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Foundational Materials

**Department of the Interior
U.S. Geological Survey**

**Advisory Committee on Climate Change and Natural Resource Science
Charter**

1. **Committee's Official Designation.** Advisory Committee on Climate Change and Natural Resource Science (Committee).
2. **Authority.** The Committee is in the public interest in connection with the responsibilities of the Department of the Interior (DOI) under Section 2 of the Reorganization Plan No. 3 of 1950 (64 Stat. 1262), as amended, and the Consolidated Appropriations Act of 2008, P.L. 110-161, Division F, Title I. The Committee is established in accordance with the provisions of the Federal Advisory Committee Act (FACA), as amended, 5 U.S.C. Appendix 2.
3. **Objectives and Scope of Activities.** The Committee advises the Secretary of the Interior on the establishment and operations of the U.S. Geological Survey (USGS) National Climate Change and Wildlife Science Center (NCCWSC) and the DOI Climate Science Centers (CSCs).
4. **Description of Duties.** The duties of the Committee shall include:
 - A. Advising on the contents of a national strategy identifying key science priorities to advance the management of natural resources in the face of climate change.
 - B. Advising on the nature, extent, and quality of relations with and engagement of key partners at the regional/CSC level.
 - C. 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.
 - D. 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.
 - E. Coordinating as appropriate with any Federal Advisory Committee established for the DOI Landscape Conservation Cooperatives.
5. **Official to Whom the Committee Reports.** The Committee reports to the Secretary through the Director, USGS, or the Designated Federal Officer (DFO).
6. **Support.** The USGS will provide administrative and logistical support to the Committee.
7. **Estimated Annual Operating Costs and Staff Years.** The annual operating costs associated with supporting the Committee's functions are estimated to be approximately \$500,000, including all direct and indirect expenses and .50 FTE staff year.

8. **Designated Federal Officer.** The DFO is a full-time Federal employee appointed in accordance with Agency procedures. The DFO will approve or call all Committee and subcommittee meetings, prepare and approve all meeting agendas, attend all Committee and subcommittee meetings, adjourn any meeting when the DFO determines adjournment to be in the public interest, and chair meetings when directed to do so by the Secretary.
9. **Estimated Number and Frequency of Meetings.** The Committee will meet approximately 2-4 times annually, and at such other times as designated by the DFO.
10. **Duration.** Continuing.
11. **Termination.** The Committee will terminate 2 years from the date the Charter is filed, unless, prior to that date it is renewed in accordance with the provisions of Section 14 of the FACA. The Committee will not meet or take any action without a valid current Charter.
12. **Membership and Designation.** The members of the Committee shall be composed of approximately 25 members from both the Federal Government, and the following interests:
 - State and local governments, including state membership entities
 - Non-governmental organizations, including those whose primary mission is professional/scientific and those whose primary mission is conservation and related scientific and advocacy activities
 - American Indian tribes and other Native American entities
 - Academia
 - Individual landowners
 - Business interests

Within these categories, it is expected that one or more individuals will be directly associated with Landscape Conservation Cooperatives (LCC), as Coordinator, Science Coordinator, or Steering Committee member. In addition, the Committee may include scientific experts, and will include rotating representation from one or more of the institutions that host the DOI Climate Science Centers.

Alternate members may be appointed to the Committee. Alternate members must be approved and appointed by the Secretary before attending meetings as representatives. Alternate members shall have experience and/or expertise similar to that of the primary member.

Members of the Committee will serve without compensation. However, while away from their homes or regular places of business, non-Federal members, including alternate members, engaged in Committee, or subcommittee business, approved by the DFO, may be allowed travel expenses, including per diem in lieu of subsistence, in the same manner as persons employed intermittently in Government service under Section 5703 of Title 5 of the United States Code.

Members may be appointed as regular Government employees, special Government employees, or representative members. Members appointed as special Government employees are required to file on an annual basis a confidential financial disclosure report.

Members will be appointed for 2 or 3 year terms. A vacancy on the Committee will be filled in the same manner in which the original appointment was made. Members serve at the discretion of the Secretary.

The Secretary will appoint the Committee Chair.

13. **Ethics Responsibilities of Members.** No Committee or subcommittee member will participate in any specific party matter including a lease, license, permit, contract, claim, agreement, or related litigation with the Department of the Interior in which the member has a direct financial interest. In addition, the Department will provide materials to those members serving as special Government employees, explaining their ethical obligations with which members should be familiar. Consistent with the ethics requirements, members will endeavor to avoid any actions that would cause the public to question the integrity of the Committee's operations, activities, or advice. The provisions of this paragraph do not affect any other statutory or regulatory ethical obligations to which a member may be subject.
14. **Subcommittees.** Subject to the DFO's approval, subcommittees may be formed for the purposes of compiling information or conducting research. However, such subcommittees must act only under the direction of the DFO and must report their recommendations to the full Committee for consideration. Subcommittees must not provide advice or work products directly to the Agency. The Committee Chair, with the approval of the DFO, will appoint subcommittee members. Subcommittees will meet as necessary to accomplish their assignments, subject to the approval of the DFO and the availability of resources. At least one subcommittee, to provide expert scientific advice to the Committee, will be established.
15. **Recordkeeping.** The records of the Committee, and formally or informally established subcommittees of the Committee, shall be handled in accordance with General Records Schedule 26, Item 2 or other approved Agency records disposition schedule. These records shall be available for public inspection and copying, subject to the Freedom of Information Act, 5 U.S.C. 552.



Secretary of the Interior

SEP 25 2012

Date

Date Filed

Federal Advisory Committee (FAC) Membership Balance Plan

Please read the [Federal Advisory Committee Membership Balance Plan Guidance](#) prior to completing this form

U.S. DEPARTMENT OF THE INTERIOR
(1) FEDERAL ADVISORY COMMITTEE NAME <i>State the legal name of the FAC</i>
Climate Change and Natural Resource Science Advisory Committee
(2) AUTHORITY <i>Identify the authority for establishing the FAC</i>
The Committee is in the public interest in connection with the responsibilities of the Department of the Interior (DOI) under Section 2 of the Reorganization Plan No. 3 of 1950 (64 Stat. 1262), as amended, and the Consolidated Appropriations Act of 2008, P.L. 110-161. The Committee is established in accordance with the provisions of the Federal Advisory Committee Act (FACA), as amended, 5 U.S.C. Appendix 2.
(3) MISSION/FUNCTION <i>Describe the mission/function of the FAC</i>
The Committee advises the Secretary of the Interior on the establishment and operations of the U.S. Geological Survey National Climate Change and Wildlife Science Center and the DOI Climate Science Centers.
(4) POINTS OF VIEW <i>Based on understanding the purpose of the FAC,</i> <i>(a) describe the process that will be used to ensure the committee is balanced, and identify the categories (e.g. individual expertise or represented interests) from which candidates will be considered;</i> <i>(b) consider identifying an anticipated relative distribution of candidates across the categories; and</i> <i>(c) explain how a determination was made to appoint any individuals as Special Government Employees or Representative members</i>
The members of the Committee shall be composed of approximately 25 members from both the Federal Government, and the following interests: • State and local governments, including state membership entities such as the Western Governors Association or Association of Fish and Wildlife Agencies. • Non-governmental organizations, including those whose primary mission is professional/scientific; those whose primary mission is conservation and related scientific and advocacy activities, and those whose primary mission is advancing the interests of landowners and other business interests. • American Indian tribes and tribal organizations (e.g. Northwest Indian Fisheries Commission) as well as representatives of Alaska Natives and Hawaiian natives. • Academia • Individual landowners • Business interests In addition, the Committee may include scientific experts, and will include rotating representation from one or more of the institutions that host DOI Climate Science Centers.

(5) OTHER BALANCE FACTORS

List any other factors your agency identifies as important in achieving a balanced FAC

Additional considerations will be given in selection of members to ensure geographic diversity.

(6) CANDIDATE IDENTIFICATION PROCESS

Summarize the process intended to be used to identify candidates for the FAC, key resources expected to be tapped to identify candidates and the key persons (by position, not name) who will evaluate FAC balance. The summary should:

- (a) describe the process*
- (b) identify the agency key staff involved (by position, not name)*
- (c) briefly describe how FAC vacancies, if any, will be handled by the agency; and*
- (d) state the membership term limit of FAC members, if applicable*

In order to obtain members, the DOI announces a 30-day open call for nominations period in the Federal Register and the DFO will solicit candidate names from the Federal agencies.

The DFO will develop a candidate list that will be evaluated by the Associate Director for Climate and Land Use Change (for relevant experience/expertise). A short list of the best qualified candidates will be developed and discussed with the Director, U.S. Geological Survey and the Assistant Secretary for Water and Science.

The resulting top candidates will be vetted by the White House Liaison and approved for appointment. Formal letters of invitation to serve on the Committee will be extended by the Secretary.

A vacancy on the Committee will be filled in the same manner in which the original appointment was made.

Members serve for 2 or 3-year terms.

(7) SUBCOMMITTEE BALANCE

Subcommittees subject to FACA should either state that the process for determining FAC member balance on subcommittees is the same as the process for the parent FAC, or describe how it is different*

**This is relevant to those agencies that require their subcommittees to follow all FACA requirements.*

Subcommittees are not subject to FACA because they are not providing advice directly to a Federal Officer of the Department of the Interior. All advice or work products go directly to the parent Committee for review, consideration and deliberation at a FAC meeting before being submitted to the Department of the Interior through the DFO.

(8) OTHER

Provide any additional information that supports the balance of the FAC

Additional considerations will be given in selection of members to ensure geographic diversity.

(9) DATE PREPARED/UPDATED

Insert the actual date the Membership Balance Plan was initially prepared, along with the date(s) the Plan is updated

06/02/2011; revised by ROMalley, USGS 8/1/11

THE SECRETARY OF THE INTERIOR

Washington

ORDER NO. 3289, Amendment No. 1 (*Amended material italicized*)

SIGNATURE DATE: February 22, 2010

Subject: Addressing the Impacts of Climate Change on America's Water, Land, and Other Natural and Cultural Resources

Sec. 1 Purpose and Background. Secretarial Order No. 3285, issued on March 11, 2009, made production and transmission of renewable energy on public lands a priority for the Department. This Order establishes a Department-wide approach for applying scientific tools to increase understanding of climate change and to coordinate an effective response to its impacts on tribes and on the land, water, ocean, fish and wildlife, and cultural heritage resources that the Department manages. This Order replaces Secretarial Order No. 3226, Amendment No. 1, issued on January 16, 2009, and reinstates the provisions of Secretarial Order No. 3226, issued on January 19, 2001.

To fulfill our nation's vision for a clean energy economy, Interior is now managing America's public lands and oceans not just for balanced oil, natural gas, and coal development, but also – for the first time ever – to promote environmentally responsible renewable energy development. Sun, wind, biomass, and geothermal energy from our public and tribal lands is creating new jobs and will power millions of American homes and electric vehicles.

The Department is also taking the lead in protecting our country's water, land, fish and wildlife, and cultural heritage and tribal lands and resources from the dramatic effects of climate change that are already occurring – from the Arctic to the Everglades. The realities of climate change require us to change how we manage the land, water, fish and wildlife, and cultural heritage and tribal lands and resources we oversee. For example:

- New water management imperatives associated with climate change may require restoration of natural systems and construction of new infrastructure to reduce new flood risks or to capture early run-off.
- Strategies to address sea level rise may require acquisition of upland habitat and creation of wetlands and other natural filters and barriers to protect against sea level rise and storm surges. It may be necessary to relocate certain iconic and culturally historic structures.
- Shifting wildlife and habitat populations may require investments in new wildlife corridors.
- New invasions of exotic species and new wildland fire threats due to longer fire seasons and more severe droughts will require innovation and more effective ways of managing the Department's resources.

The Department of the Interior, with its 67,000 employees and scientific and resource management expertise, is responsible for helping protect the nation from the impacts of climate change. In particular the Department must:

- Adapt its water management strategies to address the possibility of shrinking water supplies and more frequent and extended droughts to continue to supply drinking water to more than 31 million people and irrigation water to 140,000 farmers.
- Wisely manage millions of acres of parks, refuges and other public lands, and prudently exercise its shared responsibility for managing the 1.7 billion acres of the U.S. outer continental shelf.
- Conserve and manage fish and wildlife resources, including over 800 native migratory bird species and nearly 2,000 federally listed threatened and endangered species.
- Protect cultural and archaeological resources and iconic structures that may be affected by climate change.
- Address the impacts of climate change on American Indians and Alaska Natives, for whom the Department holds trust responsibilities on behalf of the Federal government.
- Continue to provide state-of-the art science to better understand the impacts of climate change and to develop science-based adaptive management strategies for natural and cultural resource managers.
- Continue its work to quantify the amount of carbon stored in our forests, wetlands, and grasslands, identifying areas where carbon dioxide can be safely stored underground, and ways to reduce the Department's carbon footprint.

Sec. 2 **Authority.** This Order is issued under the authority of Section 2 of Reorganization Plan No. 3 of 1950 (64 Stat. 1262), as amended.

Sec. 3 **Coordinating the Department's Response to Climate Change Impacts on Our Resources.** *The Climate Change Response Council within the Office of the Secretary is renamed the Energy and Climate Change Council (Council).* The Council will execute a coordinated Department-wide strategy to address **renewable energy efforts and** to increase scientific understanding of and development of effective adaptive management tools **to address** the impacts of climate change on our natural and cultural resources. The **Energy and Climate Change Council** will be composed of the Secretary (Chair), Deputy Secretary (Vice-Chair), Counselor to the Secretary (Vice-Chair), Assistant Secretaries, Bureau Directors and the Solicitor. The Council will help coordinate activities within and among the Department's agencies and bureaus to develop and implement an integrated strategy for responding to **renewable energy efforts and** climate change impacts involving the resources managed by the Department. The Department's **Energy and Climate Change Council** will also coordinate its **energy and** climate change activities with all relevant Federal Departments and agencies including, but not limited to, the Council on Environmental Quality, the Office of Energy and Climate Change, the Office of Science and Technology Policy, the National Science and Technology Council, the Department of Agriculture, the Department of Commerce, the Department of Defense, and the Environmental Protection Agency.

The **Energy and Climate Change Council** will implement Department-specific **energy activities as described in Secretarial Order # 3285 (Amendment No. 1), and implement** climate change activities through the following mechanisms:

a. Climate Change Planning Requirements. Each bureau and office of the Department must consider and analyze potential climate change impacts when undertaking long-range planning exercises, setting priorities for scientific research and investigations, developing multi-year management plans, and making major decisions regarding potential use of resources under the Department's purview. These requirements were set forth in Secretary's Orders No. 3226 and 3285, and remain in effect. The organizational changes made by this Order will enable the bureaus and agencies to fulfill these planning requirements.

b. DOI Climate Science Centers. Management decisions made in response to climate change impacts must be informed by science and require that scientists work in tandem with those managers who are confronting climate change impacts and evaluating options to respond to such impacts. Pursuant to P.L. 110-161, the United States Geological Survey (USGS) has been developing regional science centers to provide climate change impact data and analysis geared to the needs of fish and wildlife managers as they develop adaptation strategies in response to climate change. These centers are currently known as "regional hubs" of the National Climate Change and Wildlife Science Center, and are being developed in close collaboration with Interior agencies and other federal, state, university, and non-governmental partners.

The Energy and Climate Change Council will work with USGS and other Department bureaus to rename these regional science centers as ***DOI Climate Science Centers (Centers)*** and broaden their mandate to encompass other climate-change-related impacts on Departmental resources. These eight Centers will synthesize and integrate climate change impact data and develop tools that the Department's managers and partners can use when managing the Department's land, water, fish and wildlife, and cultural heritage resources.

c. Landscape Conservation Cooperatives. Given the broad impacts of climate change, management responses to such impacts must be coordinated on a landscape-level basis. For example, wildlife migration and related needs for new wildlife corridors, the spread of invasive species and wildfire risks, typically will extend beyond the borders of National Wildlife Refuges, BLM lands, or National Parks. Additionally, some bureau responsibilities (e.g., Fish and Wildlife Service migratory bird and threatened and endangered species responsibilities) extend nationally and globally. Because of the unprecedented scope of affected landscapes, Interior bureaus and agencies must work together, and with other federal, state, tribal and local governments, and private landowner partners, to develop landscape-level strategies for understanding and responding to climate change impacts. Interior bureaus and agencies, guided by the *Energy and Climate Change Council*, will work to stimulate the development of a network of collaborative "Landscape Conservation Cooperatives." These cooperatives, which already have been formed in some regions, will work interactively with the relevant ***DOI Climate Science Center(s)*** and help coordinate adaptation efforts in the region.

Sec. 4 Additional Departmental Action to Mitigate Climate Change. In accordance with Secretarial Order No. 3285, the Department has prioritized development of renewable energy on public lands and offshore waters to reduce our dependence on foreign oil and to reduce greenhouse gas pollution. This Order establishes two additional projects to mitigate climate change: the DOI Carbon Storage Project, and the DOI Carbon Footprint Project. Additional

mitigation projects will be encouraged and supported by the *Energy and Climate Change Council*.

a. The DOI Carbon Storage Project. This project is being implemented under P.L. 110-140, “The Energy Independence and Security Act of 2007,” which gives the Department statutory responsibility to develop carbon sequestration methodologies for geological (i.e., underground) and biological (e.g., forests and rangelands) carbon storage. The USGS has the lead in administering the Carbon Storage Project, but will work closely with other bureaus and agencies in the Department and external partners to enhance carbon storage in geologic formations and in plants and soils in a manner consistent with the Department’s responsibility to provide comprehensive, long-term stewardship of its resources. The DOI Carbon Storage Project is vital for successful domestic and global geological and biological carbon sequestration efforts.

b. The DOI Carbon Footprint Project. The project will develop a unified greenhouse gas emission reduction program, including setting a baseline and reduction goal for the Department’s greenhouse gas emissions and energy use. The Assistant Secretary for Policy, Management and Budget will have the lead in administering the DOI Carbon Footprint Project, with the cooperation of all of the Department’s agencies and bureaus.

Sec. 5 American Indians and Alaska Natives. Climate change may disproportionately affect tribes and their lands because they are heavily dependent on their natural resources for economic and cultural identity. As the Department has the primary trust responsibility for the Federal government for American Indians, Alaska Natives, and tribal lands and resources, the Department will ensure consistent and in-depth government-to-government consultation with tribes and Alaska Natives on the Department’s climate change initiatives. Tribal values are critical to determining what is to be protected, why, and how to protect the interests of their communities. The Department will support the use of the best available science, including traditional ecological knowledge, in formulating policy pertaining to climate change. The Department will also support substantive participation by tribes in deliberations on climate-related mechanisms, agreements, rules, and regulations.

Sec. 6 Implementation. The Deputy Secretary is responsible for ensuring implementation of all aspects of this Order. This responsibility may be delegated as appropriate. This Order does not alter or affect any existing duty or authority of individual bureaus.

Sec. 7 Effective Date. This Order is effective immediately and will remain in effect until its provisions are converted to the Departmental Manual or until it is amended, superseded, or revoked, whichever occurs first.

/s/ Ken Salazar
Secretary of the Interior

SO#3289A1 2/22/10



USGS National Climate Change
and Wildlife Science Center

Final Report on
Outreach & Recommendations



Ecological Society of America
The Wildlife Society
December 2009

USGS National Climate Change
and Wildlife Science Center

Final Report on Outreach & Recommendations

Ecological Society of America

The Wildlife Society

December 2009

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This report about the National Climate Change and Wildlife Science Center (NCCWSC) was sponsored by the U.S. Geological Survey under Cooperative Agreement G09AC00023. Staff from The Wildlife Society, the Meridian Institute, and the Ecological Society of America helped organize and facilitate workshops to assist in planning the NCCWSC, and also prepared this report.

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The Wildlife Society and Ecological Society of America,
2009. *USGS National Climate Change and Wildlife Science
Center, Final Report on Outreach and Recommendations.*
Bethesda, MD: The Wildlife Society.

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EXECUTIVE SUMMARY

Changes in the earth's climate are already having noticeable effects on habitats and the species they support. Even casual observers have noticed songbirds arriving earlier on their breeding grounds, or garden plants thriving in regions where it was once too cold. During this century, projected changes in temperature and precipitation patterns are expected to intensify the impacts on species and ecosystems in many areas. Rising sea levels, more frequent wildfires and floods, rapid expansion of invasive species, and disease outbreaks—all attributed at least in part to climate change—are challenging the management of natural resources throughout the world.

In the United States, federal agencies manage natural resources on vast areas of public land, where climate change has enormous implications. In an effort to understand and predict the effects of climate change, numerous federal agencies and departments have been participating in an integrated research program mandated by Congress in the Global Change Research Act of 1990. Research on changes in atmospheric conditions, ecosystems, land use, and other issues will help inform policymakers and enable resource managers to anticipate and adapt to a rapidly changing world.

In a shifting landscape, managing for the status quo becomes obsolete, and restoration of habitats may be unproductive. Effective planning for resource management instead requires being able to anticipate the impacts of climate change on plant and animal communities and to devise strategies to mitigate the changes or to adapt to them. To meet this challenge, Congress in 2008 authorized the U.S. Geological Survey (USGS)—the science agency of the Department of Interior—to establish a “Global Warming and Wildlife Science Center,” now named the National Climate Change and Wildlife Science Center (NCCWSC).

The USGS began an intensive effort to engage a wide array of stakeholders in planning for the Center, with the intent of providing scientific information about the complex effects of climate change on terrestrial and aquatic plants and animals. Over the past year USGS staff, along with a project team, organized

a series of workshops to help identify information gaps, research needs and priorities, collaboration strategies, and an organizational and staffing structure that would meet the goals of the Center.

The first workshop, in December 2008, promoted dialogue and information sharing between scientists and wildlife managers, and helped build consensus on the objectives, priorities, and organizational structure of the Center. Because the needs of managers will vary across the landscape, the NCCWSC was conceived as a network comprising a central office linked to some number of Regional Climate Science “Hubs.” These Hubs will work with one or more collectives of natural resource partners, known as Application Partnerships, which will include agencies, universities, NGOs, and other stakeholders engaged in on-the-ground resource management or conservation in that region.

Three subsequent regional workshops sought to familiarize regional stakeholders with the NCCWSC concept and the status of the implementation efforts, and to obtain further recommendations. The USGS convened a final, national workshop in July 2009 to gather input on the Five-Year Strategy it was developing for the NCCWSC. The major recommendations of workshop participants are summarized below:

- The Center should focus on linking physical climate models with ecological and biological responses. The focus should therefore be on simulating resource response to climate change and providing the decision support for adaptation and mitigation efforts.
- The efforts of the Center must be “value added” and complement, rather than duplicate, the climate-change efforts of other agencies and organizations.
- The Center must be a true partnership based upon collaborations at national and regional scales. Advisory Councils at the Hub level will ensure both collaborative priority-setting and feedback to the national office about information gaps.
- The Regional Climate Science Hubs should tap into existing partnerships in the region, and must have “fuzzy” geographic boundaries to effectively address climate change and resource management issues that are defined ecologically, rather than geographically.

Although the USGS envisions ultimately setting up Regional Climate Science Hubs to ensure full geographic coverage in the United States, available funding will dictate how many Hubs can be established and on what time frame. Workshop participants underscored that adequate funding will be necessary for sufficient staffing to meet the increasing demands of wildlife and resource managers in a rapidly changing landscape.

The following report is a summary of the process that created the NCCWSC.

INTRODUCTION

In the United States, federal agencies—principally the bureaus of the Department of the Interior (DOI) and the U.S. Forest Service (USFS) in the Department of Agriculture—manage vast acreages for which climate change has enormous implications. As part of its responsibilities to conserve, protect, and enhance fish and wildlife species and habitats, the U.S. Fish and Wildlife Service (FWS) manages numerous refuges, many of which are in areas especially vulnerable to the effects of climate change, such as Alaska, Florida, and the Pacific islands. As climate change accelerates, the forests and grasslands under the purview of the USFS and the Bureau of Land Management (BLM) face greater threats from pathogens, fire, insect pests, and invasive species. Climate change also complicates the mission of the National Park Service (NPS) to preserve “unimpaired the natural and cultural resources and values of the National Park system.”

In an effort to understand and predict these effects, numerous federal agencies and departments have been participating in an integrated research program, mandated by Congress in the Global Change Research Act of 1990. Research on changes in atmospheric conditions, ecosystems, land use, and other issues will help inform policymakers and enable resource managers to anticipate and adapt to a rapidly changing world. As former FWS director Dale Hall stated in his message about the Service’s efforts on climate change, “The warming of the earth could potentially have a more far-reaching impact on wildlife and wildlife habitat than any challenge that has come before us.”¹

¹<http://www.fws.gov/home/climatechange/dhall-public.html>

Indeed, the scope and magnitude of the impacts of climate change require a complete shift in the frame of reference that natural resource managers use for planning and action. Managing the status quo becomes obsolete, and restoration of habitats may be ineffective as a means of preserving particular biological communities. Effective planning for resource management instead requires being able to anticipate the impacts of climate change on plant and animal communities and to devise strategies to mitigate those impacts or to adapt to them—a difficult challenge in a landscape already fragmented and altered by human influences.

To meet this challenge, federal agencies, their counterparts in many states, and a host of non-governmental organizations are launching major new research initiatives and programs designed to facilitate the conservation and management of ecosystems and wildlife species in response to a changing climate.

DOI’s efforts have been expanded to include adaptation science and adaptive management of natural resources and ecosystem services, as well as research into mitigation strategies such as carbon sequestration. Within the USFS, strategies include both managing forest and grassland ecosystems to mitigate climate change and facilitating the adaptation of these resources to changing conditions. The FWS has developed a proposed strategic plan (see www.fws.gov/home/climatechange/) to address its growing management challenges as climate change exacerbates other effects on the fish and wildlife species for which the agency is responsible, such as habitat loss and fragmentation, pollution, and invasive species. To help assess the health of each National Park, the NPS is monitoring the parks’ “vital signs”—physical, chemical, and biological indicators. Such monitoring provides information on how the parks’ resources are changing, and can help managers develop effective approaches for restoration or management.

In March 2009, DOI formed a new Energy and Climate Change Task Force, which is developing a department-wide climate change and adaptation strategy that integrates climate science efforts across bureaus and agencies within DOI. This strategy will focus on tracking environmental changes caused by climate change, improving data integration and management, and translating science into decision support and adaptation management strategies.

The Interior Department’s scientific arm is the

U.S. Geological Survey (USGS), which has a Global Change Program that builds on 30 years of climate change research, forecasting, and monitoring. As part of the new DOI climate strategy, the USGS is launching three initiatives. One of these is the Carbon Sequestration Program, a large-scale effort to assess the sequestration potential of both biological and geological features on the landscape. A second is the Climate Effects Network (CEN), a multi-scale monitoring network intended to track large-scale changes in physical and biological patterns related to climate change. Conducted in collaboration with the National Oceanic and Atmospheric Administration (NOAA) and the not-for-profit National Ecological Observatory Network (NEON), CEN will promote data sharing among physical and biological scientists. Both of these new programs will generate science that helps meet resource management challenges and supports the end users of science, with a focus on ecosystem sustainability and resilience.

The USGS' third major initiative is the creation of the National Climate Change and Wildlife Science Center (NCCWSC). After the Center was established in federal budget legislation in 2008, the USGS began an intensive effort to engage a wide array of stakeholders in the planning process. This effort was coordinated by a project team comprising representatives from two preeminent scientific and educational organizations—the Ecological Society of America (ESA) and The Wildlife Society (TWS)—as well as the Meridian Institute, an internationally recognized organization that provides process design and facilitation for complex issues.

Over the past year this team, supported by a cooperative agreement with USGS and working with USGS staff, organized a series of workshops to help identify information gaps, research needs and priorities, collaboration strategies, and an organizational and staffing structure that would meet the goals of the NCCWSC. What follows is a summary of how that planning process shaped the evolution of the Center. Part I describes the genesis of the NCCWSC, including its legislative history. Part II details the planning process and input from participants and other stakeholders concerning the priorities, structure, and activities of the Center. Part III summarizes the recommendations that emerged from this process regarding NCCWSC structure, purpose, and activi-

ties. Appendices provide lists of workshop invitees, workshop agendas, a sample request for information from workshop invitees, and the Fiscal Year 2009 Omnibus Appropriations Act language. Workshop reports are available on the NCCWSC website, <http://nccw.usgs.gov>.

PART I – BACKGROUND OF THE NATIONAL CLIMATE CHANGE AND WILDLIFE SCIENCE CENTER

In 2007, the Government Accountability Office summed up the problem facing resource managers: “Resource managers have limited guidance about whether or how to address climate change and, therefore, are uncertain about what actions, if any, they should take. In general, resource managers lack specific guidance for incorporating climate change into their management actions and planning efforts. Without such guidance, their ability to address climate change and effectively manage resources is constrained.”

These concerns were echoed by the conservation community at large. Conservationists began working with lawmakers, who also recognized that climate change could have profound effects on wildlife species and their habitats. Throughout 2007 and 2008, the 110th Congress drafted legislation that would direct the federal government to attempt to mitigate these impacts. The Consolidated Appropriations Act of 2008 (PL 110-161) stipulated that, in Fiscal Year 2008, \$10 million be allocated to fund USGS research on the wildlife impacts of climate change. The bill directed USGS to spend up to \$2.5 million to plan for and establish the NCCWSC (initially referred to in the legislation as the National Global Warming and Wildlife Science Center). The House Appropriations Committee report specified that the funding was being provided for the Center “to develop mechanisms that will ensure it is responsive to the research and management needs of federal and state agencies regarding the impacts of global warming on fish, wildlife, plants and ecological processes and the mechanisms for adaptation to, mitigation of, or prevention of those impacts.” Of this \$2.5 million, USGS devoted approximately \$300,000 to a series of workshops and other interactions with DOI agen-

cies, other federal and state agencies, and potential nongovernmental and private partners. These included the workshops described in this report, as well as others, which provided core input used in shaping the Center. All of the remaining funds were used by USGS to “fund research projects...to address the needs of resource management agencies and the American public through greatly accelerated global warming research and through development of decision support tools,” as directed by Congress.

For Fiscal Year 2009, Congress appropriated a total of \$10 million to support what it now called the National Climate Change and Wildlife Science Center. USGS applied the funds to three primary activities: research, partner meetings, and Center operations, with over \$7.5 million dedicated to collaborative research. The proposed FY 2010 budget for the USGS added \$5 million to the funding for the NCCWSC, which the USGS intends to spend on expanded collaborative research initiatives.

PART II – PLANNING AND STAKEHOLDER INPUT ON OBJECTIVES

Strategizing on how to develop the NCCWSC began when USGS appointed an Interim Steering Committee, which convened in the spring of 2008. The purpose of the Committee was to identify a preliminary set of high-priority research needs and to frame a strategy for guiding the development of the Center. In addition, to ensure that the evolution of the Center was truly a collaborative effort, the Committee established the initial guidelines and operational scope for a comprehensive review workshop to be held at the end of the year. That workshop and a series of follow-up workshops held throughout the country in 2009 aimed to bring together a broad range of stakeholders (federal, state, academic, and NGO) who would collaborate directly with the NCCWSC to develop the structures and mechanisms needed to link climate change science to wildlife and natural resource management in the United States and its territories.

The Steering Committee consisted of representatives from federal and state agencies involved in climate science or in management of fish and wildlife resources and habitat including: five agencies from

the Department of the Interior (USGS, BLM, USFWS, NPS, and the Bureau of Reclamation), the Environmental Protection Agency (EPA), NOAA, the National Aeronautics and Space Administration (NASA), the USFS, the Department of Defense, and the Association of Fish and Wildlife Agencies (AFWA), which represents natural resource managers in state agencies. Committee meetings were open to the public and attended by various other government agencies and non-governmental organizations that work with wildlife managers, the Ecological Society of America, and The Wildlife Society.

The Steering Committee drafted the following three broad objectives for the Center as a starting point for further discussions during the planning phase:

- **Build Science Basis and Capacity:** Assess and synthesize the current state of our scientific knowledge concerning climate change’s potential impact on wildlife and their habitats and prioritize scientific gaps in order to forecast the ecological impacts of climate change on fish and wildlife at the ecosystem, habitat, community, population, and species levels.
- **Develop Tools for Adaptive Management:** Develop and improve tools to identify, evaluate, and, where appropriate, link together different scientific approaches and models for forecasting the impacts of climate change and adaptation on fish, wildlife, and their habitats. Such tools include monitoring, predictive models, vulnerability analyses, risk assessments, and decision support systems to help managers make informed decisions.
- **Participate in Adaptive Management and Monitoring:** Participate actively in collaborative processes with federal and state agencies and other partner organizations to develop and implement strategies to manage and monitor fish and wildlife adaptation to a changing climate.

On December 3-4, 2008, the USGS convened a workshop, assisted by ESA and TWS, which brought together nearly 200 representatives from invited state and federal agencies, tribal organizations, academia, and non-governmental organizations. Prior to the workshop, participants were asked to prepare to discuss their agency’s or organization’s perspective, capabilities, information needs, and priorities as well as any existing or potential collaborations to further the goals of the center. At the workshop, scientists engaged in climate change research provided infor-

mation on the current status of assessment, synthesis, and forecasting efforts. The participants were presented with the three broad objectives listed above and were tasked with identifying research needs and priorities, devising strategies for partnerships and collaboration, and providing input on a structure for the Center.

The USGS hoped to achieve three major outcomes at that first workshop: (1) as much consensus as possible among the stakeholders on the priorities and organizational approaches for advancing the mission of the NCCWSC; (2) constructive dialogue and information sharing between scientists and wildlife managers on the objectives and organizational structure of the Center; and (3) a clearer way forward in implementation of the NCCWSC.

Following the December meeting, three regional workshops were held in 2009 for the three USGS regions. The Eastern regional workshop occurred May 6-7 in Laurel, Maryland; the Western workshop was June 4-5 in Seattle, Washington; and the Central workshop was June 10-11 in Denver, Colorado. The aim of these workshops was to familiarize regional stakeholders, including USGS personnel, with the evolving NCCWSC concept and status of implementation efforts, and to obtain further recommendations on the objectives, priorities, and structure of the NCCWSC. In addition, the USGS was interested in recommendations for locations of possible regional offices, or “Hubs,” of the Center.

Invitees to the regional workshops were asked to respond to a Request for Information about their activities relevant to climate change and wildlife (see Appendix C). The questionnaires asked participants to describe the purpose of their work as well as their priorities, the “single top climate challenge” in their region, and the types of climate change information needed to facilitate adaptive management of wildlife and natural resources. Participants were also asked for suggestions on how to share information among scientists, managers, and the public, and among national and regional entities. Finally, invitees were asked to describe their capabilities, key parties, and existing or potential partnerships, which would inform efforts to build a regional presence for the NCCWSC, as well as whether their organization would be interested in partnering with the NCCWSC to develop a regional Hub.

A fifth and final, national workshop was held on July 16, 2009, in Arlington, Virginia. It brought together representatives from federal and state agencies, tribes, universities, and national NGOs working on climate change or wildlife issues. The purpose of this final workshop was to gather input on the Five-Year Strategy that the USGS was developing for the NCCWSC.

Objectives and Priorities of the NCCWSC

Discussions with agency partners and other stakeholders at all five workshops helped to articulate the management needs and define the priorities of the Center, whose mission is to provide the science and technical support that will help fish and wildlife managers anticipate climate change impacts and develop adaptive management strategies. Although the views of participants were not always unanimous, broad consensus developed over the course of the regional meetings in regard to a number of key elements, including the Center’s major objectives and priorities. What follows is a summary of the priorities that emerged during discussions at stakeholder meetings.

The Center should be a conduit between science and management. Participants stressed that the science must be driven by management needs and should focus on evaluating and translating existing climate change information as it relates to wildlife in order to guide management decisions and policy development. Participants further stated that there is a need for enhanced capacity to fulfill the goals of the Center, both on the part of scientists and resource managers. Scientists will need the skills to better understand and develop tools to address the needs of resource managers. Resource managers will need to build capacity to implement the Center’s products, conduct monitoring, and provide feedback.

The Center should be a neutral purveyor of information. Because of its long-term observational networks, extensive databases, and diverse scientific expertise, the USGS plays an important role in the climate change science community. It is essential that it continue to provide objective science to the NCCWSC enterprise, and that there be a clear distinction between science and policy. For this reason the Center will, as a matter of policy, not make resource management recommendations based on its scientific output.

Efforts of the Center must be “value added.”

Numerous efforts to address climate change are underway throughout the country, and many agencies already have useful databases on both climate change and wildlife. Integration is therefore essential. The Center must concentrate its resources on core priorities so that its work complements, rather than duplicates, the efforts of its partners, including the nation’s university system. One issue that saw considerable evolution as a priority for the Center, for example, was whether it should serve as a clearinghouse for storing or disseminating information related to climate change and wildlife. This role was first proposed at the December meeting, and although the merits in principle were recognized, many participants acknowledged that the Center could not give this high priority, owing to anticipated limitations on staffing and budget. It was suggested, however, that this might be a useful function of the science Hubs at a regional level. In particular, participants identified a need for a forum(s) for sharing adaptation strategies and lessons learned among Application Partnerships and Regional Hubs.

The Center should focus on linking physical climate models with ecological and biological responses. Numerous models on climate change and other physical information exist, but they are not at scales of time and space useful to wildlife managers, nor have these models been linked in a useful way to ecological and biological responses. The Center’s focus should therefore be on simulating resource response to climate change and providing the decision support for adaptation and impact mitigation efforts. Because various federal agencies and universities are already involved in physical climate modeling, the Center should not itself develop General Circulation Models (GCMs) of current and future climate. However, participants envisioned that the Center should inform the GCMs by communicating wildlife managers’ information needs to the climate modelers. Among the issues to consider:

- **Downscaling.** Forecasting wildlife and habitat responses depends on the ability to downscale climate models to temporal and spatial scales that will be useful to managers. The NCCWSC intends to use and create high-resolution climate change modeling information and derivative products in order to produce key information that is needed

to forecast the range of possible ecological and population responses at national, regional, and local levels. Participants agreed on the need for downscaling at finer scales, but provided several caveats: (1) The goal should not be downscaling of climate models per se, but rather applying the downscaled information to fish and wildlife science. (2) Downscaling necessarily entails a great deal of uncertainty. It is important that the Center acknowledge that uncertainty and help resource managers account for it in their management decisions. In addition, combining downscaled models with observational data obtained at smaller scales can help reduce uncertainty. (3) Downscaled models must reflect the variability, not just the averages. It is the extremes—the “tails of the distribution”—that often hold the most important information about adaptability and change.

