Climate Change Executive Order 13653:
U.S. Fish and Wildlife Service Response to Template 1 Questions

1. **The new EO calls for modernizing Federal programs to support climate resilient investment; managing lands and waters and providing information data and tools for climate preparedness and resilience; and planning for risk.**

   Remove or reform barriers that discourage investments to increase the Nation's resilience to climate change.

   FWS Regions and Programs have identified a number of opportunities to remove or reform barriers that discourage investments that might enhance resilience to climate change. These include the need to better prioritize the acquisition and protection of water rights for trust resources (R6);[1] streamlining land acquisition procedures (R4); and facilitating the pooling of resources across agencies for common needs (R2). In addition, the Service conducted an internal survey of laws, regulations and policies that might need reviewed in light of climate change (copy attached). While the survey is now several years old, it did provide a valuable perspective on the relative importance and urgency the Service Programs and Regions placed on the climate worthiness of the major policies and authorities the Service uses to achieve its mission. Of highest importance according to the survey were policies on habitat acquisition, best available science and the Coastal Barriers Resources Act.

   Reform policies and funding programs that may increase vulnerability of natural or built systems, economic sectors, natural resources, or communities to climate change risks.

   The major needs identified here by Service Regions and Programs were to: (1) amend the injurious wildlife regulations (50 CFR part 16) to streamline the process for identifying, listing and managing injurious wildlife (FAC and R1); and (2) better balancing the allocation of wildfire funding between proactive (i.e., prescribed fire and fuel treatments) versus reactive (firefighting) approaches (R2). In addition, ES and R2 highlighted the importance of the Coastal Erosion and Planning Response Act (CEPRA) and the Coastal Impact Assistance Program (CIPA) in addressing issues of sea level rise. CEPRA is still funded, but CIAP has not been (reauthorized/appropriated) by Congress.

   Support climate-resilient investments by States, local communities, and tribes, including through grants and technical assistance.

   The Service actively seeks opportunities to partner with States, local communities, and tribes when it can further our conservation mission. There are numerous examples across the country, especially of coastal refuges working with state and/or local, and/or tribal partners to undertake

[1] Abbreviations in parentheses refer to the Region or Program that identified the item. More details can be found in that Program's or Region's section of the compendium of responses received. R1-8 refers to FWS geographic regions. Program abbreviations are as follows: Ecological Services (ES), Fisheries and Aquatic Conservation (FAC) Migratory Birds (MB), National Wildlife Refuge System (NWRS), Office of the Science Advisor (OSA), Wildlife and Sport Fish Restoration (WSFR)

stewardship investments and/or management activities intended to lessen the impacts of sea level rise on the refuge to both its benefit and that of the local community. Examples include work at the Backwater NWR in Virginia (R5), Alligator River NWR in North Carolina (R4), Texas Coastal Refuges (R2), and Seal Beach NWR in California (R8), and others.

In addition to the type of direct climate-resilient investments being made by our Refuges and other facilities, the Service is also introducing climate change considerations into some of its grant and technical assistance programs. Examples include incentives in the competitive portion of the State and Tribal Wildlife Grants Program for the inclusion of climate change considerations in the revision of State Wildlife Action Plans (WSFR), using climate change considerations in projects funded under the National Fish Habitat Partnership (R2) and in Cooperative Endangered Species Conservation Fund (Section 6) grants to the States (ES).

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

The Service has hosted at least one Tribal training course on climate change (R8).

Work across agency lines and with USGCRP to develop and provide authoritative, easily accessible, usable, and timely data, information, and decision-support tools;

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

- Developing inventory, monitoring or observation networks (R7)
- Building geospatial databases, including climate related information (R2, R5, R8)
- Modelling sea level rise (R2, R4)
- Assessing climate change impacts on species and ecosystems (R5
- Conducting vulnerability assessments for species and ecosystems (R2, R3, R4, R5, R7, R8
- Building species distribution models under climate change (R2
- Developing information management systems (R2
- Creating various tools for detecting climate impacts, or selecting adaptation strategies (R5, R8)
- Developing species, habitat, and landscape conservation plans (R5, R8)

Identify and assess climate change related impacts on and risks to the agency's ability to accomplish its missions, operations, and programs.

As noted above much of the Service's effort in these areas is being carried out by the LCCs through impact assessments and vulnerability analyses (VAs), but certain Programs or Regions are also conducting such work. Specific examples include:

- Refuges is finalizing a Strategic Growth Policy for the NWRS which specifies that project proposals must evaluate vulnerability to climate change and other stressors. In a demonstration of how this might be done in an integrated fashion, R1, in collaboration with the Great Northern LCC, is supporting a partnership-driven, science-based, technologically-advanced landscape conservation design for the Columbia Plateau Ecoregion that will incorporate climate change analyses along with other stressors to conservation targets selected through the surrogate species approach (R1).
- The Endangered Species Program ensures that climate change considerations are included in a wide variety of analyses and decisions under the Endangered Species Act (ESA), including in listing, critical habitat designations, recovery planning, consultation, and other aspects of ESA implementation (ES).
- The National Wetland Inventory, although not originally intended to address climate change, is now proving a vital resource for many planning entities dealing with sea level rise or other forms of flooding (ES).
- R1 has piloted vulnerability assessments for the Winthrop National Fish Hatchery and plans to expand the hatchery VA work to three additional hatcheries in FY 2014. Based on its experience, the Region recommends revising Service hatchery policy to require such VAs for all hatcheries (R1).
- R1 is exploring a new species-based climate impacts monitoring program to identify and track species and/or habitats that are, or will be responding to key climate change stressors. Depending on the results of this effort, the Service may consider including climate change impacts monitoring in its surrogate species and landscape conservation and design efforts.
- The Migratory Bird Program in R2 has funded studies of several species of birds that utilize low-lying coastal habitats to assess potential climate impacts (R2).
- The Gulf Coast Joint Venture has utilized sea level rise projections to identify where high priority bird habitat may be impacted along the Texas coast (R2).
- Seal Beach NWR is working with partners to identify what actions it can take to conserve its trust resources in light of climate change (R8).

Improve adaptation and resilience, including the costs and benefits of such improvement, with respect to agency suppliers, supply chain, real property investments, and capital equipment purchases such as updating agency policies for leasing, building upgrades, relocation of existing facilities and equipment, and construction of new facilities; and to

The Service has taken immediate and long-term actions in modifying and managing infrastructure to accommodate the potential impacts of climate change. In the near term, the Service is building to more stringent codes and regulations to ensure facilities guard against the possible physical impacts of climate change (e.g., proximity to flood plains). In addition, we are constructing and managing facilities to reduce the Service's greenhouse gas (GHG) emissions.

Examples include (BMO):

- Coastal marsh restoration at Prime Hook NWR
- Attainment of LEED certification (at some level) for one or more buildings at Audubon NWR, (ND), Rocky Mountain Arsenal (CO), San Luis NWR (CA), Texas Chenier Plain Refuge complex (TX), Turnbull NWR (WA), and the Winnie Depot facility (TX).
- Installation of photovoltaic systems at such facilities as Anahuac, Maxwell, and Wichita Mountains NWRs, Brazoria NWR (TX), Farallon NWR (CA), Willow Beach, Mora National Fish Hatcheries and the Southwest Native Aquatic Restoration and Recovery Center (BMO and R2)
- Replacement of older vehicles with flex-fuel or hybrid vehicles

Contribute to coordinated interagency efforts to support climate preparedness and resilience at all levels of government, including collaborative work across agencies' regional offices and hubs, and through coordination of information, data, and tools.

As with the earlier bullet on working across agency lines, much of the Service's effort pertinent to this bullet point is being conducted through the LCCs. LCCs were purpose built to create a venue for interagency, indeed inter-governmental coordination of conservation efforts. The numerous examples listed earlier of LCC collaborative work on climate change related data, information, tools and plans pertain to this bullet as well.

In addition to the work of the LCCs, many Service programs and activities require interagency coordination and provide an opportunity for integrating climate change considerations into the agendas of the many agencies involved. Examples include the Coastal Program, the ESA, Migratory Bird Joint Ventures, the National Fish Habitat Partnerships, the National Fish Passage Program, the Partners for Wildlife Program, etc.

