

# Providing Science for Climate Adaptation

**The National Climate Change and Wildlife Science Center and  
DOI Climate Science Centers**

**Progress Report – SUMMER 2013**

Prepared for the  
**Advisory Committee on Climate Change  
and Natural Resource Science**

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The majority of this report is derived from a similar report prepared in late 2011, for a “National Partners Dialogue” convened by the National Climate Change and Wildlife Science Center on November 30 and December 1, 2011. The text has been revised and updated. For those reading both reports, we appreciate your forbearance.



Cover photo, Red-tailed tropicbird, Encyclopedia Britannica

## Executive Summary

The National Climate Change and Wildlife Science Center (NCCWSC) and Department of the Interior (DOI) Climate Science Centers (CSCs) are being implemented based on input from a wide range of partners, guidance from the Secretary of the Interior and the Department of the Interior's climate strategy, and with strong Congressional oversight. The enterprise is intended to:

- be strongly partner-driven
- respond directly to the needs of natural and cultural resource managers for science to address ongoing and future climate change
- leverage the intellectual capabilities of the nation's academic sector and the substantial scientific talent and assets of the federal government
- provide science on a regional basis to support decision making

*The role of the NCCWSC and CSCs is to provide scientific information to support management decision making.* The scientific niche is intermediate between very large scale, often investigator-driven science that explores how earth systems function and the immediate tactical information needs of managers. Specifically, the NCCWSC and CSCs work to identify key uncertainties about how systems function, spur research to meet those gaps, synthesize and translate information from multiple disciplines, and deliver it to users in forms (including models, decision support tools, etc.) that they can apply to decisions.

The scientific agenda for the enterprise consisting of the NCCWSC and CSCs is being built from the bottom up with input from resource managers. Landscape Conservation Cooperatives (LCCs) and other management entities identify their science needs, these are reconciled at the regional CSC level to provide *regional* priorities, and these are further aggregated and distilled to identify national scale gaps and needs. At all levels, dialogue between managers and scientists ensures the priority questions are both relevant and scientifically tractable.

Implementation of the NCCWSC-CSC enterprise is ongoing. All eight CSCs have been formally established, and permanent directors hired for seven of these<sup>1</sup>. Initial science agendas are also in place<sup>2</sup>, with increasing focus on the highest priority regional needs and integration of science planning across CSCs and up to the national level. CSC Stakeholder Advisory Committees (SACs) are in place and informal collaboration between LCCs, CSCs, and other partners is growing daily. A national science agenda, derived from the CSC regional agendas, is in its initial stages. The establishment of the Advisory Committee on Climate Change and Natural Resource Science (ACCCNRS) is a milestone for the program. Interactions between NCCWSC, CSCs, and other major entities and initiatives such as the National Climate Assessment, National Fish, Wildlife and Plants Climate Adaptation Strategy, and others are being clarified to ensure minimal duplication and maximum effectiveness.

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<sup>1</sup> Neither a permanent director nor a science plan is in place at the Pacific Islands CSC.

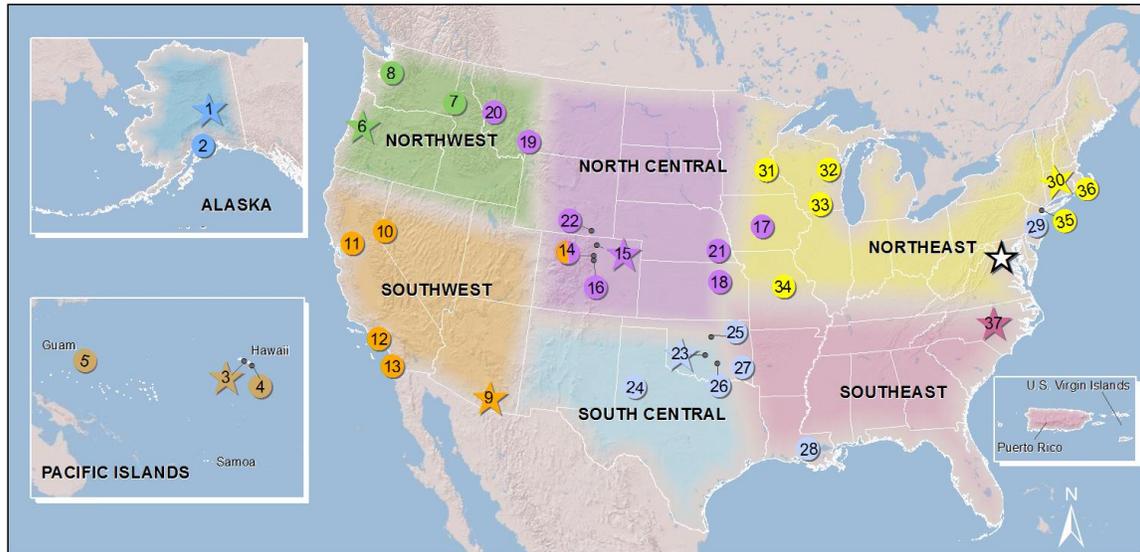
<sup>2</sup> The Pacific Islands CSC plan is in draft form.

## Key Facts about NCCWSC and CSCs

- NCCWSC was established by Congress in 2008 to provide scientific information to assist managers of the Nation’s fish, wildlife, and their habitats in responding to climate change.
- Climate Science Centers were originally planned as “hubs” of NCCWSC, but their mission was expanded by former Secretary of the Interior Salazar. They are now Department of the Interior Climate Science Centers, managed by the USGS NCCWSC. There are eight such centers. See Figure 1.
- The NCCWSC and CSCs are envisioned as integral parts of a climate science planning enterprise (NCCWSC-CSC enterprise). Together, the NCCWSC-CSC enterprise, Landscape Conservation Cooperatives (LCCs) and other management partners make up a broader climate science and conservation planning initiative.
- LCC-identified science needs form the core of the science agendas at CSCs; LCCs and other management entities are represented on CSC stakeholder committees, and CSCs are represented on LCC steering committees.
- CSCs take steps to ensure that science conducted in response to these needs is managed so that outputs are of maximum use to the original intended users.
- Each CSC stakeholder advisory committee includes representation from the region’s natural and cultural resource managers as well as regional scientific partners. *These committees establish priorities for needed science, and match and leverage scientific responses to ensure the most efficient use of limited government funds.*
- CSCs are federal-university collaboratives. USGS has a small staff at each CSC and can access scientific capabilities and expertise across the lead university or consortium. Federal-university research collaboration is encouraged.
- CSCs support moderate numbers of graduate students and post-doctoral researchers, both to support needed research and to build a “pipeline” for training future employees.
- Based on LCC and other expressed scientific needs, each CSC has or will develop a strategic *science agenda* with a five-plus year horizon, and annual project funding plans. Stakeholders are and will continue to be engaged in both levels of decision making.
- Based on the eight regional CSC science agendas, NCCWSC is developing a national scale agenda for climate science to support natural resource adaptation. Key research needs will be communicated to agencies that support scientific research for consideration as priorities.
- USGS and the Department of the Interior have established a federal advisory committee, the Advisory Committee on Climate Change and Natural Resource Science (ACCCNRS), to provide input and guidance to the NCCWSC-CSC enterprise. An initial meeting is planned for September 2013.

