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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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]

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

[1] http://www.fws.gov/home/climatechange/dhall-public.html

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 activities. 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 Gulledge	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 Huemmrich	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

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

Name	*Affiliation*	State Agency
Doug Austen	Pennsylvania state government	State Agency
Alan Belensz	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

Name	*Affiliation*	*Category*
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 Lohoefener	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

Name	*Affiliation*	*Category*
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

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

Name	*Affiliation*	*Category*
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 Pfirman	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 break-out 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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