



Alaska Center for Climate Assessment and Policy: Phase I Final Report

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INTRODUCTION

Alaska and the Arctic are warming more rapidly than any other place on the planet. Impacts are already experienced in Alaska's economy, infrastructure, transportation, and Native food systems. Demand for climate change information and assistance in adaptation planning is increasing state-wide. The availability of updated climate change information and the need for interpretation and application of this information by Alaskan stakeholders is evolving rapidly. At the same time, federal agencies are ramping up climate change research and placing increasing attention on how changing conditions impact infrastructure and land and resource management. The Alaska Center for Climate Assessment and Policy (ACCAP), the current Alaska RISA, spent its first five years building stakeholder relationships, developing climate adaptation tools, educating, and assessing climate impacts and vulnerability in Alaska, and expanding our capacity in needs assessment and adaptation planning for coastal and living marine resources.

A. PRIMARY AREAS OF FOCUS:

Coastal and Living Marine Resources (CLMR): ACCAP research faculty P. Loring supports the development of current and future coastal and living marine resources research. This involves studies of coastal community vulnerability and adaptation to climate change and science issues such as marine biodiversity and invasive species management. Dr. Loring has provided multiple kinds of outreach/education support regarding coastal and marine climate issues to stakeholders, including lectures, roundtable discussions, and participation in planning/steering workshops. Among these stakeholders are the Western Alaska Landscape Conservation Cooperative (LCC), Kachemak Bay Research Reserve (a NOAA National Estuarine Research Reserve), the Kenai Peninsula School District, and the Bristol Bay Natives Association. Loring was an invited participant at science steering workshops for the Western Alaska LCC, and was also an invited participant by the Yukon River Drainage Fisheries Association (YRDFA) to their "Natural Indicators of Salmon Run Timing and Abundance" project. Loring conducted coastal community vulnerability research in Bristol Bay, in partnership with Alaska Native Tribal Health Consortium, Bristol Bay Borough, and Bristol Bay Natives Association (with leveraged funds from NOAA CPO/CSI-Coasts). Loring initiated a citizen science biodiversity monitoring project on the arctic coast of Alaska, in collaboration with Alaska SeaLife Center (with leveraged funds from USFWS Arctic LCC).

Native Climate Impacts and Adaptation: Rural Native communities in Alaska are among those most directly impacted by the changing climate. ACCAP focuses on conducting research and providing decision support for these vulnerable and underserved communities. This includes responding to invitations by tribal service organizations in Alaska such as the Maniilaq Association, the Alaska Native Tribal Health Consortium (ANTHC), and the Environmental Protection Agency's (EPA) Indian General Assistance Program (IGAP). S. Trainor has presented community-specific climate projections and community adaptation planning strategies at various venues, including a workshop on

climate and health in Kotzebue in October 2010 and the Alaska Forum on the Environment in Anchorage.

Food Security: C. Gerlach led a community-based participatory food systems research program to better understand how changes to Alaska's landscapes and seascapes impact food and environmental security and to more effectively communicate research results to rural and urban communities. P. Loring and C. Gerlach initiated food security assessments in Southcentral Alaska. Partners include NOAA's Kachemak Bay National Estuarine Research Reserve and Sustainable Homer. Loring continues to develop related research on food and water contamination, which both have climate change dimensions, e.g., heavy metals in fish and game. He has tested a risk-benefit index for evaluating fish and marine mammal consumption and used this tool to identify regional monitoring needs and data gaps across the state. B. Gamble represented ACCAP at the Association of Natural Resource Extension Professionals (ANREP) conference in June 2011. Themed "Opportunities for Extension in a Changing Environment: Lessons from the Last Frontier," the conference provided an opportunity to strengthen ties with ANREP professionals focused on rapid ecological and agricultural changes statewide and nationwide.

Co-Production of Knowledge: ACCAP has a focus on analyzing the process and evaluating the effectiveness of climate science communication, application, and stakeholder partnerships. This involves reflexive analysis of the co-production of knowledge and the translation of scientific research findings for use in policy and decision-making. Our analysis includes program evaluation and social science research that increases our understanding of stakeholder information needs and decision processes as well as scientist perception of stakeholder knowledge. Moving beyond a basic examination of scientist-stakeholder interactions, we build an enhanced vision and understanding of the development of "use-inspired science" and the process of science engagement in natural resource management and public planning.

Sea Ice and Cryosphere Hazards: ACCAP forged new partnerships with scientists at UAF and the Alaska Division of Geological and Geophysical Surveys (DGGs) in Snow, Ice and Permafrost Hazards in Alaska. A research needs and opportunities scoping workshop was held in June 2011 (leveraged funds from UAF Chancellor's Office). A follow-up stakeholder engagement session was held and development of a bi-annual cryosphere hazards newsletter is underway.

