Alaska Climate Science Center: Annual Action Plan FY2012

Introduction

In early 2011, the **Alaska Climate Science Center (AK-CSC)** opened as the first of eight Department of Interior Climate Science Centers. As a part of the U.S. Geological Survey's (USGS) National Climate Change and Wildlife Science Center (https://nccwsc.usgs.gov/), the AK-CSC provides scientific information, tools, and techniques that managers and other parties interested in land, water, wildlife and cultural resources can use to anticipate, monitor, and adapt to climate variability and climatic change.

The AK-CSC was created as part of a joint USGS and University of Alaska Fairbanks (UAF) effort, and the center is physically housed within the University of Alaska Anchorage (UAA). In addition to its relationships with UAF and UAA, the AK-CSC has also developed strong partnerships with faculty from the University of Alaska Southeast (UAS), the USGS Alaska Science Center, the US Fish and Wildlife Service, National Oceanic and Atmospheric Administration, USDA Forest Service, and National Park Service. Together these partners provide expertise in climate science, ecology, impacts assessment, modeling, cultural impacts, and advanced information technology. These partnerships are essential for addressing climate issues in Alaska, where changes in temperature and precipitation are already having significant impacts on terrestrial, aquatic and marine ecosystems.

The AK-CSC's research program and other activities are guided by the center's Strategic Plan, a document that establishes priorities for the center and helps ensure that these efforts address management priorities. The first draft of the AK-CSC's Strategic Plan was completed in October 2011, and a review copy can be obtained by contacting the center director (sgray@usgs.gov). In developing this plan, the AK-CSC received guidance from the Alaska Climate Change Executive Roundtable (ACCER), which is composed of executives from key State and Federal resource management agencies. ACCER also provides annual input on shorter-term (1-2 year) science priorities, and a venue to review the AK-CSC's yearly progress. The Alaska Climate Change Coordinating Committee (C4) provides additional input on the annual implementation of the AK-CSC Strategic Plan. The AK-CSC relies heavily on collaborations with the Alaska region Landscape Conservation Cooperatives (LCCs), and the bulk of the center's activities are intended to address LCC-related needs.

Stakeholder Input

Based on discussions during the November 1, 2011 ACCER meeting, the AK-CSC has identified the following priorities for its FY2012 activities:

- Coastal processes
- Hydrology: Water resources
- Hydrology: Water chemistry
- Downscaling and climate data/monitoring issues
- Improved science communication involving local communities
- Human Impacts: Food security, water security, hazards and the built environment

Over the course of the following two months, the C4 then provided additional guidance on how these broad themes might be converted into research projects and other activities. C4 contributors were nearly unanimous in their emphasis on coastal issues. The need to improve our understanding of coastal storms and their impacts on coastal habitats was clearly articulated by many, while most contributors also stressed the need to improve related modeling capabilities. Comments from several C4 partners indicated a pressing need to link water resources, water chemistry and glacier change. Downscaling was universally recognized as a priority for the AK-CSC, with many C4 partners expressing their desire to use the products of center-sponsored work. There was no specific mention of particular downscaling products or variables to pursue, but rather a general push to 1) develop standardized methods for applications in Alaska, and 2) to make downscaled datasets more widely available for use in the resource management community. Another persistent theme was the need to leverage AK-CSC efforts to help communities cope with and adapt to climate. In particular comments from several of our Federal C4 partners emphasized the need to link any AK-CSC sponsored work on coastal processes back to community sustainability and subsistence. The State of Alaska and many of our partners from the LCC community reiterated the need to 1) collect more baseline data related to the physical environment, and 2) the need for data collection standards and improved data management.

Addressing FY2012 Priorities

Coastal Processes

As summarized above, ACCER and the C4 identified coastal processes including storm-induced erosion and impacts on coastal habitats as a critical priority for FY2012. The Western Alaska LCC has also identified coastal issues as a key priority for 2012, thereby creating multiple opportunities for additional AK-CSC and LCC cooperation. Resulting actions are described below.

1) The AK-CSC will hire a post-doctoral scientist to examine how changes in coastal storms and related coastal processes might impact coastal habitats/ecosystems. The exact

scope of work for this position will be developed in collaboration with the Western Alaska LCC and USGS Alaska Science Center, but will likely focus on *a) reviews of existing literature; b) performing background work needed to develop a conceptual framework for understanding future coastal ecosystem impacts/change; and c) coordination with researchers who are modeling the physical aspects of coastal storms.* **Proposed funding amounts = $65K to $85K with potential continuation for a second year.**