The Service has also made a major contribution to coordinated interagency efforts to support climate preparedness and resilience through its work to help lead development of the National Fish, Wildlife, and Plants Climate Adaptation Strategy (Strategy). The Strategy was published in 2013 and involved representatives from 15 federal agencies, ten states, and two inter-tribal commissions. It is currently the only adaptation strategy in the United States that was developed collaboratively by all relevant levels of government. Many of the activities described in this response are called for in the Strategy (see response to Question 3 for more on the Service's role in implementation).

Many of the Regions also participate in multi-agency resource coordination conservation efforts. Examples include: the Bahia Grande Restoration Project (R2), the Alaska Climate Change Executive Roundtable (R7).

2. **The new Executive Order also calls for identifying those land and water-related policies, programs or regulations that now or with reform could best catalyze resilience in the face of climate change for the nation's watersheds, natural resources, and ecosystems and the communities and economies that depend on them. Please identify the most significant opportunities to accomplish this goal within your Bureau's jurisdiction.**

The first of seven major goals identified in the National Fish, Wildlife, and Plants Climate Adaptation Strategy is to conserve habitat to support healthy fish, wildlife and plant populations in a changing climate. Consequently, the identification and protection of such habitat are high priorities for promoting resilience. Increased resources and streamlined procedures for using those resources could be catalytic for resiliency efforts. These recommendations apply to both land and water protection programs including, but not limited to: the Land and Water Conservation Fund, North American Wetlands Conservation Act, Gulf RESTORE Act, Forest Legacy, etc., etc.)

The Service is also supporting a landscape-level approach with climate resilient investments in the restoration of the Gulf of Mexico ecosystem following the 2010 Deepwater Horizon oil spill. The Service is engaging states and other partners on shared restoration priorities to sustain a broad range of ecosystem services that will benefit fish and wildlife resources and enhance the resiliency of coastal communities and their economies. The Service's Vision for a Healthy Gulf of Mexico Watershed (2013) reinforces this approach and provides the platform for facilitating collaborative conservation. The Service has committed its resource programs and staff to engage in the full suite of Gulf restoration programs which provide the opportunity to support climate resilient investments by States, local communities, and tribes, including through grants and technical assistance. The Service will be working in 2014 and beyond to leverage available funding and ensure that restoration actions are complementary in order to secure the long-term resiliency of the natural resources, ecosystems, fisheries, habitats, and human communities of the Gulf Coast.

Other opportunities identified by various programs or regions include:

- Substantially increase the Services technical expertise on climate change, its projected impacts on wildlife, and on adaptation options to underpin both the Service's own management programs and to influence the actions of others through its various regulatory or technical assistance programs (e.g., ESA consultation, etc.). (ES)
- Reform the injurious wildlife regulations as described earlier. (FAC)
- Expand the capacity of the National Fish Habitat Partnerships. (FAC)
- Expand the unique partnerships of the National Fish Passage Program. (FAC)
- Authorize the incidental take of migratory birds in conjunction with adopting a "net benefits standard" in implementation of mitigation requirements. (MB)
- Require that the issue of climate change and its projected impacts be addressed in future revisions of the State Wildlife Action Plans. (WSFR)
- Collaborate with other organizations in developing strategies and in planning. (R2)
- Developing guidance on reconciling conflicting trust resource demands. (R2)
- Further coordination with USACE on wetlands projects. (R2)
- Identify opportunities to work with state agencies in protecting water and watersheds. (R6)
- Modify Subsistence Management Regulations for Public Lands in Alaska to account for climate change impacts (R7)
- Develop climate change criteria for land acquisition and restoration funding. (R7)
- Develop guidelines for the assisted relocation of species to new areas/habitats as a climate change management strategy. (R7)

- Revise the Services Manual Chapter on Biological Integrity, Diversity and Environmental Health in light of climate change. (R7)
- Develop landscape level plans pursuant to Section 10 of the ESA in combination with the consultation with the consultation requirements pursuant to Section 7 of the ESA. (R8)

3. Please describe any specific efforts to implement interagency climate adaptation strategies such as the National Action Plan: Priorities for Managing Freshwater Resources in a Changing Climate; the National Fish, Wildlife and Plants Climate Adaptation Strategy; and the National Ocean Policy Implementation Plan.

At present, most Programs and Regions are still considering the recommendations of the Strategy and either sharing it with partners (via the LCC steering committees-R2), or cross-walking it with their existing program priorities and plans (e.g., MB). ES developed a synopsis of the Strategy for use by its staff and OSA expanded this synopsis for use by staff Service-wide. Some programs are using information or ideas from the Strategy in their work (e.g., ES in R2 for recovery planning, WSFR for State Wildlife Grants, and National Fish Habitat Partnerships in R5) and others are focused on implementing specific actions. For example, FAC is currently working to implement three actions of the Strategy (1.4.5, 7.3.1, and 7.3.4) related to habitat connectivity and to invasive species, respectively. R7 reports activities underway that address four different actions recommended by the Strategy ranging from the identification of priority species to capacity building, data integration and data development. A number of LCCs have reviewed the Strategy and expressed either their general support for its recommendations or more detailed commitments to their role in implementing its major recommendations.

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

Reporting 2013 Climate Change Adaptation Activities and Plans for 2014:
U.S. Fish and Wildlife Service Response to Template 2 Questions

1. **Please describe significant efforts to mainstream and integrate climate change adaptation into policies, planning, programs and operations – including agency-wide and regional planning efforts, in coordination with other Federal agencies as well as state and local partners, Tribal governments and private stakeholders.**

   The Fish and Wildlife Service (FWS or Service) is working to integrate climate change into a wide variety of activities, including as part of conservation planning for National Wildlife Refuges (NWR) and Joint Ventures. Many Landscape Conservation Cooperatives (LCCs) are currently addressing climate change as part of regional landscape conservation design plans or initiatives. The agency is also working to include climate change considerations into major Service activities such as listing determinations under the Endangered Species Act (ESA) and implementation of the North American Waterfowl Management Plan, and activities around siting of renewable energy development and FERC licensing of hydroelectric projects. The agency is working with partners and the LCCs to conduct vulnerability assessments and research and monitoring projects to help inform management. In addition, the Service is actively engaged in adaptation and restoration projects intended to build resilience and help prepare our trust resources for the impacts of climate change.

   Planning for Climate Change

   - Climate change is addressed in NWR Comprehensive Conservation Plans through a variety of stages in the planning process. LCCs and other partners and stakeholders are consulted to obtain scaled-down climate change models, and a hydro-geomorphic analysis may be used to determine historical conditions as a frame of reference. Resources of concern are identified to guide priorities and develop habitat management objectives. Climate change strategies are identified including protecting and restoring contiguous blocks of habitat and using linkages and corridors to enhance connectively. Additionally, plans include specific climate change objectives to decrease greenhouse gases and contribute to the agency becoming carbon-neutral by 2020.
   - Cape Romain NWR in South Carolina is implementing a comprehensive Climate Change Action Plan to address the loss of coastal habitat due to sea level rise, accelerated erosion, and storm impacts. The plan includes sea turtle nest recovery program, projects to increase resilience for managed wetlands on Bulls Island, active land acquisition to provide a migration corridor from the sea islands to the mainland, partnerships with agencies, and NGO partners, focused research projects, and engagement with the public and partners on climate change impacts.
   - In California, a project was initiated in FY2013 to develop a Natural Resource Management Plan for Anaho Island NWR using the Open Standards for the Practice of Conservation model which explicitly incorporates climate change threats and development of adaption strategies. The plan will be completed in spring 2014, and partners include the Pyramid Lake Paiute Tribe.
   - Joint Ventures are collaborative, regional partnerships of government agencies, non-profit organizations, corporations, tribes, and individuals that conserve habitat for priority bird species, other wildlife, and people. Various Joint Ventures are incorporating climate change

considerations in their planning documents. For example, the Pacific Coast Joint Venture has completed a management plan for the North Puget Lowlands that utilized the Sea Level Affecting Marshes (SLAMM) model as part of consideration of the impact of climate change. The Intermountain West Joint Venture also incorporated climate change considerations within revision of its 2013 Implementation Plan, which establishes a roadmap for priorities and objectives for the migratory bird conservation partnership across an eleven state geographic area. The plan identified climate change as a key threat to wetland habitat conservation, and developed actions targeted at addressing these threats. The Designing Sustainable Landscapes project lead by the Atlantic Coast Joint Venture in the Southeast includes sea-level rise and explicitly uses that information in the decision support models projected into the future.

