

Priority Agenda

Enhancing the Climate Resilience



of America's

Natural Resources

COUNCIL ON CLIMATE PREPAREDNESS AND RESILIENCE



Prepared by the
**COUNCIL ON CLIMATE PREPAREDNESS
AND RESILIENCE CLIMATE AND
NATURAL RESOURCES WORKING GROUP**



The Departments of Defense, Interior, and Agriculture, the Environmental Protection Agency, the National Oceanic and Atmospheric Administration, the Federal Emergency Management Agency, and the U.S. Army Corps of Engineers.

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EXECUTIVE SUMMARY

In November 2013, a few days after the first anniversary of Hurricane Sandy, President Obama issued Executive Order 13653 calling on Federal agencies to work with states, tribes, and local governments to improve preparedness for the impacts of a changing climate.

Agencies with a responsibility for natural resources were given a specific charge, outlined in Section 3 of the Order, titled, *Managing Lands and Waters for Climate Preparedness and Resilience*. The Order directed Federal agencies with responsibility for managing natural resources to:

“[C]omplete an inventory and assessment of proposed and completed changes to their land- and water-related policies, programs, and regulations necessary to make the Nation's watersheds, natural resources, and ecosystems, and the communities and economies that depend on them, more resilient in the face of a changing climate. Further, recognizing the many benefits the Nation's natural infrastructure provides, agencies shall, where possible, focus on program and policy adjustments that promote the dual goals of greater climate resilience and carbon sequestration, or other reductions to the sources of climate change. The assessment shall include a timeline and plan for making changes to policies, programs, and regulations.”

The interagency Council on Climate Change Preparedness and Resilience, established by Section 6 of the Order, convened a Climate and Natural Resources Working Group (CNRWG) to complete the inventory, assessment, and plan called for in Section 3 of the Order. The CNRWG includes Departments of Defense, Interior, and Agriculture, the Environmental Protection Agency, the National Oceanic and Atmospheric Administration, the Federal Emergency Management Agency, and the U.S. Army Corps of Engineers.

Through the first half of 2014, the CNRWG conducted an interagency process to inventory and assess current policies, programs, and regulations, as directed by the Executive Order. A variety of stakeholders were informally consulted throughout the process, including close collaboration with the State, Local, and Tribal Leaders Task Force for Climate Preparedness and Resilience. This work considered several existing interagency strategies addressing climate change adaptation and natural resources, particularly the *National Ocean Policy*, the *National Action Plan: Priorities for Managing Freshwater Resources in a Changing Climate*, and the *National Fish, Wildlife and Plants Climate Adaptation Strategy*.

This document, the *Priority Agenda for Enhancing the Climate Resilience of America's Natural Resources*, is the result of this deliberation. The *Agenda* builds upon the robust climate change adaptation work already accomplished by Federal agencies and identifies significant actions moving forward.

Key Themes and Commitments Moving Forward:

This *Agenda* identifies four priority strategies to make the Nation’s natural resources more resilient to a changing climate. For each strategy, the *Agenda* documents significant progress and provides a roadmap for action moving forward. Highlights of the key actions agencies will undertake in the near term to implement each of the four strategies are described below and in Table 1.



- 1. Foster climate-resilient lands and waters** – Protect important landscapes and develop the science, planning, tools, and practices to sustain and enhance the resilience of the Nation’s natural resources.

Key actions include the development of a Resilience Index¹ to measure the progress of restoration and conservation actions and other new or expanded resilience tools to support climate-smart natural resource management. Agencies will identify and prioritize landscape-scale conservation opportunities for building resilience; fight the introduction and spread of invasive species; and partner internationally to promote resilience within the Arctic. Throughout, agencies will evaluate resilience efforts to inform future actions.



- 2. Manage and enhance U.S. carbon sinks** – Conserve and restore soils, forests, grasslands, wetlands, and coastal areas that store carbon. Maintain and increase the capacity of these areas to provide vital ecosystem services alongside carbon storage such as clean air and water, wildlife habitat, food, fiber, and recreation.

Key actions include the development of improved inventory, assessment, projection and monitoring systems for important carbon sinks and the development of estimates of baseline carbon stocks and trends to inform resource management. A number of actions will secure the continued health of the Nation’s natural resources that provide carbon biosequestration, including forests, agricultural lands, and inland and coastal wetlands.



- 3. Enhance community preparedness and resilience by utilizing and sustaining natural resources** – Harness the benefits of nature to protect communities from harm and build innovative 21st century infrastructure that integrates natural systems into community development.

Federal agencies will take action to encourage investment in natural infrastructure to improve resilience and enhance natural defenses through new federal guidance on ecosystem services assessment, an actionable research agenda, rigorous program evaluation, and expanded decision support tools and services. Federal agencies will increase assistance to states, tribes and localities interested in pursuing green stormwater management solutions and will expand partnerships that reduce wildfire risk and protect critical drinking water supplies, promote irrigation efficiency and water efficiency,

¹ See page 19.

launch coastal resilience research projects and create decision support tools for local communities to manage their coastal resources.



4. Modernize Federal programs, investments, and delivery of services to build resilience and enhance sequestration of biological carbon – Ensure that Federal programs, policies, trainings, and investments consider climate resilience and carbon sequestration, and organize the delivery of Federal science, tools and services to help resource managers, landowners, and communities optimize their natural resource management decisions in a changing climate.

Agencies will incorporate resilience into natural resources planning and management across all existing operations and programs. Climate-smart practices will be reflected in land acquisition programs and financial assistance programs. Agencies will develop agency-specific principles and guidance for considering biological carbon in management and planning decisions. Agencies will enhance coordination among existing regional resilience information and services operations to better meet the needs of American communities, and strengthen the Federal workforce through training to build the climate literacy and capability of natural resource managers. Targeted training and grant assistance to tribes will help prepare indigenous communities for the impacts of climate change and support the development of tribal climate adaptation plans to enhance community resilience.

Implementation

Under the direction of the interagency Council on Climate Preparedness and Resilience, the CNRWG will track the implementation of this *Priority Agenda* in coordination with the existing efforts to implement the *National Ocean Policy*, the *National Action Plan: Priorities for Managing Freshwater Resources in a Changing Climate*, and the *National Fish, Wildlife and Plants Climate Adaptation Strategy*. In 2015, Federal agencies will conduct a 12 month appraisal of implementation.

Table 1: Summary of Strategies and Priority Actions

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1. Develop an Ecosystem Resilience Index	19
2. Develop and Provide Decision Support Tools for Climate-Smart Natural Resource Management	19
3. Identify Landscape Conservation Priorities to Build Resilience	19

4. Fight the Introduction and Spread of Invasive Species	20
5. Evaluate and Learn from Ongoing Resilience Efforts to Inform Future Actions	20
6. Work with International Partners to Foster Resilience in the Arctic, U.S. Territories, and Freely Associated States	21

STRATEGY II: MANAGE AND ENHANCE U.S. CARBON SINKS



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2. Develop Estimates of Baseline Carbon Stocks and Trends to Inform Federal Natural Resources Management	29
3. Promote Forest Conservation and Restoration, Complementary Markets for Sustainably Harvested Wood Products, and Urban Forestry	29
4. Support Forest Conservation and Investment Tax Provisions as a Means to Retain and Restore Forests	30
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6. Assess, Restore, and Protect Coastal Habitats to Understand and Enhance the Storage of Blue Carbon	31

STRATEGY III: ENHANCE COMMUNITY PREPAREDNESS AND RESILIENCE BY UTILIZING AND SUSTAINING NATURAL RESOURCES



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2. Address Performance Measurement and Benefits Assessment Challenges to Natural Infrastructure	41
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4. Promote Drought Resilience and Enhance Water Use Efficiency, Water Reuse, and Water Supply	42
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1. Modernize Federal Programs	51
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Chapter I: Introduction

Priority Agenda for Enhancing the Climate Resilience of America's Natural Resources

"The hard truth is carbon pollution has built up in our atmosphere for decades now. And even if we Americans do our part, the planet will slowly keep warming for some time to come. The seas will slowly keep rising and storms will get more severe, based on the science. It's like tapping the brakes of a car before you come to a complete stop and then can shift into reverse. It's going to take time for carbon emissions to stabilize. ...So in the meantime, we're going to need to get prepared."

President Obama, June 25, 2013

America's Natural Bounty



From the Gulf Coast bayous to the East Coast beaches, from Western sagebrush steppes to Pacific Northwest rain forests, Chesapeake Bay to Puget Sound and the rich ecosystems off our coasts, America's lands and waters have shaped our history, traditions, and way of life. When healthy, these ecosystems also deliver valuable goods and services and stimulate our economy; they provide food, jobs, building materials, medicines, clean water, outdoor recreation, and

wildlife habitat, while also protecting our communities from extreme events such as flooding, storm-surge, drought, heat waves, and wildfire.

These benefits have enormous value - for example, America's forests, farms, and ranches provide 87 percent of the surface supply of drinking water in America, and the economic value of the outdoor recreation economy is substantial, with spending estimates ranging as high as \$646 billion.² Spending on wildlife-related recreation alone was estimated at \$145 billion in the United States in 2011.³ Agriculture, forestry and related industries contributed \$775.8 billion to the U.S. gross domestic product (GDP) in 2012 and 16.5 million full-and part-time jobs - about 9.2 percent of total U.S. employment.⁴



² Southwick Associates Inc. and The Outdoor Industry Association, 2012 Report on The Outdoor Recreation Economy, http://outdoorindustry.org/pdf/OIA_OutdoorRecEconomyReport2012.pdf.

³ U.S. Fish and Wildlife Service, 2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation: National Overview, <http://www.doi.gov/news/pressreleases/upload/FWS-National-Preliminary-Report-2011.pdf>.

⁴ "Ag and Food Sectors from the Economy," USDA ERS, <http://ers.usda.gov/data-products/ag-and-food-statistics-charting-the-essentials/ag-and-food-sectors-and-the-economy.aspx>.

Commercial and recreational domestic fishing activities in coastal and ocean areas supports approximately 1.7 million jobs, \$199 billion in sales, and \$69 billion in income annually.⁵ In addition, coastal habitats reduce storm impacts, maintain water quality, support tourism and recreation, and provide other services that increase resilience of communities and businesses in coastal shoreline counties - home to 39 percent of the United States population and the economic engine of the U.S. economy (roughly half-or \$6.6 trillion-of the U.S. Gross Domestic Product).⁶

Natural Resources in Peril

Climate change is already altering the structure and function of ecosystems, changing the distribution and abundance of plants and animals, and in many cases limiting the ability of lands and waters to provide services to communities. As described in the 2014 *National Climate Assessment*,⁷ drought is contributing to record low flows in many streams, more widespread and intense wildfires, and the drying of many lakes in the South and West. Caribbean coral cover, important for fishing and tourism, has decreased by 80 percent in less than three decades. Arctic permafrost decline and sea ice retreat are leading to rapid coastal erosion, disrupting onshore infrastructure and traditional livelihoods. Many commercial and recreational fish stocks have exhibited shifts in distribution associated with changes in ocean temperatures. Roughly 81 million acres of the Nation’s forests are at risk due to pests, pathogens, and drought stress associated with increased temperature and/or changes in precipitation. Wetlands and dunes that buffer communities are declining at the same time that more severe storms and increased flooding threaten roads, bridges, and businesses around the country and rising sea levels threaten coastal communities, ecosystems, and ports. These impacts to our lands and waters are amplified by many other existing stressors, such as pollution and land conversion. The carbon pollution that is driving these impacts continues to increase in the atmosphere, raising temperatures and acidifying the ocean, with serious implications for the health of both natural and human systems. However, the ecosystems that support our economy and provide extensive services to communities are also very good at reducing carbon levels in the atmosphere. Natural systems like forests, wetlands, grasslands, and sea grasses use the carbon in the atmosphere to grow, thereby pulling harmful pollution from the air and converting it into carbon in soils, leaves, seaweed, and grasses. Essentially, these ecosystems do double duty by both providing us with essential services *and* mitigating the damage of carbon pollution.



5 “Fisheries Economics of the U.S,” NOAA Office of Science and Technology, http://www.st.nmfs.noaa.gov/economics/publications/feus/fisheries_economics_2012.

6 “Spatial Trends in Coastal Socioeconomics,” NOAA, http://stateofthecoast.noaa.gov/coastal_economy/welcome.html.

7 Melillo, Jerry M., Terese (T.C.) Richmond, and Gary W. Yohe, eds. *Climate Change Impacts in the United States: The Third National Climate Assessment*. U.S. Global Change Research Program, 2014. 841 pp.

For these reasons, it is essential that the impacts of climate change be minimized to assure the health of these ecosystems. Addressing climate impacts to natural resources and the communities that depend upon them will require innovation and a national commitment, to not only limit the carbon pollution in the air, but also to modernize the Nation’s natural resource management agenda. This modernized agenda reflects the need to adapt to these changes and enhance the resilience of our natural resources while also boosting the capacity of ecosystems to reduce carbon levels in the atmosphere. Success will require efforts at every scale, from private lands to tribal lands, from local government to the Federal government. A more coordinated, forward-thinking and inclusive management approach is necessary, now more than ever, to address the scope of impacts being felt across the Nation.

Strategies for Resilience

Increasing “resilience” – the ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from disruptions⁸ – is a complex endeavor. Many cities, states,⁹ tribes, and landowners have already begun to tackle the challenge of building resilience to the changing climate. Federal agencies are supporting these efforts with data and information, tools, strategies, incentives, and expertise.

Over the past several years, Federal agencies have advanced comprehensive strategies to address important natural resource resilience issues.

- The *National Ocean Policy* was developed in 2010 to encourage a coordinated, inclusive approach to meeting the needs of the many communities and stakeholders that depend upon ocean resources. Under the *National Ocean Policy Implementation Plan*, released in 2013, Federal agencies are taking specific actions to address key ocean challenges, give states, tribes, and communities greater input in Federal decisions, streamline Federal operations, save taxpayer dollars, and promote economic growth. The *Implementation Plan* also includes a series of actions that Federal agencies are taking to improve resilience and prepare communities for the impacts of climate change, sea level rise, more frequent or severe extreme weather, and ocean acidification.



- Biological diversity is essential to ecosystem resilience; fish, wildlife, and plant resources provide Americans with important benefits and services, including jobs, income, food, clean water and air, building materials, storm protection, tourism, and recreation. Federal

⁸ Executive Order 13653, November 1, 2013, Preparing the United States for the Impacts of Climate Change. 78 FR 66817: 66817 - 66824.

⁹ Instances of “state” in this report inclusively refer to U.S. States, the Commonwealth of Puerto Rico, the U.S. Virgin Islands, Guam, the Commonwealth of the Northern Mariana Islands, and American Samoa.

agencies partnered with state, tribal and local representatives to develop a *National Fish, Wildlife and Plants Climate Adaptation Strategy*, released in 2013, that describes goals and actions to adapt to the impacts that climate change is having on fish and wildlife resources and the people and economies that depend on these resources. A Joint Implementation Working Group was formed in late 2013 to promote, track, and report on implementation of the *Strategy*. An initial implementation progress report was published in September 2014.

- The *National Action Plan: Priorities for Managing Freshwater Resources in a Changing Climate*, released in 2011, describes actions that Federal agencies are taking to help freshwater resource managers ensure adequate water supplies and protect water quality and public health as the climate changes. Realizing the challenges associated with water resource management in a changing climate, the Administration also formed the *National Drought Resilience Partnership* (NDRP), a partnership of seven Federal agencies announced in 2013, to help communities better prepare for droughts and to reduce the impact of drought events on families and businesses.¹⁰

These three initiatives (on oceans, fish and wildlife, and freshwater resources) are important vehicles for coordinating and implementing the *Priority Agenda for Enhancing the Climate Resilience of America's Natural Resources*. In addition to these interagency strategies, each Federal agency has developed a Climate Adaptation Plan, to be updated every four years following the National Climate Assessment. Climate Adaptation Plans will be implemented in coordination with the three interagency strategies and this *Priority Agenda*.

Successful implementation of resilience strategies depends on access to, and integration of, the best-available scientific information. Multiple Federal agencies with science and stewardship responsibilities invest in observations, research, modeling, data and information services, and tools to advance understanding and consideration of the impacts of climate change on natural resources. Through the U.S. Global Change Research Program (USGCRP), thirteen Federal agencies collaboratively help the United States better understand global change and its impacts. The USGCRP advances the scientific knowledge of the integrated natural and human components of the Earth's climate system, translates this knowledge into information that can enable timely decisions, conducts sustained assessments, such as the quadrennial National Climate Assessment, and advances communication and education to broaden public understanding of global change. The Third National Climate Assessment emphasized the impacts of climate change on biodiversity and ecosystem services in the United States.

Other Federal science investments include observing systems located in space, in the oceans, on land, and in the atmosphere; research on climate impacts and vulnerability; and development of climate-



¹⁰ For more information on the three national strategies, see <http://www.whitehouse.gov/administration/eop/ceq/initiatives/resilience>. For more information on NDRP, see <http://www.whitehouse.gov/blog/2013/11/15/introducing-national-drought-resilience-partnership>.

relevant indicators and other information to support decision-making. Through the National Plan for Civil Earth Observations and the Big Earth Data Initiative, both led by the U.S. Group on Earth Observations, agencies are working to enhance coordinated and sustained observations of the planet and its natural resources to better track, predict, and respond to climate impacts on ecosystems and the people who depend on them. Agencies are also working to enhance access to data and tools associated with climate and ecosystems through the Climate Data Initiative and Climate Resilience Toolkit, as called for in the President’s Climate Action Plan.¹¹ Collectively, these efforts, among others, help to provide the information that is needed to support sustainable natural resource investments and management in a changing climate.¹²

Moving Forward

Recognizing the need to build upon these efforts, President Obama signed Executive Order 13653 – *Preparing the United States for the Impacts of Climate Change* – on November 1, 2013. This Order established the State, Local, and Tribal Leaders Task Force on Climate Preparedness and Resilience and the Federal interagency Council on Climate Preparedness and Resilience, which has several working groups, including the Climate and Natural Resources Working Group, the Climate Data and Tools Working Group, the Infrastructure Resilience Working Group, and the Agency Adaptation Working Group. These Working Groups have been collaborating to address the needs expressed in the Order.

Section 3 of the Executive Order, *Managing Lands and Waters for Climate Preparedness and Resilience*, asked Federal agencies to:

“[C]omplete an inventory and assessment of proposed and completed changes to their land- and water-related policies, programs, and regulations necessary to make the Nation's watersheds, natural resources, and ecosystems, and the communities and economies that depend on them, more resilient in the face of a changing climate. Further, recognizing the many benefits the Nation's natural infrastructure provides, agencies shall, where possible, focus on program and policy adjustments that promote the dual goals of greater climate resilience and carbon sequestration, or other reductions to the sources of climate change.”

The agencies that comprise the Climate and Natural Resources Working Group¹³ prepared this *Priority Agenda: Enhancing the Climate Resilience of America’s Natural Resources* in response to the direction in Section 3 of the Executive Order and in coordination with the State, Local, and Tribal Leaders Task Force. This *Priority Agenda* provides a strategy with specific actions that Federal agencies are doing to enhance the climate resilience of natural resources and the communities that depend on them. These actions fall into four focal areas:

11 “The President’s Climate Action Plan,” Executive Office of the President, <http://www.whitehouse.gov/sites/default/files/image/president27sclimateactionplan.pdf>.

