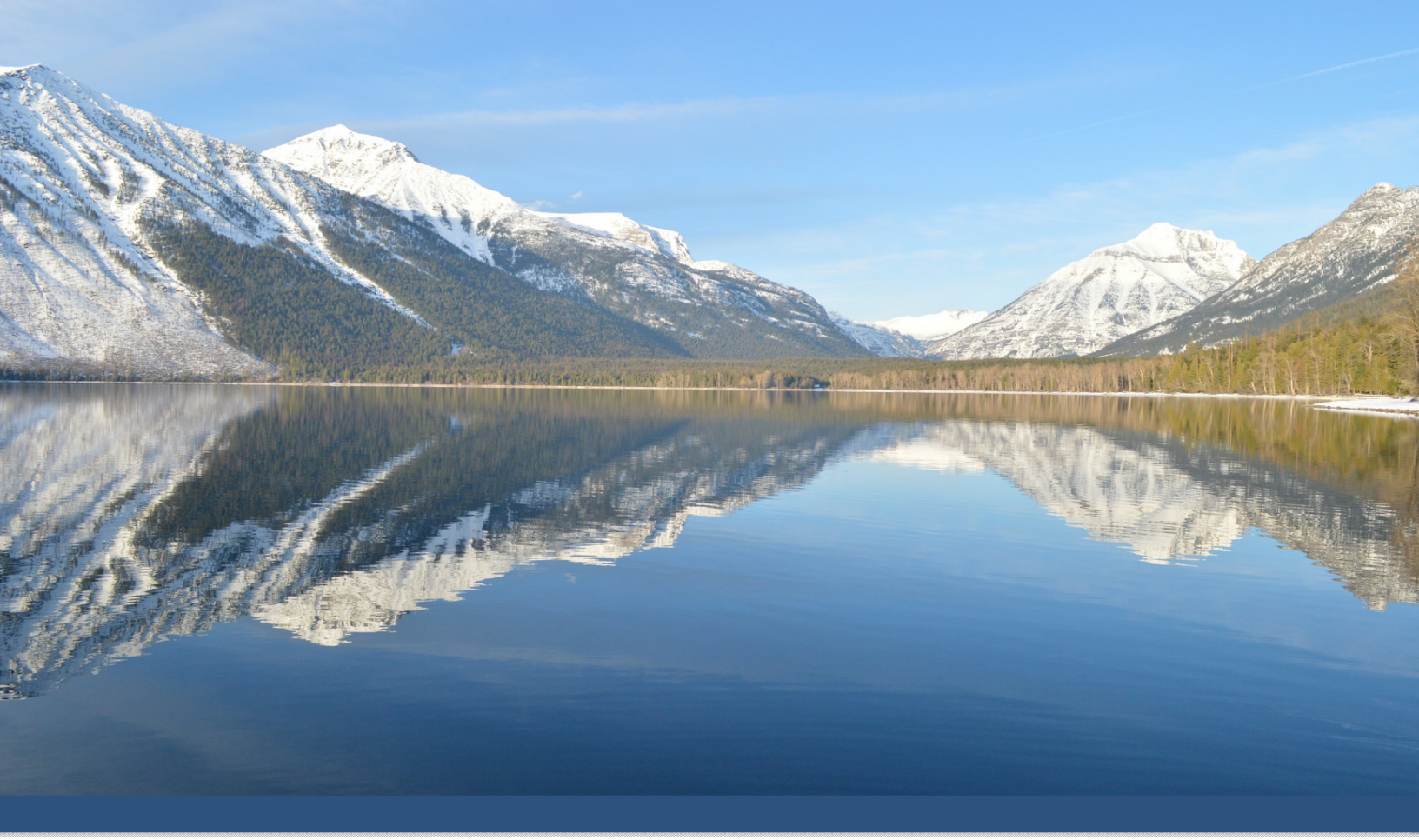

Department of the Interior
Climate Change Adaptation Plan

2014

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Department of the Interior Climate Change Adaptation Plan

2014

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I. Overview – The Department of the Interior's Response to Climate Change

The Department of the Interior (Department) is taking action to prepare for anticipated climate change impacts and build the resilience of the resources it manages. Climate change is predicted to have widespread impacts on the nation's natural resources, including melting glaciers, sea-level rise, significant wildlife habitat changes, and alterations to fresh water availability – all of which will have serious implications for the Department's operations and management responsibilities. A dedicated focus on increasing the resilience of resources and operations will ensure the Department is able to withstand these impacts and continue to achieve its mission.

The Department's areas of responsibility are critical to the economic and social well-being of the nation. The Department's responsibilities include managing 20 percent of the nation's lands; supplying water and hydropower in 17 western states; conserving plants and wildlife; conserving historic and cultural resources; providing geological, hydrological, and biological science; fulfilling trust responsibilities to American Indians and Alaska Natives; providing financial and technical assistance for tribes as well as insular areas such as Guam and the U.S. Virgin Islands; and leasing for renewable and non-renewable energy development on public lands and the Outer Continental Shelf. Managing this broad spectrum of activities are the Department's nearly 70,500 employees and more than 300,000 volunteers located in approximately 2,400 locations spanning 12 time zones.

The Department's Climate Change Adaptation Policy (523 DM 1[1]) was issued in December 2012 in response to the need to prepare for the impacts of climate change. The Policy articulates and formalizes the Departmental approach to climate change adaptation and provides guidance to bureaus and offices for addressing climate change impacts upon the Department's mission, programs, operations, and personnel. The new policy also establishes clear Departmental leadership responsibilities for climate change adaptation implementation.

In November 2013, President Obama signed Executive Order 13653[2], which directs Federal agencies to prepare for the impacts of climate change. The Department will work with the White House and federal agency partners throughout 2014 and beyond to implement the Executive Order. The Department is also committed to several important interagency plans, including the *National Action Plan: Priorities for Managing Freshwater Resources in a Changing Climate*[3], released October 28, 2011; the *National Fish, Wildlife and Plants Climate Adaptation Strategy*[4], released March 26, 2013; and the *National Ocean Policy Implementation Plan*[5], released April 16, 2013. The Department also led the development of an interagency approach, called

[1] Department of the Interior Climate Change Adaptation Policy. (532 DM 1) December 2012
[2] Executive Order 13653 – Preparing the United States for the Impacts of Climate Change. November 2013
[3] National Action Plan: Priorities for Managing Freshwater Resources in a Changing Climate. October 2011
[4] National Fish, Wildlife and Plants Climate Adaptation Strategy. March 2013.
[5] National Ocean Policy Implementation Plan. April 2013

Integrated Arctic Management, for coping with the rapid and devastating changes taking place in the U.S. Arctic.[6]

The Department is conducting a new Climate Change Adaptation Priority Performance Goal for FY 2014 and FY 2015, to measure bureau performance and achievements toward implementing five priority climate change adaptation strategies, which were established in the 2013 Strategic Sustainability Performance Plan (SSPP). The new Performance Goal will be used to target, track, and report progress on a quarterly basis over the next two years and will be instrumental in ensuring that the Department meets the requirements of Executive Order 13653.

While the Department's 2013 Climate Change Adaptation Plan focused on assessing the Department's climate change related vulnerabilities, the 2014 Plan focuses more on the Department's work to address climate change through implementation of the Department's Climate Change Adaptation Policy (523 DM 1) and Executive Order 13653. Section II of this plan explains the Department's official Climate Change Adaptation Policy and provides additional guiding principles. Section III summarizes the Department's climate change vulnerabilities. Section IV demonstrates the Department's engagement in numerous climate change adaptation activities.

II. The Department of the Interior's Climate Change Adaptation Policy

The Department's Climate Change Adaptation Policy (523 DM 1) has been formalized and is available to the public on the Department's website. The following policy statement is taken directly from the official policy.

Official Policy

It is the policy of the Department to effectively and efficiently adapt to the challenges posed by climate change to its mission, programs, operations, and personnel. The Department will use the best available science to increase understanding of climate change impacts, inform decisionmaking, and coordinate an appropriate response to impacts on land, water, wildlife, cultural and tribal resources, and other assets. The Department will integrate climate change adaptation strategies into its policies, planning, programs, and operations, including, but not limited to, park, refuge, and public land management; habitat restoration; conservation of species and ecosystems; services and support for tribes and Alaska Natives; protection and restoration of cultural, archeological and tribal resources; water management; scientific research and data collection; land acquisition; management of employees and volunteers; visitor services; construction; use authorizations; and facilities maintenance.

[6] Clement, J.P., J.L. Bengtson, and B.P. Kelly. 2013. Managing for the Future in a Rapidly Changing Arctic. A Report to the President. Interagency Working Group on Coordination of Domestic Energy Development and Permitting in Alaska (D.J. Hayes, Chair), Washington, D.C.

Consistent with existing laws and regulations, it is the Department's policy to:

- Ensure that climate adaptation plans are grounded in the best available science and understanding of climate change risks, impacts, and vulnerabilities, incorporating traditional knowledge where available.

- Use the network of Landscape Conservation Cooperatives, Climate Science Centers, and other partnerships to increase understanding of climate change impacts; build upon and monitor existing response efforts; coordinate adaptation strategies across multiple sectors, geographical scales, and levels of government; and inform decision makers.

- Ensure consistent and in-depth government-to-government engagement with tribes, Alaska Natives, and Native Hawaiians to address climate change impacts on health, infrastructure, livelihoods, traditional practices, natural and cultural resources, and to apply adaptation strategies.

- Consider climate change when developing or revising management plans, setting priorities for scientific research and assessments, and making major investment decisions.

- Identify and avoid investments that are likely to be undermined by climate impacts, such as investing in infrastructure likely to be adversely affected by repeated floods or inundation, or planting/introducing species vulnerable to changes in temperature or precipitation patterns.

- Address the impacts of climate change on the U.S. territories and Freely Associated States.

- Use well-defined and established approaches, as appropriate, for managing through uncertainty, including: (1) vulnerability assessments, (2) scenario planning, (3) adaptive management, and (4) other risk management or structured decision making approaches. The Department's Adaptive Management Implementation Policy is provided in 522 DM 1.

- Avoid "maladaptive" actions, that is, actions intended to avoid or reduce vulnerability to climate change that negatively impact or increase the vulnerability of other systems, sectors, or social groups.

- Promote landscape-scale, ecosystem-based management approaches to enhance the resilience and sustainability of linked human and natural systems.

- Advance approaches to managing linked human and natural systems that help mitigate the impacts of climate change, including:

    - Protect diversity of habitat, communities and species;

    - Protect and restore core, unfragmented habitat areas and the key habitat linkages among them;

    - Anticipate and prepare for shifting wildlife movement patterns;

- Maintain key ecosystem services;

- Monitor, prevent, and slow the spread of invasive species (defined in Executive Order 13112 as alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health); and

- Focus development activities in ecologically disturbed areas when possible, and avoid ecologically sensitive landscapes, culturally sensitive areas, and crucial wildlife corridors.

- Routinely track, record, and report on the progress and results of climate change adaptation activities to help further public understanding, encourage the engagement of partners, promote the conduct of similar activities, and better inform decision making on a broader scale.

Guiding Principles

The Department and its component bureaus and offices adhere to the following Guiding Principles for climate change adaptation.[7] Not all Guiding Principles apply to all components within the Department.