*USGS and The Department of the Interior are committed to the success of this enterprise as a partnership effort. The Advisory Committee on Climate Change and Natural Resource Science is an important element in achieving this partnership goal.*

## Map: CSC Locations, Partners, and Leadership



Base from ESRI, 2009, Albers Equal Area Conic Projection, North American Datum of 1983

- ★ National Climate Change and Wildlife Science Center
- ★ CSC Lead Institutions
- ② CSC Institutions
- Alaska CSC**
  - 1. University of Alaska - Fairbanks
  - 2. University of Alaska - Anchorage
- Pacific Islands CSC**
  - 3. University of Hawaii at Manoa
  - 4. University of Hawaii at Hilo
  - 5. University of Guam

- Northwest CSC**
  - 6. Oregon State University
  - 7. University of Idaho
  - 8. University of Washington
- Southwest CSC**
  - 9. University of Arizona
  - 10. Desert Research Institute (Nevada)
  - 11. University of California - Davis
  - 12. University of California - Los Angeles
  - 13. Scripps Institute of Oceanography
  - 14. University of Colorado

### EXPLANATION

- North Central CSC**
  - 14. University of Colorado
  - 15. Colorado State University
  - 16. Colorado School of Mines
  - 17. Iowa State University
  - 18. Kansas State University
  - 19. Montana State University
  - 20. University of Montana
  - 21. University of Nebraska - Lincoln
  - 22. University of Wyoming
- South Central CSC**
  - 23. University of Oklahoma
  - 24. Texas Tech University
  - 25. Oklahoma State University
  - 26. Chickasaw Nation
  - 27. Choctaw Nation of Oklahoma
  - 28. Louisiana State University
  - 29. NOAA Geophysical Fluid Dynamics Laboratory

- Northeast CSC**
  - 30. University of Massachusetts Amherst
  - 31. University of Minnesota
  - 32. College of Menominee Nation
  - 33. University of Wisconsin - Madison
  - 34. University of Missouri Columbia
  - 35. Columbia University
  - 36. Marine Biological Laboratory
- Southeast CSC**
  - 37. North Carolina State University

**Figure 1.** Locations of the U.S. Geological Survey National Climate Change and Wildlife Science Center (NCCWSC) and Department of the Interior (DOI) Climate Science Center (CSC) lead institutions and consortia partners.

## Introduction

*The National Climate Change and Wildlife Science Center and DOI Climate Science Centers are moving forward to provide answers to key questions about how natural and cultural resources of the U.S. will be affected by climate change, and how managers may plan for adapting to these changes.*

At geographic scales ranging from local to national, the enterprise consisting of the National Climate Change and Wildlife Science Center (NCCWSC) and the eight regional Department of the Interior (DOI) Climate Science Centers (CSCs) brings together scientists and managers to conduct research and scientific activities to address key priorities related to the adaptation of natural and cultural resources to climate change. Work completed by the NCCWSC and CSCs considers the larger context of ongoing global change (including changing patterns of land-use, invasive species, hydrology etc.) and provides information to managers working to consider current and future climate impacts.

The mission of the National Climate Change and Wildlife Science Center is to *provide natural resource managers with the tools and information they need to develop and execute management strategies that address the impacts of climate change on fish, wildlife, and their habitats.*

The mission of the DOI Climate Science Centers is to *provide natural and cultural resource managers with the tools and information they need to develop and execute management strategies that address the impacts of climate change on a broad range of natural and cultural resources.*

This progress report describes the NCCWSC-CSC enterprise – its key framing principles, its history and development, structure and intended goals. It is being written in Summer 2013, as the NCCWSC-CSC enterprise refines and perfects its implementation of the core ideas identified in an extensive stakeholder consultation process in 2008 and 2009:

- a network of eight regional centers (“hubs”)
- a scientific focus on the impacts of projected climate change on fish, wildlife, ecosystems and other natural and cultural resources,
- heavy emphasis on the science needs of land and resource managers, and
- extensive science-management dialogue and stakeholder engagement at multiple geographic scales.

With the convening of the Advisory Committee on Climate Change and Natural Resource Science (ACCCNRS), NCCWSC is seeking input on its implementation of this ambitious vision.

## Mandate and Core Principles

In 2008, amid mounting observations of changes in drought, wildfire, precipitation, and temperature, and projections that these trends would continue, Congress established the National Climate Change and Wildlife Science Center<sup>3</sup>. The aim was to provide a focus for scientific activities that would enable resource managers to predict and cope with these changes.

The National Climate Change and Wildlife Science Center (NCCWSC) now manages a network of eight regional Department of the Interior Climate Science Centers (CSCs) and an expanding portfolio of scientific activities intended to inform management of natural and cultural resources.

This enterprise has been shaped by the following principles:

- *Meet the scientific needs of resource managers.* NCCWSC and CSCs receive their scientific direction from consultations with those whose work involves decisions about natural and cultural resources. Landscape Conservation Cooperatives are primary partners, along with other federal, state, tribal, local, and nongovernmental partners.
- *Foster partnerships aggressively.* Effectively responding to landscape-scale changes requires ongoing engagement of multiple management partners (e.g., federal and state) as well as collaboration among science providers to ensure efficient use of resources. These partnerships require conscious development and dedicated resources.
- *Maximize resources for science.* NCCWSC and CSCs have been implemented in ways that minimize staff and facilities costs and devote the maximum amount of funding to science.
- *Utilize the strengths of both university and government.* The scientific expertise required to address climate change is growing and changing rapidly, and strong government-university collaborations enable the public to access state-of-the-science tools and expertise.
- *Focus on ecosystems, not jurisdictions.* Management of natural resources can only truly be effective if it is based on a rich understanding of the full setting, context, and extent of a species, habitat, or other ecological element.

*Meet the scientific needs of resource managers.* The NCCWSC-CSC enterprise is designed to respond to the scientific needs identified by resource managers. Thus, the scientific agenda for the collective efforts of NCCWSC and CSCs is not driven by an *a priori* national science agenda. Rather, this science agenda is being built up from the bottom, beginning with the needs identified by Landscape Conservation Cooperatives (LCCs) and other land, water, wildlife and other natural and cultural resource managers. These landscape-level needs are reviewed by each CSC and its Stakeholder Advisory Committee (SAC) – which has strong management representation – to identify key regional priorities. CSC funds are directed to these needs, in order of priority as defined by the partners. Regional priorities are similarly reconciled to build a

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<sup>3</sup> Consolidated Appropriations Act of 2008, P.L. 110-161. In this bill, the center was referred to as the National Global Warming and Wildlife Science Center.

higher level national-scale agenda, with input from the Advisory Committee on Climate Change and Natural Resource Science, a national-level federal advisory committee. This committee will provide a vehicle for management partners to have substantive input to a national agenda and to communicate any concerns about the need for improved coordination or communication.

*Foster partnerships aggressively.* The scientific work of the NCCWSC and CSCs is embedded within partnerships that identify priorities, leverage resources, and ensure regional and national integration. The core partnerships for the CSCs are those with Landscape Conservation Cooperatives (LCCs) and other management entities. As noted previously, science needs identified by these managers will drive CSC scientific activities. In addition, the actual *delivery* of scientific information must involve partnerships between scientists and managers to ensure the maximum utility and applicability of the results. CSC scientists are committed to working directly with managers to ensure useful outcomes.