12 For more information on the USGCRP see <http://www.globalchange.gov/>.

13 See Appendix B for list of Climate Natural Resources Working Group members.



- **Foster climate-resilient lands and waters** – Protect important landscapes and develop the science, planning, tools, and practices to sustain and enhance the resilience of the Nation’s natural resources.



- **Manage and enhance U.S. carbon sinks** – Conserve and restore soils, forests, grasslands, wetlands, and coastal areas that store carbon. Maintain and increase the capacity of these areas to provide vital ecosystem services alongside carbon storage such as clean air and water, wildlife habitat, food, fiber, and recreation.



- **Enhance community preparedness and resilience by utilizing and sustaining natural resources** – Harness the benefits of nature to protect communities from harm and build innovative 21st century infrastructure that integrates natural systems into community development.



- **Modernize Federal programs, investments, and delivery of services to build resilience and enhance sequestration of biological carbon** – Ensure that Federal programs, policies, training, and investments consider climate resilience and carbon sequestration, and organize the delivery of Federal science, tools and services to help resource managers, landowners, and communities optimize their natural resource management decisions in a changing climate.

The actions described in this document and summarized in Appendix A, are concrete commitments that the Federal government is undertaking to support these four major goals. Much of the work described is already under way. Other actions, such as future commitments to begin work in 2015, will depend on the appropriation of funding and effective leveraging of resources and partnerships. Together these actions comprise a priority agenda for building on the tremendous progress made over the past several years to ensure that America’s natural resources continue to enrich the lives of Americans, support the economy, and prepare communities for the impacts of a changing climate.



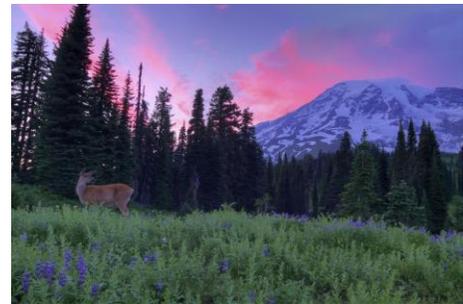
Chapter II: Foster Climate-Resilient Lands and Waters **Protect important landscapes and develop the science, planning, tools, and practices to sustain and enhance the resilience of the Nation’s natural resources.**

“... most of all, I think about our obligation to be good stewards of our blessings – to make sure that our children’s children get the same chance to experience these natural wonders.”

President Obama, May 21, 2014

The Challenge

America is blessed with a wide diversity of rich ecosystems, from Pacific Northwest rainforests to the river of grass known as the Everglades, to tropical coral reefs. These places are more than just awe-inspiring and beautiful; they support every aspect of American life. They comprise the natural bounty that brought prosperity to a young Nation and today still provides the foundation for national, state, tribal, and local economies. When healthy they bless us with clean water, protect communities from flooding or drought, ensure that crops can grow and reproduce, and provide recreational and cultural opportunities for all Americans.



As described in the 2014 *National Climate Assessment*, climate-related changes to the structure and function of these ecosystems are already taking place and are limiting the ability of these lands and waters to provide services to communities and economies. To ensure that these threatened land and water resources will thrive, we must learn to anticipate future changes and adapt our management approaches and actions to build resilience.

Executive Order 13653 defines "resilience" as the ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from disruptions. A “resilient” landscape or ecosystem may be characterized as an area with sufficient options to enable species and ecosystems to rebound in the face of great stresses without transforming into an undesirable condition. Such options, or characteristics that foster resilience, include a high diversity of species, multiple core habitat areas with redundant linkages among them, topographic and elevation diversity that provides a range of habitat types and microclimates, and minimal barriers that restrict adaptive movement of species or ecosystems. Just as a diversified stock portfolio is more resilient to dramatic financial swings, this diversity of form and function ensures that these landscapes, and those who manage them, are better able to cope with future change. A landscape or species without such options would be considered vulnerable in the face of climate change.

By planning and implementing management at the landscape scale,¹⁴ rather than only focusing narrowly on a local scale or an individual project, natural resource managers, planners, and landowners can more effectively consider, avoid, and minimize a broader range of impacts that compromise resilience; more accurately evaluate cumulative impacts upon priority resources;¹⁵ and minimize risk for project proponents and other stakeholders. This forward-looking approach, in contrast to managing for historical conditions, fosters resilience because it anticipates and prepares for disruptions to the system.

To be effective at the landscape scale, natural resource managers at the Federal, state, tribal, and local levels must better understand resilience as it applies to each resource they address, what actions will build resilience for those resources, what places are most important to protect and restore, and then incorporate relevant information into decision-making. This will require new information, tools, and policy approaches to ensure these considerations are systematically taken into account. The following sections describe some of the ongoing and new efforts that Federal agencies are implementing to build resilience at the landscape scale and sets an agenda for a) establishing and building upon partnerships; b) identifying resilience objectives; c) developing the tools necessary for landowners and managers to foster resilient landscapes; and d) establishing protocols to monitor and adaptively manage for resilience going forward.

Progress to Date

The Administration has made significant progress through landscape-scale partnerships that bring together Federal, state, tribal, and private interests to address habitat fragmentation, wildlife protection, and the continued productivity of farms, ranches, and the Nation’s forests, coasts, and oceans. These partnerships are now beginning to bear fruit and foster resilience. Continued commitment to these efforts and the partnerships to guide them is a key part of building resilience going forward. Key examples include:

- **Advance Landscape-Scale Initiatives:** Through existing initiatives like America’s Great Outdoors and place-based investments in locations such as the Chesapeake Bay, Klamath Basin, the Crown of the Continent, the Everglades, and the sagebrush steppe of the arid West, Federal agencies are partnering with states, tribes, and communities across the country to catalyze and bolster local conservation and management



¹⁴ The term “landscape-scale” can represent many different spatial scales depending on the resource values being managed. For the purposes of this report, a “landscape” is defined as a large area encompassing an interacting mosaic of ecosystems and human systems that is characterized by a set of intersecting management concerns. The landscape is not defined by the size of the area, but rather by the interacting elements that are meaningful to the management objectives. In addition, for the purposes of this report, the term “landscape” encompasses watersheds and marine environments that match the above description.

¹⁵ The term “cumulative impacts” refers to the combined, incremental effects of human activity on a resource, ecosystem, or human community. Impacts of an action may be relatively insignificant on their own, but as they accumulate over time and combine with the impacts from other sources, they can lead to significant overall degradation of resources (EPA, 1999).

efforts and demonstrate the power of these collaborators to more effectively align, target, and leverage resources to accomplish shared goals and objectives.

Continued support for existing landscape initiatives, and broader application of this approach, is essential for building landscape resilience. Other examples of successful landscape-scale efforts include the Department of the Interior's (DOI) Landscape Conservation Cooperatives (LCCs) and Climate Science Centers (CSCs); ocean-focused Regional Planning Bodies in the Northeast, mid-Atlantic, Caribbean and Pacific; the Great Lakes Restoration Initiative; Hurricane Sandy recovery investments; coordinated Gulf of Mexico investments and vulnerability studies; U.S. Department of Agriculture's (USDA) Collaborative Forest Landscape Restoration Program; Bureau of Reclamation's Basin Studies; National Park Service's Scaling Up initiative; National Oceanic and Atmospheric Administration's (NOAA) Habitat Focus Areas; and Environmental Protection Agency's (EPA) Preserving Healthy Watersheds program.

- **Target Conservation Practices on Farms, Ranches and Forests:** The President advanced and is implementing more than \$1 billion in unprecedented conservation investments in the 2014 *Farm Bill* to sustain the productivity and resilience of America's farms, ranches, and working lands. New provisions in the *Farm Bill* such as the Regional Conservation Partnerships Program (RCPP) will support and build off of past Landscape Initiative and partnership successes, such as the Working Lands for Wildlife, Sentinel Landscapes, and Sage Grouse initiatives.



- **Implement a Landscape Approach to Mitigation to Improve Private Investments for Resilience:** The DOI developed a comprehensive strategy for implementing a landscape-scale approach to the offsets and mitigation that are frequently required when permitting development or other human activities. This approach will improve the effectiveness of billions of dollars of private investment in habitat protection and restoration each year to offset development activities, and will leverage those dollars with public sector investments to improve the resilience of the landscapes upon which communities and livelihoods depend.
- **Develop Tools for Tracking and Assessing Climate Impacts on Landscapes and Habitats:** The Administration has prioritized developing tools and research to better track and assess current and anticipated impacts of climate change on natural resources, enabling climate-smart decisions by resource managers. Developing these types of tools will continue to be a key priority. An example that serves the fishing community is the NOAA Fisheries and The Environment (FATE) program's research to increase understanding of the impacts of climate variability and change on U.S. marine ecosystems and the distribution and abundance of valuable fish stocks. Another example is the National Drought Mitigation Center's decision support series, "Managing Drought Risk on the Ranch," which, with support from NOAA's Coping with Drought initiative, provides ranchers and consultants

with the tools they need to develop near- and long-term management strategies at the landscape scale.

WE'VE MADE GREAT PROGRESS



Significant progress has been made through landscape-scale partnerships, bringing together Federal, state, tribal, and private interests to address habitat fragmentation, wildlife protection, and the continued productivity of farms, ranches and the Nation's forests and coasts.

PROGRESS:



Through landscape initiatives such as America's Great Outdoors, Federal agencies are partnering with communities across the country to catalyze local conservation and management efforts in order to more effectively accomplish shared goals and objectives.

PROGRESS:



The President is implementing more than \$1 billion in unprecedented conservation investments in the Farm Bill in order to sustain the productivity and resilience of America's farms, ranches, and working lands.

PROGRESS:



The Administration is prioritizing the development of tools that track and predict the impact of climate change on natural resources. Examples include NOAA Fisheries and The Environment (FATE) Program's research and the National Drought Mitigation Center's decision-support series, 'Managing Drought Risk on the Ranch, supported by NOAA's Coping with Drought' initiative.

MOVING FORWARD

- Identify and map priority areas for conservation, restoration, or other investments to build resilience within flagship geographic landscapes or regions
- Design a Resilience Index tool to measure progress in building resilience through restoration, conservation, and other investments
- Produce decision support tools for climate-smart natural resources management
- Develop a program that helps fight the introduction and spread of invasive species
- Evaluate and learn from ongoing resilience efforts
- Work with interNational partners to foster resilience in the Arctic



Moving Forward

Despite all of the progress described above, management at the landscape scale is not yet the norm, and decision-makers do not always have the information or tools necessary to set management objectives for resilience and take necessary actions to achieve them. Building the information base, developing management tools, and refining approaches to decision-making will help ensure that our investments are durable and that landscape resilience is enhanced over time. The following actions will build on existing efforts and add important capacity and direction for mainstreaming resilience efforts:

➤ **Design an Ecosystem Resilience Index:** In 2015, Federal agencies, to include DOI, NOAA, the Federal Emergency Management Agency (FEMA), the Army Corps of Engineers (USACE), and the Department of Transportation (DOT), will design a framework for a decision-support tool that will provide baseline resilience data and measure the progress of restoration, conservation, and other resilience-enhancing management approaches. Experts will work toward developing common metrics, monitoring protocols, modeling approaches, and valuation methodologies to establish baseline conditions and provide measures of increased ecosystem resilience from cost-effective restoration. This work will be coordinated with other Federal projects, including the Community Resilience Index under development by FEMA, NOAA and the National Institute of Standards and Technology (NIST), the Disaster Resilience Framework under development by NIST (see Chapter IV), the efforts of the Data and Tools Working Group described in Chapter I, the Climate Resilience Toolkit, and emerging efforts to develop indicators through the *National Climate Assessment* conducted by the U.S. Global Change Research Program.

➤ **Develop and Provide Decision Support Tools for Climate-Smart Natural Resource Management:** Within one year, Federal agencies will develop and provide decision support tools to improve the ability of agencies and landowners to manage for resilience. Examples include:

- By the end of calendar year 2014, the U.S. Geological Survey (USGS) will initiate, through pilot projects with the Fish & Wildlife Service (and other DOI bureaus if funding permits), production of a tool to help resource managers consider the impacts of management decisions on carbon stocks and flux as well as impacts on resilience and ecosystem services, such as water quality, flood risk reduction, wildlife viewing, cultural heritage, and nutrient cycling.



Nutrient cycling is a biogeochemical process by which nutrients are transferred from plant to soil to air and back to plant again through processes such as decomposition.
Source: <http://pubs.usgs.gov/fs/2009/3078/>

- Over the next year, NOAA will deploy new or expanded resilience tools, including a Northeast climate and marine ecosystem dashboard for information on current and future conditions; an expanded Coastal Flood Exposure Mapper for coastal states on the East Coast and Gulf of Mexico; a Climate Change Vulnerability Assessment tool for Coastal Habitats; and a new performance support tool for GIS professionals working with agencies and organizations on natural infrastructure planning for coastal resilience. These resources and tools will be developed with a goal of future incorporation into the Climate Resilience Toolkit.

➤ **Identify Landscape Conservation Priorities to Build Resilience:** The first goal of the *National Fish, Wildlife, and Plants Climate Adaptation Strategy* is to build or maintain ecologically connected network of terrestrial, coastal, and marine conservation areas that are

likely to be resilient to climate change and support a broad range of fish, wildlife, and plants under changing conditions. Identifying such priority areas also benefits wildfire management, mitigation investments, restoration efforts, and water and air quality. Within six months, Federal agencies working to address ecosystem management issues through LCCs and other multi-stakeholder bodies will work with partners to select flagship geographic regions for which they will identify priority areas for conservation, restoration, or other investments to build resilience in vulnerable regions, enhance carbon storage capacity, and support management needs. Within 24 months, these agencies and their partners will have identified and mapped the initial list of priority areas within each of the selected geographic landscapes or regions.

➤ **Fight the Introduction and Spread of Invasive Species:** One of the most pervasive threats



The zebra mussel is considered one of the most damaging invasive species in the United States.
Source: <http://www.nwf.org/Wildlife/Threats-to-Wildlife/Invasive-Species/Invasive-Mussels.aspx>

to resilience is the establishment and spread of invasive species – these non-native plants, animals, and pathogens not only displace native species and disrupt ecosystems, but also cause economic harm. A program designed to identify and find invasive species before they have spread, and eliminate them before they have caused significant harm, is both ecologically effective and cost effective.

Within twelve months, the Secretary of the Interior, working with other members of the National Invasive Species Council, including Department of Commerce (NOAA), EPA, and USDA, will work with states and tribes to develop a framework for a national Early Detection and Rapid Response (EDRR) program that will build on existing programs to assist states and tribes in forestalling the stress caused by the establishment and spread of additional invasive species populations, thereby improving the resilience of priority landscapes and aquatic areas. This will include the development of a plan for creating an emergency response fund to increase the capacity of interagency and inter-jurisdictional teams to tackle emerging invasive species issues across landscapes and jurisdictions.

➤ **Evaluate and Learn from Ongoing Resilience Efforts to Inform Future Actions:** Within six months of the release of this agenda, agencies to include DOI, USDA, NOAA, U.S. Army Corps of Engineers (USACE), Department of Defense (DOD), and EPA will identify programs for resilience evaluation. Such evaluations will include a) developing resilience metrics and b) evaluating whether investments produce resilience benefits for the resources and surrounding communities. An example is the third-party evaluation of DOI's \$300 million Sandy Supplemental resilience investments, initiated in September 2014. These efforts will be used to inform the Resilience Index over time.

- **Work with International Partners to Foster Resilience in the Arctic, U.S. Territories, and Freely Associated States:** While the impacts of climate change are being felt everywhere, some communities and ecosystems are particularly vulnerable due to geological, geographic, or climatic factors. The circumpolar Arctic, an area of the globe that is warming twice as fast as the rest of the planet, is particularly vulnerable. Disappearing sea ice has accelerated erosion under coastal communities now exposed to storm-driven seas, terrestrial infrastructure is undermined by melting permafrost, and the subsistence way of life is compromised by disruptions in wildlife migratory patterns. Alaska Natives are, by virtue of isolated location, culture, and economic status, the most subsistence-dependent population in the United States. Federal agencies that have partnered to advance a landscape-scale approach to management, called Integrated Arctic Management, will work closely with the Department of State to promote a suite of community and ecosystem resilience measures as part of the program for the United States Chairmanship of the Arctic Council, a two-year term to begin in April, 2015. In addition, the Department of Interior will update funding programs to the U.S. Territories and Freely Associated States – islands with acute vulnerability to sea level rise – to enhance climate resilience through the development of climate adaptation plans and other efforts.





Chapter III: Manage and Enhance U.S. Carbon Sinks **Conserve and restore soils, forests, grasslands, wetlands, and coastal areas that store carbon. Maintain and increase the capacity of these areas to provide vital ecosystem services alongside carbon storage such as clean air and water, wildlife habitat, food, fiber, and recreation.**

“My Administration is committed to cutting carbon pollution in the United States, and safeguarding and restoring our forests will help us fulfill that mission. We also continue to advance community-driven conservation, preservation, and outdoor recreation initiatives that are strengthening local economies and contributing to the well-being of lands, waters, and wildlife.”

President Obama, October 18, 2013

The Challenge



The Nation’s forests, grasslands, soils, wetlands and coastal areas play a critical role in buffering the impacts of carbon pollution by offsetting more than 14 percent of total U.S. greenhouse gas emissions every year—an amount equivalent to roughly half of the annual emissions from the nation’s electric power sector. The capacity of these areas to continue to serve as beneficial “sinks” for carbon is at risk—primarily due to development and land-use change, but also as a result of increased frequency and

severity of climate-driven disturbances such as catastrophic wildfire, insects and disease outbreaks, drought, severe storms, flooding, and changing sea levels.