Science: The Department will use the best available science to increase understanding of climate change impacts, to inform decision making, and to coordinate an effective response to impacts on land, water, wildlife, cultural, heritage, and tribal resources, and other assets. To ensure that climate science and services meet internal decision-making needs, bureaus should:

- Ensure that management decisions made in response to climate change impacts are informed by science.

- Build or access regional and local capacity to interpret climate science to inform adaptation plans for infrastructure and natural and cultural resources.

- Where appropriate, coordinate with other regional science resources in order to inform adaptation plans and actions – e.g., co-locating or integrating scientific efforts with regional climate change science consortia such as the Department of the Interior Climate Science Centers (DOI CSCs), the National Oceanic and Atmospheric Administration (NOAA) Climate Program Office Regional Integrated Science and Assessment centers, and the Department of Agriculture Regional Climate Hubs.

[7] DOI's Guiding Principles are informed by the Interagency Climate Change Adaptation Task Force's "Guiding Principles" and "National Action Plan: Priorities for Managing Freshwater Resources in a Changing Climate;" the National Fish, Wildlife, and Plants Climate Adaptation Strategy; and the National Ocean Council's "Draft National Ocean Policy Implementation Plan."

- Where appropriate, ensure representation at the executive level on the Stakeholder Advisory Committee for each DOI CSC and the Steering Committee for each Landscape Conservation Cooperative (LCC).

- Facilitate and support data integration and access to enable broad use of scientific information for management decisions.

- Consider and incorporate Traditional Ecological Knowledge and long-term observational information as data sources.

- Ensure that scientific activities conform to appropriate laws and regulations (e.g., Information Quality Act) and apply best scientific practices (e.g., peer review).

Ecosystem-Based Management: Integrating the management of natural and human systems and balancing trade-offs to ensure sustainability is essential to success in the face of rapid changes. Ecosystem-based management (EBM) is a science-driven alternative to sector-based or species-based management approaches that are poorly suited to address such changes. Effective EBM integrates multiple objectives (ecological, cultural, and economic), provides guidance at multiple scales, and requires meaningful input from a broad range of stakeholders, including indigenous communities. While implementing EBM, bureaus should consider employing the following strategies:

- Climate change is a threat multiplier, in that it amplifies and adds complexity to existing impacts and the interactions among them. Bureaus should incorporate consideration of climate change impacts as a component of cumulative impacts.

- Climate change adaptation actions cannot be delayed to wait for a complete understanding of climate change impacts; bureaus can use adaptive management, as appropriate, for managing resources in the face of uncertainty. Adaptive management can provide feedback to managers as conditions change, by setting project goals carefully and monitoring progress toward stated goals.[8]

- Targeting a single preferred outcome under a single presumed future is not an adequate management strategy in a rapidly-changing environment. Bureaus should employ scenario planning to allow planners and managers to explore the effectiveness of various strategies across a range of plausible futures.[9]

- The timing, likelihood, and nature of specific climate risks are difficult to predict. Risk management provides an effective means to assess and respond to climate change. Risk management approaches are already used in many critical decisions (e.g., for fire, flood, and disease outbreaks), and can aid in understanding the potential consequences of inaction as well as options for risk reduction.

[8] http://www.doi.gov/ppa/Adaptive-Management.cfm

[9] The principles and general approach for scenario planning in the context of natural resource management are discussed in: Peterson, G.D., G.S. Cumming, and S.R. Carpenter. 2003. Scenario Planning: a Tool for Conservation in an Uncertain World. Conservation Biology 17: 358-366.

Ecosystems and Wildlife: Bureaus should implement the following general approaches to enhance the ability of ecosystems and wildlife populations to absorb change and maintain key qualities and services:

- Protect diversity of habitat, communities, and species.

- Develop adaptation plans that protect and restore contiguous blocks of un-fragmented habitat and enhance connectivity among habitat blocks.

- Identify and protect resilient ecosystems (i.e., places that can absorb change and maintain healthy community structure and function) and climate refugia (i.e., places that do not exhibit as much change as surrounding landscapes).

- Monitor invasive species (defined as non-native species whose introduction does or is likely to cause economic or environmental harm or harm to human health) and coordinate with other agencies to prevent new introductions and stop the spread of such species.

- Consider the landscape context of adaptation actions: Bureaus should work together and with other partners to jointly identify large landscape features (specific corridors, etc.) and mutual conservation goals for their protection.

- Reduce non-climate stressors that interact with climate change impacts, e.g., pollution, invasive species, habitat fragmentation, and human activities contributing to resource scarcity or degradation of natural resources.

  These general approaches reflect “best practices” at the present time; they should be tailored to specific locations and issues and informed by climate-related studies to ensure maximum benefits.

Energy, Mining, and Water: The Department is responsible for managing water supplies and leasing areas for mining and development of renewable and non-renewable energy sources. In addition to the implementation of EBM as described above, bureaus should ensure the sustainability of these efforts by adopting the following approaches:

- Employ a basin-wide approach to achieve sustainable water management and to address current and future water shortages, including the potential for decreased water availability due to drought and climate change.

- Focus development activities in ecologically disturbed areas when possible, and avoid ecologically sensitive landscapes, culturally sensitive areas, and crucial wildlife corridors. Implement the mitigation hierarchy of avoid, minimize and compensate for major development activities.

- Strengthen and enhance assessments of the vulnerability of water resources to climate change.

- Expand and encourage efficiency measures for water and energy use.

Cultural and Heritage Resources: Human societies have inhabited the areas that are now the United States, including affiliated states and insular areas, for many thousands of years. Consequently, many ecosystems and plant, fish, and wildlife species hold cultural significance, as do fixed-place cultural and heritage resources including archaeological sites, prehistoric and historical period structures, districts, cultural and sacred landscapes, and museums and curation facilities. In addition, there are various intangible cultural heritage resources, including inherited traditions or living expressions such as oral traditions, performing arts, social practices, rituals, festive events, knowledge and practices concerning nature and the universe or the knowledge and skills to produce traditional crafts.[10] To address impacts to these resources and the information they provide regarding long-term human interactions with variable environments, managing bureaus should:

- Integrate cultural resources into climate change vulnerability assessments to identify both inventoried resources and uninventoried areas (if any) at risk from projected impacts.

- Use projected climate change impacts as a factor to prioritize completion of cultural resource inventories pursuant to bureau responsibilities under the National Historic Preservation Act (NHPA) Sections 110 and 106, respectively.

- Update or implement cultural resource monitoring systems to track environmental effects that may vary under altered climate regimes and adversely affect cultural resources. Some monitoring needs may overlap partially or fully with natural resource monitoring. For example, monitoring of changes in water tables can inform wetland and drainage issues as well as alteration of archaeological sites.

- Coordinate cultural resource preservation and research priorities across local, regional, and national scales (such as through LCC and DOI CSC networks).

- Engage indigenous communities in dialogue and incorporate traditional knowledge in assessing climate change effects on cultural, natural, and heritage resources and developing appropriate adaptation strategies.

- Engage federal stakeholders to coordinate requirements and processes of compliance with NHPA, such as programmatic agreements, for all climate change response actions.

- Incorporate cultural resource significance as a factor in management decisions and adaptation actions for vulnerable resources. Significance determinations may require stakeholder consultation.

[10] http://www.unesco.org/culture/ich/index.php?lg=en&pg=00001

- Incorporate knowledge from prehistoric and historic human adaptation (contained in cultural and heritage resources) into contemporary adaptation planning, decision-making, and communication.

American Indians, Alaska Natives, and Insular Areas: It is a priority of the Department to work with American Indians, Alaska Natives, and residents of Insular Areas to anticipate and prepare for climate change impacts to their lands, communities, and ways of life. To do so, bureaus should:

- Provide tribes, communities, and Insular Areas with the most recent climate change information and climate adaptation guidance.

- Respectfully solicit traditional knowledge from tribes, communities, and villages to complement existing scientific resources on past and present ecological and sociological changes.

- Ensure ongoing inclusion of indigenous groups in any EBM implementation by providing avenues for participation and soliciting information on areas of cultural value.

Coordination and Partnerships: Adaptation requires coordination across multiple sectors, geographical scales, and levels of government and should build on the existing efforts and knowledge of a wide range of stakeholders. Bureaus should:

- Coordinate and collaborate with federal, state, tribal, and local governments, and with private landowners, in support of activities that contribute to effective management of species, natural communities, cultural resources, lands, waters, and other assets placed at risk by changing climate conditions.

- Ensure consistent and in-depth government-to-government engagement with tribes, Alaska and Hawaii Natives, and insular areas to address climate change impacts on natural and cultural resources and to apply adaptation strategies.

- Engage with the relevant LCCs to ensure integration with local and regional climate adaptation priorities.

- As appropriate, coordinate with and undertake actions consistent with the National Ocean Policy Implementation Plan; the National Fish, Wildlife, and Plants Climate Adaptation Strategy (NFWPCAS); and the National Action Plan: Priorities for Managing Freshwater Resources in a Changing Climate (Freshwater Action Plan).

- Coordinate scientific activities and plans with the relevant DOI CSCs or the National Climate Change and Wildlife Science Center, and with federal, state, tribal, university, and other science partners to ensure maximum efficiency.

- Adjust partnerships to the scale of the adaptation action. For example, a local adaptation action will be most effective when driven by local interests, risks, and needs, but must also be congruent with regional or landscape-level actions.

- To the extent feasible, include participation from those charged with implementing adaptation plans.

- Support local capacity building since adaptation actions will mainly be implemented at the local level.

- Incorporate outreach efforts into adaptation strategies and actions; tailor adaptation communications to the local context. Communicate information about adaptation plans and projects to stakeholders using clear language that addresses local concerns.

- Provide training bureau staff and managers on climate change, adaptation, and mitigation to increase climate change knowledge within the Department.

- Where possible, implement adaptation strategies and actions that complement or directly support other related management goals such as efforts to improve disaster preparedness, promote sustainable resource management, and reduce greenhouse gas emissions.

- Minimize maladaptation, that is, actions to avoid or reduce vulnerability to climate change that negatively impact, or increase the vulnerability of other systems, sectors, or social groups.

Human Health and Safety: The Department will anticipate, prepare for, and develop cost-effective approaches to ameliorate adverse impacts that climate change may have on employees, contractors, volunteers, visitors, and others for whom it has special responsibilities.

Infrastructure and Equipment: All components of the Department should consider potential climate change impacts when planning, designing, building, purchasing, leasing, upgrading, maintaining, and decommissioning infrastructure and equipment. The Department should identify and avoid investments that are likely to be undermined by climate impacts, such as investments in infrastructure likely to be subject to repeated floods or inundation.

III. Assessment of Climate Related Vulnerabilities

Vulnerabilities to climate change impacts vary widely across the Department's mission areas. Bureaus' climate change adaptation priorities are based on the particular vulnerabilities of their mission and assets. The following is a summary of the Department's climate change vulnerabilities by key mission areas.

