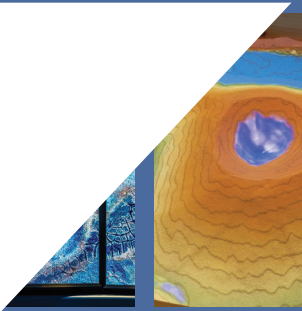
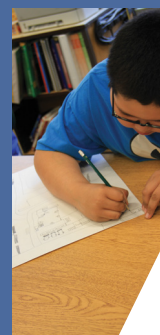


# Sharing Questions, Sharing Answers:

## A Report on Alaska ACE Stakeholder Engagement

photos by Tom Moran, Courtney Breest, and Christine Kelli/Alaska EPSCoR



Alaska  
**EPSCoR**  
February 2019

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# Message from the Director

The subject of this report is stakeholder engagement by researchers in the Alaska Adapting to Changing Environments (ACE) project: our efforts to involve local communities, organizations and individuals in shaping, conducting and benefiting from our research. But that begs the question: why engage stakeholders at all? Why take the extra time to gauge and respond to local needs?

There are a few answers. For starters, we are all citizens of the same state, country, and planet, so the answers that benefit our stakeholders should be of value to all of us. At the same time, stakeholders offer unique insight into the places they (and we) live that can strengthen our work. Also, partnerships with stakeholders help to demystify the research process and make it more likely that findings will be accepted and acted upon. But most importantly, we are supported with public money to do research for the public benefit. So there's a moral imperative to involve stakeholders in the process and to share results.

Which leads to another question: who are our stakeholders? Who is interested in our research, who is involved in it, and who stands to benefit from our findings?

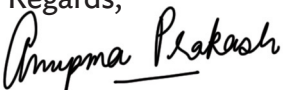
Because of the breadth of our work, that can be difficult to answer. Our six-year mission was to study the ways different kinds of communities adapt to environmental change. This research is relevant across the globe, which is why many of our outreach efforts, from social media to academic articles, were aimed at a national and international audience.

On the other hand, posting on Facebook and publishing in journals hardly constitute groundbreaking outreach. So what we chiefly focus on in this report are our novel interactions with local Alaskan groups who helped to shape and to conduct our research and who can make constructive use of ACE findings. In our Southeast Test Case, the emergent focus was on Juneau tour operators who need to factor thawing glaciers and other environmental changes into their business plans. Principal stakeholders in the Southcentral Test Case were the land and resource managers who make decisions about salmon fisheries on the Kenai Peninsula, which are being impacted by both climate and landscape change. And in the Northern Test Case, we partnered with residents of the Arctic village of Nuiqsut, whose mixed-subsistence lifestyle is being impacted by both climate change and increasing oil development.

Researchers met with individuals and agencies representing these groups at workshops and individually to help shape and scope the ACE project. Researchers also gathered data through surveys and interviews, collaborated on unique efforts to co-produce knowledge, and shared data and findings via slideshows, symposia, reports and web pages. The processes by which diverse stakeholders were involved in our research design, and the ways they shared in our discoveries, make up the substance of this report. It all culminates in a set of general recommendations for future scientists conducting stakeholder-focused research in the Arctic – or anywhere. We hope this document will serve as a stepping stone toward future research efforts that partner with the audiences whom science is ultimately designed to benefit.

After all, if findings aren't going to do people any good, then what's the point of making them?

Regards,



Anupma Prakash

Alaska ACE Project Director and Principal Investigator

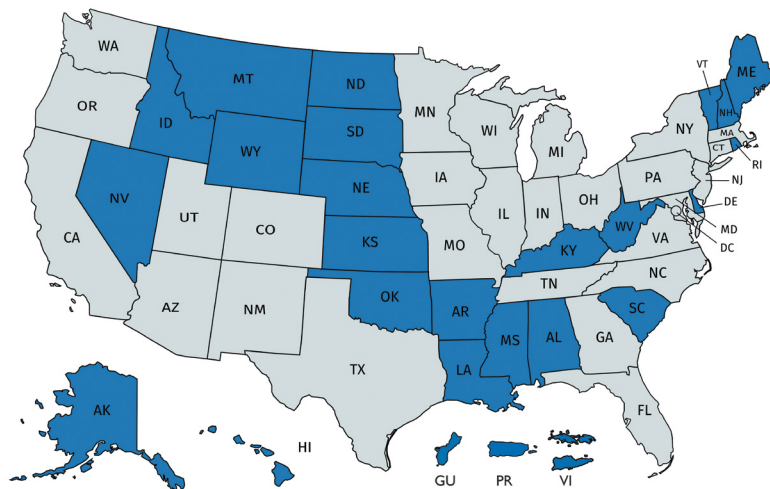




# 1. Introduction

“Alaska Adapting to Changing Environments (ACE)” was a “Track-1” research project of Alaska NSF EPSCoR (National Science Foundation Established Program to Stimulate Competitive Research). NSF EPSCoR is a nationwide program founded by Congress to build research capacity in states and territories which receive relatively small amounts of NSF funding. Currently 26 states and territories qualify for EPSCoR programs. Alaska has been an EPSCoR state since 2001.

The six-year (2012–2018), \$21 million ACE project consisted of biological, physical and social research into *adaptive capacity*: the mechanisms that enable communities and groups to effectively respond to environmental and social change. ACE researchers monitored biophysical changes (with an emphasis on hydrologic and landscape changes) around selected Alaska communities by installing sensor networks, mapping with LiDAR, and acquiring biophysical data and traditional knowledge. Researchers then compiled social science data and used surveys, interviews and other methods to measure community responses. These results were synthesized into reports, models and other tools to aid community adaptation.



EPSCoR states and jurisdictions, 2018.

ACE research was organized around three “test cases” in different regions of Alaska (see map, next page). Results from the test cases were used by a statewide Coordination, Integration and Synthesis (CIS) Working Group to answer larger scientific questions about adaptation and to create decision-support tools. A statewide Education, Outreach and Diversity (EOD) Group worked to involve students and the public in ACE research and to share findings.

## Purpose and methodology of this report

As a condition of its funding, Alaska NSF EPSCoR was directed to write a report “describing the effectiveness of the methods and tools used for stakeholder engagement, how the Alaska ACE project was received by local communities, resource managers, and policy makers, adaptation strategies to address environmental changes, and how the research results influenced policy decisions and actions by decision makers.” Alaska NSF EPSCoR has answered this call by producing this document, as well as multiple peer-reviewed articles that focus on or incorporate aspects of ACE stakeholder outreach (see bibliography, page 26).

This report was prepared by Alaska NSF EPSCoR Communications Director Tom Moran based on internal record keeping, interviews with project leaders and stakeholders, participant surveys, researchers’ academic articles, and external evaluations of the ACE program. In addition, Sarah Trainor, an Assistant Professor of Social-Ecological Systems Sustainability at the University of Alaska Fairbanks (UAF) and an Alaska ACE faculty hire, recruited students in her graduate-level Natural Resources Management (NRM) classes to prepare two reports on ACE stakeholder engagement. For the initial report, six students conducted interviews with a total of 15 ACE faculty and staff, then collated and analyzed results. For the second report, students in a subsequent class formally analyzed the initial interviews as well as documents found on the Alaska NSF EPSCoR website or provided by EPSCoR staff. Findings from both classes have been incorporated into this report. Also, Trainor and UAF NRM graduate student Barbara Johnson collaborated to synthesize the classes’ findings into an academic publication, which they are preparing for submission to the *International Journal of Sustainability Education*.



## 2. Program Structure

The **Northern Test Case** focused on Nuiqsut, a 400-person Iñupiaq village near the Arctic Ocean that relies heavily on subsistence practices. Arctic Alaska is experiencing increases in average surface temperature and fire frequency, thawing permafrost, changes in terrestrial and river hydrology, reduction of sea ice, changes in vegetation, and shifts in seasonality. In addition, Nuiqsut is increasingly surrounded by oil and gas development, which is impacting wildlife and access to traditional subsistence areas.