LCCs identify needed science, and have some of their own resources to acquire scientific support. Thus, CSCs and LCCs – and other science providers in a region – will collaboratively allocate needed scientific activities among various providers, matching tasks to resources and mandate to efficiently use public funds. CSCs are also partnerships between the federal government and universities, ensuring that the most appropriate scientific expertise is available and extending the reach of existing federal capabilities. Finally, NCCWSC and the CSCs are involved in many *internal* partnerships – leveraging the capabilities of USGS scientists to deliver needed results.

*Maximize Resources for Science.* In a time of fiscal restraint, NCCWSC and the CSCs are being implemented carefully to ensure maximum availability of funds for science. As part of the federal-university partnerships, office space for CSCs is being provided at little or no cost. Administrative support (purchasing, budget/fiscal management, etc.), originally purchased regionally from nearby USGS facilities, will move towards administrative services provided by 2 or 3 full-time USGS staff for all CSCs.

Beyond basic management and administration, hiring of new scientific staff is being undertaken strategically, and only after it is clear that the needed expertise does not reside in the relevant region. And scientific activities are increasingly being coordinated to maximize the benefit from each investment – in such important and expensive assets such as downscaled climate

#### What is “Actionable Science”?

**Actionable Science:** Actionable science at the scales of decision making includes the theories, data, analyses, and other information that are available, relevant, reliable, and sufficiently understandable to support multiple scales of decision making, including capital investment decision making. It is one output from “science translation” in which decision makers and science producers interact to describe the decisions and actions requiring science support and the relevant, reliable, and applicable science available for translation into that support (United States Global Change Research Program working definition).

*Actionable science is processed information that can be readily used by engineers, planners, and decision makers.*

David Raff, Levi Brekke, Kevin Werner, Andy Wood, and Kathleen White, January 2013. Short-Term Water Management Decisions: User Needs for Improved Climate, Weather, and Hydrologic Information. Joint USCOE, BOR, NOAA Technical Report

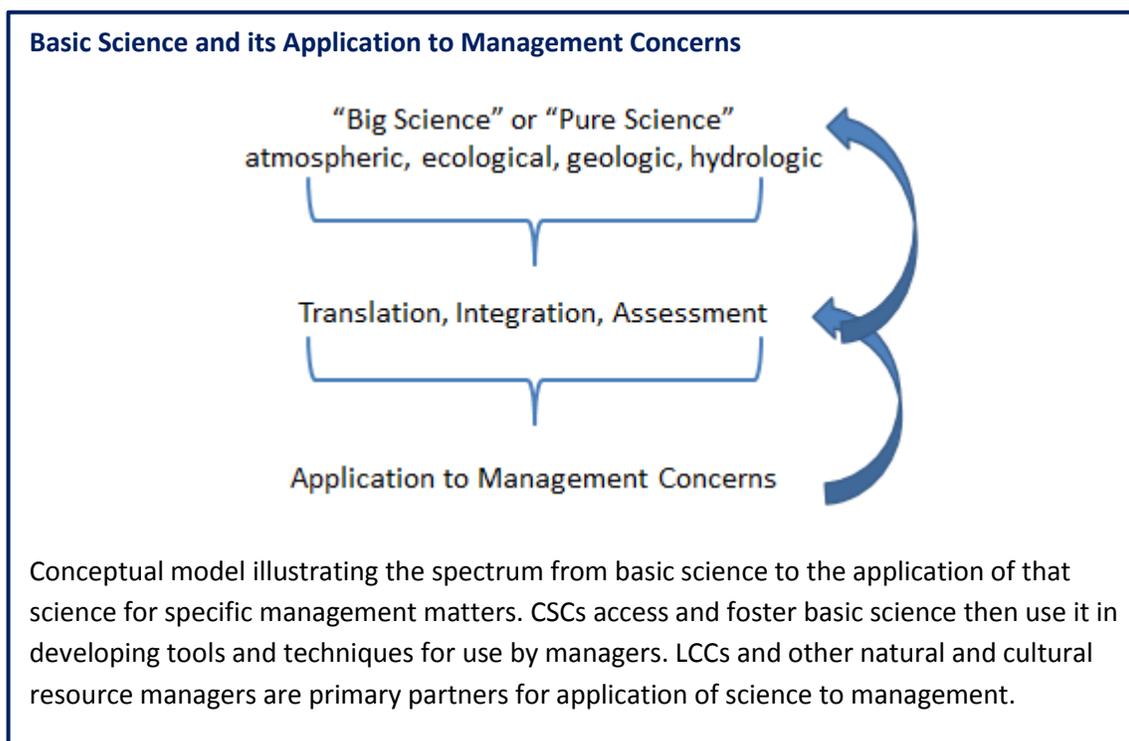
projections – as well as in specific projects. A key role for the CSC Stakeholder Advisory Committees will be to provide a venue for leveraging of scientific assets in this way.

*Utilize the strengths of both university and government.* The scientific challenges associated with a changing climate are extraordinary, and solving these challenges will require input from a broad and rapidly changing intellectual spectrum. By establishing partnerships with key academic institutions and consortia, USGS and DOI have greatly expanded the operational capacity to answer key questions and deliver the results directly to managers. In this regard, Cooperative Fish and Wildlife Research Units were a key model for the CSCs.

*Focus on ecosystems, not jurisdictions.* It is now a truism of conservation science and practice that management of natural resources must involve multiple jurisdictions, ownerships, and management responsibilities. The scale of many existing problems demands such cross-jurisdictional action – and the science to support landscape scale action. A changing climate simply reinforces and strengthens the necessity of landscape-to-regional scale science and action. The effects of climate change are expected to play out at large regional scales, with similar influences across broad regions. With this in mind, the guidance to CSCs is that the science they undertake should be bounded by ecological limits – the extent of a species range, watershed divides, vegetation coverage, etc. – rather than administrative boundaries or jurisdictional lines.

## Defining a Role – The “Operating Space” for the NCCWSC and CSCs

The role of the NCCWSC-CSC enterprise is driven by its mandate to support the scientific needs of managers. This role can be viewed as part of a continuum that begins with very high level science, which provides basic understandings about how atmospheric and ecological systems operate and interact. This basic knowledge must be synthesized and aggregated and often incorporated into decision support tools, and can be complemented and made more useful by effective translation and support for application by managers on the ground. In this view, the NCCWSC and CSCs conduct new science or assemble results from others’ work, develop models or other application-oriented tools, and work with managers to ensure appropriate application. The Joint Fire Science Program<sup>4</sup> is an excellent model for the kind of management-oriented science and delivery effort envisioned for the NCCWSC and CSCs.



A second way of describing the role for Climate Science Centers involves the development and implementation of adaptation plans – management strategies designed to assist ecosystems or their components in coping with the effects of changing climate. The continuum described above involves the NCCWSC-CSC enterprise as well as several other entities. The NCCWSC and CSCs act as sources of scientific information and tools, Landscape Conservation Cooperatives act as venues where science and management intersect, enabling development of multi-party landscape-scale plans based on strong scientific foundations, and, finally, federal,

<sup>4</sup> See <http://www.firescience.gov>

state, tribal, local, private and nongovernmental partners apply the scientific information and tools to implement elements of the adaptation plans. These three groups have obvious individual strengths and areas of special expertise, but the entire continuum requires close collaboration between the various entities to ensure success.