Natural and Cultural Resources

The Department's key mission areas under this category are protecting natural, cultural, and heritage resources; improving land and water health; sustaining fish, wildlife, and plant species; providing recreation and visitor experiences; and managing the impacts of wildland fire. At a general level, some major potential impacts (risks and opportunities) to these resources associated with climate change include:

- *Increased temperature and evaporation* may lead to increased numbers of large wildland fires due to increased lightning activity and decreased fuel moisture; longer wildland fire seasons; earlier spring melt and loss of glaciers, permafrost, and Arctic sea ice; and increased air and water temperatures that may stress, extirpate, and otherwise affect some species and cultural practices, and damage or destroy cultural and heritage resources. Increased temperature and evaporation will also reduce seasonal snow storage for water resources management, and will cause increased evaporation and transpiration that may affect public water supply and demand, lakes, streams, and cold water fisheries, and may stress timber and forage species. Rising ocean temperatures will also impact ocean ecosystems, including more frequent mass bleaching and infectious disease outbreaks on coral reefs.

- *Changes in precipitation patterns* may lead to dramatic changes in moisture and stream flow that impact species, ecosystems, and infrastructure, as well as lead to more severe wildland fire seasons that may alter ecosystems and threaten species and cultural resources. Changes in precipitation patterns may cause impacts to:

  - Stream flow that affect water supply and hydropower production (e.g., via changes in reservoir levels, low summer flow levels, and dewatering in some areas);
  - Reclamation of areas used for production of energy and minerals;
  - Water infrastructure (e.g., drought reducing water levels);
  - Water resources and water quality, for example due to flooding in some areas, and water scarcity due to prolonged droughts;
  - Livestock forage, wood products, tree and forage species distributions; and
  - Channels and stream banks, due to erosion.

- *Sea level rise and higher storm surge may lead to inundation of, and damage to, coastal ecosystems and cultural and heritage resources.*

People and Communities

With responsibility for about 70,500 employees and more than 300,000 volunteers, service to 1.7 million American Indians and Alaska Natives, as host to nearly 500 million visitors each year, and as a source of electricity, water and other natural resources to significant sectors of the American economy and to communities adjacent to DOI managed lands, the Department must understand and address the impacts of climate change on people. Much of the human activity of concern to the Department occurs outdoors, in places where climate change impacts will be felt most acutely. The Department is also responsible for advancing government-to-government trust

relationships with American Indians and Alaska Natives and honoring commitments to insular areas.[11] With respect to these responsibilities, vulnerabilities include:

- *An increase in temperature and changes in precipitation patterns* may result in changes in the geographic range and incidence of diseases and health conditions affecting humans;

- *Changes in frequency and intensity of weather-related events, such as heat-waves, precipitation events, and floods* exacerbated by climate change may put lives, livelihoods, and homes and businesses at risk; and

- *These impacts as well as others such as sea level rise and higher storm surge* may affect employee, volunteer, and visitor safety, and recreational opportunities and experiences, with resulting impacts on local employment.

- *Increased temperature* would cause:

  - Changes in the incidence of heat-related illnesses and deaths and, in combination with changes in cloud-cover, may affect the incidence of adverse health outcomes related to poor air quality; and
  - *Melting permafrost and reduced sea ice,* threatening livelihoods of Alaska Natives.

- *Sea level rise and higher storm surge* will lead to inundation of and damage to shore ecosystems, dwellings, infrastructure, and cultural and heritage resources (inundation threatens the existence of low-lying island societies).

- Several climate change-related impacts may threaten traditional ways of life that are tied closely to nature, such as increased susceptibility of ecosystems to invasive species and potential migration and extirpation of plant and animal species of importance to native people and indigenous communities.

Infrastructure and Equipment

The Department has significant investments in infrastructure and equipment, including buildings, dams, roads, vehicles, fences, scientific labs, and equipment. These assets typically require significant investments and long-term commitments, and modifications and repairs can be costly. Climate change impacts could alter the operations, efficiency, and safety of infrastructure and equipment, making it more difficult for the Department to achieve its mission and fulfill its responsibilities. Climate change impacts on infrastructure include:

- *Sea level rise and higher storm surge* may damage or reduce the effectiveness of offshore and coastal infrastructure, potentially eliminating access to coastal areas, for example;

[11] Insular areas include: The territories of American Samoa, Guam, the U.S. Virgin Islands, and the Commonwealth of the Northern Mariana Islands; and the Freely Associated States of the Federated States of Micronesia, the Republic of the Marshall Islands, and the Republic of Palau.

- *Changes in precipitation patterns and increased temperature* in some areas may impact operations of buildings, vehicles, and other equipment, and may impact the capacity for dams to supply water and generate electricity;

- *Flooding* may damage buildings, roads, vehicles, and other equipment and dramatically alter water supply planning; and

- *Changes in intensity, timing, and location of weather events* may disrupt energy conversion, generation, transmission, and transportation, and may impose different stresses on the Department's disaster preparedness infrastructure.

IV. Current Status and Planned Implementation of Climate Change Adaptation at the Department of the Interior

In 2014, the Department will continue to identify and seek opportunities to modernize Federal programs to support climate resilience investments as directed by Executive Order 13653. Opportunities include reforming barriers that discourage climate change adaptation investments; reforming policies that may unintentionally increase vulnerability to climate change risks; and identifying methods to encourage climate resilient investments by States, local communities, and Tribes. The Department will implement Executive Order 13653 requirements while taking into consideration the advice and recommendations of the Climate Preparedness and Resilience Council, the Council's four working groups, and the State, Local, and Tribal Leaders Task Force.

The Department is conducting a new Climate Change Adaptation Priority Performance Goal for FY 2014 and FY 2015 to measure bureau performance and achievements toward implementing five priority climate change adaptation strategies, which were established in the 2013 Strategic Sustainability Performance Plan (SSPP). The Climate Change Adaptation Priority Performance Goal will be used to target, track, and report progress on a quarterly basis over the next two years and will be instrumental in ensuring that the Department meets the requirements of Executive Order 13653. The five strategies follow.

Strategy 1: Mainstream and integrate climate change adaptation into both agency-wide and regional planning efforts, in coordination with other Federal agencies as well as state and local partners, Tribal governments and private stakeholders.

Strategy 2: Ensure agency principals demonstrate commitment to adaptation efforts through internal communications and policies.

Strategy 3: Ensure workforce protocols and policies reflect projected human health and safety impacts of climate change.

Strategy 4: Design and construct new or modify/manage existing agency facilities and/or infrastructure with consideration for the potential impacts of projected climate change.

Strategy 5: Update agency external programs and policies (including grants, loans, technical assistance, etc.) to incentivize planning for and addressing the impacts of climate change.

While the Department continues to work to identify climate change adaptation opportunities, much has been accomplished. The following information demonstrates each bureau's current status and planned implementation of climate chance adaptation. Interior bureaus are at differing levels of implementation and planning, which is reflected in the information provided.

BUREAU OF INDIAN AFFAIRS

The Bureau of Indian Affairs (BIA) is working with Tribes in both trust and self-determination capacities to promote climate change adaptation efforts and encourage participation in policy and program reforms. The BIA has adopted a three-pronged approach to the mainstreaming of climate change adaptation for both the Tribes and the BIA – policy alignment, coordination, and tribal technical support. The following is a summary of BIA's implementation status and planned implementation activities.

Implementation Status

Policy Alignment: The BIA Director issued a guidance memorandum reinforcing the Department's Climate Change Adaptation Policy. The memorandum reinforces leadership commitment requirements. BIA also adopted a high-level Climate Change Adaptation Plan that mirrors the components of the Department's plan. The BIA plan is a strategic document that outlines how BIA programs are expected to consider and address the broad impacts of climate change in planning, administration, and operations.

Coordination: BIA regularly coordinates with other federal partners on climate change issues and tribal adaptation challenges, including:

- the Federal Climate Change Community of Practice;
- the National Fish, Wildlife, and Plants Climate Adaptation Strategy, Joint Implementation Working Group;
- the Interagency Land Management Agency Working Group; and
- the National Ocean Policy Implementation Plan.

BIA maintains an informal network of tribal and BIA manager contacts and an official set of Regional Points-of-Contact to disseminate climate-related opportunities and solicit input and needs from the field. Additionally, BIA supports tribal involvement in climate change forums. In 2013, the BIA supported tribal involvement in the National Adaptation Forum, and the Native American Fish and Wildlife Annual Meeting.

Tribal Technical Support: BIA developed a competitive tribal climate adaptation grant that in FY 2013 focused on strategic climate adaptation plans for tribes, a pilot adaptation plan training event, and support for tribal staff to participate in technical sessions and interagency climate change forums. The projects receiving the FY 2013 BIA grants will support climate preparedness planning for 18 tribes and tribal organizations that received direct support and an additional 32 tribes and two local governments benefiting or cooperating in the projects. The grant program emphasizes leveraged funds, cooperative projects and landscape efforts[12].

Additionally, BIA:

- joined an existing National Park Service effort in the Midwest to bring downscaled climate data to seven local NPS units and the Red Lake Nation;

- provides technical support to the Tribal Co-Chair of the National Fish, Wildlife, and Plants Climate Adaptation Strategy, Joint Implementation Working Group; and

- participates in the DOI Senior Ocean Policy Team and provides ocean planning funding for tribes to support Tribal Ocean and coastal planning.

Planned Implementation

Policy Alignment: The following are BIA's policy alignment plans for 2014:

- Ensure that climate change adaptation is part of the Regional Director's policy and management agenda.

- Regions will plan and communicate their vision of an administrative environment that will enable all levels of managers to incorporate adaptation considerations across all mission areas.

- Implement administrative guidance to identify and address climate driven threats to facilities and infrastructure.

- Considering a review of administrative guidelines to insert climate change considerations into facilities acquisition and management.

Coordination: The following are BIA's coordination plans for 2014:

- Support tribal efforts to share traditional ecological knowledge to benefit non-native management partners addressing climate change.

- Partner with the National Park Service and the University of Minnesota to bring downscaled climate data to the Red Lake Reservation and 7 Park Service units and to further provide

[12] Federal funds passing through P.L. 94-638 contacts to tribes lose their federal character and are considered non-federal for the purposes of leveraging.

National Park unit data and technical advice to four additional tribes adjacent to those National Park units.

Tribal Technical Support: The following are BIA's Tribal Technical Support plans for 2014:

- Restore a competitive grant program to support tribal development of Integrated Resource Management Plans (IRMP) for natural resource management in 2014. In concert with the climate adaptation grants, the IRMPs allow tribes to set ecosystem benefit goals (such as climate resilience), which would be secondary outcomes if considered by individual programs. The BIA will allocate $1 million in FY 2014 to IRMP development and coordinate those grants with the climate change adaptation competitive grants to ensure that opportunities for tribes to leverage funds are available.

- Support tribes to include ocean and coastal management planning and enable participation by tribes in the ocean management Regional Planning Bodies.

BUREAU OF SAFETY AND ENVIRONMENTAL ENFORCEMENT

The Bureau of Safety and Environmental Enforcement (BSEE) works to promote safety, protect the environment, and conserve resources offshore through vigorous regulatory oversight and enforcement. BSEE has several ongoing activities that address climate change adaptation and has plans to implement additional activities.

Implementation Status

Rigs to Reefs Policy: BSEE partnered with the National Ocean Council (NOC) and other Federal and State partners to develop a nationwide policy that creates sustainable marine habitats, which could become important aquatic life refuges as climate change impacts arise. The leadership and collaboration by BSEE and the NOC successfully brought together stakeholders from disparate groups including federal agencies, States, oil and gas industry, commercial and recreational fishing groups, diving groups, and the general public, resulting in the successful creation and implementation of an effective policy on Rigs to Reefs (signed June, 24, 2013).