Additionally, ACCAP published a Review of Sea-Ice & Related Climate Information Resources for Alaska's Arctic Coastal Communities: A Manual for Accessing & Using Online Information. ACCAP coordinated and published this manual both in print and on the web to improve the availability of current information about sea ice from operational and academic observation programs to key user groups. See more about this project in section E.

Drought, Water Availability, and Changing Seasonality: With the assistance of coping with drought/cross-RISA and leveraged funds we focused on several projects related to drought, water availability, and changing seasonality. We developed a pilot decision-support tool to forecast area burned for Interior Alaska and worked closely with the State of Alaska Division of Natural Resources, Bureau of Land Management, U.S. Fish and Wildlife Service, National Park Service and Bureau of Indian Affairs to refine the model so that it best meets their needs. This tool is based on a gradient boosting model that takes advantage of strong linkages between teleconnection indices, weather, and fire in Alaska and makes use of available CPC data. Additionally, we completed an Evaluation of Seasonal Fire Assessment Products. This cross-RISA (CLIMAS, CAP, ACCAP) drought project assessed the impact the National Seasonal Assessment workshops (NSAW) seasonal and monthly fire outlooks have on decision makers across the agencies who collaborate to plan for and manage wildfires in the Western U.S..

B. MAIN STAKEHOLDERS AND PARTNERS

International Agencies/Entities: British Columbia Climate Action Secretariat, Consulate of Canada, Fisheries and Oceans Canada, Russian Embassy.

Federal Agencies/Entities (non-NOAA): Alaska Coastal Rainforest Center (a collaboration between USFS, University of Alaska Fairbanks and University of Alaska Southeast), Alaska Fire Science Consortium (funded by the Joint Fire Sciences Program), Argonne National Laboratory, Bureau of Indian Affairs, Bureau of Land Management, Bureau of Ocean Energy Management, Regulation and, Enforcement, Environmental Protection Agency, Joint Fire Sciences Program, Lawrence Berkeley National Laboratory, National Maritime Intelligence Center, National Park Service, The Denali Commission, U.S. Army Corps of Engineers, U.S. Coast Guard, U.S. Department of Defense, U.S. Department of Energy, U.S. Department of State, U.S. Department of the Interior, U.S. Fish & Wildlife Service, Members and Staffers of the U.S. House of Representatives, U.S. Navy.

NOAA and NOAA Funded Entities: Alaska Ocean Observing System (AOOS), Alaska Sea Grant, Climate Prediction Center, Coastal Services Center, Kachemak Bay Research Reserve, Marine Debris Program, Mid-Atlantic Regional Association Coastal Ocean Observing System (MARCOOS), National Ice Center (NOAA/Navy/Coast Guard), National Ocean Service, National Sea Grant Office, National Snow and Ice Data Center, National Weather Service, National Marine Fisheries Service, Pacific RISA.

State Agencies/Entities: Alaska Department of Fish & Game, Alaska Division of Geological & Geophysical Surveys, Alaska Food Policy Council, Alaska Governor's Sub-Cabinet on Climate Change, Alaska Highway Safety Office, Alaska Fire Service, Alaska Senator Begich's Office, Alaska Senator Paskvan's Office, State of Alaska Department of Health and Social Services, State of Alaska Department of Environmental

Conservation, State of Alaska Department of Law, State of Alaska Department of Transportation.

Local Government: Bristol Bay Borough, City of Halibut Cove, City of Homer, City of North Pole, Coastal Villages Region Fund, Fairbanks North Star Borough, Matanuska-Susitna Borough, North Slope Borough, Northwest Arctic Planning Commission, Northwest Arctic Borough, Port of Nome, Southern Kenai Peninsula Communities Project.

Tribal Government/Non-Profit Organizations: Alaska Native Tribal Health Consortium, Council of Athabascan Tribal Governments, Bristol Bay Native Association, Institute of Tribal Environmental Professionals, Inuit Circumpolar Council Alaska, Kiana Traditional Council, Maniilaq Association, Nez Perce Tribe, Village of St. Michael.