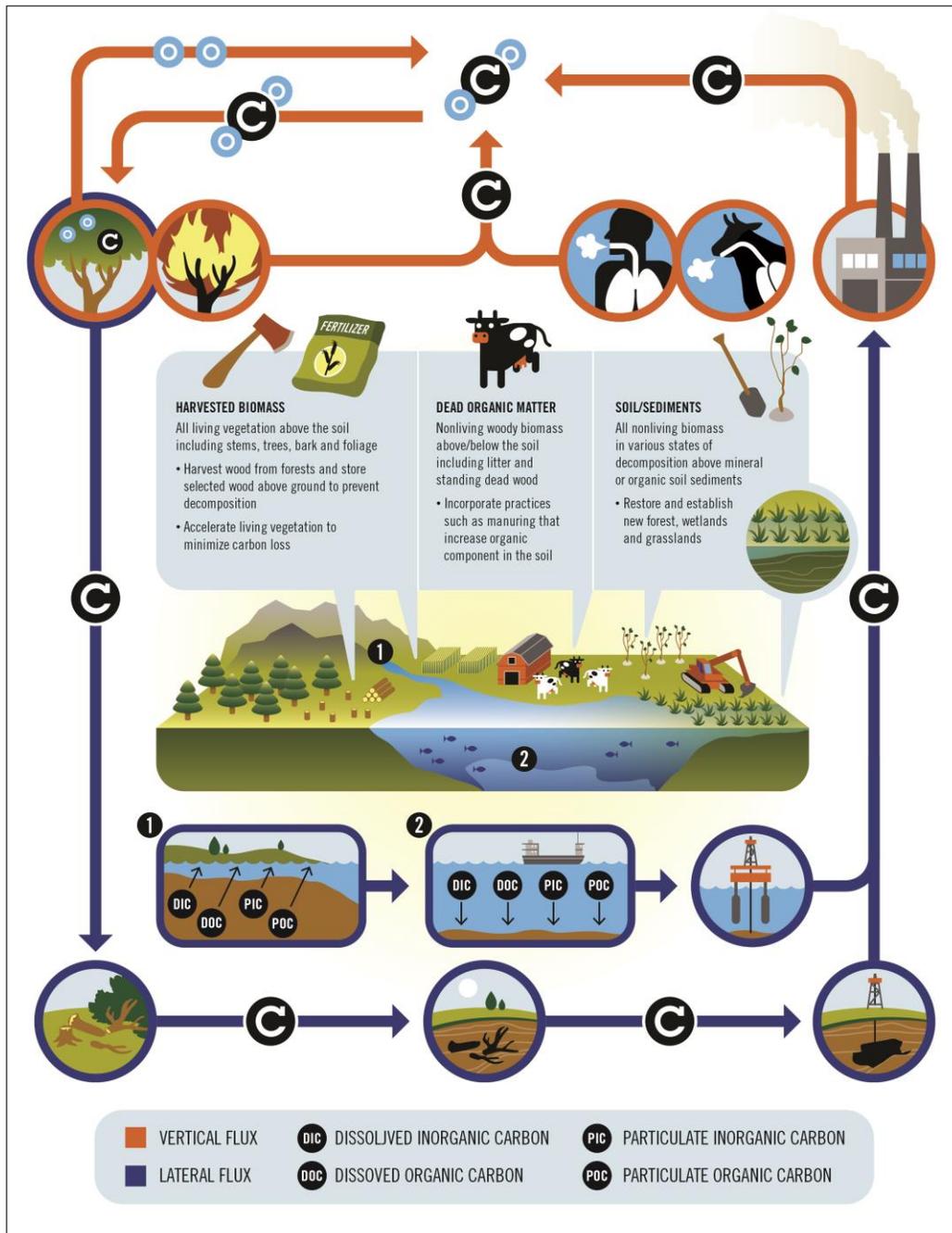
The trends indicate that carbon sinks may be in jeopardy—urban land area in the United States is projected to nearly triple over the next several decades placing some 34 million acres of privately owned forest land at risk of development by 2060. Nearly 82 million acres of the Nation’s forests are vulnerable to high levels of climate-induced insect and disease mortality over the next 15 years. Fire seasons are presently 60 to 80 days longer, and forest fires have approximately doubled in extent over the last three decades. In many Western States, catastrophic wildfire is causing particulate matter emissions that are degrading air quality in the places many Americans live and recreate. Vast Alaska forest and tundra ecosystems are at risk of tipping from a carbon sink to a carbon source. Coastal wetlands, important contributors to carbon storage (“blue carbon”), are being lost at a rate of approximately 80,000 acres per year from development and climate-related impacts,



such as severe coastal storms and changing sea levels.

By protecting key carbon storage areas and building the capacity of natural systems and working lands to store carbon in the future, we can strengthen the Nation’s capacity to fight carbon pollution. These actions also ensure that the Nation’s natural resources—public and private, terrestrial and aquatic—continue to provide important co-benefits such as clean air and water, wildlife habitat, food, fiber, energy, and recreation opportunities that foster social and economic resilience in the face of climate change.

Figure 1: Carbon Cycle and Sequestration



Progress to Date

The Administration has made progress measuring and incorporating carbon into management strategies through the strengthening of science, policy, and assessment activities. This work has helped a variety of agencies to pursue initial strategies to retain important carbon sinks and restore the health and resiliency of natural systems, so they continue to buffer carbon pollution. Agencies have also developed a suite of tools to help private landowners and natural resource managers make informed decisions, and have launched a diverse suite of voluntary carbon mitigation demonstration projects to meet emerging offset needs of the private sector. Accomplishments include:

- **Measuring Greenhouse Gas Emissions and Storage and Developing User Friendly Tools:** Natural resource managers and private landowners require access to easy-to-use decision support tools based on the best-available science to incorporate greenhouse gas considerations into management decisions. Agencies have made progress developing methods and tools to inform management, including:
 - USDA has issued a science-based and peer-reviewed compendium of methods for quantifying changes in greenhouse gas emissions and carbon storage for farms, ranches and forest operations. The methods in the report are comprehensive, addressing a wide variety of cropland, grazing land, livestock, and forest management practices. USDA will use the methods in the report to assess the greenhouse gas performance of current and future conservation programs and initiatives.
 - In addition, USDA has developed several user-friendly tools for assessing the greenhouse gas impacts of forest and agricultural practices. COMET-Farm¹⁶ allows farmers, ranchers, and forest landowners to enter information about their current management practices and compare the greenhouse gas storage and emissions under alternative management scenarios. Moving forward, COMET-Farm will be updated to reflect the latest comprehensive methods for measurement. I-Tree¹⁷, a USDA-Forest Service tool which helps communities of all sizes to strengthen their urban forest management and advocacy efforts by quantifying the structure of community trees and the environmental services that trees provide, including carbon storage and emissions avoided as a result of building energy savings.
 - USDA has developed a statistically reliable estimate of the Nation's soil carbon stocks. The Rapid Assessment of U.S. Soil Carbon (RaCA) involved more than 144,000 samples, 300 soil scientists and assistance from 24 universities. The RaCA data provides a snapshot of the coterminous U.S. soil carbon stocks at one meter resolution, to inform computer modeling and assessment tools, carbon stock inventories, emerging carbon markets, and the ongoing Soil Health Campaign.

¹⁶ USDA Natural Resources Conservation Service released the Carbon Evaluation and Management Online Tool, called COMET-Farm, in 2013. The tool allows growers to calculate carbon mitigation through certain conservation efforts, like reducing tillage or planting grasses.

¹⁷ I-Tree is a suite of software tools for measuring and modeling the benefits individual trees and urban forests provide to communities, such as stormwater management, shading and cooling, air quality, and more.

- The USACE is conducting carbon sequestration disturbance pilot studies encompassing diverse climate, land-cover, and land-use characteristics and variable disturbance regimes and response characteristics. The pilots address the effects of common disturbances such as drought, floods, hurricanes, land-cover change, fire, and insect outbreaks on carbon sequestration rates, and include the development of a geospatial assessment tool.
 - USGS LandCarbon is a national assessment focusing on improving our understanding of carbon sequestration and greenhouse gas fluxes in and out of ecosystems related to land use. It covers all major terrestrial and aquatic ecosystems and provides estimates of baseline as well as future potential carbon storage and greenhouse gas fluxes.
 - As part of the Santa Ana River Basin Study, completed in FY 2013, the Bureau of Reclamation developed a Greenhouse Gas Emissions Calculator that can be used by water managers in California to analyze the carbon footprint of potential water management decisions in order to comply with California Assembly Bill 32, the Global Warming Solutions Act.
 - The North American Carbon Program (NACP) and the Ocean Carbon and Biogeochemistry Program (OCB), under the auspices of USGCRP's U.S. Carbon Cycle Science Program, have been conducting a major North American Coastal Carbon Synthesis for 7 years. In 2014, scientists convened to refine coastal carbon budget numbers and initiate a Science Plan for the North American Coastal Carbon Budget. This work has been funded by members of USGCRP's Carbon Cycle Interagency Working Group/U.S. Carbon Cycle Science Program.
 - In 2014, NASA made grants to advance the development of a carbon monitoring system (CMS). Emphasis is directed towards continued development of CMS pilot studies and acquisition, field sampling, quantification, and development of prototype Monitoring Reporting and Verification (MRV) system capabilities.
 - In 2013, four agencies from the Carbon Cycle Interagency Working Group (NASA, USDA, DOE, NOAA) collaborated to make awards to research institutions to improve the understanding of changes in the distribution and cycling of carbon among the active land, ocean, and atmospheric reservoirs and how that understanding can be used to establish a scientific foundation for societal responses to global environmental change. These awards will also help in advancing the science to support ecosystem resilience.
- **Forest Service Planning Rule, Roadmap and Scorecard for Climate Change:** The USDA-Forest Service is considering forest carbon in land management policies, programs, and activities such as the 2012 Planning Rule, the Climate Change Roadmap and Scorecard, USDA Strategic Plan, and internal guidance for planning and project-level decisions. Under the 2012 Planning Rule, forest units must "...identify and evaluate existing information relevant to the plan area for ...baseline assessment of carbon stocks."

All National Forests are working on strategies to adjust and prepare for new conditions created by changing climate and to consider carbon stocks and emissions in management decisions. To guide the Forest Service in achieving these goals, the agency developed a Roadmap for Responding to Climate Change and a companion Scorecard. Since 2011, each National Forest and Grassland has used a 10-point scorecard to report accomplishments and plans for improvement on ten questions in four dimensions – organizational capacity, engagement, adaptation, and mitigation. By 2015, each is expected to answer yes to at least seven of the scorecard questions, with at least one yes in each dimension. The goal is to create a balanced approach to climate change that includes managing forests and grasslands to adapt to changing conditions, mitigating climate change, building partnerships across boundaries, and preparing our employees to understand and apply emerging science.

The National Park Service has also modernized its policies and now requires park management plans -- which direct land management, facility construction and visitor services -- to include climate change considerations. A policy providing guidance on how to take climate change into consideration for facility design and construction will soon be completed.

The Fish and Wildlife Service has adopted a Climate Change Strategic Plan that outlines the agencies response to climate change, including its work on carbon biosequestration..

➤ **Voluntary Carbon Mitigation Partnership Pilots:** Through research, the development of offset protocols, and demonstration projects, Federal agencies are paving the way for private investment in land and water based carbon by developing high quality, quantifiable and verifiable offset projects. For example:

- The U.S. Fish and Wildlife Service (FWS), in partnership with such groups as The Conservation Fund (TCF), has undertaken forest restoration projects on nearly 75,000 acres in the Lower Mississippi Valley that provide substantial carbon sequestration benefits. These projects have been privately funded for carbon credits through nonprofit organizations, public utilities, and private companies, as well as through The Conservation Fund’s Go Zero Program. With its partners, the FWS has planted more than 22 million trees that will capture more than 33 million tons of carbon over the next 90-plus years.



- NOAA, through the Waquoit Bay National Estuarine Research Reserve (NERR) is leading an effort to generate science and management tools with the potential to bring coastal wetlands into international carbon markets and incentivize investment in tidal wetland restoration and preservation. This three-year project (FY11-FY14), which incorporates broad stakeholder input, is examining the relationship between salt marshes, climate change, and nitrogen pollution.
- In 2011, USDA’s Natural Resources Conservation Service (NRCS) awarded \$7.4 million to support large-scale demonstration projects that will accelerate the adoption of new and innovative approaches to leverage carbon markets, reduce greenhouse gas emissions, and promote carbon sequestration on private lands. In partnership with the Coalition on Agricultural Greenhouse Gases (C-AGG), USDA has helped develop protocols to meet voluntary carbon credit registry standards and California’s regulatory carbon credit registry requirements for a wide range of voluntary private lands conservation practices. For example:

- The Delta Institute, The Climate Trust, and their partners have worked with Midwest corn growers to maintain yield while reducing nitrogen fertilizer rate, timing, and placement to reduce nitrous oxide emissions. Quantified and verified credits will be retired in an



effort to partially offset the emissions of a fossil fuel-fired electric utility.

- Rice growers in Arkansas and California, in partnership with Environmental Defense Fund, California Rice Commission, White River Irrigation District, and Terra Global Capital are more precisely managing water and nitrogen to reduce methane and nitrous oxide emissions from rice production.
- The Nature Conservancy (TNC) is pursuing a partnership that builds on USDA’s Conservation Reserve Program (CRP) and Wetland Reserve Easement Program (WRE) to retain conservation values through the sale of carbon offsets.
- In the Prairie Pothole Region, Ducks Unlimited, TNC, and The Climate Trust are partnering with USDA to enable grassland producers to receive compensation through the sale of voluntary carbon offsets by protecting the carbon sequestered by prairie grasslands.
- In Marin County, California, the Marin Carbon Project is working with NRCS and local producers to enhance carbon sequestration while building a more drought-resilient farmscape through diverse conservation practices.

WE’VE MADE GREAT PROGRESS



Significant progress has been made measuring and incorporating carbon into management strategies through strengthening science, policy, and assessment activities.

PROGRESS: ✓

USDA has developed user-friendly tools, such as COMET-Farm and I-Tree, for assessing the greenhouse gas impacts of forest and agricultural practices. USACE is conducting carbon sequestration disturbance studies. USGS’ LandCarbon assessment improves understanding of carbon processes.

PROGRESS: ✓

U.S. Fish and Wildlife Service (FWS) has provided substantial carbon sequestration benefits through its forest restoration projects in the Lower Mississippi Valley with private sector and NGO partners. FWS has planted more than 22 million trees that will capture more than 33 million tons of carbon over the next 90-plus years.

PROGRESS: ✓

USDA Natural Resources Conservation Service supported large-scale demonstration projects that will accelerate the adoption of new and innovative approaches to leverage carbon markets by awarding \$7.4 million in financial support. Other USDA programs partner with farmers, NGOs, and local and regional organizations to enhance sequestration.

MOVING FORWARD

- Use the best information and methods available from agencies with Federal natural resource stewardship responsibilities to develop initial baseline estimates of carbon stocks and trends at local or regionally appropriate levels for lands and waters within their jurisdiction within 18 months
- Improve inventory, assessment, projection and monitoring systems for important carbon sinks
- Develop estimates of baseline carbon stocks and trends to inform Federal natural resources management
- Provide support for programs that foster forest conservation and retention to advance carbon mitigation and adaptation in the context of management objectives
- Support voluntary, incentive-driven emissions reductions from working agricultural lands that benefit productivity and resilience
- Continue to support key tax provisions for maintaining forest carbon
- Build a North American community of practice for advancing understanding and management of blue carbon ecosystems and valuing the sequestration potential of coastal habitats



Moving Forward

Despite significant progress developing the research, tools, and demonstrations needed to incorporate and incentivize carbon considerations into natural resource management, work still remains to strengthen our understanding of carbon stocks and emissions and to better link that information with policy. Improvements to the national inventory, assessment, projection, and monitoring systems for carbon will better equip the Nation to evaluate the drivers of emissions and carbon storage and improve the ability to track the impact of specific policy and practice changes aimed at sustaining and enhancing U.S. carbon sinks. Moving forward, agencies will take actions consistent with their authorities to better measure and incorporate carbon into natural resource management practices, and will continue to build incentives and support investments aimed at emissions reductions and carbon storage from the land use, land-use change, and forestry sectors. Additional efforts will seek to assess, restore, and protect the carbon services of coastal ecosystems.

- **Improve Inventory, Assessment, Projection, and Monitoring Systems for Important Carbon Sinks:** USDA, in coordination with EPA, the State Department, and DOI, will establish a robust capacity to provide projections of greenhouse gas emissions and carbon sequestration from agricultural lands, forests, and grasslands on a biennial basis to support planning, analysis, and reporting under the United Nations Framework Convention on Climate Change. USDA, with input from EPA and other agencies (DOI, NASA, and NOAA), will reduce uncertainties in land-use related emission and sink estimates in the Nation's annual greenhouse gas inventory and better link these estimates to projections through:
 - Strengthening the collection, coordination and assessment of field inventory data through the Forest Inventory and Analysis (FIA) Program, the Natural Resources Inventory (NRI), and other surveys of terrestrial condition; and
 - Integrating survey information with satellite-based land cover products, where appropriate, to improve estimation of land cover and land-use change and improve attribution of carbon stock change to management activities or natural disturbance.

USDA will also work collaboratively with EPA, DOI, and other agencies to address potential missing anthropogenic emissions and sinks in the national greenhouse gas inventory. USDA will evaluate the current carbon sequestration contribution of Federal grasslands and



agroforestry systems (wind breaks, shelter belts, riparian buffers, etc.). The USGS, USACE, and USDA will support efforts toward completion of the first-ever assessment of the ecosystem carbon stocks and anthropogenic emission rates in Alaska. NOAA will assess the role that coastal ecosystems play in terms of their anthropogenic emissions and carbon sink potential including an initial assessment of land cover for salt marsh, mangroves, and seagrasses.

All of the above improvements will be consistent with applicable methodological guidelines from the Intergovernmental Panel on Climate Change (IPCC) and reporting requirements under the United Nations Framework Convention on Climate Change (UNFCCC).

- **Develop Estimates of Baseline Carbon Stocks and Trends to Inform Federal Natural Resources Management:** Within 18 months, agencies with Federal natural resource stewardship responsibilities will use the best-available information and methods to develop initial baseline estimates of carbon stocks and trends at local or regionally-appropriate levels for lands and coastal wetlands within their jurisdiction. Stock and trend information will better enable managers and the public to consider the relationships between carbon storage and other management objectives. Methods will be consistent with applicable methodological guidelines from the IPCC and reporting requirements under the UNFCCC.

By the end of calendar 2015, the USGS will enhance landcarbon.org by covering all 50 states and including a new carbon calculator that allows for interactive tradeoff analysis. Further, USGS will complete a study for the Greater Yellowstone Ecosystem that examines the effects of protected areas and conservation policies on long-term carbon sequestration. The USGS, in cooperation with University of California at Berkeley, is also developing a large data management and visualization tool for delivering biological carbon sequestration data to users at the national scale. This effort, highlighted in the President’s Climate Action Plan, focuses on enhancing data delivery and communication using advanced web-based visualization tools. The tool allows users to interactively estimate carbon management tradeoffs in an online and downloadable format.

- **Promote Forest Conservation and Restoration, Complementary Markets for Sustainably Harvested Wood Products, and Urban Forestry:**

USDA and the DOI will provide support for programs that foster forest conservation and retention, and where possible, align these programs around “climate-smart” projects that advance carbon mitigation and adaptation in the context of management objectives. The agencies will incorporate climate resilience evaluation criteria for relevant forest and land and water conservation programs such as the Forest Legacy Program, Land and Water Conservation Fund (LWCF), Community Forest Program, the Agricultural Land Easement Program, Wetlands Reserve Program, and the Healthy Forest Reserve Program.



USDA will continue to make investments to advance wood in building, wood energy use, and other wood products - bolstering incentives for retaining and restoring forests - through providing life cycle analysis and technical and financial assistance. Within six months, USDA will launch the U.S. Tall Wood Building Competition to spur increased sustainability in construction and will give priority to applicants that source materials from rural domestic

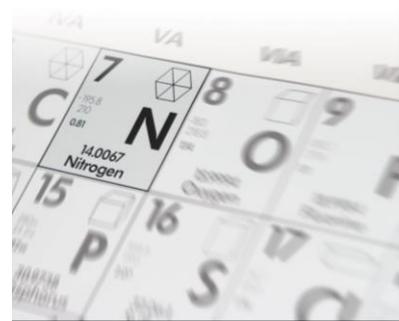
manufacturers and domestic, sustainably-managed forests. Incorporation of wood building systems in buildings 7-15 stories tall could potentially offset meaningful levels of carbon emissions while also supporting healthy forests and manufacturing opportunities.