- **Forecasting.** Managers lack information about how climate change is likely to affect species and habitats under their purview. At the first NCCWSC workshop in December 2008, participants agreed that one focus should be on forecasting changes in species distributions, habitat condition, and ecosystem functioning. While the need for forecasting has been a common theme among workshop participants, this concept was further fleshed out in later meetings. It is not sufficient, for example, to focus simply on fish and wildlife population endpoints. Parameters such as hydrology and vegetation are key elements of ecological response to climate change.
- **Vulnerability and Risk Assessment.** Participants urged that the Center take forecasting to the next logical step: assessing the vulnerability and risk of species and habitats to climate change. How can forecasts be used to identify species or populations that are at risk? What is the degree of vulnerability, and to what extent is climate change, as opposed to other factors, key in understanding predicted range and population declines?
- **Monitoring.** Monitoring is key to managing wildlife in a changing climate, and the Center’s role in this area was a lively topic throughout the stakeholder meetings. Monitoring was suggested early on as a possible role for the Center, but as the priorities were further refined, it was generally agreed that the Center would not conduct long-term monitoring

of responses to land management activities. Many agencies and organizations are already monitoring natural resources at various scales. However, these efforts are not standardized, so the results often cannot be compared. Thus, participants urged that a priority of the Center should be to develop standardized monitoring protocols so that monitoring efforts could be more easily, and more reliably, linked to climate change and ecological response models.

The role of communication needs more emphasis. Throughout the meetings, participants stressed the need for clearer avenues of communication, particularly in the following areas: (1) communicating the goals of the Center and how interested parties can participate; (2) informing the public and policymakers about the work of the Center and any resultant management decisions; (3) improving communication between the National Office and the Regional Hubs, and among the Hubs; and (4) two-way communication between climate scientists and ecologists, and between climate scientists and managers. Numerous suggestions were made about how to use partnerships for outreach at the regional level and for communicating with and among partners. The USGS needs to clarify that while the NCCWSC is a forum for science-management communication and collaboration, the products of NCCWSC will be science products and not policy. This is essential if the Center wants to ensure the participation of tribal entities, which have a history of troubled relations with state and federal agencies. Developing an effective governance structure appears to be the best way to ensure communication among the offices. Seminars and workshops might provide the forum for communication between scientists of different disciplines.

PART III – STRUCTURE OF THE NCCWSC

From the outset, the USGS understood the need for the Center to have national coverage. Input from workshop attendees and other stakeholders has helped define how this should be accomplished. Because the needs of managers will vary across the landscape, the NCCWSC was conceived as a network comprising a central office linked to some number of

Regional Climate Science Hubs. In turn these Hubs would work with one or more collectives of natural resource partners, referred to as Application Partnerships, which would include agencies, universities, tribes, NGOs, and other stakeholders engaged in on-the-ground resource management or other conservation-related activities in that region. The structure of the Center and its relationship with regional partners have been refined considerably through meetings with stakeholders.

The Center must be a true partnership based upon collaborations at national and regional scales. Partners should represent expertise in both management and science. Science should be developed collaboratively among agencies and universities. Regional collaborations should build upon existing infrastructure and partnerships (described in greater detail below). Although collaboration can be achieved largely through the work of the Regional Climate Science Hubs and their Application Partnerships, participants encouraged the USGS to include a mechanism for partnering at the regional level outside of the Application Partnerships. Such regional partners would include tribes, states, universities, and non-governmental organizations.

Regional Climate Science Hubs

How many Hubs are desirable, where the Hubs should be based, and what their priorities should be were all questions discussed at length during the planning process. Following are the key ideas that emerged from these meetings.

The Regional Climate Science Hubs must have “fuzzy” geographic boundaries. Many climate change and natural resource management issues will be defined ecologically, rather than geographically, and therefore will not fit neatly into fixed Hub boundaries. The same is true for issues affecting resources in areas bordering Mexico and Canada and in the Caribbean, Hawaii, and the Pacific Islands. One function of the National Office will be to coordinate efforts—between Hubs and with international entities—that cross boundaries.

The structure of the Regional Climate Science Hubs should ensure that scientists are responsive to the external partner groups that have shaped the Hubs’ agendas. Participants stressed the importance for regional decision

making to be collaborative, and for Hubs to be accessible to both managers and scientists. The Hubs' principal responsibility is to be responsive to the needs of managers on the ground. By working closely with managers in the field, Hub staff can identify common products that are needed.

Advisory Councils for each Hub could ensure collaborative priority setting, from the top down and the bottom up. Participants agreed on the need for advisory councils at the Hub level, and discussed the need to include a broad spectrum of partners on the advisory councils, possibly with representation by each partner group. The importance of representing private landowners and tribal, state, and local governments was stressed. Advisory councils would in turn be able to identify gaps in climate science information and provide feedback to the National Center to aid in priority setting at the national level.

Basing the Regional Climate Science Hubs at universities makes sense. Universities provide a way to leverage capacity as well as further the mission of the Center. Many universities have active climate science and ecology programs, and some are already part of the Cooperative Ecosystem Studies Units (CESU) network, a national network involving universities and federal agencies established to provide research, technical assistance, and education to resource and environmental managers. University co-location would enable the USGS to tap into students for research and to introduce students to the professions related to the work of the Center. However, the USGS must have clearly defined criteria for selecting the university host(s). Some participants stressed that host institution(s) should have the capacity to work across state and institutional boundaries.

Priorities should be set collaboratively and avoid duplication of effort. Participants identified a number of questions that could help guide priority setting at the regional level. Some key questions include the following: Are there issues for which the Hub could provide synergy better than another entity? What issues are common to different ecosystems within a Hub? Can thematic issues (such as fire or water) provide a focus? Is it possible for other entities working with the Hub to rank their needs as a way to determine priorities?

Expectations for the Hubs are high and adequate staffing will be essential. Because the Regional Climate Science Hubs are expected to do so much, the USGS anticipates that Hubs will be developed sequentially as funding permits. Participants recognized that the trans-disciplinary and collaborative inter-organizational structure of the Center is novel but essential, and said that achieving this culture shift will require staff with skills in collaboration, conflict resolution, and working at the interface of science and management. This skill set will be particularly important and should be a selection criterion for Hub leaders. Current resources will be sufficient to establish two or three Hubs initially, but the final number will ultimately be determined by need and available resources. In accordance with Secretarial Order 3289, "Addressing the Impacts of Climate Change on America's Water, Land and Other Natural and Cultural Resources" (September 14, 2009), the regional Hubs will be incorporated into a set of eight Regional Climate Change Response Centers, with their mandate broadened to encompass other climate-change-related impacts on DOI resources.

Application Partnerships

Each Regional Climate Science Hub would work with Application Partnerships that would help identify priority science needs and inform science directions. Participants discussed how collaborations would be linked to the regional level and what activities the partnerships would be engaged in. Among their recommendations:

The mechanism for creating partnerships should be flexible. A given Hub could partner with multiple collaborative groups. Some might be existing partnerships, as described below; whereas others might emerge around a common resource issue. One example participants suggested was partnerships that would focus on implementation of State Wildlife Action Plans.

Partnerships should engage specialists and the private sector. Although federal, state, and local resource managers would be key partners, involvement of the private sector is important, especially in regions where land ownership is primarily in private hands. Participants mentioned the importance

of consulting specialists within an agency, not just decision makers, for input on priorities. Specialists have research needs and could also provide a valuable perspective to the Hub.

Feedback between the Hubs and the Application Partnerships is essential for developing adaptation strategies. Partnerships would be geared toward on-the-ground resource management or conservation activities. Partnerships would also develop the information needs that would inform the development of down-scaled climate models, climate change projections, biological and ecological response models, and other derivative products produced by the Hubs. In turn, there must be a mechanism to ensure feedback to the Hubs from monitoring efforts by partners.

The Regional Climate Science Hubs should tap into existing partnerships in the region. Existing partnerships abound throughout all regions, and these could form the nucleus of an Application Partnership. Examples include national programs such as NOAA's Regional Integrated Sciences and Assessments (RISA) program, university-based Cooperative Ecosystem Studies Units, DOI's Cooperative Fish and Wildlife Research Units, and the USFWS's emerging Landscape Conservation Cooperatives (LCCs). The Joint Fire Sciences Program is a collaboration among bureaus from the DOI and the Department of Agriculture that may serve as a potential model for the NCCWSC and its regional Hubs. Examples of other vibrant regional partnerships include the Climate Change Executive Roundtable in Alaska, the San Francisco Bay Area Ecosystem Climate Change Consortium, Rocky Mountain Climate Organization, EPA Great Lakes Program, and the Hawaii Conservation Alliance. Numerous other relationships have been developed among federal and state agencies, NGOs, and other stakeholders that are addressing the impacts of climate change on natural resources management.

PART IV – SUMMARY OF RECOMMENDATIONS

The planning and outreach process for the National Climate Change and Wildlife Science Center resulted in numerous recommendations regarding objectives, priorities, and structure. These are summarized below,

followed by additional recommendations based on observations of project team members.

Objectives and Priorities

- The Center should be a conduit between science and management with the science driven by management needs.
- The Center should be a neutral purveyor of information with a clear distinction maintained between science and policy.
- The efforts of the Center must be “value added” and vigorously avoid duplicating the work of partners in other agencies and organizations.
- Although the Center will not serve as a clearinghouse for information, USGS should explore the development of forums for sharing adaptation strategies and lessons learned across Application Partnerships and Regional Climate Science Hubs. Such an effort could be coordinated through the Climate Change Response Council established by Secretarial Order 3289 on addressing the impacts of climate change on natural resources.
- The Center should focus its modeling efforts on linking physical climate models with ecological and biological responses to climate change at time and space scales useful to wildlife managers. This includes efforts aimed at both forecasting potential impacts and assessing the vulnerability of species and habitats to climate change. The Center should not develop General Circulation Models (GCMs), but should inform the GCMs by communicating managers' information needs to climate modelers.
- Although the Center will not conduct monitoring, it should develop standardized monitoring protocols to help link monitoring efforts to climate change and ecological response models.
- The Center should develop a comprehensive communications plan that addresses both external communication to policymakers and the public, and internal communication among the Center, Hubs, resource managers, and partners. The plan should also seek to ensure the participation of tribal entities, in keeping with Secretarial Order 3289's commitment to “ensure consistent and in-depth government-to-government consultation with Tribes and Alaska Natives on the Department's climate change initiatives.”

Structure

- The Center must be a true partnership based upon collaborations at national and regional scales, with partners representing both management and science expertise.
- A proposed Center Advisory Board, noted in the draft Center strategy, should include representatives from both science and management, including from Hub Advisory Councils (see below) and other federal, state, tribal, and NGO stakeholders. This Advisory Board should serve two functions: priority setting and independent science review. The science review function could be accomplished through *ad hoc* scientific committees appointed by the Board, or through a body convened by an outside entity such as the National Academy of Sciences.
- The Regional Climate Science Hubs must have “fuzzy” geographic boundaries, allowing for ecological issues to affect boundaries otherwise based on state or international boundaries, and allowing for projects to cross Hub boundaries.
- The structure of the Regional Climate Science Hubs should ensure that Hub scientists are responsive to the external partner groups, particularly including managers in the field, that should help shape the Hubs’ agendas. This should include active input to the identification of products of the Hubs.
- Hub Advisory Councils should be established, representing the private landowner community and tribal, state, and local governments as well as scientists. Advisory councils should be empowered to identify information needs and gaps and provide feedback to the National Center to aid in priority setting at the national level.
- Basing the Regional Climate Science Hubs at universities makes sense, but USGS must have clearly defined criteria for selecting the university hosts.
- As with the Center itself, priorities for Hubs should be set collaboratively and avoid duplication of efforts by other organizations.
- Adequate staffing of Hubs is essential for scientific and management credibility. Hubs should include staff with skills in collaboration and conflict resolution, and experience working at the interface of science and management.
- The mechanism for creating Regional Application Partnerships should be flexible and take advantage of existing partnerships where appropriate.
- Hubs should take advantage of existing partnerships in a region, such as (but not limited to) NOAA’s Regional Integrated Sciences and Assessments program, Cooperative Ecosystem Studies Units, DOI’s Cooperative Fish and Wildlife Research Units, and the USFWS’s Landscape Conservation Cooperatives.
- In addition to federal, state, and local resource managers, partnerships should seek involvement of the private sector and of specialists within agencies.
- Mechanisms should be included to ensure feedback between Hubs and Application Partnerships. One such mechanism might be having partnerships represented on Hub Advisory Councils.

Additional Recommendations from Project Team Members

- The NCCWSC should be housed in Reston, with the Director reporting either to the USGS Associate Director for Biology or to the USGS Director. This reporting structure will emphasize the Center’s national role and avoid any perception that its efforts are restricted to any particular USGS region.
- USGS should consider involving the cooperative research units in the Hubs; they are already university-based and have working relationships with other potential Hub partners in their regions. This would be similar in nature to the opportunities afforded by involvement of the Cooperative Ecosystem Studies Units.
- Although the USGS science centers will not house Hubs, potential roles should be explored for the centers or for individual scientists in them to take advantage of their existing partnerships with other organizations in their regions.

APPENDICES

Appendix A: Master Invitee List for All Workshops

Appendix B: Agendas for All Workshops (summaries available at <http://nccw.usgs.gov>)

Appendix C: Sample “Request for Information” from Workshop Participants

Appendix D: FY09 Omnibus Appropriations Act – USGS Section

Appendix A: Master Invitee List for All Workshops

First Workshop: December 3-4, 2008 in Lansdowne, Virginia

Name	Affiliation	Category
Divya Abhat	The Wildlife Society	Staff
Jeff Amthor	Department of Energy, Office of Science, SC-23	Federal Agency
Donald Anderson	NASA	Federal Agency
Liz Appel	Assistant Secretary-Indian Affairs, Office of Regulatory Management	Federal Agency
Thomas Armstrong	US Geological Survey	Federal Agency
Dan Ashe	US Fish and Wildlife Service	Federal Agency
Natasha Atkins	The Wildlife Society	Staff
Melody Avery	NASA Langley Research Center	Federal Agency
Tom Bancroft	National Audubon Society	NGO
Scott Belfit	US Army, HQ ISE	Federal Agency
Rick Bennett	US Fish and Wildlife Service	Federal Agency
Laura Bies	The Wildlife Society	Staff
David Bornholdt	US Geological Survey - Eastern Region	Federal Agency
Jonathan Boydston	The Wildlife Society	Staff
Jean Brennan	Defenders of Wildlife	NGO
Gary Brewer	US Geological Survey - Eastern Region	Federal Agency
Patricia Bright	US Geological Survey	Federal Agency
Christine Buckley	Ecological Society of America	Staff
Kristy Buckley	Meridian Institute	Staff
Jeff Burgett	US Fish and Wildlife Service	Federal Agency
Virginia Burkett	US Geological Survey	Federal Agency
Stacy Bushée	US Geological Survey	Federal Agency
Cheryl Caldwell	US Geological Survey	Federal Agency
Karen Carney	Research Associate, Smithsonian Environmental Research Center	NGO
Shawn Carter	National Park Service	Federal Agency
Dan Cavanaugh	US Geological Survey	Federal Agency
Arpita Choudhury	Association of Fish and Wildlife Agencies	NGO
Antoinette Condo	US Department of State	Federal Agency
John Cooper	Bipartisan Policy Center	NGO
Piper Corp	Ecological Society of America	Staff
Gladys Cotter	US Geological Survey	Federal Agency
Art Coykendall	Bureau of Reclamation	Federal Agency
Tricia Crocker	Ecological Society of America	Staff
Terri Cruce	Pew Center on Global Climate Change	NGO
Robert (Bob) Davison	Defenders of Wildlife	NGO
Nav Dayanand	Wildlife Conservation Society	NGO
John Dennis	National Park Service	Federal Agency
Frank D'Erchia	US Geological Survey - Central Region, Regional Science Office	Federal Agency
Howard Diamond	NOAA/National Climatic Data Center	Federal Agency
Jay Diffendorfer	Rocky Mtn Geographic Science Center	Federal Agency
Cliff Duke	Ecological Society of America	Staff
Steve Earsom	Federal Highway Administration	Federal Agency
David Eisenhauer	US Fish and Wildlife Service	Federal Agency
Morgan Elmer	US Fish and Wildlife Service - Prairie/Mountain Region Fisheries	Federal Agency
Mike Estey	US Fish and Wildlife Service	Federal Agency

Dwight Fielder	Bureau of Land Management	Federal Agency
Mary Foley	National Park Service	Federal Agency
Robert (Bob) Ford	US Fish and Wildlife Service	Federal Agency
Tom Franklin	Theodore Roosevelt Conservation Partnership	NGO
Daniel Froehlich	Institute for Bird Populations	NGO
Bert Frost	National Park Service	Federal Agency
Kevin Gallagher	US Geological Survey	Federal Agency
Alisa Gallant	US Geological Survey	Federal Agency
Martha Garcia	US Geological Survey	Federal Agency
Bess Gillelan	Office of Habitat Conservation, National Marine Fisheries Service, NOAA	Federal Agency
Pierre Glynn	US Geological Survey	Federal Agency
Kathy Goodin	NatureServe	NGO
John Gross	National Park Service	Federal Agency
Sharon Gross	US Geological Survey	Federal Agency
Bernadette Guerra	US Geological Survey	Federal Agency
Jay Gulledege	Pew Center on Global Climate Change	NGO
Linda Gundersen	US Geological Survey	Federal Agency
Hannah Hamilton	US Geological Survey	Federal Agency
Grant Harris	US Fish and Wildlife Service - Region 2	Federal Agency
Mike Harris	Georgia Dept. of Natural Resources Wildlife Resources Division	State
Sue Haseltine	US Geological Survey	Federal Agency
Elden Hawkes	American Fisheries Society	NGO
Mark Hay	School of Biology, Georgia Inst. of Technology	Academic
Tim Hayden	US Army, ERDC/CERL	Federal Agency
Katharine Hayhoe	Atmos Research and Consulting	NGO
Greg Hayward	USDA Forest Service, Rocky Mountain Region	Federal Agency
David Hebert	US Geological Survey, Office of Communications	Federal Agency
Jay Hestbeck	US Geological Survey	Federal Agency
Steve Hodapp	Bureau of Land Management	Federal Agency
Leslie Holland-Bartels	US Geological Survey	Federal Agency
Jeanne Holler	US Fish and Wildlife Service	Federal Agency
Doug Holy	USDA Natural Resources Conservation Service	Federal Agency
Leslie Honey	NatureServe	NGO
Karl Huemrich	University of Maryland Baltimore County	Academic
Mark Humpert	Association of Fish and Wildlife Agencies	NGO
Michael Hutchins	The Wildlife Society	Staff
Skip Hyberg	Farm Service Agency/USDA	Federal Agency
Doug Inkley	National Wildlife Federation	NGO
David Inouye	University of Maryland	Academic
Roland Jacobs	US Fish and Wildlife Service/National Conservation Training Center	Federal Agency
Kurt Johnson	US Fish and Wildlife Service	Federal Agency
Bruce Jones	US Geological Survey - BRD	Federal Agency
Sonya Jones	US Geological Survey	Federal Agency
Kate Kase	US Geological Survey - Bioinformatics	Federal Agency
Richard Kearney	US Geological Survey	Federal Agency
Amy Keister	US Fish and Wildlife Service	Federal Agency

Appendix A: Master Invitee List for All Workshops *First Workshop continued*

Dirk Kempthorne	Secretary of the Interior	Federal Agency
Dan Kimball	National Park Service	Federal Agency
Anne Kinsinger	US Geological Survey	Federal Agency
Robert Klaver	US Geological Survey - EROS	Federal Agency
Patrice Klein	American Association of Wildlife Veterinarians	NGO
Cindy Kolar	US Geological Survey	Federal Agency
Amy Krause	Bureau of Land Management	Federal Agency
Linn Kwan	US Geological Survey	Federal Agency
Meredith Lane	US Geological Survey	Federal Agency
Mike Larson	Minnesota Department of Natural Resources	State
Linda Leake	US Geological Survey - North Central Area	Federal Agency
Elaine Leslie	National Park Service	Federal Agency
Wendy Loya	The Wilderness Society	NGO
Michael MacCracken	Climate Institute	NGO
Bruce Marcot	USDA Forest Service	Federal Agency
Thomas Martin	US Geological Survey	Federal Agency
Deirdre Mason	Association of State Drinking Water Administrators	NGO
Elroy Masters	Bureau of Land Management - Nevada State office	Federal Agency
Corrie Mauldin	Ecological Society of America	Staff
Tom McCabe	DOI USFWS Region 8 Conservation Partnerships Program	Federal Agency
Julie McNamee	National Park Service	Federal Agency
Chad McNutt	NOAA	Federal Agency
Yvonne McQuire	US Geological Survey	Federal Agency
Tim Mealey	Meridian Institute	Staff
Abraham Miller-Rushing	USA National Phenology Network	Federal Agency
Miranda Mockrin	USDA Forest Service	Federal Agency
Tim Modde	US Fish and Wildlife Service	Federal Agency
Anne Morkill	US Fish and Wildlife Service - Florida Keys National Wildlife Refuges Complex	Federal Agency
Cheryl Morris	US Geological Survey - CR RGIO	Federal Agency
Jeff Mow	National Park Service	Federal Agency
Rachel Muir	US Geological Survey	Federal Agency
Peter Murdoch	US Geological Survey, Global Change Program Office	Federal Agency
Ruth Musgrave	Center for Wildlife Law - Univ. of New Mexico Institute of Public Law	Academic
Mark Myers	US Geological Survey	Federal Agency
Meenakshi Nagendran	US Fish and Wildlife Service - Division of International Conservation	Federal Agency
Vivian Nolan	US Geological Survey	Federal Agency
John O'Leary	Massachusetts Division of Fish and Wildlife	State
Peggy Olwell	Bureau of Land Management	Federal Agency
Robin O'Malley	The Heinz Center	NGO
Kenric Osgood	NOAA/NMFS	Federal Agency
Doug Parsons	Florida Fish and Wildlife Conservation Commission	State
Geoffrey Patton	Maryland Alliance for Greenway Improvement and Conservation	NGO
Shannon Pederson	The Wildlife Society	Staff
Don Pereira	Minnesota Department of Natural Resources	State
Tim Petty	DOI Asst. Secretary for Water and Science	Federal Agency
Frances Pierce	US Geological Survey	Federal Agency
Duane Pool	The Nature Conservancy	NGO

Catherine Puckett	US Geological Survey	Federal Agency
Robert Quint	US Bureau of Reclamation	Federal Agency
Jamie Rappaport Clark	Defenders of Wildlife	NGO
David Reynolds	National Park Service	Federal Agency
Deborah Rocque	US Fish and Wildlife Service - R7	Federal Agency
Carlos Rodriguez-Franco	Forest Service	Federal Agency
Walt Sadinski	US Geological Survey/UMESC	Federal Agency
John Sauer	US Geological Survey - Patuxent Wildlife Research Center	Federal Agency
Jacqueline Savino	US Geological Survey/BRD/GLSC	Federal Agency
Lynn Scarlett	Deputy Secretary of the Interior	Federal Agency
Robert Schneider	Bureau of Land Management	Federal Agency
Robin Schrock	US Geological Survey	Federal Agency
Peter Schultz	US Climate Change Science Program Office	Federal Agency
Mike Scott	US Geological Survey	Federal Agency
Mark Shaffer	Doris Duke Charitable Foundation	NGO
Allison Shipp	US Geological Survey, South Central Area	Federal Agency
Caitlin Simpson	NOAA Climate Program Office	Federal Agency
Jonathan Sleeman	American Association of Wildlife Veterinarians	NGO
Stacy Small	Environmental Defense Fund	NGO
Jonathan Smith	US Geological Survey	Federal Agency
Stan Smith	US Geological Survey	Federal Agency
Mark Sogge	US Geological Survey	Federal Agency
Allen M. Solomon	USDA Forest Service	Federal Agency
Bruce Stein	National Wildlife Federation	NGO
Charla Sterne	US Fish and Wildlife Service - R7	Federal Agency
Burton Suedel	US Army, ERDC/EL	Federal Agency
Barry Sullivan	National Park Service	Federal Agency
Bruce Taggart	US Geological Survey, Leetown Science Center	Federal Agency
Janith Taylor	US Fish and Wildlife Service	Federal Agency
Peter Thomas	Marine Mammal Commission	Federal Agency
Edith Thompson	US Fish and Wildlife Service	Federal Agency
Monica Tomosy	USDA Forest Service	Federal Agency
Woody Turner	NASA Earth Science Division	Federal Agency
Randall Updike	US Geological Survey	Federal Agency
Sally Valdes	Minerals Management Service	Federal Agency
Beatrice Van Horne	US Geological Survey	Federal Agency
Matthew Varner	Bureau of Land Management	Federal Agency
Yanin Walker	The Wildlife Society	Staff
Scott Warsen	The Wildlife Society	Staff
Greg Wathen	Tennessee Wildlife Resources Agency	State
Jess Weaver	Regional Executive, SE Area	Federal Agency
Brian Wee	NEON, Inc.	NGO
Jake Weltzin	USA National Phenology Network	Federal Agency
David Whitehurst	Virginia Department of Game and Inland Fisheries (Northeast Association of Fish and Wildlife Agencies)	State
Aleta Wiley	Ecological Society of America	Staff
Ken Williams	US Geological Survey - Cooperative Research Units	Federal Agency

Appendix A: Master Invitee List for All Workshops *First Workshop continued*

Steve Williams	Wildlife Management Institute	NGO
Paul Wilson	Sierra Club, Wildlife & Endangered Species Comm.	NGO
Rodney Wittler	US Bureau of Reclamation	Federal Agency
Karen Wood	US Geological Survey	Federal Agency
Teresa Woods	US Fish and Wildlife Service	Federal Agency
Paul Young	US Geological Survey	Federal Agency

Eastern Regional Workshop: May 6-7, 2009 in Patuxent, Maryland

<i>Name</i>	<i>Affiliation</i>	<i>State Agency</i>
Doug Austen	Pennsylvania state government	State Agency
Alan Belenz	New York state government	State Agency
Chris Burkett	Virginia Department of Game and Inland Fisheries	State Agency
Lean Carl	US Geological Survey	Federal Agency
Steven Carpenter	University of Wisconsin, Madison	Academic
John Christy	University of Alabama, Huntsville	State Agency
Chuck Collins	Florida Fish and Wildlife Conservation Commission	State Agency
Pat Comer	NatureServe	NGO
Jeff Corbin	Virginia state government	State Agency
Virginia Dale	Oak Ridge National Laboratory	Academic
Margaret Davidson	National Oceanic and Atmospheric Administration	Federal Agency
Frank Dawson	Maryland state government	State Agency
John Dennis	National Park Service	Federal Agency
John Eder	Great Lakes Commission	State Agency
Terrell Erickson	USDA Farm Services Administration	Federal Agency
Andy Finton	The Nature Conservancy	NGO
Dan Forster	Georgia state government	State Agency
Robert Gardner	University of Maryland	Academic
Jaime Geiger	Fish and Wildlife Service	Federal Agency
Gary Gulezian	Environmental Protection Agency	Federal Agency
Ken Haddad	Florida Fish and Wildlife Conservation Commission	State Agency
Kimberly Hall	The Nature Conservancy of Michigan	NGO
Kathryn Hayhoe	Texas Tech University	NGO
Tony Janetos	Pacific Northwest National Laboratory	Academic
Kate Kellerlain Morrison	The Nature Conservancy of Massachusetts	NGO
Cliff Kraft	Cornell University	Academic
Ian Kraucunas	National Research Council	Academic
Michael MacCracken	The Climate Institute	NGO
Tom Melius	Fish and Wildlife Service	Federal Agency
George Meyer	Wisconsin Wildlife Federation	State Agency
Kevin Moody	Department of Transportation	Federal Agency
Gordon Myers	North Carolina Wildlife Resources Commission	State Agency
Peggy O'Dell	National Park Service	Federal Agency
Robin O'Malley	The Heinz Center	NGO
Judy Okay	US Forest Service	Federal Agency
Lou Pitelka	University of Maryland	Academic

Ernie Quintana	National Park Service	Federal Agency
Gus Rassam	American Fisheries Society	NGO
Ron Regan	Association of Fish and Wildlife Agencies	NGO
Dennis Reidenbach	National Park Service	Federal Agency
Ken Rentiers	South Carolina government	State Agency
representative	National Park Service	Federal Agency
representative	US Forest Service	Federal Agency
representative	US Forest Service	Federal Agency
Peyton Robertson	National Oceanic and Atmospheric Administration	Federal Agency
Scott Robinson	Southeast Aquatic Resources Partnership	State Agency
Don Scavia	University of Michigan	Academic
Loring Schwarz	The Nature Conservancy	NGO
Kevin Sellner	Chesapeake Bay Research Consortium	NGO
Bruce Stein	National Wildlife Federation	NGO
Jack Sullivan	Wisconsin state government	State Agency
Tracy Tomajoer	New York state government	State Agency
Gaeto Tori	Ducks Unlimited	NGO
David Vela	National Park Service	Federal Agency
John Wolflin	US Geological Survey	Federal Agency
Chris Zganjar	The Nature Conservancy	NGO

Western Regional Workshop: June 4-5, 2009 in Seattle, Washington

<i>Name</i>	<i>Affiliation</i>	<i>Category</i>
Jim Abbott	Bureau of Land Management	Federal Agency
Mark Abbott	Oregon State University	Academic
Michelle Ackermann	Wilderness Society	NGO
Liana Aker	Department of Defense	Federal Agency
Phil Anderson	Washington Department of Fish and Wildlife	State
Ellen G. Aronson	Minerals Management Service Pacific OCS Region	Federal Agency
Grant Ballard	PRBO Conservation Science	NGO
Tony Barber	Environmental Protection Agency	Federal Agency
Kit Batten	Department of the Interior	Federal Agency
Dietrich Belitz	University of Oregon	Academic
Allen Biaggi	Nevada Department of Conserv and Natural Resources	State
Robert Bonnie	US Department of Agriculture	Federal Agency
Jean Brennan	Defenders of Wildlife	NGO
N. Kathryn "Kat" Brigham	Columbia River Inter-Tribal Fish Commission (CRITFC)	Tribal
Bob Broscheid	Arizona Department of Game and Fish	State
Maria Brown	National Oceanic and Atmospheric Administration (NOAA)-National Ocean Service	Federal Agency
Arpita Choudhury	Association of Fish and Wildlife Agencies	NGO
Mike Chrisman	California Resources Agency	State
Ellie Cohen	Point Reyes Bird Observatory, Conservation Science	NGO
Bob Davison	Defenders of Wildlife	NGO
Kim Delfino	Defenders of Wildlife	NGO

Appendix A: Master Invitee List for All Workshops *Western Regional Workshop continued*

Doug DeMaster	National Oceanic and Atmospheric Administration (NOAA) Alaska Fisheries Science Center	Federal Agency
Hal Dengerink	Washington State University (Vancouver)	Academic
Leslie Dierauf	US Geological Survey	Federal Agency
Cynthia Dohner	US Fish and Wildlife Service	Federal Agency
Tom Dwyer	Ducks Unlimited	NGO
Gary Edwards	US Fish and Wildlife Service	Federal Agency
Clarence Everly	Department of Defense	Federal Agency
Dr. Wanda Ferrell	Climate and Environmental Sciences Division	Federal Agency
Billy Frank Jr	Northwest Indian Fisheries Commission	Tribal
Bill Geer	Theodore Roosevelt Conservation Partnership (TRCP)	NGO
Don Glaser	Bureau of Reclamation	Federal Agency
Peter Gleick	Pacific Institute	Academic
Patty Glick	National Wildlife Federation	NGO
Michael Goldstein	US Forest Service-Region 10	Federal Agency
John Goll	Minerals Management Service	Federal Agency
Dave Graber	National Park Service	Federal Agency
Kathy Granillo	US Fish and Wildlife Service	Federal Agency
Lisa Graumlich	University of Arizona	Academic
Elizabeth Gray	TNC of Washington	NGO
Joe Grindstaff	CALFED	State
Cal Groen	Idaho Department of Fish and Game	State
Randy Hagenstein	The Nature Conservancy	NGO
Kevin Hamilton	International Pacific Research Center (IPRC) & University of Hawaii at Manoa	Academic
Geoff Hammerson	NatureServe	NGO
Larry Hartig	Alaska Department of Environmental Conservation	State
Robert Hartman	National Oceanic and Atmospheric Administration (NOAA)-National Weather Service	Federal Agency
Dennis Hartmann	University of Washington	Academic
Susan Haseltine	US Geological Survey	Federal Agency
Geoff Haskett	US Fish and Wildlife Service	Federal Agency
Nadine Hitchcock	California Coastal Conservancy	NGO
Gretchen Hoffman	UC Santa Barbara	Academic
Leslie Holland-Bartels	US Geological Survey	Federal Agency
Amy Holman	National Oceanic and Atmospheric Administration (NOAA) Alaska Regional Coordination Team	Federal Agency
Leslie Honey	NatureServe	NGO
Travis Huxman	Biosphere2	Academic
Jon Jarvis	National Park Service	Federal Agency
Pat Jellison	US Geological Survey	Federal Agency
Sonya Jones	US Geological Survey	Federal Agency
Anne Kinsinger	US Geological Survey	Federal Agency
Julie Kitka	Alaska Federation of Natives	Tribal
Marge Kolar	US Fish and Wildlife Service	Federal Agency
Larry Kruckenberg	Western Association of Fish and Wildlife Agencies	NGO
Chris Lauver	National Park Service CESU	Federal Agency
Denby Lloyd	Alaska Department of Fish and Game	State
Ren Lohofener	US Fish and Wildlife Service	Federal Agency

Thomas Lonnie	Bureau of Land Management	Federal Agency
Jay Manning	Washington Department of Ecology	State
Sue Masica	National Park Service	Federal Agency
Pam Matson	Stanford University	Academic
Molly McCammon	Alaska Ocean Observing System	Academic
Bill McLaughlin	University of Idaho	Academic
Holly Michael	Oregon Department of Fish and Game	State
Abe Miller-Rushing	USGS National Phenology Network	Federal Agency
Kevin Moody	Department of Transportation	Federal Agency
Randy Moore	US Forest Service-Pacific Southwest Region	Federal Agency
Ted Murphy	Bureau of Land Management	Federal Agency
Kathy O'Halloran	US Forest Service	Federal Agency
Kim Peterson	Univ. of Alaska, Anchorage	Academic
Michelle Pirzadeh	Environmental Protection Agency	Federal Agency
Mary Power	UC Berkeley	Academic
William E Rapp	US Army Corps of Engineers	Federal Agency
Cecil Rich	Alaska Department of Fish and Game	state
Steve Richie	California Coastal Conservancy	NGO
Phil Roger	Columbia River Inter-Tribal Fish Commission (CRITFC)	Tribal
William Ruckelshaus	Puget Sound Partnership (PSP)	NGO
Scott Rupp	Univ. of Alaska, Fairbanks	Academic
Robin Schrock	US Geological Survey	Federal Agency
Mark Schwartz	UC Davis	Academic
Stan Senner	Audubon Alaska	NGO
Ed Shepard	Oregon & Washington Bureau of Land Management	Federal Agency
Frank Shipley	US Geological Survey	Federal Agency
Michelle Shouse	CALFED	State
Michael Shulters	US Geological Survey	Federal Agency
Deanna Spooner	Hawaii Conservation Alliance and Hawaii Conservation Alliance Foundation	NGO
Mike Styler	Utah Department of Natural Resources	State
Arnold Taylor	Hopi Nation	Tribal
Dan Taylor	Audubon Society	NGO
Laura Thielen	Hawaii Department of Land and Natural Resource	State
Robyn Thorson	US Fish and Wildlife Service	Federal Agency
Arvin Trujillo	Navajo Nation	Tribal
Benjamin Tuggle	US Fish and Wildlife Service	Federal Agency
Larry Voyles	Arizona Department of Game and Fish	State
Mary Wagner	US Forest Service	Federal Agency
Phil Ward	Oregon Water Resources Department	State
Brian Wee	National Ecological Observatory Network (NEON)	NGO
Ken Williams	US Geological Survey Cooperative Research Units	Federal Agency
Greg Yarris	California Waterfowl Association	NGO

Central Regional Workshop: June 10-11, 2009 in Denver, Colorado

<i>Name</i>	<i>Affiliation</i>	<i>Category</i>
Leslie Armstrong	US Geological Survey	Federal Agency
Mohammad Baloch	Bureau of Indian Affairs	Federal Agency
Eric Barron	National Science Foundation, National Center for Atmospheric Research	Federal Agency
Kit Batten	Department of the Interior	Federal Agency
Pamela Benjamin	National Park Service	Federal Agency
Gillian Bowser	Colorado State University	Academics
Jean Brennan	Defenders of Wildlife	NGO
Clay Brewer	Texas Parks and Wildlife Department	State Agency
Curtis Brown	Bureau of Reclamation	Federal Agency
Rick Cables	US Forest Service	Federal Agency
Pat Comer	NatureServe	NGO
John Cooper	Association of Fish and Wildlife Agencies	NGO
Andy Dessler	Texas A&M University	Academics
George Dickison	National Park Service	Federal Agency
Tamara Dickinson	US Geological Survey	Federal Agency
Nolan Doesken	Colorado State University	Academics
Cynthia Dohner	US Fish and Wildlife Service	Federal Agency
Lisa Duriancik	Natural Resources Conservation Service	Federal Agency
Kimberly Espy	University of Nebraska	Academics
Leigh Espy	Bureau of Land Management	Federal Agency
Max Ethridge	US Geological Survey	Federal Agency
Curtis Flather	US Forest Service	Federal Agency
Jonathan Foley	University of Minnesota	Academics
George Foster	US Forest Service	Federal Agency
Sharon Friedman	US Forest Service	Federal Agency
Michael Gealt	University of Arkansas at Little Rock	Academics
David Gori	The Nature Conservancy - New Mexico	NGO
Craig Groves	The Nature Conservancy - Worldwide Office	NGO
Stephen Guertin	US Fish and Wildlife Service	Federal Agency
Pat Guinan	University of Missouri Climate Center	Academics
Amy Haak	Trout Unlimited	NGO
Sam Hamilton	US Fish and Wildlife Service	Federal Agency
James Hannon	US Army Corps of Engineers	Federal Agency
Susan Haseltine	US Geological Survey	Federal Agency
Jay Hestbeck	US Geological Survey	Federal Agency
James Hocker	Oklahoma University	Academics
Bill Hohman	Natural Resources Conservation Service	Federal Agency
John Hoskins	Missouri Department of Conservation	State Agency
Kenneth Hubbard	National Oceanic and Atmospheric Administration (NOAA)	Federal Agency
Dale Humburg	Ducks Unlimited	NGO
Ron Huntsinger	Bureau of Land Management	Federal Agency
Skip Hyberg	Farm Services Administration	Federal Agency
David Inouye	University of Maryland	Academics
Sonya Jones	US Geological Survey	Federal Agency
Laura Joss	National Park Service	Federal Agency