2) The AK-CSC will partner with the Western Alaska LCC and Arctic Ocean Observing System (AOOS) convene a workshop aimed at developing a cooperative strategy for addressing key knowledge gaps related to coastal issues and climate impacts. Proposed topics include *a) modeling of coastal storms; b) modeling of coastal erosion; c) impacts on coastal wetlands and other habitats; and d) linkages to cultural resources, community sustainability and subsistence.* Comments from the C4 group suggest that this workshop should focus on an assessment of current research and monitoring capacities, and the potential for longer-term predictive capabilities. **Proposed funding amounts = *TBD*.**

3) Using a targeted request for proposals (RFP), the AK-CSC will engage coastal storm and/or coastal-erosion experts as a means to *a) calibrate existing storm/erosion models for applications in western Alaska; b) assess the capabilities of existing storm/erosion models for applications throughout the region; and c) assess needs related to input datasets for broader applications in western Alaska and the region as a whole*. This project would be closely linked to the joint AOOS, Western Alaska LCC and AK-CSC coastal workshop and the proposed coastal processes post-doctoral researcher. Ideally this work would serve as a strategic foundation for future projects that address coastal resource issues throughout the region. Invitations for proposal submission will be made in consultation with the Western Alaska LCC, with the requirement that any prospective PIs also submit to a related RFP from the Western Alaska LCC. **Proposed funding amounts = $20K to $60K.**

Linking Water Resources, Water Chemistry and Alaska's Glaciers

The water resources and water chemistry priority themes could be addressed in any number of ways. However, input from C4 suggests an especially urgent need to link these themes to Alaska's changing glaciers. Moreover, in FY2011 the AK-CSC funded two larger, multi-year projects aimed at studying glacier change in the Yukon River Basin and Gulf of Alaska watershed. In turn, these projects can serve as an excellent foundation for examining glacier to hydrology linkages. Finally, a focus on glacier-hydrology linkages allows the AK-CSC to capitalize on significant resources and expertise housed with the USGS Alaska Science Center, UAF, and UAS. Specific actions are outlined below.

1) The AK-CSC will provide continued funding of Dr. Matthew Nolan's (UAF) project entitled "Integrating Studies of Glacier Dynamics and Estuarine Chemistry in the context of ANWR Landscape Change". AK-CSC staff will also work with Dr. Nolan to help ensure that this work speaks to management needs as identified by ACCER and the C4, and to better integrate this work with the needs of the Alaska LCCs. **Funding amount = $100,000.**

2) The AK-CSC will work with Drs. Shad O'Neel (USGS Alaska Science Center) and Eran Hood (UAS) to expand their study entitled, "Assessing the Sensitivity of Alaska's Coastal Rainforest Ecosystem to Changes in Glacier Runoff." The expanded study will include additional work aimed at understanding glacier mass-balance to runoff relationships. Work in FY2012 will also emphasize impacts on water chemistry in streams and rivers originating from glaciers in Southeast Alaska, and impacts on water chemistry in fjords and near-shore marine systems. **Funding amount = $200K.**

3) Given the need to better communicate research findings to the management community and public at large, the AK-CSC will use a targeted RFP to develop a workshop that explores recent work on glaciers in Alaska. The exact scope and intended audience for the workshop is still under consideration, but will likely focus on *a) the impact of glaciers on fish, wildlife and water resources; b) an overview of recent (last 10-20 years) changes in Alaska's glaciers, and; c) a prospectus for predicting future glacier change.* This workshop will feature events for both technical audiences and the general public. Invitations for proposals will be made in consultation with the AK-CSC's University Leadership team and the USGS Alaska Science Center and Regional Executive's Office. Submissions will be limited to PIs or teams of PIs with previous glacier-related funding from the AK-CSC. **Proposed funding amount = Up to $50K.**

4) The AK-CSC has hired Dr. Andrew Schroth (USGS Woods Hole) as a half-time post-doctoral associate tasked with *a) summarizing existing studies of glacier change in Alaska, and b) assisting the center in linking ongoing research throughout the region.* Dr. Schroth's duties focus on finding opportunities to leverage existing datasets and capabilities, as well as the further development of standard techniques for monitoring water chemistry in glacier-fed streams. **Funding amount = $43K.**

Downscaling and Climate Data

When compared to the Lower-48, there has been very little Alaska-specific work on the downscaling of coarse-scale climate model output. Likewise, when one considers the size of

the state, there is a profound lack of actual climate observations. As a result, the AK-CSC will focus its initial efforts related to the downscaling and climate data themes on 1) foundational work that will set the stage for a collaborative, strategically-sound and sustainable approach to the creation of advanced climate data/information products, and 2) investments to address longer-term needs for the creation and application of advanced climate products. Specific actions follow.