- The Gulf Coastal Plain and Ozarks LCC is collaborating with 5 other LCCs and the Southeast Climate Science Center, on the development of a Southeast Conservation Adaptation Strategy, which will define sustainable landscapes and habitat systems for natural and cultural resources in the southeastern United States, incorporating future global change (climate change and urbanization) into this regional conservation planning initiative. Southeast Regional staff also worked with regional LCCs and contributed to the development of a Southeast Region Conservation Planning Atlas to support and facilitate coordination among local, state, and regional conservation efforts across agencies and nongovernmental partners.
- The North Atlantic LCC is piloting Landscape Conservation Designs (LCDs) that incorporate projections of climate change and land use change that can be used by NWRs to guide future refuge Comprehensive Conservation Plans resulting in land acquisition, restoration and management.

Integrating Climate Change into Service Activities

- The Ecological Services Program ensures that information regarding the ongoing and likely impacts of climate change is a key component of analyses for various purposes under the ESA, since such information is crucial for identifying and designing appropriate climate adaptation measures. For example, since the listing of the polar bear as a threatened species in 2008, the Service has routinely included climate change considerations in analyses that are used for determinations of whether to list species under the ESA and in designations of critical habitat for such species. The Service also works with the National Marine Fisheries Service to prepare information for use by Regional and Field offices to help ensure that efforts to prepare or revise recovery plans for threatened or endangered species include climate change adaptation measures as appropriate.
- The 2012 Revision to North American Waterfowl Management Plan (NAWMP) has recognized the role of climate change effects on waterfowl and the need to incorporate climate change adaptation into planning and management. The NAWMP Science Support Team's Work Plan has identified tasks to address climate change considerations (although these tasks are only planned and are not funded). Specifically, the NSST will serve as a forum to: (1) Perform a vulnerability assessment of all waterfowl to climate change predictions; (2) Identify and assess the relevance of climate change to changes in key landscape attributes; (3) Support development of models that relate to waterfowl demographics and their relationships to habitat changes; (4) Support

coordinated monitoring efforts that explicitly test the relationships of waterfowl abundance and distribution over time; (5) Support a national database for long-term phenology and demographic data; and (6) Provide guidance to individual Joint Ventures on how to incorporate climate change impacts into waterfowl planning and design strategies.

- The Migratory Bird Program in conjunction the Canadian Wildlife Service and the U.S. Geological Survey (USGS) are undergoing a comprehensive review of the May Waterfowl Breeding Population and Habitat Survey. One component of this review will be devoted to determining how might climate change and other sources of system change influence survey bias, in order to make recommendations regarding modifications or changes in survey objectives.
- The Migratory Bird Program chairs the staff committee of the Council for the Conservation of Migratory Birds, which oversees the implementation of the Executive Order 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds). The Service is working through this committee to improve agency access and use of conservation measures to maintain healthy populations and decrease susceptibility of managed populations to stochastic events, encouraging the protection of lands to allow species to move across the landscape, promoting monitoring and research to inform management should conditions change, and fostering partnerships between other federal and state agencies, tribes, and non-governmental entities.
- The Migratory Bird Program in conjunction with other partners is in the final phases of conducting a comprehensive review of our Banding Program, which will ensure banding is conducted in a fashion to minimize the risk associated for our management decisions. An optimal banding program will enhance our ability to assess the potential impacts of climate change on our management decisions.
- The Migratory Bird Program is collaborating on the Integrated Waterbird Management and Monitoring program in the Atlantic and Mississippi Flyways, which is designed to link to coastal models that include sea-level rise (e.g., NALCC's Designing Sustainable Landscapes project) and incorporate this into the decision-support process.
- The Service is participating in developing the Desert Renewable Energy Conservation Plan (DRECP), a regional planning effort to promote environmentally responsible renewable energy development while conserving habitats for endangered, threatened, and sensitive species over approximately 22.5 million acres in the California deserts. The DRECP is being prepared by a Renewable Energy Action team consisting of the California Energy Commission, California Department of Fish and Wildlife (CDFW), the U.S. Bureau of Land Management (BLM), and the FWS, with the input of state and local partners, tribal governments, and a variety of stakeholders. The DRECP will identify development focus areas for energy generation on disturbed areas and areas where conflicts with biological resources can be minimized, and will include a conservation reserve system for mitigation of unavoidable impacts. The DRECP will integrate adaptive management strategies to deal with climate change by ensuring the reserve system includes environmental gradients to protect core habitat and linkages for covered species, and preserves key ecosystem services such as sand sources, transport, and deposition.
- The Fish Passage Engineering group in the Northeast Region identified a need to update its fishway capacity criterion used in FERC licensing of hydroelectric projects. The capacity criterion

is based on a synthesis of the temporal distribution of American shad spawning migrations which are influenced by stream flow and temperature, both affected by changing climate. The majority of the statistical analyses for the update were completed in 2013.

Assessing Vulnerability

- The Service is actively conducting vulnerability assessments for species and habitats across the country to improve understanding of how climate change will affect our trust resources in the coming years. Vulnerability assessments are used in conjunction with analyses of non-climate stressors to assess the overall vulnerability of species and habitats and plan for needed management activities.
- In 2011, the agency worked with partners to develop the report "Scanning the Conservation Horizon: A Guide to Climate Change Vulnerability Assessment." This report seeks to help resource managers understand the impacts of climate change on species and ecosystems and to support efforts to safeguard these valuable natural resources.
- Through the Partners in Flight effort, the Service is using a species vulnerability assessment to determine species or species groups that are more vulnerable to climate change. The assessment has revealed that among the major bird groups, waterbirds and shorebirds are the most vulnerable, followed by landbirds and waterfowl.
- In 2013, the Fish and Aquatic Conservation Program initiated a project to evaluate the vulnerability of Pacific lamprey, a native anadromous species that has declined in numbers and in range. This project will modify an existing vulnerability index to accommodate more specific information on changes in stream condition predicted by climate change models. The assessment will be used to guide restoration actions across the range of the Pacific lamprey. The project is being done in cooperation with USGS and the Cow Creek Band of Umpqua Tribe of Indians, and is supported by the North Pacific LCC.
- In California, high resolution sea level rise models are being developed at four coastal tidal marsh refuges (San Diego Bay, Tijuana Slough, Seal Beach, and Humboldt Bay). Models will be completed by summer 2014 and used to develop species or community-specific vulnerability assessments and climate adaptation strategies. Partners include the Service's Inventory and Monitoring Program, the California LCC, the Southwest Climate Science Center, USGS Western Ecological Center, and the National Estuarine Research Reserve System.
- The Great Northern LCC has funded a number of climate change adaptation projects that provide information and science to FWS and partners to be used in planning and policy as well as to support on the ground management. Projects include efforts to model and mapping thermal habitats and predict vulnerability of aquatic species to climate change, analyzing species adaptations to climate change in grassland, sagebrush, and riparian-associated birds, developing a science-based decision support tool for prioritizing mitigation of road impacts on wildlife corridors, and identifying fire refugia in Rocky Mountain ecosystems.
- In addition, the Southern Rockies LCC assisted the Gunnison Basin Climate Workgroup in conducting vulnerability assessments on 24 ecosystems and 73 species across the Gunnison Basin. As a result of the vulnerability assessments, adaptation strategies were developed for the Gunnison Sage Grouse, and the partners completed construction of over 100 rock structures on

private lands in the Basin to improve or restore wetlands (brooding habitat) as the Gunnison Sage-Grouse Adaptation Demonstration Project.

- The Gulf Coastal Plain and Ozarks LCC is collaborating on a number of research projects that are incorporating climate change into conservation planning efforts. For example, a project with the Long Point Waterfowl Observatory uses the Weather Severity Index to predict how waterfowl respond to weather conditions, and integrates downscaled climate projections. Using the NatureServe Climate Change Vulnerability Index tool, another project is assessing the vulnerability of 120 species of Greatest Conservation Need identified in the Tennessee State Wildlife Action Plan. Working with the USGS National Wetlands Research Center, another project examines the ecological implications of mangrove forest migration in the southeast.