Other Non-Profit Organizations: Adaptation International, Alaska Center for the Environment, Alaska Marine Conservation Council, Alaska SeaLife Center, Alaska Wilderness League, Arctic Research Consortium of the United States, Barrow Arctic Science Consortium, Center for Biological Diversity, Center for Water Advocacy, Conservation Council, Cook Inletkeeper, Defenders of Wildlife, Earthjustice, Ecotrust, Environmental Law Institute, Friends of the Earth, Institute of the North, Moore Foundation, National Life Center, National Wildlife Federation, Native American Race Fund, NWT Association of Communities, Ocean Conservancy, Oceana, Pacific Environment, Pew Environment Group, Southwest Alaska Municipal Conference, Southwest Research Institute, Sustainable Homer, The Nature Conservancy, Wilderness Society, Wildlife Conservation Society, Yukon River Drainage Fisheries Association.

University and Public Education: Alaska Climate Research Center, Alaska Pacific University, Aniak University, Arctic Region Supercomputing Center, Duke University, Geophysical Institute, UAF, Harvard University, Institute of Circumpolar Health Studies, International Arctic Research Center, National Center for Atmospheric Research, National Oceanographic Partnership Program, National Science Foundation, Oregon Climate Change Research Institute, University of Alaska Anchorage, University of California Los Angeles, University of Cambridge, University of Alaska Fairbanks, University of Alaska Fairbanks Cooperative Extension, University of New Hampshire, University of Vermont, University of Virginia, University of Washington.

Industry: Alaska Energy Authority Group/Project Performance Corporation, Alaska Water Wastewater Management Association, Aleutian Pribilof Island Community Development Association, C3F, Conoco Philips, Crowell & Moring, Gemmell & Associates, Green associates, HDR Alaska, Inc., JOA Surveys LLC, National Ocean Policy Coalition, Perkins Coie, R&M Consultants Inc., SeaJay Environmental, Sheinberg Associates, Shell, TerraSond, Three Parameters Plus Inc., URS Corporation, Van Ness Feldman, Zender Group.

C. RESEARCH FINDINGS

Coastal and Marine Living Resources

- The vulnerability of coastal community infrastructure in Bristol Bay is influenced heavily by seasonal demographic patterns related to fishing and other seasonal employment booms.
- The reputation for sustainability in Alaska fisheries may be counteracting opportunities for meaningful social change (and improvement of quality of life in rural Alaska) as well as continued improvement in the management of Alaska fisheries. The associated outcome is that coastal, fishing-dependent communities remain vulnerable to the challenges of climate change, despite the presence of a commercial industry that appears thriving.
- The ability to fish locally is an important source of food security for low-income households of the Kenai Peninsula. This suggests a related vulnerability of low-income households to disruptions in fisheries/fisheries declines.
- Local opinion and perspectives in the Kenai Peninsula are heavily divided regarding the sustainability of local salmon populations; this feeds into a general distrust of management and contentious relationships between fishing sectors (i.e., commercial, sport, personal use, subsistence).

Climate Change Vulnerability, Adaptation and Literacy

- Extended and extreme events such as fog and high snow years can increase rural community vulnerability to other non-climate related challenges. For example, the costs associated with extensive snow removal can tap community coffers and extended fog that closes airports can interrupt important supply chains in remote rural communities.
- Adaptation to climate change in Alaska is closely linked to other social, economic and environmental drivers. (Trainor, Walsh, Gamble, in prep.)
- Alaskan stakeholders are less familiar with global and national assessment reports than local information on climate change.

Climate and Weather

- The occurrence of warm extremes is increasing and the occurrence of cold extremes is decreasing in Alaska. Trends of precipitation extremes in Alaska are varied.
- The Arctic's five warmest years on record were 2005-2010 (Walsh et al. 2011).

D. ACCOMPLISHMENTS

Developing Stakeholder Relationships – As the current Alaska RISA, ACCAP has built a strong stakeholder base throughout Alaska. Our work contributes to the Alaska Climate Strategy developed by the Governor's Sub-Cabinet for Climate Change; collaboration with Alaska Sea Grant in coastal community adaptation planning; assessing the impacts of climate variability on hydropower production for Alaska Southeast utilities.

Specific outreach products (highlighted in more detail in Section E) include: report on “Decision-making for at-risk communities in a changing climate,” commissioned by the National Council for Energy Policy for use by the State Climate Change Sub-Cabinet; Sea Ice Information Manual; Climate Change Vulnerability report for the Fairbanks North Star Borough; a newly instated quarterly newsletter, the Alaska Climate Dispatch; a monthly Alaska Weather and Climate Highlights Webtool; and a 4-minute video on ocean acidification and Alaska impacts. ACCAP sponsors monthly Alaska Climate webinars, now available in archive as podcast and video files and has embraced new technology with a presence on multiple social media sites.