Urban trees store over 708 million tons of carbon and can help further reduce emissions by lowering electricity demand for summer air conditioning and winter heating, while also improving air quality, reducing runoff, buffering high winds, and controlling erosion. In 2015, the Forest Service will work with the Federal Urban Waters Partnership, states, and local partners to target urban forestry investments that support: increased carbon sequestration; reduced energy consumption and greenhouse gas emissions; enhanced urban air quality; resilience from insects and disease; clean water quality and quantity needs; and bioenergy from urban wood waste to off-set fossil fuel usage.

- **Support Forest Conservation and Investment Tax Provisions as a Means to Retain and Restore Forests:** America's privately owned forests account for roughly 59 percent of the Nation's forest carbon stores. Tax incentives are a tool that can encourage continued forest landownership and stewardship of these resources. The Administration will evaluate key tax provisions for maintaining forest carbon, including provisions such as:
 - *Federal Tax Deduction for Conservation Easements:* Federal tax incentives for conservation easements are a critical tool for retaining important privately owned carbon sinks, especially grasslands, forests, and forested wetlands. From 2006-2013, incentives for donations of conservation easements were enhanced, allowing most individuals to deduct up to 50 percent of their income for contributions of easements, and up to 100 percent for contributions of easements on many working lands. Making these provisions permanent, while reforming the conservation easement rules to ensure better targeting, will support retention of important carbon sinks.
- **Support Voluntary, Incentive-driven Emissions Reductions from Working Agricultural Lands that Provide Co-benefits for Farm Productivity and Resilience:** USDA will target Farm Bill conservation programs to provide incentives for voluntary emissions reductions from America's farmers and ranchers that also support other important co-benefits for landowners and the public. While the agriculture sector makes a relatively small contribution to total annual U.S. greenhouse gas emissions, the sector is capable of offering low-cost, verifiable emissions reductions through the voluntary implementation of conservation practices. Many of these conservation practices also improve efficiency and productivity, reduce operation costs, foster resilience for businesses and natural resources, and alleviate pressures on other land-uses. USDA will improve conservation technical assistance and delivery of practices that reduce emissions and build resilience through programs such as the Environmental Quality Incentives Program (EQIP), the Agricultural Conservation Easement Program (ACEP), and Conservation Innovation Grants (CIG). Specific practices include:

- Prioritizing farming systems and conservation practices that build soil organic matter, increase carbon sequestration, and prevent denitrification;
- Encouraging practices that reduce methane emissions, especially in livestock systems;
- Prioritizing conservation easement and restoration programs on lands that currently provide climate and other resilience benefits (e.g., prairie grasslands, wetlands, rangelands)
- Promoting on-farm energy conservation, increased energy efficiency, and renewable energy production;
- Encouraging transition to systems that keep the land in sod and other perennial vegetation, and support sustainable rangeland management practices that enhance carbon sequestration; and
- Partnering with states, farmer groups, the private sector, and non-governmental organizations to facilitate investments in agricultural-based emission reductions that are additional, quantifiable, and verifiable.



Denitrification is an ecologically important bacterial process that converts reactive nitrogen compounds to inert nitrogen gas.
 Source: <http://water.usgs.gov/nawqa/sparrow/biogeochem/>

➤ **Assess, Restore, and Protect Coastal Habitats to Understand and Enhance the Storage of Blue Carbon:** Coastal ecosystems, particularly mangroves, tidal marshes, and seagrasses, (collectively referred to as coastal blue carbon) sequester and store large amounts of carbon. However, the benefits provided by coastal ecosystems historically have not been recognized. Thus, coastal ecosystems have typically not been managed in order to maintain or enhance these important climate services. There are many opportunities through existing scientific programs to advance understanding of carbon cycling in these ecosystems and to use existing management policies and practices to maintain and increase our coastal carbon stores. Over the next two years, the United States will improve its understanding of carbon storage and cycling in coastal ecosystems, as well as the value of protecting coastal habitats to safeguard these important services:



- **Improve understanding of carbon storage and cycling in coastal ecosystems:** NOAA will generate baseline information on the role that coastal ecosystems play in terms of their emissions and carbon sink potential. This baseline would include an initial assessment of land cover for salt marsh, mangroves, and seagrasses, as well as best estimates of sequestration and storage in these different ecosystem types. NOAA and partners will quantify marsh soil organic carbon content at eight NERRS sites across the United States to fill critical gaps in estimates of current carbon storage across a range of marsh types, and to improve the methodology upon which many of these existing estimates are made. NOAA and EPA, working through the

Commission for Environmental Cooperation, will build a North American community of practice for advancing understanding and management of blue carbon ecosystems by supporting the development of methodologies to measure carbon, compile maps, and conduct scientific studies to improve our understanding of the current and future role of coastal systems in the North American carbon cycle. NOAA and EPA will coordinate participation by other Federal agencies with coastal resource management responsibilities in this effort. Reporting standards will be developed to be consistent with Intergovernmental Panel on Climate Change guidelines.

○ **Determine the value of protecting coastal habitats to safeguard carbon services:**



Photo of downtown Tampa Bay, the location for a pilot demonstration project that seeks to demonstrate the value of different blue carbon habitats in various regions of the United States.

NOAA and FWS, working with other Federal, state, and other partners, will identify and support key restoration projects that can increase coastal blue carbon sinks, both terrestrial and aquatic. For example, NOAA is supporting a pilot demonstration project in Tampa Bay, Florida to demonstrate the value of different blue carbon habitats in various regions of the United States. NOAA will also support up to four local landscape assessments, and associated workshops, on different blue carbon habitats to demonstrate the added benefits of coastal carbon values to specific

restoration and protection goals. EPA will build on the pilot project in Tampa Bay – one of 28 National Estuary Programs – and support assessment of GHG benefits associated with carbon sequestration with the goal of sharing algorithms and methods with estuaries that are part of the National Estuary Program. USGS will collaborate with DOI resource management agencies to provide science support for wetland management and restoration actions. As more wetlands are restored and protected, the USGS will be able to measure and estimate the effects of management to enhance carbon sequestration and resilience of the ecosystems to climate change.



Chapter IV: Enhance Community Preparedness and Resilience by Utilizing and Sustaining Natural Resources **Harness the benefits of nature to protect communities from harm and build innovative, 21st century infrastructure that integrates natural systems into community development.**

“And we’ll partner with communities seeking help to prepare for droughts and floods, reduce the risk of wildfires, and protect the dunes and wetlands that pull double duty as green space and as natural storm barriers.”

President Obama, June 25, 2013

The Challenge

Managing for the effects of climate change means that communities must anticipate and plan for future impacts, which include sea-level rise and storm surges, increased storm intensity bringing high winds and flooding, higher air and water temperatures that shift habitats for fish wildlife and plants, drought, and other impacts. Ensuring the continued productivity, biodiversity, and sustainability of natural resources requires managing for climate change in addition to other stressors on these systems. Today’s challenge is to minimize these risks, reduce vulnerability, and prepare communities to thrive, grow, and adapt to a changing climate.

Ecosystems, such as forests, wetlands, and oceans provide a variety of benefits to human and natural systems including shoreline protection from erosion and inundation, flood and storm damage reduction, habitat for commercially and recreationally important species, opportunities for recreation and commerce, jobs, improved water quality and conservation, and carbon sequestration. The benefits provided by this “natural infrastructure”¹⁸ also can play an important role in strengthening ecosystem resilience to the impacts of climate variability and change. Increasing the resilience of fisheries and other natural resources is also key to enhancing the resilience of communities and businesses. As states, tribes, and local communities work toward enhancing resilience to weather and climate related impacts, there is increasing demand to build their capacity to integrate natural and traditional infrastructure solutions.

Improved, climate-resilient resource management provides opportunity to address a wide range of challenges, including:

Water Supply Availability: In conjunction with traditional infrastructure, natural infrastructure can improve reliability of water supply for both ecosystem and human uses.

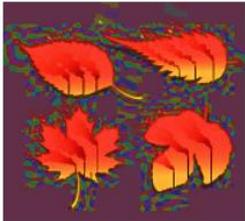
¹⁸ Barbier, Edward B., Sally D. Hacker, Chris Kennedy, Evamaria W. Koch, Adrian C. Stier, and Brian R. Silliman, "The value of estuarine and coastal ecosystem services," *Ecological Monographs*, 81(2), 2011, pp. 169–193, <http://www.esajournals.org/doi/pdf/10.1890/10-1510.1>.

USEPA, 2013 Case Studies Analyzing the Economic Benefits of Low Impact Development and Green Infrastructure, http://water.epa.gov/polwaste/green/upload/lid-gi-programs_report_8-6-13_combined.pdf.

As climate change results in reduced precipitation in some areas and population increases alter water uses, the capacity of natural systems to improve reliability of water supplies (e.g. groundwater recharge, water reuse, wetlands protection/restoration for water retention on site) can supplement investments in water conservation and built infrastructure.



Managing Municipal Stormwater: Expanded use of low-impact development (“green infrastructure”) practices in urban stormwater management that retain and infiltrate water on site can complement more conventional built infrastructure systems that channel stormwater directly to water bodies. For example, urban forests and rooftop gardens can be used to intercept precipitation, slow runoff, and mitigate heat island effects. By weaving natural processes into the built environment, green infrastructure provides not only stormwater management, but also improved water quality, greenhouse gas reduction, flood mitigation, and recreational opportunities.



By intercepting airborne pollutants, leaves help to improve air quality.

Air Quality Improvements: Increased vegetation on the landscape serves as a natural filter for ambient air pollutants like particulate matter. Leaves and vegetative matter intercept airborne pollutants, and also interrupt winds and reduce wind speeds, limiting the amount of particulate matter that can become airborne and improving air quality.

Coastal Storm Surges and Sea-Level Rise: Expanded use of natural infrastructure systems – such as dunes, coastal estuaries, wetlands, mangrove forests, and even oyster reefs – can help reduce impacts of storm surges and sea level rise on communities and existing natural systems.

Flood Risk Management: Preserving or restoring natural systems to retain precipitation where it falls across a watershed is a natural infrastructure technique that can be integrated with conventional “gray” or engineered flood management structures, such as levees and seawalls. Land-use management that strategically conserves natural infrastructure can also reduce the damaging impacts of flooding on human infrastructure and natural systems.

Wildlife Protection: Ensuring a diversity of well-connected natural areas or corridors along rivers and elsewhere to support the movement of species in response to climate change, and to sustain healthy populations into the future.

Community resilience will require the smarter use of traditional infrastructure integrated with natural infrastructure. The business case for expanded use of natural infrastructure in conjunction with, or in place of, more conventional built, or gray, infrastructure has been made in numerous studies¹⁹. Benefits of natural infrastructure may include cost savings compared to

¹⁹ World Resources Institute, Investing in Forested Landscapes for Source Water Protection in the United States, <http://www.wri.org/publication/natural-infrastructure>.

built infrastructure, particularly over time, as well as a rich stream of additional benefits including recreation, habitat protection, and biological carbon sequestration. Federal agencies are striving to implement natural infrastructure where appropriate but are, in a number of cases, limited by both policy and law.

Understanding and quantifying the ecosystem services and benefits provided by natural infrastructure to communities is fundamental to sound decision-making, long-term community resilience, and climate adaptation. The development of consistent, analytically robust, and well-tested methodologies and tools for ecosystem services assessment and valuation remains a major challenge. While progress can be made through enhanced efforts and coordination at all levels of government, the public sector cannot meet this challenge alone. Federal programs, policies, and incentives are critical drivers for private investment. The Administration can help scale private investments in promoting climate resilience, encouraging voluntary GHG reductions and increasing the adoption of natural infrastructure by aligning market and non-market drivers and supporting replicable investments already occurring in isolated parts of the country. Similarly, there are numerous opportunities for retail and institutional investors, fund managers, and members of the financial services industry to expand private investment in these areas.

To enhance community preparedness and the resilience of natural resources, the Federal government is focused on developing the information and tools necessary to support smart infrastructure investment (whether traditional or natural) and target the highest priority resilience needs, enhancing partnerships with communities to accomplish high priority preparedness needs, and highlighting innovation and sharing best practices among all stakeholders.

Progress to Date

The Administration has advanced creative solutions that utilize natural and traditional infrastructure to reduce community risk while also enhancing natural resources resilience. As communities prepare for climate impacts, well-managed natural resources play a critical role in moderating risk and in providing communities with fundamental ingredients to sustain current and future generations, such as clean abundant water, robust wildlife populations and living marine resources, and healthy soils. Key examples include:



- **Resilience Grants to Communities:** Announced in July 2014, HUD's National Disaster Resilience Competition will make \$1 billion available to communities that have been struck by natural disasters. The competition will promote risk assessment and planning and will fund the implementation of innovative resilience projects to better prepare communities for future storms and other extreme events. Focused on the needs of vulnerable lower-income people, and targeting the most impacted and distressed areas, this program addresses a wide range of community development objectives. Projects that incorporate natural infrastructure

into recovery are eligible for support, where shown to be an effective and competitive approach to rebuilding for resilience.

- **Strengthening Coastal Resilience:** Federal agencies are providing coastal inundation and sea-level change decision support tools to help communities reduce risks and increase the effectiveness of adaptation efforts. For example, in the aftermath of Hurricane Sandy, NOAA, USACE, and FEMA released a sea-level rise planning tool that includes interactive maps and a sea-level rise calculator to help inform decisions about how to rebuild in disaster-affected areas. In addition, HUD and DOI awarded grants to communities to incentivize innovative approaches to preparing for future storms through the use of natural infrastructure.
- **Enhancing Capacity to Manage Wildland Fire:** Climate change is leading to longer and more intense wildland fire seasons: fire season lengths have increased by 60-80 days over the last three decades and the annual acreages burned have more than doubled to over 7 million acres annually. That dynamic increases the danger to urban communities and erodes landscape integrity, which is critical to water supply, wildlife, and other important values. In 2014, the Administration announced the *Cohesive Wildland Fire Management Strategy*, a collaborative, inter-governmental strategy to tackle the wildland fire risks facing the Nation. The *Strategy* coordinates and integrates the efforts of Federal, state, tribal, and local partners and private property owners, to better restore and maintain landscapes, improve community resilience to wildfire, and implement safe, effective, and efficient risk-based wildfire management decisions.



However, the escalating cost of fighting wildfire remains a challenge to implementing the *Strategy*. Fire costs on Federal lands have increased significantly in real terms, from \$2.0 billion in 2000 to \$3.3 billion in 2014. As the suppression budget grows, it crowds out critical forest management and resilience priorities that decrease fire risk – including assistance provided to states, tribes, and

communities – and it threatens to make fire danger worse as land managers lack resources for essential prevention and restoration work. The President’s Fiscal Year 2015 budget proposes a new approach to addressing suppression costs by budgeting for extreme fires like other natural disasters – treating them as catastrophic costs that are funded outside of budget caps.

- **National Drought Resilience Partnership:** Launched in 2013, the National Drought Resilience Partnership (USDA, NOAA, DOI, USACE, FEMA, EPA and DOE, with participation from NASA) coordinates and integrates Federal activities to promote long-term

drought resilience, and leverages important capabilities of the National Integrated Drought Information System (NIDIS). As one example, the partnership is working with the State of Montana to develop a demonstration project in the Upper Missouri River watershed that will inform a joint Federal-State strategy to enhance drought resilience.

➤ **Assessing Climate Impacts on U.S. Oceans and Fish Stocks:**

In 2014, NOAA completed two new tools to help fisheries managers better understand and prepare for impacts of changing climate and ocean conditions on the Nation’s valuable marine fish stocks. The Ocean Climate Web Portal provides easy access to information on past and projected changes in regional ocean conditions, while the Fish Stock Climate Vulnerability Assessment Methodology enables fishery scientists and managers to assess the relative vulnerability of fish stocks. In May 2014, NOAA used this methodology to assess the vulnerability of 80 East Coast fish stocks.



➤ **Increasing Water Supply Sustainability:** Through the Water SMART Program, DOI’s Bureau of Reclamation is working with non-Federal partners to improve water management and sustainability. Reclamation is working with its partners through the Basin Studies to assess basin-wide impacts of climate change and to develop strategies to meet future water demands. The Bureau is advancing innovative water and energy efficiency projects through WaterSMART Grants. Through the Title XVI Water Reclamation and Reuse Program, the Bureau supports water recycling projects that diversify water supply, provide a drought resistant supply, and reduce the pressure to transfer water from agricultural to urban uses. The Drought Response Program incentivizes drought contingency planning and incorporation of climate change information in planning. Since the establishment of WaterSMART in 2010, Reclamation has provided more than \$200 million to non-federal partners through the program. Funded projects are expected to conserve 730,000 acre-feet of water per year once complete – about the amount of water needed for household use in Denver, Colorado and the surrounding metropolitan area. Five Basin Studies have now been completed, with an additional six Basin Studies expected to be finished by the end of 2014 and eleven others underway.

➤ **Integrating Climate Considerations into Water Resources Planning and Tools:** The Administration is incorporating climate change science into technical assumptions for major water resources planning and projects. In 2014, USACE instituted its *Preparedness and Resilience Policy*, which states that “it is the policy of USACE to integrate climate change preparedness and resilience planning and actions in all activities for the purpose of enhancing the resilience of our built and natural water-resource infrastructure and the effectiveness of our military support mission, and to reduce the potential vulnerabilities of that infrastructure

and those missions to the effects of climate change and variability.” This policy permeates USACE’s activities, including the consideration of potential climate change impacts when undertaking long-term planning, setting priorities, and making decisions affecting its resources, programs, policies, and operations.

DOI’s Bureau of Reclamation is incorporating climate change information into planning activities for infrastructure investments and safety, reservoir operations, and drought preparedness. Reclamation requires climate change be considered in all feasibility studies, and, beginning in FY 2015, Reclamation will develop a framework for considering climate change in prioritizing investments in infrastructure repair, replacement, and renovations. Reclamation is also developing the science and tools needed to apply climate change information to decisions about infrastructure safety through pilot projects within the Safety Evaluation of Existing Dams program. Separately, Reclamation began a pilot initiative in FY 2014 to identify methods to incorporate climate information in reservoir operations planning. The President’s Fiscal Year 2015 budget also supported Reclamation’s new Drought Response Program, which will prioritize drought contingency planning that includes consideration of climate change information to build long-term resiliency to drought.

Weather-Ready Nation: To mitigate the impacts of extreme weather, water, and climate events on communities, ecosystems, and other natural resources, NOAA’s National Weather Service (NWS) is translating its products and services into formats for use by stakeholders and communities. For example, the NWS Tampa Forecast Office and the National Ocean Service are working with external partners to expand a suite of services, including public health services; storm surge/coastal inundation services, ecological and environmental services for water temperature, salinity, currents and red tide; hydrologic runoff forecasts to mitigate development and transport of harmful algal blooms (HAB); and air quality forecasts.

Collaborative Research for Resilience: In 2012-2013, USDA National Institute for Food and Agriculture (NIFA) launched four climate-related grant areas: Agriculture and Natural Resources Science for Climate Variability (\$5M) Challenge Area; the Carbon Cycle Science (\$26.5M, in a joint NASA-ROSES CCIWG-U.S. Carbon Cycle Science Program with NASA, DOE and NOAA); Water Sustainability and Climate (\$25M, in a joint effort with National Science Foundation); and Decadal and Regional Climate Prediction using Earth System Models (\$15 M in a joint effort with NSF). The grant areas further understanding of the interaction between the water system, human activities, ecosystems and climate change; advance the science behind climate predictions, adaptation and resilience; reduce greenhouse gas emissions; increase carbon sequestration in agricultural and forest production systems; and prepare the Nation’s agriculture and forests to adapt to variable climates.