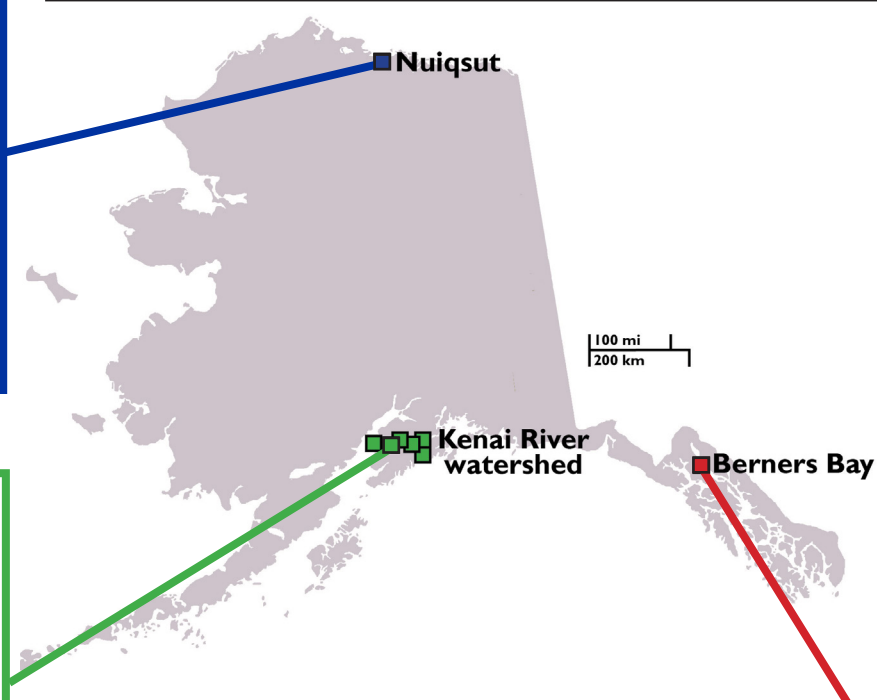
Northern Test Case researchers used LiDAR mapping and existing sensor networks to gather data about hydrologic, landscape and land-use changes. They complemented these efforts with interviews and surveys of Nuiqsut residents, through an innovative program to gather data from Nuiqsut hunters in the field, and through research into land and resource management.

The **Southcentral Test Case** studied the Kenai Peninsula south of Anchorage, with a particular focus on the area's salmon fisheries. The Kenai is subject to multiple, interacting hydrologic changes, including changes to discharge, water temperature, and sedimentation; and land cover changes, including urbanization, new resource extraction infrastructure, and drying wetlands.

Test case researchers studied these changes by deploying sensors in three Kenai River tributaries, by analyzing existing records, and by conducting new aerial mapping, sediment coring, and other fieldwork. They then determined the impacts of change on Kenai River communities through surveys and socioeconomic data.

The statewide **Coordination, Integration and Synthesis (CIS) Group** tied together research across test cases to create cyberinfrastructure and decision-support tools. Projects included data portals for ACE findings; an interactive salmon visualization program; and the Vis Space visualization environment at UAF.

The **Education, Outreach and Diversity (EOD) Group** conducted projects to bolster science, technology, engineering and math (STEM) education and to enable the flow of information between Alaska NSF EPSCoR, the University of Alaska, and the Alaskan public. Major efforts included training to incorporate students' environmental observations into K-12 curricula; grants to engage Alaska Natives in STEM; and an interactive augmented-reality sandbox.



The **Southeast Test Case** focused on an “icefield-to-estuary” ecosystem in Berners Bay, located about 50 miles north of the city of Juneau, as well as on Juneau and its surroundings. The area's glaciers are receding, which is changing water discharge, affecting waterways and estuaries, and accelerating forest succession. These ecosystem changes affect biological resources such as plankton and salmon, and have the potential for major impacts to economic drivers like fisheries and tourism.

The test case used new sensors and data collection partnerships to examine patterns of key environmental variables, such as ice, forest cover and salmon. Researchers then gathered socioeconomic data from businesses and resource managers to evaluate how changes in these variables impact them, and how they would respond to projected changes.

# 3. The Southeast Test Case

## Stakeholder research question

What is the capacity of resource managers and nature-based tourism operators to perceive, project and respond to changes in ecosystem services brought on by glacial recession in Berners Bay, and in the greater Juneau area?

## Overview of stakeholder engagement

Southeast Test Case (SETC) stakeholder engagement followed an unusual trajectory, in that the primary stakeholder group changed over the course of the project. The initial goal was to provide land and resource managers with data on environmental change to aid in decision-making, but test case lead Sanjay Pyare said initial meetings indicated managers would be unlikely to take action based on findings. “There’s ambiguity in their mind about whether there’s change and how they should react, and what they can really do,” Pyare said. “It’s just not that dynamic.”

Pyare and other researchers determined that another group, nature-based tour operators, were more likely to make constructive use of test case findings on a day-to-day basis. “These were people who made decisions about how to interpret phenomena, and how to utilize scientific information and do outreach with it,” he noted, citing examples such as helitour operators picking safe landing spots on glaciers, and marine tours tracking wildlife in changing ocean conditions. As a result, over the latter years of the project the test case increased an emphasis on collecting data useful for tour guides, and crafted engagement events aimed at the tourism community.

### Primary stakeholders

- Nature-based tour operators
- Resource managers

### Secondary stakeholders

- Tourists
- Fishers and fish consumers
- Recreational users of Berners Bay



photo by Tom Moran/Alaska EPSCoR

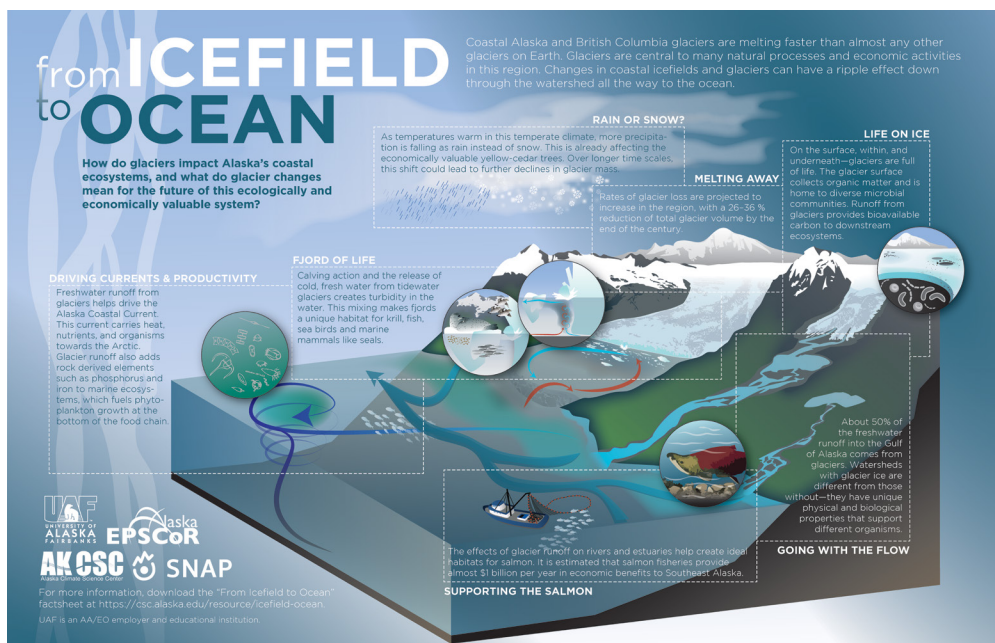
A Southeast Test Case research symposium for tour guides, held in May 2016 in Juneau.

## Primary methods and tools

### 1. Tour guide research symposia

In May 2015, SETC hosted a workshop at Juneau’s Mendenhall Glacier Visitor Center for about 60 local glacier-based guides, including helicopter guides, hiking tour guides, and U.S. Forest Service visitor center interpretive staff. Researchers gave a series of talks aimed to equip guides with information on current and ongoing local research, and with the scientific method in general. The goal was that this information would





An award-winning poster designed by SETC graduate student Kristin Timm.

on the University of Alaska Southeast (UAS) campus, which resulted in a broader audience than the first symposium, though there was less participation by U.S. Forest Service staff. The event attracted 123 participants and included presentations from researchers on paralytic shellfish poisoning, salmon run timing, the economic value of glaciers, and many other topics, as well as a talk from expert Tracey Manning on ways to communicate about climate change.

## 2. Research publications

SETC produced multiple items for use as outreach tools by naturalists and guides. 150 copies of an award-winning poster (see above) detailing an icefields-to-estuaries system were distributed to tour operators and educators. SETC outreach personnel created a pair of glossy newsletters, entitled “From Icefield to Ocean,” that highlighted test case research in layman’s terms. Approximately 500-1,000 copies of these were printed and distributed to tour operators and community members through the University of Alaska Southeast and collaborating agencies.