Michael Larson	Minnesota Department of Natural Resources	State Agency
Jim Leach	US Fish and Wildlife Service	Federal Agency
Jeff Lusk	Nebraska Game and Parks	State Agency
Joe Maurier	Montana Fish, Wildlife, and Parks	State Agency
Chad McNutt	National Oceanic and Atmospheric Administration (NOAA)	Federal Agency
Tom Melius	US Fish and Wildlife Service	Federal Agency
Jerry Mitchell	National Park Service	Federal Agency
Kevin Moody	Department of Transportation	Federal Agency
Peter Murdoch	US Geological Survey	Federal Agency
Jason Neff	University of Colorado	Academics
Kirk Nelson	Nebraska Game and Parks	State Agency
John Nielsen-Gammon	Texas A&M University	Academics
Monica Norby	University of Nebraska	Academics
Stan Ponce	US Geological Survey	Federal Agency
Janine Powell	US Forest Service	Federal Agency
Paul Prem	University of Nebraska	Academics
Ernie Quintana	National Park Service	Federal Agency
Andrea Ray	National Oceanic and Atmospheric Administration (NOAA)	Federal Agency
Tom Remington	Colorado Division of Wildlife	State Agency
representative	The Nature Conservancy (New Mexico or Colorado)	NGO
Kenny Ribbeck	Louisiana Department of Wildlife and Fisheries	State Agency
Kevin Robbins	National Oceanic and Atmospheric Administration (NOAA)	Federal Agency
Mary Ann Rondinella	Department of Transportation	Federal Agency
Steven Running	University of Montana	Academics
Stephen Saunders	Rocky Mountain Climate Organization	NGO
David Schad	Minnesota Department of Natural Resources	State Agency
Tom Schreiner	Colorado Division of Wildlife	State Agency
Robin Schrock	US Geological Survey	Federal Agency
Jason Shogren	University of Wyoming	Academics
Kitty Smith	USDA Office of Secretary	Federal Agency
Mike Snyder	National Park Service	Federal Agency
Jim Stefanov	US Geological Survey	Federal Agency
Konrad Steffen	University of Colorado	Academics
Mike Stone	Wyoming Game and Fish	State Agency
Tim Sullivan	The Nature Conservancy - Colorado	NGO
Tom Tidwell	US Forest Service	Federal Agency
Alan Townsend	University of Colorado	Academics
Benjamin Tuggle	US Fish and Wildlife Service	Federal Agency
Robert Twilley	Louisiana State University	Academics
Bradley Udall	National Oceanic and Atmospheric Administration (NOAA)	Federal Agency
Randall Updike	US Geological Survey	Federal Agency
Margaret Walsh	US Department of Agriculture	Federal Agency
Greg Watson	US Fish and Wildlife Service	Federal Agency
Robert Webb	National Oceanic and Atmospheric Administration (NOAA)	Federal Agency
Leigh Welling	National Park Service	Federal Agency
Jake Weltzin	National Phenology Network	Federal Agency
Dave White	US Department of Agriculture	Federal Agency

Appendix A: Master Invitee List for All Workshops *Central Regional Workshop continued*

Cathy Whitlock	Montana State University	Academics
Jack Williams	Trout Unlimited	NGO
Janet Wise	National Park Service	Federal Agency
Sally Wisely	Bureau of Land Management	Federal Agency

Final, National Workshop: July 16, 2009 in Arlington, Virginia

<i>Name</i>	<i>Affiliation</i>	<i>Category</i>
Deanna Archuleta	Department of the Interior	Federal Agency
Leslie Armstrong	US Geological Survey	Federal Agency
Tom Armstrong	US Geological Survey	Federal Agency
Dan Ashe	US Fish and Wildlife Service	Federal Agency
Ann Bartuska	US Forest Service	Federal Agency
Kit Batten	Department of the Interior	Federal Agency
Laura Bies	The Wildlife Society	Staff
Mary Boatman	Minerals Management Service	Federal Agency
Jean Brennan	Defenders of Wildlife	NGO
Virginia Burkett	US Geological Survey	Federal Agency
Arpita Choudhury	Association of Fish and Wildlife Agencies	NGO
Cindy Dohner	US Fish and Wildlife Service	Federal Agency
Cliff Duke	Ecological Society of America	Staff
Steve Earsom	DOT Federal Highway Administration	Federal Agency
Wendy Fink	Association of Public and Land-Grant Universities	Academic
Bert Frost	National Park Service	Federal Agency
John Goll	Minerals Management Service	Federal Agency
Sam Hamilton	US Fish and Wildlife Service	Federal Agency
Mike Harris	Georgia Department of Natural Resources, Wildlife Resources Division	State
Susan Haseltine	US Geological Survey	Federal Agency
John Haugland	Environmental Protection Agency	Federal Agency
David Hayes	Department of the Interior	Federal Agency
Jonathan Hoekstra	The Nature Conservancy	NGO
Matt Hogan	Association of Fish and Wildlife Agencies	NGO
Dale Humburg	Ducks Unlimited	NGO
Mark Humpert	Association of Fish and Wildlife Agencies	NGO
Ron Huntsinger	Bureau of Land Management	Federal Agency
Michael Hutchins	The Wildlife Society	Staff
Doug Inkley	National Wildlife Federation	NGO
Tony Janetos	Pacific Northwest National Laboratory	Academic
James Kendall	Minerals Management Service	Federal Agency
Jan Keough	Environmental Protection Agency, Mid-Continent Ecology Division	Federal Agency
Suzette Kimball	US Geological Survey	Federal Agency
D. Fred Matt	Native American Fish and Wildlife Society	Tribal
Corrie Mauldin	Ecological Society of America	Staff
M. Peter McPherson	Association of Public and Land-Grant Universities	Academic
Tim Mealey	Meridian Institute	Staff
Holly Michael	Oregon Department of Fish and Wildlife	State

Marvin Moriarty	US Fish and Wildlife Service	Federal Agency
Robin O'Malley	Heinz Center	NGO
Doug Parsons	Florida Fish and Wildlife Conservation Commission	State
Hardy Pearce	US Geological Survey	Federal Agency
Stephanie Pfirmen	Council of Environmental Deans and Directors	Academic
Joe J. Pinkham	Native American Fish and Wildlife Society	Tribal
Jennifer Pratt Miles	Meridian Institute	Staff
Roger Pulwarty	National Oceanic and Atmospheric Administration (NOAA)	Federal Agency
Jamie Rappaport Clark	Defenders of Wildlife	NGO
Ron Regan	Association of Fish and Wildlife Agencies	NGO
Carlos Rodriguez-Franco	US Forest Service	Federal Agency
David Schad	Minnesota Department of Natural Resources	State
Robin Schrock	US Geological Survey	Federal Agency
Larry Schweiger	National Wildlife Federation	NGO
Mark Sogge	US Geological Survey	Federal Agency
Mike Stone	Wyoming Game and Fish	State
Bill Taylor	National Association of University Fish and Wildlife Programs	Academic
Gary Taylor	Association of Fish and Wildlife Agencies	NGO
Robyn Thorson	US Fish and Wildlife Service	Federal Agency
Greg Wathen	Tennessee Wildlife Resources Agency	State
Robert Webb	National Oceanic and Atmospheric Administration (NOAA)	Federal Agency
Brian Wee	National Ecological Observatory Network (NEON)	NGO
Leigh Welling	National Park Service	Federal Agency
Dave White	USDA Natural Resources Conservation Service	Federal Agency
David Whitehurst	Virginia Department of Game and Inland Fisheries	State
Aleta Wiley	Ecological Society of America	Staff
Jack Williams	Trout Unlimited	NGO
Steve Williams	Wildlife Management Institute	NGO
Chris Zganjar	The Nature Conservancy	NGO

Appendix B: Agendas for All Workshops

(summaries available at <http://nccw.usgs.gov>)

First Workshop, Planning for the NCCWSC December 3-4, 2008, Lansdowne, Virginia

AGENDA

Purpose of the National Climate Change and Wildlife Science Center: To improve the scientific information and forecasting capability of federal and state agencies to respond to global climate change and wildlife adaptation on the landscape using adaptive management strategies and partnerships.

Objectives for the Workshop:

- Generate as much consensus as possible amongst diverse stakeholders on the priorities and organizational approaches for advancing the mission of the NCCWSC.
- Foster constructive dialogue and information sharing among science and wildlife management participants on the objectives and organizational structure of the center.
- Create a clear understanding among workshop participants about the next steps USGS intends to take in the establishment and implementation of the NCCWSC.

DAY 1: WEDNESDAY, DECEMBER 3, 2008

8:00 a.m. Welcome & Opening Remarks

—The Honorable Lynn Scarlett, Deputy Secretary of the Interior

8:20 a.m. Agenda Review

—Tim Mealey, Senior Partner, Meridian Institute

8:30 a.m. Presentation on the NCCWSC Mission, Vision, Overarching Objectives and Organizational Structure

—Susan Haseltine, Associate Director for Biology, U. S. Geological Survey

Proposed Objectives for the NCCWSC include:

1. Build Science Basis and Capacity: Assess and synthesize the current physical and biological scientific knowledge and prioritize scientific gaps in order to forecast the ecological impacts of climate change on fish and wildlife at the ecosystem, habitat, community, population, and species levels.
2. Develop Tools for Adaptive Management: Develop and improve tools to identify, evaluate, and, where appropriate, link together different scientific approaches and models for forecasting the impacts of climate change and adaptation on fish, wildlife and their habitats. Such tools include monitoring, predictive models, vulnerability analyses, risk assessments and decision support systems to help managers make informed decisions.
3. Participate in Adaptive Management and Monitoring: Participate actively in collaborative processes with federal and state agencies and other partner organizations to develop and implement strategies to manage and monitor fish and wildlife adaptation to changing climate.

9:00 a.m. Presentations on Science and Wildlife Management Dimensions:

Challenges to Wildlife Management

—Steve Williams, Wildlife Management Institute

High Resolution Climate Change Projections for Impact Assessments

—Katharine Hayhoe, Texas Tech University

Habitat and Wildlife Response to Climate Change

—Virginia Burkett, U. S. Geological Survey

10:00 a.m. Plenary Q&A Session

- 10:25 a.m. Overview of the Breakout Group Sessions and Process**
- 10:30 a.m. BREAK**
- 10:45 a.m. Breakout Session 1 – First Round of Discussion of NCCWSC Objectives**
- 12:30 p.m. LUNCH**
- 1:30 p.m. Remarks by the Honorable Dirk Kempthorne, Secretary of the Interior**
- 1:50 p.m. Breakout Group Reports from Session 1**
- 2:45 p.m. Breakout Session 2 – Second Round of Discussion of NCCWSC Objectives**
- 5:15 p.m. BREAK**
- 5:30 p.m. Adjourn for the Day**
- 5:45 p.m. Reception**
– Remarks by Mark Myers, Director of the U. S. Geological Survey

DAY 2: THURSDAY, DECEMBER 4, 2008

- 8:00 a.m. Breakout Session 3 – Third Round of Discussion of NCCWSC Objectives**
- 9:00 a.m. BREAK**
- 9:15 a.m. Breakout Group Reports from Session 2 & 3 and Overarching Insights on NCCWSC Objectives**
- 11:00 a.m. Panel of Climate Change Science and Wildlife Management Experts Respond to Breakout Group Reports**
– Dan Ashe, Senior Advisor to the Director, U. S. Fish and Wildlife Service
– John Gross, Inventory and Monitoring Program, U. S. National Park Service
– Doug Parsons, Association of Fish and Wildlife Agencies
– Michael MacCracken, Chief Scientist for Climate Change, Climate Institute
- 12:15 p.m. LUNCH**
- 1:15 p.m. Breakout Session 4 – Organizational Approaches for Advancing the Mission and Objectives of the NCCWSC**
- 2:15 p.m. BREAK**
- 2:30 p.m. Breakout Group Reports on Organizational and Phased Approaches**
- 3:30 p.m. Overview of Workshop Results**
– Tim Mealey, Senior Partner, Meridian Institute
- 3:40 p.m. Closing Remarks**
– Susan Haseltine, Associate Director for Biology, U. S. Geological Survey
- 4:00 p.m. ADJOURN**

Suggested Discussion Topics Regarding the Proposed Objectives for the NCCWSC

- 1. Build Science Basis and Capacity:** Assess and synthesize the current state of knowledge and prioritize scientific research needs to predict the impacts of climate change on fish and wildlife at the species, population, community, habitat and ecosystem levels.

Suggested Discussion Topics:

- a. What information should the Center be synthesizing regarding the impacts of climate change on fish and wildlife? Are there existing data, databases, research capacities and structures critical to climate change forecasting?
- b. What are some important research priorities to improve gaps for which we need research and monitoring to predict the impact of climate change on fish and wildlife?

- c. What collaborations already exist that could be built upon and what partnership approaches should be taken to achieve this objective?
- 2. Develop Tools for Adaptive Management:** Develop new tools and improve existing tools to identify, evaluate, and, where appropriate, link together different scientific approaches and models for forecasting the impacts of climate change and adaptation on fish and wildlife at the species, population, community, habitat, and ecosystem levels. Such tools include predictive models, vulnerability analyses, risk assessments and decision support systems to help managers make informed decisions.
Suggested Discussion Topics:
 - a. What should be the Center's focus regarding the development of new tools or improvements to existing approaches and tools?
 - b. What are some important opportunities for partnerships and challenges associated with the development of new tools?
 - c. What information streams need to be synthesized to update tools and models?
- 3. Participate in Adaptive Management and Monitoring:** Participate actively in collaborative processes with federal and state agencies and other partner organizations in developing adaptive management strategies and managing for adaptation to meet the challenges of managing fish and wildlife in a changing climate.
Suggested Discussion Topics:
 - a. What role and value added contribution should the NCCWSC play in contributing to monitoring activities?
 - b. What lessons have been learned about science applications for adaptive management to date that should be applied to the NCCWSC?
 - c. What role should NCCWSC staff play when participating actively in adaptive management planning and evaluation processes?

Organizational Approaches for Advancing the Mission and Objectives of the NCCWSC

Suggested Discussion Topics:

- a. Are there particular organizational models and approaches that are worthy of consideration for the NCCWSC? If so, what are they?
- b. Should there be a phased approach to establishing the NCCWSC and implementing the objectives? If so, how should it be phased?

Eastern Regional Workshop

May 6-7, 2009, Patuxent Research Refuge, Laurel, Maryland

AGENDA

Workshop purpose: Bring together a broad range of stakeholders (federal, state, academic and NGO) who will collaborate directly with the NCCWSC to develop the structures and mechanisms needed to link climate science to wildlife and natural resource management in the U.S.

Desired outcomes:

- Familiarization with NCCWSC concept and status of 2009 implementation efforts
- Recommendations for NCCWSC objectives, priorities, and structure
- Preliminary scoping of potential regional hubs

DAY 1: WEDNESDAY, MAY 6, 2009

- 8:00 a.m. Coffee, Continental Breakfast, and Registration**
- 8:30 a.m. Welcome**
– Brad Knudsen, Refuge Manager
- 8:35 a.m. Welcome, Opening Remarks, and Introduction of Regional Executives**
– William Werkheiser, Regional Director, U.S. Geological Survey
- 8:55 a.m. Review Workshop Purpose and Agenda**
– Tim Mealey, Senior Partner, Meridian Institute
- 9:00 a.m. Presentation on the NCCWSC and the Regional Hub Collaboration Concept**
– Susan Haseltine, Associate Director for Biology, U.S. Geological Survey
- 9:30 a.m. Presentation on Related Activities of the USGS Global Climate Change Programs**
– Tom Armstrong, Senior Advisor for Global Climate Change Programs, U.S. Geological Survey
- 10:00 a.m. Plenary Session: Questions and Discussion Regarding USGS Global Climate Change Program and the NCCWSC**
- 10:30 a.m. Break and Transition to Breakout Groups**
- 10:50 a.m. Breakout Groups Provide Input on Proposed NCCWSC Objectives, Priorities and Structure**
Participants will be divided into three groups of approximately 15 people each, organized along regional area geographic lines (e.g. NE, SE, Midwest). Each breakout group will have a balance of federal, state, academic and non-governmental organization participants. Each breakout group will discuss options regarding NCCWSC objectives, priorities and structure synthesized from the 2008 national workshop.
- 12:30 p.m. Lunch**
- 1:30 p.m. Report Out by Breakout Groups**
- 2:00 p.m. Questions and Discussion**
- 2:15 p.m. Example of Existing Work in the Region on Climate Change Science and Natural Resources Management**
– Cindy Dohner, Deputy Director, U.S. Fish and Wildlife Service Southeast Region
– Sonya Jones, Program Officer, U.S. Geological Survey Southeast Regional Area
Cindy Dohner and Sonya Jones will provide an overview of the Southeastern Regional Assessment. Following this, Meridian Institute will share highlights of other climate science efforts in the region based on the information submitted in response to the pre-workshop request for information.
- 2:45 p.m. Plenary Discussion: Brainstorm Ideas about Regional Climate Science Hubs in the Eastern Region**
What are some existing efforts that could become part of a regional hub?
What work could be done to develop regional hubs?
- 3:45 p.m. Summary of Day 1 Accomplishments and Review Day 2 Agenda**
– Tim Mealey, Senior Partner, Meridian Institute
- 4:30 p.m. Adjourn**

DAY 2: THURSDAY, MAY 7, 2009

- 8:00 a.m. Coffee**
- 8:30 a.m. Breakout Groups Explore Potential Regional Hubs**
Building on the previous day's work, breakout groups organized along regional area lines will

reconvene to scope out potential regional hub partners, location, needs and activities. We anticipate that there will be different levels of familiarity with the NCCWSC and regional hub concepts in the three regional areas, and therefore the discussions that occur in the three breakout groups will vary – some will be exploratory in nature, while others will be further developed.

10:30 a.m. Break

10:45 a.m. Report Outs on Potential Regional Hubs

Each group will have 15 minutes to report the results of their discussion along with key questions or issues that arose.

11:30 a.m. Closing Remarks Panel

This panel will share their observations about the outcomes of the discussions at the workshop and next steps for forming Regional Climate Science Hubs in the Eastern Region. Participants will then be invited to discuss issues, opportunities and next steps in response to the panel's comments.

12:15 p.m. Summary of Workshop Results and Next Steps

– Susan Haseltine, Associate Director for Biology, U. S. Geological Survey

12:30 p.m. ADJOURN

Western Regional Workshop June 4-5, 2009, Seattle, Washington

AGENDA

Workshop purpose: Bring together a broad range of stakeholders (federal, state, academic and NGO) who will collaborate directly with the NCCWSC to develop the structures and mechanisms needed to link climate science to wildlife and natural resource management in the U.S.

Desired outcomes:

- Familiarization with NCCWSC concept and status of 2009 implementation efforts
- Recommendations for NCCWSC objectives, priorities and structure
- Preliminary scoping of potential regional hubs

DAY 1: THURSDAY, JUNE 4, 2009

9:00 a.m. Coffee and Registration

Participants will register, purchase a meal ticket, and make a lunch selection.

9:30 a.m. Welcome, Opening Remarks, and Introduction of Regional Executives

– Anne Kinsinger, Western Regional Director, U.S. Geological Society

9:50 a.m. Review Workshop Purpose and Agenda

– Timothy Mealey, Senior Partner, Meridian Institute

10:00 a.m. Presentation on the NCCWSC and the Regional Hub Collaboration Concept

– Susan Haseltine, Associate Director for Biology, U. S. Geological Survey

10:30 a.m. Presentation on Related Activities of the USGS Global Change Programs

– Pat Jellison, Global Change Research and Development Coordinator, U.S. Geological Survey

11:00 a.m. Plenary Session: Questions and Discussion Regarding USGS Global Change Programs and the NCCWSC

11:30 a.m. Lunch

- 12:30 p.m. Breakout Groups: Review and Provide Input on Proposed NCCWSC Objectives, Priorities, and Structure**
Participants will be divided into three groups of approximately 15 people each. Each breakout group will have a balance of federal, state, academic and non-governmental organization participants. Each breakout group will discuss and provide feedback on the proposed NCCWSC objectives, priorities, and structure.
- 2:30 p.m. Break and Transition back to Plenary**
- 2:50 p.m. Report Out by Breakout Groups**
Each breakout group will have 10 minutes to present the key points from their discussions.
- 3:20 p.m. Plenary Session: Questions and Discussion Regarding Breakout Group Reports**
- 3:40 p.m. Overview of the Southeastern Regional Assessment**
– Cindy Dohner, Deputy Director, U.S. Fish and Wildlife Service Southeast Region
– Sonya Jones, Program Officer, U.S. Geological Survey Southeast Regional Area
- 4:00 p.m. Examples of Existing Work in the Region on Climate Change Science and Natural Resources Management**
Meridian Institute will provide a summary of responses to the Request for Information.
- 4:10 p.m. Plenary Session: Discussion of Existing Work in the Region on Climate Science and Natural Resources Management and How to Organize Regional Climate Science Hubs**
What other work is taking place on climate change and natural resources management? Do the proposed boundaries of regional hubs make sense? If not, how should they be changed?
- 4:30 p.m. Breakout Session: Brainstorm Ideas for Potential Regional Climate Science Hubs**
Participants will divide into groups to brainstorm ideas for potential Regional Climate Hubs, including what science-management questions need to be addressed to develop and monitor climate adaptation strategies in this area.
- 5:30 p.m. Plenary Session: Summary of Day 1 Accomplishments and Review Day 2 Agenda**
– Tim Mealey, Senior Partner, Meridian Institute
- 5:45 p.m. Adjourn**
- 6:30 p.m. Group Dinner**
The Regional Director's office will identify a local restaurant where participants who would like to can dine together.

DAY 2: FRIDAY, JUNE 5, 2009

- 9:00 a.m. Breakout Groups Explore Potential Regional Hubs**
Building on the previous day's work, breakout groups will reconvene to scope out potential regional hub partners, location, needs and activities.
- 10:30 a.m. Break**
- 10:45 a.m. Report Outs on Potential Regional Hubs**
Each group will have 10 minutes to report the results of their discussion.
- 11:15 a.m. Closing Remarks Panel**
This panel will share their observations about the discussions at the workshop and next steps for forming Climate Science Hubs in the Region. Participants will then be invited to discuss issues, opportunities and next steps in response to the panel's comments.
- 12:15 p.m. Summary of Workshop Results and Next Steps**
–Susan Haseltine, Associate Director for Biology, U. S. Geological Survey
- 12:30 p.m. ADJOURN**

Central Regional Workshop

June 10-11, 2009, Denver, Colorado

AGENDA

Workshop purpose: Bring together a broad range of stakeholders (federal, state, academic, and non-governmental organization) who will collaborate directly with the NCCWSC to develop the structures and mechanisms needed to link climate science to wildlife and natural resource management in the U.S.

Desired outcomes:

- Familiarization with NCCWSC concept and status of 2009 implementation efforts
- Feedback on proposed NCCWSC priorities and structure
- Recommendations for NCCWSC regional hubs

DAY 1: WEDNESDAY, JUNE 10, 2009:

- 8:00 a.m. Coffee, Continental Breakfast, and Registration**
Participants will register and purchase a meal ticket.
- 8:30 a.m. Welcome, Opening Remarks, and Introduction of Regional Executives**
– Stan Ponce, Regional Director, Central Region, U.S. Geological Survey
- 8:45 a.m. Review Workshop Purpose and Agenda**
– Tim Mealey, Senior Partner, Meridian Institute
- 8:55 a.m. Opening Remarks**
– Kit Batten, Science Advisor to the Deputy Secretary of the Interior, Department of the Interior
- 9:10 a.m. Presentation on the NCCWSC and the Regional Hub Collaboration Concept**
– Susan Haseltine, Associate Director for Biology, U. S. Geological Survey
- 9:40 a.m. Presentation on Related Activities of the USGS Global Change Programs**
– Tom Armstrong, Senior Advisor for Global Change Programs, U.S. Geological Survey
- 10:00 a.m. Plenary Session: Questions and Discussion Regarding USGS Global Climate Change Program and the NCCWSC**
- 10:30 a.m. Break and Transition to Breakout Groups**
- 10:50 a.m. Breakout Groups Provide Input on Proposed NCCWSC Priorities and Structure**
Participants will be divided into three groups of approximately 15 people each. Each breakout group will have a balance of federal, state, academic and non-governmental organization participants. Each breakout group will discuss proposed NCCWSC priorities and structure.
- 12:30 p.m. Lunch**
- 1:30 p.m. Report Out by Breakout Groups**
- 2:00 p.m. Plenary Session: Questions and Discussion of Reports Outs**
- 2:15 p.m. Overview of the Southeast Regional Assessment**
– Cindy Dohner, Deputy Director, U.S. Fish and Wildlife Service Southeast Region
– Sonya Jones, Program Officer, U.S. Geological Survey Southeast Regional Area
- 2:35 p.m. Examples of Existing Work in the Region on Climate Change Science and Natural Resources Management**
Meridian will provide a summary of responses to the pre-workshop Request for Information.

- 2:45 p.m. Plenary Session: Discussion of Existing Work in the Region on Climate Science and Natural Resources Management and How to Organize Regional Climate Science Hubs**
- 3:00 p.m. Break and Transition to Breakout Groups**
- 3:20 p.m. Breakout Session: Brainstorm Ideas for Potential Regional Climate Science Hubs**
- 5:00 p.m. Adjourn**
- 6:00 p.m. Group Dinner**
Dinner will be on your own. Participants who would like to can dine together at Simm's Landing.

DAY 2: THURSDAY, JUNE 11, 2009:

- 8:00 a.m. Coffee**
- 8:30 a.m. Breakout Groups Explore Potential Regional Hubs**
Building on the previous day's work, breakout groups will reconvene to scope out potential regional hub partners, location, needs and activities.
- 10:30 a.m. Break**
- 10:45 a.m. Report Outs on Potential Regional Hubs**
- 11:15 a.m. Closing Remarks Panel**
Representatives from a diverse array of perspectives will share their observations about the discussions at the workshop and next steps for forming Climate Science Hubs in the Region. Participants will then be invited to discuss issues, opportunities and next steps in response to the panel's comments.
- 12:15 p.m. Summary of Workshop Results and Next Steps**
–Susan Haseltine, Associate Director for Biology, U. S. Geological Survey
- 12:30 p.m. ADJOURN**

Final, National Workshop July 16, 2009, Arlington, Virginia

AGENDA

Workshop Purpose: To review and provide input on the proposed NCCWSC 5-year strategy.

- 8:15 a.m. Coffee and Registration**
- 8:30 a.m. Welcome, Introductions, and Agenda Review**
–Tim Mealey, Senior Partner, Meridian Institute
- 8:45 a.m. Welcome and Opening Remarks**
–Deanna Archuleta, Deputy Assistant Secretary for Water and Science
- 9:00 a.m. Overview of Proposed NCCWSC Strategic Plan**
–Susan Haseltine, Associate Director for Biology, U. S. Geological Survey
- 9:40 a.m. Clarifying Questions**
This will be an opportunity for participants to get clarification about parts of the overview presentation about which they have questions.

- 10:00 a.m. Break**
- 10:15 a.m. General Feedback on the Proposed NCCWSC Strategy**
 Participants will be invited to provide feedback on the proposed strategy as a whole during this time. Later in the day, participants will be asked to provide input on specific, pre-identified issues related to the Center. In addition, attendees will have an opportunity to identify one or two other issues on which they would like to provide input.
- 11:45 a.m. Lunch**
- 12:45 p.m. Input on the Relationship between NCCWSC Regional Climate Science Hubs and Application Partnerships**
- How to ensure that Application Partnerships get engaged early on?
 - What mechanisms or processes are needed to ensure information learned from application of climate science information is fed back to the NCCWSC and its partners?
- 1:45 p.m. Feedback on the Proposed Functions and Composition of National Advisory Board and Regional Advisory Councils for the NCCWSC**
- What are your general reactions to the proposed functions and composition of the National Advisory Board and Regional Advisory Councils?
 - Should there be a connection between the National Advisory Board and Regional Advisory Councils?
- 2:45 p.m. BREAK**
- 3:00 p.m. Discussion of Issue(s) Identified by Participants**
 This time is set aside for discussion of an aspect of the Center that participants would like to provide input on, to be identified at the beginning of the meeting.
- 4:00 p.m. Summary of Input Provided**
 –Tim Mealey, Senior Partner, Meridian Institute
- 4:15 p.m. Round Robin – Closing Thoughts from Participants**
- 4:30 p.m. Next steps**
 –Susan Haseltine, Associate Director for Biology, U. S. Geological Survey
 –Cliff Duke, Ecological Society of America
 –Michael Hutchins, The Wildlife Society
- 5:00 p.m. Adjourn**

Appendix C: USGS National Climate Change and Wildlife Science Center (NCCWSC) Regional Workshops Request for Information

The USGS National Climate Change and Wildlife Science Center (NCCWSC) will conduct three regional workshops across the United States in May and June to provide information about and get input on the NCCWSC conceptual approach to developing and implementing a science-management interface between climate change science and natural resource management. The conceptual approach is based on stakeholder input provided at a workshop and interim steering committee meetings held in 2008.

In preparation for these workshops, the Meridian Institute is collecting information about existing partnerships and work related to climate change science and wildlife and natural resources management in your area. Please inform us about the work you are currently doing by sending your response to the following questions to Aleta Wiley, The Ecological Society of America, at Aleta@esa.org or by fax 202.833.8775 by close of business on Friday, May 1, 2009.

- 1. What are you currently doing?** Please describe climate science work and/or efforts to link climate science to fish and wildlife and natural resources management that you and your agency or organization are engaged in or know about, including:
 - a. the purpose of your work
 - b. key parties involved and their roles
 - c. current activities and capabilities
 - d. names and contact information for other people we should contact to learn more about this or related efforts
- 2. What is your single top climate challenge?**
- 3. What are your needs?** Please indicate the climate change information you need for adaptive management of wildlife and natural resources in your region.
 - a. downscaling global climate models
 - b. monitoring of species and habitat response to climate change
 - c. ecological and population forecasting
 - d. monitoring related to information needs for land/water use interactions and climate change
 - e. other? _____
- 4. What are your priorities?** What applications of forecasts for wildlife and habitat response to climate change will be a priority of your agency or organization in the near future?
- 5. What is the best way to share information?** Please share your suggestions for how to exchange climate science and wildlife and natural resource response information between national and regional activities, between scientists and managers, and with the public.
- 6. Are you interested in participating in development of Regional Climate Science Hubs of the NCCWSC?** Would you be interested in partnering with the NCCWSC and others to develop a regional “Hub” of the Center to exchange information about global climate models, regional ecological and biological response modeling, and vulnerability analyses, and to participate in applications of this information to the management of fish and wildlife and natural resources in your region?

Appendix D: FY09 Omnibus Appropriations Act – USGS Section

FY 2009 Omnibus Appropriations Act USGS Section of Explanatory Statement Submitted by Mr. Obey

United States Geological Survey
Surveys, Investigations, and Research

Appropriation enacted, 2008	\$1,006,480,000
Budget estimate	986,516,000
Bill, 2009	1,043,803,000
Comparisons:	
Appropriations, 2008	+37,323,000
Budget estimate, 2009	+75,287,000

The detailed allocation of funding by program, activity and subactivity is included in the table at the end of this section of the statement. The bill includes the proposed global change research technical adjustments which move funds from several activities into the global change activity. The proposed reductions for travel are not included for any activity. In addition, the bill also includes the following specific funding levels and directions:

Geographic Research and Remote Sensing. The bill includes \$1,000,000 for the national cooperative geographic information system mapping program but does not include the funding increase requested for the national land imaging program. The bill includes the requested reduction for geographic research and the transfer of priority ecosystems science funding to biological research. The bill fully funds the budget request of \$24,150,000 for the Landsat Data Continuity Mission and \$16,000,000 to continue the Landsat 5/7 program. Satellite development and launch costs associated with future US Geological Survey (USGS) land remote sensing operations should not be transferred from the National Aeronautics and Space Administration (NASA) to the Department of the Interior (DOI). These are functions that are not a component of current DOI operations but clearly fall within NASA's jurisdiction. Until a new plan for future land imaging and remote sensing coordination is drawn up that evaluates how satellite development, launch and operations should be funded, DOI should not undertake any action that attempts to assume the funding responsibilities that have traditionally been a part of the NASA budget.

Geological Hazards Assessments. The bill includes \$3,000,000 for the earthquakes portion of the multi-hazards initiative and \$500,000 for the one-time costs of seismological equipment at the Arkansas Seismological Observatory, but the requested reduction for earthquake grants is not included. There is a general increase of \$2,000,000 for volcano hazards research. The Survey should evaluate ongoing needs for important volcano research and monitoring in active areas, such as Hawaii, Yellowstone, the Cascades and Alaska, where the USGS maintains observatories. The bill also includes a \$1,500,000 increase for the global seismographic network.

Geologic Landscapes and Coastal Assessments. The bill does not include the funds requested for the water census. The Administration should revisit that issue and consider resubmitting a more integrated program request in the next budget cycle. The bill moves funds for priority ecosystems science from earth surface dynamics to biological research as requested, and provides \$750,000 for Great Lakes region geological mapping within the National cooperative geologic mapping subactivity. The bill includes \$3,000,000 for extended continental shelf mapping in the Arctic Ocean, a total of \$1,000,000 for the ocean action plan coastal geology effort, and \$500,000 for California sea floor mapping.

Geologic Resources Assessments. The bill provides the fiscal year 2008 funding level for the minerals resources activities and assessments and includes \$650,000 to initiate a minerals resource assessment of federal lands in Nye County, Nevada, in collaboration with the University of Nevada, Las Vegas and the Nevada Bureau of Mines and Geology. The Survey's April 2008 petroleum resource assessment of the Bakken Formation was an important benchmark to further our nation's energy security. The Survey is strongly encouraged to expedite its efforts to conduct further applicable assessments or make additional data publicly available that can demonstrate the full range of energy resources in the stratigraphic sequences surrounding the Bakken Formation.

Ground Water Resources. The bill does not provide funding for the Water for America initiative but it does include a \$500,000 general increase and \$900,000 for San Diego, CA, aquifer mapping. Although funding is not provided for new aspects of the Water for America initiative, the importance of this work is recognized and future budgets should consider a more integrated program request for this work.

National Water Quality Assessment. The bill does not include the large reduction requested for this vital program.

Toxic Substances Hydrology. As requested, the bill transfers funds for priority ecosystems science to the biological research program. In disagreement with the budget request, the bill continues funding for amphibian research and monitoring but moves that amount to biological research where the work will be accomplished.

Hydrologic Research & Development. The bill provides \$270,000 to continue the Hood Canal, WA dissolved oxygen study, \$295,000 to maintain the San Pedro River partnership, AZ, \$400,000 for the Long Term Estuary Assessment Group, LA, and \$500,000 to continue work pursuant to the US-Mexico Transboundary Aquifer Assessment Act.

National Streamflow Information Program. The bill does not include funds for the Water for America initiative but does include a general increase of \$2,000,000 for the stream gage program.

Hydrologic Networks and Analysis. The bill maintains the fiscal year 2008 funding level for the ocean action plan in this subactivity, provides \$497,000 to continue the Lake Champlain basin toxic materials study and \$500,000 to maintain Hawaii water resources monitoring activities. The Survey is encouraged to evaluate the need for selenium studies in Colorado and, to the extent possible, incorporate that work into other ongoing hydrologic research in the area.

Biological Research. The bill includes the following: a total of \$750,000 for the Healthy Lands Initiative; the requested funds for priority ecosystems science; the fiscal year 2008 level for Pacific Northwest forest biology; \$650,000 for contaminant and endocrine biology research; \$200,000 for the science excellence program with the Fish and Wildlife Service; \$500,000 to maintain the San Francisco, CA salt ponds restoration science; \$800,000 to maintain the Leetown, WV molecular biology effort; \$750,000 to maintain amphibian research and monitoring; a \$1,000,000 increase for Great Lakes biological sciences; and a total of \$5,000,000 for National Biological Information Infrastructure. The Survey is encouraged to provide full support for the southern sea otter science and monitoring effort.

Facilities. The bill provides the budget request, plus an additional \$4,000,000 for the deferred maintenance and capital improvement activity to continue the on-going project begun last year.

Global Climate Change Research. The bill includes all of the internal funding transfers recommended by the Survey in order to establish this new budget activity, and an increase of \$14,045,000 above the total request. Within the amounts provided, \$10,000,000 is for the National Global Warming and Wildlife Science Center and at least \$3,000,000 is to implement required geological and biological carbon sequestration studies as required by sections 711, 712 and 714 of the Energy Independence and Security Act of 2007.

The National Global Warming and Wildlife Science Center funding includes \$2,500,000 to complete establishment of the Center. Additionally, the funding allows the Center to develop mechanisms that will ensure that it is responsive to the research and management needs of Federal and State agencies regarding the impacts of global warming on fish, wildlife, plants and ecological processes and the mechanisms for adaptation to, mitigation of, or prevention of those impacts. The recommendation also includes \$7,500,000 for the Center to fund research projects, including use of external and independent scientific peer review, to address the needs of resource management agencies and the American public through greatly accelerated global warming research and through development of decision support tools.

The Secretary, with the assistance of the USGS National Climate Change and Wildlife Science Center and a science advisory board, including members recommended by the National Academy of Sciences, should initiate development of a national strategy to assist fish, wildlife, plants, and associated ecological processes in becoming more resilient, adapting to, and surviving the impacts of climate change. In developing this national framework for flora and fauna conservation in a changing climate, the Secretary should consult with other Federal agencies, State fish, wildlife and conservation data agencies, Territories, Tribes, scientists, and stakeholders, and the Secretary should provide the public with notice and opportunity for comment.