WE'VE MADE GREAT PROGRESS



Significant progress has been made in the advancement of creative solutions that capitalize on natural infrastructure to reduce community risk while also enhancing natural resources resilience.

PROGRESS:



HUD is promoting risk assessment and planning through its National Disaster Resilience Competition which is making \$1 billion available to communities that have been struck by natural disasters.

PROGRESS:



The Administration is tackling the wildland fire risks facing the Nation through the development of a collaborative, inter-governmental strategy called the Cohesive Wildland Fire Management Strategy. The National Drought Resilience Partnership (USDA, NOAA, DOI, USACE, FEMA, EPA and DOE, with participation from NASA) is promoting drought resilience.

PROGRESS:



WaterSMART grants awarded by DOI's Bureau of Reclamation have improved water supply sustainability. Water resources managers, including USACE and Reclamation, are incorporating climate change considerations in water resources planning and projects. NOAA is expanding services to support a weather-ready Nation.

MOVING FORWARD

- Strengthen Federal support to improve state, local, and Tribal flood preparedness and reduce wildfire risks
- Strengthen FEMA grant guidance to encourage use of natural infrastructure to reduce flood risk after developing methods to measure performance and value benefits
- Develop tools to support smart development decisions within floodplains and along coasts
- Continue to address the Hurricane Sandy Rebuilding Strategy
- Develop a broad-based, multi-sector Green Infrastructure Collaborative for stormwater management
- Work with communities to enhance water use efficiency and reuse, and improve drought resilience
- Improve the resilience of coastal areas to extreme events, including preparedness for climate impacts to fish stocks
- Establish interagency support teams for climate-resilient water resources on a regional basis
- Establish a Climate Resilience Leaders award and conduct competitions to spur creative solutions
- Identify or develop a community resilience index that considers environmental, economic, and social resilience
- Implement new Principles, Requirements, and Guidelines (PR&G) for Federal investments in water resources



Moving Forward

While significant progress has been made to integrate climate change science into Federal programs and services, there is more to be done to strengthen natural resource resilience and prepare communities for a changing future. There are continued opportunities to update existing programs and operations to integrate climate change science and to align objectives to support and enhance climate resilient communities and natural systems. Understanding the performance of natural infrastructure and how to integrate nature-based solutions into built infrastructure is an area ripe for early adoption of proven approaches, greater research, and enhanced cooperation and collaboration. Key actions moving forward include:

- **Partner with Communities to Enhance Resilience to Natural Hazards Risks:** Well-managed natural resources can enhance community resilience to hazards and threats. The following actions will help communities prepare for risks while integrating climate resilient natural resources considerations into operations:

- **Strengthen support for state, tribal and local flood preparedness:** Flood preparedness is widely recognized as more cost-effective than post-flood response and recovery, yet many communities lack the resources, tools, and training to take preventive actions that could dramatically reduce flood losses, save lives – and reduce



outlays by the National Flood Insurance Program and the Federal disaster relief and recovery programs. In 2015, FEMA will strengthen its grant guidance to encourage use of natural infrastructure to reduce flood mitigation risk, while NOAA, USGS, and other agencies will develop tools to support smart development decisions within floodplains and along coasts.

- **Expand partnerships to reduce wildfire risk and protect community infrastructure:** USDA and DOI will restore resilience of priority landscapes where critical resource values are at high risk from wildfire. Advancing the *National Cohesive Wildland Fire Strategy*, Federal land managers will expand multi-jurisdictional partnerships, such as the Western Watershed Partnership and the Joint Chiefs' Initiative, aimed at reducing hazardous fuels and protecting community water supplies and other critical infrastructure. The Forest Service will partner with states to implement new provisions in the 2014 Farm Bill that reduce threats from wildfire, insects and disease and bolster forest restoration, across all land ownerships. Additionally, through the 21st Century Conservation Service Corps, USDA and DOI will engage nearly 10,000 youth and veterans to accomplish critical restoration work on public lands through watershed restoration, hazardous fuel reduction, and other important projects.

The wildfire cap adjustment included in the President's Fiscal Year 2015 budget (noted on p. 37) would allow for more pro-active forest restoration work that has been severely delayed and constrained in order to pay for wildfire emergencies. For example, the USFS Vegetation and Watershed Management program, which performs post-fire restoration to achieve healthy watershed and ecological conditions after a fire, has experienced a 22 percent reduction since 2001 due to this structural budget challenge. Other investments in National Parks and Forests that Americans

expect – to simply maintain roads, trails and facilities – have been similarly severely impacted as catastrophic fire events squeeze out other operations, in some cases reduced as much as 95 percent since 2001. The President’s proposed wildfire cap adjustment would prevent suppression from subsuming a greater share of the budget moving forward.

➤ **Address Performance Measurement and Benefits Assessment Challenges to Natural Infrastructure:** In 2015, the Administration will address barriers to investment in and implementation of natural infrastructure solutions by improving measurement and evaluation of these approaches. All of the following actions address *Hurricane Sandy Rebuilding Strategy - Recommendation #22*:

- Develop an Actionable Research Agenda: The EOP will lead the development of a research agenda to address emerging and persistent methodological challenges and other barriers for the Federal government’s integration of ecosystem services into resilience efforts. The research agenda will identify key knowledge gaps, particularly those associated with valuation, and outline needs and opportunities for addressing these gaps.
- Issue Federal Guidance on Ecosystem Services Assessment: The Administration will develop guidance to bring high-level visibility and support for the use of ecosystem services assessment methods where appropriate and practicable. By providing this guidance to Federal agencies, the Administration will encourage the use of sound approaches to assessing ecosystem services and integration of assessment into Federal decision making.
- Launch Natural Infrastructure Tools and Resources Website: CEQ, NOAA, and USGS will partner with Federal agencies to populate the Climate Resilience Toolkit existing online tools and resources on natural infrastructure to support Federal, state, tribal and local decision-makers. This website will leverage other agency and interagency efforts.
- Conduct Program Evaluation of Resilience Investments: As noted on page 20, DOI will verify performance metrics and evaluate the performance of \$300 million in Hurricane Sandy Supplemental resilience investments, which includes \$100 million in external grants for natural infrastructure and other nature-based solutions. NOAA



is also providing \$300,000 toward a trade-off analysis to develop estimates of the economic value associated with Sandy-related restoration work. This will inform future Federal community resilience investments in natural infrastructure.

- **Expand Collaboration and Technical Assistance to Help Communities Implement Green Infrastructure for Stormwater Solutions:** EPA, along with HUD, DOT, USDA, DOI, DOD, and DOE recently announced the development of a broad-based, multi-sector Green Infrastructure Collaborative. The Collaborative will help communities better manage stormwater and more rapidly adopt low impact development techniques. In support of this initiative, in 2015 EPA will provide technical assistance to at least 25 communities while also disseminating information to support local adoption of such stormwater practices. This initiative will:

- Provide on-the-ground support to communities to more fully realize their green infrastructure objectives;
- Create a network of public, private, and NGO participants to leverage the full range of information and resources;
- Align Federal resources to help local communities integrate green infrastructure planning into broader community development efforts, including through transportation systems (e.g., complete streets) and parks/open spaces;
- Provide tools and training for communities to build local capacity around resiliency and sustainable water infrastructure;
- Recognize innovative green infrastructure projects and foster information sharing about innovative approaches;
- Lead by example by installing and supporting green infrastructure to demonstrate the suite of benefits that these approaches can provide; and
- Create a network of organizations that can mobilize resources and develop the strategies for implementing green infrastructure for a range of community objectives.



- **Promote Drought Resilience and Enhance Water Use Efficiency, Water Reuse, and**



Water Supply: Climate change can impact the duration and severity of drought. Drought events can have major environmental, social, and economic consequences. For example, damages from the 2012 drought totaled approximately \$30 billion, and the severe drought currently affecting the West is impacting critical sectors, including agriculture, ranching, cities, industry, recreation, and the environment. Federal agencies will work with communities to protect and extend limited water supplies; actions include:

- USDA will invest in irrigation efficiency and management strategies to address groundwater depletion and will improve drought and snowpack monitoring.

- The EPA WaterSense program will promote water use efficiency to sustain water supplies, which will have the added benefit of reducing the use of energy to move and heat water by 23 million metric tons per year by 2018.
 - USACE will incorporate climate considerations into any planned or ongoing water reallocation actions.
 - Bureau of Reclamation will continue to incorporate climate change considerations throughout its programs and policies as it carries out its mission to develop, manage and protect water and related resources in an environmentally and economically sound manner. Reclamation's WaterSMART Program is well positioned to address near-term impacts of climate change via the competitive grants provided to non-Federal partners under the program. The Basin Study component of the WaterSMART Program provides an effective process through which Reclamation will continue to work with study partners to identify and develop adaptation strategies to meet future water supply needs. In addition to this effort, Reclamation will assist its study partners with the technical expertise, planning support, science, and tools needed to advance adaptation strategies that can be implemented by non-Federal stakeholders.
 - USGS will begin a series of projects to understand the impacts of drought on fish and wildlife species.
 - In 2015, NOAA's National Weather Service National Water Center, with partners, will begin development of a national water model that will improve water prediction capability to optimize communities' use of increasingly limited water resources.
 - In 2015, USDA will use Farm Bill programs to support conservation practices and technologies that build drought resilience. Through planned research, USDA will also enhance food security through analyzing improved crops and plant breeding tools with increased resilience to heat and drought; developing systems to model and test climate change scenarios' impact on animal, food, and waterborne diseases and pests; and by researching drought impacts to nutritional composition and quality of food.
 - The interagency National Integrated Drought Information System (NIDIS) will work to ensure that its regional drought early-warning information capabilities in partnership with Federal agencies, states, tribes, and communities across the Nation.
- **Establish Federal Agency Support Teams for Climate Resilient Water Resources Based on the WestFAST Model:** Federal agencies will work with state, tribal and local partners to identify appropriate regional associations dealing with water resources management and develop Federal agency support teams, comparable to the existing WestFAST partnership wherein Federal agencies embed a dedicated Federal liaison to work with the Western states on issues of common concern. This highly efficient approach saves both Federal and state partners time and money and ensures that a high level of coordination takes place.

- **Build Regional Capacity for Natural Resource Disaster Recovery and Restoration in the Pacific Islands:** Within 18 months, NOAA, USGS, and FWS will produce a regional handbook for natural resource and emergency managers for the Pacific Islands Region. To be developed in collaboration with Pacific Islands partners, the handbook will document recent policy and capacity developments and lessons learned to address challenges associated with managing natural resources in the context of more frequent and severe extreme events.
- **Strengthen the Resilience of Coastal Resources and Communities to Extreme Events:** In 2014, NOAA will launch new coastal resilience research projects to provide coastal communities and businesses with better information and tools to identify risks and increase resilience, and in 2015, proposes to create a new competitive grants program to fund collaborative projects that increase coastal communities' and economies' resilience. In coordination with USACE and other relevant Federal agencies, NOAA will provide resources and technical assistance to state, tribal, local, and private sector partners to enhance the use of natural infrastructure to address storm surge, sea-level rise, and other stressors on coastal communities and ecosystems; NOAA plans to pilot a water-level inundation "dashboard" to facilitate decision-making concerning flooding and storm events through scenarios that include how the flooding will impact the natural and built environment.
- **Prepare for Climate Impacts on Fish Stocks and Fishing-dependent Communities:**

In 2015, NOAA will help fishing-dependent communities prepare for climate impacts on fish stocks by completing climate vulnerability assessments for major commercial and recreational marine fish stocks; helping communities undertake risk assessment and adaptation planning; supporting collaborative research on the impacts of climate variability and change on fish



stocks and fisheries in the U.S. Northeast Shelf Large Marine Ecosystem; and establishing Resilient Fishing Communities Pilot Projects to provide technical assistance to fishing-dependent communities in risk assessment and adaptation planning. NOAA also proposes to increase investment in its Ecological Forecasting Roadmap to include resilience related activities, such as connecting how living marine resources respond to changes in coastal and marine habitats, and to launch a new coastal ocean acidification modeling initiative to help resource managers and coastal communities better understand and prepare for impacts of changing chemical conditions on commercially important fishery species.

➤ **Foster Innovation and Recognize Leadership:**

- **Prize competitions:** Under the authority of the America Competes Reauthorization Act of 2010, the Administration will provide incentives and opportunities for the private sector and public to share creative solutions to natural resource and community resilience challenges through one or more prize competitions focused on flooding, storm surge, wildfire, drought, or other key challenges. Past examples of this approach are challenges issued through the Climate Data Initiative and the Wood in Green Building competition. As noted on page 29, within 6 months, USDA will launch a U.S. Tall Wood Building Competition to spur use of sustainable forest products in construction. In 2015, Bureau of Reclamation will launch several challenges focused on infrastructure sustainability, ecosystem restoration, and water supply and drought management under a changing climate.
- **Leadership awards:** To point to success and encourage replication of climate smart practices, the Administration will also establish a Climate Resilience Leaders award to recognize Federal, tribal, state, and local leadership in advancing the resilience of natural resources and the communities that depend on them.

➤ **Provide Policies, Data, and Tools to Facilitate Smart Restoration and Conservation Investments:**

- **Develop a Community Resilience Index:** In 2014, FEMA will begin work in coordination with NOAA, NIST, and insurers to identify or develop a community resilience index that considers environmental, economic, and social resilience. This work will focus on economic and social components, in particular infrastructure, and will incorporate data and ecosystem information developed through DOI and NOAA efforts to measure progress on resilience through restoration. By 2015, this work will produce a set of key indicators and an initial index methodology for implementation. Products of this effort will be incorporated into the Climate Resilience Toolkit as appropriate in the future.
- **Disaster Resilience Framework:** In 2015, NIST will deliver a Disaster Resilience Framework to establish a community-based approach to resilience, including performance goals for classes of buildings and infrastructure systems based on their importance to the function of the community as defined by its purpose. NIST is conducting a series of stakeholder workshops to inform the development of the Disaster Resilience Framework. NIST is coordinating with a number of Federal agencies, including, but not limited to NOAA, DHS, FEMA, HUD, as well as state and local governments, private sector stakeholders, and academia. This is part of a long-term program to provide guidance and tools that communities can use to establish priorities and prepare plans to improve their resilience. Products of this effort will be incorporated into the Climate Resilience Toolkit as appropriate in the future.

- **Implement Modernized Principles, Requirements, and Guidelines (PR&G) for Federal Investments in Water Resources:**

In 2009, the Administration began a major effort to update 30-year-old criteria that guide national investments in water resource projects. These new criteria encourage more responsible taxpayer investment by bringing a smarter, more balanced approach to planning. Under the new PR&G, agencies will evaluate the full range of costs and benefits of proposed actions, to more broadly consider how water resource investments impact the economy, environment, and local communities. By considering the environmental impacts of proposed actions, this improved approach to cost benefit analysis will better account for the benefits nature-based solutions provide. The Administration is nearing the implementation of the new PR&G, to the extent permissible under current law. In 2014, the Administration will release Interagency Guidelines (IG), followed by the finalization of Agency Specific Procedures to implement the PR&G. Agencies will lead an effort in 2015 to fully implement these modernized criteria for climate-resilient water resource investments.





Chapter V: Modernize Federal Programs, Investments, and Delivery of Services to Build Resilience and Enhance Sequestration of Biological Carbon development

“But what I also know is, is that when you take those first steps, even if they’re hard and even if they’re halting sometimes, that you start building momentum and you start mobilizing larger and larger communities. And when it comes to a challenge as far-reaching and important as protecting our planet, every step makes a difference.”

President Obama June 25, 2014

The Challenge

Climate change poses new challenges for Federal agencies, both operationally as well as for the management programs they administer and the services they provide. Though much progress has been made, most Federal natural resource management programs, investments, and grant programs lack clear guidelines to ensure that Federal efforts and investments are informed by climate-smart principles or prioritize regional strategies.

Climate change also poses new challenges for stakeholders with unique needs and interests including farmers, ranchers, fishermen, foresters, wildlife professionals, city managers, water utility managers, and others. These challenges are not limited to one region or scale and cannot be addressed by any single Federal science or extension program. Federal agencies are increasingly working with partners to deliver regional programs and services to provide context-specific data, user-friendly tools, and information to help people make climate-sensitive decisions.

These regional programs rely on partnerships between scientists and stakeholders to identify and refine science and information needs in specific regions, at scales most useful for decision-makers at all levels. In the rapidly changing arena of climate science, there is increased demand for information and tools to support local decision-making by an array of users with diverse interests and questions. Organizing the delivery of information, services, and products to better serve state, tribal, local, and working landowner needs is an ongoing challenge that Federal agencies are working to meet.

Federal agencies are also committed to providing training in the use of new data and tools to ensure that decision-makers at all levels have the knowledge they need. Federal agencies also recognize the importance of tribal governments in building climate resilience and will expand effort to support tribes in this work.

Progress to Date

Federal agencies have been making great strides toward building the resilience of natural resources and the communities that depend upon them, improving the ability of our ecosystems to fight carbon pollution, and adapting policies and procedures to more effectively anticipate and address climate impacts and build resilience. Agencies have also begun to incorporate resilience considerations into resource management, financial assistance, and other programs.

As directed by Executive Order 13653 (November 1, 2013), *Preparing the United States for the Impacts of Climate Change*, Federal agencies are required to develop or continue to develop, implement, and update comprehensive plans that integrate consideration of climate change into agency operations and overall mission objectives. To support the efforts of regions, states, local communities, and tribes, the Executive Order also requires all agencies, consistent with their missions, to:

- identify and seek to remove or reform barriers that discourage investments or other actions to increase the Nation's resilience to climate change while ensuring continued protection of public health and the environment;
- reform policies and Federal funding programs that may, perhaps unintentionally, increase the vulnerability of natural or built systems, economic sectors, natural resources, or communities to climate change related risks; and
- identify opportunities to support and encourage smarter, more climate-resilient investments by states, local communities, and tribes, including by providing incentives through agency guidance, grants, technical assistance, performance measures, safety considerations, and other programs, including in the context of infrastructure.

In March 2014, the Administration launched the Climate Data Initiative, bringing together extensive open government data and innovation competitions to develop data-driven resilience tools for communities. In addition, Federal agencies are working together to develop a Toolkit for Climate Resilience that centralizes access to new and existing data-driven resilience tools, services, and best practices, including those developed through the Climate Data Initiative.

Many programs have already made efforts to include resilience criteria, such as land acquisition and easements supported through the Land and Water Conservation Fund, support for sustainable water supplies through Reclamation's WaterSMART grants, as well as EPA's Underground Injection Control Grants program and Wetlands Program Development Grants. Federal agencies are also



working cooperatively with states and tribes to help them incorporate climate resilience considerations into programs on a voluntary basis (e.g., State and Tribal Wildlife Grants, Coastal Zone Management Grants, Clean Water State Revolving Fund, Drinking Water State Revolving Loan Fund).