## 3. Formal and informal information exchange

Test Case researchers regularly sought input from community partners in shaping research. Interactions with partners frequently came via test case events. The first of these was a September 2012 planning retreat held on a boat trip to Berners Bay, an environment relevant to test case research and well-suited for networking with representatives of nine external partners who attended. In March 2013, the test case partnered with other research entities to hold a Pilot Community Workshop in Juneau with 32

then be incorporated into the visitor experience for some of the approximately one million tourists who visit Juneau each year. SETC also held a panel discussion at the event focused on incorporating challenging information, including information on climate change, into tours. The same month, SETC also collaborated on the Juneau Marine Naturalist Symposium, a similar event for ocean-based tour guides.

In May 2016 SETC held a larger two-day workshop aimed at both glacier and marine guides. The event was held



Southeast Test Case faculty met with stakeholders during a planning retreat on a cruise to Berners Bay in September 2012.

photo by Tom Moran/Alaska EPSCoR



agency members and researchers. And in April 2016 the test case collaborated on a Juneau stakeholder workshop with resource managers. Over the course of the project, the test case partnered with 12 different agencies to gather data from Berners Bay and across Southeast Alaska. SETC researchers also formally solicited input from stakeholders via multiple surveys, administered both at events and independently.

Pyare noted that a significant amount of input from the tour guide community came via informal encounters. He said scientists worked with tour operators to facilitate field research, and that nature-based tourism is deeply ingrained in Juneau, leading to key interactions. “It’s sort of inescapable,” he noted. “Maybe a third of students end up working in some way for the interpretive community here.”

## Other methods and tools

- **Personnel:** SETC employed two individuals (consecutively) as outreach specialists. The position carried both administrative and outreach duties.
- **“Hike with the Scientists:”** In June 2013 and again in May 2014, researchers led groups of Juneau educators on hikes to nearby Herbert Glacier, stopping along the way to describe aspects of the icefield-to-estuary ecosystem.
- **Videos:** In 2015, SETC and UAS co-produced four video highlights of SETC research, which were shared online.

## Reception of project and effectiveness of methods and tools

*“I am a retired biologist with 30 years’ experience in Alaska, and I learned many new and relevant facts.” -2015 symposium attendee*

Surveys at the 2015 and 2016 tour guide symposia indicate attendees were both satisfied and edified by the events. A survey by evaluator Angela Larson of 16 attendees in 2015 showed a strong “composite satisfaction” score of 4.4 (on a scale of 1 to 5). Respondents reported moderately to greatly increased understanding of ACE topics (4.3), moderately increased interest in ACE topics (3.9), and moderately increased ability to participate in activities related to ACE topics (3.6). The event mod-

erately increased respondents’ likelihood of taking various actions related to social and ecological systems (3.9). SETC also distributed a brief survey after the 2016 event; the 34 responses were overwhelmingly positive, with all respondents agreeing that researchers effectively communicated scientific information, results were useful to their work, and they would like to see similar events in the future.

Respondents’ comments about the 2015 symposium were complimentary. One wrote, “I am a retired biologist with 30 years’ experience in Alaska, and I learned many new and relevant facts.” More than half of the participants wrote specifically about hydrological processes and how Juneau’s Mendenhall Glacier affects marine habitat, a major topic at the event. Other participants wrote about social and ecological connections: “I learned how to tell a better interpretive ‘story’ to tourists about the important connection between terrestrial,



SETC faculty Anne Beaudreau discusses estuaries with Juneau-area educators at a “Hike with the Scientists” event in June 2013.

photo by Tom Moran/Alaska EPSCoR

freshwater, and marine ecosystems in a way that is accessible to laypersons.”

Both Pyare and SETC outreach specialist Suzie Teerlink said responses of tour guides to the workshops have been overwhelmingly positive. “All we’ve gotten since is, ‘Why aren’t you still doing this?’” noted Pyare. Pyare also said resource managers were appreciative of test case findings, in particular the way researchers worked across disciplines to build a larger scientific framework. Resource agencies have also shown continued appreciation for ACE data collection, and eight of them agreed to continue collection efforts after the end of the ACE project.

Both Pyare and Teerlink said research publications have proven popular. The test case’s “From Icefield to Ocean” research poster, which was distributed to guides, won both an NSF “Vizzie” People’s Choice award and a U.S. Geological Survey Shoemaker Award for external communications. The four SETC videos posted on YouTube have been watched a total of 5,316 times as of February 2019, including more than 4,300 views for a video about glacial outburst flooding that was featured on the Weather Underground website.



Image from Southeast Test Case video on “The Suicide Basin Outburst Flood Project,” produced by Ryan Cortes.

## Adaptation strategies and policy decisions

The National Oceanic and Atmospheric Administration Alaska River Forecast Center has used SETC research on Mendenhall Glacier and Suicide Basin to help predict the magnitude and timing of glacier outburst floods in the Mendenhall Valley. The City and Borough of Juneau, the Alaska Electric Light and Power Company, and the Eaglecrest Ski Area have used real-time data from SETC high elevation weather stations in their operational avalanche forecasting. And the U.S. Forest Service is using data from SETC stream temperature studies to help design a regional stream temperature monitoring network.

Participants in the 2015 tour guide workshop indicated a moderately increased likelihood to engage in various activities as a result of the event. Out of nine categories, four had a score above 4 (on a scale of 1 to 5): take practical steps to reduce my carbon footprint; incorporate environmental change into planning; adopt scientifically-derived solutions into my practice; and attend another similar workshop. Another concrete development that can potentially be traced back to ACE is the institution of a new annual program of scientific training for staff at the Mendenhall Glacier Visitor Center.

Pyare said he believes the test case offered nature-based tourism operators some significant context to bring to their jobs, both grounding them in concepts of environmental change and enabling them to interact with others in the industry. “It wasn’t so much a product of us as it was the interaction between them that allowed them to generalize and understand that there’s a commonality about uncertainty in environmental conditions, and how to plan a season of doing nature-based tourism,” he said.



## 4. The Southcentral Test Case

### Stakeholder research question

How can Kenai River communities perceive, project and respond to anticipated changes to salmon fisheries brought about through hydrologic and landscape change?

### Overview of stakeholder engagement

The Southcentral Test Case (SCTC) made community partnerships a hallmark of its engagement. One key partner was a local nonprofit, the Kenai Watershed Forum, which synchronized its hydrological sensors with those of SCTC to jointly collect data, and also assisted with outreach for the Salmon 2050 project (see below). Other major partners included the Kenaitze Indian Tribe (see below) and the Kachemak Bay National Estuarine Research Reserve (KBNERR) in Homer.

SCTC's overarching strategy for engaging stakeholders crystallized with the arrival of University of Alaska Anchorage (UAA) faculty hire Jamie Trammell. Trammell had experience in scenarios planning, in which researchers and stakeholders work together to plot out potential alternate futures. Trammell took the lead in "Salmon 2050," which brought together stakeholders from across the Kenai Peninsula to chart out possible trajectories for the area's salmon fisheries.

### Primary methods and tools

#### 1. Salmon 2050 workshops

SCTC's central stakeholder engagement effort took the form of a pair of scenario workshops with natural resource managers. Attendees for the events were chosen using a social network analysis process that entailed identifying the key stakeholders within the Kenai River fishery, ranking each stakeholder's investment within the fishery in 11 categories, and using these categories to characterize each stakeholder's role in the local system.

An initial two-day workshop in October 2015 brought together managers and policymakers from 11 Kenai agencies and organizations and asked them to identify the top six uncertainties facing the region; the three biggest choices facing the Kenai; and the six major actors who will make those choices.

Researchers then combined workshop results with data collected by researchers and sensors across the peninsula. At a one-day workshop in May 2016, participants worked to turn these results into a set of five scenarios of the future of the Kenai, each based on different uncertainties and management decisions.

SCTC planned to subsequently build and assess a series of impact models based on the scenarios, including a regional economic model, geographic models, and others, and to share final results through community

### Primary stakeholders

- Land and resource managers
- Fishers

### Secondary stakeholders

- Fish consumers
- Residents of the Kenai watershed



Southcentral Test Case co-lead Jamie Trammell speaks at a Salmon 2050 workshop in Kenai in October 2015.

photo by Courtney Breest/Alaska EPSCoR



meetings. However, this phase of the project was cancelled due to budget constraints. Researchers instead met directly with three local organizations to share results. Findings were also shared via an extensive website containing workshop summaries, scenario descriptions, maps, and even artwork and videos based on the different scenarios.

## 2. Annual meetings

Major partnerships were established and solidified through annual meetings, which included content and events for researchers, students and stakeholders. In addition to traditional presentations and meetings held on the Kenai Peninsula College campus, stakeholders participated in “field trips” to test case research sites across the Kenai River watershed.