Research and Monitoring to Inform Management

- The inventory and monitoring of biological resources, ecological processes, and components of the physical environment are critical to meeting the Refuge System's legislated mission and mandates. The Refuge System is taking a leadership role in developing a nationally-coordinated program of inventories and monitoring (I&M program) on Service lands. The I&M program is designed to address the Refuge System's critical information needs and to help plan and evaluate the effectiveness of conservation strategies implemented by the Service and conservation partners in the face of accelerating climate change and other growing threats.
- Linking climate data to conservation and management of aquatic resources has been a focus area of Service applied research programs across the country. Climate change can affect populations through a variety of mechanisms, such as physiological stress from stream warming or mortality from hydrologic disturbances. The Service is developing decision support tools that assist biologists in understanding which factors contribute most to extinction risk so conservation actions can be prioritized. In 2013, models and tools were developed for species such as bull trout, westslope cutthroat trout, and Colorado cutthroat trout.
- In the Southeast Region, long-term sea level rise monitoring stations have been established on Refuges, in coordination with other partners and LCCs. Water Resource Inventory and Assessments (WRIA) have also been developed to assess condition and provide baseline measures for assessment of water resources, threats and needs on Refuges and National Fish Hatcheries to address changes through time. Two WRIAs (Cape Romain and Cahaba River NWRs) have been completed, and several others are under development.
- The Florida Keys NWRs are working with various partners to develop sea level rise and storm surge models to assess vulnerabilities of different habitats and wildlife. A long term ecological monitoring program has been established to document incremental changes in water quality, sediment deposition, and plant response to sea level rise.
- In the Northeast Region, the Refuge System has developed a method of assessing salt marsh integrity (SMI). SMI assessments provide Refuges an objective basis for determining the relative "health" (including resiliency) of each salt marsh unit and any need for restoration, to help manage resiliency and restoration efforts at both local and regional scales, and identify the most valuable and vulnerable parcels.

- The Modoc NWR undertook a project to use a downscaled water budget and climate change output model to evaluate the effect of climate change on refuge water management. This analysis included estimates of the effects of projected climate change on water supply and availability, evapotranspiration, and future irrigation demands for wetland habitats. Results assisted the Refuge with prioritizing adaptation strategies to future climates, including prioritizing habitat needs with limited water and expanding the current water storage reservoir. Partners include the University of California-Davis and USGS.
- The Humboldt Bay Refuge is in the third year of an abiotic monitoring program for itsdune system. Barrier spit dune systems provide the protected, depositional environment needed for salt marsh accretion that will be critical as sea level rise accelerates. Dunes also provide a buffer to coastal communities, absorbing storm energy. Unlike salt marshes, dune systems are not able to gain in elevation in response to sea level rise, but must migrate to maintain an equilibrium relationship with beach and near shore processes. The project is quantifying sediment budget, and will provide data needed for models that predict response of the system to rising sea levels.
- The Desert NWR encompasses more than 1.5 million acres and includes both Mojave Desert and Great Basin ecoregions, providing an opportunity to monitor climate change responses in a naturally functioning ecosystem that includes a significant ecotonal transition. The University of Nevada has established infrastructure to allow long-term monitoring, including five monitoring stations on Desert NWR, focusing measurements on climatic and ecological variables.
- The Midwest Region is continuing to examine the effects of extreme climate events on avian demographics and the role of habitat refugia in mitigating climate change. The study's goals are to predict the effects of extreme climate and weather events on bird demographics, focusing especially on waterfowl and forest birds, to quantify the role of Refuges and National Forests as refugia during extreme events, and to identify management actions to enhance this function.
- The Migratory Bird Program is currently examining the population dynamics of three species of ducks as they relate to habitat and weather conditions in the North American prairies using three-decades of population, habitat, and weather data. The project forecasted population responses to different climate change scenarios and identified areas where populations may be resilient or vulnerable to future climate change. Results will be useful for developing adjustments to current adaptive harvest management decision frameworks in response to large-scale system shifts associated with climate change.
- The Black Duck Joint Venture is working on several related studies to investigate the habitat carrying capacity to support wintering black ducks in coastal marsh systems within the northern portion of the Atlantic Flyway, and identify where to specifically focus on conservation efforts in the face of habitat stressors.
- The Service's Aquatic Invasive Species Program is refining and utilizing risk assessment models and developing trait-based decision-support tools to identify injurious species. This work includes refinement of a Risk Assessment Mapping Program used to predict the risk of an invasive species establishing in U.S. ecosystems under various climate scenarios described by the Intergovernmental Panel on Climate Change. Data generated by those improved risk

assessment models will allow the Service to better identify high-priority threats and take more effective action for the benefit of trust resources.

- The Mountain Prairie Region is using long-term Four-Square-Mile Survey data to identify factors influencing individual basin wetness and long-term trends in wetness. Projected climate data from down-scaled atmosphere-ocean general circulation models developed by USGS partners will then be incorporated to develop spatially explicit predictions of the future wet area of wetland basins. Projections will be applied to species-habitat models predicting the distribution and density of wetland-dependent wildlife under future climatic conditions.
- In 2009, the Carlsbad Fish and Wildlife Office initiated a long-term research project (Wildhorse Biophysical Monitoring Station) to monitor boreal forest response to climate change in the San Bernardino Mountains of southern California. Cooperators include the San Bernardino National Forest, NASA Jet Propulsion Lab, and the Joint Institute for Regional Earth System Science and Engineering at UCLA. The sensor array in the San Bernardino Mountains will provide baseline data to inform management decisions affecting 13 listed taxa plus other sensitive species of concern. Now in its fifth year of data collection, the sensor array is beginning to provide information on the impact climatic stresses have on local forest trees.
- Leveraging a small seed grant for equipment from the Natural Resources Program Center, a small team led by Ecological Services field office staff is working with the Refuges and Fisheries programs to establish a regional network of continuous stream temperature monitoring sites at inland refuges and hatcheries to obtain baseline data and monitor possible long-term impacts of climate and land use change on stream temperature. Site selection will prioritize stream types or geographic areas where existing data are sparse, as well as areas where endangered, at-risk, or thermally sensitive species are likely to be present.
- Information derived through LCC projects is filling gaps in scientific information that other entities and smaller partnerships are unable to obtain due to the magnitude of issues associated with climate change. For example, in the Midwest, local LCCs are engaged in projects to predict long-term landscape change along the Missouri River and examine implications for cottonwood forests and songbird populations, as well as predicting effects of climate change on native fishes in the northern Great Plains, as well as identifying the most climate vulnerable terrestrial species and natural communities in the region.
- In the Mountain-Prairie Region, the Southern Rockies LCC helped bring partners together around a variety of projects, including tracking changes in amphibian, reptile and avian communities in riparian habitats where invasive plant control has occurred, assisting Arizona Game and Fish Department with development of a native fish database and decision support tool for forecasting the spread of aquatic invasive species, and development of a platform for improving river simulation system models that incorporate ecological flows into water management decisions for the Colorado River basin.
- In 2014, Great Rivers LCC will be working on a variety of projects including improving data collection and modeling of snowpack conditions to increase the accuracy of seasonal stream flow forecasts that inform water management decisions in the Upper Rio Grande Basin, assessing the importance of tributary junctions along the Colorado and Dolores Rivers for

maintaining riparian and aquatic habitat as lower peak flows reduce areas of complex habitat on the main stem reaches, and assessing how forest restoration actions (thinning and prescribed burning) and climate change impact the hydrologic functions of watersheds, providing valuable information on forest ecology and watershed management.