Serving Native Communities – ACCAP directly serves Alaska Native communities and constituents through workshops providing assistance in climate adaptation, training in the access to and use of sea ice information. We have hosted panel sessions featuring Native Elders on climate, language and indigenous perspectives of climate change and cross-RISA, cross-regional video conferences on climate and water impacts and adaptation. We collaborate with the Alaska Native Tribal Health Consortium on climate change and health assessments in the Northwest Arctic Borough.

Mini-Grant Program – ACCAP engaged Alaska Sea Grant Marine Advisory Program (MAP) agents and University of Alaska faculty in a mini-grants program to meet user demand for climate information products in coastal and living marine resources. The resulting products assist marine-dependent communities adapting to a changing climate. Funded projects include: implementing seminars, MAP training, and outreach for ocean acidification and adaptation information; developing a citizen based science observation program for invasive crab species in south east Alaska; developing a climate change adaptation decision tool for marine-dependent communities; creating a community guidebook for marine species range extension and invasive species in Northern Alaskan waters; and using NCEP reanalysis and other data to create community presentations and real-time information for local and regional scale coastal sea ice break-up.

Model Projections and Advisory Guidance for the Governor’s Subcabinet on Climate Change – ACCAP scientists participated on the adaptation and mitigation advisory groups for the Alaska Governor’s sub-cabinet on climate change as well as the technical working groups for these advisory groups (<http://climatechange.alaska.gov/>). In collaboration with the Scenario Network for Alaska and Arctic Planning, we provided downscaled climate projections and analysis for these groups. ACCAP worked with the program manager for the sub-cabinet to review and edit the adaptation working group final reports.

ACCAP Program Evaluation – ACCAP conducted a program evaluation in summer 2010 including a web-based survey and targeted semi-structured interviews with attendees of the webinar series from ACCAP’s main stakeholder groups: federal, state, and local government, education, non-profit, native, media, and industry organizations.

The interviews and analysis were contracted to an independent researcher at the University of Alaska Fairbanks with no affiliation with ACCAP to eliminate potential bias. Our 50 survey respondents represented municipal, borough, and tribal government; post-secondary and K-12 education; private industry; native corporation; media; conservation non-profit; native non-profit and service organization; federal agencies - BLM, Environmental Protection Agency (EPA), National Oceanic and Atmospheric Administration (NOAA), NPS, US Department of Agriculture (USDA), US Department of the Interior (USDO), (FWS), US Forest Service (USFS); Alaska State agencies - Department of Environmental Conservation (DEC), Department of Fish and Game (ADF&G), Division of Forestry (DOF), Division of Public Health (DPH), Department of Transportation & Public Facilities (DOT). Respondents ranked the top climate issues in Alaska as: marine ecosystems (44%), coastal planning (38%), and water availability (34%). ACCAP's performance in providing climate change information and tools for Alaska was rated as excellent or good by 89% of respondents. In semi-structured interviews a stakeholder from the non-profit sector noted, "... in a short period of time ACCAP has established itself as a key Alaskan go to center for climate information."

E. HIGHLIGHTS OF COMMUNICATING SCIENCE TO DECISION MAKERS

Monthly Alaska Climate Webinar Series – ACCAP webinars promote dialogue between scientists, planners, state and local government, land and resource managers, industry, the news media, and others who need information specific to climate change in Alaska to make informed decisions. The average number of participants per webinar has increased from 31 in 2007, the program's inaugural year, to over 100 in 2012, and our webinars continue to draw an increasingly diverse audience including representatives from a range of federal and state agencies, industry and tribal groups.

Additionally, ACCAP has established itself as a trusted facilitator for stakeholder outreach, with organizations such as the U.S. Arctic Research Commission and the National Science Foundation's Interagency Arctic Research Policy Committee and Office of Polar programs seeking opportunities to participate in our program and diversify their own outreach efforts in Alaska. Archived webinar videos, podcasts, presentation slides, and associated media coverage from 2007 to present are available on the ACCAP website.

ACCAP Website, Social Media & Multi-Media Outreach – We receive significant and consistently positive feedback on the depth and breadth of climate information and resources available on our website. We have undertaken a major website upgrade to add functionality and to streamline the look of the site so it will better display our growing library of photos and videos. In conjunction, we are overhauling the Weather and Climate Highlights tool to include an easily searchable archive, and other interactive features.

ACCAP has embraced social media with Facebook, Twitter, LinkedIn, Vimeo, and YouTube accounts. The ACCAP listserv includes over 700 members from tribal, local, state and federal government agencies, NGOs, industry, academia, and individuals from communities spanning the entire U.S., including but not limited to the stakeholders listed in Section B. Through these outlets, we can highlight the webinar series, stakeholder workshops, the Alaska Climate Dispatch, Alaska Weather and Climate Highlights, fire forecasts, share collaborators’ and stakeholders’ information, exchange knowledge, and showcase our growing library of audio, video, and animation products to a wider audience.