## Scientific Focus of the National Climate Change and Wildlife Science Center and Climate Science Centers

The initial five year strategic plan for NCCWSC and the CSCs included five key themes for the enterprise's scientific focus:

- Use and create high resolution climate modeling information and derivative products in order to produce key information that is needed to forecast ecological and population response at national, regional, and local levels.
- Integrate physical climate models with ecological, habitat, and population response models.
- Forecast fish and wildlife population and habitat changes in response to climate change.
- Assess the vulnerability and risk of species and habitats to climate change.
- Develop standardized approaches to modeling and monitoring techniques, to facilitate the linkage of existing monitoring efforts to climate models and ecological/biological response models.

NCCWSC intentionally did not elaborate on this strategic agenda. Rather, the development of an overall science agenda for the NCCWSC-CSC enterprise is being managed as a bottom-up affair, beginning with input from partners, which feed into CSC Science Agendas, which in turn will tier to multi-CSC climate change phenomena and national assessment and synthesis.

NCCWSC hopes and believes that a national agenda created in this management-driven process will be of utility in several ways. Its primary role will be to assist NCCWSC in designing its national science strategy – projects undertaken at the national level to complement, knit together or contribute to regional science. A second role, however, will be to communicate to those agencies with national science assets and programs the most important and large scale questions arising as the natural and cultural resource management community confronts climate change – with the expressed intent of enlisting these agencies to assist in answering these large/difficult questions. This process of engagement is in its early stages, and it is likely that the roster of scientific questions will evolve over time. The periodic updating of the national science agenda will allow this evolution to be communicated to science agencies.

The scientific work of the NCCWSC-CSC enterprise can be categorized into two bins: *science infrastructure and capacity* and *thematic science* projects.

*Science infrastructure and capacity* is the added value and tangible by-products of conducting science. It includes objectives such as communication and translation of scientific results, coordination of science across multiple organizations, training and education, development of data and information infrastructures, and the provision of a long term evaluation process (akin to adaptive management frameworks) that allows us to build on success and modify our objectives to meet the current needs of the stakeholder community.

*Thematic science projects* are the backbone of the NCCWSC-CSC enterprise, and this body of work adheres to mission-relevant areas of research. Projects should contain a mix of strategic and tactical science, coordinate across boundaries to assure added value of the enterprise, and

provide national multidisciplinary expertise to assure science performed meets the needs of DOI. Further these projects must occur across a scalar gradient, meeting the tactical needs of the resource manager while providing regional, national, and global advancements on understanding climate change impacts on fish, wildlife and their habitats within the larger context of ongoing global change (including changing patterns of land-use, invasive species, hydrology etc.). The NCCWSC-CSC enterprise is also a vehicle for decision support. Science conducted within the enterprise should provide credible information about climate impacts with the end result being actionable decisions.

### **NCCWSC and CSC Science Goals**

The scientific work of the NCCWSC-CSC enterprise can be categorized into two bins, *science infrastructure and capacity* and *thematic science projects*.

Science infrastructure and capacity is the added value and tangible by-products of conducting science. Thematic science projects are the backbone of the NCCWSC-CSC enterprise and adhere to mission-relevant areas of research.

*Science conducted within the enterprise should be encompassed by relevant themes of research that provide credible information about climate impacts with the end result being actionable decisions.*

### **Science Infrastructure and Capacity Goals**

Science Capacity Goal 1: Collaborate, communicate and translate science results to managers, stakeholders and the public interested in climate change science.

Science Capacity Goal 2: Create and maintain shared information and data management platform.

Science Capacity Goal 3: Educate and train a core of climate scientists that will provide expertise in the future.

Science Capacity Goal 4: Evaluate the impacts of the NCCWSC-CSC enterprise.

### **Thematic Science Goals and Outcomes**

Thematic Science Goal 1: Assess and synthesize our state of knowledge about climate change impacts to DOI natural and cultural resources within the larger context of ongoing global change (including changing patterns of land-use, invasive species, hydrology etc.).

Thematic Science Goal 2: Perform vulnerability assessments of species and ecosystems.

Thematic Science Goal 3: Understand the social-ecological impacts of climate change.

Thematic Science Goal 4: Understand the interactions between climate and the physical, biological, and chemical forces that influence the structure and functioning of ecosystems and the goods and services they provide.

## History and Development

As this report is written, the NCCWSC-CSC enterprise is moving from an early *infrastructure-building phase*, in which CSC host locations were identified and agreements put in place with university consortia, initial stakeholder advisory consultations held, staffing and science planning initiated, and early rounds of science activities funded. The next phase might be termed *strategic alignment*, in which CSCs focus more tightly on a modest number of high priority themes, building toward deeper and more consequential outcomes, link together to address common large-scale phenomena, such as sea level rise and extended drought, and connect to national synthesis and assessment activities.

**2008 – First Steps.** In the Fiscal Year 2008 appropriations act<sup>5</sup>, Congress provided \$1.5 million for establishment of what was then called the National Global Warming and Wildlife Science Center, which became NCCWSC.

With this initial seed funding, USGS identified and funded five demonstration projects that illustrated the nature of the science to be undertaken by the new Center<sup>6</sup>. In addition, it began a stakeholder consultation process that drove the eventual structure and function of the new entity. This process was chaired by the Ecological Society of America and The Wildlife Society, ably assisted by the Meridian Institute, a public policy facilitation organization. A major national meeting in December 2008 was followed by four regional listening and strategy development meetings, capped by a smaller, final national meeting in July 2009<sup>7</sup>.

This process identified key elements of the new National Climate Change and Wildlife Science Center. These include:

- A small headquarters office and a network of eight regional centers (called “hubs” at the time).
- Extensive partner involvement in decision making – such as the concept of a stakeholder committee to shape the agenda for each CSC.
- A science program focused on bridging the distance between atmospheric science and conservation action: conducting research, synthesizing and aggregating research findings, developing tools for managers, and helping to effectively manage and enable access to the extensive data needed for both science and decision making.

**2009-2010 – A Broader Mission and the First CSCs.** Fiscal years 2009 and 2010 brought significantly increased resources -- \$10.0 million and \$15.0 million, respectively, enabling serious implementation to begin. Because Climate Science Centers were in the planning and early startup stages, NCCWSC undertook a national level request for proposals to begin scientific activities in support of climate adaptation planning. A total of 23 individual research

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<sup>5</sup> Consolidated Appropriations Act of 2008, P.L. 110-161.

<sup>6</sup> See <https://nccwsc.usgs.gov/projects-list/5050cb9ce4b0be20bb30eac5>

<sup>7</sup> A report of this process and its recommendations can be found at <https://nccwsc.usgs.gov/sites/default/files/documents/TWS-ClimChgReportFINAL.PDF>

projects<sup>8</sup> (generally 3 years in duration) were funded, addressing a wide range of geographic areas and ecosystems, and focusing on both broad questions of ecosystem response as well as on specific aquatic and terrestrial species.

In addition, in September 2009, Interior Secretary Salazar signed Secretarial Order 3289 (SO3289), which, among other things, recognized CSCs as *assets of the entire Department of the Interior (DOI)*, with a mission to provide science to support adaptation decision making for all natural and cultural resources within the purview of DOI.

SO3289 raised concerns that the expansion of the CSC mission might result in dilution of the effort devoted to fish and wildlife and their habitats, as CSCs were asked to address broader concerns of DOI bureaus. USGS believes this concern is less problematic than it may seem, for several reasons. First, effectively addressing fish and wildlife concerns demands an *ecosystem approach*, in which a full range of ecological context and settings are considered. This approach can and indeed should be a basic element in a wide range of natural and cultural resource management decisions, meaning that the core science undertaken by CSCs is in fact applicable to a wider range of concerns. Second, the decision making process of CSCs is managed such that USGS NCCWSC funds – which are appropriated to address fish, wildlife, and ecosystems – will be applied only to science activities consistent with the appropriations mandate. In practice – acknowledging a relatively short history – USGS has not been presented with science demands that would go beyond the breadth of NCCWSC’s funding.