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Committee Member Information

**Members of the
Advisory Committee on Climate
Change and Natural Resource Science (ACCCNRS)**

- David Behar, co-chair, Climate Program Director, **San Francisco Public Utilities Commission / Water Utilities Climate Alliance**
- Matthew Larsen, co-chair, Associate Director Climate and Land Use Change. *Alternate*, Sarah Ryker, Deputy Associate Director, **U.S. Geological Survey**
- Paul Beier, President, **Society for Conservation Biology**
- Ed Carter, Director, **Tennessee Wildlife Resources Agency and the Southeastern Association of Fish and Wildlife Agencies**
- Gabriela Chavarria, Science Advisor. *Alternate*: David Patte, Senior Advisor, Pacific region, **U.S. Fish and Wildlife Service**
- Ann Marie Chischilly, Executive Director, **Institute for Tribal Environmental Professionals (ITEP)**
- Clifford Duke, Director of Science Programs, **Ecological Society of America**
- Herbert C. Frost. Associate Director, Natural Resource Stewardship and Science, *Alternate*: Leigh Welling, Director Climate Change Program, **U.S. National Park Service**
- Peter Frumhoff, Director of Science and Policy, **Union of Concerned Scientists**
- Kimberly Hall, Great Lakes Climate Change Ecologist, **The Nature Conservancy**
- Lara Hansen, Founder, Chief Scientist, and Executive Director, **EcoAdapt**
- Lynn Helbrecht, Climate Change Coordinator, Dept. of Fish and Wildlife, **Washington, and the Western Association of Fish and Wildlife Agencies**
- William Hohenstein, Director, Climate Change Program Office, *Alternate*: David Cleaves, Climate Change Advisor to the Chief, US Forest Service, **U.S. Department of Agriculture**
- Larry Irwin, NCASI Fellow. *Alternate*: Ben Wigley, Mgr. Sustainable Forest Research, **National Council for Air and Stream Improvement, Inc.** (forest industry research organization)

- Noah Matson, Vice President for Climate Change and Natural Resources Adaptation.
Alternate: Natalie Dubois, **Defenders of Wildlife**
- Richard Merrick, Chief Science Advisor, NOAA Fisheries. *Alternate:* Adam Parris, RISA Program Manager, **National Oceanic and Atmospheric Administration**
- Berrien Moore, Vice President, Weather and Climate and Director National Weather Center.
Alternate: Paul Risser Chair and Chief Operating Officer, University Research Cabinet,
University of Oklahoma (host to South Central CSC)
- Gary Morishima, Technical Advisor to the Chairman, **Quinault Nation**
- John O’Leary, State Wildlife Action Plan Coordinator, **State of Massachusetts** and the
Northeast Association of Fish and Wildlife Agencies. *Alternate,* Karen Bennett,
Landscape Conservation Coordinator, Delaware Division of Fish and Wildlife and the
Northeast Association of Fish and Wildlife Agencies
- Jeffrey Peterson, Senior Advisor, Office of Water, **U.S. Environmental Protection Agency**
- Robert Pietrowsky, Director, Water Resources Institute. *Alternates:* Jeffrey Arnold, Senior
Climate Scientist and Paul Wagner, Senior Environmental Scientist, **U.S. Army Corps of Engineers**
- Bruce Stein, Director, Climate Change Adaptation, *Alternate:* Douglas Inkley, **National
Wildlife Federation**
- John Sullivan, Director, Science Services; *Alternate:* Karl Martin, Chief, Wildlife and
Forestry Research Section, **Wisconsin Department of Natural Resources and the
Midwest Association of Fish and Wildlife Agencies**
- Bradley Udall, Director of the Getches-Wilkinson Center for Natural Resources, Energy and
the Environment., University of Colorado. *Alternate:* Richard Palmer, Professor and Chair,
Department of Civil and Environmental Engineering, University of Massachusetts/Amherst
(host, NE CSC), **University of Colorado** (member of SW and North Central CSCs)
- Jeffrey Williams, Manager, Climate Consulting, **Entergy, Inc.**

Advisory Committee on Climate Change and Natural Resource Science

Member Biographies

Defenders of Wildlife

Noah Matson (Member)

Mr. Noah Matson is a conservation leader with over fifteen years of experience in the national environmental policy non-profit community. He is currently the Vice President for Landscape Conservation and Climate Adaptation with the Defenders of Wildlife in Washington DC, where he leads the organization's climate adaptation portfolio, and its programs to improve the stewardship of national wildlife refuges, national forests, and other public lands, as well as landscape conservation policy initiatives. From 2009-2012, he served as the Vice President for Climate Change and Natural Resources Adaptation with the Defenders of Wildlife where he established new climate change department within the organization to focus, expand, and coordinate the Defenders' climate change programs. In this position, he also served as a policy leader in successful coalition effort to incorporate natural resource adaptation into several comprehensive climate change and stand-alone adaptation bills. Mr. Matson has also worked as a Vice President for Land Conservation, a Director of Federal Lands Program, and as a Science Policy Analyst within the Defenders of Wildlife. Mr. Matson received his B.S. in Biology and Geology from the University of Rochester, and his Masters in Environmental Management from the Yale University.

Natalie Dubois (Alternate)

Dr. Natalie S. Dubois serves as a Climate Change and Wildlife Scientist for the Defenders of Wildlife in Washington, DC, where she provides technical and scientific guidance pertaining to climate change impacts and adaptation planning for wildlife management and conservation, and works with state agencies and other conservation organizations to incorporate climate change into strategic conservation planning. In this position, Dr. Dubois has developed a framework integrating climate change into the Open Standards for the Practice of Conservation which is being used by the California Department of Fish and Game for the State Wildlife Action Plan. In addition, she has received State Wildlife Grant funding to help the Florida Fish and Wildlife Conservation Commission incorporate climate change into planning and decision-making as part of the agency's integrated climate change response strategy. Previously, she served as a Conservation Planning Associate for the Defenders of Wildlife, a LandScope America Intern with NatureServe, and as a Research

Associate for the American Association for the Advancement of Science and the Department of Biological Sciences in Ohio University. Dr. Dubois holds a B.A. in Biology and French from the Albion College, and a Ph.D. in Ecology, Evolutionary Biology and Behavior and Zoology from the Michigan State University.

EcoAdapt

Lara Hansen (Member)

Dr. Lara Hansen is the Chief Scientist, Executive Director and Co-Founder at EcoAdapt where she develops climate change strategies, plans and actions with governments, non-governmental organizations and private entities in need of support; trains managers and planners in the science, philosophy and practice of climate change adaptation; facilitates the creation of a climate change adaptation field; and helps with the co-creation of the Climate Adaptation Knowledge Exchange. From 2001-2008, Dr. Hansen served as the Chief Scientist and Director of Climate Change Impacts and Adaptation Program with the World Wildlife Fund(WWF) where she developed and advised on management and conservation goals for the WWF and their partners in the field. Dr. Hansen has also served research roles with the U.S. Environmental Protection Agency and the University of California – Davis, and has had teaching experiences at the University of California, Johns Hopkins University and Pensacola Junior College. She is the author of numerous scientific publications, as well as two of the leading books on adaptation planning. Dr. Hansen received her B.A. from the University of California, Santa Cruz, and her Ph.D., in Ecology from the University of California, Davis.

Ecological Society of America

Clifford Duke (Member)

Dr. Clifford Duke directs the Ecological Society of America's (ESA) Office of Science Programs, which promotes the continued development of ecological science and its integration into decision-making and education. Projects that he has led at ESA include a series of outreach workshops for the National Climate Change and Wildlife Science Center. He is also an ESA representative to the American Association for the Advancement of Science's Science and Human Rights Coalition and serves on the National Research Council's (NRC) Board on Research Data and Information and the Sustainable Rangelands Roundtable's Steering Committee. He previously served on the NRC Committee on Sustainable Development of Algal Biofuels and US EPA's Board of Scientific Counselors. Before assuming his current position at ESA in 2003, Dr. Duke worked for thirteen years as a consultant in environmental impact analysis and project management on National Environmental Policy Act (NEPA) and Comprehensive Environmental Response,

Compensation and Liability Act (CERCLA) projects for defense, transportation, and waste management facilities nationwide. He previously held postdoctoral research positions at Northeastern University, Wellesley College, and Harvard University. His career combines expertise in environmental science with a commitment to the effective application of science to public policy. He received his Ph.D. in Botany in 1985, and a M.A. in Public Policy Science in 1986, both from Duke University.

Entergy

Jeffrey Williams (Member)

Mr. Jeffrey Williams is the Director of Climate Consulting at Entergy where he plays an important role in helping Entergy manage carbon risk, and help business units develop strategy to build resilient communities, prosper in a carbon constrained economy and execute future sustainable growth opportunities. Mr. Williams has been a strong advocate for taking proactive, responsible action to manage climate risks and build cost effective resilience to a changing climate, and has implemented innovative climate change, sustainable development, environmental management system, renewable energy, behavioral safety, human error reduction, quality improvement and environmental excellence initiatives. From 2003-2008, he served as the Manager of Corporate Environmental Initiatives with Entergy where was responsible for planning and executing Entergy's Greenhouse Gas Stabilization Commitment and managing a \$25 million Environmental Initiatives Fund. In this duty, Mr. Williams orchestrated sustainable development initiatives that helped business units contribute to the company's competitiveness, profitability and environmental leadership position; conducted outreach and maintained constructive relationships with environmental groups, conservation groups, government agencies and the socially responsible investment community; provided strategic input developing Entergy's environmental "Points of View"; and championed renewable energy growth opportunities. Mr. Williams has also held professional positions with the AEOCOM, Spectra Environmental, and Rochester Gas and Electric. He graduated with a B.A. in Biology from Olivet College and an M.S. in Environmental Sciences from the University of Rochester.

Massachusetts/Northeast Association of Fish and Wildlife Agencies

John O'Leary (Member)

Mr. John O'Leary is the State Wildlife Action Plan Coordinator for the Massachusetts Division of Fisheries and Wildlife (MDFW). In this position, he is responsible for coordinating the creation of the State Wildlife Action Plan and supervising the MDFW Private Lands Management Program. Mr. O'Leary also serves as the MDFW representative to the Non-game Migratory Bird Technical Section of the Atlantic Flyway Council, the

USDA Natural Resources Conservation Service (NRCS) State Technical Committee, and for Natural Resource Damage claims administered through the Executive Office of Environmental Affairs. Prior to this position, Mr. O'Leary was the Westfield and Farmington River Watershed Team Leader for the Massachusetts Executive Office of Environmental Affairs (EOEA) where he completed annual work plans and represented the team on Advisory Committees for both watersheds. He has also worked as the Connecticut River Watershed Team Leader for EOEA. His prior work experience includes serving as Anadromous Fish Restoration Project Leader and District Fisheries Manager for the MDFW and as Fisheries Biologist for the U.S. Fish and Wildlife Service. Mr. O'Leary received a Bachelor of Science in Fisheries Biology and a Master of Science in Fisheries and Wildlife Biology from the University of Massachusetts at Amherst.

Karen Bennett (Alternate)

Ms. Karen Bennett currently serves as the Deputy Principal Assistant and Landscape Conservation Coordinator in the Office of the Secretary at the Delaware Department of Natural Resources and Environmental Control (DNREC). In this position, she leads the Delaware Bayshore Initiative (DBI), a landscape-level conservation priority of Governor Jack Markell's Administration and recognized as part of the national vision for America's Great Outdoors, an initiative of President Obama's Administration. Ms. Bennett also works to collaboratively advance science-based, partnership-involved approaches to fish and wildlife conservation integrated with conservation-compatible recreation, outreach and interpretation, and community-based economic development. Prior to this position, Ms. Bennett was Program Manager for the Delaware Division of Fish and Wildlife where she coordinated and provided oversight for all aspects of multiple conservation programs including Natural Heritage and Endangered Species, Environmental Review, Private Lands Habitat Restoration and Technical Assistance, Land Acquisition, Comprehensive Wildlife Conservation Planning, and Volunteer Coordination Services. Ms. Bennett has also spent time working for The Nature Conservancy, Delaware Natural Heritage Program and the Nongame and Endangered Species Program within the Division of Fish and Wildlife. Ms. Bennett received her Bachelor of Science in Biology at the University of Pittsburgh at Johnstown and completed post-graduate studies in Ecology and Evolution at Rutgers University.

National Council for Air and Stream Improvement

Larry Irwin (Member)

Dr. Larry Irwin is currently a Fellow at the National Council for Air and Stream Improvement (NCASI). In the past, he has served as the Principal Scientist for the NCASI; Western Forest, Wildlife Program Manager for the NCASI in Oregon; Assistant and Associate Professor at the University of Wyoming; Research Associate and Research

Instructor at the University of Idaho; Graduate research assistant at the University of Minnesota; and as a Biology and General Science Teacher in Darby, Montana. His research and conservation interests lie in the management of vertebrate wildlife populations and their habitats; habitat management for wildlife and biological diversity; vegetation succession; fire ecology; land management; large mammal ecology and management; forest and range ecology; and abiotic environmental influences on wildlife population-vegetation relations. Dr. Irwin has held various teaching positions at the University of Wyoming, University of Idaho, Oregon State University, and the University of Montana where he has taught Vertebrate Biology, Fire Ecology, Game Biology and Management, Big Game Population Ecology, Wildlife Habitat Ecology, Wildlife Biology, Senior Seminars and Wildlife Conclave. Dr. Irwin received his Ph.D. in Wildlife Science from the University of Idaho in Moscow, Idaho.

Thomas Bently Wigley, Jr. (Alternate)

Since 2005, Dr. Thomas Wigley has served as a Manager of the Sustainable Forest Research Center at the National Council for Air and Stream Improvement (NCASI). From 1998-2004, he was the Manager of the Wildlife and Watershed Programs, and from 1990-1998, a Forest Wildlife Scientist at the NCASI. Prior to that, Dr. Wigley was an Associate Professor at the University of Arkansas-Monticello. He has held teaching positions at various universities, including Clemson University, University of Arkansas-Monticello, Auburn University, Mississippi State University, University of Georgia, and North Carolina State University. He has written or edited chapters in four books, is a reviewer for several journals, and has offered presentations at many symposia and workshops. Dr. Wigley also serves as a member of numerous organizations, including the Wildlife Society (Southeastern and South Carolina Sections); the Arkansas Forestry Association; South Carolina Forestry Association; and the Society of American Foresters. Dr. Wigley received his B.S., M.S., and Ph.D. from the Mississippi State University

National Oceanic and Atmospheric Administration

Richard Merrick (Member)

Dr. Richard Merrick is the Chief Advisor and Director of Scientific Programs at the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS). His responsibilities include formulating and directing NOAA NMFS biological and social science research within the United States for fish, marine mammal and turtle species. He also provides science policy advice to NOAA leadership, Congressional members, and various stakeholders. Prior to this position, Dr. Merrick served as the Resource Evaluation and Assessment Division Chief at the NOAA Northeast Fisheries Science Center. Dr. Merrick's past experience also includes acting as the Protected Species Branch Chief/Research Oceanographer at the Northeast Fisheries Science Center and as Task Leader

and Zoologist for the Alaska Ecosystem Program at the National Marine Mammal Laboratory, NOAA Alaska Fisheries Science Center. Dr. Merrick received his Bachelor's degree from Clemson University. He also holds a Master of City and Regional Planning from Clemson University and a Master of Marine Resource Management from Oregon State University. He completed his Ph.D. in Fisheries at the University of Washington.

Adam Parris (Alternate)

Mr. Adam Parris currently serves as Physical Scientist and Regional Integrated Sciences and Assessments (RISA) Program Manager at the National Oceanic and Atmospheric Administration (NOAA). In this position, he develops and manages initiatives to strengthen a nationally and internationally recognized program for producing actionable knowledge and innovating climate services for decision makers. Prior to his time at NOAA, Mr. Parris was a Coastal Planner for the San Francisco Bay Conservation and Development Commission (BCDC). During this time, he performed policy and planning research investigating the effects of sea-level rise on the San Francisco Bay ecosystem. Mr. Parris also helped revise policies on tidal wetlands to address the impacts of sea-level rise and initiated a study on sea-level rise and coastal flooding in the San Francisco Bay to develop and test shoreline adaptation techniques incorporating tidal wetland restoration. Prior to working at BCDC, Mr. Parris served as a geomorphologist and hydrologist at Philip Williams and Associates where he performed analysis of watershed, estuary, and coastal settings including extensive field-work throughout the state of California. His graduate research in geology focused on patterns of climate and flooding in the Northeastern United States over the past 12,000 years. He holds a Bachelor of Arts in Environmental Geology and English Literature from Bucknell University and a Master of Science in Geology from the University of Vermont.

National Wildlife Federation

Bruce Stein (Member)

Dr. Bruce Stein is the Director of Climate Change Adaptation at the National Wildlife Federation (NWF), where he leads NWF's work on safeguarding wildlife and their habitats in the face of a changing climate. Dr. Stein has a long history of working on biodiversity inventory, assessment, and conservation issues, and in recent years has turned his focus to the emerging field of climate change adaptation and specifically developing climate-smart approaches to conservation. At NWF, Dr. Stein has been actively involved in convening collaborative work groups to develop guidance on adaptation planning and implementation. He was the co-editor and a lead author of *Scanning the Conservation Horizon: A Guide to Climate Change Vulnerability Assessment*, which is being widely used by federal and state agencies, and in 2011, received the U.S. Secretary of the Interior's Partners in Conservation Award. As Director of NWF's Climate Change Safeguards Team, Dr. Stein

develops and oversees the execution of a number of applied climate adaptation projects. These include collaborative work with National Oceanic and Atmospheric Administration in the Great Lakes and Chesapeake Bay region focused on incorporating climate adaptation considerations into their Community-Based Restoration Partnership; projections of sea level rise impacts on coastal habitats in regions such as coastal Louisiana; climate change vulnerability assessments at regional (e.g., Northeastern United States), state (e.g., Virginia, Washington), and local (e.g., Parker River National Wildlife Refuge) scales. Dr. Stein received his B.A. in Environmental Studies from the University of California, Santa Cruz, and his Ph.D. in Population Biology and Plant Systematics from the Washington University.

Douglas Inkley (Alternate)

Dr. Douglas Inkley is currently the National Wildlife Federation's (NWF) Senior Scientist. He has collaborated extensively with professionals in the conservation field including U.S. Fish and Wildlife Service, U.S. Geological Survey, US Forest Service (USFS), National Oceanic and Atmospheric Administration (NOAA), the Association of Fish and Wildlife Agencies (AFWA) and the Wildlife Management Institute on issues surrounding wetlands, waterfowl regulations, wildlife conservation funding, invasive species, endangered species, migratory birds, National Wildlife Refuges, U.S. Department of the Interior Bureau of Land Management and USFS management, oil spills, polar bears, etc. Currently, Dr. Inkley is leading NWF's collaborative work with NOAA to make on-the-ground coastal restoration projects in the Great Lakes and Chesapeake Bay "climate smart". He also supervised NWF's collaboration with NOAA to convene the Coastal Habitat Conservation in a Changing Climate: Strategies and Tools for the Great Lakes Region workshop. Dr. Inkley was a member of the multi-faceted team which prepared the 2011 report *Scanning the Conservation Horizon - A Guide to Climate Change Vulnerability Assessment*, recognized with a Partnership in Conservation award from Secretary of the Interior Ken Salazar. Dr. Inkley received his B.S. in Wildlife Ecology from Michigan State University, his M.S. in Natural Resources Planning from the University of Vermont, and his Ph.D. in Zoology and Physiology from the University of Wyoming.

Northern Arizona University

Ann Marie Chischilly (Member)

Ann Marie Chischilly is the Executive Director of the Institute for Tribal Environmental Professionals (ITEP) at Northern Arizona University (NAU) in Flagstaff, AZ. She is responsible for coordinating ITEP's work with NAU, state and federal agencies, tribes and Alaska Native villages. Before coming to ITEP, she served for over ten years as Senior Assistant General Counsel to the Gila River Indian Community, where she assisted the Community in implementing the historic Arizona Water Settlement Act and founded their

Renewable Energy Team. At ITEP, Ms. Chischilly oversees four environmental programs (climate change, air quality, solid waste and educational outreach) and established the "Tribal Clean Energy Resource Center" to assist tribes in transitioning from fossil fuel based energy to sustainable/clean energy solutions. ITEP celebrated 20 years in the fall of 2012 and has served over 504 tribes and Alaskan Native Villages nationwide. Ms. Chischilly currently serves on the *Arizona Attorney* magazine Editorial Board, Indian Law Section Executive Board of the Arizona State Bar, Arizona Energy Consortium-Tribal Liaison, First Stewards on Climate Change Founding Board and Native American Connections Board. She served on the National Tribal Water Council and is a graduate of the Arizona Bar Leadership Institute. Ms. Chischilly is an enrolled member of the Navajo Nation (Diné). She earned her Juris Doctorate (J.D.) degree from St. Mary's University School of Law, and a Masters in Environmental Law (LL.M) from Vermont Law School. She is licensed in Arizona.

Quinault Nation

Gary Morishima (Member)

Dr. Gary Morishima has over forty years of experience in natural resource management, policy analysis, computer simulation modeling and mathematical statistics. Since 1974, he has served as Technical Advisor for Natural Resources to the President of the Quinault Indian Nation, providing information and assistance in matters pertaining to forestry, fisheries, climate change, and inter-jurisdictional natural resources management. He has been the Chief Executive Officer of his natural resources consulting firm, MORI-ko LLC, since 1969, which specializes in providing consulting services to Indian tribes, government agencies, and private industry in areas pertaining to computer simulation of natural resource management systems, statistical analysis, forestry and fisheries management, workshop organization, conflict resolution, and meeting facilitation. Dr. Morishima has been a member of the Executive Board of the Intertribal Timber Council since its inception in 1976. He served on the Salmon Technical Team of the Pacific Fishery Management Council for over 25 years, and currently chairs several technical committees for the United States section of the Pacific Salmon Commission. He was appointed to the Intergovernmental Advisory Council by the U.S. Secretary of Agriculture to provide advice regarding implementation of the Northwest Forest Plan and to the Salmon and Steelhead Advisory Commission by the Secretary of Commerce. Dr. Morishima has authored numerous publications and reports on natural resource management and has often been called upon to testify and make presentations before tribal, administrative, professional, academic, public and Congressional forums. He received a B.S. in Mathematics and Ph.D. in Quantitative Science & Environmental Management, both from the University of Washington.

San Francisco Public Utilities Commission

David Behar (Member)

Mr. David Behar is the Climate Program Director with the San Francisco Public Utilities Commission where he serves as an expert on climate change assessment and adaptation from adaptation community perspective, and supports efforts to build bridges between adaptation community and scientific experts. He is also a founding chair of the Water Utility Climate Alliance (WUCA), coalition of ten of the largest water utilities in the United States, including San Francisco, New York, Seattle, San Diego, Las Vegas, Denver, Central Arizona, Southern California, Portland, San Diego, and Tampa Bay. WUCA focuses on responding to climate change adaptation challenges by advocating improved climate science, linking science and decision-makers, and enhancing decision support tools. From 1999-2001, and again from 2004-2005, Mr. Behar served as an Environmental Policy and Development Consultant where he managed a variety of policy, political, development, and related programs at both strategic and execution levels. Mr. Behar has also worked as a Chief Operating Officer with the Switzer Communications, Inc. and as an Executive Director of the Bay Institute. In 2006, he was elected to the Board of Directors of Marin Municipal Water District, the oldest municipal water district in California. Mr. Behar has also provided leadership roles, and served as speakers in several climate change-related alliances and platforms. He graduated with a B.A. in Politics from University of Santa Cruz Honors College in 1987.

Society for Conservation Biology

Paul Beier (Member)

Dr. Paul Beier is a professor of Conservation Biology and Wildlife Ecology at Northern Arizona University School of Forestry. He specializes in science-based design of wildlife corridors. To better understand landscape resistance and connectivity, he has studied individual movement and gene flow of several species, including cougars, grizzly bears, and kinkajous. Dr. Beier has authored four book chapters and eighteen peer-reviewed papers related to wildlife corridor design. He has designed over 70 conservation plans for multiple-species corridors in the western US; each plan is being implemented by government and non-governmental agencies. Working for state wildlife and transportation agencies, he was a lead author of two statewide maps of wildlife corridors, namely Arizona Wildlife Linkage Assessment (2006) and California Essential Habitat Connectivity (2010), the Wildlife Corridors Initiative (unanimously adopted by the Western Governors' Association in 2008). Beier's recent work investigates the use of geophysical elements or 'enduring features' as a coarse-filter basis for conservation planning in a changing climate. He is President of the Society for Conservation Biology (2011-2013), Associate Editor of the Journal of Wildlife

Management, and a member of the American Society of Mammalogists. He received his Ph.D. in Wildland Resource Science from the University of California, Berkeley

Tennessee Wildlife Resources Agency

Ed Carter (Member)

Mr. Ed Carter began his 40-year career with the (then) Tennessee Game and Fish Commission in 1972 and has held positions in the Divisions of Law Enforcement, Information and Education, Tennessee Wildlife Resources (TWRA) Region 2 as Assistant Manager over all fish, wildlife, and enforcement programs in the twenty-five counties of middle Tennessee. He was the Chief of the Boating Division until March of 2009, when the Tennessee Wildlife Resources Commission appointed him as the Executive Director. As the Executive Director, Mr. Carter is responsible for all aspects of the TWRA and its 700 plus employees. The agency is charged by law with the management of the state's wildlife and fisheries programs and is the sole authority for boating safety programs within the state. Active in several organizations, he is now serving as President Elect of the Southeastern Association of Fish and Wildlife Agencies, an organization comprised of the fish and wildlife agencies of fourteen southern states. He is also a member of the Association of Fish and Wildlife Agency Executive Committee, and serves as Chairman of the Amphibian and Reptile sub-committee for the Association. Mr. Carter is a graduate of the University of Tennessee with a B.S. in Forestry and Wildlife Management.

The Nature Conservancy

Kimberly Hall (Member)

Dr. Kimberly Hall serves as the Great Lakes Climate Change Ecologist at The Nature Conservancy (TNC), and is based in Lansing, Michigan. In this position, she focuses on research and outreach on incorporating climate change impacts and adaptation into site and regional-scale conservation activities pursued by TNC and partners within the Great Lakes region. Specific projects include developing guidance for "climate smart" management of natural areas in the Chicago region, working with multiple partners to update forest management in the upper Midwest, evaluating the vulnerability of conservation strategies in agricultural landscapes, and collaborating with a multi-disciplinary team at the University of Notre Dame to develop a web-based "Collaboratory" for Climate Change Adaptation (adapt.nd.edu). She is also part of a team led by the National Wildlife Federation that is developing guidance for practitioners on adaptation, and is an Executive Board member of the National Climate Predictions and Projections Platform. Dr. Hall received her Ph.D. in Terrestrial Ecology from the University of Michigan in 2002, and her M.S. in

Conservation Biology from the same institution in 1996, and is currently an adjunct faculty member at Michigan State University.

Union of Concerned Scientists

Peter Frumhoff (Member)

Dr. Peter C. Frumhoff is the Director of Science and Policy at the Union of Concerned Scientists. He is a global change ecologist and has published widely on topics including climate change impacts, climate science and policy, tropical forest conservation and management, and biological diversity. He was a lead author of the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), the IPCC Special Report on Land Use, Land-use Change and Forestry. He was also the Chair of Northeast Climate Impacts Assessment (NECIA). Mr. Frumhoff currently serves on the Board of Directors of the American Wind Wildlife Institute, is an Associate of the Harvard University Center for the Environment, and has served on the Board of Editors of *Ecological Applications*. Dr. Frumhoff has taught at the Fletcher School of Law and Diplomacy at the Harvard University, University of Maryland, and was an American Association for the Advancement of Science. Science and Diplomacy Fellow at USAID. He holds a Ph.D. in Ecology from the University of California, Davis.

University of Colorado Boulder

Bradley Udall (Member)

Mr. Bradley Udall is the Director of the Getches-Wilkinson Center for Natural Resources, Energy, and the Environment, and brings a wealth of experience with him. Previously, Udall was the director of the CU-Boulder–NOAA Western Water Assessment. He brings a successful career in natural resources policy to the helm of the Getches-Wilkinson Center. Udall has worked closely with the Natural Resources Law Center over the years, sponsoring work by the center and speaking at the center's annual conference on numerous occasions. Since 2003, he has also been concurrently serving as a faculty member of the University of Colorado Research. Mr. Udall has been a visiting scholar at the Department for Water of the Government of South Australia; a member of the Donnell Kay Foundation; Executive Director of the Eagle Valley Land Trust in Vail, Colorado; and Principal of the Hydrosphere Resource Consultants in Boulder, Colorado. He is currently a member of the U.S. Department of Agriculture Agricultural Research Service External Review Team on Water Availability and Watershed Management. Previously, he served as a member of numerous advisory boards and panels including the National Center for Atmospheric Research Applications Laboratory Advisory Board; Colorado Water Institute Advisory Board; Union of Concerned Scientists Energy and Water in a Warming Climate Advisory Board; National

Science Foundation Nevada Experimental Program to Stimulate Competitive Research AAAS Review Panel; and Water Research Foundation Expert Panel on Climate Change. Mr. Udall received his Master's in Business Administration from the Colorado State University in 1993, and his B.S. in Environmental Engineering from the Stanford University in 1981.

Richard Palmer (Alternate)

Dr. Richard Palmer is the Department Head and Professor of Civil and Environmental Engineering at the University of Massachusetts, Amherst. From 1979 to 2008, he was a professor at the University of Washington in Seattle, Washington. His primary areas of interest are in the application of structured planning approaches to water resources. This includes impacts of climate change on water resources, drought planning, real-time water resource management, and the application of decision support to civil engineering management problems. He helped develop the field of "shared vision modeling" in water resources planning and pioneered the use of "virtual drought exercises." Dr. Palmer received his Ph.D. from the Johns Hopkins University in 1979 and his Masters of Science in Environmental Engineering from Stanford University in 1973. During his Ph.D. research, he was a member of a team at Johns Hopkins University and the Interstate Commission on the Potomac River Basin recognized as a finalist by American Society of Civil Engineers (ASCE) for Engineering Achievement of the Year in 1983. Dr. Palmer currently has research funding from National Oceanic and Atmospheric Administration (NOAA), the Nature Conservancy, the Department of Defense, and a variety of public utilities. He is the Principal Investigator of the new North East Climate Science Center, funded by the Department of Interior, which is a five year project to evaluate the impacts of climate change.

University of Oklahoma

Berrien Moore (Member)

Dr. Berrien Moore is the Vice President of the Weather and Climate Programs at the University of Oklahoma. He also serves as the Director of National Weather Center, as a Dean of College of Atmospheric and Geographic Science, and as a Chesapeake Energy Corporation Chair in Climate Studies within the School of Meteorology. Since 2008, Dr. Moore has also been the Director Emeritus of the Institute for the Study of Earth, Oceans, and Space at the University of New Hampshire. From 2008-2010, Dr. Moore was the executive director of the Climate Central, and prior to that, he held numerous teaching and research scientist positions at University of New Hampshire, University of Stockholm, Universite Pierre et Marie Curie, and University of Virginia. Dr. Moore received his B.S. in Mathematics from University of North Carolina in 1963, and his Ph.D., also in Mathematics, from University of Virginia in 1969.

Paul Risser (Alternate)

Dr. Paul Risser is the Chair and Chief Operating Officer at the University Research Cabinet at University of Oklahoma. Dr. Risser has served as the Chancellor of the Oklahoma System of Higher Education, and has held numerous teaching positions including the President and Professor of Botany at Oregon State University; President and Professor of Botany at Miami University; Professor at University of New Mexico; Affiliate Professor at University of Illinois; and Assistant Professor at University of Oklahoma. Dr. Risser has also served as the Director of Ecosystem Studies Program with the National Science Foundation. He has been the Principal or Co-Principal Investigator on more than fifty funded research projects on ecological questions and hypotheses, applied questions relating to natural resource management, and science education; and has authored or edited half a dozen books. Dr. Risser received his B.A. from Grinnell College, and his M.S. and Ph.D. from the University of Wisconsin. He was awarded with an Honorary Degree from Grinnell College in 1994.

U.S. Army Corps of Engineers

Robert Pietrowsky (Member)

Mr. Robert Pietrowsky is the Director of the U.S. Army Institute for Water Resources at the U.S. Army Corps of Engineers (USACE). As Director of the U.S. Army Institute for Water Resources (IWR), Mr. Pietrowsky oversees a program of water resources planning, policy and decision-support model development, training and national/international interface with academia, professional societies and non-government organizations. IWR's mission emphasizes the linkage of economic, social, environmental, hydrologic and engineering risk considerations within a contemporary evaluation framework for water resources systems, global change and collaborative problem solving. Mr. Pietrowsky began his career forty years ago as a planning practitioner, and later as a district planning/engineering field office Chief, for the USACE New York District. Previously at IWR, he served as Chief of the Navigation Division and as Director of the Federal Infrastructure Strategy Program. Mr. Pietrowsky received a Bachelor of Science in Engineering from Stony Brook (SUNY) University and a Master of Science in Civil Engineering with dual specialties in Water Resources Engineering and Environmental Planning from Polytechnic Institute of New York. He is a graduate of the USACE Water Resources Planning Associates Program, a charter member of the USACE Executive Development Program for Engineers and Scientists, and a graduate of Federal Executive Institute's resident leadership program for executives.

Jeffrey Arnold (Alternate)

Dr. Jeffrey Arnold currently serves as the Senior Climate Scientist, Senior Atmospheric Scientist and Senior Lead Scientist for Climate Change Mitigation for the U.S. Army Corps of Engineers (USACE), Institute for Water Resources (USACE IWR). Prior to his position at

USACE, Dr. Arnold was the Senior Atmospheric, Senior Lead Scientist for Atmospheric Exposure and Deposition Processes at the U.S. Environmental Protection Agency (EPA) Office of Research and Development in the National Center for Environmental Assessment. He has worked as a Scientist for the University Corporation for Atmospheric Research (UCAR) and the National Oceanic and Atmospheric Administration (NOAA). He also served on review committees for field measurements and large-scale numerical modeling for NOAA, NASA, U.S. EPA, National Science Foundation, U.S. Department of Energy, U.S. Department of Defense, U.S. Department of the Interior Bureau of Reclamation and the U.S. Geological Survey. Dr. Arnold received his Ph.D. in Environmental Sciences and Engineering from University of North Carolina at Chapel Hill (UNC-CH). He completed two postdoctoral positions in Atmospheric Chemistry and Physics at UNC-CH and at UCAR.

Paul Wagner (Alternate)

Dr. Paul Wagner is Senior Ecologist and Branch Chief at the U.S. Army Corps of Engineers Institute for Water Resources (IWR). His work is divided between the leadership of an interdisciplinary group of twenty subject matter experts, and technical work as a freshwater ecology subject matter expert. Dr. Wagner's work at IWR addresses a variety of technical and policy related questions in the areas of decision support, climate change, conservation and planning, and integrated water resources management. Paul represents the U.S. Department of Defense on the Subcommittee on Water Availability and Quality, and he leads the Society for Freshwater Science's Subcommittee on Climate Change. Paul is also responsible for leadership of the U.S. Federal Partnership supporting Mexico's development of their national wetlands inventory and Mexico's National Wetlands Advisory Council. Prior to joining IWR, Dr. Wagner worked as landscape ecologist for the U.S. Environmental Protection Agency's Regional Vulnerability Assessment program and served as research ecologist, and science and policy analyst assigned to the National Center for Environmental Assessment. Paul has also worked as the Senior Aquatic Ecologist for The Nature Conservancy's south-central division, where he was responsible for multi-scale strategic habitat conservation and planning. Dr. Wagner's doctoral research was completed at Virginia Tech, where he studied the long-term recovery of streams following early 20th century logging. His Master's research included studies of aquatic invertebrate ecology and thermal tolerance in fishes

U.S. Department of Agriculture

William Hohenstein (Member)

Mr. William Hohenstein is the Director of the U.S. Department of Agriculture (USDA) Climate Change Program Office, within the Office of the Chief Economist. The Climate Change Program Office provides coordination and policy development support for the

USDA's climate change program. It serves as the focal point for all support to the Secretary of Agriculture on the causes and consequences of climate change, as well as strategies for addressing them. In this role, Mr. Hohenstein chairs USDA's Global Change Task Force which is made up of representatives of thirteen USDA agencies and offices. Mr. Hohenstein serves on U.S. delegations to international negotiations on climate change. He has also been a U.S. representative to the Intergovernmental Panel on Climate Change. Mr. Hohenstein is also currently serving as the Acting Director of the USDA Office of Environmental Markets (OEM), also within the Office of the Chief Economist. Efforts within OEM focus on the development of technical guidelines and science-based methods to quantify environmental benefits, and guidance for use in developing environmental benefit registries. Before arriving at USDA, Mr. Hohenstein served as a Division Director in the U.S. Environmental Protection Agency's National Center for Environmental Economics. Mr. Hohenstein has a Bachelor of Science in Natural Resource Management from Cook College, Rutgers University and a Master of Engineering Management in Resource Economics from Duke University's School of Forestry and Environmental Studies.

David Cleaves (Alternate)

Dr. David Cleaves serves as the Climate Change Advisor to the Chief at the U.S. Department of Agriculture Research and Development Program. In this position, Dr. Cleaves coordinates activities related to climate change adaptation, mitigation, and communication and is the primary spokesperson for the agency on the role of forests in climate change. He also leads the implementation of the US Forest Service's nationwide strategy for weaving climate change response into policies, processes, and partnerships. Dr. Cleaves was formerly the deputy administrator for the agency's Science and Technology Program consisting of five regional research stations, the national Forest Products Lab, the Institute of Tropical Forestry and eighty-three experimental forests. Previous to that, Dr. Cleaves was Director of the Rocky Mountain Research Station overseeing multidisciplinary research and development at twelve laboratories in fourteen states in the Interior West. He has also been staff director for all national research programs in economics, forest products, social science, recreation and tourism, urban forestry, science education and the Resources Planning Act (RPA) assessment. In the Washington Office, Dr. Cleaves led the agency's research and development programs in fire behavior and prediction, fuels management, planning and economics, and human dimensions. Dr. Cleaves received a Bachelor's and Master's degree from Michigan State University and a Ph.D. in economics from Texas A&M University.

U.S. Environmental Protection Agency

Jeffrey Peterson (Member)

Mr. Jeffrey Peterson has served as Senior Policy Advisor advising the Assistant Administrator for Water at the U.S. Environmental Protection Agency (EPA) Office of Water

since 1995. He currently serves as the Senior Policy Advisor advising the Assistant Administrator for Water on management and policy issues related to clean water and drinking water. He is also Chair of the Climate Change Workgroup of the Advisory Committee on Water Information and manages the Office of Water Climate Change Workgroup, including implementation of the climate Strategy for water programs. During his time at EPA, Mr. Peterson completed a detail assignment as Deputy Associate Director for Water Policy for the White House Council on Environmental Quality (CEQ). In this position, he advised the Chair of CEQ and senior staff on policy matters related to water resources including the scope of the Clean Water Act, protection of Chesapeake Bay, and diverse water regulations. At EPA, Mr. Peterson served as Senior Policy Advisor, Acting Deputy Office Director for the Office of Science and Technology, Director of Water Policy Staff, and Environmental Protection Specialist. Mr. Peterson completed his Bachelor's degree in Government and Legal Studies at Bowdoin College and his Master's degree in Public Administration at University of Washington.

U.S. Fish and Wildlife Service

Gabriela Chavarria (Member)

Dr. Gabriela Chavarria has served as Science Advisor to the Director for the U.S. Fish and Wildlife Service (FWS) since July 2010. As Science Advisor, Dr. Chavarria serves as counsel to the Service Director and provides leadership on science policy and scientific applications in resource management. This includes leading agency efforts to respond to changes in the global climate system; shaping the FWS agenda for change toward a science-driven landscape conservation business model; expanding Service capacities to acquire, apply and communicate scientific information; cultivating the next generation of Service scientists, and other tasks. Prior to her work with FWS, Dr. Chavarria served as Director of the Natural Resources Defense Council's (NRDC) Science Center, where she applied her scientific knowledge to translate the most up-to-date science into solutions for environmental problems. She also has served as Vice President for Science and International Conservation at Defenders of Wildlife, Policy Director for Wildlife Conservation at the National Wildlife Federation and as the Director of International and Special Programs at the National Fish and Wildlife Foundation. Dr. Chavarria has a Master's and Ph.D. in Organismic and Evolutionary Biology from Harvard University where her research focused on the systematics, behavior, and biogeography of Neotropical bumble bees.