## 3. Kenaitze engagement

SCTC collaboration with the Kenai-based Kenaitze Indian Tribe took several forms. Three different students from the tribe served as ACE research interns. ACE funded a project to document perceptions of environmental change on the Kenai River by Kenaitze elders and youth; some of the latter presented on the project at the tribe’s annual meeting and the Alaska Federation of Natives Elders and Youth Conference. SCTC produced and distributed a hardcover book capturing students’ hopes for the Kenai River. SCTC researchers also served as instructors in Kenaitze summer science camps in 2015 and 2016, and created a “Decision Library” for the tribe containing traditional language, knowledge, and place name maps as well as collected ACE research. A Kenaitze representative also took part in Salmon 2050.



photo by Scott Moon

Kenaitze students take a wildlife-watching trip as part of the tribe’s Janteh Science Camp in July 2015.

## Other methods and tools

- **Personnel:** SCTC employed two individuals (consecutively) as outreach specialists. The position carried both administrative and outreach duties.
- **Brochure:** The test case produced a brochure aimed at the general public describing its goals and progress.
- **Presentations:** Test case researchers presented to the public many times, including hosting booths at the Kenai River Festival, brown bag lunches at KBNERR, and panel discussions and presentations at the Kenai Fish Habitat Science Symposium, Kenai Peninsula College and KBNERR.
- **K-12 Outreach:** K-12 outreach activities included public “Discovery Labs” at KBNERR which exposed students and the public to SCTC research, and “Adventure Learning,” through which Kenai Peninsula and Anchorage teachers teamed up with SCTC staff to conduct outdoor experiential learning activities.

## Reception of project and effectiveness of methods and tools

In an academic paper, SCTC researcher Meagan Krupa said the use of social network analysis to identify stakeholders for workshops “allow(s) researchers to easily identify common interests across the stakeholders and better foster dialogue” and “greatly streamlines the identification process.” Trammell called the analysis “a home run” because the deliberate selection process gave participants motivation to stay engaged. “That gave them this huge boost of confidence,” he said. “They saw that ‘Oh, you’re not just choosing me because you found my name on the website, you’re choosing me because you’ve actually done your homework, you know that I do play a role in this system.’”

Attendees at the second stakeholder workshop responded positively, giving a composite survey score of 3.4 (on a 1-4 scale) when asked eight questions about the event. The highest scores were in response to questions about the effectiveness of the researchers in communicating scientific information (3.6) and the effectiveness of the scenario process (3.8). Two of the lowest scores concerned whether the results would benefit their organization (3.1) and whether they would be able to use the outcomes (3.3). Attendees in general praised the collaborative nature of the effort, and when asked to summarize it in three adjectives, used words including “interesting,” “engaging,” and “enlightening.” More critical adjectives included “confus(ing)” and “overwhelming,” while suggestions to improve the workshop included a less intense schedule (it was a one-day event) and more advance information for, or engagement with, attendees to lay groundwork.

**“People are very accustomed to being told what the answer is, and this was the opposite of that.”**  
*-Kenai Peninsula Borough Land Management Officer Marcus Mueller*

Individual workshop attendees had mixed reactions. Brenda Trefon, Environmental Coordinator for the Kenaitze, found the initial process confusing but was impressed by how information was transformed into digestible formats like models and graphs. She said members of the tribe found a simple trifold brochure the most useful of all Salmon 2050 outreach efforts. Kenai Peninsula Borough Land Management Officer Marcus Mueller appreciated the diversity of opinions and the open-endedness of discussions, though he thought the latter made some other attendees uncomfortable. “People are very accustomed to being told what the answer is, and this did the opposite of that,” he noted.



photo by Tom Moran/Alaska EPSCoR

**A field trip to the Russian River during a Southcentral Test Case annual meeting in May 2014.**

Efforts to engage local organizations through annual meetings and regular contact were effective. The most productive was the partnership with the Kenai Watershed Forum; KWF input was invaluable in shaping the SCTC plan for gathering hydrological data, and KWF will manage many of the Salmon 2050 biophysical datasets, and serve as long-term stewards of the scenario planning effort. Community partners regularly briefed researchers on local issues at annual meetings and led portions of field trips. Trammell said the meetings were crucial for helping partners understand the ACE research

process and also called them “incredibly valuable” for graduate students, who had the opportunity to meet stakeholders and better understand how their data would be used.

Trefon speaks glowingly of the ACE partnership with the Kenaitze. She said the close and continued involvement of researchers with the tribe has given many tribal members a better impression of scientists. “I think when you’re showing them this is what we can learn about salmon, this is what we can learn to protect the salmon for future generations, then that is something we really care about,” she said. “It built up trust between people who had not worked with a university before.” Trammell said the Kenaitze Indian Tribe partnership served as a valuable source of perspective. “They brought a really crucially needed piece of a long history, local involvement, but also a totally different side of the institutions at play in the Kenai, representative of stakeholders that aren’t typically present at these kinds of meetings.”



## Adaptation strategies and policy decisions

Attendees at the scenario workshops gave a composite score of 3.3 (on a 1–4 scale) when asked whether they could make use of these outcomes. Individual comments indicated attendees valued results in the abstract: they “brought the need for change to the forefront” and “will be telling of many perspectives.” Others suggested possible concrete actions: one said they would be






used to “direct research, develop long-term management, and improve relationships with key agencies (actors),” another said data would be used “in directions with people and perhaps with managers.”

Interviewees also said Salmon 2050 had led them to incorporate scenarios into their thinking. “I do feel that the involvement helped me incorporate a broader view of the impacts of the evolving salmon crisis and how culture may adapt (or not) to those changes,” said Jack Sinclair, Executive Director of the Kenai Watershed Forum. Mueller, the borough land management officer, said the current redraft of the borough’s Comprehensive Plan incorporates a new level of flexibility to respond to future stressors, which is a result of the scenario process. “It provided me with a new mode of thinking and talking about things and in just kind of having a little bit of a veil removed from the complexity of interactions and on certainty of futures.”

Trammell noted that another participant continued Salmon 2050’s momentum by organizing a joint Kenai land management meeting in March 2017 that drew more than 80 people. Attendees agreed the meeting should continue on an annual basis. “To me, that’s the very essence of adaptation, is getting people to realize they have to drop their barriers and look across,” Trammell said. Along the same lines, the Northwest Boreal Landscape Conservation Cooperative is using the scenario results to justify increased funding for anticipatory planning efforts throughout interior Alaska.

Trammell said that the cancellation of the final phase of Salmon 2050 likely contributed to a sense by stakeholders that they didn’t gain concrete direction from the process. “We never got to that final step of modeling things, and saying, look, these are the real hardcore implications,” he noted. “We weren’t able to use the full weight of the scientific capital in the Southcentral Test Case because we didn’t have that last year funding. It left a lot of strings loose.”

Trefon said ACE activities increased interest in college attendance among Kenaitze tribal members: “The higher ed scholarship program now has more applications than it ever used to.” One of the three Kenaitze students who interned with ACE recently graduated from UAF, she said, and another is a student at the University of Montana. Trefon also noted the Decision Library funded by ACE has seen extensive use, including tribal members using it to look up information on topics like mercury in fish and a proposed gravel pit project. “I do think it’s helping people make decisions based on science, which was our goal,” she said.

Scenario	Climate Change (i.e. stream temps)	Ocean Conditions (i.e. water temps)	Economic Development	Sport Fishing	Commercial Fishing	Personal Use Fishing
<b>Retirement Paradise</b> 	Moderate increases in stream temp	No change	Increase in retirement housing and infrastructure	Significant increase	Decrease	Decrease
<b>Industrial Boom</b> 	Large increase in stream temperature, less water available	No change	Increase in industrial development	Significant decrease	Significant decrease, only smaller operations	No change
<b>Fishing Capital</b> 	No change	No change	Increase in residential housing	Significant increase	Increase	Up a little, leveled off
<b>No More Sockeye</b> 	No change	Colder ocean temps, less productive fishery	Increase in industrial development	Significant increase, new species focus	Significant decrease, only smaller operations	Shut down
<b>Back to Basics</b> 	Significant increase	More variable, hard to predict	No change	Maintain high level	Mostly shut down	Significant increase

Summaries of the five scenarios generated by the Salmon 2050 process.



## 5. The Northern Test Case

### Stakeholder research question

How are mixed-subsistence households on Alaska's North Slope responding to changes to ecosystem services brought on by hydrologic, landscape, and land use changes?