The broader departmental mandate was also intended to encourage provision of additional resources to match the mandate and address broader questions. For example, the National Park Service (NPS) had planned to station social scientists in at least two and perhaps three CSCs, increasing the CSCs’ intellectual breadth and capacity, and supporting NPS decision making on cultural and related resources. Budget reductions have required NPS to scale this back to one scientist assigned part time to a CSC. Other bureau and agency external resources are likewise limited during this period.

In Fiscal Year 2010, USGS began the process of establishing CSCs with the identification of the University of Alaska as the location for the first CSC, and initiated competitive selection of host institutions for four additional Centers. The Alaska, Northwest, and Southeast Centers were formally established in September 2010, with Fiscal Year 2010 funds. Implementation of the Southwest and North Central CSCs was delayed by the late passage of appropriations legislation for Fiscal Year 2011, and these centers were established in June 2011. The final three CSCs were established formally in March 2012 (Northeast, South Central, and Pacific Islands), completing the planned suite of eight regional DOI Climate Science Centers.

The CSC host selection process emphasized two key criteria – the strength of both climate and ecosystem impact science capabilities the university could provide access to, and demonstrated orientation to delivering science for natural resource decision making. Proposals were reviewed by a Technical Review Panel with representation from all Department of the Interior bureaus as well as the U.S. Forest Service and National Oceanic and Atmospheric Administration, with

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<sup>8</sup> <https://nccwsc.usgs.gov/display-csc/5050cb0ee4b0be20bb30eac0>

USGS as a non-voting chair. The resulting host institutions and consortia provide an extremely strong and deep source of scientific capabilities, across a wide range of subject areas that complement and extend USGS and other government science assets.

2009 and 2010 also saw the hiring of key headquarters/NCCWSC staff, moving from a skeleton crew of detailees to a small core of permanent staff.

**2011 — Implementation and Planning.** With the initial suite of CSCs “on the ground,” efforts turned to development of the core institutional elements needed to make these centers successful. NCCWSC and CSC development focused on several key elements:

- *Strong linkages to partners, especially LCCs.* Each CSC has a formal advisory committee, with representation from their region’s Landscape Conservation Cooperatives, other management entities, and other government science providers in the region. Stakeholder Advisory Committees (SACs) provide broad input on a strategic level and on the specific annual work plans of the CSC. This formal mechanism is being augmented by strong informal links between the CSC staff and partners. Stakeholder Advisory Committees have been established in all regions (see box for representative membership). In most cases, the SAC will be chaired by the relevant USGS Regional Director.

- *Transparent science planning – both strategic and tactical.* CSCs have or will develop, on a roughly five-year basis, a regional science plan that is intended to identify the key scientific questions arising from the challenges faced by natural and cultural resource managers in the region. This plan will necessarily be broader than the agenda for NCCWSC funds<sup>9</sup>, facilitating a broad regional dialogue about priorities and how to efficiently meet these science needs, leveraging CSC funds and scientists with those of other agencies/science providers. Tiering from this strategic view of the management-driven science needs, each CSC will develop an annual project plan,

**Membership on the Stakeholder Advisory Committee for the Southwest Climate Science Center**

USGS Pacific Southwest Area (chair)  
FWS - Pacific Southwest Region  
FWS - Southwest Region  
BOR Lower Colorado Regional Office  
BIA Pacific Regional Office  
NPS - Pacific West Region  
BLM California State Office  
USFS - Pacific Southwest Region  
USFS - Research Pacific Southwest Research Station  
USFS - Research; Rocky Mountain Research Station  
NOAA - Southwest Fisheries Science Center  
DOD - Navy Region Southwest  
California - Natural Resources Agency  
California - Department of Water  
California - Department of Fish and Game Climate Science and Renewable Energy Branch  
Nevada - Department of Conservation and Natural Resources; Natural Heritage Program  
Nevada - Department of Wildlife; Wildlife Diversity Division  
Utah (currently vacant)  
Arizona - Game and Fish Department  
Habitat Management of Upper Lake  
Hopi Tribe  
California LCC Steering Committee Chair (USFS)  
Desert LCC Steering Committee Chair (AZ Game and Fish)  
Southern Rockies LCC Steering Committee Chair (USFWS)  
Great Basin LCC Steering Committee Chair (USFWS)

<sup>9</sup> As noted, NCCWSC funding is intended by Congress to be applied to fish, wildlife and ecosystems.

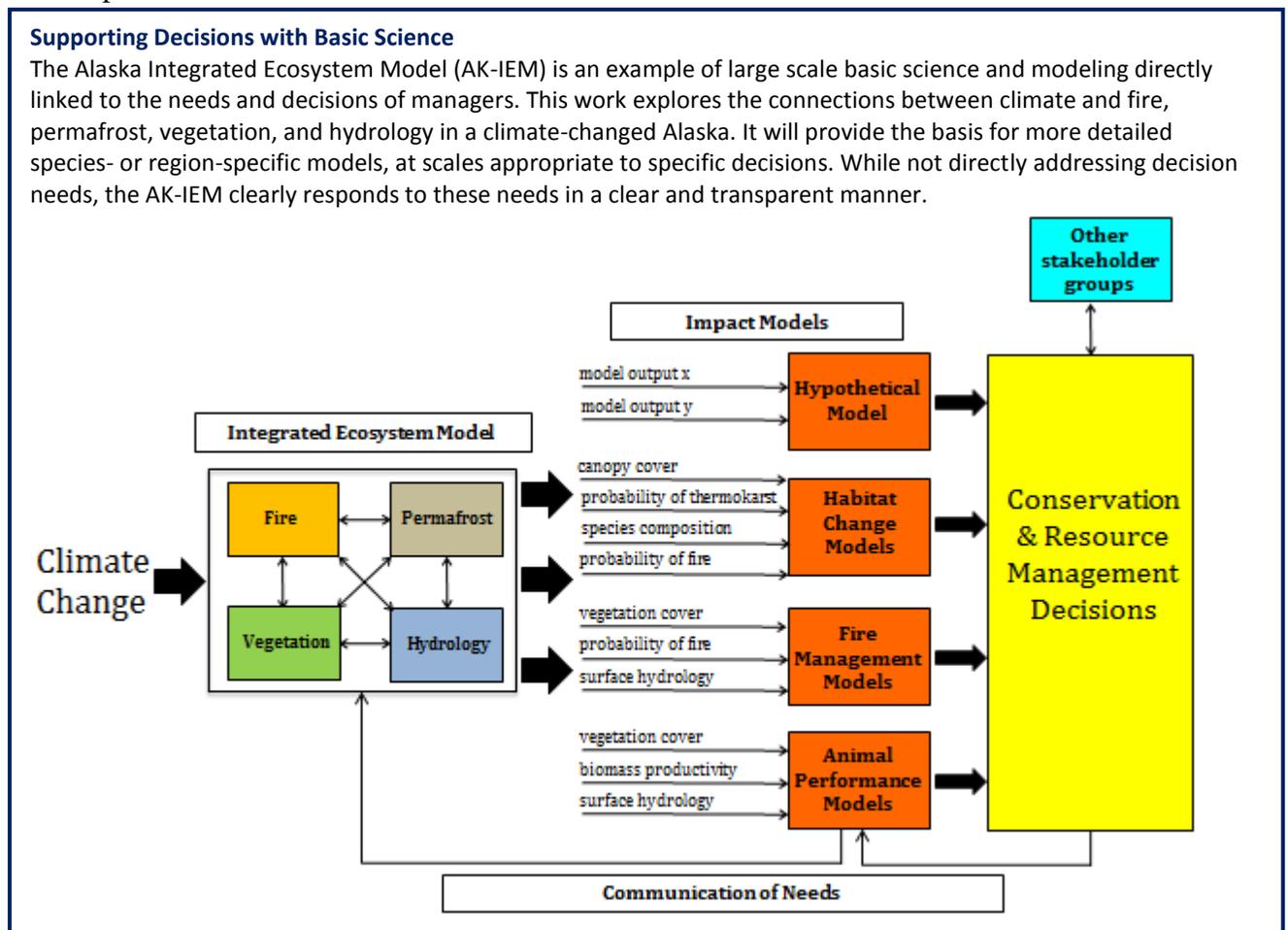
identifying its funding targets as part of the larger regional dialogue.