David Patte (Alternate)

Mr. David Patte is Senior Advisor on Ecosystem Change of the Pacific Region for the U.S. Fish and Wildlife Service (FWS). In this position, Mr. Patte coordinates the region's strategic approach to climate change and other changing environmental conditions such as sea-level rise, water regime shifts, increased invasive species, and many other stressors to fish and

wildlife resources. Mr. Patte also coordinates regional efforts to reduce its carbon footprint and to engage employees and the public in understanding that fish and wildlife conservation requires that we not only address environmental problems of the past, but also anticipate and prepare for those of the future. Additionally, Mr. Patte is on the planning team for the annual Pacific Northwest Climate Science Conferences, and co-leads C3, a federal interagency Climate Change Collaboration for the Pacific Northwest focused on information exchange and collaboration. Prior to his current position, Mr. Patte led the Region's Climate Change efforts during 2007 and 2008. He co-led and/or led seven inter-agency scientific conferences and workshops on Climate Change, and was a co-creator of C3. Mr. Patte has held the following prior positions with the Service: Assistant Regional Director for External Affairs, Chief of the Region's Division of Budget and Finance, and Budget Formulation Analyst.

U.S. Geological Survey

Matthew Larsen (Member)

Dr. Matthew Larsen is the Associate Director of Climate Change and Land Use at the U.S. Geological Survey (USGS) where he is responsible for USGS climate- change research, adaptation, and mitigation programs as well as geographic analysis and monitoring and land remote-sensing programs. Dr. Larsen began his USGS career in 1977 with the Branch of Pacific and Arctic Marine Geology, Geologic Division, Menlo Park, California, where he served as a physical science technician in a study of natural hazards to petroleum development in the Northern Bering Sea, Alaska. Before being named Associate Director for Climate and Land Use Change in 2010, he served as Associate Director for Water from 2008 to 2010. Prior to this duty, he was the Chief Scientist for Hydrology and led the USGS National Research Program in hydrology. From 2000 to 2003, he was the USGS Caribbean District Chief and supervised USGS water resources programs in Puerto Rico and the U.S. Virgin Islands. During that period, he also served as a coordinator and researcher on a USGS international mission that responded to the December 1999 landslide and flashflood disaster in Venezuela. Dr. Larsen was the Luquillo, Puerto Rico, Water, Energy, and Biogeochemical Budgets (WEBB) project chief from 1990 to 2000. Prior to that, he was a project chief on a USGS study of landslide hazards in eastern Puerto Rico. He is currently the Chair of the U.S. National Committee for the United Nations Educational, Scientific and Cultural Organization International Hydrological Programme and is the author of seventy-five scientific reports and journal articles. Dr. Larsen earned his Bachelor's in Geology from Antioch College in Yellow Springs, Ohio, and a Ph.D. in Geography at the University of Colorado Boulder.

Sarah Ryker (Alternate)

Dr. Sarah Ryker is currently the Deputy Associate Director for Climate and Land Use Change (CLU) at the U.S. Geological Survey (USGS). As Deputy Associate Director she shares responsibility with the Associate Director for the development, management, and coordination of CLU activities and provides leadership for science direction and planning for the program, among other tasks. Prior to her time at USGS, Dr. Ryker was Senior Research Staff Member with the White House Office of Science and Technology Policy Research Center. In this position, she advised the presidential transition team and White House staff on existing Federal programs, purviews and mechanisms for policy implementation. Dr. Ryker's past experiences also includes serving as a Science and Technology Policy Fellow at the National Research Council, working on a National Synthesis Team for the USGS National Water-Quality Assessment, and acting as Project Manager and Project Scientist for the USGS Washington State Water Science Center. Dr. Ryker received a Bachelor's degree from University of Washington, and completed her Master's and Ph.D. in Engineering and Public Policy at Carnegie Mellon University.

U.S. National Park Service

Herbert Frost (Member)

Dr. Herbert C. Frost is the Associate Director for Natural Resource Stewardship and Science (NRSS) for the U.S. National Park Service (NPS). He also serves as Chief Scientist for the NPS and has programmatic responsibility for all aspects of the Natural Resource and Science Programs throughout the Service. This includes programs in air resources, soundscapes, night skies, geologic resources, climate change, social science, environmental compliance, resource damage assessment and restoration, biological resources, water resources, and the NPS inventory and monitoring program. Before coming to his present position, he was Deputy Associate Director for NRSS for three years. Prior to that, he was the NPS Research Coordinator at the Great Basin Cooperative Ecosystem Studies Unit (CESU), located at University of Nevada, Reno. Dr. Frost also worked as the Wildlife Biologist and Natural Resource Program Manager at Gettysburg National Military Park and Eisenhower National Historic Site. Currently, he spends most of his time on issues relating to climate change, renewable and traditional energy development, transmission lines, air tour management, ungulate overabundance and bison conservation. He has a Bachelor of Science in Wildlife and Range Management, a Master of Science in Zoology, and a Ph.D. in Wildlife Ecology.

Leigh Welling (Alternate)

Dr. Leigh Welling is Chief of the Climate Change Response Program with the U.S. National Park Service (NPS), and leads the program, which provides training, technical expertise, project funding, and information products to support NPS actions that preserve the park resources and values in a changing climate. She coordinates service-wide science, adaptation, and communication efforts, including staffing, strategic planning, and program

development and implementation. Dr. Welling came to the Washington Office from Glacier National Park where she was Director of the Crown of the Continent Research Learning Center for five years and served as National Coordinator for the NPS Research Learning Centers from 2006-2008. Prior to joining the NPS, Dr. Welling held research faculty positions at University of North Dakota and University of Nevada, Las Vegas, where she taught, supervised students, and managed research applications programs aimed at the intersection of science and decision making. She has a Ph.D. and a Master of Science in Oceanography from Oregon State University and a BA in Geology from University of Colorado, Boulder. Her research focused on statistical modeling of marine micro zooplankton assemblages to facilitate reconstruction of past oceanic and climatic systems.

Washington/Western Association of Fish and Wildlife Agencies

Lynn Helbrecht (Member)

Ms. Lynn Helbrecht currently serves as the Climate Change Coordinator for the Washington Department of Fish and Wildlife where her work revolves around developing and implementing strategies to ensure agency activities and programs are robust to changing climatic conditions. Specifically, Ms. Helbrecht prioritizes and facilitates implementation of research projects, conducts educational programs to build staff capacity to understand and respond to climate change, develops adaptation strategies, and engages state, regional and national organizations in partnerships to ensure a coordinated approach to climate response for species and ecosystems. Previously, she worked as the Executive Coordinator for the Washington Biodiversity Council where she served as lead staff for a public-private partnership established by the Governor to advance collaborative approaches to biodiversity conservation. Her past experiences include working as Sustainability Coordinator for the Governor's Executive Policy Office, Environmental Analyst and Senior Environmental Planner for the Washington State Department of Ecology, and Project Manager for the U.S. Agency for International Development. Ms. Helbrecht received a Bachelor of Arts in Environmental Studies from University of California Santa Barbara and a Masters of Environmental Science from Evergreen State College.

Wisconsin Department of Natural Resources

Jack Sullivan (Member)

Jack Sullivan has served as Director of the Wisconsin Department of Natural Resources (DNR) Science Services Programs since June of 2000. In this role he directs agency research in fish, wildlife, forestry and human dimensions. From 2002-2004 he also served as Administrator for the DNR Division of Enforcement & Science. He came to the DNR in 1983 after serving as faculty/staff at the University of Wisconsin-Madison Department of Civil

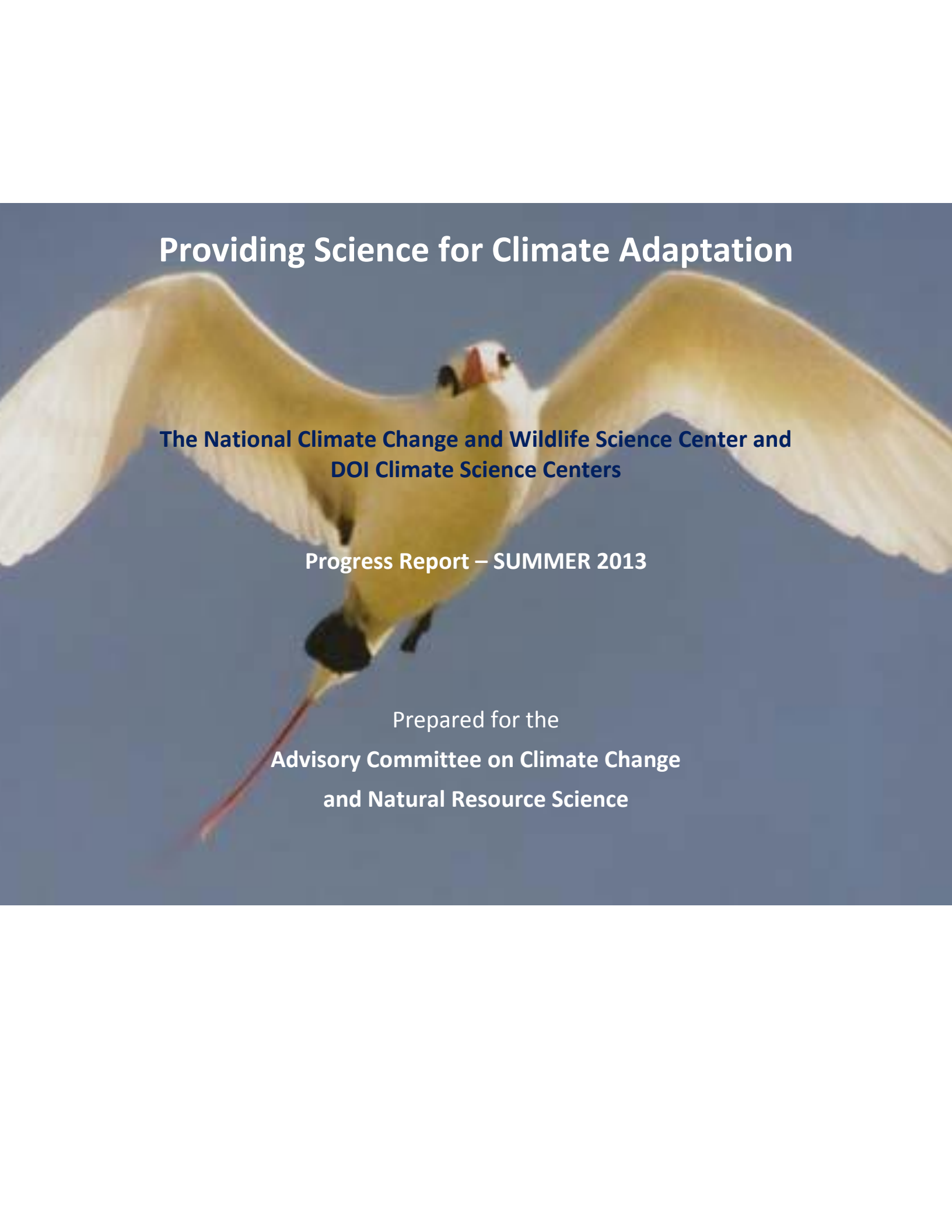
and Environmental Engineering, Water Chemistry Program. In 1997 and 1998 he was on special assignment as an International Consultant for the United Nations working on environmental management issues in the Socialist Republic of Vietnam. He has BS and MS degrees from the University of Wisconsin, with a specialty in Water Resources Engineering and is a Wisconsin Registered Professional Hydrologist. Throughout his career he has been involved in emerging environmental issues and most recently has been focusing on adaptation strategies for climate change.

Karl Martin (Alternate)

Dr. Karl Martin is currently Chief of the Wildlife and Forestry Research Section of the Wisconsin Department of Natural Resources (WDNR) and Adjunct Professor at the University of Wisconsin-Madison Department of Forest and Wildlife Ecology. At WDNR, Dr. Martin works with internal and external partners to develop, design, fund, and implement landscape scale wildlife and forestry conservation research activities. Dr. Martin also serves as Co-Chair of the Wisconsin Initiative on Climate Change Impacts (WICCI) Wildlife Working Group and as a mentor/supervisor for scientists serving on the WICCI Wildlife, Forestry, and Natural Areas Working Groups. Dr. Martin serves and/or leads numerous wildlife and forestry committees including the Wildlife Policy Team, Science Services Management Team, State Forest Assessment Oversight Committee, American Marten Stocking Team, Continuous Forest Inventory Committee, and the Ecosystem Management Team. Dr. Martin has previously served as Research Scientist, Program Planning Analyst, and Wildlife Technician at WDNR. He received his Master's degree in Wildlife Science and completed his Ph.D. in Forest Science at Oregon State University. His Ph.D. dissertation focused on habitat associations of small mammals and amphibians in the Oregon Coast Range.

1.3

Background Materials

A white seabird, possibly a booby, is shown in flight against a clear blue sky. The bird's wings are spread wide, and its long, red beak is pointed downwards. It has black markings around its eyes and on its feet.

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 these¹. Initial science agendas are also in place², 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.

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

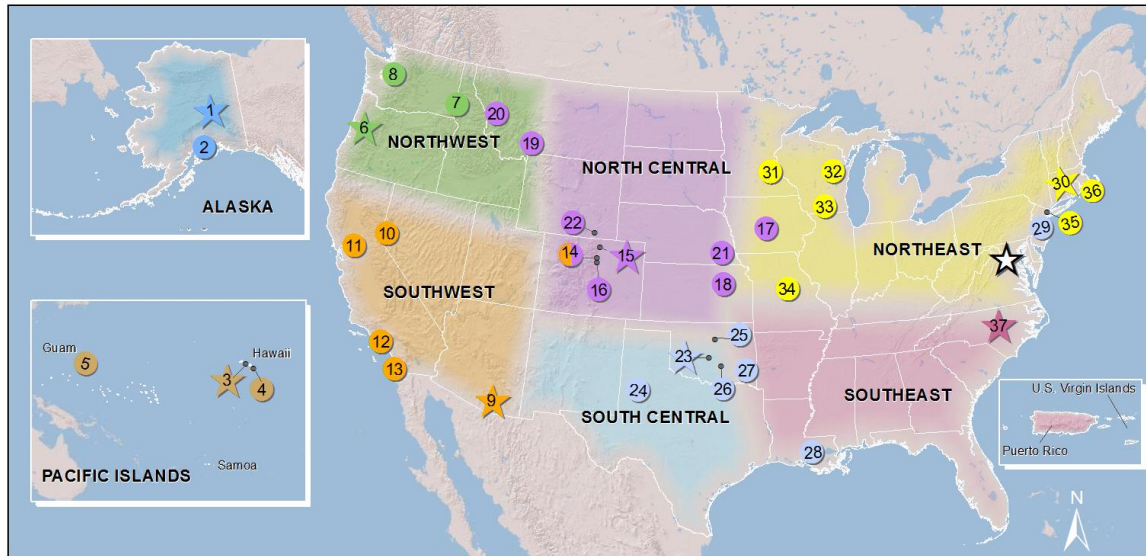
² The Pacific Islands CSC plan is in draft form.

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 1963

EXPLANATION			
★	National Climate Change and Wildlife Science Center		
1	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		
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 Center³. 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

³ 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

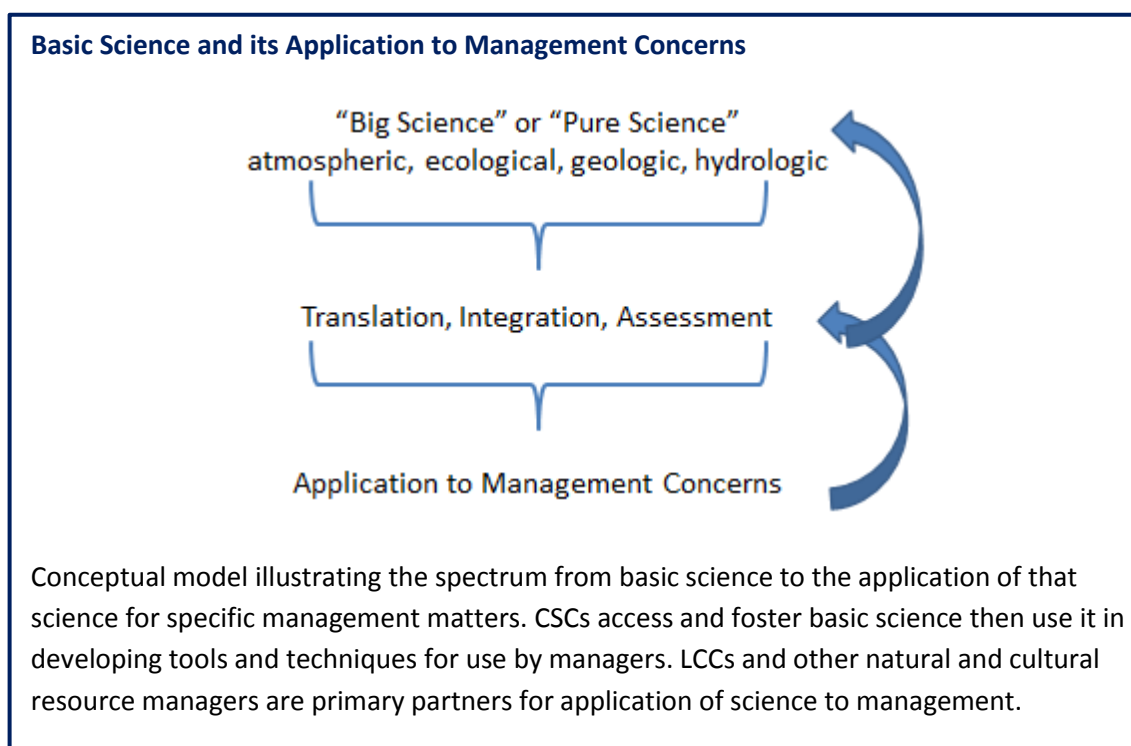
projections – as well as in specific projects. A key role for the CSC Stakeholder Advisory Committees will be to provide a venue for leveraging of scientific assets in this way.

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 Program⁴ 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,

⁴ 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 act⁵, 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 Center⁶. 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 2009⁷.

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

⁵ Consolidated Appropriations Act of 2008, P.L. 110-161.

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

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

projects⁸ (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

⁸ <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 funds⁹, 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)

⁹ 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.

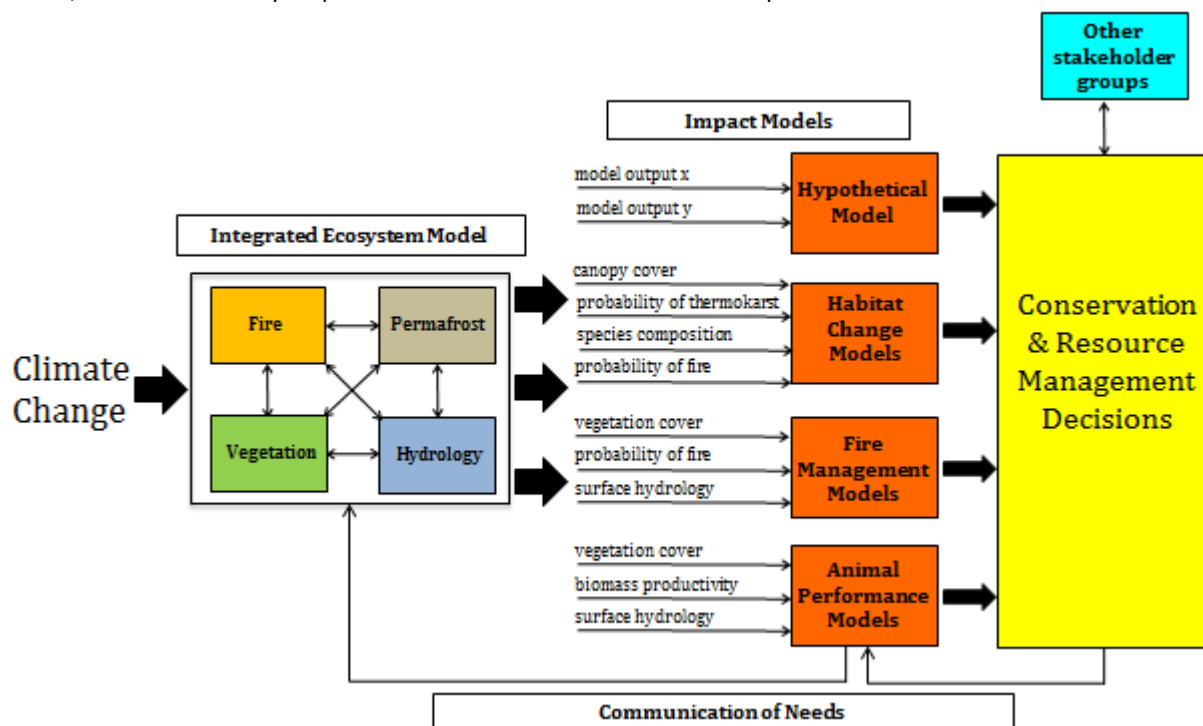
Finally, as the new CSCs are gaining their footholds, the initial, nation-wide FY2009 research funding projects are nearing completion. In FY12 and beyond, these funds have largely been allocated to CSCs to be directed to regionally-identified high priority topics, rather than being directed through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

Supporting Decisions with Basic Science

The Alaska Integrated Ecosystem Model (AK-IEM) is an example of large scale basic science and modeling directly linked to the needs and decisions of managers. This work explores the connections between climate and fire, permafrost, vegetation, and hydrology in a climate-changed Alaska. It will provide the basis for more detailed species- or region-specific models, at scales appropriate to specific decisions. While not directly addressing decision needs, the AK-IEM clearly responds to these needs in a clear and transparent manner.

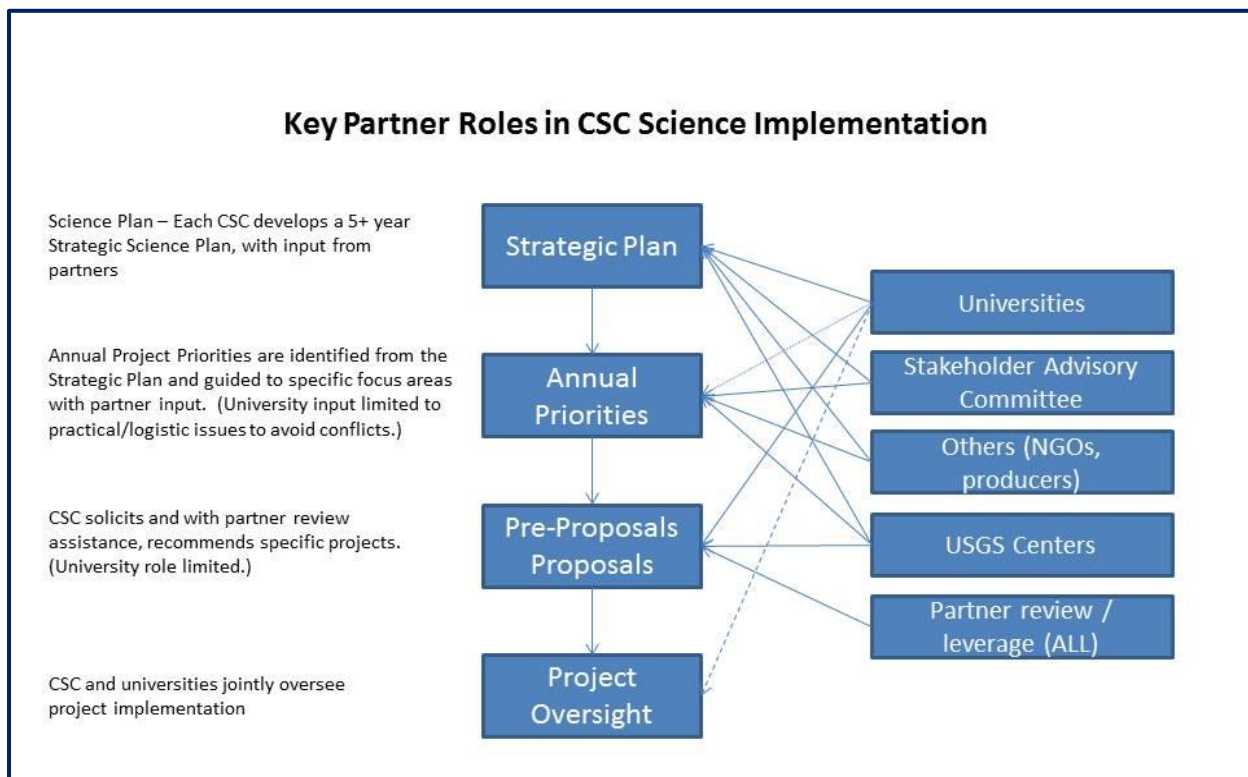


- *Focus on decisions:* CSCs will increasingly expect researchers to engage directly with the management partners they expect to serve, and to ensure that their results are in fact not simply *relevant* to these needs, but *used* by these partners. Where scientific activities do not result in directly 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 representatives¹⁰.
- ***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.

¹⁰ 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-acccnrs>

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

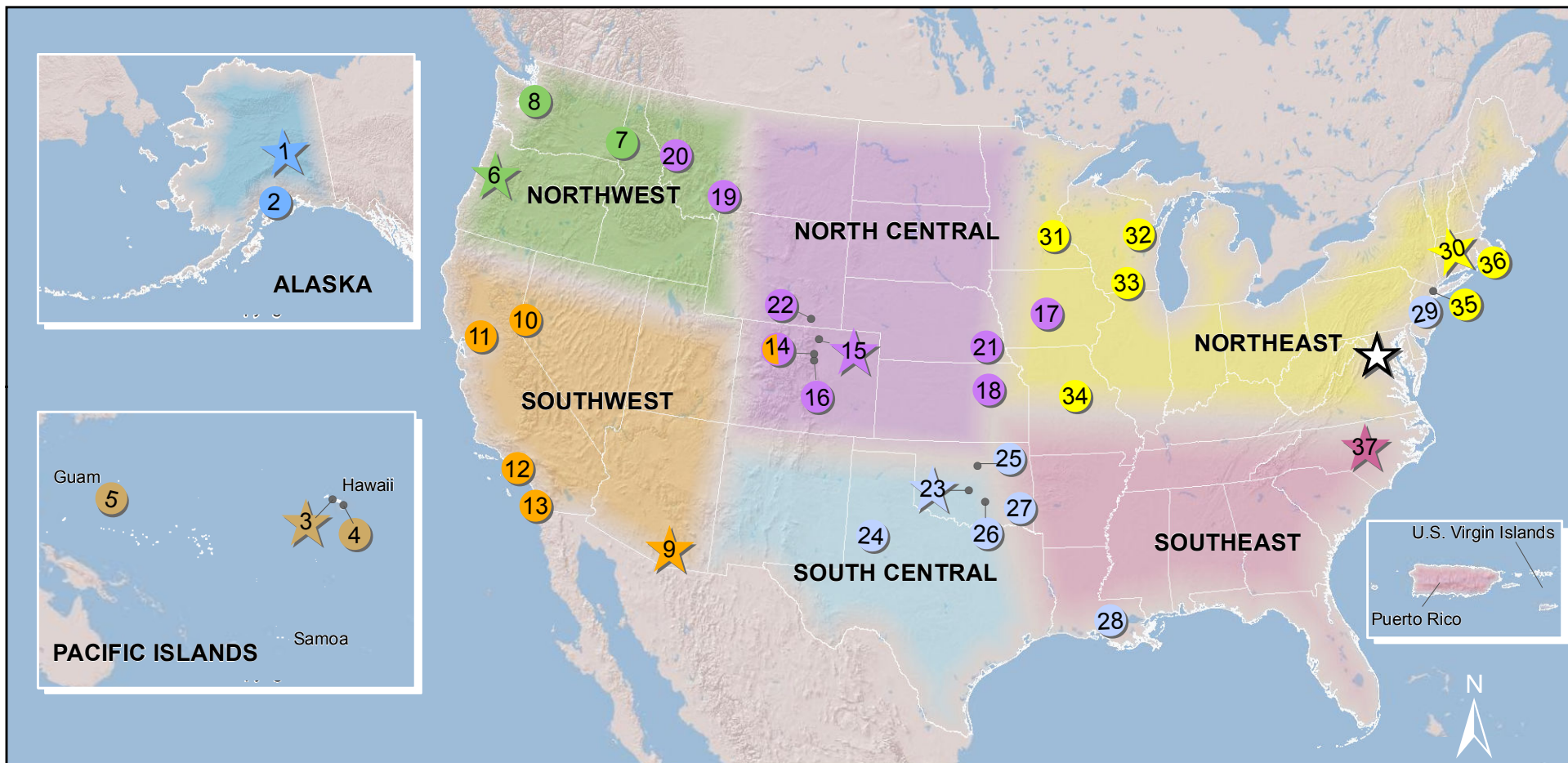
The enterprise consisting of the National Climate Change and Wildlife Science Center and Climate Science Centers, working closely with the Landscape Conservation Cooperatives and other natural and cultural resource managers, is committed, in its structure and operations, to a partnership-driven model.

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

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



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

EXPLANATION

★ National Climate Change and Wildlife Science Center

1 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

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

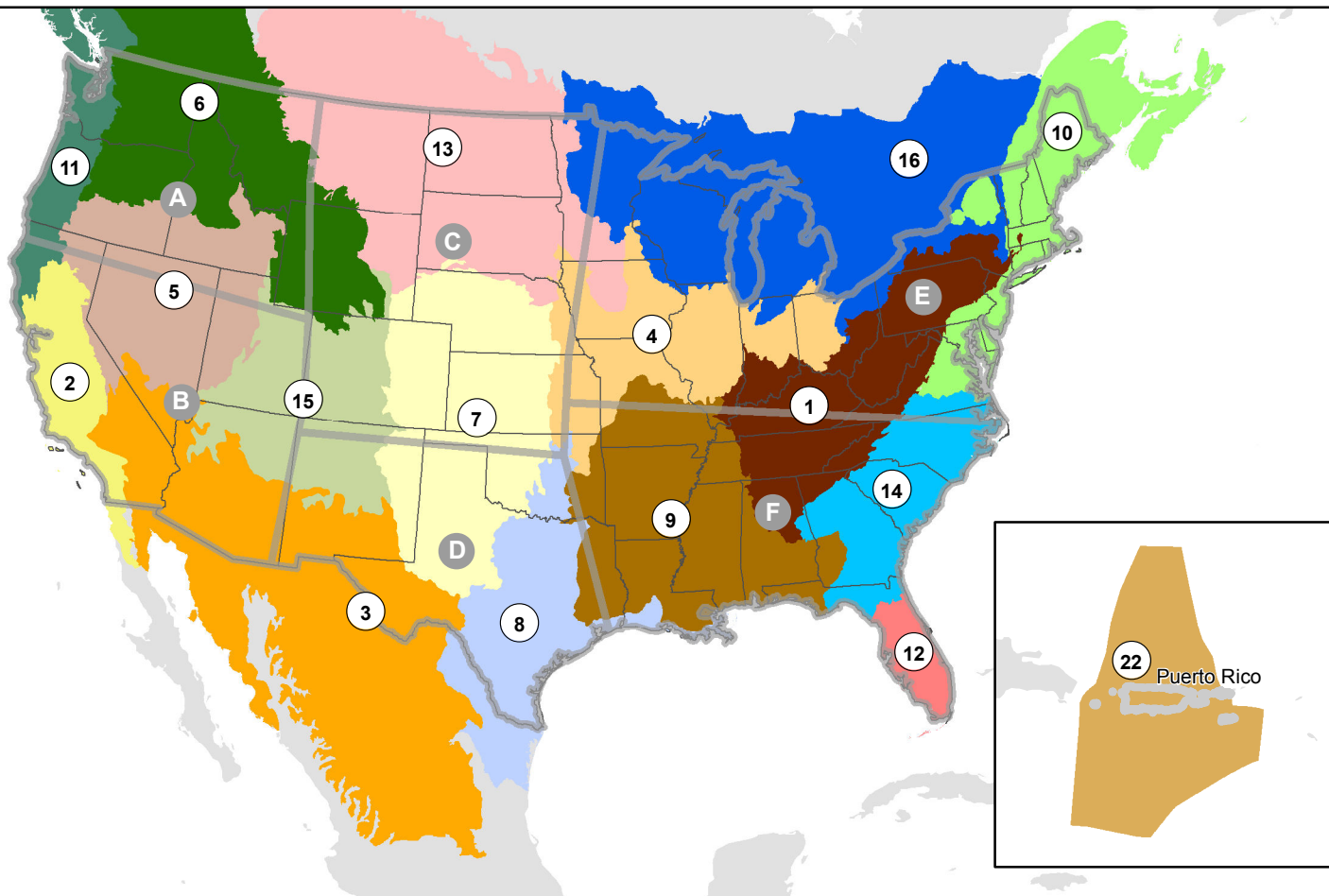
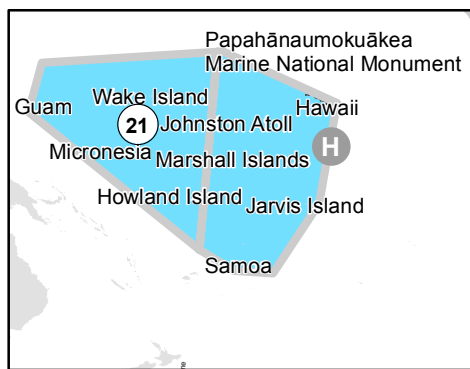
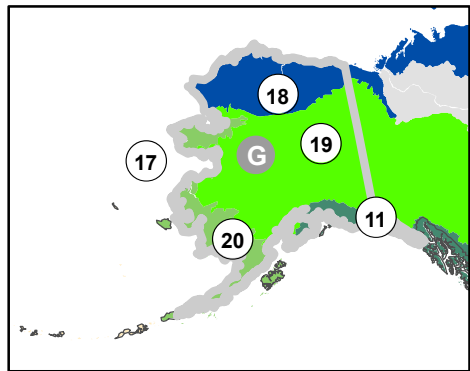
Southeast CSC

37. North Carolina State University



U.S. Department of the Interior

Landscape Conservation Cooperatives - Climate Science Centers



DOI Climate Science Centers

- A Northwest
- B Southwest
- C North Central
- D South Central
- E Northeast
- F Southeast
- G Alaska
- H Pacific Islands

Landscape Conservation Cooperatives

- 1. Appalachian
- 2. California
- 3. Desert
- 4. Eastern Tallgrass Prairie and Big Rivers
- 5. Great Basin

- 6. Great Northern
- 7. Great Plains
- 8. Gulf Coast Prairie
- 9. Gulf Coastal Plains and Ozarks
- 10. North Atlantic
- 11. North Pacific

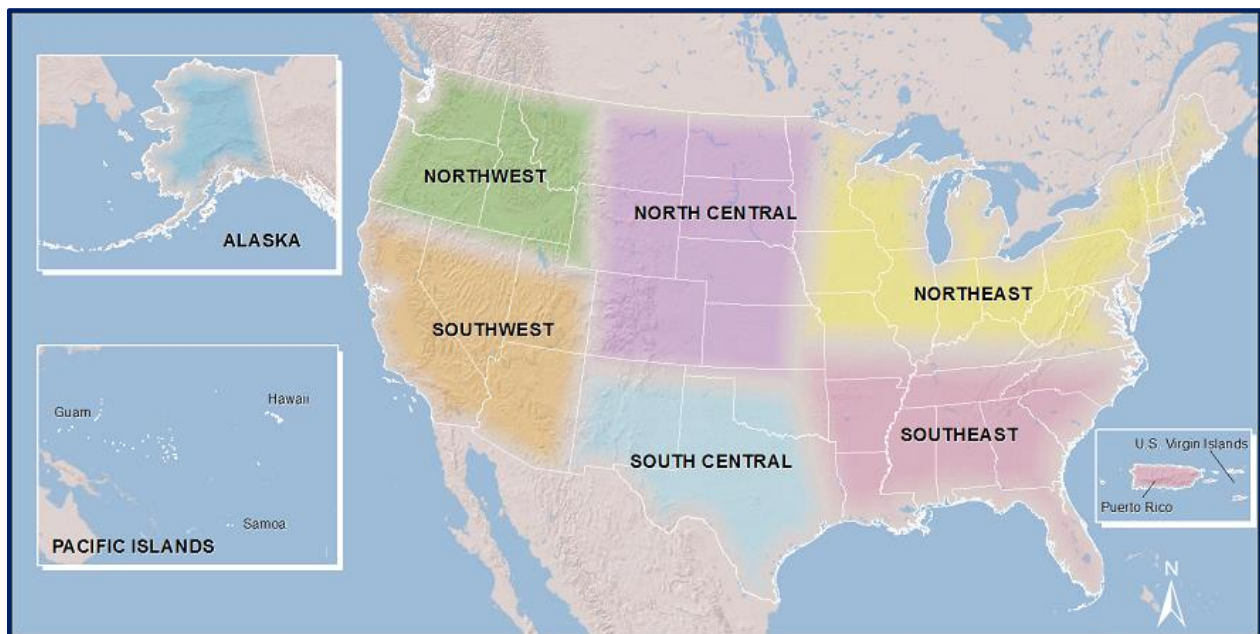
- 12. Peninsular Florida
- 13. Plains and Prairie Potholes
- 14. South Atlantic
- 15. Southern Rockies
- 16. Upper Midwest and Great Lakes
- 17. Aleutian and Bering Sea Islands

- 18. Arctic
- 19. Northwestern Interior Forest
- 20. Western Alaska
- 21. Pacific Islands
- 22. Caribbean
- Unclassified

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

A Summary of Staff, Collaborators, Partners and Projects

2013



National Climate Change and Wildlife Science Center

<https://nccwsc.usgs.gov/>

NCCWSC Staff

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Budget History and Breakout for the National Climate Change and Wildlife Science Center and Department of the Interior Climate Science Centers				
	NCCWSC	CSCs	Total Appropriation	
FY 08	\$ 1,500,000	\$ -	\$ 1,500,000	
FY 09	\$ 9,500,000	\$ 500,000	\$ 10,000,000	
FY 10	\$ 1,000,000	\$ 14,000,000	\$ 15,000,000	
FY 11	\$ 1,200,000	\$ 19,721,000	\$ 20,921,000	
FY12	\$ 5,306,000	\$ 19,892,000	\$ 25,198,000	Continuing Resolution
FY 13	\$ 5,600,000	\$ 19,598,000	\$ 25,198,000	Continuing Resolution
FY 14			\$ 35,292,000	President's Budget Request

NCCWSC Funded Projects

For more information about the NCCWSC FY 2009-2013 projects, including publications, data, and maps, please [visit this page](#).