From 1979 to 2013, 421 structures have been reefed, creating approximately 800 acres of sustainable marine habitat. The new policy has national application and demonstrates BSEE's continued commitment to Rigs to Reefs. Rigs to Reefs allows for a unique and innovative approach to dismantling out-of-service offshore oil and natural gas production platforms by creating new, thriving, sustainable habitats for marine life, while providing States millions of dollars and saving the oil and gas industry millions of dollars. BSEE also is contributing to marine spatial planning by providing reefing location information. The national Rigs to Reefs policy has universal support and benefits the oil and gas industry, fishing associations, tourism, the host state, local communities, and other stakeholders.

Facilities: The Ohmsett facility, located in Leonardo, NJ, is critical to BSEEs mission of protecting the environment. In addition to testing oil spill response equipment, the facility is used to support BSEE oil spill research projects and to train oil spill responders, including the U.S. Coast Guard's National Strike Force. During tropical storm Sandy, the facility sustained at least $3.3M in damage, including facility damage and loss of equipment. Much of the Ohmsett facility was partially submerged due to the storm surge. The depth and force of the surge was well beyond anything previously seen. Testing was interrupted for a month. Prior to the storm, approximately 60,000 gallons of oil had to be transported inland for safe keeping. Although there were no oil spills at the facility, one warehouse was demolished, another warehouse sustained significant damage, and a great deal of equipment was destroyed.

BSEE is spending $4M from the Hurricane Sandy Mitigation funds to take precautionary measures to mitigate against future storms. This includes relocating fixed assets to higher elevations, building barriers to protect against battering for those assets that cannot be raised, rebuilding the replacement warehouse on higher ground and hardening the warehouse. The prevention measures will reduce the risks associated with the release of oil and/or saline water into fragile ecosystems and water bodies surrounding Ohmsett.

Interagency Coordination: BSEE is involved as a federal leader in the implementation of the Administration's National Ocean Policy (NOP), which has identified resilience and adaptation to climate change and ocean acidification as one of the nine priority objectives. The final NOP Implementation Plan identifies a number of milestones focused on various aspects of climate change, including a better understanding of changes underway, assessing coastal vulnerability, and developing adaptation strategies.

BSEE is engaged in the Council on Environmental Quality's efforts to guide federal agencies to address climate change impacts during compliance with the National Environmental Policy Act.

Planned Implementation

The Bureau of Safety and Environmental Enforcement will continue to work with the Department, across the Federal Government, and with the oil and gas industry to implement policies that reflect the impacts of climate change, including working to implement a sound adaptation policy in the BSEE Strategic Plan.

BSEE will continue to provide experts and input, while serving on the National Ocean Council, Climate Change Taskforce, Science Advisor/Science Integrity Officer Working Group and other expert panels as requested to further the Department's policies for climate adaptation.

As a regulator of energy development on the Outer Continental Shelf, BSEE is considering requiring operators to report structure damages due to a natural occurrence (e.g., hurricane, earthquake, or tropical storm). Additionally, BSEE may require operators to assess a structure's ability to withstand any anticipated environmental conditions (30 CFR 250.919 (b) and (c)).

BUREAU OF OCEAN ENERGY MANAGEMENT

The Bureau of Ocean Energy Management (BOEM) seeks to balance economic development, energy independence, and environmental projection through Outer Continental Shelf (OCS) oil and gas leasing, renewable energy development, and environmental reviews and studies. The bureau is responsible for developing the Five-Year OCS Oil and Natural Gas Leasing Program, leasing OCS oil and gas blocks, and OCS plan approval for exploration and development operations. The BOEM is also responsible for renewable energy leasing and permitting of offshore wind, current, and hydrokenetic energy projects.

Implementation Status

Coastal Ecosystems: BOEM's Marine Minerals Program (MMP) recognizes that ongoing sea level rise and future increased storm frequency and intensity as predicted by climate scientists, will translate into increased coastal erosion and the need for additional sand resources to combat or recover from coastal erosion. Therefore, BOEM is actively engaged in delineating additional resources, leading a pilot effort to consider regional leases with states (thereby streamlining the leasing process), and conducting environmental studies to support effective protection of sensitive resources. The MMP is also focusing on enhanced resource management by analyzing data, conducting studies, and using tools such as Geospatial Information Systems (GIS) and the MMC to manage risks associated with climate change, which could include sand resource depletion from increased coastal restoration projects.

Interagency Coordination: The MMP is involved with ocean and coastal planning bodies such as the Northeastern Regional Ocean Council, the Mid-Atlantic Regional Council on the Ocean, and the Gulf of Mexico Alliance, which are composed of Federal, State, and Tribal representatives. The MMP also provides information for the MMC, which is a collaborative effort among a number of federal agencies, regional planning bodies, state entities, and non-governmental organizations. In addition, the MMP is an active participant for the U.S. Army Corps of Engineers' North Atlantic Comprehensive Coast Study and was part of interagency effort to organize recovery from Hurricane Sandy while providing risk reduction strategies and promoting resilient coastal communities.

In the Gulf of Mexico region, the MMP participates on state-federal RESTORE Act Regional Regulatory Working Groups that bring state and federal regulatory agencies together with each state to identify and resolve problems associated with regulatory actions delaying large-scale coastal ecosystem restoration projects. The MMP also participated on the Gulf Coast Ecosystem Restoration Task Force, Gulf of Mexico RESTORE Council, and the DOI RESTORE Gulf Science Team.

BOEM's Office of Environmental Programs (OEP) is involved in the Interagency Arctic Research and Policy Committee (IARPC), and its staff has been actively involved in policy discussions. OEP personnel are contributing authors to the National Climate Assessment (NCA) and have been lead reviewers of the latest International Panel on Climate Change report. Both efforts (NCA and IPCC review) were led by the U.S. Global Change Research Program. BOEM actively contributes to coordinated interagency efforts such as IARPC and the NCA.

In partnership with the National Science Foundation (lead) and French agencies, BOEM is co-funding the Arctic Science Education and Engineering for Sustainability program (ArcSEES). This program will support climate change resilience in northern Alaska. One of the studies that BOEM is funding within this program aims to reduce the impact of the oil and gas industry in the region.

BOEM is actively engaged in National Ocean Policy (NOP) implementation. Climate change resiliency and adaptation, along with ocean acidification, are identified as one of the nine priority objectives. The final NOP Implementation Plan identifies a number of milestones focused on various aspects of climate change, including a better understanding of changes underway, assessing coastal vulnerability, and developing adaptation strategies.

Environmental Impact Statements: BOEM factors climate change risks in nearly all of its environmental impact statements.

Planned Implementation

Coastal Ecosystems: The MMP is developing a regional-use lease with southeastern Florida for a pilot project to streamline access to OCS sand resources for coastal restoration projects along the sand-starved counties of the Florida Atlantic coast. By streamlining this process, sand could be accessed and used to recover from coastal erosion more quickly for the counties that have the greatest need, as prioritized by the State of Florida. As the effects of climate change are realized along our coasts, the need for OCS sand will likely increase. OCS sand could be used to reduce storm damage to infrastructure and communities, and rebuild sensitive habitat such as wetlands, which are becoming inundated and converting into open water environments.

Interagency Coordination: Cooperatives Agreements are in the process of being negotiated between MMPS and East Coast states that were affected by Hurricane Sandy. Through these Cooperative Agreements, states will perform a variety of studies, including coastal sediment needs assessments, to determine how to improve coastal resilience to future storms and effects of climate change. In addition, OCS sand resources can be used by coastal communities to construct protective dunes and widen critically eroded beaches to help stabilize the coastline and protect infrastructure against future storms and sea-level rise. Study data compiled as part of the Cooperative Agreements will be incorporated into the Multipurpose Marine Cadastre (MMC) to make it publicly available and accessible.

BUREAU OF LAND MANAGEMENT

To more effectively address climate change and other large-scale stressors, the Bureau of Land Management (BLM) is developing and implementing a landscape approach to managing the public lands. The major components of this approach include regional assessments, regional strategies, land use plans, on-the-ground projects to implements these plans, and monitoring for adaptive management. Focusing on three major priorities -- the North Slope of Alaska,

renewable energy development and Greater Sage Grouse and Lesser Prairie Chicken conservation -- the BLM is systematically refining this landscape approach and developing generic and resource-specific program guidance to institutionalize it. Wherever possible, the BLM is doing this work in collaboration with other federal, state, Tribal and non-governmental partners.

Implementation Status

Regional Assessments: The BLM released four Rapid Ecoregional Assessments (REAs) in 2013 and is planning to release four additional REAs in 2014, six in 2015, and one in 2016. Taken together, these 15 REAs cover over 700 million acres of public and non-public lands. The REAs are peer-reviewed science products that synthesize existing information (including a significant amount of non-BLM data) about resource conditions and trends. They highlight and map areas of high ecological value; gauge potential risks from stressors including climate change, wild land fire and invasive plants and animals; and establish landscape-scale baseline ecological data to gauge the effect and effectiveness of future management actions. The REAs provide the BLM with a large amount of information about current and projected resource condition. It is the policy of the BLM to use this REA information and similar information from other large-scale assessments to help identify potential development and conservation priorities; prepare land use plans and plan amendments; conduct cumulative impact analyses; develop best management practices; and authorize public land uses. The REAs and other sources for regional information, such as the Western Governors Association's Crucial Habitat Assessment Tool, are foundational to the landscape approach.

Regional Strategies: Regional conservation and development strategies are critical bridges between regional assessments and land use planning and other decision making processes. In 2014, BLM will begin work with a number of LCCs to develop synthesis reports covering all or significant portions of four ecoregions: the Central Basin and Range, the Colorado Plateau, the Mojave Basin and Range, and the Northwestern Plains. These synthesis reports will help develop a shared understanding of the regional conservation and development opportunities highlighted by the REAs and other large-scale assessments; identify what the BLM and its partners are already doing to address regional challenges and opportunities; and outline additional actions that could be undertaken over the next five to ten years to help achieve regional goals. These regional strategies will significantly help the BLM implement the recent Secretarial Order on Improving Mitigation Policies and Practices.

Land Use Planning: The BLM and the USFS are in the process of revising or amending 98 land use plans in 11 western states to conserve the Greater Sage Grouse. As the Greater Sage Grouse is a keystone species for the sage brush biome, these plans will be foundational to conserving and enhancing ecosystem resilience in a significant portion of the Rocky Mountain and Intermountain West. In 2015 the BLM will work with other federal and state agencies, tribes, and non-governmental partners to implement these plans through the development of regional mitigation strategies, compensatory mitigation programs, and systematic monitoring of terrestrial and aquatic condition and disturbance.

Restoration and Resilience: Every year, the BLM and its partners complete a significant number of on-the-ground projects to restore or enhance ecosystem resilience. Funding for these projects is appropriated in multiple accounts, including the Healthy Landscapes, Hazardous Fuels Reduction, Forestry, and Emergency Stabilization and Rehabilitation programs. To help coordinate and focus these multiple funding streams west-wide, in 2014 the BLM will identify priority focal areas for 2015-19 funding.