In addition, by the end of 2011, USGS had hired permanent directors for the five established CSCs. NCCWSC (“headquarters”) is at near-final configuration, with four senior staff, two post-doctoral researchers, and administrative support.

Finally, as the new CSCs are gaining their footholds, the initial, nation-wide FY2009 research funding projects are nearing completion. In FY12 and beyond, these funds have largely been allocated to CSCs to be directed to regionally-identified high priority topics, rather than being directed through national funding opportunities.

**2012 and Beyond – Strategic Integration.** The basic infrastructure for CSCs is in place – partners, initial plans, staff, science directions, and community visibility. NCCWSC and the CSCs are now moving to a more strategic and integrated strategy, with the following key elements:

- *CSC science directions: fewer, more high impact activities:* CSCs will increasingly establish priorities with their partners to enable work to focus on a smaller number of higher priority, longer term science focal areas, with correspondingly higher impact products.

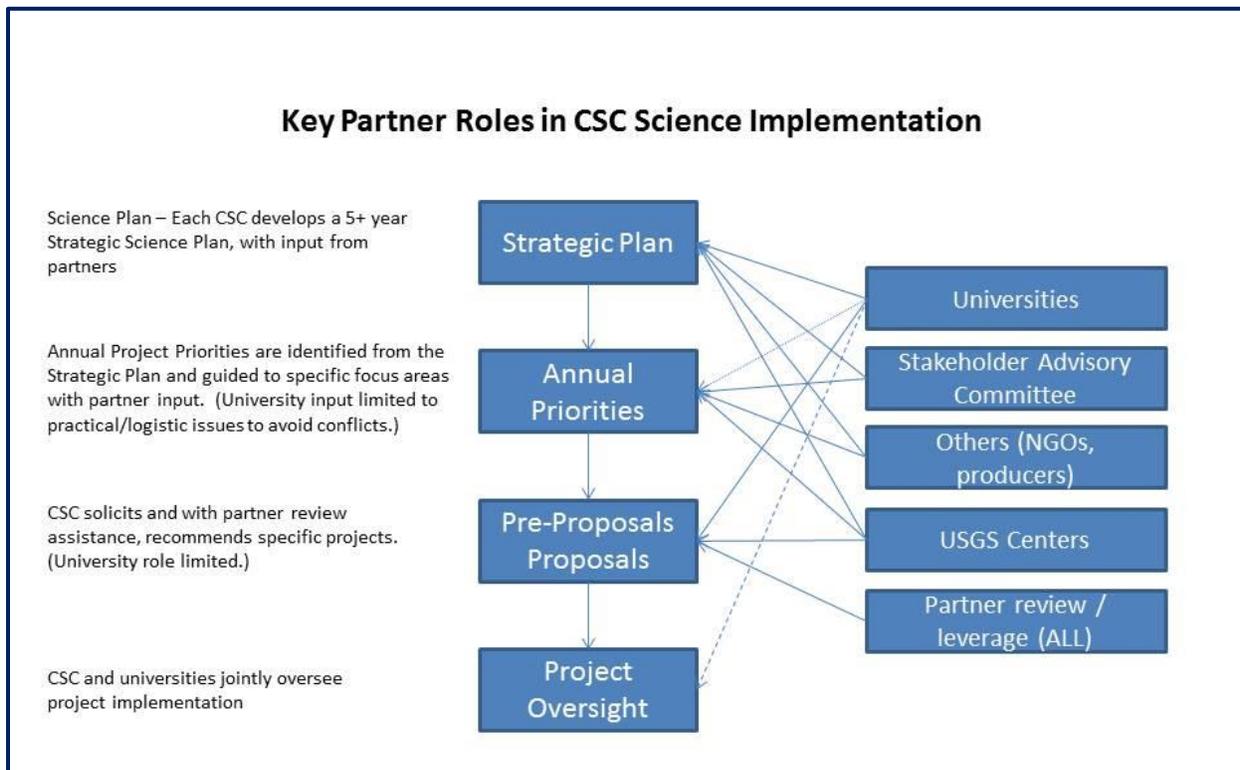


- *Focus on decisions:* CSCs will increasingly expect researchers to engage directly with the management partners they expect to serve, and to ensure that their results are in fact not simply *relevant* to these needs, but *used* by these partners. Where scientific activities do not result in directly applicable tools or knowledge, but rather provide a basis for future science that *is* applicable, those future applications should be explicit and designed in collaboration with management partners.
- *Focus on impacts:* Projections of changes in climate are a crucial base for the work of NCCWSC and the CSCs. However, the primary emphasis for research is upon the *impacts to natural and cultural resources*. Increasingly, CSCs will focus on communicating the needs of those studying these impacts to those providing physics-based climatic and hydrologic models and projections, rather than directly conducting the modeling and physics-based work.
- *Multi-region and national integration:* CSCs were designed to address large scale climate phenomena, and as such must work effectively across large areas. CSCs will increasingly work together on issues that span geography, such as sea level rise, extended drought, and issues such as island weather and climate (Pacific, Caribbean). NCCWSC will complement multi-region work with national-level synthesis and assessment activities. For example, NCCWSC scientists just completed a major national assessment of the effects of climate change on biodiversity, ecosystems, and ecosystem services, as part of the U.S. National Climate Assessment (<http://www.globalchange.gov/what-we-do/assessment>); an upcoming issue of the journal, *Frontiers in Ecology and Environment* will also highlight the key findings from this effort.

## Climate Science Centers – Basic Structure and Operations

- *Federal-university joint enterprise.* A CSC is comprised of a small Federal staff, aligned with key principal investigators from the host university/consortium. Administrative arrangements enable funding to flow to scientists in any part of the university/consortium and their external partners.
- *Stakeholder Advisory Committee (SAC).* As described above, stakeholders from both management and science perspectives are engaged in setting priorities and identifying efficient ways to meet identified needs. Legal constraints preclude formal membership by nongovernmental parties on this committee, but each CSC will solicit input from nongovernmental organizations, landowner groups, etc.
- *Strategic science agenda and annual science plan.* As noted above, each CSC (except Pacific Islands) has developed a long range (5-10 year) strategic agenda. All CSCs will periodically refine these long range agendas, and will develop annual plans based on this larger perspective.
- *Commitment to co-development.* The framing of science questions and the conduct of the research itself is not viewed by CSCs as “their” job – rather it is a joint enterprise with the management entities that requested the information and will use it in their work. CSCs are committed to ensuring that this vital translation and assistance approach is a part of every project.