Adaptation and Restoration Projects

- In the Northeast, a multitude of coastal restoration projects are planned that will restore sites damaged by Hurricane Sandy and increase resiliency from future storms. Many of these projects are being conducted with partners. For example:
    - *Delaware* – An effort to restore highly damaged salt marsh ecosystems with focus on potential for beneficial use of dredged material for marsh creation, improvement in sediment retention, creation of aquatic nursery habitat and storm surge tempering for adjacent lands is in progress. There are also efforts to restore ecological function of Prime Hook NWR marshes destroyed by storm-induced breaching and subsidence.
    - *Maryland* – Using living shoreline restoration technology can enhance resiliency of marshes by capturing sediment and allowing it to accrete. Living shoreline projects are a wildlife compatible, dynamic, soft and semi-soft engineering erosion protection method, well suited to improving resiliency of the Chesapeake Bay marshes in NWRs such as Eastern Neck, Martin, and Blackwater.
    - *New Jersey* – Restoring networks of salt ponds, pannes, potholes, and channels in salt marshes in areas such as Forsythe and Cape May NWRs will increase the capacity of salt marshes to keep pace with sea level rise. An integrated restoration approach with state and federal partners addresses tidal hydrology, surface water habitat, invasive species, mosquito control and sea level rise to restore natural hydrology and living shorelines.
    - *New York* - Restoration of natural hydrology will increase resilience and decrease long-term vulnerability and risk from storm events in areas such as Long Island Complex NWR and Seatuck NWR. Other efforts will remove dam debris restricting flow to 132 acres of salt marsh at Sunken Meadow State Park and restore aquatic connectivity in a currently impeded fish passage at Wertheim NWR.
    - *Rhode Island* – Restoration efforts are needed to improve marsh habitat quality and flood resilience, reduce disturbance to Piping Plovers, decrease flooding of adjacent public roads and reduce occurrence of E. coli accumulation in water. Projects include dredging and sediment distribution at Chafee NWR Restore hydrology for salt marsh protection and local infrastructure improvements at Sachuest Point NWR.
    - *Virginia* - Planting native salt marsh vegetation and constructing terracing to restore highly eroding marshes at Back Bay NWR can help create resilient living shorelines. This project will use oyster reefs to create a stable living shoreline that will protect tidal marsh, submerged aquatic vegetation and clam/oyster beds in Toms Cove, Chincoteague NWR.
- Through Fish and Aquatic Conservation habitat restoration programs and Fish and Wildlife Conservation Offices, the Service has increased our efforts to remove aquatic barriers across the country. Not only does this action provide species a chance to adapt to climate pressures within their habitats, but it provides additional benefits to local communities by resorting natural

function to riverine systems increasing their resiliency to flood events. Outdated or improperly-sized road stream crossings that cannot withstand flooding are causing increased hazards to human health and safety and significant, sometimes repeated, replacement costs. In addition to these threats, the devastation to water quality and aquatic life is immeasurable. Since the flooding brought on by Hurricane Irene in August 2011 in Vermont and New York, the Service has been working with federal response agencies on promoting aquatic connectivity and barrier removal as a means to future flood resiliency that will protect financial investments, increase safety and protect streams, rivers, roads, homes and businesses from significant damage, all while restoring fish habitat and aquatic connectivity.

- The Service's Environmental Contaminants program is partnered with NWRs, Coastal programs, and North Carolina Department of Environment and Natural Resources to restore extensively altered peatlands at Pocosin Lakes NWR. The Service is dedicated to helping reduce the impacts of climate change, important drivers of which are pollutants such as carbon dioxide and nitrous oxide. Restoring drained peatlands is a quantifiable approach to sequestering these pollutants. Environmental Contaminants staff is working with the Duke University Wetlands Center to verify site-specific estimates of these sequestration benefits, thereby facilitating projects to get important wildlife habitat restored as well as addressing climate change effects.
- In FY2014, the Partners for Fish and Wildlife program in the Mountain Prairie Region was able to restore or enhance 130 river miles specifically for high priority native fishes stressed by climate change. These projects also benefitted many riparian obligate species, greater sage-grouse and amphibians. The PFW program restored, created or enhanced 13,285 acres of wetlands to benefit suites of high priority migratory birds, the imperiled Dakota Skipper, boreal toad, and many other wetland dependent species – all species demonstrating that climate change is a stressor for them. They also restored and/or enhanced 112,500 upland acres, benefiting suites of grassland dependent birds, sagebrush obligate species, grizzly bear and other key species identified as part of their climate change adaptation strategy.
- The National Fish Passage Program in the Mountain Prairie Region is working to create access to fish habitats for native species and improve project designs to maximize fish passage. Needed research is being conducted by multiple entities including the Bozeman Fish Tech Center and Colorado State University. The work will improve the understanding of the abilities and behaviors of native fishes and the ability of the structures to pass native fish. Creating effective passage structures will improve these populations resiliency under climate change.
- In 2010-2011, areas of former salt marsh around Humboldt Bay that were diked and drained in the early 1900s that have experienced significant subsidence were identified for potential restoration. A team of Refuge and Coastal Program staff and local non-profit conservation organizations designed a plan to raise the elevation of subsided areas to a level consistent with salt marsh elevations across the bay. Fill was generated from a Refuge creek channel restoration project, and within two years the filled areas were almost completely covered by pickleweed, a native salt marsh plant. This project has helped offset the loss of approximately 95% of historic salt marsh around the Bay, and builds resiliency to climate change and sea level rise by providing areas for salt marshes to migrate to behind dikes. Due to the success of this

project, a larger salt marsh restoration effort is being designed for the White Slough Unit of Humboldt NWR, with implementation scheduled to begin in 2014.

- The best available science indicates that Chesapeake waters are very likely to rise by more than three feet by the end of this century. Within the boundaries of the Blackwater NWR, 5,000 marsh acres have been lost since the late 1930s, from a combination of invasive species, land subsidence, and rising sea level. For two years, The Conservation Fund and the Audubon Maryland-DC Chapter have collaborated with the Service, Maryland Department of Natural Resources and others. Steps are now being taken to slow the rate of loss of these tidal marshes and to improve their health, including projects that ensure the marsh has room to move and re-establish as the tide rises; invasive species control; sediment enhancement; and improvement of hydrological flows.
- At Alligator River NWR on the North Carolina coast, the Service is working with partners to evaluate the effects of different adaptation strategies on areas impacted (or likely to be impacted) by sea level rise, to determine how to make the shoreline more resilient to rising sea levels. The strategies include constructing oyster reefs to buffer shorelines from waves and storm surges, restoring the natural hydrologic regime and associated wetland systems, and planting salt- and flood-tolerant species. The goal of this project is to facilitate a transition to salt marsh and open-water habitats that is an inevitable consequence of sea level rise in this area. The project will lead to outcomes that will inform adaptation efforts in other parts of coastal North Carolina as well as throughout the United States and around the world.
- The Ash Meadows NWR is working to restore natural ecosystem functioning to desert oases consisting of spring-fed wetlands and alkaline desert uplands inhabited by at least 26 plants and animals found nowhere else in the world. Many of the Refuge's seeps, springs, pools, and streams supporting sensitive species were destroyed or altered by human activities in the last 100 years. The expectation is that a healthier functioning ecosystem will enhance resilience of the system to climate change.

2. Please describe how agency principals demonstrate commitment to adaptation efforts through internal communications and policies.

Service leadership has recognized the importance of addressing climate change to the agency's mission and has demonstrated a significant commitment to adaptation efforts. For example, the Service's Climate Change Strategic Plan issued in 2010 lays out an agency-wide framework for responding to this critical issue. The agency also took the lead in developing the interagency National Fish, Wildlife and Plants Climate Adaptation Strategy, issued in 2013. The Service is currently developing internal policies for climate change adaptation, mitigation, and engagement. An existing National Climate Team helps to coordinate activities and share information, and the Service is the process of establishing a new Climate Adaptation Network to help provide additional leadership. The Service's National Conservation Training Center has developed a wide variety of climate change training opportunities utilized by Service staff as well as many agency partners. Service staff are also integrally involved in climate change adaptation through close coordination

with the LCCs at all levels. The Service is currently working with DOI to establish climate change performance measures as part of the agency's High Priority Performance Goals.