The BLM also chairs the Interagency Native Plant Material Develop Program, which collects, propagates and stores native seed and sage-grouse specific focus for restoration and rehabilitation activities. As part of its native plant material program, in 2013 the BLM completed the field work required to develop climate envelops for 300 rare and iconic taxa and completed 319 vulnerability index studies for native materials.

Monitoring: Informed decision making and adaptive management require current data about the status and trend of terrestrial and aquatic systems and about the location and extent of natural and human-caused disturbances. The BLM's Assessment, Inventory, and Monitoring (AIM) Strategy is the framework for this data collection. This strategy outlines a process for using core indicators, standardized field methods, remote sensing, and a statistically valid study design to provide nationally consistent and scientifically defensible information to determine status and track changes to natural resources on the public lands over time. The AIM Strategy is currently being implemented through five sets of interrelated projects. The first three are designed to implement West-wide monitoring that is coordinated, and where possible, integrated with the monitoring activities of other Federal, State and non-governmental partners. The West-wide projects include the BLM Rangeland Assessment, the BLM Western Rivers and Streams Assessment, and the BLM Grass-Shrub Fractional Mapping Project. Some of the Federal partners' included in these efforts are ARS, EPA, NRCS, USGS, and USFS. The two remaining projects are designed to help support immediate multi-State and field office priorities. These projects include efforts to monitor the effectiveness of BLM land use plans and to determine the effectiveness of BLM treatments and actions. In 2015, these five interrelated monitoring efforts will be implemented to inform the regional mitigation and monitoring strategies for the Solar Programmatic EIS and for the Greater Sage-Grouse Conservation Strategy.

Interagency Coordination: To enhance the bureau's ability to adapt to climate change, the BLM is committed to working with other federal and state agencies, Tribes and non-governmental organizations on landscape-scale change agents, better integrating evolving scientific understanding with planning and day-to-day decision-making, and developing the capacity to more effectively plan at multiple-scales. Examples of this commitment include creating a more nimble approach to land use planning (Planning 2.0), establishing a more systematic and robust governance structure for integrating science and management in the BLM, supporting the Landscape Conservation Cooperatives (LCCs) and other interagency and inter-sectorial collaborations, and participating in the Quadrennial Fire Review (QFR) to consider the long term trends that the fire community will need to address in the 2025-35 window, including climate change.

The BLM also is actively participating in the implementation of the National Ocean Policy and the Joint Implementation Working Group for the National Fish, Wildlife, and Plants Climate Adaptation Strategy.

Planned Implementation

The BLM will complete its first Climate Change Adaptation Strategy in 2014. It will emphasize, among other things, identifying priority areas for conservation, focusing restoration activities in these priority areas, and applying the mitigation hierarchy to development activities.

In addition to the climate change adaptation strategy, in 2014 the BLM plans to develop additional policy guidance on the following topics:

- Addressing Climate Change in NEPA Documents
- Fish and Wildlife Conservation
- Identifying Focal Areas for Restoration
- Incorporating Landscape-scale Assessments into Land Use Plans
- Regional Mitigation
- Terrestrial, Aquatic and Disturbance Monitoring

BUREAU OF RECLAMATION

The Bureau of Reclamation (Reclamation) has a mission is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public. Reclamation is the largest supplier and manager of water in the 17 western states west of the Mississippi, excluding Alaska and Hawaii, and has constructed more than 600 dams and reservoirs including Hoover Dam on the Colorado River and Grand Coulee on the Columbia River. Reclamation's facilities deliver water to one in every five western farmers to irrigate about ten million acres of land, and provide water to over 31 million people for municipal and industrial (M&I) uses as well as other non-agricultural uses. Reclamation is also the nation's second largest producer of hydroelectric power, generating 40 billion kilowatt hours of energy each year from 53 power plants. Reclamation is taking importance steps to better understand the impacts of climate change on its mission and to begin to address vulnerabilities.

Implementation Status

SECURE Water Act Section 9504(a) Appropriations Cap: Section 9504(a) of the SECURE Water Act is a critical tool for engaging stakeholders and creating incentives to address climate change adaptation strategies, and is the basis for important programs such as Reclamation's WaterSMART Grants program; the Water Conservation Field Services Program; grants in

California under the Bay-Delta Restoration Program (including both CALFED Water Use Efficiency Grants and Agricultural Water Conservation and Efficiency Projects implemented in coordination with the Natural Resources Conservation Service); including the grants highlighted in the President's Climate Action Plan (Section II, "Protecting our Economy and Natural Resources") as key to maintaining agricultural sustainability in the face of drought and long-term climate change. Section 9504 authorizes the appropriation of $200 million to carry out cost-shared financial assistance. Reclamation's current estimate is the ceiling will be reached in FY 2015. Without prompt congressional action to increase the appropriations ceiling, Reclamation will lose this critical tool and be unable to continue the efforts cited in the President's Climate Action Plan.

WaterSMART Grant Program. Through the WaterSMART Grants, Reclamation provides cost-shared assistance on a competitive basis for water and energy efficiency improvements, including projects that save water, increase energy efficiency and the use of renewable energy in water management, address endangered species and facilitate transfers to new uses. On-the-ground projects may also include implementation of climate adaptation strategies identified in a completed Basin Study. Collectively, WaterSMART Grant projects have contributed 420,503 of the 734,851 AF reported under the Department's Priority Goal for Water Conservation for the four year period 2010-2013. In 2013, $21.4 million in FY 2013 appropriations was used to fund 42 WaterSMART Water and Energy Efficiency Grant projects. Together, these projects contributed 100,300 acre-feet of water savings toward the Priority Goal. With $19 million in FY 2014 funding for WaterSMART Grants, Reclamation anticipates funding approximately 35 new projects, including projects that are expected to contribute an expected 40,000 acre-feet of annual water savings toward the Priority Goal for Water Conservation. Reclamation anticipates announcing successful projects in June 2014 and awarding funding by the end of September 2014.

Basin Studies: Through the Basin Studies, Reclamation collaborates with non-Federal cost-share partners to evaluate climate change impacts on a basin-wide scale and identify adaptation strategies. Since 2009, Reclamation has leveraged $14.3 million in Federal funding with $15.7 million in non-Federal funding to initiate 19 of these collaborative studies, covering many critical watersheds in the western United States. In 2014, Reclamation will select two-three new Basin Studies for funding and up to seven ongoing studies will be completed. Information about individual Basin Studies is available at: http://www.usbr.gov/WaterSMART/bsp/studies.html

Downscaled Climate and Hydrology Projections Website: This website provides quick and easy access to downscaled climate and hydrology projections that can be used to answer questions about daily climate, streamflow and water supplies at a local scale. This information is used by scientists, engineers and water managers in local efforts to address water resources adaptation under climate change. Reclamation leads a partnership of 8 Federal and non-Federal entities (including USGS) that develop and make this information available through a public website serving research, planning and education communities. Partners continue to update website content as new global climate projections become available. Reclamation issued downscaled CMIP5 climate projections in May 2013, and plans to issue hydrology projections for the contiguous U.S. consistent with new CMIP5 climate projections by FY14Q3.

Minute 319: In response to ongoing historic drought, likely effects of climate change and future uncertainties, the 1944 Water Treaty with Mexico was recently supplemented by adoption of Minute 319 by the U.S. and Mexico. The key provisions of Minute 319 - which is a five-year pilot program - provide for additional deliveries to Mexico under high reservoir conditions and reduced deliveries to Mexico under low reservoir conditions on the Colorado River; permit Mexico to defer delivery of some of its allotted water (thereby retaining water in Colorado system reservoirs); facilitate investment (by Reclamation and water users in the U.S.) for improvements and repairs to Mexico's water infrastructure generating conserved water for use in the U.S. and Mexico, and to provide for environmental flows (both a one-time pulse flow and longer term base flows) to enhance riparian habitat in the Colorado River Delta in Mexico. Minute 319 is a result of tremendous bi-national collaborative effort including the Basin States, the U.S., Mexico, and several non-governmental organizations from both countries. In 2013, several bi-national small teams were formed to aid in implementation of the various minute components, including the development of delivery plan for a pulse flow of approximately 105,000 acre-feet of water for environmental purposes. The Delivery Plan will be finalized in early 2014 and result in a pulse flow release that is anticipated for March/April 2014. By deferring water deliveries, Mexico is helping to preserve reservoir elevations that increase the resilience of the system to climate change and both countries are exploring mechanisms to enhance water conservation actions during a period of historic drought.

Middle Rio Grande River Maintenance Program: Through this program, Reclamation performs specific on-the-ground projects to re-establish riverine and riparian habitat along the river corridor and works toward holistic river-wide strategies that balances human infrastructure and water supply needs with ecological needs of endangered species. Projects support adaptation to drought and are designed to make our system more resilient to the projected hydrologic impacts of climate change. During drier periods, many projects involve maintaining a competent channel in a reach to facilitate water delivery downstream. Specific projects performed in 2013 include:

- Maintenance of a 20-mile-long channel in the Elephant Butte Reservoir Delta for effective water delivery to the Rio Grande Project. Regional drought conditions have lowered reservoir pool elevations by approximately 125 feet, to historic lows.

- Response to extreme weather events related to September monsoonal flooding on the Rio Grande below Elephant Butte Dam; also, immediately below Cochiti Dam at the confluence of Peralta canyon where a fire damaged watershed deposited debris and sediment and completely blocked off the river channel.

- Response to monsoonal flooding events on tributaries to the Rio Grande (the Rio Puerco and Rio Salado) that caused damages to the levee and drainage systems in areas along the Rio Grande.

- In cooperation with the New Mexico Interstate Stream Commission, performed rehabilitation of the drain systems south of Belen to enhance delivery of water through the river corridor in response to the drought conditions.

For 2014, the River Maintenance Program will continue work on projects listed previously, including the channel into Elephant Butte and the reaches affected by extreme weather events, to ensure channel integrity and water delivery in areas where climatic factors have affected our river system.

West-Wide Climate Risk Assessments (WWCRA) Team: Reclamation established an internal climate change network, the West-Wide Climate Risk Assessment team, in 2010. The WWCRA Team has members from across Reclamation and representatives from other Federal agencies, including National Oceanic and Atmospheric Administration, U.S. Army Corp of Engineers, U.S. Geological Survey and U.S. Department of Agriculture who work together to assess climate change risks and impacts to water supply and demands in a consistent manner in the western 17 states. The team produces data products that can be used by Reclamation staff and stakeholders to develop climate adaptation strategies. In 2013, the Team developed guidance for implementation of WWCRA Impact Assessments and draft technical guidance for assessing climate change impacts on ecological resources. In 2014, the Team will release a west-wide assessment of climate change impacts to crop water demands and will initiate a new assessment of impacts to water supplies using updated climate projections (CMIP 5) that will inform the climate assessment to be reported to Congress in the 2016 SECURE Water Act Report.

Improving Tools and Methods for Assessing Climate Change Impacts on Water Resources: Reclamation, in partnership with National Center for Atmospheric Research (NCAR) and U.S. Army Corps of Engineers, has undertaken a project to identify strengths and weaknesses of current methods for assessing impacts of climate change on water resources, and for steering research to develop improved techniques. These techniques are used to develop hydrologic projection sets that inform adaptation planning and investments. In 2013, an assessment of current methods was completed. In 2014, documentation on assessment of current methods will be completed.