## How NCCWSC and CSCs Relate to Other Programs and Partners



The following short notes illustrate the breadth and nature of the interactions between CSCs, the National Climate Change and Wildlife Science Center and many other federal, state, and other partners. This is not, and cannot be a complete list – new linkages are forged daily and weekly.

- *Native American/Indian Tribes:* Several CSCs have initiated activities with or to benefit tribes, including strategic priority setting, as well as scientific activities related to tribal resources of concern. NCCWSC seeks to expand this base of interactions, and has offered both formal consultation as well as direct ongoing interactions to ensure that tribal management needs are addressed. Two tribes/nations and one tribal college are formal partners in CSC consortia. Each CSC Stakeholder Advisory Committee will include tribal representatives<sup>10</sup>.
- *National Climate Assessment (NCA):* USGS and NCCWSC are strongly supportive of the NCA. NCCWSC is leading the biodiversity and ecosystem services component, and several CSCs have initiated activities in support of the NCA. However, the majority of funds from both NCCWSC and CSCs will be directed to activities identified by LCCs and other management partners. A longer term role for CSCs in the NCA requires additional discussion.

<sup>10</sup> In Hawaii, where natives do not have tribal status, the (state) Office of Hawaiian Affairs provides a link to native concerns.

- *U.S. Forest Service (FS)*: The FS is a major land management partner of DOI, and shares many landscapes and issues. Forest Service representatives will be on regional CSC stakeholder bodies, helping to set priorities and to identify common research activities, and on the federal advisory committee for NCCWSC and the CSCs. Forest Service researchers are partners on projects led by both USGS and CSC-university Principal Investigators, and the Forest Service devoted a full time staff member to ensure smooth initial integration of CSCs and FS activities.

### **Advisory Mechanisms for CSCs and NCCWSC**

As part of its commitment to partnership-driven science, DOI and USGS are establishing a number of advisory mechanisms to ensure that partners have the formal access necessary to communicate management-related science needs.

*CSC Stakeholder Advisory Committee* – established at each CSC, with representation from both regional management entities and science providers. Function is to both reach agreement on regional science priorities and to leverage the assets of regional science providers to effectively provide the needed knowledge. At present, these committees may include only federal, state, tribal and other governmental representatives, to comply with the Federal Advisory Committee Act.

*Advisory Committee on Climate Change and Natural Resource Science* – DOI has established a formal federal advisory committee to provide guidance and input to the overall NCCWSC-CSC enterprise. Federal, state, tribal, nongovernmental and other partners will be included. The first meeting will be held in September 2013.

*Informal and ad hoc Mechanisms*—CSC Directors and staff interact regularly with their peers and partners in both management and science agencies. Groups are convened to address specific science topics, to participate in review of proposals, and the like.

- *National Oceanic and Atmospheric Administration (NOAA)*: NOAA is a major science and management partner of DOI, and shares many issues and concerns. DOI and the Department of Commerce have entered into a Memorandum of Understanding (MOU) pledging collaboration on climate science and services. Several CSCs were (intentionally) co-located with or have common Principal Investigators with NOAA Regional Integrated Science and Assessment (RISA) programs, to leverage common interests and minimize duplication.
- *Landscape Conservation Cooperatives (LCCs)*: LCCs are primary partners of CSCs and the NCCWSC. Their identification of conservation priorities and resulting science needs will form the core of the science agenda for each CSC. CSCs have made a strong commitment to working closely with LCCs and management entities on the framing of research plans, conduct of the work, and delivery of the result (and ensuring our university partners do as well). Both groups will invite the other's participation on relevant stakeholder and priority-setting bodies.
- *State governments*: States are primary natural resource management partners with DOI. CSCs will invite state participation on their stakeholder committees, in addition to states' engagement with LCCs. CSCs are also frequently associated with Cooperative Fish and Wildlife Research Units, and there are already multiple examples of joint activities.
- *National Fish, Wildlife and Plants Climate Adaptation Strategy (NFWPCAS)*: Staff from USGS (although not CSCs) are contributing significantly to the NFWPCAS, and

NCCWSC has been involved at the Steering Committee level. This strategy should serve as a common reference for federal, state, and other partners concerned with adaptation.

- *Nongovernmental organizations, including conservation advocates, science/professional societies, and producer/landowner advocates:* Nongovernmental organizations and private sector (business, landowners) are also key partners. Such entities can be members of the Advisory Committee on Climate Change and Natural Resource Science, but may not be formal members of CSC Stakeholder Advisory Committees. However, each CSC will develop outreach mechanisms to ensure adequate opportunity for these stakeholders to provide input.
- *The Advisory Committee on Climate Change and Natural Resource Science (ACCCNRS),* chartered under the Federal Advisory Committee Act: A Federal Advisory Committee (FAC) was recently established to provide guidance and input to the NCCWSC-CSC enterprise. The ACCCNRS has 25 members from federal, state, tribal, nongovernmental and private sectors and academia. The duties of the Committee include:
  - Advising on the contents of a national strategy to advance the management of natural resources in the face of climate change.
  - Advising on the nature, extent, and quality of relations with and engagement of key partners at the regional/CSC level.
  - Advising on the nature and effectiveness of mechanisms to ensure the identification of key priorities from management partners and to effectively deliver scientific results in useful forms.
  - Advising on mechanisms that may be employed by the NCCWSC to ensure high standards of scientific quality and integrity in its products, and to review and evaluate the performance of individual CSCs, in advance of opportunities to re-establish expiring agreements.
  - Coordinating as appropriate with any federal advisory committee established for the DOI Landscape Conservation Cooperatives.

The ACCCNRS charter and related information may be found at:

<https://nccwsc.usgs.gov/content/advisory-committee-climate-change-and-natural-resource-science-accnrs>

Again, this list is illustrative. NCCWSC and CSCs are moving forward to build collaborative relationships to ensure the right science gets done efficiently and effectively, and the right people get and are able to use the results.

## A Partnership Driven Enterprise

The enterprise consisting of the National Climate Change and Wildlife Science Center and Climate Science Centers, working closely with the Landscape Conservation Cooperatives and other natural and cultural resource managers, is committed, in its structure and operations, to a partnership-driven model.

LCCs at a “landscape” scale, CSCs at the regional level, and NCCWSC at the national scale – will be guided by interlocking stakeholder entities. LCCs have Steering Committees with broad membership, which will include representation from the relevant CSC. Each CSC has a stakeholder body, which although limited in formal membership, will solicit input from a wide range of partners, and will include formal membership from LCCs and other managers. USGS and DOI have established a federal advisory committee for the NCCWSC and CSCs, which will include federal, state, tribal, NGO, academic, and private interests.

This structure is intended to ensure that the NCCWSC-CSC enterprise focuses on the right scientific questions in the right places, and delivers the answers in an effective and efficient manner.