Service Climate Change Policies

- In 2010, the Service was among the first federal agencies to develop a Climate Change Strategic Plan, which referred to climate change as, "the greatest challenge to fish and wildlife conservation in the history of the Service." This Strategic Plan, titled "Rising to the Urgent Challenge: Strategic Plan for Responding to Accelerating Climate Change," established a basic framework to help ensure the sustainability of fish, wildlife, plants and habitats in the face of accelerating climate change. It was the result of more than 18 months of intensive work, thorough discourse within the agency, and recommends actions under three key strategies to address climate change: adaptation, mitigation, and engagement.
- In response to language in the Conference Report for the Fiscal Year 2010 Interior, Environment and Related Agencies Appropriations Act, the Service helped chair and develop the interagency National Fish, Wildlife and Plants Climate Adaptation Strategy (Strategy) released in March of 2013. This Strategy identifies key vulnerabilities and presents a unified approach – reflecting shared principles and science-based practices – to reduce the negative impacts of climate change on fish, wildlife, plants, our natural resource heritage, and the communities and economies that depend on them.
- Efforts to develop the Strategy were co-led by the National Oceanic and Atmospheric Administration (NOAA) and the New York State Department of Environmental Conservation, representing state fish and wildlife agencies. The Strategy was developed in close coordination with other federal adaptation efforts such as the National Ocean Policy Implementation Plan and the USGS and EPA led Freshwater National Action Plan, and it draws from existing adaptation efforts by states, federal agencies and others. The Service is now co-leading (along with NOAA and the Association of Fish and Wildlife Agencies) a Joint Implementation Working Group that is promoting implementation of the Strategy and will be responsible for reporting on Strategy implementation and future revisions.
- The Office of the Science Advisor has been asked to lead Service efforts in developing policy and guidance that ensures compliance with the recently released Departmental Climate Change Adaptation Policy. The Service climate change policies will be placed in a new 3-part Climate Change Series in the Service Manual: adaptation (Part 056), mitigation (Part 057), and engagement (Part 058). In the first step of this process, a new Service Manual chapter on Climate Change Adaptation (056 FW 1) has been issued that establishes initial Service policy and staff responsibilities on climate change adaptation, stepped down from the Departmental policy. Meaningfully addressing the challenges of climate change will require additional, more detailed policies on specific topics to be added as subsequent chapters on an "as needed" basis. Examples of these additional topics include integrating climate change into planning, Service mitigation practices and responsibilities, and measuring performance around adaptation.
- The Refuge System has also proposed a policy to implement a strategic approach to growth, recognizing that the Service cannot fulfill its mission in the face of challenges related to climate change and other stressors unless it provides consistent direction for adding lands and waters to

the system. The draft policy recommends focusing protection measures on priority conservation features in order to ensure that limited resources are directed toward making the greatest contribution to the conservation of species under climate change in a strategic, cost-effective, and transparent manner. The interim goal is to incorporate this draft policy as Part 602, Chapter 5 of the Service Manual after seeking public comment through Federal Register. It is expected to be announced in February 2014.

- The first climate change planning document (A Primer on Climate Change) in the Refuge System originated in 2008 as a collaborative project of the Service and the University of Maryland. Through work with a variety of agency and university collaborators, this document has now evolved into a draft entitled "Planning for Climate Change on the National Wildlife Refuge System," written in direct response to DOI and Service mandates. The purpose of this document is specifically to serve as a resource to Refuge System planners and managers to better incorporate climate change considerations into planning documents. The document is currently undergoing final editing and will be distributed and made publically available in February 2014.

Communication and Training

- The Office of the Science Advisor has initiated a new Service-wide climate change newsletter to provide a FWS-oriented synopsis of selected announcements and tailored climate change information. The goal is to help regional and field staff stay informed about major climate change developments, and allow staff to share success stories and examples, access key resources, and stay up-to-date about the agency's climate change response. Several Programs and Regions have also developed internal climate change newsletters or listserves highlighting new articles, course opportunities, new policies, etc.
- The Service also works to ensure that agency websites and materials include up-to-date climate change information and announcements. A designated climate change website includes reports, resources, links, and announcements relevant to the agency's climate change response. Many Programs and Regions have their own climate change websites and incorporate climate change information into online information. For example, the Service's Coastal Barrier Resources Act (COBRA) webpage was recently updated to include information about coastal resiliency and sustainability in response to Hurricane Sandy.
- The Service's National Conservation Training Center (NCTC) is providing leadership by developing and implementing climate change training opportunities for FWS staff and our conservation partners. The climate change curriculum has been developed in partnership with the FWS Office of the Science Advisor, state, federal, university, and NGO scientists and staff and has grown significantly during FY2013. This training is widely recognized as state-of-the-art in addressing conservation issues posed by climate change and is anticipated to continue its growth during FY2014. These training opportunities include online courses, webinars, instructor-led courses, and hands-on workshops and focus on emerging practices in dealing with adaptation, vulnerability assessment, scenario planning, and downscaling models.
- NCTC has also added specialized training which addresses basic climate science, communication about climate change, integrating climate change into conservation planning efforts, and focused elements of the structured decision making/adaptive management curriculum on

addressing climate-related uncertainty. NCTC has an ongoing effort to incorporate climate change broadly into FWS training courses to ensure that all Service employees are aware of the impacts of climate change, the Climate Change Strategic Plan, the National Fish, Wildlife, and Plants Climate Adaptation Strategy, and the Department's new climate change adaptation policy.

- Service Programs and Regions also sponsor climate change trainings and workshops. For example, the Northeast Region has entered into a "Fish Passage" agreement (via an MOU) with the University of Massachusetts, Amherst and the USGS Conte Anadromous Fish Research Center in Turners Falls, MA. Under one of the eight objectives of the MOU, the FWS Fish Passage Engineering group will teach a fish passage training workshop every 3-years which will also leverage the hydrological expertise of University of Massachusetts engineering faculty associated with the Northeast Climate Center. This workshop will advance the biological and engineering capabilities of participants to address climate-related issues in fish passage design.

Internal Commitment to Climate Change

- The Service's National Climate Team is an internal group made up of representatives of each Service Program and Region, led by the Office of the Science Advisor. The team works to share information across the agency about climate change activities, resources, and events, provides guidance and feedback around climate change issues and policies, and responds to employee, field station, and program needs for information, tools, and training. It also works to develop, share, and provide accessible and usable data, decision-support tools, and training on climate preparedness, adaptation, and resilience based on the best available science.
- All Service Programs and Regions support a staff person who acts as a liaison with the National Climate Team as either a fulltime position or collateral duty. This individual may also ensure engagement with the LCCs. For example, the Ecological Services Program supports a full-time climate change scientist to provide timely information regarding scientific information and tools for incorporating climate change considerations, including adaptation measures, into planning and decision-making processes under the ESA.
- In addition, in response to the Department's policy on Climate Change Adaptation (523 DM 1), the Service is currently working to establish a new, higher level Climate Adaptation Network. A draft policy describing the scope and activities of this Network is currently in development (056 FW 2). The proposed Network would advise Service leadership around responding to climate change, guide the development of appropriate policies and application of best available science, and would be responsible for overseeing the National Climate Team's work to assess and meet employee, field station, and program needs for information, tools, and training.
- LCCs are public-private partnerships composed of states, tribes, federal agencies, non-governmental organizations, universities and others. LCCs fill a critical need by providing a forum for connecting the entire conservation community within a defined geography and focusing conservation investments and actions on shared priorities. LCCs provide science support for Service conservation activities that address a variety of broad-scale land use pressures and landscape-scale stressors. Service staff are integrally involved in the LCCs at all levels, serving as LCC Coordinators, Science Coordinators, National Coordinators, Steering

Committee members, and project leads/collaborators. FWS Director Dan Ashe is a member of the LCC National Council, a group of interagency, tribal, and non-governmental representatives that provide national-level coordination and support for LCCs.

- For example, the Mountain-Prairie Region has implemented a strategy to create LCC Advisory Committees to the Regional Director and Deputy Regional Director who sit on the Steering Committees for the Great Northern and Southern Rockies LCCs. In addition to FWS representation on LCC Steering Committees, staff also participate on various work groups formed through the LCCs.
- The Service is currently working with DOI to establish climate change performance measures as part of agency High Priority Performance Goals. In addition, some Service Programs such as the Division of Wildlife and Sport Fish Restoration are currently exploring adoption of a potential performance measure relating to administration of program funds for assisting states and their partners with adaptation planning and implementation. Similarly, the integration of Climate Change considerations into goals, objectives, strategies, and tasks are incorporated as a requirement to be fully successful in the Branch of Bird Conservation's 2014 Performance Plans.

3. Please describe how workforce protocols and policies are being developed to reflect projected human health and safety impacts of climate change. Please include examples of any efforts that also focus on volunteers and visitors.

The Service recognizes that climate change is likely to result in more frequent occurrences of current health and safety hazards such as heat exposure. As these hazards are currently addressed in Service policy, the agency is not currently planning any additional actions to address the projected impacts of climate change on the safety and health of employees, volunteers, and visitors.