Federal agencies have also organized a number of regional climate science and service approaches for delivering information, tools, and training to better serve state, local, tribal, and regional needs. For example, NOAA Regional Climate Partnerships provide integrated science, climate data and information products, and partnership building efforts to local, state, tribal, and Federal entities seeking to manage climate- and weather-related risks. For almost 20 years Regional Integrated Science and Assessment (RISA) teams have worked with a diverse range of sectors (e.g. public health) as a research engine for partnership-driven science. Through Regional Climate Hubs, USDA delivers tailored information to help farmers, ranchers, and private forestland owners adapt to the impacts of climate change and weather variability and to promote sustainable agriculture/forestry production through development of adaptation responses. LCCs have convened major conservation stakeholders in each bioregion to work on developing resilient landscape designs to help maintain fish, wildlife, and plant resources. DOI Climate Science Centers, working with many of the same stakeholders, are identifying the related LCC science needs and directing their resources to meet those needs. Each of EPA's ten regional offices have developed a climate adaptation plan defining support they will provide to state, tribal, and local governments, and stakeholders, such as water utilities. There are also other Federal agency and interagency efforts, including USACE, FEMA, and the interagency Climate Change and Water Working Group,²⁰ that have regional organizations that participate in supporting resilience activities.

Agencies are working internally and with external partners to enhance climate literacy of the conservation workforce. Specific examples include:

- The National Park Service developed staff training based on its 2011 assessment to identify the highest priority climate change training needs. Now in its fourth year, the Interpreting Climate Change in National Parks training program provides the knowledge, skills and abilities needed by front line interpreters to actively engage the public in climate change education. The NPS New Superintendents Academy Climate Change Leadership Series (in its 3rd year), is a multi-week course in which experienced managers share their insights, resources, tools, and tested response options about climate change with new superintendents. To enhance these training courses, fourteen place-

²⁰ The Federal Climate Change Water Working Group (CCAWWG) provides engineering and scientific collaborations in support of water management under a changing climate. It fosters communication and research partnerships around these needs across the water and science communities of practice. <http://www.ccawwg.us/index.php/home>.

based climate change videos are available online, which explore management actions on topics such as sea level rise, glacial melting, and species shifts.²¹

- The Department of the Interior’s Bureau of Indian Affairs launched a new \$10 million Federal-Tribal Climate Resilience Partnership and Technical Assistance Program that will help tribes prepare for climate change by developing and delivering adaptation training, providing tribes with data and information, improving Federal collaboration, and assisting with climate change adaptation and mitigation efforts.
- Many RISA teams work with indigenous communities to prepare for the effects of climate variability and change. For example, the Climate Assessment for the Southwest, working with the Hopi Department of Natural Resources in Arizona, co-produced the first ever Quarterly Hopi Drought Status Report in 2014. The Southern Climate Impacts Planning Program is working with the Chickasaw Nation and the South Central CSC to develop climate science training for tribal environmental professionals in Oklahoma and Texas. The Alaska Center for Climate Assessment & Policy worked with the City of Dillingham, the Bristol Bay Native's Association, and the Bristol Bay Borough to complete an initial assessment of health vulnerability and environmental security around the issue of water security in Bristol Bay. The Pacific RISA is providing scientific support to Hawaii, the Republic of the Marshall Islands, and other Pacific islands regarding the sustainability of fresh water resources in a changing climate.
- The National Integrated Drought Information System (NIDIS) is developing training, drought early warning and preparedness plans with tribal communities in the Missouri, Colorado, and Columbia River Basins.

21 “Photos and Multimedia,” National Park Service, www.nps.gov/subjects/climatechange/photosmultimedia.htm.

WE'VE MADE GREAT PROGRESS



Significant progress has been made toward building the resilience of natural resources and the communities that depend upon them, improving the ability of our ecosystems to fight carbon pollution, and adapting policies and procedures to more effectively anticipate and address climate impacts and build resilience.

PROGRESS:



Numerous programs have made efforts to include resilience criteria including EPA's Underground Injections Control Grant program and Wetlands Program Development Grants, and Reclamation's WaterSMART grants.

PROGRESS:



DOI's Bureau of Indian Affairs launched a \$10M program to help tribes prepare for climate change through advances in data and information supporting adaptation and mitigation as well as enhanced technical assistance.

PROGRESS:



NOAA Regional Integrated Science and Assessment (RISA) teams are working with a diverse range of sectors, such as public health, as a research engine for partnership-driven science.

MOVING FORWARD

- Incorporate climate smart practices in Federal land acquisition programs and natural resource grant and financial assistance programs
- Develop agency-specific principles and guidance for considering biological carbon in management and planning decisions
- Identify exemplary facilities and resource management activities that demonstrate cutting edge resiliency efforts
- Provide the Council on Climate Preparedness and Resilience with a status update on progress-to-date in modernizing programs
- Provide an online "front door" to the array of regional information, services, and tools available
- Increase support for NOAA's Regional Integrated Sciences and Assessments (RISA) teams
- Use Climate Smart Conservation Guide to train hundreds of natural resource managers across the country in climate smart conservation
- Place tribal Climate Extension Support Liaisons in the DOI Climate Science Centers
- Develop at least one flagship tribal partnership in every Forest Service Region



Moving Forward

- **Modernize Federal Programs:** Many Federal programs have already made efforts to update existing operations to promote climate resilience and carbon sequestration considerations. Federal agencies will build on this momentum through the following actions:
 - **Incorporate resilience into natural resources planning and management:** Within 12 months, Federal agencies with natural resources responsibilities or whose activities impact natural resources will identify best practices for applying resilience criteria to program management, practices, training, and investments, and institute policies that ensure such practices are implemented and updated on a regular basis.

- **Modernize land acquisition, and natural resource financial assistance programs to address resilience needs:** Climate-smart practices should also be reflected in Federal land acquisition programs and natural resource grant and financial assistance programs. Within 12 months, Federal agencies that administer these programs will identify best practices for applying resilience criteria to them, and develop policies for implementing these practices, as well as mechanisms for updating those policies.
 - **Implement policies, procedures, and performance metrics for considering biological carbon in Federal natural resource management practices:** In addition to actions outlined in Chapter III, within 12 months Federal land, water and coastal management agencies will develop agency-specific principles and guidance for considering biological carbon in management and planning decisions. Such guidance shall acknowledge the importance of sustaining long-term ecosystem function and resilience over short-term accounting for carbon changes, consider carbon within the context of other management objectives and ecosystem service goals, and integrate carbon considerations as part of a balanced and comprehensive program of sustainable management and climate change adaptation.
 - **Lead by example at Federal facilities:** Federal agencies own or manage many properties and facilities that are vulnerable to the impacts of climate change. Federal agencies will lead by example by employing best practices in ensuring resilient natural systems and built infrastructure at Federal facilities and lands. Within 12 months, each Federal agency will identify a small number of exemplary facilities and resource management activities that demonstrate cutting edge resiliency efforts, such as use of natural infrastructure, documenting the "best of best practices". Where appropriate, Federal agencies will enhance their visitation, education, and outreach activities to encourage emulation of these practices more broadly in the public and private sectors.
 - **Status update:** Within 12 months, Federal agencies will provide the Council on Climate Preparedness and Resilience with a status update on progress-to-date in modernizing programs as described above.
- **Provide Regional Resilience Information and Services to Meet the Needs of American Communities:** Despite progress to date, there is a need to better communicate and coordinate regional Federal efforts, to make it easier for people, communities, and tribal, state, and local governments to get access to resilience services, and to identify the decision support infrastructure that will be needed in the future. There is also a call for greater awareness and coordination of existing decision support tools available to support resilience planning at various scales. The following actions moving forward will build on existing efforts to enhance the delivery of regional resilience services.

- Within 12 months, NOAA, USDA, and DOI, in coordination with other Federal agencies that support regional resilience, will improve customer service by providing an online “front door” to the array of regional information, services, and tools available, using the National Climate Assessment regions as a consistent framework or “inroad” for communities and the public. These agencies will also develop a networked approach whereby access to any one agency’s regional services will provide a clear path to the others. This will include an online directory of regional experts, services, and tools. This work will include coordinated development of priorities and plans for investments in research and tools in each region that will assure effective use of limited resources. Products of this effort will be disseminated through the Climate Resilience Toolkit as appropriate.
- Within 12 months, each USDA Hub will pursue a set of partnerships with Cooperative Extension university partners and other stakeholders to better understand the local and regional challenges posed by climate change and to develop and deliver guidance on climate resilient management strategies to farmers, ranchers, and other landowners.
- In 2015, NOAA plans to increase support for its RISA teams who work with resource managers and planners to develop and utilize new information about the impacts of climate on communities, natural and managed resources, infrastructure, transportation, and health. Now serving eleven regions, two new regions would be competitively awarded funding to expand services to the Mid-Atlantic and the Midwest.

The National Climate Assessment collects, integrates, and assesses observations and research from around the country, helping us to see what is actually happening and understand what it means for our lives, our livelihoods, and our future. In addition to providing an analysis of impacts on seven sectors, the report assesses key impacts on eight major U.S. regions: Northeast, Southeast and Caribbean, Midwest, Great Plains, Southwest, Northwest, Alaska, Hawai'i and Pacific Islands, as well as the country's coastal areas, oceans, and marine resources. These regions provide a framework from which the delivery of Federal regional services can be better understood and accessed by regional, state, tribal, and local decision-makers, stakeholders, and the public.

- **Identify Regional Priorities for Science and Services to Enhance Resilience:** By early 2015, following the methods of drought outlook forums convened by NIDIS, NOAA, USDA, and DOI, Federal agencies will convene at least three regional collaborative discussions with resource managers, decision-makers, and others, to identify and anticipate science and service priorities in light of unfolding climate related events, such as droughts and floods resulting from the potential El Niño, or disasters such as Atlantic hurricanes and tropical storms. Partners will work collaboratively to develop tools, provide information and planned engagement, and inform investment around these unfolding climate-related events.

➤ **Train and Inform Resource Managers and Stakeholders on Climate Resilience:**

Generating needed data and tools is an important step, but Federal agencies also need to bolster climate-smart education and develop training programs to help decision-makers, resource managers, stakeholders, and others get the most value from information resources.

- By 2015, NOAA, USDA, and DOI, in cooperation with other Federal agencies, will define a framework for education and training to build climate literacy and capability among relevant Federal agency staff and technical service providers, such as planners, engineers, and consultants. The framework should include assessing climate literacy in Federal agencies,²² and developing partnerships with non-profit or professional groups to promote climate resilience outreach, education, training, certification, and engagement of academic training capability.
- In 2014, a coalition of Federal and state agencies and nongovernmental partners released a *Climate Smart Conservation Guide*²³ that describes practices to safeguard vital natural resources in a changing climate. The guide provides natural resource managers with state-of-the-art information and tools to assess risks and design effective resource management efforts that incorporate and respond to climate-related changes in U.S. ecosystems. Over the next year and beyond, the guide will be used by the FWS National Conservation Training Center to train hundreds of natural resource managers across the country in climate smart conservation.
- Building off these efforts, Federal natural resource agencies will work to enhance their efforts to integrate climate information and communications into place-based stewardship. This will provide enhanced and informed visitor education on the impacts of climate change upon the lands and waters managed by the Federal government, including National Parks, National Wildlife Refuges, National Forests, National Marine Sanctuaries, and other sites



²² This effort should build off of the “Climate-Smart Conservation: Putting Adaptation Principles into Practice” manual and training program developed by the National Wildlife Federation in cooperation with the USGS, FWS, NPS, EPA, USACE, USFS, NOAA and several other state and stakeholder partners.

²³ NWF, Climate Smart Conservation, http://www.nwf.org/pdf/Climate-Smart-Conservation/NWF-Climate-Smart-Conservation_5-08-14.pdf.

which collectively receive 938 million visits a year.²⁴

- In 2014, the National Park Service will complete development of a Natural Resource Career Field Academy online climate change module to help resource professionals understand key climate change related issues and explore adaptation and planning options.

➤ **Prepare Indigenous Communities for the Impacts of Climate Change:** As described in



Photo of a Tlingit man, a member of an indigenous people group who live in southeast Alaska.

Source:

<http://www.pbs.org/harriman/1899/native.html>

the National Climate Assessment, “[t]he peoples, lands, and resources of indigenous communities in the United States, including Alaska and the Pacific Rim, face an array of climate change impacts and vulnerabilities that threaten many Native communities. The consequences of observed and projected climate change have and will undermine indigenous ways of life that have persisted for thousands of years. Key vulnerabilities include the loss of traditional knowledge in the face of rapidly changing ecological conditions, increased food insecurity due to reduced availability of traditional foods, changing water availability, Arctic sea ice loss, permafrost thaw, and relocation from historic homelands”.²⁵

Federal agencies have a variety of existing and upcoming national and regional programs, and initiatives that provide information, training, technical assistance, financial support, and other services to support

community capacity to bolster resilience and prepare for the impacts of climate change. Federal agencies are also integrating traditional knowledge into technical assistance and assessments to inform decision-making.

- DOI will place five tribal Climate Extension Support Liaisons in the Climate Science Centers, as part of its Federal-Tribal Climate Resilience Partnership and Technical Assistance Program. These liaisons will work at the regional level with tribes to identify climate information and science needs of tribes and coordinate Federal assistance across agencies to address those needs. The five regional tribal liaisons

²⁴ Department of the Interior, The Department of Interior’s Economic Contributions FY 2012, <http://www.doi.gov/ppa/upload/Chapter-2-FY2012-Econ-Report.pdf>.

US Forest Service, National Visitor Use Monitoring Results,

http://www.fs.fed.us/recreation/programs/nvum/2012%20National_Summary_Report_061413.pdf.

US Army Corps of Engineers, Value to the National – Recreation Economic Impact,

<http://www.corpsresults.us/recreation/receconomic.cfm>.

and Office of National Marine Sanctuaries, Bob Leeworthy, Chief Economist.

²⁵ Bennett, T. M. B., N. G. Maynard, P. Cochran, R. Gough, K. Lynn, J. Maldonado, G. Voggesser, et al. “Chapter 12: Indigenous Peoples, Lands, and Resources,” in *Climate Change Impacts in the United States: The Third National Climate Assessment*. eds. J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe (U.S. Global Changes Research Program, 2014), pp 297-317.

will also support tribal workshops, practitioner working groups, and regional training needs. Liaisons will be contracted to tribal organizations to ensure strong ties to tribal practitioners and to further enhance tribal capacity.

- Within 12 months, the USDA-Forest Service will create at least one flagship tribal partnership in every Forest Service Region to develop and implement climate adaptation strategies for tribal lands and adjacent National Forests.
- In 2015, NOAA proposes to increase efforts to provide fisheries and other decision makers in the Alaska region with information on climate impacts on major fish stocks and protected species and to implement a distributed biological observatory to improve understanding of how climate and human-induced change are affecting subsistence cultures and the environment in the Arctic.



Chapter VI: Conclusion

Climate change is the challenge of our time. We can take action now to improve climate resilience of our land and water resources, as well as to take action that will help improve the ability of our land and water to absorb more carbon.

Recognizing the importance and urgency of taking action, in November 2013, the President asked Federal agencies to complete an inventory and assessment of proposed and completed changes to their land- and water-related policies, programs, and regulations necessary to make the Nation's watersheds, natural resources, and ecosystems, and the communities and economies that depend on them, more resilient in the face of a changing climate (Section 3 of EO 13653). This effort convened the Departments of Defense, Interior, Agriculture, Environmental Protection Agency, National Oceanic and Atmospheric Administration, Federal Emergency Management Agency, the U.S. Army Corps of Engineers, working with the Chair of the Council on Environmental Quality and the Director of the Office of Management and Budget (OMB).

This inventory and assessment led to the development of this *Priority Agenda for Enhancing the Climate Resilience of America's Natural Resources*. This *Agenda* identifies significant actions to foster climate-resilient lands and waters, manage biological carbon sinks associated with Federal lands and waters, use natural infrastructure to strengthen community resilience, and provide agency support to regional, state, local, and tribal resilience efforts. The *Agenda* builds off of the robust climate and natural resource efforts of the Administration to date, internal reviews of existing efforts, and feedback from partners and the State, Local, and Tribal Leaders Task Force for Climate Preparedness and Resilience to improve the resilience of America's natural resources and the communities that rely upon them. In 2015, Federal agencies intend to conduct a twelve month appraisal of implementation to date.

In the course of conducting the inventory and assessment, a number of substantial challenges and opportunities were identified that require further attention beyond the actions described in this *Agenda*. The challenges and opportunities fall generally into three categories:

Science and Information: Developing and providing access to the relevant information and tools to support decision-making is among the greatest ongoing challenges in protecting and enhancing the resilience of natural resources, and therefore the resilience of the communities and economies that rely upon them. Efforts are underway to: collect information on the changes that are happening and that will occur in the future, integrate data and information into research and analysis that supports our understanding of possible outcomes for human and natural systems, ensure that science is effectively translated and delivered, and train decision makers in utilizing this information in a highly uncertain environment, where

climate is only one of a number of factors that are being experienced. To meet this demand, Federal agencies have established several networks of science and data providers, developed multiple classes of climate tools and services, and provided numerous innovations in modeling and prediction. Additional work is needed to improve translation, utility, and delivery of existing knowledge – and to address key information needs that have been identified by user communities.

- Collaboration and Capacity: The Federal government alone cannot address all of the implications of climate impacts on our natural resources. Addressing climate change and fostering the resilience of our natural resources will require leveraging the skills, tools, and innovations of the entire Nation, from residents of vulnerable coastal towns and villages, to innovative county leaders intent on solving emerging challenges, to state and tribal officials who are having to adapt quickly to changing resource conditions that are happening over a matter of years, not decades or centuries. Fostering this level of innovation and adaptive capacity to address these changes will require improved collaboration. And building such partnerships will also strengthen the ability of all parties to bring resources to the table to help the Nation sustain and restore our natural resources.

- Funding Resilience: Increasing wildfires, droughts, floods, and severe storms, are all reminders that climate related costs are rapidly on the rise. Because the scale is immense and the well-being of many American communities is so closely linked to the many services ecosystems and landscapes provide, Federal, state, tribal, and local governments must share responsibility to foster the resilience of the Nation’s natural resources. With constrained resources at all levels of government, we must re-think how we fund and finance investments by identifying and removing barriers that can impede the ability of all parties to invest in resilience, and through providing incentives to move forward with important investments in natural resources.



With these challenges ahead, the Federal agencies involved in this exercise recognize more investment is needed and would welcome continued dialogue around:

- Innovative financing mechanisms that leverage private sector investment

- Increasing support for existing landscape scale restoration as well as land acquisition and easement programs
- Expanding support through the tax code for retaining working forests
- Reducing wildfire risk and restoring fire-impacted landscapes
- Innovative ways to encourage proven water conservation and efficiency investments
- Building support for regional climate services (CSCs, LCCs, Hubs, RISAs, etc.)
- Increasing state and local climate and natural resources resilience planning and implementation capacity through existing mechanisms like the Fish & Wildlife Service State Wildlife Action Grants, and the Forest Service Cooperative Forestry Programs

We have to act now to make our communities and ecosystems more resilient in the face of climate impacts. It will take more than “re-thinking” how we spend the resources available today, it will take the kind of financial and community commitment that this Nation has directed in the past for recovery in the wake of natural disasters. Building the resilience of our natural resources and the communities across this nation that depend on them will take up-front, thoughtful, strategic investment and increased ambition at the local, state and Federal level. This agenda highlights the significant work that’s been done and that will be done to implement the President’s Climate Action Plan and prepare the Nation’s natural resources for the impacts of climate change. It is a historic and important start.