CALFED Storage Feasibility Studies: New surface storage is likely to be an important climate change adaptation strategy given the potential loss of snow storage in the Sierra Nevada Mountains under most climate change scenarios with more precipitation falling as rain. Climate change impacts are being incorporated into each of the storage project feasibility reports. As an example, the proposed Upper San Joaquin River Basin storage project (Temperance Flat) is in a watershed that relies mostly on snowmelt for water supply. Precipitation is highly variable in this watershed and existing reservoir is too small to fully capture the large snowmelt volumes that occur during wetter years. The proposed new1.2 MAF storage would capture additional snowmelt under today's conditions, and rainfall that is anticipated to replace snowmelt under future conditions. Additionally, the new reservoir would provide emergency water supplies south of the Delta, in the event a catastrophic seismic or sea level rise event damages the levee system in the Delta compromising the water delivery system from Northern to Central and Southern California. In 2013, a climate change analyses was developed for the Shasta and North-of-the-Delta Offstream Storage Investigation CalFED studies. In 2014, Reclamation is developing the climate change analyses for the Upper San Joaquin River Basin Storage Investigation.

Planned Implementation

Reclamation Drought Program: Reclamation is in the process of reformulating this program to implement drought actions and comprehensive drought planning that incorporates climate change and involves collaboration by a broader range of stakeholders than in the past (Drought Response program). Historically, earmarked funding and limitations in program authority have created an incentive to use Drought program funding for drilling wells, and a disincentive to use funding for contingency planning to identify a range of other drought mitigation actions that might be more effective in the long-term. Through the program changes, Reclamation can broaden the Drought program from providing emergency support for wells, to identifying a suite of strategies and actions that will help mitigate the short-term impacts of drought, and address the longer-term impacts of adapting to more severe and more frequent droughts.

Reservoir Operations Guidance: Development of guidance that will bring adaptive learning processes and risk informed decision-making to improve reservoir operations under climate change. The guidance will identify current reservoir operations criteria which will not meet requirements under climate change conditions, and develop recommendations for updating those operations criteria. A work plan was developed in December 2013 and Reclamation will complete one pilot analysis of a reservoir by the end of FY 2014.

Probabilistic Mid-Term Operational Model: Development of a mid-term operation model for the Colorado River which can use multiple climate forecasts to quantify the uncertainty in future reservoir conditions and support risk informed decision making for reservoir operations. The hydrologic model and supporting system components were completed in 2013. Model results will be distributed to key stakeholders in 2014.

Feasibility Study Guidance: Development of guidance to incorporate climate change information into water resources planning studies, including feasibility studies, was initiated in FY 2013 and scheduled for completion in FY 2014. The planning guidance will help Reclamation staff effectively select and utilize analytical methods to characterize climate change impacts and design adaptation strategies that are cost effective at minimizing potential for future risks.

Developing Climate Change Training Capacity: This effort serves as Reclamation's contribution to *National Action Plan: Priorities for Managing Freshwater Resources in a Changing Climate* (2011) Action 21, "Establishing a core training program on climate change science." Reclamation is working with the Federal Climate Change and Water Working Group (including USGS) and Universities Corporation for Atmospheric Research COMET MetEd Program to develop new COMET Professional Development Series oriented towards technical practitioners: "Assessing Natural Systems Impacts under Climate Change." Effort is focused on pilot development and delivery of training courses, and evaluation of sustainable, user-based business models that support future delivery of training to Federal and non-Federal communities.

U.S. FISH AND WILDLIFE SERVICE

The U.S. Fish and Wildlife Service (Service) is the government agency dedicated to the conservation, protection, and enhancement of fish, wildlife and plants, and their habitats. It is the only agency in the Federal Government whose primary responsibility is management of these important natural resources for the American public. The Service also helps ensure a healthy environment for people through its work benefiting wildlife, and by providing opportunities for Americans to enjoy the outdoors and our shared natural heritage. The Service's adaptive response to climate change involves strategic conservation of terrestrial, freshwater, and marine habitats within sustainable landscapes.

Implementation Status

Coordination: Coordination: The Service has been a leader in the Department's work to establish and support the Landscape Conservation Cooperatives (LCCs), public-private partnerships composed of states, tribes, federal agencies, non-governmental organizations, universities and others. LCCs fill a critical need by providing a forum for connecting the entire conservation community within a defined geography and focusing conservation investments and actions on shared priorities. LCCs are vital to the Service's ability to develop and implement robust adaptation strategies for fish and wildlife in collaboration with federal, state, local, and private partners. On-the-ground conservation actions, previously done independently and often opportunistically, must now strategically connect to goals and objectives shared by the community of partners working to conserve these large landscapes and the people who live within them. LCCs help align large-scale federal conservation efforts such as climate change adaptation planning to ensure federal efforts complement each other, and lead to more efficient and coordinated management across jurisdictions.

The Service has also made a major contribution to coordinated interagency efforts to support climate preparedness and resilience through its work to help lead development of the National Fish, Wildlife, and Plants Climate Adaptation Strategy (Strategy). The Strategy was published in 2013 and involved representatives from 15 federal agencies, ten states, and two inter-tribal commissions. It is currently the only adaptation strategy in the United States that was developed collaboratively by all relevant levels of government. Many of the activities described in this response are called for in the Strategy.

The Service actively seeks opportunities to partner with States, local communities, and tribes when it can further our conservation mission. There are numerous examples across the country, especially of coastal refuges working with state and/or local, and/or tribal partners to undertake stewardship investments and/or management activities intended to lessen the impacts of sea level rise on the refuge to both its benefit and that of the local community. Examples include work at the Backwater NWR in Virginia (Region 5), Alligator River NWR in North Carolina (Region 4), Texas Coastal Refuges (Region 2), and Seal Beach NWR in California (Region 8), and others.

Grants and Technical Assistance: In addition to the type of direct climate-resilient investments being made by our Refuges and other facilities, the Service is also introducing climate change considerations into some of its grant and technical assistance programs. Examples include incentives in the competitive portion of the State and Tribal Wildlife Grants Program for the inclusion of climate change considerations in the revision of State Wildlife Action Plans (WSFR), using climate change considerations in projects funded under the National Fish Habitat Partnership (Region 2) and in Cooperative Endangered Species Conservation Fund (Section 6) grants to the States (Ecological Services).

The Service is also increasingly integrating climate change information and considerations into many of its technical assistance programs, including under the Endangered Species Program and the Coastal Barrier Resources Act.

Data and Tools: The Service has made a significant commitment to the development of relevant data, information and decision-support tools related to climate change through its investment in the Landscape Conservation Cooperatives. The LCCs are, by design, inter-agency and inter-governmental (Federal, State, and Tribal). Examples of the LCC investment in developing climate change related, data, information, analyses and tools are too numerous to list comprehensively, but prime examples include:

- Developing inventory, monitoring or observation networks
- Building geospatial databases, including climate related information
- Modeling sea-level rise
- Assessing climate change impacts on species and ecosystems
- Conducting vulnerability assessments for species and ecosystems
- Building species distribution models under climate change
- Developing information management systems
- Creating various tools for detecting climate impacts, or selecting adaptation strategies
- Developing species, habitat, and landscape conservation plans

Facilities and Infrastructure: The Service has taken immediate and long-term actions in modifying and managing infrastructure to accommodate the potential impacts of climate change. In the near term, the Service is building to more stringent codes and regulations to ensure facilities guard against the possible physical impacts of climate change (e.g., proximity to flood

plains). In addition, we are constructing and managing facilities to reduce the Service's greenhouse gas (GHG) emissions. Examples include:

- Coastal marsh restoration at Prime Hook NWR

- Attainment of LEED certification (at some level) for one or more buildings at Audubon NWR, (ND), Rocky Mountain Arsenal (CO), San Luis NWR (CA), Texas Chenier Plain Refuge complex (TX), Turnbull NWR (WA), and the Winnie Depot facility (TX)

- Installation of photovoltaic systems at such facilities as Anahuac, Maxwell, and Wichita Mountains NWRs, Brazoria NWR (TX), Farallon NWR (CA), Willow Beach, Mora National Fish Hatcheries and the Southwest Native Aquatic Restoration and Recovery Center (Region 2)

- Replacement of older vehicles with flex-fuel or hybrid vehicles

Training and Capacity Building: The Service's National Conservation Training Center is developing and implementing climate change training opportunities for staff and conservation partners. These include online courses, webinars, instructor-led courses, and hands-on workshops and focus on emerging practices in dealing with climate change adaptation, climate change vulnerability assessment, scenario planning, and downscaling models. NCTC is also working to incorporate climate change broadly into Service training courses to ensure that all employees are aware of the impacts of climate change, the Climate Change Strategic Plan, the National Fish, Wildlife, and Plants Climate Adaptation Strategy, and Department's new climate change adaptation policy. During FY2013 and 2014, NCTC will develop and deliver 36 classes and 58 webinars, which explicitly addressed the challenges of climate change adaptation planning efforts.

Policy Alignment: The Office of the Science Advisor has been asked to lead Service efforts in developing policy and guidance that ensures compliance with the recently released Departmental Climate Change Adaptation Policy. The Service climate change policies will be placed in a new 3-part Climate Change Series in the Service Manual around adaptation, mitigation, and engagement. In the first step of this process, a new Service Manual chapter on Climate Change Adaptation (056 FW 1) has been issued that establishes initial Service policy and staff responsibilities on climate change adaptation, stepped down from the Departmental policy.

The Refuge System has also proposed a policy to implement a strategic approach to growth, recognizing that the Service cannot fulfill its mission in the face of challenges related to climate change and other stressors unless it provides consistent direction for adding lands and waters to the system. The draft policy recommends focusing protection measures on priority conservation features in order to ensure that limited resources are directed toward making the greatest contribution to the conservation of species under climate change in a strategic, cost-effective, and transparent manner.

Gulf of Mexico: The Service is also supporting a landscape-level approach with climate resilient investments in the restoration of the Gulf of Mexico ecosystem following the 2010 Deepwater

Horizon oil spill. The Service is engaging states and other partners on shared restoration priorities to sustain a broad range of ecosystem services that will benefit fish and wildlife resources and enhance the resilience of coastal communities and their economies. The Service's Vision for a Healthy Gulf of Mexico Watershed (2013) reinforces this approach and provides the platform for facilitating collaborative conservation. The Service has committed its resource programs and staff to engage in the full suite of Gulf restoration programs which provide the opportunity to support climate resilient investments by States, local communities, and tribes, including through grants and technical assistance. The Service will be working in 2014 and beyond to leverage available funding and ensure that restoration actions are complementary in order to secure the long-term resilience of the natural resources, ecosystems, fisheries, habitats, and human communities of the Gulf Coast.

Planned Implementation

Implementation of the National Fish, Wildlife and Plants Climate Adaptation Strategy: The Service's Programs and Regions are reviewing the recommendations of the Strategy and either sharing it with partners or cross-walking it with their existing program priorities and plans. For example, Ecological Services developed a synopsis of the Strategy for use by its staff and the Office of the Science Advisor (OSA) expanded this synopsis for use by staff Service-wide. Some programs are using information or ideas from the Strategy in their work and others are focused on implementing specific actions. For example, Facilities and Aquatic Conservation is currently working to implement three actions of the Strategy related to habitat connectivity and to invasive species, respectively. Region 7 reports activities underway that address four different actions recommended by the Strategy ranging from the identification of priority species to capacity building, data integration and data development. A number of LCCs have reviewed the Strategy and expressed either their general support for its recommendations or more detailed commitments to their role in implementing its major recommendations.