### Overview of stakeholder engagement

Primary Northern Test Case (NTC) stakeholders were not professionals or agency representatives, as in the other test cases, but rather the residents of Nuiqsut, whose everyday lives are being profoundly impacted by climate change and oil and gas development. Nuiqsut's Arctic location and mixed-subsistence lifestyle mean the community is subject to significant amounts of research interest; as a result, the test case had to take a number of measures to ensure community involvement in the research. Central to this was working to understand local needs through a program to collect observations of environmental change, which led to spinoff research projects directly based on stakeholder input.

#### Primary stakeholders

- Nuiqsut subsistence harvesters

#### Secondary stakeholders

- Nuiqsut residents
- North Slope residents

### Primary methods and tools

#### 1. Community partnerships

Nuiqsut has a tripartite system of governance, involving a tribal government, a municipal government, and a local Alaska Native corporation. The test case initially primarily worked with the Kuukpik Subsistence Oversight Panel (KSOP), a board focused on subsistence practices that contains members from each of the three organizations of Nuiqsut. "KSOP was a logical place for us to go," noted NTC lead Gary Kofinas. "One, it addressed the trilateral question, and two, its focus is on land and resources." The test case provided KSOP with regular funding, and KSOP staff performed numerous functions for NTC, such as arranging meetings. A key role of KSOP was to identify residents that NTC researchers could interview about their perceptions of environmental change in the Nuiqsut homelands.

#### 2. Community-based monitoring program

NTC co-lead Todd Brinkman led a project to issue camera-equipped GPS units to 14 hunters and ask them to document and take photos of environmental change. "One of my main goals going in was to try to figure out a way to engage the community, and how we did that was basically start a new project that better identified what was on the community's mind," Brinkman said.



Montage of photos taken by Nuiqsut subsistence harvesters as part of the NTC community-based monitoring program. Photos by (clockwise from top left, concluding with center photo) Herbert Ipalook Jr., Samuel Kunaknana, Jonah Nukapigak, Clayton Kaigelak, and Clayton Kaigelak.

KSOP helped design the project and selected hunters to participate. Hunters were reimbursed a stipend for each month they participated, and NTC provided a KSOP staff member a monthly stipend to collect and organize observations. Every 3-4 months over the course of the 2-year effort, researchers returned to Nuiqsut to assist with download of GPS photos, collect data sheets, and address questions and concerns. The result is a database of more than 200 geotagged pictures and accompanying data documenting changes in vegetation, river ice, sea ice, air quality, boat and snowmobile travel conditions, harvest locations, erosion, lake and river levels, industry activity, cultural ceremonies, artifacts from past military activity, aircraft disturbance, and health of local fish and wildlife. At the end of the project, the data was organized and provided to the community. In addition, hunters' photos and datasheets were used by Nuiqsut middle-school students to make online Story Maps through MapTEACH, an ACE program that brought GPS instruction to Nuiqsut classrooms.



NTC lead Gary Kofinas presents at a Nuiqsut stakeholder workshop on the UAF campus.

### 3. Stakeholder workshops

In June 2017, 12 NTC researchers gathered at UAF for a two-day workshop with the Board of Directors of Kuukpik, Nuiqsut's Alaska Native village corporation. A similar event was held in Nuiqsut in May 2018 which drew 17 attendees representing four local organizations. The focus of both events was on landscape changes in the traditional use area of Nuiqsut, the effects of those changes on the ecosystem, and potential adaptations to these changes. Researchers presented on their findings, and attendees were given many opportunities to offer input and to recommend

future research. "We summarized the study's findings briefly and left a lot of room for conversation about what people think, what are their concerns, and what studies they'd like to see in the future," Kofinas said.

## Reception of project and effectiveness of methods and tools

The amount of research being conducted in Nuiqsut, as well as the politicized nature of some land-use changes, meant building community interest in the project as well as trust in ACE researchers was a long-term process. "Trust relations develop over time, they don't just happen," Kofinas noted. "After a while local residents started to recognize that our intent was to work in a way that was helpful to them. I think we got there, but it took almost five years."

The working relationship with KSOP worked well initially. Kofinas said later in the project it was more productive for the test case to instead work with the three local governing entities, which provided an opportunity to interact directly with decision makers.

The community-based monitoring project proved a success. The project initially ran for a four-month pilot season, after which KSOP requested it continue with a different set of hunters to gain additional perspectives. "Everybody that I've talked with in the community that has been part of the project or aware of the project wants it to continue," Brinkman said. He attributes this to local residents appreciating the chance to register their opinions and to help set future research priorities.



## Other methods and tools

- **Personnel:** NTC employed a staff member to function as an outreach specialist.
- **Communications:** The test case disseminated information to Nuiqsut via multiple community meetings, a Facebook page, two print newsletters, and a final report on findings.
- **Symposium:** NTC collaborated in a Co-Management Symposium at UAF which brought together Native and agency stakeholders along with researchers and community members. NTC's major contribution was a day focused on co-production of knowledge between researchers and village residents.
- **GPS instruction:** In collaboration with the EOD component, NTC conducted Mapping Technology Experience with Alaska's Community Heritage (MapTEACH) activities at the Nuiqsut Trapper School, engaging K-12 students in science through mapping, GIS and Google Earth.

"They like the holistic approach where we weren't setting a really strict, rigid research agenda and asking them to help us implement it," he said. He said residents also appreciated the connection of the project to the K-12 curriculum and how it facilitated interactions between hunters and students.

The project played a strong role in shaping test case research in the latter years of ACE. Based on hunters' responses and discussions with KSOP, researchers embarked on a pair of research projects: one to monitor aircraft noise and its potential effects on caribou and subsistence hunting; and the other to chart the changing navigability of the Colville River. "I think the best thing we did was just work with them on the front end to shape the research agenda," Brinkman noted. "That greatly increased our chances of not only getting meaningful engagement, but also potentially generating a product that is locally relevant and useful."

Researchers experienced varying degrees of success in terms of engaging residents in workshops, meetings and other research activities. Kofinas

described an early public meeting that drew only three attendees. Attempts to interview local residents about their observations of change netted only 28 subjects, a smaller number than researchers had hoped for. A subsequent attempt to gather information via a mailout survey was "a total failure," according to Kofinas, netting only a handful of responses. The sometimes-paltry numbers came in spite of frequent financial incentives offered to participants, from honoraria to (in the case of the mailout survey) a raffle of valuable fuel oil.

On the other hand, participation was strong at the concluding stakeholder workshops in Fairbanks and Nuiqsut. A dozen members of the Kuukpik Board of Directors attended the Fairbanks event, and the Nuiqsut workshop was attended by 17 residents representing the Native Village of Nuiqsut Tribal Council, the Nuiqsut City Council, the Kuukpik Board of Directors, and KSOP. The workshops afforded Nuiqsut residents an opportunity to hear results of ACE research, and to offer input to shape future research priorities. For example, several residents cited concerns about human health, including a need to further study contaminants being loosed by thawing permafrost and river erosion. Kofinas said the benefits of the workshop also extended to researchers, some of whom had never before interacted with local residents on a research project, and who likely came away with a new appreciation of local needs.



A Nuiqsut student creates a "Story Map" based on data and photos culled from the NTC community-based monitoring program.

photo by Christine Keill/Alaska EPSCoR



At the conclusion of the workshop in Nuiqsut, attendees were asked their overall impressions of the Northern Test Case research project, and the response was positive. “They all looked at us and they all gave us thumbs up,” Kofinas said. “And they said we want you to come back.” In addition, the Nuiqsut City Administrator thanked NTC researchers for their willingness to share their findings and to listen to the community, describing the atmosphere as “far more positive than usual” for Nuiqsut community meetings.