- The Service has safety and health policies in place to protect employees, volunteers, and visitors from workplace hazards. None of these policies were developed to specifically protect against the impacts of climate change.
- According to the Centers for Disease Control, projected climate change impacts on safety and health are heat-related morbidity and mortality; asthma, respiratory allergies, and airway diseases; vector-borne and zoonotic diseases; cardiovascular disease and stroke; weather-related morbidity and mortality; foodborne diseases and nutrition; waterborne diseases; human developmental effects; mental health and stress-related disorders; neurological diseases and disorders; cancer. According to the EPA, projected climate change impacts on safety and health are increased heat waves (heat stroke, dehydration), increased extreme weather occurrences (drowning, intestinal disease), reduced air quality (lung damage, respiratory diseases, allergies), increased climate sensitive diseases (food-borne, water-borne, animal-borne diseases), and other health linkages (food shortages).
- Neither OSHA nor DOI Safety has identified climate change as a separate and distinct safety and health topic. Projected impacts present no <u>new</u> safety and occupational health topics.
- Climate change should however, result in <u>more frequent</u> occurrences of current hazards. These hazards are addressed in Service policies: 241 FW 1, *Watercraft Safety*; 241 FW 3, *Personal*

Protective Equipment; 241 FW 9, *Wildlife Handling and Inspections*; 242 FW 5, *Tick-Borne Disease Prevention*; 242 FW 7, *Pesticide Users Safety*; and 242 FW 12, *Respiratory Protection*.

- The Division of Safety and Health is currently assessing the most effective method to issue prevention of heat exposure information.

4. Please describe any efforts to plan, design and/or construct new or modify/manage existing agency facilities and/or infrastructure with consideration for the potential impacts of projected climate change.

The Service has taken immediate and long-term actions in modifying and managing infrastructure to accommodate the potential impacts of projected climate change. Most immediately the agency is building to more stringent codes and regulations to ensure facilities guard against possible physical impacts (e.g., elevation, and proximity to flood plains). In addition, the Service is constructing and managing facilities to reduce the Service's Greenhouse Gas (GHG) emissions, which are believed to contribute to climate change. Reducing GHG emissions is one of two components of the Mitigation Goal in the Service's Climate Change Strategic Plan.

Compliance with Codes and Regulations

- Building codes have undergone extensive changes in recent years to respond to existing and potential climate change impacts. Federal engineers and architects must meet or exceed either national or local code, whichever is more stringent. For this reason, recently constructed or rehabilitated Service buildings comply with the most recent and up-to-date codes.
- The Service is observing such codes in executing the Hurricane Sandy Response and Recovery projects along the east coast. In particular, New Jersey's state code is more stringent than federal code, and requires that new buildings must have higher finished floor elevations, be located outside of known storm surge zones and avoid areas prone to flooding. Areas of code improvement addressing potential climate change impacts include improved design and location of utilities (i.e. power, sanitary) to resist flooding, adoption of higher wind loading standards, modifications to building systems to save energy while maintaining occupant comfort, increased use of resilient building materials to resist water damages, among others.
- Sandy projects include repairs to property and environmental damage on refuge units, fish hatcheries, and other Service field stations. The most significant damages are found in the mid-Atlantic, New Jersey, Long Island, and southern New England coastal areas. Sandy Supplemental funds are being invested to restore facilities to their pre-hurricane condition, making facilities more resilient and better able to withstand future storms and rising sea levels.
- For example at Mackay Island NWR in North Carolina, Hurricane Sandy ripped large sections of a bulkhead that surrounds Live Oak Point, causing massive erosion and compromising the safety of Mackay Island Road, the only auto tour route on the refuge. Replacing the bulkhead will protect Mackay Island Road and the habitat that is heavily used by wintering waterfowl, and make this area available for visitation.
- Construction of the Winnie Depot, Winnie, Texas is another example of the Service's consideration of potential impacts of potential climate change. The Winnie Depot is comprised

of more than 17 acres and 13 buildings, and serves as a centralized, operational hub for maintenance and heavy equipment operations serving a NWR Complex along the Texas and Louisiana Gulf coasts. In response to repeated hurricane storm damage and loss of equipment, the region decided to consolidate operations into one centrally located depot facility that is above any threat from future flooding, rather than continuing to maintain separate fleets of equipment at four individual, low-lying refuges.

- At the Cape Romain NWR, ARRA funding at approximately $1.5M was used to replace 11 water control structures and improve water management capability for waterbirds on Bulls Island; it will protect against future losses of habitat caused by increasing storm surge and sea level rise, which have been exacerbated by climate change.
- The Service also participates in an interagency effort regarding infrastructure and climate change. DOI is considering the implications of the new Federal Emergency Management Agency (FEMA) Advisory Base Flood Elevation (ABFE) maps which define the 100 year flood plain, recently issued to the public for Hurricane Sandy areas. Though the ABFE maps do not yet have legal enforceability, the Department has made the determination to apply the new map data to recovery and mitigation implementation. For all projects, construction must account for ABFE plus one foot. For critical infrastructure, such as a power supply or water treatment operations, there is a strong recommendation from the Task Force for application of ABFE plus two feet.

Reducing the Service's Carbon Footprint

- The Service's Strategic Plan includes a section dedicated to mitigating climate change. Mitigation Goal 5 is that, "We will change our business practices to achieve carbon neutrality by the Year 2020." The three objectives of this goal are: (1) Assess and Reduce the Carbon Footprint of the Service's Facilities, Vehicles, Workforce, and Operations; (2) Assess and Reduce the Service's Land Management Carbon Footprint; and (3) Offset the remaining Carbon Balance.
- Emissions inventories show that energy consumed to operate and manage facilities is the most significant component of the Service's carbon footprint. This means the way the agency constructs, adapts and manages buildings significantly affects progress toward achieving this goal. This realization, coupled with Administration priorities set forth through Executive Orders, legislation, and a Memorandum of Understanding to observe the "Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings," mean that all new buildings and major building rehabilitations must make progress toward the net-zero energy, water efficiency, and other sustainability mandates.
- Accordingly, Service engineers and architects routinely incorporate 12 common strategies into building designs which may enable achievement of net-zero energy use. These include highly efficient building envelopes, cool roofs, high R-value low-e window glazing, daylighting, highly efficient lighting including occupancy controls, minimized plug loads, natural ventilation, highly efficient HVAC systems, heat recovery, radiant heating/cooling systems, geothermal (ground source) heat pumps, and renewable energy systems, such as solar photovoltaic arrays.
- As a matter of policy, new Service construction and major renovation exceeding 5,000 square feet the Service policy requires Leadership in Energy and Environmental Design (LEED) Silver certification by the U.S. Green Building Council. This certification is significant in an external

party evaluates and affirms that the Service successfully incorporates sustainable principles into appropriate buildings. In addition, all new buildings must be at least 30% more energy efficient than relevant code (currently ASHRAE 90.1-2007), where life cycle cost effective, or as energy efficient as possible.