1) The AK-CSC will hire a permanent USGS research-grade position in Applied Climate Science. The incumbent will possess advanced knowledge of available climate datasets and climate projections, and the application of these products to issues in natural resource management. As such, the incumbent will serve as a liaison between the natural resource management community and the research scientists that produce downscaling products so that the AK-CSC can help ensure that these products best fit the needs of our LCC and agency partners. Furthermore, the incumbent will have significant experience in linking climate variability and climate change to natural resource management. The incumbent will also be expected to conduct and collaborate on multi-disciplinary and multi-agency research projects aimed at understanding climate-ecosystem linkages in Alaska. ***Funding = Approximately $150K/yr, with an obligation for continued funding.***

2) As a part of the USGS and UAF partnership, the AK-CSC has hired two post-doctoral fellows to address 1) technical issues related to improving climate data and downscaling issues for Alaska, and 2) the development of predictive modeling systems that can link downscaled climate projections to arctic hydrology. The Applied Downscaling position is administered through UAF's Scenarios Network for Alaska Planning (SNAP, http://www.snap.uaf.edu/), and physically located at the AK-CSC offices in Anchorage. The Arctic Hydrology position is administered and housed within the International Arctic Research Center (IARC, http://www.iarc.uaf.edu/) at UAF. ***Funding = Approximately $175K/yr, with 2-3 additional years likely.***

3) As part of a longer-term, comprehensive strategy to meet the needs of resource managers in Alaska, the AK-CSC is funding three UAF graduate students (1 PhD, 2 Master's) whose work focuses on issues related to climate data and/or the creation and application of advanced climate projections. As a part of the USGS and UAF partnership, the AK-CSC will also look for additional training and student research opportunities in FY2012. ***Funding = Approximately $150K/yr with plans for additional years of funding.***

4) The AK-CSC will continue funding the multi-investigator USGS and UAF project entitled, "The Alaska Integrated Ecosystem Modeling (IEM) Project". This project seeks to link state of the art models for vegetation, permafrost, ecosystem processes and hydrology into a single, integrated system that can be used as a platform for exploring climate impacts on Alaska's arctic and boreal ecosystems. The IEM will ultimately serve as a powerful tool for incorporating downscaled climate projections into natural resource planning and management. In the meantime, the development of the integrated model provides the AK-CSC its partners with multiple opportunities to 1) assess the quality of existing climate datasets, and 2) a forum for exploring strategies for the creation of new downscaling products. The IEM effort has been cosponsored by Alaska region LCCs, and so it also provides additional opportunities for CSC-LCC collaboration on downscaling and other climate data issues. ***Funding = $535K/yr, with a commitment for up to 3 additional years of funding.***

Monitoring and Basic Data Needs

Unmet needs for monitoring and baseline environmental data are many and varied. While the AK-CSC could easily use all of its funding to help fill these data gaps, the center's Strategic Plan points to a strategy that 1) leverages previous and ongoing AK-CSC sponsored work, and 2) leads to the development of data collection standards or improved data collection platforms. Furthermore, the AK-CSC's Strategic Plan emphasizes the need to capitalize on the strengths of our research partners. The three actions listed below were developed accordingly.

1) Using a joint RFP developed with the Arctic LCC, the AK-CSC will engage snow experts as a means to calibrate and test a snow distribution model for arctic and interior Alaska. It is expected that this model will serve as a foundation for future work aimed at improving the collection of distributed snow measurements, and as a means to develop strategies for expanded snow data collection. Ideally this project will be closely linked to the AK-CSC's Integrated Ecosystem Modeling (IEM) project. **Proposed funding amount = Approximately $75K.**

2) The AK-CSC will continue funding for the "Ecology, Soil Carbon, and Permafrost Experiments (ECOSCAPE)" project led by Dr. Mark Waldrop (USGS Alaska Science Center). The ECOSCAPE project provides critical measurements related to permafrost change and ecosystem dynamics that fed directly into the AK-CSC's IEM effort. Moreover, ECOSCAPE serves as a platform for the development of novel techniques for measuring environmental change in areas of discontinuous permafrost, and the results

of this instrumentation work should be of wide benefit to many of our partners. **Funding amount = $200K.**

3) In consultation with the AK-CSC, the National Climate Change and Wildlife Science Center will provide the USGS Alaska Science Center (ASC) with funds to continue its data integration efforts. The ASC's Data Integration Team is addressing a wide range of critical issues, and resulting products will include standards for data management plans and strategies for data archiving that can be applied across the AK-CSC and LCC communities. The ASC's Data Integration Team is also making significant contributions toward the creation of a national data infrastructure for CSC and LCC research, and team members act as liaisons between the AK-CSC and other data-related efforts (e.g., Geographic Information Network of Alaska [GINA]) in Alaska. **Funding = Approximately $150K.**

Summary

Based on input from ACCER, the C4, and our LCC and University partners, the AK-CSC will address its FY2012 priority themes using a combination of new hires, student funding, research funding and workshop activities. Total funding for these efforts exceeds $2.1 million, with $1.4 million in the form of direct funding for research. A summary of progress towards FY2012 implementation will be provided during the May 2012 ACCER meeting, along with a recap of FY2011 activities.