## Adaptation strategies and policy decisions

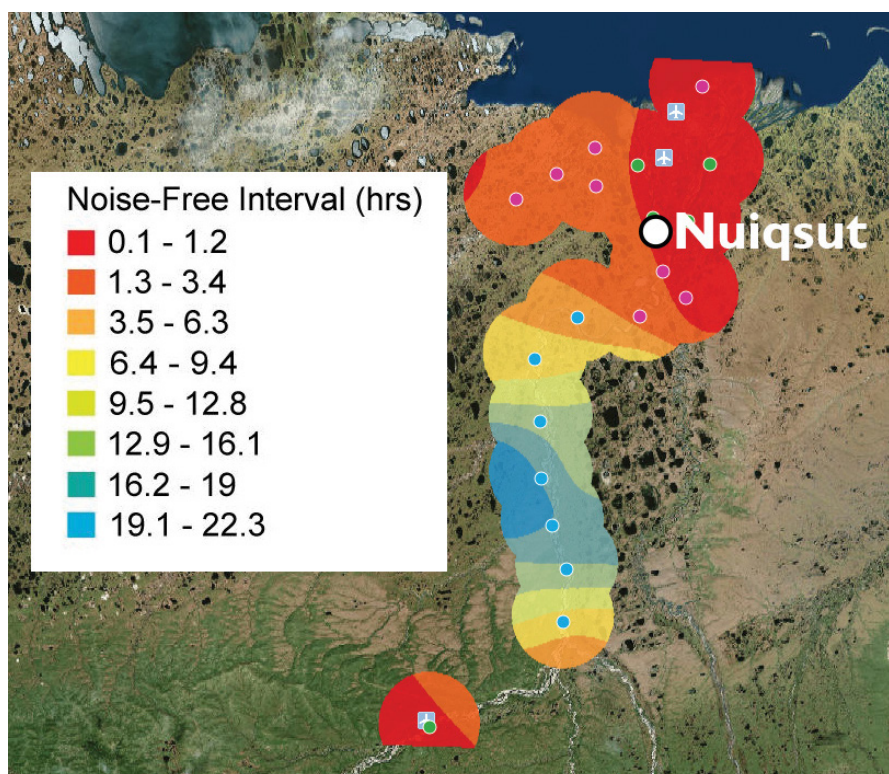
Several strands of Northern Test Case research have yielded results that are being, or that will be, incorporated into strategies and policies. Hydrologic researchers made findings that pointed to the need for closer monitoring of the arctic lakes that supply water for winter ice roads. Brinkman said results from the aircraft noise study are being incorporated into environmental impact statements and assessments across the North Slope, and that a regional research effort, the North Slope Science Initiative, has created a working group specifically to address aircraft disturbance. Kofinas noted a number of Northern Test Case products that can facilitate adaptation, including a new tool to aid river navigation, and models that project vegetation changes as well as permafrost-related landscape change.

Both Kofinas and Brinkman are hesitant to point to major strategies and decisions originating from NTC work. Both describe the role of ACE as not to suggest or select courses of action, but rather to learn about local adaptation strategies, and to provide expertise and support for the community to enact them. “We’re

“What we do hope to do is generate information that the community can use to advocate for their own interests, and I think we’ve done that.” -Northern Test Case co-lead Todd Brinkman

not an advocacy organization,” Brinkman said. “But what we do hope to do is generate information that the community can use to advocate for their own interests, and I think we’ve done that.”

Kofinas also noted that it’s too soon to expect the research to be translated into policy, calling it a multiyear process. Ultimately he anticipates that NTC data and results will be useful in the near future as residents debate how to respond to future development proposals in light of factors like climate change, health, and potential impacts on hunting practices. “This region is going gangbusters with new development,” he noted. “I think that as the community goes forward and as there are efforts made to link human health to environmental change, the work we did will be useful, in that they can better anticipate the future, and respond in ways that support their sustainability.”



A “heat map” of intervals between aircraft flyovers in the Nuiqsut and Colville River areas, created by UAF graduate student Taylor Stinchcomb. The project resulted directly from Nuiqsut community concerns.

## 6. The Coordination, Integration and Synthesis Group

### Stakeholder research question

What can we learn about adaptive capacity by studying ACE findings from different Alaskan communities, and how can ACE results be used to aid stakeholders?

### Primary methods and tools

#### 1. Visualization improvements

The Coordination, Integration and Synthesis (CIS) Group secured funding to build a new decision-support space on the UAF campus. The Vis Space is a configurable conference room ringed by seven high-definition 75-inch screens which also offers audio, a videoconferencing system, high-speed wi-fi, dedicated memory and a 10-gig link to UAF computing. The facility has improved UA's capacity to display complex data and to provide decision-making support to communities, including hosting a key Northern Test Case workshop. CIS also made improvements to the UAA Planetarium and Visualization Theater (PVT) to better support high-resolution imagery and interactivity.

#### Primary stakeholders

- Stakeholders in test cases
- All Alaskans

#### Secondary stakeholders

- Residents of the circumpolar Arctic
- Social-ecological systems researchers



photo by Todd Paris/UAF

The Vis Space visualization and collaboration environment.

#### 2. SalmonSim and virtual reality applications

CIS developed “SalmonSim,” an interactive salmon simulation nested in a virtual Kenai River ecosystem. Users of the simulation take the role of a salmon, learning in the process about the salmon lifecycle and the ways it is impacted by landscape and hydrologic change. The simulation has been used to make various films for the UAA Planetarium and Visualization Theater and also ported to a virtual reality application. In addition, CIS used Southcentral Test Case data to create a virtual flyover of the Kenai Peninsula, as well as a virtual reality application that enables the user to tour different future scenarios of the Kenai Peninsula generated through the “Salmon 2050” process (see Southcentral Test Case section). These products have been used as outreach tools at ACE events in the PVT and across the state, and SalmonSim and Kenai fly-over videos have been made available on YouTube.



### 3. Data portals

ACE technicians created three data portals to enable public access to ACE project data. These have since been consolidated into one portal. Technicians continually worked to improve the portals and make them more user-friendly, enabling easier access by stakeholders.

## Reception of project and effectiveness of methods and tools

The Vis Space has proven to be a popular venue both within and outside of the academic community. Since its opening in 2016 it has been used for dozens of seminars, webinars, trainings, meetings and thesis defenses. Its major contribution to ACE stakeholder outreach was hosting the Northern Test Case's Kuukpik Board of Directors workshop in June 2017. It has demonstrated its capacity for decision support on many other occasions, such as an Alaska Department of Transportation open house to present alternatives for a road improvement project, and a meeting of Fairbanks-area mayors and local experts to discuss municipal sustainability indicators.

## Other methods and tools

- **International Workshop:** CIS held an Arctic Adaptation Exchange Workshop in partnership with the Arctic Council, a high-level intergovernmental forum. The event brought together approximately 60 researchers from four countries. Based on input from this meeting, CIS developed and hosted the Arctic Adaptation Exchange Portal, a clearinghouse for adaptation information for arctic communities across the globe.

- **Water Indexes:** Arctic Water Resource Vulnerability Indexes (AWRVIs) use a variety of indicators to display how vulnerable a community's water supply is to disruption. CIS populated AWRVI's for communities across the test cases and made them available online.



Image from the "SalmonSim" program.

ACE improvements to the UAA Planetarium and Visualization Theater are put to regular use. PVT events run by ACE in recent years include an exhibition as part of the 2017 Alaska Science Olympiad; demonstrations for two UAA STEM expositions; and a meeting for the Municipality of Anchorage Heritage Land Bank. PVT officials continue to hold film showings and classes using the Uniview software and hardware system, which was installed by ACE to facilitate interactive PVT events. A student is currently working on migrating content for UAA astronomy classes to Uniview, and the PVT manager has migrated some of

UAA's full-dome films to Uniview and could potentially use the system for all film showings. Uniview continues to be used to render a flyover of the Kenai Peninsula for outreach events. SalmonSim programs and the Kenai virtual world have been used for multiple ACE outreach events. As of February 2019, SalmonSim videos had been viewed over 1,100 times on YouTube and the Kenai Peninsula flyover video had received more than 500 views.

From April 1, 2016 through April 1, 2018 ACE's main online data portal was viewed approximately 2,400 times. It currently holds 955 datasets.

# 7. The Education, Outreach and Diversity Group

## Primary methods and tools

### 1. GLOBE teacher training

The Global Learning and Observations to Benefit the Environment (GLOBE) program conducted annual workshops at UAF for teachers from across the state, who learnt ways to teach about climate change and the scientific method by involving students in data collection and scientific observations. GLOBE teachers and students measure climate change through measurements of phenomena such as river freeze-up and break-up, permafrost, and mosquitoes. ACE specifically recruited teachers from the test case areas to attend workshops.

### 2. Alaska Native Engagement Grants

The Education, Outreach and Diversity (EOD) Group awarded seven grants to UA faculty for projects to increase interest of Alaska Native K-12 or university students in STEM. Grants had to connect to one of the test case areas, and many directly tied into test case stakeholder efforts. These included an award to Kenai Peninsula College Anthropology Professor Alan Boraas for the “Kenaitze Youth Speak” project and publication; a project by ACE faculty Dan Rinella to create a “Decision Library” for the Kenaitze tribe to include traditional Dena’ina language and knowledge as well as collected ACE research; and a project by Matthew Sturm of the UAF Geophysical Institute to create a photo book and museum exhibit based on observations of local landscape change by Nuiqsut residents.

### 3. Augmented-reality sandboxes

Augmented-reality sandboxes use an overhead projector to create an interactive topographic map. When people sculpt hills and valleys with their hands, the elevation changes appear as contour lines and color striations, and when they hover a hand over the box, it “rains” and the water pools and channels. ACE built four sandboxes, based on a design from the University of California-Davis, and developed an educational curriculum to use the devices to teach about topography and water flow. The devices have been displayed by ACE dozens of times to student and public audiences across the state and beyond.