Appendix A: Strategies and Priority Actions



STRATEGY I: FOSTER CLIMATE-RESILIENT LANDS AND WATERS

STRATEGIES AND PRIORITY ACTIONS	Lead Federal Agency and Supporting Agencies	Target Completion Date	Page
<p>1. Resilience Index</p> <p>a. In 2015, Federal agencies, to include DOI, NOAA, the Federal Emergency Management Agency (FEMA), the Army Corps of Engineers (USACE), and the Department of Transportation (DOT), will design a framework for a decision-support tool that will provide baseline resilience data and measure the progress of restoration, conservation, and other resilience-enhancing management approaches.</p> <p>b. Experts will work toward developing common metrics, monitoring protocols, modeling approaches, and valuation methodologies to establish baseline conditions and provide measures of increased resilience from cost-effective restoration.</p> <p>c. This work will link with a broader Community Resilience Index, which FEMA, NOAA and the National Institute of Standards and Technology (NIST) are developing (see Chapter IV), as well as the efforts of the Data and Tools Working Group described in Chapter I.</p>	<p>DOI, NOAA, FEMA, DOT, USACE</p>	<p>Within 2015</p>	<p>19</p>
<p>2. Decision Support Tools for Climate-Smart Natural Resource Management</p> <p>a. Within one year, Federal agencies will develop and provide decision-support tools to improve the ability of agencies and landowners to manage for resilience. Examples include:</p> <ul style="list-style-type: none"> • By the end of calendar year 2014, the U.S. Geological Survey (USGS) will initiate, through pilot projects with the Fish & Wildlife Service (and other DOI bureaus if funding permits), production of a tool to help resource managers consider the impacts of management decisions upon carbon stock and flux as well as impacts on resilience and ecosystem services, such as water quality, flood risk reduction, wildlife viewing, cultural heritage, and nutrient cycling. • Over the next year, NOAA will deploy new or expanded resilience tools, including a Northeast climate and marine ecosystem dashboard for predicting future conditions; an expanded Coastal Flood Exposure Mapper for coastal states on the East Coast and Gulf of Mexico; a Climate Change Vulnerability Assessment tool for Coastal Habitats; and a new performance support tool for GIS professionals working with agencies and organizations on natural infrastructure planning for coastal resilience. 	<p>USGS, FWS, NOAA</p>	<p>Within 2015</p>	<p>19</p>

STRATEGY I: FOSTER CLIMATE-RESILIENT LANDS AND WATERS



STRATEGIES AND PRIORITY ACTIONS	Lead Federal Agency and Supporting Agencies	Target Completion Date	Page
<p>3. Identify Landscape Conservation Priorities to Build Resilience</p> <p>a. Goal 1 of the <i>National Fish, Wildlife, and Plants Climate Adaptation Strategy</i> is to build or maintain ecologically connected network of terrestrial, coastal, and marine conservation areas that are likely to be resilient to climate change and support a broad range of fish, wildlife, and plants under changing conditions. Identifying such priority areas also benefits wildfire management, mitigation investments, restoration efforts, and water and air quality.</p> <p>b. Within 6 months, Federal agencies working to address ecosystem management issues through LCCs and other multi-stakeholder bodies will work with partners to select flagship geographic regions for which they will identify priority areas for conservation, restoration, or other investments to build resilience in vulnerable regions, enhance carbon storage capacity, and support management needs.</p> <p>c. Within 24 months, these agencies and their partners will have identified and mapped the initial list of priority areas within each of the selected geographic landscapes or regions.</p>	<p>FWS, NOAA</p>	<p>Within Two Years</p>	<p>19</p>
<p>4. Fighting the Introduction and Spread of Invasive Species</p> <p>a. Within 12 months, the Secretary of the Interior, working with other members of the National Invasive Species Council, including Department of Commerce (NOAA), EPA, and USDA, will work with states and tribes to develop a framework for a national Early Detection and Rapid Response (EDRR) program that will build on existing programs to assist states and tribes in forestalling the stress caused by the establishment and spread of additional invasive species populations, thereby improving the resilience of priority landscapes and aquatic areas.</p> <ul style="list-style-type: none"> This will include the development of a plan for creating an emergency response fund to increase the capacity of interagency and inter-jurisdictional teams to tackle emerging invasive species issues across landscapes and jurisdictions. 	<p>Secretary of the Interior, National Invasive Species Council (DOC/NOAA, EPA, USDA)</p>	<p>Within 12 months</p>	<p>20</p>

STRATEGY I: FOSTER CLIMATE-RESILIENT LANDS AND WATERS



STRATEGIES AND PRIORITY ACTIONS	Lead Federal Agency and Supporting Agencies	Target Completion Date	Page
<p>5. Evaluate and Learn from Ongoing Resilience Efforts to Inform Future Actions</p> <p>a. Within 6 months of the release of this agenda, agencies to include DOI, USDA, NOAA, U.S. Army Corps of Engineers (USACE), Department of Defense (DOD), and EPA will identify programs for resilience evaluation. Such evaluations will include:</p> <ul style="list-style-type: none"> • Developing resilience metrics and, • Evaluating whether investments produce resilience benefits for the resources and surrounding communities. 	<p>DOI, USDA, NOAA, USACE, DOD, EPA</p>	<p>Within 6 months</p>	<p>20</p>
<p>6. Working with International Partners to Foster Resilience in the Arctic, U.S. Territories and Freely Associated States</p> <p>a. Federal agencies that have partnered to advance a landscape-scale approach to management, called Integrated Arctic Management, will work closely with the Department of State to promote a suite of community and ecosystem resilience measures as part of the program for the United States Chairmanship of the Arctic Council, a two-year term to begin in April 2015.</p> <p>b. DOI will update funding programs to the U.S. Territories and Freely Associated States - islands with acute vulnerability to sea level rise - to enhance climate resilience through the development of climate adaptation plans and other efforts.</p>	<p>Department of State, DOI</p>	<p>April 2017</p>	<p>21</p>

STRATEGY II: MANAGE AND ENHANCE U.S. CARBON SINKS



STRATEGIES AND PRIORITY ACTIONS	Lead Federal Agency and Supporting Agencies	Target Completion Date	Page
<p>1. Improve Inventory, Assessment, Projection and Monitoring Systems for Important Carbon Sinks</p> <p>a. USDA, with input from and review by EPA, the State Department, and DOI, will establish a robust capacity to provide projections of greenhouse gas emissions and carbon sequestration from agricultural and forest lands on a biennial basis to support planning, analysis, and reporting under the United Nations Framework Convention on Climate Change.</p> <p>b. USDA, with input from EPA and other agencies (DOI, NASA, and NOAA), will reduce uncertainties in land-use related emission and sink estimates in the Nation's annual greenhouse gas inventory and better link these estimates to projections through:</p> <ul style="list-style-type: none"> • Strengthening the collection, coordination and assessment of field inventory data through the Forest Inventory and Analysis (FIA) Program, the Natural Resources Inventory (NRI), and other surveys of terrestrial condition, and • Integrating the latest Multi-Resolution Land Characteristics (MRLC) consortium land-cover and land-area change estimates and other surveys of terrestrial condition, as appropriate. <p>c. USDA will also work collaboratively with EPA, DOI, and other agencies to address potential missing anthropogenic emissions and sinks in the national greenhouse gas inventory.</p> <p>d. USDA will evaluate the current carbon sequestration contribution of Federal grasslands and agroforestry systems (wind breaks, shelter belts, riparian buffers, etc.).</p> <p>e. The USGS, USACE, and USDA will support efforts toward completion of the first-ever assessment of the ecosystem carbon stocks and anthropogenic emissions and sequestration rates in Alaska.</p> <p>f. NOAA will assess the role that coastal ecosystems play in terms of their anthropogenic emissions and carbon sink potential including an initial assessment of land cover for salt marsh, mangroves, and seagrasses.</p> <p>g. All of the above improvements will be consistent with applicable methodological guidelines from the Intergovernmental Panel on Climate Change (IPCC) and reporting requirements under the United Nations Framework Convention on Climate Change (UNFCCC).</p>	<p>USDA, EPA, State Department, DOI, USGS, USACE, NOAA, NASA</p>		<p>28</p>

STRATEGY II: MANAGE AND ENHANCE U.S. CARBON SINKS



STRATEGIES AND PRIORITY ACTIONS	Lead Federal Agency and Supporting Agencies	Target Completion Date	Page
<p>2. Develop Estimates of Baseline Carbon Stocks and Trends to Inform Federal Natural Resources Management</p> <p>a. Within 18 months, agencies with Federal natural resource stewardship responsibilities will use the best-available information and methods to develop initial baseline estimates of carbon stocks and trends at local or regionally-appropriate levels for lands and waters within their jurisdiction. Stock and trend information will better enable managers and the public to consider the relationships between carbon storage and other management objectives. Methods will be consistent with applicable methodological guidelines from the IPCC and reporting requirements under the UNFCCC.</p> <p>b. By the end of calendar 2015, the USGS will enhance landcarbon.org by covering all 50 states and including a new carbon calculator that allows for interactive tradeoff analysis.</p> <p>c. Further, USGS will complete a study for the Greater Yellowstone Ecosystem that examines the effects of protected areas and conservation policies on long-term carbon sequestration.</p> <p>d. The USGS, in cooperation with University of California at Berkeley, is also developing a large data management and visualization tool for delivering carbon sequestration data to users at the national scale. This effort, highlighted in the President's Climate Action Plan, focuses on enhancing data delivery and communication using advanced web-based visualization tools. The tool allows users to interactively estimate carbon management tradeoffs in an online and downloadable format.</p>	<p>USGS</p>	<p>Within 18 months</p>	<p>29</p>

STRATEGY II: MANAGE AND ENHANCE U.S. CARBON SINKS



STRATEGIES AND PRIORITY ACTIONS	Lead Federal Agency and Supporting Agencies	Target Completion Date	Page
<p>3. Promote Forest Conservation and Restoration, Complementary Markets for Sustainably Harvested Wood Products, and Urban Forestry</p> <p>a. USDA and the DOI will provide support for programs that foster forest conservation and retention, and where possible, align these programs around “climate-smart” projects that advance carbon mitigation and adaptation in the context of management objectives. The agencies will incorporate climate resilience evaluation criteria for relevant forest and land and water conservation programs such as the Forest Legacy Program, Land and Water Conservation Fund (LWCF), Community Forest Program, the Agricultural Land Easement Program, Wetlands Reserve Program, and the Healthy Forest Reserve Program.</p> <p>b. USDA will also continue to make investments to advance wood in building and wood energy use—bolstering incentives for retaining and restoring forests—through providing life cycle analysis and technical and financial assistance.</p> <p>c. Within 6 months, USDA will launch the U.S. Tall Wood Building Competition to spur increased sustainability in construction and will give priority to applicants that source materials from rural domestic manufacturers and domestic, sustainably-managed forests. By some estimates, incorporation of wood building systems in buildings 7-15 stories tall could offset the equivalent of 1.6-2.5 million passenger vehicles off the road for one year, while also supporting healthy forests and rural manufacturing opportunities.</p> <p>d. In 2015, the Forest Service will work with the Federal Urban Waters Partnership, states, and local partners to target urban forestry investments that support: increased carbon sequestration; reduced energy consumption and greenhouse gas emissions; enhanced urban air quality; resilience from insects and disease; clean water quality and quantity needs; and bioenergy from urban wood waste to off-set fossil fuel usage.</p>	<p>USDA, DOI</p>	<p>Within 2015</p>	<p>29</p>

STRATEGY II: MANAGE AND ENHANCE U.S. CARBON SINKS



STRATEGIES AND PRIORITY ACTIONS	Lead Federal Agency and Supporting Agencies	Target Completion Date	Page
<p>4. Support Forest Conservation and Investment Tax Provisions as a Means to Retain and Restore Forests</p> <p>a. The Administration will continue to support key tax provisions for maintaining forest carbon, including provisions such as:</p> <ul style="list-style-type: none"> • Deduction for Forest Management Expenses as Means to Retain and Restore America’s Forests • Tax Incentive for Reforestation • Capital Gains Treatment of Timber Income as an incentive to Retain Working Forests • Federal Tax Deduction for Conservation Easements 	Administration		30
<p>5. Support Voluntary, Incentive-driven Emissions Reductions from Working Agricultural Lands that Provide Co-benefits for Farm Productivity and Resilience</p> <p>a. USDA will target Farm Bill conservation programs to provide incentives for voluntary emissions reductions from America’s farmers and ranchers that also support other important co-benefits for landowners and the public. While the agriculture sector makes a relatively small contribution to total annual U.S. greenhouse gas emissions, the sector is capable of offering low-cost, verifiable emissions reductions through the voluntary implementation of conservation practices. Many of these conservation practices also improve efficiency and productivity, reduce operation costs, foster resilience for businesses and natural resources, and alleviate pressures on other land-uses.</p> <p>b. USDA will improve conservation technical assistance and delivery of practices that reduce emissions and build resilience through programs such as the Environmental Quality Incentives Program (EQIP), the Agricultural Conservation Easement Program (ACEP), and Conservation Innovation Grants (CIG). Specific practices include:</p> <ul style="list-style-type: none"> • Prioritizing farming systems and conservation practices that build soil organic matter, increase carbon sequestration, and prevent denitrification; • Encouraging practices that reduce methane emissions, especially in livestock systems; • Prioritizing conservation easement and restoration programs on lands that currently provide climate and other resilience benefits (e.g., prairie grasslands, wetlands, rangelands) • Promoting on-farm energy conservation, increased energy efficiency, and renewable energy production; • Encouraging transition to systems that keep the land in sod and other perennial vegetation, and support sustainable rangeland management practices that enhance carbon sequestration; and • Partnering with states, farmer groups, the private sector, and non-governmental organizations to facilitate investments in agricultural-based emission reductions that are additional, quantifiable, and verifiable. 	USDA		30

STRATEGY II: MANAGE AND ENHANCE U.S. CARBON SINKS



STRATEGIES AND PRIORITY ACTIONS	Lead Federal Agency and Supporting Agencies	Target Completion Date	Page
<p>6. Assess, Restore, and Protect Coastal Habitats to Understand and Enhance the Storage of Blue Carbon</p> <p>a. Improve understanding of carbon storage and cycling in coastal ecosystems:</p> <ul style="list-style-type: none"> • NOAA will generate baseline information on the role that coastal ecosystems play in terms of their emissions and carbon sink potential. This baseline would include an initial assessment of land cover for salt marsh, mangroves, and seagrasses, as well as best estimates of sequestration and storage in these different ecosystem types. • NOAA and partners will quantify marsh soil organic carbon content at eight NERRS sites across the United States to fill critical gaps in estimates of current carbon storage across a range of marsh types, and to improve the methodology upon which many of these existing estimates are made. • NOAA and EPA, working through the Commission for Environmental Cooperation, will build a North American community of practice for advancing understanding and management of blue carbon ecosystems by supporting the development of methodologies to measure carbon, compile maps, and conduct scientific studies to improve our understanding of the current and future role of coastal systems in the North American carbon cycle. • NOAA and EPA will coordinate participation by other Federal agencies with coastal resource management responsibilities in this effort. <p>b. Determine the value of protecting coastal habitats to safeguard carbon services:</p> <ul style="list-style-type: none"> • NOAA and FWS, working with other Federal, state, and other partners, will identify and support key restoration projects that can increase coastal blue carbon sinks, both terrestrial and aquatic. For example, NOAA is supporting a pilot demonstration project in Tampa Bay, Florida to demonstrate the value of different blue carbon habitats in different regions of the United States. • NOAA will also support up to four local landscape assessments, and associated workshops, on different blue carbon habitats to demonstrate the added benefits of coastal carbon values to specific restoration and protection goals. • EPA will build on the pilot project in Tampa Bay – one of 28 National Estuary Programs – and support assessment of GHG benefits associated with carbon sequestration with the goal of sharing algorithms and methods with estuaries that are part of the National Estuary Program. • USGS will collaborate with DOI resource management agencies to provide science support for wetland management and restoration actions. As more wetlands are restored and protected, the USGS will be able to measure and estimate the effects of management to enhance carbon sequestration and resilience of the ecosystems to climate change. 	<p>NOAA, EPA, FWS, USGS, DOI</p>	<p>Within two years</p>	<p>31</p>

STRATEGY III: ENHANCE COMMUNITY PREPAREDNESS AND RESILIENCE BY UTILIZING AND SUSTAINING NATURAL RESOURCES



STRATEGIES AND PRIORITY ACTIONS	Lead Federal Agency and Supporting Agencies	Target Completion Date	Page
<p>1. Partner with Communities to Enhance Resilience to Natural Hazards Risks</p> <p>a. Strengthen support for state, tribal and local flood preparedness:</p> <ul style="list-style-type: none"> In 2015, FEMA will strengthen its grant guidance to encourage use of natural infrastructure to reduce flood mitigation risk, while NOAA, USGS, and other agencies will develop tools to support smart development decisions within floodplains and along coasts. <p>b. Expand partnerships to reduce wildfire risk and protect community infrastructure:</p> <ul style="list-style-type: none"> USDA and DOI will restore resilience of priority landscapes where critical resource values are at high risk from wildfire. Advancing the National Cohesive Wildland Fire Strategy, Federal land managers will expand multi-jurisdictional partnerships, such as the Western Watershed Partnership and the Joint Chiefs' Initiative, aimed at reducing hazardous fuels and protecting community water supplies and other critical infrastructure. The Forest Service will partner with states to implement new provisions in the 2014 Farm Bill that reduce threats from wildfire, insects and disease and bolster forest restoration, across all land ownerships. Additionally, through the 21st Century Conservation Service Corps, USDA and DOI will engage nearly 10,000 youth and veterans to accomplish critical restoration work on public lands through watershed restoration, hazardous fuel reduction, and other important projects. 	<p>FEMA, NOAA, USGS, USDA, DOI, Forest Service</p>	<p>Within 2015</p>	<p>40</p>