## Climate Science Center Locations, Partners, and Leadership

|  |  |  |   |
|--|--|--|---|
| <p><b>Alaska Climate Science Center</b></p> <p><u>USGS Director:</u><br/>Dr. Stephen Gray<br/>907-786-6780<br/><a href="mailto:sgray@usgs.gov">sgray@usgs.gov</a></p> <p><u>University Director:</u><br/>Dr. T. Scott Rupp<br/>907-474-7535<br/><a href="mailto:tsrupp@alaska.edu">tsrupp@alaska.edu</a></p> <p><u>Host:</u> University of Alaska Fairbanks (in Anchorage)</p> <p><u>Mailing Address:</u><br/>4210 University Drive<br/>Anchorage, AK 99508<br/><br/><a href="http://www.doi.gov/csc/alaska">www.doi.gov/csc/alaska</a></p>  | <p><b>North Central Climate Science Center</b></p> <p><u>USGS Director:</u><br/>Dr. Jeffrey Morissette<br/>303-968-8986<br/><a href="mailto:morissettej@usgs.gov">morissettej@usgs.gov</a></p> <p><u>University Director:</u><br/>Dr. Dennis Ojima<br/>970-491-1976<br/><a href="mailto:dennis.ojima@colostate.edu">dennis.ojima@colostate.edu</a></p> <p><u>Host:</u> Colorado State University - Fort Collins <i>with</i> Colorado School of Mines, Iowa State University, Kansas State University, Montana State University, University of Colorado, University of Montana, University of Nebraska - Lincoln, and University of Wyoming</p> <p><u>Mailing Address:</u><br/>NC CSC c/o Natural Resource Ecology Lab<br/>Dept. 1499<br/>Colorado State University<br/>Fort Collins, CO 80523-1499<br/><br/><a href="http://www.doi.gov/csc/northcentral">www.doi.gov/csc/northcentral</a></p> | <p><b>Northeast Climate Science Center</b></p> <p><u>USGS Director:</u><br/>Dr. Mary Ratnaswamy<br/>413-545-3424<br/><a href="mailto:mratnaswamy@usgs.gov">mratnaswamy@usgs.gov</a></p> <p><u>University Director:</u><br/>Dr. Richard Palmer<br/>413-545-2508<br/><a href="mailto:palmer@ecs.umass.edu">palmer@ecs.umass.edu</a></p> <p><u>Host:</u> University of Massachusetts - Amherst <i>with</i> College of Menominee Nation, Columbia University, Marine Biological Laboratory, University of Minnesota, University of Missouri - Columbia, and University of Wisconsin - Madison</p> <p><u>Mailing Address:</u><br/>233 Morrill Science Center<br/>611 North Pleasant Street<br/>University of Massachusetts<br/>Amherst, MA 01003-9297<br/><br/><a href="http://www.doi.gov/csc/northeast">www.doi.gov/csc/northeast</a></p> | <p><b>Northwest Climate Science Center</b></p> <p><u>USGS Director:</u><br/>Dr. Gustavo Bisbal<br/>541-737-2525<br/><a href="mailto:gbisbal@usgs.gov">gbisbal@usgs.gov</a></p> <p><u>University Director:</u><br/>Dr. Phil Mote<br/>541-737-5694<br/><a href="mailto:pmote@coas.oregonstate.edu">pmote@coas.oregonstate.edu</a></p> <p><u>Host:</u> Oregon State University <i>with</i> University of Washington and University of Idaho</p> <p><u>Mailing Address:</u><br/>326 Strand Hall – Oregon State University<br/>Corvallis, OR 97331<br/><br/><a href="http://www.doi.gov/csc/northwest">www.doi.gov/csc/northwest</a></p>   |
| <p><b>Pacific Islands Climate Science Center</b></p> <p><u>USGS Interim Director:</u><br/>Dr. David Helweg<br/>808-985-6409<br/><a href="mailto:dhelweg@usgs.gov">dhelweg@usgs.gov</a></p> <p>Dr. Gustavo Bisbal (for FY13 science funding/proposal process)<br/>541-737-2525<br/><a href="mailto:gbisbal@usgs.gov">gbisbal@usgs.gov</a></p> <p><u>University Director:</u><br/>Dr. Kevin Hamilton<br/>808-956-8327<br/><a href="mailto:kph@hawaii.edu">kph@hawaii.edu</a></p> <p><u>Host:</u> University of Hawai'i - Manoa <i>with</i> University of Hawai'i - Hilo and University of Guam<br/><br/><a href="http://www.doi.gov/csc/pacific">www.doi.gov/csc/pacific</a></p> | <p><b>South Central Climate Science Center</b></p> <p><u>USGS Director:</u><br/>Dr. Kim Winton<br/>405-325-1272<br/><a href="mailto:kwinton@usgs.gov">kwinton@usgs.gov</a></p> <p><u>University Director:</u><br/>Dr. Berrien Moore III<br/>405-325-3095<br/><a href="mailto:berrien@ou.edu">berrien@ou.edu</a></p> <p><u>Host:</u> University of Oklahoma <i>with</i> Louisiana State University, The Chickasaw Nation, The Choctaw Nation of Oklahoma, Oklahoma State University, NOAA's Geophysical Fluid Dynamics Laboratory, and Texas Tech University</p> <p><u>Mailing Address:</u><br/>301 David L. Boren Blvd, Suite 3030<br/>Norman, OK 73019<br/><br/><a href="http://www.doi.gov/csc/southcentral">www.doi.gov/csc/southcentral</a></p>  | <p><b>Southeast Climate Science Center</b></p> <p><u>USGS Director:</u><br/>Dr. Gerard McMahan<br/>919-515-2229<br/><a href="mailto:gcmcmahan@usgs.gov">gcmcmahan@usgs.gov</a></p> <p><u>University Director:</u><br/>Dr. Damian Shea<br/>919-515-4663<br/><a href="mailto:d_shea@ncsu.edu">d_shea@ncsu.edu</a></p> <p><u>Host:</u> North Carolina State University</p> <p><u>Mailing Address:</u><br/>Department of Biology<br/>127 David Clark Labs<br/>North Carolina State University<br/>Raleigh, NC 27695-7617<br/><br/><a href="http://www.doi.gov/csc/southeast">www.doi.gov/csc/southeast</a></p>   | <p><b>Southwest Climate Science Center</b></p> <p><u>USGS Director:</u><br/>Dr. Stephen Jackson<br/>307-760-0750<br/><a href="mailto:stjackson@usgs.gov">stjackson@usgs.gov</a></p> <p><u>University Director:</u><br/>Dr. Jonathan Overpeck<br/>520-626-4364<br/><a href="mailto:ito@u.arizona.edu">ito@u.arizona.edu</a></p> <p><u>Host:</u> University of Arizona - Tucson <i>with</i> University of California - Davis, University of California - Los Angeles, Desert Research Institute, Scripps Institution of Oceanography, and University of Colorado – Boulder</p> <p><u>Mailing Address:</u><br/>1955 E. 6<sup>th</sup> St.<br/>Tucson, AZ 85719<br/><br/><a href="http://www.doi.gov/csc/southwest">www.doi.gov/csc/southwest</a></p> |
| <p style="text-align: center;"><b>National Climate Change and Wildlife Science Center</b></p> <p><u>Director:</u><br/>Dr. Douglas Beard, Jr.<br/>703-648-4215<br/><a href="mailto:dbeard@usgs.gov">dbeard@usgs.gov</a></p> <p><u>Mailing Address:</u><br/>USGS Headquarters<br/>12201 Sunrise Valley Drive, MS 400<br/>Reston, VA 20192<br/><a href="http://nccwsc.usgs.gov">http://nccwsc.usgs.gov</a></p>  |  |  |   |