FY 2013

Maintaining Resilience in the Face of Climate Change

In Resilience and Law (forthcoming Columbia University Press)

Authors: Alejandro E. Camacho and Douglas Beard

The physical and biological effects of climate change raise fundamental challenges to the resilience of natural ecosystems (Gunderson & Holling 2002: 35). Existing governmental institutions lack the adaptive capacity to manage changes to ecological and legal systems. In particular, regulators and managers lack information about ecological effects and alternative management strategies for managing the effects of climate change (Karkkainen 2008: 1439-42; Camacho 2009: 65-70), as well as the institutional infrastructure for obtaining such information (Peters 2008: 20, 22). A number of recent initiatives have been proposed to address the effects of climate change on ecological systems.

However, these nascent programs insufficiently attend to this lack of adaptive capacity. As discussed in this paper, a federal, publicly accessible, and system-wide portal and clearinghouse will help regulators at all levels of government manage the effects and uncertainty from climate change (DiMento & Ingram 2005: 300; Farber 2007: 219). Such an information infrastructure, combined with a range of incentives that encourage regulators to engage in adaptive management and programmatic adjustment over time (Baron et al. 2008: 2; Kareiva et al. 2008: 31-32), will help governmental and private institutions become more resilient and capable at managing the physical and human institutional effects of changing climate (Camacho 2009).

Vulnerability Assessment Project

The NCCWSC has an interest in organizing the creation of a searchable public database on climate change vulnerability assessments. The intention is to create a central location for researchers and managers to locate information on current and past vulnerability assessments so that research redundancy may be reduced, collaboration increased, and their utility shared beyond the region they were created in. Vulnerability assessments are a great tool to assist managers in assessing ecosystem, habitat, and species health and can be used in combination with other decision support tools.

FY 2012

[Impacts of Climate Change on Biodiversity, Ecosystems, and Ecosystem Services](#): Technical Input to the 2013 National Climate Assessment

Principal Investigators: Michelle Staudinger, Shawn Carter

The report, *Impacts of Climate Change on Biodiversity, Ecosystems, and Ecosystem Services*, synthesizes the scientific understanding of the way climate change is affecting ecosystems, ecosystem services and the diversity of species, as well as what strategies might be used by natural resource practitioners to decrease current and future risks. More than 60 federal, academic and other scientists, including the lead authors from the U.S. Geological Survey, the National Wildlife Federation and Arizona State University in Tempe, authored the assessment. Lead authors of this report include Michelle Staudinger, USGS; Shawn Carter, USGS; F. Stuart Chapin III, University of Alaska, Fairbanks; Peter Kareiva, The Nature Conservancy; and Mary Ruckelshaus, Natural Capital Project. Federal law requires that the U.S. Global Change Research Program submit an assessment of climate change and its impacts to the President and the Congress once every four years. Technical reports, articles and books – such as this

report -- underpin the corresponding chapters of the Third U.S. National Climate Assessment, due out in 2013.

Developing a framework for a Biodiversity and Ecosystem Services Trends (BEST) Assessment

Principal Investigators: Laura Thompson, Douglas Beard

In response to a report issued by the President's Council of Advisors on Science and Technology (PCAST), federal agencies are developing a framework for a Biodiversity and Ecosystem Services Trends (BEST) assessment. The framework identifies how existing assessments and monitoring programs can be used to determine the trends and drivers of change in biodiversity, ecosystems, and ecosystem services so better decisions can be made regarding management of U.S. terrestrial, marine, and inland water ecosystems.

Identifying Department of Interior vulnerability assessments with the greatest potential to inform climate change adaptation planning

Principal Investigators: Laura Thompson, Robin O'Malley

Project researchers summarized a 2011 U.S. Department of Interior (DOI) data call on vulnerability assessments to determine the number of projects that considered multiple vulnerability components (i.e., exposure, sensitivity, adaptive capacity) and, therefore have the greatest potential to inform climate change adaptation planning. We found that the majority of projects related to sea-level rise and landscapes (including wildlife habitat) assessed both exposure and sensitivity or all three components and should be the focus for initial adaptation efforts.

FY 2011

[Climate Change and Federal Land Management: Assessing priorities using a social network approach](#)

Principal Investigators: Mark Schwartz and Mark Lubell, University of California, Davis

FY 2010 - Interagency Projects

[Southeast Regional Assessment Project \(SERAP\)](#)

The Southeast Regional Assessment Project (SERAP) was the first regional assessment to be funded by the USGS National Climate Change and Wildlife Science Center. The USGS worked closely with the developing Department of Interior Landscape Conservation Cooperatives to ensure that the project met the needs of resource managers in the Southeast. In addition, the U.S. Fish and Wildlife Service provided resources to the SERAP to expand the scope of the project.

[Joint research by the U.S. Geological Survey and the USDA Forest Service Southern Research Station](#)

The U.S. Geological Survey (USGS) and the USDA Forest Service are working together to assess how land-use, water-management decisions, and climate change may affect ecosystem services and coldwater species such as brook trout and Pacific salmon. USGS and Forest Service researchers are engaging representatives of key regional agencies to determine what types of management scenarios they need to test. By combining efforts, the USGS and the Forest Service will not only improve the science of

stream modeling, but will also provide essential tools necessary for managers and policy makers to make science-informed decisions.

FY 2009

[A Land of Flowers on a Latitude of Deserts: Aiding Conservation and Management of Florida's Biodiversity](#)

Principal Investigators: Thomas J. Smith

[Assessing the Vulnerability of Species and Ecosystems to Projected Future Climate Change in the Pacific Northwest](#)

Principal Investigators: Sarah L. Shafer, Earth Surface Processes Team, USGS, Corvallis, OR

[A Visualization Approach for Projecting Future Distributions of North American Bioclimates](#)

Principal Investigators: Sarah L. Shafer, Earth Surface Processes Team (Central Region), U.S. Geological Survey, Corvallis, OR

[Avian conservation in the Prairie Pothole Region, northern Great Plains: understanding the links between climate, ecosystem processes, wetland management, and bird communities](#)

Principal Investigators: Susan Skagen, Fort Collins Science Center

[Can camouflage keep up with climate change? Connecting down-scaled climate models to adaptation for a key forest species](#)

Principal Investigators: Mike Mitchell, Unit Leader, Montana Cooperative Wildlife Research Unit, University of Montana, Missoula, MT

[Can mammals mediate climatically-induced vegetation transitions in alpine ecosystems of the western United States?](#)

Principal Investigators: Robert Klinger

[Characterizing Uncertainty in the Impact of Global Climate Change on Large River Fishes: Missouri River Sturgeon Example](#)

Principal Investigators: Mark Wildhaber, Columbia Environmental Research Center

[Development and Dissemination of High-Resolution National Climate Change Dataset Principal](#)

Principal Investigators: Jaime Collazo, Nathan Booth, Lauren Hay, Katharine Hayhoe, and Adam Terando

[Forecasting climate-change induced effects on recreational and commercial fish populations in the Great Lakes](#)

Principal Investigators: David Bunnell, Great Lakes Science Center

[Forecasting climate impacts on wildlife of the arid southwest at regional and local scales using downscaled climate models](#)

Principal Investigators: Charles van Riper, Southwest Biological Science Center

[Forecasting the Effects of Land-Use and Climate Change on Wildlife Communities and Habitats in the Lower Mississippi Valley](#)

Principal Investigators: Stephen Faulkner, Leetown Science Center, West Virginia

[Impacts of climate change and melting glaciers on coastal ecosystems in the nearshore waters of the Gulf of Alaska](#)

Principal Investigators: John Crusius, Woods Hole Coastal and Marine Science Center

[Impacts of Climate-induced Changes in Plant Phenology on Migration, Breeding, and Redistribution of subArctic- and Arctic-nesting Avifauna](#)

Principal Investigators: David H. Ward, Wetlands and Terrestrial Ecology Branch, Alaska Science Center, Anchorage, Alaska

[Modeling the response of imperiled freshwater mussels to anthropogenically induced changes in water temperature, habitat, and flow in streams of the southeastern and central United States](#)

Principal Investigators: Thomas J. Kwak, NC Cooperative Fish and Wildlife Research Unit, NC State University, Raleigh, NC

[Predicting climate change threats to key estuarine habitats and ecosystem services in the Pacific Northwest](#)

Principal Investigators: Deborah Reusser; Research Geographer, Western Fisheries Research Center, Seattle, WA

[Predicting risks of island extinctions due to sea level rise: model-based tools to mitigate terrestrial habitat losses in the Northwestern Hawaiian Islands](#)

Principal Investigators: Michelle Reynolds, Pacific Island Ecosystem Research Center, Hawaii National Park, HI

[Quantifying vulnerability of quaking aspen woodlands and associated bird communities to global climate change in the northern Great Basin](#)

Principal Investigators: Susan Earnst, Research Wildlife Biologist, and Doug Shinneman, Research Fire Ecologist, FIRESC – Snake River Field, Boise, ID

[Managing the Nation's Fish Habitat at Multiple Spatial Scales in a Rapidly Changing Climate](#)

Principal Investigators: Craig Paukert, USGS, Kansas Cooperative Research Unit

[Modeling and Projecting the Influence of Climate Change on Texas Surface Waters and their Aquatic Biotic Communities](#)

Principal Investigators: Reynaldo Patino, USGS Texas Cooperative Fish and Wildlife Research Unit

FY 2008

[Climate Change: A Challenge to Bird Conservation in Arid and Semi-arid Regions](#)

Principal Investigators: Susan Skagen, USGS

[Fate of endangered species in San Francisco Bay tidal marshes with sea-level rise](#)

Principal Investigators: John Y. Takekawa, Research Wildlife Biologist, Western Ecological Research Center, Vallejo, CA

[Impact of Past and Future Stream Temperature and Flow Changes on Endangered Atlantic Salmon](#)

Principal Investigators: Robert Dudley; Glenn Hodgkins

[The Potential Influence of Changing Climate on the Persistence of at Risk Native Salmonids](#)

Principal Investigators: Jeffrey Kershner, USGS Northern Rocky Mountain Science Center

[Quantifying the Influence of Climate Change on Rocky Mountain Ungulates](#)

Principal Investigators: Matthew Kauffman

Additional NCCWSC Materials

- [NCCWSC Fact Sheet 2011–3057](#)
- [CSC Fact Sheet 2012–3048](#)

Alaska Climate Science Center

Year Established: 2010

Website: <http://www.doi.gov/csc/alaska>

Principal Staff and Collaborators

CSC Director	USGS-NCCWSC	Steve Gray
Host Institution	University of Alaska	Scott Rupp
Scientist/Science Manager	USGS	Jeremy Littell

Graduate Students and Post-Doctoral Researchers

Dr. Stephanie McAfee, Postdoctoral Fellow: Climate Model Downscaling

Dr. Alessio Gusmeroli, Postdoctoral Fellow: Permafrost Hydrology

Dr. Jacob LaCroix, Postdoctoral Fellow: Wildlife Habitat Modeling

Katrina Bennett, Doctoral Research Assistant: Influence of Climate Change on Regional Hydrologic Extremes in Interior Sub-Arctic Alaskan Watersheds

Carson Baughman, Graduate Research Assistant: Controls and consequences of peat in a permafrost landscape on Alaska's North Slope

Winslow Hansen, Graduate Research Assistant: Linked Disturbance interactions in Alaska: Implications for Ecosystems and People

Rick Lader, Graduate Research Assistant: Intercomparison and validation study of reanalysis models for Alaska

Earnest Eckerson, Undergraduate Research Assistant: Freshwater discharge from Alaska glaciers

Brittany Bennett, Undergraduate Research Assistant: Population-level responses of Alaska wildlife species to short-and long-term effects of climate change on the environment

AK CSC Stakeholder Advisory Committee – current membership

CSC	AK CSC	Title
Chair	U.S. Geological Survey (USGS)	Alaska Regional Executive
	Alaska Department of Environmental Conservation	Commissioner
DOI	USGS	Alaska Regional Executive
	National Park Service	Regional Director
	U.S. Fish & Wildlife Service	Regional Director
	Bureau of Indian Affairs	Regional Director
	Bureau of Land Management	State Director
	Bureau of Ocean Energy Management / successor	Regional Director
Other Federal	U.S. Forest Service Research & Development	Regional Forester
	U.S. Army Corps of Engineers	Engineering Division Chief
	Environmental Protection Agency	for administrator,
	National Oceanic and Atmospheric Administration (NOAA)	Director, Alaska Fisheries Research Center
	National Weather Service	Regional NWS Coordinator
	U.S. Arctic Research Commission	U.S. Arctic Research Commission
	Department of the Interior (DOI)	Special Asstistant to Secretary for Alaska
Tribal	Alaska Native Tribal Health Consortium	Alaska Native Tribal Health Consortium
	AK Native U.S. Arctic Research Commission / University of Alaska	U.S. Arctic Research Commission, Director Kuskokwim Campus University of Alaska
State	Alaska Department of Natural Resources	Commissioner
	Alaska Department of Environmental Conservation	Commissioner
	Alaska Department of Fish and Game	Commissioner
Ex officio	University of Alaska Fairbanks	Vice Chancellor for Research
	AK Ocean Observing System	Director

FY 2011 Alaska CSC Funded Projects

For more information about the CSC FY 2011 projects, including publications, data, and maps, please click on the title of a project in the list below, or [visit this page](#). A downloadable list (PDF) of FY 2011 project summaries can also be accessed [here](#).

[Development and Application of an Integrated Ecosystem Model \(IEM\) for Alaska](#)

Principal Investigator: **David McGuire**, University of Alaska, Fairbanks (UAF)

Co-investigators: **T. Scott Rupp**, UAF; **Vladimir Romanovsky**, UAF; **Eugenie Euskirchen**, UAF; **Sergey Marchenko**, UAF

[Detection of Climate-linked distributional shifts of breeding water birds across North America](#)

Principal Investigator: **Joel Schmutz**, USGS Alaska Science Center

Cooperators & Partners: **Jim Nichols**, Patuxent Wildlife Research Center; **Mark Lindberg**, University of Alaska Fairbanks; **Dave Verbyla**, University of Alaska, Fairbanks; **Mark Koneff**, U.S. Fish and Wildlife Service

[Ecology, Soil Carbon, and Permafrost Experiments \(ECOSCAPE\)](#)

Principal Investigator: **Mark Waldrop**, USGS

[Assessing the Sensitivity of Alaska's Coastal Rainforest Ecosystem to Changes in Glacier Runoff](#)

Principal Investigator: **Shad O'Neel**, USGS Alaska Science Center; **Anthony Arendt**, Geophysical Institute, University of Alaska, Fairbanks; **Eran Hood**, University of Alaska Southeast; **Sanjay Pyare**, University of Alaska Southeast

[Integrating Studies of Glacier Dynamics and Estuarine Chemistry in the context of Landscape Change in the Arctic](#)

Principal Investigator: **Matt Nolan**, University of Alaska, Fairbanks, Institute of Northern Engineering

Co-Investigators: **Jim McClelland**, University of Texas; **Ken Dunton**, University of Texas

FY 2012 Alaska CSC Funded Projects

For more information about the CSC FY 2012 projects, including publications, data, and maps, please click on the title of a project in the list below, or [visit this page](#). A downloadable list (PDF) of FY 2012 project summaries can also be accessed [here](#).

[Implications of Glacier Change in Alaska](#)

Principal Investigator: **Eran Hood**, University of Alaska Southeast

Cooperators & Partner: **Shad O'Neel**, U.S. Geological Survey Alaska Science Center; **Anthony Arendt**, University of Alaska, Fairbanks Geophysical Institute; and **Sanjay Pyare**, University of Alaska Southeast

[Validation of Yukon-Kuskokwim Delta Storm Surge Model](#)

Principal Investigator: **Tom Ravens**, University of Alaska Anchorage

Cooperators & Partners: **Sarah Saalfeld**, U.S. Fish and Wildlife Service; **Torre Jorgenson**, Alaska Ecoscience; and **Joel Schmutz**, Alaska Science Center

[Linking Climate, Vegetation, and Ungulate Dynamics Across the Alaska Region](#)

Principal Investigator **Jeffrey Welker**, Environment and Natural Resources Institute and Department of Biological Sciences, University of Alaska – Anchorage

[Development and Application of an Integrated Ecosystem Model for Alaska](#) (Continued from 2011)

Principal Investigator: **David McGuire**, University of Alaska, Fairbanks

Co-Investigators: **Scott Rupp**, **Vladimir Romanovsky**, **Eugenie Euskirchen**, and **Sergey Marchenko**

[Thermokarst Monitoring at the Landscape Level: a Feasibility Study using Snow Datasets for Arctic Terrestrial Applications](#)

Principal Investigators: **Glen E. Liston**, Cooperative Institute for Research in the Atmosphere, Colorado State University; **Benjamin Jones**, **Joshua Koch**, and **Courtney Amundson**, U.S. Geological Survey Alaska Science Center

[Western Alaska Coastal Hazards and Stream and Lake Monitoring](#)

Principal Investigator: **Robert Grumbine**, National Center for Environmental Prediction (NCEP), National Oceanic and Atmospheric Administration (NOAA)

Co-Investigator: **Joannes J. Westerink**, University of Notre Dame

Cooperators & Partners: **Patrick C. Kerr**, University of Notre Dame; **Andre van der Westhuisen** and **Hendrik Tolman**, NCEP, NOAA; **Jesse C. Feyen** and **Yuji Funakoshi**, National Ocean Service, Office of Coast Survey, and Coast Survey Development Laboratory, NOAA

Joint Project: Alaska Climate Science Center, U.S. Fish and Wildlife Service, and the Western Alaska Landscape Conservation Cooperative

[Assessing the Sensitivity of Alaska's Coastal Rainforest Ecosystems to Changes in Glacier Runoff](#)

Principal Investigators: **Shad O'Neel**, U.S. Geological Survey Alaska Science Center; **Anthony Arendt**, Geophysical Institute, University of Alaska Fairbanks; and **Eran Hood** and **Sanjay Pyare**, University of Alaska Southeast

[Integrating Studies of Glacier Dynamics and Estuarine Chemistry in the context of Landscape Change in the Arctic](#)

Principal Investigators: **Matt Nolan**, University of Alaska Fairbanks, Cooperative Ecosystem Studies Unit

Co-Investigators: **Jim McClelland** and **Ken Dunton**, University of Texas at Austin

[Yukon River Basin Project: Ecology, Soil Carbon and Permafrost Experiments](#)

Principal Investigator: **Mark Waldrup**, U.S. Geological Survey

AK CSC Additional Materials

- [AK CSC Strategic Plan](#)
- [AK CSC Annual Action Plan FY2012](#)
- [AK CSC FY11 Annual Report](#)
- [Alaska Climate Downscaling Workshop 2011](#)
- [FY12 Alaska Integrated Ecosystem Model Fact Sheet](#)
- [Assessing the Sensitivity of Alaska's Coastal Rainforest Ecosystems to Changes in Glacier Runoff](#)

North Central Climate Science Center

Year Established: 2011

Website: <http://www.doi.gov/csc/northcentral>

Principal Staff and Collaborators

CSC Director	USGS-NCCWSC	Jeffrey Morisette
Host Institution	Colorado State	Dennis Ojima
Consortium Member	Colorado School of Mines	Dag Nummedal
Consortium Member	Iowa State University	Christopher Anderson
Consortium Member	Kansas State University	John Blair
Consortium Member	Montana State University	Cathy Whitlock
Consortium Member	University of Colorado, Boulder	Bradley Udall
Consortium Member	University of Nebraska, Lincoln	Bob Oglesby
Consortium Member	University of Montana	Ric Hauer
Consortium Member	University of Wyoming	Bill (W.K.) Lauenroth
Deputy/Research Coordinator	USGS	Geneva Chong
Programmer/Geospatial Analyst	USGS	Colin Talbert
Biostatistician	USGS	Marian Talbert

Graduate Students and Post-Doctoral Researchers

Amber Childress, Graduate Student, Colorado State University, Natural Resource Ecology Lab

Shannon McNeely, Postdoctoral Fellow, Colorado State University, Natural Resource Ecology Lab

Karen Cozzetto, Postdoctoral Fellow, University of Boulder, CO

NC CSC Stakeholder Advisory Committee – current membership

CSC	NC CSC	Title
Chair	USGS	Deputy Regional Director for Science, Southwest Region
LCC	Plains and Prairie Potholes	Coordinator, Science Coordinator
	Great Northern	Coordinator, Science Coordinator
	Great Plains	Coordinator, Science Coordinator
	Southern Rockies	Coordinator, Science Coordinator
DOI	U.S. Fish and Wildlife Service (FWS)	Assistant Regional Director, Science Region 6
	National Park Service	NPS-IM Associate Regional Director for Science
	Bureau of Land Management	Associate State Director / Montana
	Bureau of Reclamation	Chief - Environmental Resources Section, USACE, Omaha District
Other Federal	National Oceanic and Atmospheric Administration (NOAA)	Director, Physical Science Division, Earth Systems Res. Lab
	USDA Forest Service	Deputy Station Director, Rocky Mountain Research Station
	USDA- Agricultural Research Service	Plant Physiologist, Rangeland Resources Research, High Plains Grassland Research Station
	DOE-National Renewable Energy Laboratory	Principal Engineer/Group Manager, Thermal Systems, NREL
	Environmental Protection Agency	EPA Region 8 Climate Change Coordinator
	U.S. Army Corps of Engineers	Chief - Environmental Resources Section, USACE, Omaha District
Tribal	Flandreau Santee Sioux Tribe	Former tribal chair
	Northern Arapaho Tribe	Tribal liaison to the state of Wyoming
Ex officio	Colorado State	Principal Investigator, NC CSC
	NOAA-National Center for Atmospheric Research (NCAR)	Director, Applications
	NC CSC	Director, NC CSC
	FWS	Assistant Regional Director, Science Applications

FY 2011 North Central CSC Funded Projects

For more information about the CSC FY 2011 projects, including publications, data, and maps, please click on the title of a project in the list below, or [visit this page](#). A downloadable list (PDF) of FY 2011 project summaries can also be accessed [here](#).

[North Central Climate Impacts and Response Research and Assessment: End-to-End Information Storage, Analysis, and Access Capacity Pilot Study](#)

Principal Investigator(s): **Dennis Ojima**, Colorado State University; **Jay Hestbeck**, USGS

[Collaborative Modeling Approaches for Climate and Landscape Planning in the Northern Rockies: Exploring FRAME-SIMPPLLE](#)

Principal Investigator(s): **Cathy L. Whitlock**, Montana State University; **Kathryn M. Irvine**, U.S. Geological Survey, Northern Rocky Mountain Science Center; **Erik Beever**, U.S. Geological Survey, Northern Rocky Mountain Science Center; **Natasha B Carr**, U.S. Geological Survey, Fort Collins Science Center; **Carl D Shapiro**, Science and Decision Center, U.S. Geological Survey; **Jimmie Chew**, Rocky Mountain Research Station, U.S. Forest Service; **Richard S Sojda**, U.S. Geological Survey, Northern Rocky Mountain Science Center

[North Central Climate Impacts and Response Research and Assessment: Data Integration Workshop](#)

Principal Investigator(s): **Dennis Ojima**, Colorado State University; **Jay Hestbeck**, USGS

[North Central Climate Impacts and Response Research and Assessment: Regional Assessment](#)

Principal Investigator(s): **Dennis Ojima**, Colorado State University; **Jay Hestbeck**, USGS

FY 2012 North Central CSC Funded Projects

For more information about the CSC FY 2012 projects, including publications, data, and maps, please click on the title of a project in the list below, or [visit this page](#). A downloadable list (PDF) of FY 2012 project summaries can also be accessed [here](#).

[Projecting Future Effects of Land Management, Natural Disturbance, and CO₂ on Woody Encroachment in the Northern Great Plains in a Changing Climate](#)

Principal Investigator: **Amy Symstad**, U.S. Geological Survey Northern Prairie Wildlife Research Center
Co-Investigators: **Dominique Bachelet**, Conservation Biology Institute and Oregon State University (OSU); **David King**, OSU; and **Ken Ferschweiler**, Conservation Biology Institute

[Projecting Climate Change Effects on Cottonwood and Willow Seed Dispersal Phenology, Flood Timing, and Seedling Recruitment in Western Riparian Forests](#)

Principal Investigator: **Patrick Shafroth**, U.S. Geological Survey (USGS) Fort Collins Science Center
Co-Investigators: **Laura Perry**, Colorado State University (CSU) Biology Department; **Lauren Hay**, **Roland Viger**, and **Steven Markstrom**, USGS Modeling of Watershed Systems, National Resource Program; **Glen Liston**, CSU Cooperative Institute for Research in the Atmosphere; and **David Blodgett** and **Nathaniel Booth**, USGS Center for Integrated Data Analytics

[Integrating Climate and Biological Data into Land Management Decision Models to Assess Species and Habitat Vulnerability: A Collaboration for Greater Sage-Grouse and their Habitats](#)

Principal Investigators: **Richard S. Sojda**, **Erik A. Beever**, **Kathryn M. Irvin**, and **Gregory T. Pederson**, U.S. Geological Survey (USGS) Northern Rocky Mountain Science Center (NOROCK)

Cooperators & Partners: **Cathy Whitlock**, Montana State University (MSU) Institute of Ecosystems (IoE); **Yvette Converse**, **Tom Olliff**, and **Sean Finn**, Great Northern Landscape Conservation Cooperative (LCC); **Rick Nelson** and **Mike Olson**, Plains and Prairie Potholes LCC; **Jeff Warren**, U.S. Fish & Wildlife Service; **Rock Potts**, Charles M. Russell National Wildlife Refuge; **Sten Benes** and **Kate Kitchell**, Bureau of Land Management; **Andrea Ray**, National Oceanic and Atmospheric Administration; **John Sheppard**, **Michael Reilly**, **Donald Greer**, and **Elizabeth Shanahan**, MSU; and **Linda Vance**, University of Montana

[The Value of Climate Information for Supporting Management Decisions within the Plains and Prairie Potholes LCC](#)

Principal Investigators: **Max Post van der Burg**, U.S. Geological Survey (USGS) Northern Prairie Wildlife Research Center, **Cathy Cullinane Thomas** and **Tracy Holcombe**, USGS Fort Collins Science Center

[Regional Short- and Long-term Climate Impacts on Northern Rocky Mountain's and Great Plain's Ecosystems: NASA DEVELOP program Central U.S. Node](#)

Principal Investigator: **Jeff Morisette**, U.S. Geological Survey, North Central Climate Science Center

[Regional Extreme Climate Events: Gaining Understanding Through Past and Present Observations and Modeling](#)

Principal Investigator: **Christopher Anderson**, Iowa State University

[Vulnerability Assessment of Ecological Systems and Species to Climate and Land Use Change within the North Central Climate Change Center and Partner Land Conservation Cooperatives](#)

Principal Investigator: **Andrew Hansen**, Montana State University

[Adaptive Capacity and Decision Making Framework](#)

Principal Investigator: **Dennis Ojima**, Colorado State University

[Wyoming Rapid Ecoregional Assessment](#)

The North Central Climate Science Center and the National Oceanic and Atmospheric Administration (NOAA) will provide support requested by the Bureau of Land Management (BLM) for the Wyoming Rapid Ecological

NC CSC Additional Materials

- [NC CSC 2012 Annual Report](#)
- [NC Science Agenda 2012-2017 \(Open-File Report 2012-1265\)](#)
- Seminar Series, [Managing our Natural Resources for Changing Climate](#), with the Natural Resource Ecology Laboratory (NREL)

Northeast Climate Science Center

Year Established: 2012

Website: <http://www.doi.gov/csc/northeast>

Principal Staff and Collaborators

CSC Director	USGS-NCCWSC	Mary Ratnaswamy
Host Institution	University of Massachusetts	Richard Palmer
Consortium Member	College / Menominee Nation	Melissa Cook
Consortium Member	Columbia University	Radley Horton
Consortium Member	University of Missouri -- Columbia	Frank Thompson
Consortium Member	University of Minnesota	Anthony D'Amato
Consortium Member	Marine Biological Laboratory	Linda Deegan
Consortium Member	University of Wisconsin Madison	Lewis Gilbert
Science Coordinator	USGS	Michelle Staudinger

Graduate Students and Post-Doctoral Researchers

Post-doctoral Associates

William Andrew Cox (portion of FY 2012, 2013), Department of Fisheries and Wildlife Science, University of Missouri; effects of the interaction of climate and landscape factors on Midwestern forest birds

Eleonora Maria Demaria (FY 2013), Department of Civil and Environmental Engineering, UMass Amherst; impacts of climate change on water resources

Fan Fangxing (portion of FY 2012, 2013), Department of Geosciences, UMass Amherst; modeling of the Northeastern US climate

Jane Foster (portion of FY 2012, 2013), Department of Forest Resources, University of Minnesota; Effects of climate and disturbance on the growth and dynamics of temperate and sub-boreal forest ecosystems within the upper Lake States

David McKenzie (FY 2013), Department of Forest Resources, University of Minnesota; influence of annual climate variability, forest management, and harvest techniques on tree growth and stand-level resistance and resilience to periodic drought

James Nelson (portion of FY 2012, 2013), The Ecosystems Center, Marine Biological Laboratory; effects of the interaction of climate and land use change on forage and top predatory fish in coastal ecosystems

Liang Ning (portion of FY 2012, 2013), Department of Geosciences, UMass Amherst; modeling regional climate change and climate variability

Graduate Students

Jocelyn Anleitner (FY 2012), Department of Civil and Environmental Engineering, UMass Amherst; impacts of climate change on water resources

Lynn Brennan (FY 2013), Department of Civil and Environmental Engineering, UMass Amherst; impacts of climate change on stream temperature

Paul Damkot (FY 2013), Department of Environmental Conservation, UMass Amherst; how climate change will affect brook trout populations

Kyle Gill (portion of FY 2012, 2013), MS candidate, Department of Forest Resources, University of Minnesota; climate factors affecting shifts between grassland and forest biomes over the past century within the upper Midwest

Megan Haserodt (FY 2013), MS candidate, Department of Geology & Geophysics, University of Wisconsin; assessment of climate change impacts on watershed hydrology and policy implication implications

Wenchi Jin (portion of FY 2012, 2013), MS candidate, Department of Forestry, University of Missouri; comparison of the performance of different ecosystem models for assessing climate impacts on tree establishment and growth

Alex Joste (FY 2013), Department of Environmental Conservation, UMass Amherst; impacts of climate change on water resources

Evan Murdoch (FY 2012), Environment and Resources Program in the Nelson Institute for Environmental Studies, University of Wisconsin; assessment of climate change impacts on groundwater recharge and policy implications

Zachary Schuster (FY 2012, 2013), Environment and Resources Program in the Nelson Institute for Environmental Studies, University of Wisconsin; assessment of climate change impacts on watershed hydrology and policy implication implications

Undergraduate

Thomas Rogg (portion of 2012), Department of Civil and Environmental Engineering, UMass Amherst

NE CSC Stakeholder Advisory Committee – current membership

CSC	NE CSC	Title
Chair	U.S. Geological Survey (USGS)	Regional Executive, NE
	USGS	Regional Executive, MW
LCC	Appalachian	Coordinator
	Eastern Tallgrass Prairie and Big Rivers	Coordinator
	Gulf Coastal Plains and Ozarks	unconfirmed
	North Atlantic	Coordinator
	Plains and Prairie Potholes	unconfirmed
	South Atlantic	unconfirmed
	Upper Midwest and Great Lakes	Coordinator
DOI	U.S. National Park Service (NPS)	Regional Chief Scientist, NE
	NPS	Associate Regional Director, NE
	NPS	Regional Director, MW
	NPS	Park Superintendent
	U.S. Fish and Wildlife Service (FWS)	Regional Director, NE
	FWS	Regional Director, MW
Other Federal	U.S. Forest Service	Assistant Director
	National Oceanic and Atmospheric Administration (NOAA)	Regional Director, Climate Services, NE
	NOAA	Regional Coordinator, Great Lakes
	Environmental Protection Agency (EPA)	Coordinator, Region 1
Tribal	Great Lakes Indian Fish and Wildlife Commission	Executive Administrator
State	Minnesota Dept. of Natural Resources	Deputy Director
	Massachusetts Division of Fish & Wildlife	Coordinator, State Wildlife Action Plan
	Great Lakes Fishery Commission	Executive Secretary

FY 2011 Northeast CSC Funded Projects

The Northeast CSC was not established in FY 2011

FY 2012 Northeast CSC Funded Projects

For more information about the CSC FY 2012 projects, including publications, data, and maps, please click on the title of a project in the list below, or [visit this page](#). A downloadable list (PDF) of FY 2012 project summaries can also be accessed [here](#).

[Critically Evaluating Existing Methods and Supporting a Standardization of Terrestrial and Wetland Habitat Classification and Mapping that Includes Characterization of Climate Sensitive Systems](#)

Principal Investigators: **David Diamond**, University of Missouri and **Don Faber-Langendoen**, NatureServe

[Characterization of Spatial and Temporal Variability in Fishes in Response to Climate Change](#)

Principal Investigator: **Brian Irwin**, U.S. Geological Survey Georgia Cooperative Fish and Wildlife Research Unit

Cooperators & Partners: **Tyler Wagner**, Pennsylvania Cooperative Fish & Wildlife Research Unit and **James R. Bence**, Quantitative Fisheries Center, Michigan State University

[Developing Fish Trophic Interaction Indicators of Climate Change for the Great Lakes](#)

Principal Investigators: **Richard T. Kraus**, **Patrick Kocovsky**, **Mark Rogers**, and **Brian Weidel**, U.S. Geological Survey, Great Lakes Science Center, Lake Erie Biological Station; **Carey Knight** and **Ann Marie Gorman**, Ohio Department of Natural Resources, Division of Wildlife

[Extending the Northeast Terrestrial Habitat Map to Atlantic Canada](#)

Principal Investigator: **Kevin McGarigal**, Department of Conservation, University of Massachusetts and **Mark G. Anderson** and **Charles Ferree**, The Nature Conservancy

[Bringing People, Data, and Models Together – Addressing Impacts of Climate Change on Stream Temperature](#)

Principal Investigators: **Austin Polebitski**, **Yi-Chen E. Yang**, **Richard N. Palmer**, and **Casey M. Brown**, University of Massachusetts; **Ben H. Letcher**, U.S. Geological Survey; and **Keith H. Nislow**, U.S. Forest Service

[A Stream Temperature Inventory Network and Decision Support Metadata Mapper - Evaluating the Resources to Understanding Climate Change Effects on Streams in New England and the Great Lakes States](#)

Principal Investigator: **Jana Stewart**, U.S. Geological Survey (USGS) Wisconsin Water Science Center
Co-Investigators: **Marcus C. Waldron** and **David Armstrong**, USGS Massachusetts Water Science Center; **Jim McKenna**, USGS Great Lakes Science Center; **Dana Infante**, Michigan State University; and **Kevin Wehrly**, Institute for Fisheries Research, Michigan Department of Natural Resources

[A Research and Decision Support Framework to Evaluate Sea-Level Rise Impacts in the Northeastern U.S.](#)

Principal Investigator: **E. Robert Thieler**, U.S. Geological Survey, Woods Hole Coastal and Marine Science Center

Co-Investigators: **Nathaniel G. Plant** and **Dean B. Gesch**, USGS, and **Radley Horton**, Columbia University
Additional Support: North Atlantic Landscape Conservation Cooperative

NE CSC Additional Material

- [NE CSC FY12 Preliminary Science Focus Area](#)

Northwest Climate Science Center

Year Established: 2010

Website: <http://www.doi.gov/csc/northwest>

Principal Staff and Collaborators

CSC Director	USGS-NCCWSC	Gustavo Bisbal
Host Institution	Oregon State University	Phil Mote
Consortium Member	University of Idaho	Steven Daley-Laursen
Consortium Member	University of Washington	Nate Mantua
Science Manager	USGS	Nicole DeCrappeo

Graduate Students and Post-Doctoral Researchers

Oregon State University

Sarah Frey-Hadley: Ph.D. student in Ecology; Identifying the major drivers of the patterns observed in bird distributions and how changes in climate and land use might alter them

Lindsey Thurman: Ph.D. student in Wildlife Science; Synergistic effects of climate change and other environmental stressors on high elevation amphibian species in the Cascade Mountain Range

Sihan (Meredith) Li: Ph.D Candidate College of Oceanic and Atmospheric Sciences; regional climate modeling

Seth Wiggins (graduated spring 2012): Ph.D in Applied Economics; Technical and economic potential of carbon sequestration on Pacific Northwest rangelands

University of Washington

Ronda Strauch: Ph.D. student in Department of Civil and Environmental Engineering; Vulnerability of transportation to climate change

Jesse Langdon: Master's student in School of Environmental and Forest Sciences; Forecasting the influence of climate change on terrestrial biodiversity in protected areas of the Pacific Northwest

Brittany Jones: Master of Science in the School of Aquatic and Fisheries Sciences at the University of Washington; Spatially-explicit assessment of natural adaptation and restoration of tidal wetlands under the influence of future climate change throughout Puget Sound

University of Idaho

Jacob Wolf (graduated spring 2012): Masters of Geography student; Exploring a suite of climate change scenarios to develop high-resolution drought metrics that span the 21st century

Collette Gantenbein (starts fall 2012): Masters of Geography student; Land cover change in relation to climate change through examining burn severity in the Pacific Northwest

NW CSC Stakeholder Advisory Committee – current membership

CSC	NW CSC	Title
Chair	U.S. Geological Survey (USGS) (co-chair)	Acting Regional Executive
LCC	Great Basin	Coordinator
	North Pacific	Coordinator
	Great Northern	Coordinator
DOI	National Park Service	Regional Director, Pacific West Region
	Bureau of Land Management	State Director for Oregon and Washington
	Fish and Wildlife Service	Regional Director, Pacific Region
	Bureau of Reclamation	Pacific Northwest Regional Director
	Bureau of Indian Affairs	Director, Northwest Region
Other Federal	Environmental Protection Agency	Regional Administrator Region 10
	USDA-Forest Service Management	Regional Forester of the Pacific Northwest Region
	USDA-Forest Service R&D	Acting Station Director
	USDA Natural Resources Conservation Service (NRCS)	Director, National Water and Climate Center
	U.S. Army Corps of Engineers	TBD
	Bonneville Power Administration	TBD
	NOAA	Deputy Science Director, Northwest Fisheries Science Center
	Federal Highway Administration (FHWA)	Division Engineer for the Western Federal Lands Highway Division
Tribal	Affiliated Tribes NW Indians (ATNI)	President
	Columbia River Intertribal Fish Commission (CRITFC)	Executive Director
	Confederated Tribes of Siletz Indians	Chairwoman
	NW Indian Fisheries Commission (NWIFC)	Executive Director
	Tulalip Tribes	Chairman
	Upper Snake River Tribes Foundation (USRT)	Environmental Program Director
State	Montana – Department of Natural Resources and Conservation	Administrator of the Water Resources Division
	Oregon – Department of Fish and Wildlife	Conservation Policy Coordinator
	Washington- Department of Ecology	Executive Policy Advisor
Ex officio	University of Washington	Assistant Dean, Planning / Initiatives
	Oregon State University (OSU)	Faculty Res Assistant
	OSU	NW CSC Principal Investigator
	USGS	Dir FRESC
	USGS	unconfirmed
Observers	Washington Dept. of Fish & Wildlife (WDFW)	Special Assistant, Director's Office

FY 2011 Northwest CSC Funded Projects

For more information about the CSC FY 2011 projects, including publications, data, and maps, please click on the title of a project in the list below, or [visit this page](#). A downloadable list (PDF) of FY 2011 project summaries can also be accessed [here](#).