## Reception of project and effectiveness of methods and tools

Evaluator Angela Larson reviewed eight EOD activities in 2016 and gave the component high marks: “Overall, the Alaska ACE EOD activities have enabled the flow of information between EPSCoR, the University of Alaska, and the Alaska public. The activities delivered have been, for the most part, well received by participants and have resulted in learning gains, increased interest in social-ecological issues, increased ability of participants to engage in activities related to social-ecological research and/or education, and increased likelihood that participants will later implement interdisciplinary research and/or educational activities.”

### Primary stakeholders

- K-12 educators and students in test case areas
- Residents of test case areas
- University of Alaska students

### Secondary stakeholders

- Alaskan students
- Alaskans



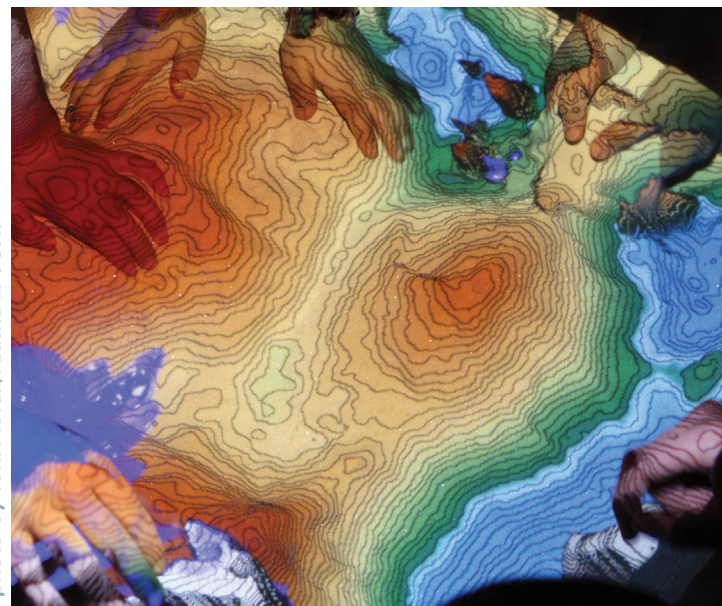
photo by Tom Moran/Alaska EPSCoR

EOD Lead Elena Sparrow (left) instructs teachers in the GLOBE program.



Larson evaluated feedback from 39 teachers who attended GLOBE professional development workshops in 2013-16. Out of 28 workshop activities in which they participated, they gave scores of 8 (out of 10) or above to 27 of them. After the workshop, attendees said they were better able to describe the idea of student inquiry, and two-thirds demonstrated increased knowledge of components of earth systems and the cycles and processes that link them together. Attendees were also able to better describe human interactions with these systems, cycles and processes. 46% of attendees said they would integrate inquiry into their classrooms, 41% said they would specifically incorporate GLOBE protocols into their classrooms, and 15% said both.

Larson also surveyed attendees at the 2016 GLOBE workshop, who were very satisfied with their overall experience. The composite satisfaction scale score was 4.5 (on a 1 to 5 scale) and each item had an average response greater than 4.4. When asked what they learned from the workshop, respondents cited science practices, landscape dynamics, and ways to engage students through data collection. Respondents reported



Children use an augmented-reality sandbox at a “Science Potpourri” event at UAF.

Larson surveyed high school students in Soldotna and Kenai who attended a March 2016 augmented-reality sandbox activity. Students found the presentation fun (3.7 on a 1-4 scale), interesting (3.6) and easy to understand (3.6). Students were asked to self-report increases in their ability after the presentation to: describe a topographic map, determine elevation on a topographic map, describe a contour line, and describe how the sandboxes work. More than two-thirds of the students reported increased learning about all four topics.

## Other methods and tools:

- **Internships:** ACE funded internships for 11 UAF graduate students in the Resilience and Adaptation Program. Internships were with Alaska Native organizations or reflected Native concerns.
- **Permafrost Outreach:** ACE supported Permafrost/Active Layer Monitoring (PALM), through which soil temperature sensors were installed at hundreds of schools across Alaska and in other permafrost regions.
- **Communications:** Major EOD outreach to the public has included a brochure, print newsletters, a website, and social media including Facebook, Twitter, Instagram, YouTube and Issuu. EOD created 17 videos available on YouTube and broadcast on KUAC-TV in Fairbanks.

moderately increased ability to teach concepts related to social and ecological systems (composite scale score of 4.4), including scores of 4.7 for “collect data to study social and ecological topics” and 4.8 for “design lessons integrating science practices and protocols.” The workshop highly increased (4.8) the likelihood that teachers would incorporate inquiry into their teaching practices, and all respondents said they were still using GLOBE activities in their classrooms.

Kenaitze Tribe Environmental Coordinator Brenda Trefon said both Alaska Native Engagement grants that supported the tribe showed positive results: The “Kenaitze Youth Speak” project contributed to a growing interest in higher education and ACE topics among tribal students, and the Decision Library receives continual use by tribal members, from K-12 students working on science projects to adults seeking information on local issues.

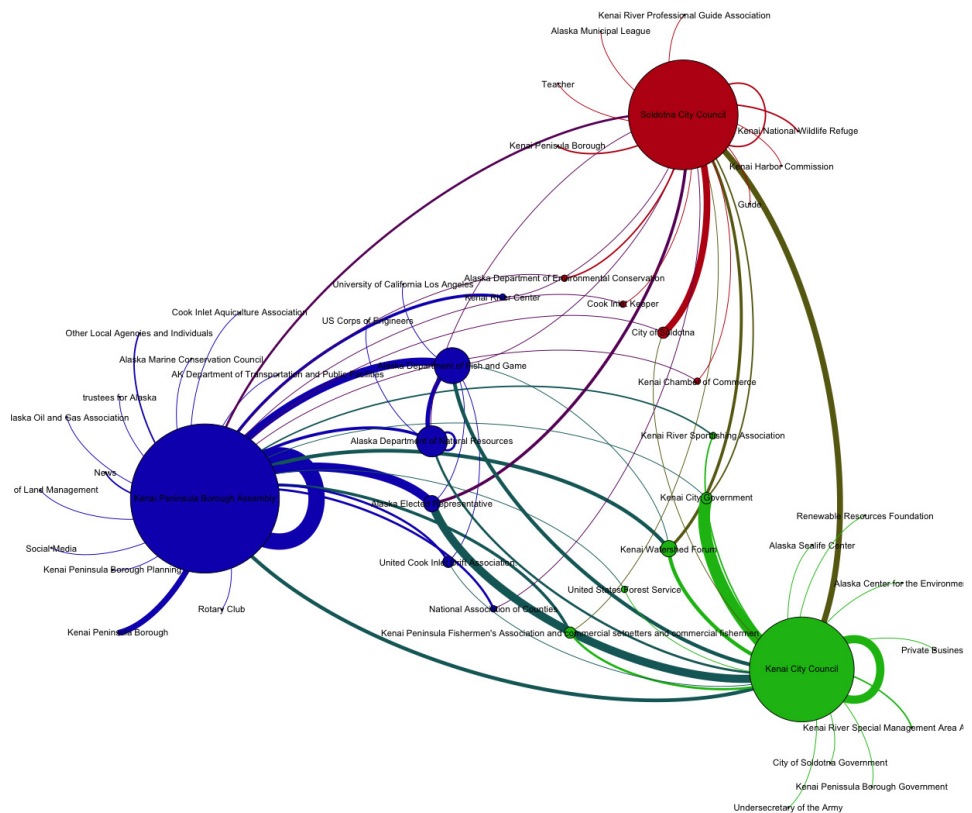
## 8. Recommendations

ACE leaders were asked to make recommendations for future scientists undertaking similar research. The most relevant responses are summarized below.

## 1. Do your homework.

Southeast Test Case lead Sanjay Pyare recommends advance work by researchers to determine which stakeholder group(s) have the most potential to contribute to findings and benefit from them. Northern Test Case researcher Todd Brinkman said one sound strategy is to focus research on a community with which researchers already have a relationship. Brinkman also recommended that if researchers primarily liaise with a small number of local organizations, they make sure that groups hold views representative of the community at large.

Brinkman further advises that researchers be sure they have sufficient background knowledge and training to understand and respect local cultural norms, and that they do a thorough review of research literature to ensure they're not duplicating work already done in a community.



