prospective cohort members, and will ramp up in fall 2014 when the entire group is enrolled. EPSCoR has a goal of graduating a set of 6-8 students who will serve as the next wave of Alaska leaders in interdisciplinary science.

Director's Letter Continued from page 1

streams. The results will yield valuable data about the ways in which people perceive and respond to change and enable us to build useful tools to help communities respond to present challenges and plan for future ones.

This edition of the newsletter focuses on the Southcentral Test Case, which studies how landscape and hydrologic changes are impacting Kenai River communities. It's an important question about a key region of the state, which has a growing population, a large role in Alaska's tourism economy, and a reputation as Anchorage's wilderness backyard.

Other articles focus on some highlights of recent EPSCoR work. We've been particularly pleased with the results from our Arctic Adaptation Exchange Workshop, and are all very excited about the prospects for "The Modern Blanket Toss." The latter program was funded through a separate award from the National Science Foundation and was one of only a few programs funded out of a large pool of nationwide applicants. We plan to justify our selection by offering an innovative and enriching educational experience to the students involved.

It's been a successful year, and an important one for our project. But the best is yet to come.♦

Alaska EPSCoR:
Experimental Program to Stimulate Competitive Research
University of Alaska Fairbanks
P.O. Box 757010
208 West Ridge Research Building
Fairbanks, Alaska 99775-7010

Non-Profit
Organization
U.S. Postage
PAID
Permit #2
Fairbanks, AK



UNIVERSITY
of ALASKA
Many Traditions One Alaska

UA is an affirmative action/
equal opportunity employer and
educational institution.

Address Service Requested

If you no longer wish to receive the Alaska EPSCoR newsletter, please contact Tom Moran at tmoran3@alaska.edu or (907)474-5581.

Alaska EPSCoR is supported by NSF awards #OIA-1208927 and #IIA-1348413 and the state of Alaska.



Working Across Borders

Anchorage isn't in the Arctic, but for three days this winter it was a center of the world for Arctic adaptation researchers.

On February 10-12, an international workshop co-sponsored by Alaska EPSCoR brought together 60 researchers from the U.S., Canada, Japan, and Norway to brainstorm and coordinate research into community adaptation. A major goal of the conference was to align efforts on "adaptive capacity indexes:" decision-making tools that community leaders can use to gauge and monitor their ability to thrive in the face of environmental and social changes.

"The purpose was to look at how we could take some of the lessons we were learning here, some of the work we were doing at Alaska EPSCoR, which is very focused on adaptation, and transfer that knowledge to other arctic nations," noted Alaska EPSCoR Co-Project Director Lil Alessa. "To figure out what should be in a knowledge exchange about adaptation."

The workshop was the brainchild of the Sustainable Development Working Group of the Arctic Council, an international Arctic social science group currently chaired by Canada. The purpose of the event was to improve connections among this international group of researchers, and to gather information for the "Arctic Adaptation Exchange Portal," a website that will enable researchers across the globe to share information and collaborate on indexes.

The first day of the three-day event consisted of presentations and group discussions, including a case study of an

index related to Arctic water resources. Attendees learned the principles behind indices, which use key indicators (like infrastructure, industry diversity, age and gender structure of population, and location) to quantify the vulnerability of communities to change, enabling leaders to set adaptation goals and to monitor progress toward them. They also



Rebecca World, Director of the Climate Change Secretariat for the Yukon Government, addresses attendees at the Arctic Adaptation Exchange Workshop.

learned the processes behind building indexes, which combine mapping and gathering of socioeconomic data with extensive partnership with local entities and residents to identify and weigh local factors.

The second and third days were devoted to refining the goals of the portal in detail, including defining its target

audience, exploring ways the portal can meet audience needs, and identifying online systems and tools to communicate the information. The portal is being managed by Canada and hosted by the University of Alaska Fairbanks, and is slated for launch in May 2015.

"Part of being able to manage our resources effectively is to share our knowledge internationally, which is kind of a unique position," Alessa said. "So having that portal, having the knowledge exchange, having that innovation space, allows not only for Alaskans to participate, but also allows other countries to participate here, so it's very central to our primary mandate."

The workshop was organized and co-sponsored by Alaska EPSCoR; other project partners include the U.S. Department of State, University of Alaska, the Aleut International Association, Gwich'in Council International, the Government of the Yukon, and Natural Resources Canada.