In addition to these programmatic and regional efforts, OSA is continuing to lead Service participation in the Joint Implementation Working Group (JIWG) that formed to promote inter-agency implementation of the strategy and report on implementation progress. The JIWG is composed of representatives from essentially the same federal, state and tribal organizations that worked together to produce the strategy. Membership is voluntary. The first meeting of the JIWG was held in late November, 2013 and its first report on Strategy implementation is expected by fall of 2014.

NATIONAL PARK SERVICE

The National Park Service (NPS) manages the 401 parks of the National Park System, covering more than 84 million acres in every state, the District of Columbia, American Samoa, Guam, Puerto Rico, and the U.S. Virgin Islands. In its entirety, the National Park System represents, interprets, and preserves both natural and cultural sites that are testaments to the nation's history, and offer an array of opportunities for much needed respite, reflection, and outdoor recreation to the American public. For the NPS, the aim of adaptation is to build resilience in the parks—

finding ways to help ecosystems and resources withstand and recover from climate change. Different kinds of resources and systems require different approaches to adaptation.

Implementation Status

Hurricane Sandy Rebuilding: The NPS is implementing the Hurricane Sandy Task Force Strategy. The Task Force provides a platform for ensuring climate change effects, such as sea level rise and storm events, are considered in current and future coastal management and restoration. NPS created a Rapid Review Team to provide review and guidance for Hurricane Sandy recovery projects. The team developed a series of questions entitled "Siting and Design Considerations" with an intent to promote a thorough analysis of facility location and design features in coastal settings, so that agency staff make wise decisions about what to replace, and construction designs given a future of sea level rise and storm events. This specific guidance will be used in facility design in 2014.

Capital Improvements: The NPS developed and applies a standard protocol to address the effects of climate change on all proposed capital improvement projects through the Development Advisory Board (DAB) review process. Since implementation of the protocol in November 2011, the NPS has reviewed 132 capital improvement projects for climate change considerations. Of the 56 projects reviewed just in 2013, 28 projects received recommendations to improve the resilience and adaptive capacity of park facilities into the future. This included, for example, recommending a floating dock system that accommodates sea level rise in Salt River Bay National Historic Park, and highlighting the need for new culverts to accommodate potentially larger flood events in Lake Mead National Recreation Area.

Decision Support Tools: To provide the best available climate change science to park managers, the NPS Climate Change Response Program partnered with the University of Wisconsin beginning in 2012 to deliver downscaled historical and projected climate spatial data to all national parks as input for vulnerability analyses, resource management planning, and the development of climate change adaptation measures.

To better assist parks in considering the uncertainty associated with climate change in park planning, the NPS completed the guidance, "*Using Scenarios to Explore Climate Change: A Handbook for Practitioners*" to share a process developed by the NPS for climate change scenario planning that enables managers to consider how to define and meet their goals under climate change. The NPS is currently preparing additional tools and guidance for climate change scenario planning.

The NPS partnered with Western Carolina University to develop a process for coastal parks to identify park resources at risk to effects from long-term climate change. The first iteration of the *Facilities Climate Change Vulnerability Tool* will examine the exposure of facilities in 40 parks to sea level rise and storms, with potential to expand to additional parks in 2014.

Vulnerability Assessments: The NPS has completed 10 vulnerability assessments of resources in 34 national parks, 3 of which were completed in 2013, including assessments in Acadia National Park and Point Reyes National Seashore. Fifteen additional vulnerability assessments

are currently in progress for resources in 40 national parks, including Shenandoah National Park, Gateway National Recreation Area, and Congaree National Park.

Interagency Coordination: Since 2010, the NPS funds full-time permanent staff in four Landscape Conservation Cooperatives including a Co-Lead in the Great Northern LCC, cultural resource management in the Pacific Islands LCC, socioeconomics expertise in the South Atlantic LCC, and oceanography and coastal management in the North Atlantic LCC. NPS staff provides unique value to the LCCs, such as incorporating socioeconomic and cultural resource considerations into land easement and purchase strategies in an adaptation plan at the South Atlantic LCC, and the linking of relevant climate science to NPS management at the Great Northern LCC.

The NPS participated on the Steering Committee in preparing the nation's first adaptation plan for climate change, the *National Fish, Wildlife and Plants Climate Adaptation Strategy*, released in April 2013, which provides a set of collaborative goals that can be applied across jurisdictions.

NPS staff also participated on the Working Group to develop the interagency/NGO *Climate Smart Conservation* Adaptation Guide to be published in early 2014.

Policy and Guidance: The memorandum "*Applying National Park Service Management Policies in the Context of Climate Change*" signed by Director Jon Jarvis in March 2012 clarifies that although climate change is beyond the control of individual managers, we have a responsibility to engage partners and apply the best available science to conserve park resources. In 2014, the NPS will release a director's memo to provide management guidance on policies related to the effects of climate change on cultural resources.

The National Park System Advisory Board Science Committee delivered *Revisiting Leopold: Resource Stewardship in the National Parks* to Director Jarvis in August 2012, which outlines a new vision for policy and management under changing conditions. Director Jarvis established a Revisiting Leopold Implementation Team.

The NPS Climate Change Coordinating Group led by NPS Director Jon Jarvis implemented the *Climate Change Action Plan 2012-2014* in November 2012, an agency-wide plan that describes 55 high-priority, near-term actions to which the NPS is committed. The Action Plan is intended to be flexible and iterative.

Training: Training and educating staff about climate change is a priority for NPS to ensure a climate literate workforce. These include sharing on-the-ground examples of adaptation and effectively communicating climate stories to the public. Fifty park superintendents participated in a 6-course leadership series, sharing ideas and fostering a community of practice for understanding and coping with climate change challenges. Also, the 3rd annual Interpreting Climate Change competency course brought together interpreters and communication professionals in a virtual shared learning environment.

In partnership with the National Wildlife Federation, U.S. Fish and Wildlife Service and other partners, the NPS designed and implemented 4 vulnerability assessment training courses and

made them available to staff across multiple federal and state agencies, non-governmental organizations, and other partners.

Planned Implementation

Policy and Guidance: NPS Director Jarvis will release a Policy Memo in early 2014 to provide management guidance related to the effects of climate change on cultural resources. NPS is also preparing a Cultural Resources Climate Change Strategy which will provide additional guidance and detail. Director Jarvis' Revisiting Leopold Implementation Team will develop a draft Policy Memo to provide interim guidance on resource stewardship, to be delivered April 2014.

The NPS Climate Change Action Plan is intended to be flexible and iterative and the NPS will complete a revised Action Plan in early 2015.

In 2014, the NPS is developing guidance for planners in how to utilize climate change projections in NPS strategic plans, management plans, and decision analyses.

Decision Support Tools: The Western Carolina University partnership will also develop an *Adaptation Options Handbook* to guide parks in decision making for natural resources and infrastructure at risk from sea-level rise and storm inundation in coastal parks, to be completed in 2014.

Developing Park-based Climate Change Adaptation Strategies is a handbook under development by the Intermountain Region. It will outline a seven-step process for parks to follow with specific guidance on the science and tools to support park decision-making, including scenario planning; resource vulnerability assessments; climate data, models, and projections; ecological and cultural resource response models; and others. The draft will be available winter 2014.

Climate Change Adaptation Planning for Great Lakes Parks will be conducted in the Midwest Region with a focus to develop strategies and implement actions that promote ecosystem resilience and enhance restoration, conservation, and of park resources.

Technical Assistance and Facilitation for Scenario Planning will be conducted for multiple parks, including Cape Lookout National Seashore.

Interagency Climate Adaptation Strategies: The NPS will commit to additional actions in the next iteration of the NPS Climate Change Action Plan, to be completed in 2015, that will incorporate identified gaps and a strong emphasis on interdivisional and interagency efforts, particularly in the areas of freshwater and marine adaptation initiatives.

NPS staff are participating in the Joint Implementation Working Group for the *National Fish, Wildlife and Plants Climate Adaptation Strategy*, a 22-member group composed of interagency, state, and tribal representatives.

Training: Additional training is planned for the Superintendents Community of Practice and for interpreters and communication professionals. Also, NPS is co-implementing the NCTC Climate Academy and will host a regional workshop for the Climate Smart handbook.

U.S. GEOLOGICAL SURVEY

The U.S. Geological Survey (USGS) undertakes scientific research, monitoring, remote sensing, modeling, synthesis, and forecasting to address the effects of climate and land use change on the Nation's resources. The resulting research and products are provided as the scientific foundation upon which policymakers, natural resource managers, and the public make informed decisions about the management of natural resources on which they and others depend.

Implementation Status

Scientific Information: The USGS provides substantial scientific information that can be used by both governmental and nongovernmental parties to evaluate policies, practices, and investments with respect to climate change. While the USGS is not directly involved in actions such as *reforming* or *removing barriers*, the USGS provides information useful for making those decisions. The USGS provides information both on *expected changes in climate* and on *impacts of those changes on physical, biological, cultural, and societal resources.* For example, USGS assessments of coastal vulnerability as a consequence of expected sea level rise can be used by third parties to evaluate investments in infrastructure in potential affected areas. Other data can provide tailored estimates of temperature, precipitation, and related variables such as *frost-free days* or *nighttime temperatures above a certain threshold*, which are relevant for specific species or locations. Complementing these physical estimates is biological and ecological impacts research, such as the effect of elevated temperature on trout and other cold water fish.

Interagency Coordination: The USGS is also an active participant in the U.S. Global Change Research Program (USGCRP) and related activities such as the National Climate Assessment (NCA). USGS authors contributed to multiple NCA Technical Reports and final NCA Report sections, and USGS scientists contribute technical expertise to multiple USGCRP subcommittees and working groups. In addition, the USGS is active in multiple non-USGCRP interagency activities, including those convened under the Council on Environmental Quality, as well as sitting on the Steering Committee for the National Fish, Wildlife, and Plants Climate Adaptation Strategy, and providing substantial technical and other input to the *National Action Plan: Priorities for Managing Freshwater Resources in a Changing Climate. The USGS also co-chairs the interagency Climate Change and Ocean Acidification sub-group coordinating the federal response to the climate change priorities of the National Ocean Policy.* The USGS is managing a joint project to develop a searchable registry of assessments that identify resources vulnerable to climate change; this is with members of the Interagency Land Management Adaptation Group (ILMAG) an ad hoc group of Federal, State, and other partners.

Goal 5 of the National Fish, Wildlife, and Plants Climate Adaptation Strategy is: *increase knowledge and information on impacts and responses of fish, wildlife, and plants to a changing climate.* This goal includes reference to the need to work collaboratively among Federal, State,

tribal and other partners to develop useful scientific outputs, conducting research into the ecological impacts of climate change, and advancing modeling as a key research tool. All of these are key components of USGS science strategies, especially those of the National Climate Change and Wildlife Science Center and Department of the Interior Climate Science Centers (CSC), which the USGS manages for the Department of the Interior. For example, science priorities at Climate Science Centers are established in consultation with regional stakeholders from Federal, State, and tribal governments, and Landscape Conservation Cooperatives, embodying the collaborative sprit of the Plan.