A social network analysis of the Kenai River fishery, used to select Salmon 2050 participants. The hubs represent the Kenai Peninsula Borough Assembly (blue), Soldotna City Council (red) and Kenai City Council (green). From Krupa, 2016.



**A Southeast Test Case cruise on Berners Bay in fall 2012 gave researchers and stakeholders an opportunity to communicate early in the project.**

The Southcentral Test Case went the extra mile to locate stakeholders, selecting participants for its Salmon 2050 project through a rigorous analysis of Kenai Peninsula social networks. Test case lead Jamie Trammell highly recommends the process, which he said helped motivate stakeholders to play an active role. “They get validation that they are part of the system and their decisions matter, and that we understand that.”



## 2. Start off on the right foot.

One refrain common across the test cases was that ACE researchers erred in first selecting research questions and then finding ways to involve stakeholders in answering them. For future projects, ACE leaders recommended liaising with stakeholders as a first step, then incorporating their input when plotting study methods and research objectives. That way scientists can pursue research that addresses fundamental science questions while encouraging local participation and meeting stakeholder needs. “I would start with

the stakeholders right away and get caught up on exactly who knows what, who needs what, and what assumptions they’re operating under,” noted Trammell.

## 3. Consider a narrow research focus.

Both Pyare and Northern Test Case Lead Gary Kofinas felt that focusing test case efforts on one specific objective or product may have been an especially effective method of engaging stakeholders and ensuring a productive project. Pyare mentioned the possibility of zeroing in on just four or five environmental variables, or a small but vital geographic area like the Mendenhall Glacier Valley. Kofinas suggested centering the project on establishing an integrative community-based environmental monitoring program.



Robert Ruffner of the Kenai Watershed Forum speaks at an outing to Beaver Creek on the Kenai Peninsula during a Southcentral Test Case annual meeting in May 2013.

ACE results also suggest depth may be preferable to breadth when it comes to relationships with community organizations. Strong, continuing and multifaceted partnerships, such as the Southcentral Test Case’s engagements with the Kenai Watershed Forum and the Kenaitze Tribe, provided some of the most fruitful results. Brinkman suggested one potential way to successfully structure research in isolated communities is to give a subaward to a community entity. “When you have some kind of subaward, it’s really evident how what you’re doing is working towards a goal that the community’s excited about,” he said. “It’s all in writing, and they’ll know exactly how this product will be useful to them.”

## 4. Engage stakeholders early and often and respond to their needs.

Multiple researchers stressed the importance of regular contact with stakeholders early on in the project, and of maintaining flexibility in funding and implementation to be able to respond to their needs. Brinkman cited the Northern Test Case’s aircraft noise and river navigability research as examples of scientists meeting local needs discovered through stakeholder engagement.

Researchers also noted that frequent engagement also helps ensure that stakeholders feel that they are equal and active participants in the research. This gives them a sense of ownership of research data and

In a 2016 survey, ACE researchers reported engaging with the following stakeholder groups:

- 63% local community groups
- 61% state government
- 59% federal government
- 54% Alaska Native groups
- 50% local government
- 43% K-12 schools
- 22% businesses
- 17% rural/community colleges

more of an incentive to ensure data is correct, and to make use of results. “The more that you can involve (stakeholders) in the research process, the better the understanding they develop and the better the project is,” noted Trammell.

Evaluators reported in 2016 that ACE researchers met with stakeholders an average of 4.38 times over the prior six months. This number increased over the course of the project, with researchers recording 3.51 visits on average in 2015 and 3.49 in 2014.

## 5. There is no substitute for time, or for face-to-face contact.

By broad agreement, ACE researchers said establishing trust with stakeholders is a years-long process. Trammell said annual meetings with stakeholders were an effective method to continually develop relationships. Kofinas and Brinkman emphasized the need for time to establish strong relationships in a village like Nuiqsut, where the large amount of science being done has resulted in “research fatigue” and a populace wary of researchers’ motivations.

Brinkman said that researchers should carve out opportunities to meet with partners in person, even at a remote site like Nuiqsut. “You can never really beat face-to-face,” he said. “The best sort of communication is sitting down and not just talking about the research and the high priorities and things that need to get done for the research, but also allocating time just to build that personal relationship, and that relationship of trust.” In one instance, a researcher’s method of transport also proved helpful to establishing trust: according to the second report by Sarah Trainor’s students, permafrost researcher Kenji Yoshikawa gained respect from Native villages when he visited them by snowmobile. “Stakeholders reported appreciating seeing scientists using the same mode of transport that villagers use,” reads the report.



photo courtesy Kenji Yoshikawa

Kenji Yoshikawa (l) and fellow permafrost researcher Ulli Neumann (r) at Moose Kerr School in Aklavik, Canada. The two traveled 3,500 miles by snowmobile in 2013, visiting schools along the way to teach and to install permafrost monitors.

## 6. Scheduling is critical.

When trying to attract stakeholders to an event, it is crucial to factor in their schedules. The Southeast Test Case had to schedule symposia when tour guides were in Juneau but not out in the field, a process Pyare described as “like threading a needle.” Northern Test Case community meetings had to be set so as not to interfere with local cultural events and hunting seasons.

## 7. Focus on what matters the most to stakeholders.

Pyare said a major reason the Southeast Test Case switched emphasis from natural resource managers to tour operators is that test case research questions were merely academic for the former. “They weren’t making day-to-day decisions about their lives, per se, they were making day-to-day decisions in a regulatory sense,” he noted. The test case’s pivot to tour operators meant it was working with individuals whose livelihoods were directly impacted by the research, and were thus more invested in it.



## 8. There is no silver bullet for communicating.

Researchers agreed that it's crucial to communicate project progress and results back to stakeholders, in formats that are digestible to them. But there was no agreement on the ideal communication methods. The Northern Test Case used newsletters, a Facebook page, a final report, and many community meetings. "There's no one way to do it, you've got to foster two-way communication in lots of different ways," said Kofinas. In the Southcentral Test Case, Salmon 2050 results took a variety of forms, including a brochure, a comprehensive website, maps, charts and graphs, reports, graphics and even videos. Out of all these, Trammell said the maps and website were most useful to stakeholders, while Brenda Trefon of the Kenaitze Tribe said the brochure was the most popular item. Brinkman said one sound strategy is to hire a staff member whose sole job is stakeholder communication, and/or to retain a community member as a paid point of contact.

Interviewees for the first Trainor report were asked to identify the most meaningful stakeholder engagement activity in which they had participated. Seven said a workshop, three a one-on-one meeting, and two a focus group.

## 9. Consider outside help.

One recommendation stated in Sarah Trainor's class report is to use boundary organizations as go-betweens to smooth relations with stakeholders. Trammell said that a paid facilitator is a worthwhile addition to stakeholder workshops, noting that in his experience they help to keep attendees focused firmly on goals.

## 10. Incorporate education into your research plans.

Kofinas said members of the Nuiqsut tribal and city councils asked him to include education in their research plans. As a result, the test case incorporated the middle school MapTEACH program into its activities, which Brinkman said was key to getting Nuiqsut leaders excited about the GPS project. "Every rural indigenous community that I've worked with, they always like the idea of how we can integrate whatever we're doing into the school curriculum," he noted. In the same vein, Brenda Trefon said ACE participation in events like the tribe's summer science camp left an indelible impression on students and solidified the relationship between the two entities. "I wish we had EPSCoR all the time - those were our best summers, and the kids loved it," she said. "It just took our learning to a higher level."

photo by Courtney Breest/Alaska EPSCoR



Kenai Peninsula College Anthropology Professor Alan Boraas, an ACE faculty member, presents to students at the Kenaitze Janteh Science Camp.

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## Useful Links

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Data Portal: [epscor.portal.gina.alaska.edu/](https://epscor.portal.gina.alaska.edu/)

Vis Space: [visspace.alaska.edu/](https://visspace.alaska.edu/)

"From Icefield to Ocean" poster: [alaska.edu/files/epscor/pdfs/Glacier-System-Poster-April-2015.pdf](http://alaska.edu/files/epscor/pdfs/Glacier-System-Poster-April-2015.pdf)

Salmon 2050: [alaska.edu/epscor/archive/phase-4/southcentral-test-case/salmon-2050/](http://alaska.edu/epscor/archive/phase-4/southcentral-test-case/salmon-2050/)

Arctic Water Resource Vulnerability Indexes: [awrvi.epscor.alaska.edu/](https://awrvi.epscor.alaska.edu/)

National EPSCoR organization: [nsf.gov/EPSCoR](https://nsf.gov/EPSCoR)

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Q: What might happen?

Q: What would changes look like?

Q: What can we do now to improve outcomes?

Hypothetical Events

Not Predictions