[Uncertainty and extreme events in future climate and hydrologic projections for the Pacific Northwest: providing a basis for vulnerability and core/corridor assessments](#)

Principal Investigator(s): **Jeremy Littell**, University of Washington Climate Impacts Group; **Alan Hamlet**, University of Washington Department of Civil and Environmental Engineering; **Nathan Mantua**, University of Washington, School of Aquatic and Fishery Sciences; **Eric Salathe**, University of Washington Bothell Science and Technology Program

[Identification and laboratory validation of temperature tolerance for macroinvertebrates: Developing vulnerability prediction tools](#)

Principal Investigator(s): Robert Black, USGS

Cooperators & Partners: **Susan B. Norton**, National Center of Environmental Assessment, U.S. Environmental Protection Agency; **Bernard W. Sweeney**, Stroud Water Research Center; **Rob Duff**, Washington State Department of Ecology; **Eric D. Fleek**, North Carolina Division of Water Quality; **Peter R. Ode**, California Department of Fish and Game

[Range-wide climate vulnerability assessment for threatened bull trout](#)

Principal Investigator(s): **Jason Dunham**, USGS Forest and Rangeland Ecosystem Science Center

Cooperators & Partners: **Stephen Zylstra**, U.S. Fish and Wildlife Service; **Tim Mayer**, U.S. Fish and Wildlife Service; **Doug Peterson**, U.S. Fish and Wildlife Service Abernathy Fish Technology Center

[Modeling effects of climate change on cheatgrass die-off areas in the Northern Great Basin](#)

Principal Investigator(s): **Bruce K Wylie**, U.S. Geological Survey Earth Resources Observation and Science Center; **Stephen Boyte**, U.S. Geological Survey, Earth Resources Observation and Science Center & SGT, Inc.; **Donald Major**, Bureau of Land Management Idaho and Great Basin Restoration Initiative

[Climate change threats to fish habitat connectivity: Growth and predation](#)

Principal Investigator(s): **Alec G Maule**, U.S. Geological Survey (USGS) Western Fisheries Research Center, Columbia River Research Laboratory; **Patrick J Connolly**, USGS; **Matthew Mesa**, USGS; **Jill Hardiman**, USGS; **James Hatten**, USGS

Cooperators & Partners: **Michael Newsome**, Bureau of Reclamation; **Jennifer Bountry**, Bureau of Reclamation; **Michelle Schmidt**, National Oceanic and Atmospheric Administration - River Forecast Center; **Karen Jenni**, Insight Decisions, LLC; **Colden Baster**, Idaho State University; **Lee Hatcher**, Methow River Watershed Council

[Toward next generation downscaling for hydrologic prediction in the Pacific Northwest \(using Multivariate Adaptive Constructed Analogs – Variable Infiltration\)](#)

Principal Investigator(s): **Philip Mote**, Oregon State University; **Dennis Lettenmaier**, University of Washington; **John Abatzoglou**, University of Idaho

[Contribution of landscape characteristics and vegetation shifts from global climate change to long-term viability of greater sage-grouse](#)

Principal Investigator(s): **Steven T Knick**, U.S. Geological Survey, Forest and Rangeland Ecosystem Science Center; **Sara J Oyler-McCance**, U.S. Geological Survey Fort Collins Science Center

[Disentangling the effects of climate and landscape change on bird population trends in the Western U.S. and Canada](#)

Principal Investigator(s): **Matthew Betts**, Forest Ecosystems and Society, Oregon State University; **Susan Shirley**, Forest Ecosystems and Society, Oregon State University; **Joan Hagar**, U.S. Geological Survey Forest & Rangeland Ecosystem Science Center

[Support to the National Climate Assessment](#)

Principal Investigator(s): **Phil Mote**, Oregon State University

[Support for the Second Annual Pacific Northwest Climate Science Center Conference](#)

Principal Investigator(s): **Amy Snover**, University of Washington

FY 2012 Northwest CSC Funded Projects

For more information about the CSC FY 2012 projects, including publications, data, and maps, please click on the title of a project in the list below, or [visit this page](#). A downloadable list (PDF) of FY 2012 project summaries can also be accessed [here](#).

[Integrated Scenarios of Climate, Hydrology, and Vegetation for the Northwest](#)

Principal Investigator: **Phil Mote**, Oregon State University

Co-Investigators: **David Turner**, Oregon State University; **John Abatzoglou**, University of Idaho; **Dennis Lettenmaier**, University of Washington

Key Personnel: **David Rupp**, Oregon State University; **Dominique Bachelet** and **David Conklin**, Conservation Biology Institute

Cooperators & Partners: **Nicholas Coops**, University of British Columbia; **Marc Kramer** and **John Kim**, U.S. Forest Service; and **V. Sridhar**, Boise State University

[Climate Change and Peak Flows: Knowledge-to-Action to Help Managers Address Impacts on Streamflow Dynamics and Aquatic Habitat](#)

Principal Investigator: **Anne Nolin**, Oregon State University

Cooperators & Partners: **Gordon Grant**, **Mark Kramer**, and **Brian Staab**, U.S. Forest Service Pacific Northwest Research Station; **Mohammad Safeeq** and **Sarah Lewis**, Oregon State University; **Jason Dunham**, U.S. Geological Survey, Forest and Rangeland Ecosystem Science Center; **Marshall Gannett**, U.S. Geological Survey, Oregon Water Science Center; **Christina Tague**, University of California, Santa Barbara; and **Karl Morgenstern**, Eugene Water and Electric Board

[Marshes to Mudflats: Climate Change Effects Along a Latitudinal Gradient in the Pacific Northwest](#)

Principal Investigator: **John. Y. Takekawa**, U.S. Geological Survey, Western Ecological Research Center

Cooperators & Partners: **Susan De La Cruz** and **Karen Thorne**, U.S. Geological Survey, Western Ecological Research Center; **Bruce Dugger**, Oregon State University; **Bruce Jaffe**, U.S. Geological Survey, Pacific Coastal & Marine Science Center; **Susan Ustin**, University of California, Davis, Center for Spatial Technologies and Remote Sensing; **Heath Bollman**, Padilla Bay National Estuarine Research Reserve System; **Joseph Evenson**, Washington Department of Fish and Wildlife; **Jackie Ferrier**, Willapa National

Wildlife Refuges; **Roger Fuller** and **Kit Crump**, The Nature Conservancy; **Alicia Helms**, South Slough National Estuarine Research Reserve; **Roy Lowe**, Oregon Coast Refuges; **Mary Mahaffy**, North Pacific Landscape Conservation Cooperative; **Doug Roster**, Nisqually and Grays Harbor National Wildlife Refuges; **Chris Ellings**, Nisqually Indian Tribe; and **Shannon Kirby**, Skokomish Indian Tribe

[Extended Monitoring and Modeling of Climate Change Effects on Pacific Northwest Wetlands](#)

Principal Investigator: **Alan Hamlet**, University of Washington

Cooperators & Partners: **Michael Adams**, U.S. Geological Survey, Forest and Rangeland Ecosystem Science Center; **Wendy Palen**, Simon Fraser University; **L. Monika Moskal**, **Maureen Ryan**, **Meghan Halabisky**, and **Se-Yeun Lee**, University of Washington; **Regina Rochefort**, North Cascades National Park; and **Lara Hansen**, EcoAdapt

[Predicting Climate Change Impacts on River Ecosystems and Salmonids Across the Pacific Northwest: Combining Vulnerability Modeling, Landscape Genomics, and Economic Evaluations for Conservation](#)

Principal Investigators: **Clint Muhlfeld**, U.S. Geological Survey, Northern Rocky Mountain Science Center, and **Gordon Luikart**, The University of Montana

Cooperators & Partners: **Tim Beechie** and **Robin Waples**, National Oceanic and Atmospheric Administration (NOAA) Fisheries; **John Duffield**, **John Kimball**, **Erin Landguth**, and **Jack Stanford**, The University of Montana; **Leslie Jones** and **Gregory Pederson**, U.S. Geological Survey, Northern Rocky Mountain Science Center

[Climate, Land Management and Future Wildlife Habitat in the Pacific Northwest](#)

Principal Investigator: **Emilie Henderson**, Oregon State University

Cooperators & Partners: **James Kagan**, Institute for Natural Resources, Portland State University; **Megan Creutzburg** and **Anita Morzillo**, Oregon State University; **Jessica Halofsky**, University of Washington; **Miles Hemstrom**, U.S. Forest Service Pacific Northwest Research Station

Additional Support: Washington Department of Natural Resources

[Improving Understanding of Threats to Whitebark Pine in the Western U.S.: Quantifying Climate Change Effects on Mountain Pine Beetle Outbreaks](#)

Principal Investigator: **Jeffrey A. Hicke**, University of Idaho

Cooperators & Partners: **Polly Buotte**, University of Idaho and **Haiganoush K. Preisler**, U.S. Forest Service

Additional Support: U.S. Forest Service Western Wildland Environmental Threat Assessment Center and the U.S. Geological Survey Western Mountain Initiative

[Climate-Change Vulnerability in the Pacific Northwest: A Comparison of Three Approaches](#)

Principal Investigator: **Joshua Lawler**, University of Washington

Cooperators & Partners: **Elizabeth Gray**, The Nature Conservancy; **J. Michael Scott**, U.S. Geological Survey Cooperative Research Unit, University of Idaho; **Rocky Beach**, Washington Department of Fish and Wildlife; **Leona Svancara**, Idaho Fish and Game; **Victoria Stevens**, British Columbia Parks

[Sagebrush Ecosystems in a Changing Climate](#)

Principal Investigator: **Matt Germino**, U.S. Geological Survey Forest and Rangeland Ecosystem Science Center

Co-Principal Investigators: **Bryce Richardson** and **Nancy Shaw**, U.S. Forest Service Rocky Mountain Research Station; **David Pilliod**, U.S. Geological Survey, Forest and Rangeland Ecosystem Science Center; **Keith Reinhardt**, Idaho State University

Cooperators & Partners: **Kevin Feris** and **Marie-Anne deGraff**, Boise State University; **Kathleen Lohse**, Idaho State University; **Diane Debinski**, Iowa State University; **Kelly McCloskey**, Grand Teton National Park; **David Pyke**, U.S. Geological Survey, Forest and Rangeland Ecosystem Science Center; **Anne Halford**, Bureau of Land Management; **Charlie Baun**, State of Idaho and Department of Defense; and **Stuart Hardegree**, U.S. Department of Agriculture, Agricultural Research Service

[Correlation and Climate Sensitivity of Human Health and Environmental Indicators in the Salish Sea](#)

Principal Investigators: **Jamie Donatuto** and **Sarah Grossman**, Swinomish Indian Tribal Community, and **Eric Grossman**, U.S. Geological Survey, Western Fisheries Research Center
Joint project with the North Pacific Landscape Conservation Cooperative

[Utilizing Yurok Traditional Ecological Knowledge to inform Climate Change Priorities](#)

Principal Investigators: **Kathleen Sloan**, Yurok Tribe
Joint project with the North Pacific Landscape Conservation Cooperative

NW CSC Additional Materials

- [NW CSC Strategic Plan 2012-2015](#)
- [NW CSC Science Agenda 2012-2015](#)
- [FY11 Annual Report](#)
- [FY12 Annual Report](#)
- [FY12 Annual Science Workplan](#)
- [FY 13 Workplan](#)
- [FY13 Brochure](#)

Pacific Islands Climate Science Center

Year Established: 2012

Website: <http://www.doi.gov/csc/pacific>

Principal Staff and Collaborators

CSC Interim Director	USGS-NCCWSC	David Helweg
Host Institution	University of Hawaii (UH) Manoa	Kevin Hamilton
Consortium Member	UH Hilo (lead)	Don Straney
Consortium Member	University of Guam	Frank Camacho

Graduate Students and Post-Doctoral Researchers

None have been funded yet at the PI CSC.

PI CSC Stakeholder Advisory Committee – current membership

CSC	PI CSC	Title
Chair	U.S. Geological Survey (USGS)	Acting Regional Executive PSW region
LCC	Pacific Islands Climate Change Cooperative (PICCC)	Coordinator
DOI	National Park Service (NPS)	National Park Service Inventory and Monitoring
	NPS	Pacific West region
	Office of Insular Affairs	Coral Reef Program Manager
	U.S. Fish and Wildlife Service (FWS)	Field Supervisor - Pacific Islands Fish and Wildlife Office
	FWS	Migratory Birds, Region 1, USFWS
	FWS	Project Leader, Hawaiian and Pacific Islands. National Wildlife Refuge
	FWS	U.S. Fish and Wildlife Service Wildlife and Sport Fish Restoration Program
	USGS	Pacific Island Ecosystems Research Center (PIERC)
	USGS	Pacific Islands Water Science Center
Other Federal	National Oceanic and Atmospheric Administration (NOAA)	NOAA Fisheries, Protected Resources Division
	NOAA	National Environmental Satellite, Data, and Information Service (NESDIS)
	NOAA	Office of National Marine Sanctuaries
	NOAA	Pacific Services Center
	Department of Defense (DoD) - U.S. Army Corps of Engineers	U.S. Army Corps of Engineers

CSC	PI CSC	Title
	DoD- Natural Resource Program	U.S. Army Garrison Hawai'i Natural Resource Program
	USDA-Forest Service R&D	U.S. Department of Agriculture Forest Service Pacific Southwest Research Station
	USDA-Natural Resources Conservation Services	Assistant State Soil Scientist
State	Hawaii	Office of Hawaiian Affairs
	Hawaii	Administrator, Division of Forestry and Wildlife
Ex officio	California	University of California - Santa Barbara
	Guam	University of Guam
	Hawaii	University of Hawaii - Hilo
	Hawaii	University of Hawaii - Manoa
	Hawaii	University of Hawaii - Manoa: Center for Conservation Research and Training
	Hawaii	University of Hawaii - Manoa: Social Science Research Institute
	Yale University	Yale University
	Carnegie	Carnegie Institution for Science
	NGO	Pacific RISA
	California	Stanford University
Observers	NGO	American Bird Conservancy
	NGO	Bishop Museum
	NGO	Hawai'i Conservation Alliance
	NGO	Hawai'i Wetland Joint Venture
	Private	Kamehameha Schools
	NGO	Pacific Science Association
	NGO	The Nature Conservancy of Hawai'i Office
	NGO	Trust for Public Lands

Pacific Islands CSC Funded Projects – FY 2011

The Pacific Islands CSC was not established in FY 2011.

Pacific Islands CSC Funded Projects – FY 2012

For more information about the CSC FY 2012 projects, including publications, data, and maps, please click on the title of a project in the list below, or [visit this page](#). A downloadable list (PDF) of FY 2012 project summaries can also be accessed [here](#).

[Climate Change Research in Support of Hawaiian Ecosystem Management: An Integrated Approach](#)

Principal Investigators: Oliver Elison Timm, International Pacific Research Center, University of Hawai'i at Mānoa; Thomas W. Giambelluca, Department of Geography, University of Hawai'i at Mānoa; and Henry F. Diaz, CIRES, University of Colorado, Boulder

Collaborators: Carter Atkinson and Dennis LaPointe, U.S. Geological Survey, Pacific Island Ecosystems Research Center; Jonathan Price, University of Hawai'i at Hilo and U.S. Geological Survey; Michael D. Samuel, U.S. Geological Survey, Wisconsin Cooperative Wildlife Research Unit

[21st Century High-Resolution Climate Projections for Guam and American Samoa](#)

Principal Investigators: Yuqing Wang, International Pacific Research Center, University of Hawai'i at Mānoa; Kevin Hamilton, Axel Lauer, and H. Annamalai, International Pacific Research Center, University of Hawai'i

[Vulnerability of Hawaiian Forest Birds to Climate Change - Using Models to Link Landscape, Climate, Disease, and Potential Adaptation](#)

Principal Investigators: Michael D. Samuel, U.S. Geological Survey, Wisconsin Cooperative Wildlife Research Unit; Dennis A. LaPointe, Carter T. Atkinson, and Eben H. Paxton, U.S. Geological Survey, Pacific Island Ecosystems Research Center

Cooperators & Partners: Loyal Mehrhoff, Jeff Burgett, and Jim Kraus, U.S. Fish and Wildlife Service; Margaret Wild and Darcy Hu, National Park Service; Scott Fretz, Hawai'i Department of Land and Natural Resources; and Colleen Cole, Three Mountain Alliance

[Modeling Climate-Driven Changes to Dominant Vegetation in the Hawaiian Islands](#)

Principal Investigators: Jonathan Price, University of Hawai'i at Hilo and U.S. Geological Survey and James D. Jacobi, U.S. Geological Survey, Pacific Island Ecosystems Research Center

[Understanding How Climate Change is Affecting Hawai'i's High-Elevation Ecosystems: an Assessment of the Long-Term Viability of Haleakala Silverswords and Associated Biological Communities](#)

Principal Investigators: Paul D. Krushelnycky, Department of Plant and Environmental Protection Sciences, University of Hawai'i at Honolulu; Lloyd L. Loope, U.S. Geological Survey, Pacific Islands Ecosystems Research Center

Cooperators & Partners: Thomas Giambelluca, Department of Geography, University of Hawai'i at Honolulu; Donald Drake, Department of Botany, University of Hawai'i at Honolulu; Stephen Anderson, Vegetation Management Program, Haleakala National Park; and Matt Brown, Resources Management Division, Haleakala National Park

South Central Climate Science Center

Year Established: 2012

Website: www.doi.gov/csc/southcentral

Principal Staff and Collaborators

CSC Director	USGS-NCCWSC	Kim Winton
Host Institution	University of Oklahoma	Berrien Moore, University Director Renee McPherson
Consortium Member	Texas Tech	John Zak
Consortium Member	Louisiana State University	Chris D'Elia
Consortium Member	Chickasaw Nation	Wayne Kellogg
Consortium Member	Choctaw Nation	Duane Smith
Consortium Member	OK State University	Keith Owens
Consortium Member	NOAA Geophysical Fluid Dynamics Laboratory	Keith Dixon

Graduate Students and Post-Doctoral Researchers

None recruited at this time for the SC CSC.

SC CSC Stakeholder Advisory Committee – current membership

CSC	SC CSC (pending)	Title
Chair	U.S. Geological Survey (USGS)	unconfirmed
LCC	Desert	Coordinator
	Great Plains	unconfirmed
	Gulf Coast Plains and Ozarks	Coordinator
	Gulf Coast Prairie	Coordinator
	Southern Rockies	unconfirmed
DOI	U.S. Fish and Wildlife Service (FWS)	Acting Director for Region 2
	FWS	ARD for Science Region 4 FWS
	Bureau of Reclamation	Regional Director Great Plains
	Bureau of Indian Affairs Southern Plains	Native American Liaison
Other Federal	U.S. Army Corps of Engineers	SWD Commander
	National Oceanic and Atmospheric Administration	Regional Climate Services Director
Tribal	All Indian Pueblo Council	Chairman
State	Oklahoma Water Resources Board	Executive Director
	Texas Parks and Wildlife Department	Executive Director; however he may nominate a branch chief to replace him

South Central CSC Funded Projects – FY 2011

The South Central CSC was not established in FY 2011.

South Central CSC Funded Projects – FY 2012

For more information about the CSC FY 2012 projects, including publications, data, and maps, please click on the title of a project in the list below, or [visit this page](#). A downloadable list (PDF) of FY 2012 project summaries can also be accessed [here](#).

[Terrestrial Connectivity across the South Central United States: Implications for the Sustainability of Wildlife Populations and Communities](#)

Principal Investigator: Kristen Baum, Oklahoma State University (OSU)

Cooperators & Partners: Samuel D. Fuhlendorf, Department of Natural Resource Ecology and Management, OSU; Kristopher L. Giles, Department of Entomology and Plant Pathology, OSU; Daniel Saenz, Southern Research Station, U.S. Forest Service; Monica Papes, Department of Zoology, OSU; Norman C. Elliot, U.S. Department of Agriculture Agricultural Research Service; Bill Bartush, Gulf Coast Prairie Landscape Conservation Cooperative, National Wetlands Research Center; Allan Janus, Oklahoma Department of Wildlife Conservation

[Delineation of Fresh, Intermediate, Brackish, and Saline Marsh Types of the North Central Gulf of Mexico Coast](#)

Principal Investigator: Steve Hartley, U.S. Geological Survey (USGS), National Wetlands Research Center

Cooperators & Partners: Brady Couvillion and Bill Jones, USGS; Nicholas Enwright, Five Rivers Services; Mike Brasher, Gulf Coast Joint Venture (GCJV) and Ducks Unlimited; Barry Wilson, GCJV and U.S. Fish & Wildlife Service; Jenneke Visser, University of Louisiana at Lafayette; and Bart Ballard, Texas A&M, Kingsville

[Occurrence and Variation in Submersed Aquatic Vegetation \(SAV\) along the Northern Gulf of Mexico: a Hierarchical Approach to Assess Impacts of Environmental Change on SAV Resources](#)

Principal Investigators: Megan La Peyre, U.S. Geological Survey (USGS), Louisiana Fish and Wildlife Cooperative Research Unit

Cooperators & Partners: Andy Nyman, Louisiana State University Agricultural Center; Mike Poirrier, University of New Orleans; Brady Couvillion, USGS, National Wetlands Research Center; Joy Merino, National Marine Fisheries Service; Mike Brasher, Ducks Unlimited, Gulf Coast Joint Venture (GCJV); Stephen DeMaso, U.S. Fish and Wildlife Service and GCJV; and Barry Wilson, GCJV

[Expert Workshop to Build CSC Expertise in Understanding the Social and Communication Dimensions of Climate Change](#)

Principal Investigator: Dennis Patterson, Texas Tech University (TTU)

Cooperators & Partners: Katharine Hayhoe, TTU, and Riley Dunlap, Oklahoma State University

[Evaluating the Assumption of Stationarity in Statistical Downscaling Applications](#)

Principal Investigators: Katharine Hayhoe, Texas Tech University, and Keith Dixon and John Lanzante, National Oceanic and Atmospheric Administration Geophysical Fluid Dynamics Laboratory

[Inter-Tribal Workshops on Climate Variability and Change](#)

Principal Investigator: Laurel Smith, University of Oklahoma

Cooperators & Partners: Renee McPherson, Randy Peppler, and Rachel Riley, University of Oklahoma; Wayne Kellogg, Chickasaw Nation, U.S. Department of Environment Health and Safety; Dana McDaniel Bonham, Choctaw Nation of Oklahoma; Kim Winton, U.S. Geological Survey; Filoteo Gómez, Private Consultant

[Synthesizing Ecohydrology Models as a Management Tool for Landscape Conservation under Climate Change](#)

Principal Investigator: Shannon Brewer, Oklahoma Cooperative Fish and Wildlife Research Unit

Cooperators & Partners: Chris Zou, Natural Resource Ecology and Management, Oklahoma State University; Paul Kemp, International Centre for Ecohydraulics Research, University of Southampton; Thomas Worthington, Natural Resources Ecology and Management, Oklahoma State University

Additional Support: Oklahoma Cooperative Research Unit

Additional Material

- [FY12 SC CSC Fact Sheet](#)

Southeast Climate Science Center

Year Established: 2010

Website: <http://www.doi.gov/csc/southeast>

Principal Staff and Collaborators

CSC Director	USGS-NCCWSC	Gerard McMahon
Host Institution	North Carolina State University	Damian Shea
Research Ecologist	USGS	Adam Terando
Research Associate & NCCWSC Support	USGS	Elda Varela-Acevedo

Graduate Students and Post-Doctoral Researchers

Global Change Post-Doctoral Fellows

[Nathan Putnam](#) : Migration and dispersal in the marine environment and make use of techniques from the fields of sensory ecology, phylogeography, geospatial ecology, and numerical modeling

[Carlos Botero](#): (Initiative in Biocomplexity at NC State University; Studies the effects of quasi-periodic oscillations in ecological conditions (particularly climate-related variables) on the dynamics and outcome of evolution

Global Change Fellows (Graduate students)

[Lauren Charles Smith](#) (Fisheries, Wildlife & Conservation Biology); bridging gaps between multiple disciplines and standardizing how we monitor wildlife movements and interactions in relation to landscape and climate changes through a spatiotemporal database management system (DBMS)

Corey Davis (Marine, Earth and Atmospheric Sciences); wildfire climatology of North Carolina, focusing on the effect of large-scale climate patterns on seasonal fire risk

[Sarah Fritts](#) (Fisheries, Wildlife & Conservation Biology); possibilities for using woody biomass as an energy feedstock

[Ernest Hain](#) (Fisheries, Wildlife & Conservation Biology); Impacts of exotic species on native migratory fishes within the framework of watershed land use and conditions

[Aaron Poteate](#) (Anthropology); how the resource management of ancient populations changed characteristics in the faunal record

Angela Harris (Anthropology); Understanding how Caribbean populations have responded to climate change in the past.

[Jessica Osborne](#) (Anthropology); Mortuary analysis of past populations from the Caribbean islands

[Kara Smith](#) (Marine, Earth and Atmospheric Sciences); evaluation of climate models and development of climate information products for use in adaptation, conservation, and other planning strategies.

Daniela Magdalena Sorger (Biology)

Siyao, Zhang (Forestry)

[Tyson Wepprich](#) (Biology); Effects of climate change on insect phenology, species interactions, and contemporary evolution

SE CSC Stakeholder Advisory Committee – current membership

CSC	SE CSC	Title
Chair	U.S. Geological Survey	Regional Executive, SE
	Gulf Coastal Plains and Ozarks	Chair LCC Advisory Committee
DOI	U.S. Fish and Wildlife Service	Regional Director, Region 4
	U.S. National Park Service	Regional Director, SE
Other Federal	National Oceanic and Atmospheric Administration (NOAA)	Regional Climate Services Director
	USDA Forest Service	Region 8 Forester
State	Southeastern Association of Fish and Wildlife Agencies (SEAFWA)	Executive Director, Florida Fish and Wildlife Commission
	Florida	Executive Director, Florida Fish & Wildlife Conservation Commission

Southeast CSC Funded Projects – FY 2011

For more information about the CSC FY 2011 projects, including publications, data, and maps, please click on the title of a project in the list below, or [visit this page](#). A downloadable list (PDF) of FY 2011 project summaries can also be accessed [here](#).

[Integrating the Effects of Global and Local Climate Change on Wildlife in North America](#)

Principal Investigator(s): **Rob Dunn**, North Carolina State University (NCSU); **Steven B Franks**, NCSU; **Nick Haddad**, NCSU; **Nadia Singh**, NCSU

[Predicting vulnerability of Southeastern sea turtle nesting beaches to climate change](#)

Principal Investigator(s): Kristen M. Hart, USGS Southeast Ecological Science Center
Cooperators & Partners: **Thomas J. Smith III**, U.S. Geological Survey; **Nathaniel G Plant**, U.S. Geological Survey; **James Watling**, University of Florida

[Impact of Ocean Warming and Acidification on Growth of Reef-building Corals](#)

Principal Investigator(s): **Ilsa B. Kuffner**, USGS St. Petersburg Coastal and Marine Geology Science Center

[Developing long-term urbanization scenarios for the Appalachian and Gulf Coastal Plain and Ozarks LCCs as part of the Southeast Regional Assessment Project](#)

Principal Investigator(s): **Jaime Collazo**, USGS North Carolina Cooperative Fish and Wildlife Research Unit

[Southeast Regional Assessment Project \(SERAP\)](#) (Continued 2009 Project)

Principal Investigator(s): **Adam Terando**, North Carolina State University

[USFS-USGS Climate Change Project \(funded through the NCCWSC\)](#)

Principal Investigator(s): **W. Brian Hughes**, USGS Georgia Water Science Center; **C. Andrew Dolloff**, U.S. Forest Service, Southern Research Station

Collaborators & Partners: **James T. Peterson**, USGS Oregon Cooperative Research Unit; **Mary C Freeman**, USGS Patuxent Wildlife Research Center; **Lauren E Hay**, USGS National Research Program; **Jacob H LaFontaine**, USGS Georgia Water Science Center; **Carolyn M. Elliot**, USGS Columbia Environmental Research Center; **Robert B Jacobson**, USGS Columbia Environmental Research Center; **Paul L Angermeier**, USGS Virginia Cooperative Research Unit; **Emmanuel A. Frimpong**, Virginia Tech, Fish and Wildlife Conservation; **James M. Vose**, U.S. Forest Service Coweeta Hydrologic Laboratory

Southeast CSC Funded Projects – FY 2012

For more information about the CSC FY 2012 projects, including publications, data, and maps, please click on the title of a project in the list below, or [visit this page](#). A downloadable list (PDF) of FY 2012 project summaries can also be accessed [here](#).

[Connectivity for Climate Change in the Southeastern U.S.](#)

Principal Investigator: Nick Haddad, Department of Biology, North Carolina State University (NCSU)

Cooperators & Partners: Jen Constanza, NCSU, and Ron Sutherland, Wildlands Network

[Ecological Implications of Mangrove Forest Migration in the Southeastern U.S.](#)

Principal Investigator: Michael Osland, U.S. Geological Survey (USGS) National Wetlands Research Center (NWRC)

Cooperators & Partners: Ken W. Krauss and Richard H. Day, USGS NWRC, and Mark Hester, University of Louisiana

[Assessing Climate-Sensitive Ecosystems in the Southeastern U.S.](#)

Principal Investigator: Jaime Collazo, U.S. Geological Survey and North Carolina Cooperative Fish and Wildlife, and William J. Wolfe, USGS Tennessee Water Science Center

Cooperators & Partners: Jennifer Costanza, North Carolina State University; Milo Pyne, Carl Nordman, and Rickie White, NatureServe; and William Gould, U.S. Forest Service

[Synthesis of Climate Model Downscaling Products for the Southeastern United States](#)

Principal Investigator: Ryan P. Boyles, Department of Marine, Earth and Atmospheric Sciences, North Carolina State University (NCSU)

Cooperators & Partners: Adrienne Wootten, Kara Smith, and Fred Semazzi, NCSU; Vasu Misra and Lydia Stefanova, Florida State University; Tom Smith, Southeast Ecological Science Center, U.S. Geological Survey (USGS); and David Blodgett, Center for Integrated Data Analytics, USGS

[Hydrological Modeling for Flow-Ecology Science in the Southeastern U.S.](#)

Principal Investigator: Jonathan Kennen, U.S. Geological Survey New Jersey Water Science Center

Co-Investigators: Peter Caldwell, Ge Sun, and Steven McNulty, U.S. Forest Service, and Stacy Nelson, North Carolina State University

[A Handbook for Resource Managers to Understand and Utilize Sea-Level Rise and Coastal Wetland Models for Ecosystem Management under Future Conditions](#)

Principal Investigator: Thomas W. Doyle, U.S. Geological Survey National Wetlands Research Center

Cooperators & Partners: Laurie Rounds, National Oceanic and Atmospheric Administration, and Martha Segura, National Park Service

[Communicating and Using Uncertain Scientific Information in the Production of 'Actionable Science'](#)

Principal Investigator: Brian Irwin, U.S. Geological Survey Georgia Cooperative Fish and Wildlife Research Unit (GCFWRU)

Cooperators & Partners: Clint Moore, GCFWRU, and Meredith Gore, Department of Fisheries & Wildlife and School of Criminal Justice, Michigan State University

[Developing Long-Term Urbanization Scenarios for the Caribbean LCC as Part of the Southeast Regional Assessment Project](#)

Principal Investigator: Jaime Collazo, U.S. Geological Survey North Carolina Cooperative Fish and Wildlife Research Unit

[Assessment of Terrestrial and Aquatic Monitoring Programs in the Southeastern United States](#)

Principal Investigator: Damian Shea, North Carolina State University

[Developing Long-Term Urbanization Scenarios for the Appalachian and Gulf Coastal Plain and Ozarks LCCs as Part of the Southeast Regional Assessment Project](#)

Principal Investigator: Jaime Collazo, U.S. Geological Survey North Carolina Cooperative Fish and Wildlife Research Unit

[Predicting Vulnerability of Southeastern Sea Turtle Nesting Beaches to Climate Change](#)

Principal Investigator: Kristen M. Hart, U.S. Geological Survey Southeast Ecological Science Center

[Impact of Ocean Warming and Acidification on Growth of Reef-Building Corals](#)

Principal Investigator: Ilsa B. Kuffner, U.S. Geological Survey St. Petersburg Coastal and Marine Geology Science Center

[Integrating the Effects of Global and Local Climate Change on Wildlife in North America](#)

Principal Investigators: Rob Dunn and Nick Haddad, Department of Biology, North Carolina State University (NCSU); Steve Frank, Department of Entomology, NCSU; and Nadia Singh, Department of Genetics, NCSU

Additional Materials

- [SE CSC FY11 Fact Sheet](#)
- [SE CSC Science and Operational Plan Open-File Report 2012–1034](#)
- [SE CSC and LCC Poster 2012](#)
- [SE CSC Seminar Series](#)

Southwest Climate Science Center

Year Established: 2011

Website: <http://www.doi.gov/csc/southwest>

Principal Staff and Collaborators

CSC Director	USGS-NCCWSC	Stephen Jackson
Host Institution	University of Arizona	Jonathan Overpeck
Consortium Member	Desert Research Institute	Kelly Redmond
Consortium Member	Scripps Institution of Oceanography at the University of California, San Diego	Alexander Gershunov
Consortium Member	University of California, Davis	Mark Schwartz
Consortium Member	University of California, Los Angeles	Glen MacDonald
Consortium Member	University of Colorado, Boulder	Bradley Udall
Climate Science Coordinator	USGS	Tom Suchanek

Graduate Students and Post-Doctoral Researchers

Ruth Cerezo-Mota – Post Doc in UCLA IoES working on dynamical downscaling of climate models

Daniel Walton – Graduate Student in UCLA Atmospheric and Oceanic Sciences working on CMIP3 and CMIP5 downscaling and intercomparison

SW CSC Stakeholder Advisory Committee – current membership

CSC	SW CSC	Title
Chair	U.S. Geological Survey (USGS)	Acting Regional Executive Pacific Southwest (PSW) region (or its successor)
	USGS	Office of the Regional Executive - PSW Area
LCC	California	SC Chair (USDA Forest Service)
	Desert	LCC Coordinator (Bureau of Reclamation)
	Southern Rockies	LCC Coordinator (USFWS)
	Great Basin	SC Chair (USFWS)
DOI	U.S. Fish and Wildlife Service (FWS)	Regional Director Region 8
	FWS	Assistant Regional Director Region 2
	FWS	unconfirmed
	FWS	Regional Director Region 6
	Bureau of Reclamation (BOR)	Lower Colorado Region
	Bureau of Indian Affairs (BIA)	Attending for Pacific Regional Director, Amy Dutschke
	National Park Service (NPS)	Chief Scientist, attending for Pacific West Regional Director, Christine Lehnertz
	Bureau of Land Management (BLM)	CA
Other Federal	USDA-Forest Service (FS)	Wildlife Program Lead, attending for RD Randy Moore
	USDA-FS R&D	PSW Research Station
	USDA-FS R&D	Rocky Mountain Research Station
	National Oceanic and Atmospheric Administration (NOAA)	Director, Southwest Fisheries Science Center
	Department of Defence (DoD) - Navy Region Southwest	unconfirmed
	Environmental Protection Agency	unconfirmed
Tribal	Habematolel Pomo / Upper Lake	unconfirmed
	Hopi	Chairman
State	CA	CA Natural Resources Agency
	CA	CA Department of Water Resources
	CA	California Department of Fish and Wildlife
	NV	NV Department Conservation & Natural Resources
	NV	NV Division of Wildlife
	UT	unconfirmed
	AZ	Deputy Director, AZ Game and Fish Department

Southwest CSC Funded Projects – FY 2011

For more information about the CSC FY 2011 projects, including publications, data, and maps, please click on the title of a project in the list below, or [visit this page](#). A downloadable list (PDF) of FY 2011 project summaries can also be accessed [here](#).

[Climate change impacts in the Southwest: An assessment of next generation climate models for making projections and derivations](#)

Principal Investigator(s): **Mark Schwartz**, University of California, Davis; John Muir Institute of the Environment; **Dan Cayan**, Scripps Institution of Oceanography, University of California, San Diego; U.S. Geological Survey National Research Program; **Sasha Gershunov**, Scripps Institution of Oceanography, University of California, San Diego; U.S. Geological Survey National Research Program; **Mike Dettinger**, Scripps Institution of Oceanography, University of California, San Diego; U.S. Geological Survey National Research Program; **Alex Hall**, University of California, Los Angeles

[Climate Assessment, Adaptation Synthesis and Research Needs for the Southwest](#)

Principal Investigator(s): **Jonathan Overpeck**, University of Arizona; **Gregg Garfin**, University of Arizona

Southwest CSC Funded Projects – FY 2012

For more information about the CSC FY 2012 projects, including publications, data, and maps, please click on the title of a project in the list below, or [visit this page](#). A downloadable list (PDF) of FY 2012 project summaries can also be accessed [here](#).