The USGS is actively engaged in responding to implementation priorities related to climate change under the National Ocean Policy. Actions supported by the USGS include conducting targeted research and disseminating findings to address information needs related to the direct and indirect impacts of climate change and ocean acidification; providing decision-support data and tools related to coastal inundation and sea-level rise hazards; developing, disseminating, and providing guidance for the use of vulnerability assessments and tools for assessing resilience of natural resources, cultural resources, populations and infrastructure; and developing interagency plans for provision of accurate elevation data.

The USGS has been contributing vital science and information in support of the National Action Plan: Priorities for Managing Freshwater Resources in a Changing Climate, Several key recommendations in the plan call for the improvement of water resources information for decision-making [*Recommendation 2: Improve Water Resources and Climate Change Information for Decision-making*], strengthening our assessment of water resources vulnerability [*Recommendation 3: Strengthen Assessment of Vulnerability of Water Resources to Climate Change]*, and expanding water use efficiency [*Recommendation 4: Expand Water Use Efficiency*]. The USGS, through its efforts to institute a National Water Census, is taking steps to improve all three of these areas. In the arena of water resources information, the USGS has already completed an assessment of thirteen years of evapotranspiration data for the coterminous 48 states and created a monthly time-series of evapotranspiration data for trends analysis.

The USGS has also substantially expanded its program to collect and provide water use information, particularly in the areas of thermoelectric, public supply, and irrigation water use. Regarding strengthening assessment of water resources vulnerability, the USGS has just recently completed a model for assessing thermoelectric water withdrawals and consumptive uses. This model can be used to project the amount of water that would be consumed under new cooling water scenarios for thermoelectric generating plants. Thermoelectric cooling water is the largest category of freshwater use, from a withdrawal perspective. Through these efforts, the USGS hopes to substantially advance the National Action Plan: Priorities for Managing Freshwater Resources in a Changing Climate.

Planned Implementation

Facilities: The USGS has entered into preliminary discussions with the Department for a standardized tool to evaluate the effects of climate change on the entire USGS real property portfolio including any potential facility investments.

Ecological Sequestration: The forthcoming visualization tool for ecological sequestration of carbon will support pilot planning efforts for integrating climate mitigation and adaptation. Pilots are currently under development with other DOI bureaus; a FWS pilot was funded for 2014.

Water-use Efficiency: The USGS is assessing the efficiency of irrigation practices through its National Water Use Information Program by developing nationally consistent methods for assessing irrigation water use practices.

Freshwater Streamflow: The USGS is working to complete additional freshwater streamflow efforts that will allow evaluations of streamflows at ungaged areas throughout the country at the finest watershed scales.

OFFICE OF SURFACE MINING RECLAMATION AND ENFORCEMENT

The Office of Surface Mining Reclamation and Enforcement (OSMRE) was established by mandate of the Surface Mining Control and Reclamation Act of 1977 to address environmental and public safety concerns associated with surface coal mining. The OSM mission is to ensure that, through a nationwide regulatory program, coal mining is conducted in a manner that protects citizens and the environment during mining, and restores the land to beneficial use following mining.

Implementation Status

Use of Spatial Data: OSMRE Technical Innovation and Professional Services (TIPS) program provides off-the-shelf scientific and engineering modeling software to state, tribal, and federal offices that administer SMCRA. TIPS has recently developed a series of remote sensing procedures to assist regulatory inspectors in using imagery in performing inspections and determining reclamation success. Current regulations require monthly inspections of all active mines. The OSMRE, State, and Tribal employees who inspect mines, review permit applications and identify and reclaim abandoned mine sites drive many miles to accomplish their work. Utilization of geospatial data, including satellite imagery, may reduce the need for on-site inspections and therefore reduce fuel consumption associated with trips to the sites. Similar gains may be possible in abandoned mine site investigations and project inspection work.

Software: OSMRE's TIPS program maintains software licenses for numerous programs that are used to evaluate mining permit applications and to design reclamation projects. Several of the software tools provide design capabilities that are specifically relevant to climate resilience in that they enable design of reclaimed mine sites to conditions that are representative of the pre-mining natural state. For example, hydrologic modeling software allows modeling of the longest possible flow route in recreated landscapes. This has the potential to reduce vulnerability to flood events (climate change induced or otherwise) by decreasing runoff rates and increasing hydrologic storage.

National Mine Map Repository: OSMRE also administers the National Mine Map Repository (NMMR), established by the Federal Coal Mine Health and Safety Act of 1969 The Repository is charged with maintaining an archive of all closed and abandoned mine maps from throughout the United States. Through its expert analysis of mine maps and related information, the NMMR assists both the private and public sectors in evaluation of related data for economic evaluation, risk assessment, industrial and commercial development, highway construction, and the preservation of public health, safety and welfare. NMMR resources will be critical to planners of previously disturbed sites for climate change initiatives, such as natural gas infrastructure and wind/solar development.

Geomorphic Reclamation: OSMRE is researching and promoting the use of geomorphic reclamation and natural stream design practices for reclamation of active and abandoned coal mines. These practices use today's modern advances in landscape design technology to quickly and inexpensively design stable landforms and streams that mimic both the look and the functionality of natural systems. Geomorphic reclamation facilitates restoration of healthy terrestrial and aquatic ecosystems on resilient stable landscapes after mining that can remain stable and productive in a changing climate. The emphasis on geomorphic reclamation is based on the idea that natural landscapes evolve over long periods of time under localized conditions. This creates a natural system that minimizes the impact of storm events. Using modern software design tools and GPS enabled earth moving equipment controlled by that software, the geomorphic reclamation technology can reclaim highly disturbed lands and create fully functional natural systems virtually indistinguishable from their surrounding landscapes. Previous technology that was dependent upon traditional engineering practices used steep, rock lined ditches, are replaced by meandering streams; and uniform or terraced hillsides are replaced by slopes that look natural yet are specifically designed to efficiently convey water down slope without excessive erosion or sediment loading.

OSMRE, beginning in 2006, has held two national interactive forums, one regional workshop, and conducted three technical sessions at the American Society for Mining and Reclamation (ASMR) annual symposium on geomorphic reclamation and natural stream design. OSMRE will hold its third national forum on "Advances in Geomorphic Reclamation at Coal Mines" May 20-22, 2014, in Albuquerque, New Mexico. OSMRE is currently funding two applied science research projects that will provide improved geomorphic reclamation models for both the arid west and the Appalachian regions of the country. The published proceedings of the second forum and talks provided at the ASMR Symposia are available at: http://www.techtransfer.OSMRE.gov/NTTMainSite/Initiatives/Geomorph/geomorph.shtm.

Interagency Coordination: OSMRE, through state and tribal partners, protects and preserves the integrity of vulnerable aquatic ecosystems during coal mining through the rigorous application of SMCRA Title 5 enforcement standards. OSMRE programs enhance climate change adaptation through ecosystem restoration projects with the National Fish Habitat Partnership (NFHP) and regional partnerships, especially Eastern Brook Trout Joint Venture. OSMRE and state and tribal partners have restored hundreds of miles of warm- and cold-water fish habitat by neutralizing acid mine drainage and removing other water pollutants. Project funding is from SMCRA Title 5, the Abandoned Mine Land (AML) reclamation program, in grants to states and tribes, and through Watershed Cooperative Agreements with non-

governmental organizations. Many grantees have completed total watershed and sub watershed restorations with ecosystem benefits such as increasing and reconnecting populations of native trout, and improving plant communities and habitat for terrestrial wildlife. In recent years, OSMRE has removed the remaining obstacles to watershed restoration by increasing the percentage of state grants allowed for AMD neutralization and enabling federal matching funds.

Planned Implementation

Policy: OSMRE will prepare a climate change policy statement. The policy statement will reiterate OSMREs commitment to programs that improve the resilience of areas under our control to the effects of climate change.

Planning: OSMRE will form an agency working group to discuss additional ideas for future integration of climate change issues. Participants in the group will include regional and field office representatives, states and tribes. Potential products include, for example, clarifying guidance on addressing conflicting priorities within SMCRA (e.g. interpretation of the prime farmland requirements versus our reforestation goals) as they relate to climate change.

Programs and Operations: OSMRE will incorporate a climate change element into the judging criteria for the agency annual awards given for high-quality mine reclamation projects. The new criteria will recognize states and companies for going above and beyond to reduce or offset emissions or to address at risk resources during reclamation. A panel of judges composed of directors of state reclamation programs and OSMRE managers vote to determine the winners.

NEPA handbook and NEPA training: OSMRE is underway with revising the agency NEPA handbook and preparing materials for OSMRE's annual NEPA training. Climate change and particularly estimation of greenhouse gas emissions will be addressed in both the handbook revisions and the training materials. All aspects of the training program, from identification of needs through course development and presentation, are cooperative efforts of State, Tribal, and OSMRE offices. The reach of this training is broader than OSMRE; students in the course include Federal, State and Tribal personnel involved in SMCRA implementation. OSMRE will have incorporated a climate change component into our NEPA training by April 2014 and into an internal draft of the handbook by 4th quarter 2014.

GeoMine: OSMRE recently completed a four-state pilot project of an interactive, web-based, digital map of coal mining and reclamation activities in the United States known as GeoMine. GeoMine contains digitized, integrated land and water data sets which provide huge efficiency benefits to regulatory enforcement in comparison to disparate paper sources. The digitization of this data will greatly facilitate proactive, collaborative planning for opportunities related to biological and geologic carbon sequestration, climate impact preparedness and resilience, and preventative risk management.

GeoMine participants collaborate across Federal and state agency lines to develop and maintain the dataset. Participating in the pilot project were the SMCRA regulatory authorities in Kentucky, Virginia, West Virginia, the Federal SMCRA program in Tennessee, the Interstate Mining Compact Commission, OSMRE, the US Fish and Wildlife Service, the Army Corps of Engineers, and the Environmental Protection Agency. OSMRE is the lead agency for this effort.

The GeoMine Interagency Team has recently completed the final GeoMine Pilot Project report. The report recommends a phased, five-year deployment of GeoMine out to additional SMCRA state and tribal agencies to achieve nationwide participation starting in fiscal year 2015. To date GeoMine includes over 128,000 SMCRA coal mining activity sites, 3.5 million acres of surface coal mine operation boundaries, and 415,000 federal agency data points including hydrologic sampling stations with analytical data. Feedback from agencies with responsibility for enforcing SMCRA, the Clean Water Act, and the Endangered Species Act, indicates that the program will be highly useful in many areas of planning, with case studies showing significant staff time savings and potential to avoid future development conflicts with mining related constraints.

V. Conclusion

This climate change adaptation plan describes the Department of the Interior's ongoing and planned activities to address climate change by building resilience in natural and cultural resources and the communities that are impacted by the Department's management and operations. Climate change adaptation is a long-term endeavor requiring a scientific understanding of vulnerabilities and a sound, yet flexible, plan to address the impacts. The Department is committed to incorporating adaptation into planning and operations and looks forward to working with federal and nonfederal partners to improve understanding, develop effective tools, and identify and implement best practices.