ACCAP Newsletter: The Alaska Climate Dispatch – ACCAP has developed a climate information tool in partnership with the Alaska Climate Research Center, SEARCH Sea Ice Outlook, National Centers for Environmental Prediction, and the National Weather Service. The quarterly Alaska Climate Dispatch is a newsletter-style document that provides stakeholders with seasonal weather and climate summaries as well as Alaska weather, wildfire, and sea ice outlooks in one easily accessible document. In addition to these regular features, guest columnists may provide information on related topics such as El Niño and La Niña, hydrology, and permafrost. Interpretive and clearly written text, full-color pictures, charts and maps provide decision-makers with a timely snapshot of a wide range of Alaska's diverse weather and climate issues. The Alaska Climate Dispatch is distributed electronically to more than 2500 people, and is made available on the ACCAP website.

A Review of Sea-Ice & Related Climate Information Resources for Alaska’s Arctic Coastal Communities: A Manual for Accessing & Using Online Information – ACCAP coordinated and published this manual both in print and on the web to improve the availability of current information about sea ice from operational and academic observation programs to key user groups. It provides Arctic Alaska coastal community leaders and local user groups with an up-to-date, comprehensive and practical guide to the current sea-ice and climate information resources that are relevant to their planning, subsistence activities, and way of life. The resources and tutorials in this manual are organized within five main types of sea ice information: sea ice concentration, extent, and type; location and extent of multi-year sea ice; sea ice leads, open water, and shorefast ice extent; local sea ice observatories at Barrow and Wales, Alaska; and sea ice summaries.

Decision Support Tool for At-Risk Communities in a Changing Climate – ACCAP worked with the National Commission on Energy Policy and the Governor’s Climate Change Sub-Cabinet to produce a guide for best management practices for communities at risk, including those facing relocation due to coastal erosion. This guide provides specific information on climate change projections, dealing with scientific uncertainty, risk management, relocation planning, and sustainability.

Participation and Facilitation of Stakeholder Meetings – ACCAP is the primary facilitator or a primary contributor to many significant stakeholder workshops and training sessions. Significant events from this reporting period are listed below. See ACCAP annual reports 2009-2012 for a more comprehensive list of participation.

- Training Workshop for Coastal Community Climate Adaptation
- DOI Alaska Climate Science Center Downscaling Workshop
- Snow, Ice and Permafrost Hazards in Alaska: Research Needs and Opportunities
- Alaska Forum on the Environment
- Alaska Fire Science Information Workshop
- Stakeholder Workshop for Assessment of Climate Impacts on Forested Ecosystems
- Alaska Climate Connections Research Reception
- Sea-Ice Workshop for Accessing and Using Online Information
- Climate, Language and Indigenous Perspectives Elder’s Panel
- Local and Indigenous Climate Knowledge Network: Addressing Drought Vulnerability and Adaptation

F. LINKS WITH OTHER NOAA PROGRAMS

In addition to being regular, contributing participants in monthly meetings of the NOAA Arctic Regional Collaboration Team (ARCTic), we have assisted team member and Regional NOAA Climate Director James Partain with the climate adaptation section for Interagency Arctic Research Policy Committee (IARPC) 5-year plan and ACCAP has been asked to help engage stakeholders in the public comment period for IARPC.

Additionally, ACCAP participated in a social network analysis to help characterize the work of the NOAA regional collaboration teams and map the networks associated with NOAA’s strategic goals. Overall results showed that ACCAP scientists are well connected and highly sought among regional NOAA teams, divisions, and non-NOAA collaborators. Our partnership with NOAA is further strengthened by site visits from Kelly Redmond and Tim Brown, Western Regional Climate Center and Jon Gottschalck with NOAA / NCEP / NWS / Climate Prediction Center.

Cross RISA collaborations are strong. S. Trainor has served as a consultant to Western Water Assessment and Southeast Climate Consortium on vulnerability assessments and adaptation planning for native lands. Additionally we have focused on building collaborations with Pacific RISA, visiting to explore synergies between programs and regions and explore future research collaboration (with leveraged funding from the Pacific Land Grant Alliance).

ACCAP engages hydrologists and meteorologists with National Weather Service Fairbanks Forecast Office and the Pacific River Forecast Center to make key quarterly contributions to Alaska Climate Dispatch articles.