[Downscaled Climate and Hydrologic Response for California and the Great Basin](#)

Principal Investigator: Lorraine Flint, U.S. Geological Survey California Water Science Center
Cooperators & Partners: Alan Flint, U.S. Geological Survey California Water Science Center; Michael Moran, U.S. Geological Survey Nevada Water Science Center; John Dingman, Bren School for the Environment, University of California; James Thorne, Information Center for the Environment, University of California; Lisa Micheli, Dwight Center for Conservation Science at Pepperwood; Healy Hamilton, University of California, Berkeley; Stuart Weiss, Bay Area Open Space Council; Bridget Thrasher and Claudia Tebaldi, Climate Analytics Group; Deanne DiPietro, Sonoma Ecology Center and California Climate Commons; and Grant Ballard and Sam Veloz, PRBO Conservation Science

[Effects of Sea-Level Rise and Extreme Events on California Coastal Habitats](#)

Principal Investigators: John. Y. Takekawa, U.S. Geological Survey (USGS) Western Ecological Research Center and Glen M. MacDonald, University of California, Los Angeles (UCLA) Institute of the Environment

Cooperators & Partners: Rich Ambrose, UCLA Environmental Science and Engineering Program; Patrick Barnard, USGS Pacific Science Center; Michael Casazza, Susan De La Cruz, and Steven Schwarzbach, USGS Western Ecological Research Center; Glenn Guntenspergen, USGS Patuxent Wildlife Research Center; Alex Hall, UCLA Department of Atmospheric and Oceanic Sciences; Bruce Jaffe, USGS Pacific Coastal & Marine Science Center; Cory Overton and Karen Thorne, University of California (UC), Davis; Susan Ustin, UC Davis Center for Spatial Technologies and Remote Sensing; Brian Collins, U.S Fish and Wildlife Service (FWS) Tijuana River Estuary National Wildlife Refuge (NWR); Kenneth Griggs and Eric Nelson, FWS Humboldt Bay NWR; Andy Yuen, San Diego Refuge Complex

[Trans-Specific Drivers of Climate-Driven Variation in Forecasted Distributional Changes of Southwest Birds and Reptiles](#)

Principal Investigator: David J. Mattson, U.S. Geological Survey (USGS) Southwest Biological Science Center

Cooperators & Partners: Matthew J. Johnson, Erika Nowak, Jennifer Holmes, Michael Peters, and Paul Heinrich, Northern Arizona University; Charles van Riper III, USGS Southwest Biological Science Center; James R. Hatten, USGS Columbia River Research Laboratory; and J. Tomas Giermakowski, University of New Mexico

Additional Support: USGS National Climate Change and Wildlife Science Center

[Comparative Analysis of Downscaled Climate Simulations: Providing Guidance to End Users](#)

Principal Investigator: Daniel Cayan, Scripps Institution of Oceanography, University of California, San Diego (UCSD) and Water Resources Division, U.S. Geological Survey (USGS)

Cooperators & Partners: Bridget Thrasher, Climate Analytics Group; Alex Hall, Institute of the Environment and Sustainability, University of California, Los Angeles; Alexander Gershunov, Scripps Institution of Oceanography, UCSD; and Mike Dettinger, Water Resources Division, USGS

[Multi-Criteria Sensitivity Analysis of the Vulnerability of Hydrologic Systems to Climate Variability and Change in the Southwestern U.S.](#)

Principal Investigator: Ty Ferré, University of Arizona (UA) Hydrology and Water Resources

Cooperators & Partners: Jesse Dickinson, U.S. Geological Survey (USGS) Arizona Water Science Center; Christopher Castro, UA Atmospheric Sciences; Peter Troch, Rafael Rosolem and Hoshin Gupta, UA Hydrology and Water Resources; Stan Leake, Pamela Nagler and Randy Hanson, USGS

Additional Support: UA Water, Environmental and Energy Solutions, the USGS National Institutes for Water Resources, USGS Office of Groundwater

[Climate Change Vulnerabilities and Adaptation Strategies to Wildfire in the Southwestern U.S.](#)

Principal Investigator: Mark W. Schwartz, John Muir Institute of the Environment, University of California (UC), Davis

Cooperators & Partners: Mark Lubell and Jim Thorne, UC Davis; Patrick Gonzales, National Park Service; Nate Stephenson, U.S. Geological Survey; Max Moritz, UC Santa Barbara; Tim Brown, Desert Research Institute; and Gregg Garfin, University of Arizona

Additional Support: U.S. Geological Survey, and the National Park Service

[Climate Change Vulnerability of Native Americans in the Southwest](#)

Principal Investigator: Karletta Chief, University of Arizona, Department of Soil, Water, and Environmental Sciences

Additional Materials

- [FY13 SW CSC Annual Science Workplan](#)
- [FY13 SW CSC Strategic Science Agenda Draft](#)

1.4

Meeting Materials

Advisory Committee on Climate Change and Natural Resource Science (ACCCNRS) Meeting

Hall of States

September 18-19, 2013

Draft Agenda

Meeting Objectives

- Provide ACCCNRS Members with a working understanding of the U.S. Geological Survey (USGS) National Climate Change and Wildlife Science Center (NCCWSC) and U.S. Department of Interior Climate Science Centers (CSC's);
- Provide an overview of other federal climate science services and programs;
- Review the Committee's charge, scope, operating procedures, and ground rules;
- Review and solicit Committee input on the CSCs and NCCWSC approach to science and stakeholder engagement; and
- Define an agenda for future Committee meetings.

Location: 444 North Capitol Street, NW | Washington, DC 20001

Insert Room Name
Access numbers: (domestic toll free)
(toll/international)

Passcode: (number)

Day 1 – Wednesday, September 18, 2013
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8:30 am **Coffee**

9:00 am **Welcome and Opening Remarks**

DOI or USGS Official

Introduction of NCCWSC Staff and ACCCNRS Co-Chairs

9:20 am **Welcome, Introductions, and Meeting Objectives**

Matt Larsen, Associate Director, Climate & Land Use Change, USGS, and ACCCNRS Co-Chair, and David Behar, Climate Program Director, San Francisco Public Utilities Commission and ACCCNRS Co-Chair

- Co-Chair and Committee Member Introductions
- Introduction of Meridian Institute

- Meeting Objectives

- 9:50 am** **Agenda Review**
Tim Mealey, Senior Partner, Meridian Institute
- 10:00 am** **Federal Advisory Committee Ethics Training**
Nancy Baumgartner, Deputy Ethics Counselor, U.S. Geological Survey
- 10:30 am** **Break**
- 10:45 am** **Overview of ACCCNRS Charge, Scope, and Operating Procedures and Ground Rules**
Presenter TBD
- 11:15 am** **Questions and Discussion about ACCCNRS Charge and Scope, and Approval of Draft Operating Procedures and Ground Rules**
- 11:45 am** **Overview of Federal Climate Science Services and Programs and ACCCNRS Role in this Landscape**
Presenter TBD
- 12:15 am** **Initial Questions and Discussion about Federal Climate Science Services and Programs** (there is an additional opportunity to discuss this topic in more depth on Day 2)
- 12:30 pm** **Lunch**
- 1:30 pm** **Overview of the NCCWSC and CSC Structure, Operations, and Partnerships**
Presenter TBD

The goal of this presentation is to clarify the roles and responsibilities of the NCCWSC and CSCs, how they relate to one another, and how they relate to other institutions (e.g., states and tribes, LCCs, etc.). Opportunities for States, Tribes, non-governmental organizations, and other partners to participate in or partner with CSCs and the NCCWSC will be highlighted.
- 2:15 pm** **Questions and Initial Discussion of NCCWSC and CSC Structure, Operations, and Partnerships**
- 2:45 pm** **Overview of NCCWSC/CSC Science Planning Approach and NCCWSC**

Science Plan*Presenter TBD*

This session will cover the processes the NCCWSC and CSCs will use to identify regional and national science questions, how CSCs will develop and share tools at regional and national levels, how the NCCWSC and CSCs will identify and fill science gaps, and how traditional ecological knowledge can be incorporated into the work of the CSCs. In addition the draft science plan for the NCCWSC, which has been developed in consultation with the CSCs, will be presented.

- 3:15 pm Questions and Initial Discussion of NCCWSC/CSC Science Planning Structure and NCCWSC Science Plan** (there is an additional opportunity to discuss the goal of producing “actionable science” on Day 2)
- 3:45 pm Break**
- 4:00 pm Review and Discuss Proposed Science Subcommittee, its Purpose, and Draft Terms of Reference (ToRs)**
Presenter TBD
Following a brief presentation of the ToRs, the aim of this discussion is to come to agreement on the Science Subcommittee TORs.
- 5:00 pm Opportunity for Public Comment**
- 5:15 pm Summary of Next Steps from Day 1 and Overview of Day 2**
- 5:30 pm Closing Remarks**
- 5:45 pm Adjourn**
- 7:00 pm No-Host Group Dinner**
Location TBD
This will be an opportunity for ACCCNRS Members to dine together and become further acquainted with one another in an informal setting.

Day 2 – Thursday, September 19, 2013

- 8:15 am Coffee**
- 8:30 am Welcome and Agenda Review**
- 8:45 am Item # 1: Relationship between NCCWSC and Other Federal Climate Science Services and Programs**

This session will provide an opportunity for Committee members to recommend how the NCCWSC and CSCs can work with other federal climate science services and programs to reduce redundancies and capitalize on synergies.

9:45 am Item # 2: Strategies for Ensuring that the NCCWSC and CSCs Deliver Actionable Science that is Used by Resource Managers

Items for discussion under this topic may include:

- How to ensure science products created by the CSCs and NCCWSC are usable and responsive to resource manager needs, including examples where this is being done well;
- How CSCs can use input from ongoing LCC science prioritization efforts, and direct input from States and other partners; and,
- Adjustments or new protocols to enable science providers who are used to working for publication to work with managers to identify the science questions to be addressed, deliver preliminary results as research is conducted, etc.

10:45 am Break

11:00 am Item # 3: To be identified through consultation with ACCCNRS Members in advance of the meeting and/or during the meeting

12:00 pm Lunch

1:00 pm Opportunity to address any Unresolved Issues from Day 1

1:30 pm Define an Agenda for the Committee

Based on Committee member interest, define a series of topics on which further briefing and Committee discussion is desired at future Committee/Subcommittee meetings.

2:30 am Opportunity for Public Comment

2:45 pm Review Next Steps from the Meeting

2:55 pm Closing Remarks

3:00 pm Adjourn

ACCCNRS Operating Procedures and Ground Rules

16 July 2013

1. The ACCCNRS will meet in-person twice annually and may conduct additional meetings in-person or via teleconference as needed. All meetings and teleconferences must be publicly noticed and open to the public.
2. The ACCCNRS will be co-chaired by a representative from the U.S. Department of the Interior (DOI) and a representative from a non-federal member of the Committee. The non-federal co-chair will be appointed by DOI.
3. The Designated Federal Officer (DFO) will determine whether to conduct Committee and subcommittee meetings, prepare and approve all meeting agendas, attend all Committee and subcommittee meetings, adjourn any meeting when the DFO determines adjournment to be in the public interest, and chair meetings when directed to do so by the Secretary.
4. An official record of Committee deliberations will be kept and be made publicly available. Drafts will be provided to Committee members for review and comment, before they are made final.
5. A quorum of 50% + 1 of the Committee members and a balance of representation (i.e. at least one member from each of the sectors represented on the Committee as per the Charter and Membership Balance Plan) is required for decision-making. Members joining an in-person meeting by telephone will be counted toward the requirement to achieve balance of representation. If one or more interest groups are not represented, the ACCCNRS may conduct an informational meeting, but cannot make decisions.
6. Committee membership has been designed to include key partners in the NCCWSC/CSC enterprise. Thus, all Committee members, including federal agency representatives, are full members for the purposes of reaching consensus or other Committee decisions.
7. Committee members are expected to attend all meetings and can be dismissed after the member or alternate fail to participate in two meetings.
8. At least one subcommittee will be established to provide expert scientific advice to the Committee. Additional subcommittees may be created as necessary. Subcommittees must act only under the direction of the DFO and must report their recommendations to the full Committee for consideration. Subcommittees must include at least one member from the parent Committee. All documents being prepared by a subcommittee for deliberation by the full Committee must be approved at a public meeting of the Committee.
9. The Committee and any Subcommittees will strive to make decisions by consensus. Consensus is defined as no dissent. If there is dissent on procedural matters, the Co-Chairs will make the decision, taking into account the views of Committee/Subcommittee members. If consensus is not possible on substantive matters, the record of the discussion will reflect the different points of view expressed and the underlying reasons for those

differing views. To enhance the prospect of consensus, Committee/Subcommittee members are asked to:

- a) participate consistently in meetings;
- b) clearly and succinctly state their needs and concerns clearly and early in discussions;
- c) seek to understand other participant's needs and concerns;
- d) actively participate in defining issues to be resolved;
- e) assist in securing and bringing forward the best available information;
- f) strive to develop creative solutions to problems that address multiple concerns; and
- g) seek input from and report progress to colleagues, networks, and constituencies.

The National Climate Change and Wildlife Science Center

Science Agenda

DRAFT

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Introduction

Purpose for this Agenda

The purpose of this science agenda is to provide a context and framework for the climate change impact research that will be conducted or coordinated by the National Climate Change and Wildlife Science Center (NCCWSC). This agenda generally describes the role of NCCWSC within the Department of the Interior's broader climate change initiatives, as outlined by Secretarial Order No. 3289. Furthermore, this document describes the approach and rationale for sponsoring climate impact science, as well as the near-term (5 year) priorities for NCCWSC and Climate Science Center (CSC) supported research.

Background and Process

In 2008 Congress created the National Climate Change and Wildlife Science Center within the U.S. Geological Survey (USGS). The center was formed to develop mechanisms that ensure the climate research and management needs for fish, wildlife, plants, and ecological processes are addressed for Department of the Interior (DOI) bureaus. The NCCWSC has currently invested over \$30M in cutting-edge climate change research and has led the DOI effort to establish eight regional Climate Science Centers (CSCs) throughout the US.

The NCCWSC and CSCs work together to implement regional-to-national climate change research and to deliver research products to resource managers. Work completed by the NCCWSC and CSCs focuses on climate change impacts while considering the larger context of ongoing global change (including changing patterns of land-use, invasive species, hydrology etc.). CSCs are housed at universities with substantial capacity to conduct climate change research and leverage existing resource management partnerships. Landscape Conservation Cooperatives (LCCs) and other management entities, including federal, state, tribal, local, and nongovernmental organizations are primary partners of the NCCWSC and CSCs. LCCs are a network of public-private partnerships that provide applied conservation science to inform integrated resource management actions addressing climate change and other stressors at a landscape level. CSCs prioritize delivery of fundamental research, data products, and decision-support tools to meet the needs of the LCCs and other resource managers within their respective regions.

NCCWSC Mission and Guiding Principles for Scientific Research

The Mission of the National Climate Change and Wildlife Science Center

The mission of the NCCWSC predates the establishment of the DOI Climate Science Center and Landscape Conservation Cooperative partnerships and is charged specifically with addressing the management needs for addressing the impacts of climate change on fish, wildlife, and their habitats.

The mission of the NCCWSC 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 and wildlife and their habitats.

While a series of regional “hubs” had originally been envisioned for the NCCWSC, Secretarial Order No. 3289 expanded the role of these hubs, naming them “Climate Science Centers” and tasking them with addressing a broader range of topics.

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.

Guiding Principles for Scientific Research

As a national center within a science agency (U.S. Geological Survey), the NCCWSC must emulate high standards of scientific integrity while also delivering timely science information to managers. Furthermore, the immense challenge of understanding past, current, and future impacts of climate change on the Nation’s resources requires integrated scientific skills from a wide array of experts. Consequently, the research sponsored by the NCCWSC will adopt principles that encourage high quality and meaningful results for DOI stakeholders.

The NCCWSC Science Agenda will:

- Be inspired by and responsive to the needs of the land and resource management community,
- Place priority on evaluation, translation, and synthesis of climate impact research findings,
- Promote rigorous, objective, and integrated research that advances fundamental understanding of climate impacts to natural resources,
- Ensure broad dissemination of results and foster professional scrutiny, critique, and learning, and
- Encourage seeking out and promoting institutional efficiencies and leveraging opportunities in climate impact research.

Science Approach

Developing a National Agenda - Stakeholder Input

The NCCWSC relies on input from stakeholders and the management community for the identification of research needs, the prioritization of projects, and the evaluation of research products. Important stakeholders for the NCCWSC, as well as the CSCs, are the land and resource managers for Department of the Interior bureaus. The NCCWSC has three primary vehicles for stakeholder input – each representing slightly different segments of the stakeholder community: LCCs, CSCs, and a federal advisory committee (The Advisory Committee on Climate Change and Natural Resource Science). Other important partners for the NCCWSC and CSCs include federal, state, tribal, local, and nongovernmental entities.

Landscape Conservation Cooperatives (LCCs) - LCCs engage DOI and other federal agencies, local and state partners and the public to craft practical, landscape-level strategies for managing the impacts of national-scale stressors, including climate-change. The twenty-two LCCs focus on impacts that typically extend beyond the borders of any single National Wildlife Refuge, Bureau of Land Management unit, or National Park. LCCs conduct science assessments to appraise the current scientific understanding of climate and other changing factors and the related impacts within their geography. These assessments identify shared needs and priorities for: fundamental research, monitoring coordination, data gaps, data integration, and the incorporation of traditional ecological knowledge. *LCC Science Assessments are important descriptions of potential management needs. CSCs use these assessments as input into their regional science agendas.*

Climate Science Centers (CSCs) - Climate Science Centers function as both regional providers of climate science information and as part of a national network coordinated by the NCCWSC. Using input from resource managers, stakeholders, and LCC Science Assessments, CSCs, in cooperation with their CSC Stakeholder Advisory Committees (SACs), establish regional Science Agendas that incorporate the key science needs for the region. Regional Science Agendas have 5 to 10 year planning horizons and generally identify: science and research priorities, monitoring priorities, information management strategies, and important scientific resources. *CSC Science Agendas are important descriptions of potential research output. The NCCWSC uses the regional CSC Science Agendas as input into its own Science Agenda, which stresses product synthesis and inter-comparison.*

Advisory Committee on Climate Change and Natural Resource Science (ACCCNRS) - ACCCNRS includes representatives from federal, state, local, tribal, academic, nongovernmental, and private institutions. This committee was created to guide the overall direction of NCCWSC and the CSCs and to advise on the contents of this national science agenda. ACCCNRS will also identify and encourage the development of linkages and connections among climate-change related programs across the federal

government. A Science Subcommittee will be convened by ACCCNRS to help broaden the scope and relevance of the NCCWSC Science Agenda.

The purpose of the Science Subcommittee will be to:

- Provide scientific and technical advice and recommendations to ACCCNRS,
- Review the strategic priorities and objectives for the NCCWSC and CSCs to ensure these are based upon authoritative scientific understanding and are implemented to the highest scientific standards; and,
- Provide advice on how scientific priorities and objectives at the NCCWSC and CSC levels should be designed to best meet the needs of resource managers and decision makers.

Concepts of a Balanced Science Portfolio

The body of research, “science portfolio”, sponsored by the NCCWSC can be thought of as a financial investment. The science needs identified by stakeholders represent a suite of investment opportunities. The ultimate goal of the science portfolio is to maximize the return on investment, which is analogous to maximizing the amount of research information that is used to inform resource management decisions. Keeping these concepts of a balanced portfolio in mind, the NCCWSC Science Agenda sponsors a range of research activities, with the overall goal of maximizing utility of the research products to the land management community. Priority is given to supporting projects that contribute to development of a regional climate change science program, rather than a set of interesting individual projects. When possible, contributions to national and international knowledge development should be pursued as well.

The overall NCCWSC science portfolio seeks to:

- Balance risk – some projects include well-established methodologies and techniques while other projects explore newer, cutting-edge, methods and technologies that are less established but potentially useful.
- Sponsor both short- and long-term projects – this recognizes the need to generate results quickly while allowing for larger, multi-year efforts.
- Encourage both regional and local application – activities at large spatial domains (e.g., downscaling a particular Global Climate Model (GCM) for a CSC region) are complemented by local activities.
- Encourage multi-sector projects – socio-economics, physical climate modeling and ecosystem modeling, etc.
- Efficiently use DOI investments (planned leveraging) – catalogue and specifically target expertise in climate science within DOI bureaus, when appropriate.
- Be flexible and opportunistic (unplanned leveraging) – retain some funding that can be used to broaden the utility of work that is already planned or being conducted by other researchers.

A Science Portfolio in Practice

Strategic science within the NCCWSC-CSC enterprise should move toward clear policy-relevant benchmarks. For example, vulnerability assessments should provide output that managers and the public care about, and should not be done simply for the sake of science. One of the main goals of the NCCWSC Federal Advisory Committee (ACCCNRS) and the CSC Stakeholder Advisory Committees is to help develop meaningful "policy relevant" endpoints to guide the activities of the enterprise.

To be successful in both the short and long terms, NCCWSC will prioritize delivery of a blended portfolio of research that informs a coherent, rather than scatter-shot, program and that explains the value added nature of the NCCWSC-CSC enterprise. These deliverables should also exemplify the ability to coordinate science activities across a broad landscape and bring the best, cutting edge science to bear on impacts of climate change on fish, wildlife and their habitat.

Goals and Outcomes for the NCCWSC Science Program

Goal Organization for the NCCWSC

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 an adaptive management framework) 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 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 and other resource managers. Further, these projects must occur across a scalar gradient, meeting the tactical needs of resource managers while providing regional, national, and global advancements on understanding climate change impacts on fish, wildlife and their habitats. 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.

Science conducted within the network should be encompassed by relevant themes of research that provide credible information about climate impacts with the end 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.

Objectives

1. Foster ongoing science-management dialogues to determine policy relevant endpoints.
2. Develop tools and approaches to ensure the usability of science outputs.
3. Use approaches to increase collaboration and reduce redundancy in conducting science across the broad climate change and resource management community.

National Outcomes

1. Develop a method/approach for building climate based vulnerability assessments into regional adaptation planning.
2. Produce a standard regional approach to conservation planning that utilizes strategic decision-making approaches.
3. Develop a series of pilots that bring together managers/scientists to clearly develop and articulate climate questions that spur science projects and then work with tools to visualize and incorporate results.
4. Develop a new science approach that both targets work on high priority management concerns and sets up a clear path for science to flow directly to decisions.

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

Objective

1. Develop data management policies and practices that ensure data and research results are shared and interoperable with other climate initiatives.

National Outcomes

1. Produce a derivative portal for downscaling data for use in linking biological information to climate impacts data.
2. Define consistent policies, guidance, and standards to enable data sharing and integration.
3. Provide a persistent catalog of funded and completed projects through implementation of a common project level metadata record, primarily in the ScienceBase system.
4. Establish a coordinated metadata search across multiple data stores (ScienceBase, GeoData Portal, and the Northwest Knowledge Network).
5. Provide resources to assist with data management for CSC funded projects.
6. Coordinate access to climate impacts information across CSC regions.

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

Objective

1. Provide training and mentoring opportunities for graduate students and early-career scientists to study interdisciplinary topics related to climate impact science

National Outcomes

1. Develop and host an annual NCCWSC/CSC wide training course to train new scientists in climate change adaptation science.
2. Hold yearly meetings (i.e. “climate boot camps”) across CSCs to develop a regional and/or national community of students and early-career scientists.
3. Ensure that graduate Students and Post-Doctoral Students, funded by the NCCWSC-CSC enterprise, work toward DOI/USGS science goals.

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

Objective

1. Conduct an evaluation of the NCCWSC-CSC enterprise to provide management relevant information to CSC Directors and demonstrate progress to others.

National Outcome

1. Develop a performance measurement system for the CSCs and NCCWSC that may include instituting client satisfaction reviews to access progress toward stakeholder goals.

Thematic Science Goals

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.).

Objectives

1. Produce assessments of climate and land use impacts on habitats, ecosystems and ecosystem services.
2. Produce assessments of climate and land use impacts to biodiversity and its components.

National Outcomes

1. Produce a national assessment of climate impacts on biodiversity, ecosystems and ecosystems services.
2. Develop a global understanding of the impacts of climate and land use change on inland fisheries and food security.
3. Develop a global understanding of the impacts of climate and land use change on bird species.
4. Develop and evaluate a nationwide suite of hypotheses related to ecological drought for the purpose of informing long-term climate adaptation responses in resource management activities.

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

Objectives

1. Develop approaches and tools that provide the ability to perform local, regional and national vulnerability assessments.
2. Perform vulnerability assessments of fish, wildlife and their habitats.

National Outcomes

1. Develop national or regional assessments of vulnerability of threatened, at risk, endangered or State Wildlife Action Plan (SWAP) species to climate driven changes in invasive species, wildfire risk, sea level rise and melting/ice permafrost.

2. Determine national and regional hotspots where climate will have impacts to freshwater, wildlife habitat, native and culture resources and ocean health.

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

Objectives

1. Develop tools and approaches that understand the climate impacts on tribes and tribal resource needs.
2. Develop tools and approaches that link climate driven changes in ecosystems services to changes in human well-being.

National Outcomes

1. Develop a series of projects that provides an understanding of the use of Traditional Ecological Knowledge in climate change adaption planning.
2. Develop a series of projects that provides an understanding of the use of ecosystem services as a concept in climate change adaption planning.

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.

Objectives

1. Develop integrated approaches/models of ecosystems to use to understand climate change impacts to fish, wildlife and their habitats.
2. Develop physical and climate approaches that can be used in adaptation planning for fish, wildlife and their habitats.
3. Compile and evaluate regional downscaling approaches that allow use of climate data for impact assessment and adaptation planning at local and regional scales.

National Outcomes

1. Develop a series of integrated ecological models that incorporate climate drivers and their impacts to fish, wildlife and their habitats.
2. Develop a series of integrated scenarios that can be used across the CSC network to better project potential impacts of climate on fish, wildlife and their habitats.
3. Develop a national projection of sea level rise impacts on coastal DOI managed areas and identify most impacted areas.
4. Complete a model inter-comparison of hydrologic models used in projecting climate impacts to aquatic systems.
5. Produce a model inter-comparison of downscaling methods used in projecting climate impacts on fish, wildlife and their habitats.

Data Management and Integration

The National Climate Change and Wildlife Science Center places a strong emphasis on data sharing and management. Collectively, the NCCWSC, CSCs, and LCCs will generate, integrate, and disseminate data and derived data products that will help resource managers develop adaptation strategies in response to a changing climate.

In order for resource managers to make decisions based on good science, that information needs to be available and accessible. Accessibility helps move the state of the science forward when colleagues can access data and leverage it as part of their work. Data management also helps the scientists and research teams. When data are well-managed, they are easier to find, understand, and replicate. Data loss is also prevented with additional security and back-up procedures.

Resource managers need data management policies and guidance to ensure that appropriate standards, consistent guidelines, and common strategies are used, providing linkages to and consistency with other similar systems, and fostering a true national network.

In order to support the resource management community and encourage sharing of scientific results and data, all NCCWSC and CSC funded projects require a data management plan, and data stewards work with every CSC to understand the project's data management plan and support project activities. All products and data must be made publically available when the projects are complete.

NCCWSC and CSC Data Management Policies and Guidance will evolve as NCCWSC, CSC and LCC implementation and operations progress. As changes occur, policies and guidance will be updated as needed.

The most up-to-date information on policies and guidance, and contact information for CSC data stewards can be found at <https://nccwsc.usgs.gov/content/data-policies-and-guidance>. Questions regarding data management and integration should be directed to Emily Fort, Data and Information Coordinator for the NCCWSC at efort@usgs.gov.

Tools and Resources

ScienceBase: NCCWSC and the CSCs are working with an established USGS data catalog, ScienceBase, as a repository for all CSC funded data and products. Information from NCCWSC and CSC funded projects in ScienceBase is displayed on the NCCWSC website. <https://www.sciencebase.gov/catalog/>

NCCWSC and CSC Project Information: Information for NCCWSC and CSC supported projects, including project summaries, maps, publications, and data, can be found on the NCCWSC website. <https://nccwsc.usgs.gov/project-pages/4f4e476ae4b07f02db47e13b>

Geo Data Portal: The Geo Data Portal is a tool for scientists that makes the process of analyzing and subsetting large model datasets (like downscaled climate scenarios) much easier.

<http://cida.usgs.gov/climate/gdp/>

Integrated Search: Using the catalog service for the web (csw), the NCCWSC has developed an integrated search that allows stakeholders and scientists to search CSC related information, including the NCCWSC/CSC Repository (ScienceBase) as well as the Geo Data Portal and a partner project at the University of Idaho, the Northwest Knowledge Network. The integrated search can be found on the NCCWSC website. https://nccwsc.usgs.gov/integrated_search

Project Management Tools: To assist NCCWSC and CSC staff with the management of projects, several tools have been developed.

- RFP Manager – Manages the submission and review of statements of interest and proposals during annual funding opportunities.
- DEPTH – Allows users to view and edit project records with a searchable interface. (Content is from ScienceBase.)
- ScienceBase – Repository of project records, data and other products for all NCCWSC and CSC funded projects.

Glossary

Advisory Committee on Climate Change and Natural Resource Science (ACCCNRS) - a committee that advises the Secretary of the Interior on the operations of the U.S. Geological Survey's National Climate Change and Wildlife Science Center and the DOI Climate Science Centers. The committee is composed of approximately 25 members from the federal government, state and local governments, non-governmental organizations, American Indian tribes and tribal organizations, academia, business interests, and scientific experts from one or more of the institutions hosting the CSCs (rotating representation).

Atmosphere-Ocean General Circulation Models (AOGCMs) - There are both atmospheric GCMs (AGCMs) and oceanic GCMs (OGCMs). An AGCM and an OGCM can be coupled together to form an atmosphere-ocean coupled general circulation model (CGCM or AOGCM). With the addition of other components (such as a sea ice model or a model for evapotranspiration over land), the AOGCM becomes the basis for a full climate model. Within this structure, different variations can exist, and their varying response to climate change may be studied.

Climate Change Vulnerability Assessments – A key tool for carrying out adaptation planning and informing the development and implementation of climate-smart resource management practices.

Climate Science Centers (CSCs) - Eight regional centers developed based on Secretarial Order No. 3289 and designed to provide fundamental scientific information, tools, and techniques that land, water, wildlife, and cultural resource managers and other interested parties can apply to anticipate, monitor, and adapt to climate change impacts. Much of the information and tools provided by the CSCs, including physical and biological research, ecological forecasting, and multi-scale modeling, will be in response to the priority needs identified by the Landscape Conservation Cooperatives (LCCs) and other resource managers. Working closely with stakeholders and managers, the CSCs will help develop statistically sound sampling programs and processes to monitor climate change effects and help develop adaptive management approaches. The CSCs will be partnership-based regional entities functioning with LCCs as well as the regional management community, scientific entities, and other stakeholders.

CSC Regional Science Agenda – an agenda that is established annually for a CSC that incorporates prioritized identification of key science needs for the region and uses LCC Science Assessments as a foundation. During initial startup of CSCs, appropriate reviews will be undertaken on the following topics to provide a baseline for early plans: 1) science/research priorities, 2) monitoring priorities, 3) information management, 4) and scientific resources and skills.

CSC Stakeholder Advisory Council - Each Climate Science Center has or will establish a Stakeholder Advisory Council (SAC), which will be chaired by a USGS Regional Director. All LCCs within the geographic area of the CSCs will be represented along with executive leaders of other management agencies, entities with scientific capabilities (e.g., NOAA-RISAs, NEON, NASA-funded science, Universities), and other regional stakeholders. The SAC will adopt the regional CSC science agenda and review the overall functioning of the CSC.

Derivatives, Derivative Products, Derivative Variables – Alteration or transformation of the properties of primary outputs from climate models and projections, creating a new product or variable. An example of a derivative product or variable is the number of days in a year <100 degrees, which is derived from projected temperature data in a climate model output.

National Agenda for Climate Impacts Research – A science agenda, based on the USGS NCCWSC Science Agenda, which will be informed by the ACCCNRS to provide broad relevance and utility to a national cadre of stakeholders.

Downscaling - techniques that take output from the model and add information at scales smaller than the grid spacing. Global climate models (GCMs) are run at coarse spatial resolution (typically on the order of 50,000 square kilometers (19,000 sq. mi.)) and are unable to resolve important sub-grid scale features such as clouds and topography. As a result, GCMs cannot be used for local impact studies. To overcome this problem, downscaling methods are developed to obtain local-scale surface weather from regional-scale atmospheric variables that are provided by GCMs.

Downscaling (2) – a method that derives local-to regional-scale (10 to 100 kilometers) information from larger-scale models or data analyses. In statistical downscaling, a statistical relationship is derived between observed local climate variables and predictors at the scale of global climate model output. Dynamical downscaling, or regional climate modeling, explicitly simulates the process-based physical dynamics of the regional climate system using a high-resolution, limited-area climate model (IPCC 2007b).

Ecological thresholds – an ecological threshold is the point at which there is an abrupt change in an ecosystem quality, property, or phenomenon, or where small changes in an environmental driver produce large responses in the ecosystem (Groffman et al. 2006).

General Circulation Model (GCM) - mathematical model of the general circulation of a planetary atmosphere or ocean and based on the Navier–Stokes equations on a rotating sphere with thermodynamic terms for various energy sources (radiation, latent heat). These equations are the basis for complex computer programs commonly used for simulating the atmosphere or ocean of the Earth. Atmospheric and Oceanic GCMs (AGCM and OGCM) are key components of Global Climate Models along with sea ice and land-surface components.

Landscape Conservation Cooperatives (LCCs) - management-science partnerships that inform integrated resource management actions addressing climate change and other national stressors within and across landscapes. The LCC network is composed of 22 regional landscape-scale applied conservation science partnerships (LCCs) that will support and enhance on-the-ground conservation efforts by facilitating the production and dissemination of applied science for resource management decision makers. LCCs may consist of Federal, State, Tribal, academic, international, local, and private stakeholders and identify and seek to coordinate among existing relevant conservation partnerships, plans, agreements, and programs with the specific goals of identifying common needs for information and sharing information and science.

LCC Science Assessments – assessments conducted to appraise the current spectrum of scientific knowledge surrounding shared resource priorities and identify and prioritize management questions and related research and technical assistance gaps and needs. They will explore potential approaches for utilizing

existing information, developing scientific tools, and improving the state of knowledge. Science Assessments will identify common needs for science among the various partners and partnerships to meet their conservation priorities and goals, and will be developed in coordination with Climate Science Centers.

Phenology – Recurring plant and animal life cycle events, such as flowering, leafing, or migration.

Science Portfolio – scientific research sponsored by the National Climate Change and Wildlife Science Center. Science incorporated into the portfolio seeks to balance scientific risk, support long- and short-term projects, encourage multi-sector projects, target expertise from DOI bureaus when appropriate, and be flexible and opportunistic.

Secretarial Order No. 3289 – the secretarial order that launched the U.S. climate-change-response strategy. Specifically, the order provides a framework to coordinate efforts among Department of the Interior (DOI) bureaus and to integrate science and management expertise with that of our partners. Two initiatives (DOI Climate Science Centers and Landscape Conservation Cooperatives) form the cornerstones of this integrated approach to climate-change science and adaptation.

Strategic habitat conservation (SHC) - way of thinking and of doing business that requires us to set biological goals for priority species populations, allows us to make strategic decisions about our work, and encourages us to constantly reassess and improve our actions. These are critical steps in dealing with a range of landscape-scale resource threats such as development, invasive species, and water scarcity--all magnified by accelerating climate change.

U.S. Global Change Research Program (USGCRP) – a program that coordinates and integrates federal research on changes in the global environment and their implications for society. The USGCRP began as a presidential initiative in 1989 and was mandated by Congress in the Global Change Research Act of 1990 (P.L. 101-606), which called for "a comprehensive and integrated United States research program which will assist the Nation and the world to understand, assess, predict, and respond to human-induced and natural processes of global change."

Advisory Committee on Climate Change and Natural Resource Science Science Subcommittee Terms of Reference

The Science Subcommittee is established under the auspices of the Advisory Committee on Climate Change and Natural Resources Science.

Purpose. The purpose of the Science Subcommittee is to:

- provide scientific and technical advice and recommendations to the Advisory Committee on Climate Change and Natural Resource Science (ACCCNRS);
- review the strategic priorities and objectives for the National Climate Change and Wildlife Science Center (NCCWSC) and the Department of Interior (DOI) Climate Science Centers (CSC) to ensure these are based upon authoritative scientific understanding and are implemented to the highest scientific standards; and,
- provide advice on how scientific priorities and objectives at the NCCWSC and CSC levels should be designed to best meet the needs of resource managers/decision makers.

Scope and Conveyance of Recommendations. The Science Subcommittee will compile, evaluate, and assess pertinent scientific research for the purpose of refining national scientific priorities outlined by the NCCWSC Science Agenda and related initiatives. The Subcommittee will provide its findings to ACCCNRS via the Chair of the Subcommittee. No advice or work products will be provided directly to USGS or the Department of the Interior, or other outside entities.

Subcommittee Responsibilities. The Science Subcommittee is responsible for serving the ACCNRS in three primary capacities:

- evaluation of current and future NCCWSC national science priorities, via the review of science plans and related documents prepared by NCCWSC and Climate Science Centers, to identify promising scientific directions, leveraging opportunities, and complementary programs;
- informing new strategic national science initiatives by identifying and highlight promising, important, and innovative scientific approaches to climate adaptation science; and,
- advising on science-related program review and oversight mechanisms to ensure that NCCWSC and CSC activities meet stakeholder requirements and needs.

Membership.

The Subcommittee will have approximately 12 standing members.

- Members will be appointed by the ACCCNRS Co-Chairs, with the concurrence of the Designated Federal Officer (DFO). At least one member of the Subcommittee must be a member of the ACCCNRS.
- Membership will be based on recognized scientific expertise in topical areas relevant to the scientific goals of NCCWSC and DOI CSCs and practitioner expertise in the use of climate impact information for adaptation planning and assessment, drawing from scientific disciplines and areas of expertise, such as:
 - Physical sciences (e.g. hydrology, climatology, scenarios/projections);

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- Ecological sciences (e.g. ecology, wildlife management, ecosystem services, ecosystem modeling, biological response to climate, biological informatics);
- Natural resource management and decision making;
- Climate adaptation (e.g. adaptation planning, risk assessment and management); and,
- “Translational science” (e.g. decision science, visualization, science translation).

The committee may invite individuals to participate in Subcommittee deliberations with specialized scientific knowledge or management experience within focal areas of interest that are not adequately captured by the standing membership.

Tenure. Members of the Science Subcommittee:

- can serve for a maximum period of three consecutive years;
- are not bound to serve the maximum term;
- will be expected to recuse themselves any time issues posing a potential or real conflict of interest arise;
- may name an alternate; and,
- are expected to attend all meetings and can be dismissed after the member or alternate fail to participate in two meetings.

Governance and Accountability.

- The formation and tenure of the ACCCNRS Science Subcommittee is subject to the DFO's approval.
- The Subcommittee Chair works under the direction of the DFO and must report Subcommittee recommendations to the full Committee for consideration.
- The Subcommittee will meet in-person, or by other means, as is necessary to accomplish their assignments, subject to the approval of the DFO and the availability of resources.
- Subcommittee meetings may, but are not required to be open public meetings. Decisions about the form of meeting to be conducted will be made by the Chair, subject to the approval of the DFO and the availability of resources.
- The Subcommittee will strive to reach consensus on decisions about recommendations and responses to Committee requests. However, if there are different points of view on a specific matter, the Subcommittee should not limit its recommendations to areas where there is a consensus but rather should include majority and minority views in its responses, along with the underlying reasons for the different points of view.