STRATEGY III: ENHANCE COMMUNITY PREPAREDNESS AND RESILIENCE BY UTILIZING AND SUSTAINING NATURAL RESOURCES



STRATEGIES AND PRIORITY ACTIONS	Lead Federal Agency and Supporting Agencies	Target Completion Date	Page
<p>2. Address Performance Measurement and Benefits Assessment Challenges to Natural Infrastructure</p> <p>a. In 2015, the Administration will address barriers to investment and implementation of natural infrastructure solutions by improving measurement and evaluation of natural infrastructure. All of the following actions address <i>Hurricane Sandy Rebuilding Strategy - recommendation #22</i>:</p> <ul style="list-style-type: none"> • Develop an Actionable Research Agenda: <ol style="list-style-type: none"> 1. The EOP will lead the development of a research agenda to address emerging and persistent methodological challenges and other barriers for the Federal government’s integration of ecosystem services into resilience efforts. The research agenda will identify key knowledge gaps, particularly those associated with valuation, and outline needs and opportunities for addressing these gaps. • Issue Federal Guidance on Ecosystem Services Assessment: <ol style="list-style-type: none"> 1. The Administration will develop guidance to bring high-level visibility and support for the use of ecosystem services assessment methods where appropriate and practicable. By providing this guidance to Federal agencies, the Administration will encourage the use of sound approaches to assessing ecosystem services and integration of assessment into Federal decision making. • Launch Natural Infrastructure Tools and Resources Website: <ol style="list-style-type: none"> 1. CEQ, NOAA, and USGS will partner with Federal agencies to develop a single web portal that would collect existing online tools and resources on natural infrastructure to support Federal, State, tribal and local decision-makers. This website will leverage other agency and interagency efforts. • Conduct Program Evaluation of Resilience Investments: <ol style="list-style-type: none"> 1. As noted on page ##, DOI will verify performance metrics and evaluate the performance of \$300 million in Hurricane Sandy Supplemental resilience investments, which includes \$100 million in external grants for natural infrastructure and other nature-based solutions. 2. NOAA is also providing \$300,000 toward a trade-off analysis to develop estimates of the economic value associated with Sandy-related restoration work. This will inform future Federal community resilience investments in natural infrastructure. 	<p>EOP, CEQ, NOAA, USGS, DOI, Administration</p>	<p>Within 2015</p>	<p>41</p>

STRATEGY III: ENHANCE COMMUNITY PREPAREDNESS AND RESILIENCE BY UTILIZING AND SUSTAINING NATURAL RESOURCES



STRATEGIES AND PRIORITY ACTIONS	Lead Federal Agency and Supporting Agencies	Target Completion Date	Page
<p>3. Expand Collaboration and Technical Assistance to Help Communities Implement Green Infrastructure for Stormwater Solutions</p> <p>a. EPA, along with HUD, DOT, USDA, DOI, DOD, and DOE recently announced the development of a broad-based, multi-sector Green Infrastructure Collaborative. The Collaborative will help communities better manage stormwater and more rapidly adopt low impact development techniques. In support of this initiative, in 2015 EPA will provide technical assistance to at least 25 communities while also disseminating information to support local adoption of such stormwater practices. This initiative will:</p> <ul style="list-style-type: none"> • Provide on-the-ground support to communities to more fully realize their green infrastructure objectives; • Create a network of public, private, and NGO participants to leverage the full range of information and resources; • Align Federal resources to help local communities integrate green infrastructure planning into broader community development efforts, including through transportation systems (e.g., complete streets) and parks/open spaces; • Provide tools and training for communities to build local capacity around resiliency and sustainable water infrastructure; • Recognize innovative green infrastructure projects and foster information sharing about innovative approaches; • Lead by example by installing and supporting green infrastructure to demonstrate the suite of benefits that these approaches can provide; and • Create a network of organizations that can mobilize resources and develop the strategies for implementing green infrastructure for a range of community objectives. 	<p>EPA, HUD, DOT, USDA, DOI, DOD, DOE</p>	<p>Within 2015</p>	<p>42</p>

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STRATEGIES AND PRIORITY ACTIONS	Lead Federal Agency and Supporting Agencies	Target Completion Date	Page
<p>4. Promote Drought Resilience and Enhance Water Use Efficiency, Water Reuse and Water Supply</p> <p>a. Federal agencies will work with communities to protect and extend limited water supplies; actions include:</p> <ul style="list-style-type: none"> • USDA will invest in irrigation efficiency and management strategies to address groundwater depletion and will improve drought and snowpack monitoring. • The EPA WaterSense program will increase the efficient use of water so that the greenhouse gas reductions resulting from the reduced use of energy to move and heat water increase from 7 million metric tons of CO2 equivalent per year in 2011 to 23 million metric tons per year in 2018. • USACE will incorporate climate considerations into water reallocation strategies. • Bureau of Reclamation will continue to incorporate climate change considerations throughout its programs and policies as it carries out its mission to develop, manage and protect water and related resources in an environmentally and economically sound manner. Reclamation's WaterSMART Program is well positioned to address near-term impacts of climate change via the competitive grants provided to non-Federal partners under the program. The Basin Study component of the WaterSMART Program provides an effective process through which Reclamation will continue to work with study partners to identify and develop adaptation strategies to meet future water supply needs. In addition to this effort, Reclamation will assist its study partners with the technical expertise, planning support, science, and tools needed to advance adaptation strategies that can be implemented by non-Federal stakeholders. • USGS will begin a series of projects to understand the impacts of drought on fish and wildlife species. • In 2015, NOAA's National Weather Service National Water Center, with partners, will begin development of a national water model that will improve water prediction capability to optimize communities' use of increasingly limited water resources. • In 2015, USDA will use Farm Bill programs to support conservation practices and technologies that build drought resilience. Through planned research, USDA will also enhance food security through analyzing improved crops and plant breeding tools with increased resilience to heat and drought; developing systems to model and test climate change scenarios' impact on animal, food, and waterborne diseases and pests; and by researching drought impacts to nutritional composition and quality of food. • The interagency National Integrated Drought Information System (NIDIS) will work to broaden its regional drought early-warning information capabilities in partnership with Federal agencies, states, tribes, and communities across the Nation. 	<p>USDA, EPA, USACE, DOI, NOAA, NIDIS</p>	<p>2015-2018</p>	<p>42</p>

STRATEGY III: ENHANCE COMMUNITY PREPAREDNESS AND RESILIENCE BY UTILIZING AND SUSTAINING NATURAL RESOURCES



STRATEGIES AND PRIORITY ACTIONS	Lead Federal Agency and Supporting Agencies	Target Completion Date	Page
<p>5. Establish Federal Agency Support Teams for Climate Resilient Water Resources Based on the WestFAST Model</p> <p>a. Federal agencies will work with state, tribal and local partners to identify appropriate regional associations dealing with water resources management and develop Federal agency support teams, comparable to the existing WestFAST partnership wherein Federal agencies embed a dedicated Federal liaison to work with the Western states on issues of common concern. This highly efficient approach saves both Federal and state partners time and money and ensures that a high level of coordination takes place.</p>			43
<p>6. Build Regional Capacity for Natural Resource Disaster Recovery and Restoration in the Pacific Islands</p> <p>a. Within 18 months, NOAA, USGS, and FWS will produce a regional handbook for natural resource and emergency managers for the Pacific Islands Region. Developed in collaboration with Pacific Islands partners, the handbook will document recent policy and capacity developments and lessons learned to address challenges associated with managing natural resources in the context of more frequent and severe extreme events.</p>	NOAA, USGS, FWS	Within 18 months	44
<p>7. Strengthen the Resilience of Coastal Resources and Communities to Extreme Events</p> <p>a. In 2014, NOAA will launch new coastal resilience research projects to provide coastal communities and businesses with better information and tools to identify risks and increase resilience, and in 2015, proposes to create a new competitive grants program to fund collaborative projects that increase coastal communities' and economies' resilience.</p> <p>b. In coordination with USACE and other relevant Federal agencies, NOAA will provide resources and technical assistance to state, tribal, local, and private sector partners to enhance the use of natural infrastructure to address storm surge, sea-level rise, and other stressors on coastal communities and ecosystems; NOAA plans to pilot a water-level inundation "dashboard" to facilitate decision-making concerning flooding and storm events through scenarios that include how the flooding will impact the natural and built environment.</p>	NOAA, USACE	2014-2015	44

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STRATEGIES AND PRIORITY ACTIONS	Lead Federal Agency and Supporting Agencies	Target Completion Date	Page
<p>8. Prepare for Climate Impacts on Fish Stocks and Fishing-dependent Communities</p> <p>a. In 2015, NOAA will help fishing-dependent communities prepare for climate impacts on fish stocks by:</p> <ul style="list-style-type: none"> • Completing climate vulnerability assessments for major commercial and recreational marine fish stocks; • Helping communities undertake risk assessment and adaptation planning; • Conducting collaborative research on climate variability and change on fish stocks and fisheries in the U.S. Northeast Shelf Large Marine Ecosystem; and, • Establishing Resilient Fishing Communities Demonstration Projects to provide technical assistance to fishing-dependent communities in risk assessment and adaptation planning. <p>b. NOAA also proposes to increase investment in its Ecological Forecasting Roadmap to include resilience related activities, such as connecting how living marine resources respond to changes in coastal and marine habitats, and to launch a new coastal ocean acidification modeling initiative to help resource managers and coastal communities better understand and prepare for impacts of changing chemical conditions on commercially important fishery species.</p>	<p>NOAA</p>	<p>Within 2015</p>	<p>44</p>
<p>9. Foster Innovation and Recognize Leadership</p> <p>a. Prize competitions</p> <ul style="list-style-type: none"> • Under the authority of the America Competes Reauthorization Act of 2010, the Administration will provide incentives and opportunities for the private sector and public to share creative solutions to natural resource and community resilience challenges through one or more prize competitions focused on flooding, storm surge, wildfire, drought, or other key challenges • Within six months, USDA will launch a U.S. Tall Wood Building Competition to spur use of sustainable forest products in construction • In 2015, Bureau of Reclamation will launch its Water and Power Solutions Technology Challenges program, including a water purification technology challenge <p>b. Leadership awards</p> <ul style="list-style-type: none"> • To point to success and encourage replication of climate smart practices, the Administration will also establish a Climate Resilience Leaders award to recognize Federal, tribal, state, and local leadership in advancing the resilience of natural resources and the communities that depend on them. 	<p>USDA, DOI</p>	<p>Within 2015</p>	<p>45</p>

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STRATEGIES AND PRIORITY ACTIONS	Lead Federal Agency and Supporting Agencies	Target Completion Date	Page
<p>10. Provide Policies, Data, and Tools to Facilitate Smart Restoration and Conservation Investments</p> <p>a. Develop a community resilience index</p> <ul style="list-style-type: none"> In 2014, FEMA will begin work with NOAA, NIST, and insurers to identify or develop a community resilience index that considers environmental, economic, and social resilience. This work will focus on economic and social components, in particular infrastructure, and will incorporate data and ecosystem information developed through DOI and NOAA efforts to measure progress on resilience through restoration. By 2015, this work will produce a set of key indicators and an initial index methodology for implementation. <p>b. Implement modernized Principles, Requirements, and Guidelines (PR&G) for Federal investments in water resources</p> <ul style="list-style-type: none"> Under the new PR&G, agencies will evaluate the full range of costs and benefits of proposed actions, to more broadly consider how water resource investments impact the economy, environment, and local communities. By considering the environmental impacts of proposed actions, this improved approach to cost benefit analysis will better account for the benefits nature-based solutions provide. The Administration is nearing the implementation of the new PR&G, to the extent permissible under current law. In 2014, the Administration will release Interagency Guidelines (IG), followed by the finalization of Agency Specific Procedures to implement the PR&G. Agencies will lead an effort in 2015 to fully implement these modernized criteria for climate-resilient water resource investments. 	<p>FEMA, EPA, NOAA, NIST, DOI</p>	<p>2014-2015</p>	<p>45</p>

STRATEGY IV: MODERNIZE FEDERAL PROGRAMS, INVESTMENTS, AND DELIVERY OF SERVICES TO BUILD RESILIENCE AND ENHANCE CARBON SEQUESTRATION



STRATEGIES AND PRIORITY ACTIONS	Lead Federal Agency and Supporting Agencies	Target Completion Date	Page
<p>1. Modernizing Federal Programs:</p> <ul style="list-style-type: none"> a. Incorporate resilience into natural resources planning and management: <ul style="list-style-type: none"> • Within 12 months, Federal agencies with natural resource responsibilities or whose activities impact natural resources will develop best practices for applying resilience criteria to program management, practices, training, and investments, and institute policies that ensure such practices are implemented. b. Modernize land acquisition, and natural resource financial assistance programs to address resilience needs: <ul style="list-style-type: none"> • Within 12 months, Federal agencies that administer these programs will develop best practices for applying resilience criteria to them, and develop policies for implementing these practices. c. Implement policies, procedures, and performance metrics for considering biological carbon in Federal natural resource management practices: <ul style="list-style-type: none"> • In addition to actions outlined in Chapter #, , within 12 months Federal land, water and coastal management agencies will develop agency-specific principles and guidance for considering biological carbon in management and planning decisions. Such guidance shall acknowledge the importance of sustaining long-term ecosystem function and resilience over short-term accounting for carbon changes, consider carbon within the context of other management objectives and ecosystem service goals, and integrate carbon considerations as part of a balanced and comprehensive program of sustainable management and climate change adaptation. d. Lead by example at Federal facilities: <ul style="list-style-type: none"> • Federal agencies will lead by example by employing best practices in ensuring resilient natural systems and built infrastructure at Federal facilities and lands. • Within 12 months, each Federal agency will identify a small number of exemplary facilities and resource management activities that demonstrate cutting edge resiliency efforts, such as use of natural infrastructure, documenting the “best of best practices”. • Where appropriate, Federal agencies will enhance their visitation, education, and outreach activities to encourage emulation of these practices more broadly in the public and private sectors. e. Status update: <ul style="list-style-type: none"> • Within 12 months, Federal agencies will provide the Council on Climate Preparedness and Resilience with a status update on progress-to-date in modernizing programs as described above. 		<p>Within 12 months</p>	<p>51</p>

STRATEGY IV: MODERNIZE FEDERAL PROGRAMS, INVESTMENTS, AND DELIVERY OF SERVICES TO BUILD RESILIENCE AND ENHANCE CARBON SEQUESTRATION



STRATEGIES AND PRIORITY ACTIONS	Lead Federal Agency and Supporting Agencies	Target Completion Date	Page
<p>2. Provide Regional Resilience Information and Services to Meet the Needs of American Communities</p> <p>a. Within 12 months, NOAA, USDA, and DOI, in coordination with other Federal agencies that support regional resilience, will improve customer service by providing an online “front door” to the array of regional information, services, and tools available, using the National Climate Assessment regions as a consistent framework or “inroad” for communities and the public.</p> <ul style="list-style-type: none"> • These agencies will also develop a networked approach whereby access to any one agency’s regional services will provide a clear path to the others. This will include an online directory of regional experts, services, and tools. This work will include coordinated development of priorities and plans for investments in research and tools in each region that will assure effective use of limited resources. <p>b. Within 12 months, each USDA Hub will pursue a set of partnerships with Cooperative Extension university partners and other stakeholders to better understand the local and regional challenges posed by climate change and to develop and deliver guidance on climate resilient management strategies to farmers, ranchers and other landowners.</p> <p>c. In 2015, NOAA plans to increase support for its RISA teams who work with resource managers and planners to develop and utilize new information about the impacts of climate on communities, natural and managed resources, infrastructure, transportation, and health. Two new regions, the Mid-Atlantic and the Midwest, adding to the current number of eleven, would be competitively awarded funding under this augmentation.</p>	<p>NOAA, USDA, DOI</p>	<p>Within 12 months</p>	<p>52</p>
<p>3. Identify Science and Service Regional Priorities to Build Resilience</p> <p>a. By early 2015, following the methods of drought outlook forums convened by NIDIS, NOAA, USDA, and DOI will convene at least three regional collaborative discussions with resource managers, decision-makers, and others, to identify and anticipate science and service priorities in light of unfolding climate related events, such as droughts and floods resulting from the potential El Niño, or disasters such as Atlantic hurricanes and tropical storms.</p> <p>b. Partners will work collaboratively to develop tools, provide information and planned engagement, and inform investment around these unfolding climate-related events.</p>	<p>NIDIS, NOAA, USDA, DOI</p>	<p>Early 2015</p>	<p>53</p>

STRATEGY IV: MODERNIZE FEDERAL PROGRAMS, INVESTMENTS, AND DELIVERY OF SERVICES TO BUILD RESILIENCE AND ENHANCE CARBON SEQUESTRATION



STRATEGIES AND PRIORITY ACTIONS	Lead Federal Agency and Supporting Agencies	Target Completion Date	Page
<p>4. Train Inform Resource Managers and Stakeholders on Climate Resilience</p> <p>a. By 2015, NOAA, USDA, and DOI, in cooperation with other Federal agencies, will define a framework for education and training to build climate literacy and capability among relevant Federal agency staff and technical service providers, such as planners, engineers, and consultants.</p> <ul style="list-style-type: none"> The framework should include assessing climate literacy in Federal agencies, and developing partnerships with non-profit or professional groups to promote climate resilience outreach, education, training, certification, and engagement of academic training capability. <p>b. In 2014, a coalition of Federal and State agencies and nongovernmental partners released a <i>Climate Smart Conservation Guide</i> to safeguarding vital natural resources in a changing climate.</p> <ul style="list-style-type: none"> The guide provides natural resource managers with state-of-the-art information and tools to assess risks and design effective resource management efforts that incorporate and respond to climate-related changes in U.S. ecosystems. Over the next year and beyond, the guide will be used by the FWS National Conservation Training Center to train hundreds of natural resource managers across the country in climate smart conservation. <p>c. Building off these efforts, Federal natural resource agencies will work to enhance their efforts to integrate climate information and communications into place-based stewardship.</p> <ul style="list-style-type: none"> This will provide enhanced and informed visitor education on the impacts of climate change upon the lands and waters managed by the Federal government, including National Parks, National Wildlife Refuges, National Forests, National Marine Sanctuaries, and other sites which collectively receive 938 million visits a year. <p>d. In 2014, the National Park Service will complete development of a Natural Resource Career Field Academy online climate change module to help resource professionals understand key climate change related issues and explore adaptation and planning options.</p>	<p>NOAA, USDA, DOI</p>	<p>2014-2015</p>	<p>54</p>

STRATEGY IV: MODERNIZE FEDERAL PROGRAMS, INVESTMENTS, AND DELIVERY OF SERVICES TO BUILD RESILIENCE AND ENHANCE CARBON SEQUESTRATION



STRATEGIES AND PRIORITY ACTIONS	Lead Federal Agency and Supporting Agencies	Target Completion Date	Page
<p>5. Prepare Indigenous Communities for the Impacts of Climate Change</p> <ul style="list-style-type: none"> a. DOI will place five tribal Climate Extension Support Liaisons in the Climate Science Centers, as part its Federal-Tribal Climate Resilience Partnership and Technical Assistance Program b. The five regional tribal liaisons will also support tribal workshops, practitioner working groups, and regional training needs. Liaisons will be contracted to tribal organizations to ensure strong ties to tribal practitioners and further enhance tribal capacity c. Within 12 months, the USDA-Forest Service will develop at least one flagship tribal partnership in every Forest Service Region, to develop and implement climate adaptation strategies for tribal lands and adjacent National Forests d. In 2015, NOAA proposes to increase efforts to provide fisheries and other decision makers in the Alaska region with information on climate impacts on major fish stocks and protected species, and implement a distributed biological observatory to improve understanding of how climate and human-induced change are affecting subsistence cultures and the environment in the Arctic 	<p>DOI, USDA-Forest Service, NOAA</p>	<p>Within 12 months</p>	<p>55</p>

Appendix B: Climate Natural Resources Working Group Members

CLIMATE & NATURAL RESOURCES WORKING GROUP



GROUP MEMBERS

Council on Environmental Quality

Department of Agriculture

Department of Defense

Department of the Interior

Environmental Protection Agency

Federal Emergency Management Agency

National Oceanic and Atmospheric Administration

Office of Management and Budget

U.S. Army Corps of Engineers