- For example, the last of the 14 Visitor Centers and/or Headquarters Building funded by the American Recovery and Reinvestment Act (ARRA) of 2009 was completed in 2013. These new buildings are all energy efficient, include some renewable energy, and meet or exceed all applicable code related to global warming and its impacts.
- At Craig Brook National Fish Hatchery, a 16 kW hydroelectric turbine was installed in the hatchery's effluent pipeline. The velocity of exiting water is sufficient to power the turbine and produces approximately 70,080 kWh of virtually free energy a year. The cost for the project was approximately $8,900 and will result in a likely project payback period of less than 5 years.
- A team from the Brazoria NWR, Texas, received both a Federal Energy and Water Management Award and a Department of the Interior Environmental Achievement Award in late October 2005 for completion of the Service's first 100% solar energy powered building. The 2,065 square-foot Brazoria Environmental Discovery Educational Center in Freeport, Texas, is used by over 5,000 students to conduct experiments in biology and environmental science, and has over 15,000 visitors per year. The Center generates 100% of its own electrical power using two separate solar photovoltaic arrays, with a total of approximately 35.5 kWh/day. One 2 kW solar array operates two direct current pumps. A second 5.4 kW solar array maintains the charge on deep-cycle batteries, where DC electrical power is converted to single-phase AC power by two inverters that serve the building's light, receptacles, and ventilation system. The solar system is backed up by an 8.5 kW electric generator. Major energy conservation measures are built-in including superinsulation, clerestories, low-E windows, sun shades, reflective metal roofing, natural ventilation, T-8 lighting, and an energy efficient HVAC system.
- Farallon NWR, California, is a group of islands located 28 miles west of San Francisco. In 1998-1999, the Service completed a $172,043 solar photovoltaic project that converted the diesel generator system to a 6.84 kW solar photovoltaic system with a generator backup. In addition, the appliances, fixtures, and electrical wiring in two houses and two shops were upgraded to be energy-efficient and compatible with the new system, and the buildings were rehabilitated to replace exterior siding with long-life vinyl siding and install additional insulation and energy-efficient windows. Hazardous ship-to-shore fuel transfers were reduced by at least 105 barrels per year. Annual fuel use fell from 5,000 gallons to 600 gallons.
- The visitor center at Assabet River NWR in Massachusetts is a net-zero energy building and subject of a DOE case study. The super-insulated high performance 5,879 square-foot building is a model of sustainable design. Construction materials were recycled, and the building includes passive solar architecture; a cool roof; daylighting; low-e glazed windows; energy-efficient fluorescent and light-emitting diode (LED) lighting; occupancy sensors; and a 12.5-ton geothermal (ground source) heat pump, resulting in energy performance 30 percent better than an average building. A 6.3-kW grid-tied solar photovoltaic array produces electricity. The 19 megawatt-hours (MWH) of renewable power saves 13.1 metric tons of greenhouse gases

annually. Inside, low-volatile organic compound (VOC) carpets, paints, and adhesives provide a healthy work environment. A unique solar-powered trash compactor saves energy. Plumbing fixtures with low flow outputs and waterless urinals conserve 3,000 gallons annually. Outside, water efficient landscaping and irrigation strategies, such as use of wildlife-friendly native plants and forbs, a "no mow" lawn, storm water containment with drainage swales, and porous pavement maximize water conservation.

- The Headquarters and Visitor Center at San Luis NWR Complex, California is the Service's first net-zero energy Leadership in Energy and Environmental Design (LEED) Platinum certified building. During the first year of operation, the new 16,500 square-foot building produced an impressive 103 MWH via nine solar photovoltaic arrays totaling 59.2 kW that helped save 42.2 metric tons of greenhouse gases. Seventeen new energy technologies used include: structural insulated panels; a cool roof; abundant daylighting achieved with "SolaTubes," clerestories, and skylights, and operable low-e glazed windows; passive and evaporative cooling; and energy-efficient lighting, yielding energy performance far better than 30% compared to an average building. Water use is reduced more than 35% with low-flow and waterless plumbing that saves approximately 396,000 gallons annually. Xeriscaping, native plants, limited drip-irrigation, and storm water containment conserve water outdoors.
- In the Northeast Region, a 416 panel, 108 kilowatt, solar photovoltaic system was added to the Northeast Regional Office Roof. This is the Service's largest solar photovoltaic system. Three net-zero residences were also constructed at Patuxent Research Refuge, which use renewable energy systems to produce as much energy as they consume.
- In addition, Service vehicle fleets include fuel efficient and hybrid vehicles that reduce fossil fuel use. Employees use alternative transportation; telecommuting; alternative work schedules; and telephone and video conferencing to reduce emissions from travel.

5. Please provide examples of any agency external programs (including grants, loans, technical assistance, etc.) that are being used to incentivize planning for and addressing the impacts of climate change. This should include figures for any non-federal dollars leveraged in programs and partnerships designed to accomplish these goals.

The Service administers a variety of natural resource assistance grants to governmental, public and private organizations, groups and individuals. The Service has been working to integrate climate change into these grant programs to help incentivize adaptation planning at a variety of scales. For example, climate change has been integrated to various degrees into the State Wildlife Grants Program, Cooperative Endangered Species Conservation Fund grants, North American Wetlands Conservation Act and Neotropical Migratory Bird Conservation Act grant programs, as well as various LCC funded projects.

- In Fiscal Year 2013, the Division of Wildlife and Sport Fish Restoration (WSFR) integrated climate change adaptation planning into the State Wildlife Grants (SWG) Program. SWG funds are used by state fish and wildlife agencies to develop and maintain the State Wildlife Action Plans (Plans), and to implement the Plans for the benefit of state-identified "species of greatest

conservation need." WSFR modified the competitive portion of the SWG Program to provide incentives for states and their partners to incorporate climate change adaptation strategies for wildlife into the Plans. Some examples of the projects encouraged through this programmatic change include climate change vulnerability assessments for multiple species and downscaling large-scale climate modeling for use at a regional or landscape scales. Due to the success of this program modification in FY2013, WSFR has offered this subprogram again in Fiscal Year 2014.

- As noted in the annual guidance, the program now offers financial incentives to states for planning efforts that seek to "integrate and align [Plan] strategies with the National Fish, Wildlife, and Plants Climate Adaptation Strategy." As a result of this change, WSFR funded several projects in FY13 which supported state planning efforts on climate change. For example:
  - Colorado Parks and Wildlife is utilizing SWG funds to collect and analyze a variety of datasets including climate projections and species distribution models to produce a vulnerability assessment for species of concern. Partners in this effort include the Southern Rockies and Great Plains LCC and the North Central Climate Science Center.
  - The Maine Department of Inland Fisheries and Wildlife will utilize SWG funds to incorporate the best-available climate science into their revised State Wildlife Action Plan. The revised Plan will provide climate-smart guidance to a broad consortium of conservation practitioners at the scale of specific management regions. A key partner in this effort is the North Atlantic LCC.
- The Cooperative Endangered Species Conservation Fund is a key source of grants to cooperating states for work to conserve threatened and endangered species. These competitive grants enable states to work with private landowners, conservation groups and other government agencies to initiate conservation planning efforts and acquire and protect habitat that benefits threatened and endangered fish, wildlife and plant species. Although a focus on climate change adaptation is not a requirement, the grant application process specifically requests whether a proposed project has a focus on climate change adaptation, as well as the conservation benefits to be derived by avoiding or offsetting climate change impacts so as to reduce or eliminate threats to species. In FY2013, $32 million in grants, many of which support climate change adaptation efforts, went to 20 states to advance efforts by partnering state wildlife agencies and conservation organizations to improve the health of the land and water that supports rare species and scores of communities across the nation.
- The North American Wetlands Conservation Act (NAWCA) grant program explicitly asks applicants questions related to climate-adaptation, and our Joint Venture ranking committee considers and provides a high ranking for coastal projects that identify clear, long-term benefits related to climate change and Sea Level Rise. In FY2014, the NAWCA program plans to overlay proposals for grant funding in coastal zones with the SLAMM model and other coastal climate change data to see whether project tracts are positioned to provide buffers against sea level rise or other climate change impacts (e.g., reducing storm surge), or otherwise prove to be a wise investment for federal dollars given likely probability of climate change impacts.
- The NAWCA and Neotropical Migratory Bird Conservation Act (NMBCA) grant programs encourage potential applicants to consider how projects may address impacts of climate

change. Proposal applications for both programs incorporate language that encourages applicants to address how the project relates to climate change. The NMBCA includes climate change related selection criteria, and projects designed to address climate change impacts will be more competitive. Although few NAWCA or NMBCA projects are specifically designed to mitigate or investigate climate change, often habitat protection and restoration projects are designed with habitat connectivity in mind which is important to create habitat in which species and systems can adapt to climate change.

- In 2013, the Service funded 42 projects in 21 states to promote adaptation to climate change, in alignment with priorities of the National Fish Habitat Partnership, leveraging federal funds at a ratio of 4:1. Thirty-three of the projects protected or improved flow, connectivity, or other physical conditions in habitats that support species vulnerable to the effects of climate change. Nine projects developed monitoring and decision support tools to support biological planning and conservation by partners, including LCCs.
- LCCs are also incorporating climate change considerations into grants and funding opportunities. For example, the North Atlantic LCC is providing a competitive grant program to partners for science delivery, including managing and translating information and working directly with partners to help them adopt science and tools to guide conservation actions including climate change adaptation. Support for the Appalachian LCC have helped in the creation of a Cooperative planning framework which in part represent incentives to help identify and direct grant funds to address conservation planning and potential risks associated with climate change.