This plan has been prepared in accordance with Executive Order (E.O.) 13653, requiring all federal agencies to integrate climate change considerations into Agency operations and overall mission objectives. The Agricultural Research Service (ARS) prepared a climate change plan in response to EO 13514 and it was published with the June 2012 USDA Strategic Sustainability Performance Plan. Updating and building upon that plan, ARS has prepared this Climate Change Adaptation Plan that addresses how it is integrating climate change into its programs, policies, and operations.

ARS Policy: ARS is committed to mitigating its impact on climate change, responsibly adapting to the impacts of climate change on the Agency, and responding programmatically to the need for research and information on the challenges of climate change as they affect its mission areas.

ARS Vision: To lead America towards a better future through agricultural research and information.

ARS Mission: ARS conducts research to develop and transfer solutions of agricultural problems of high national priority and provide information access and dissemination to:

- ensure high-quality, safe food, and other agricultural products
- assess the nutritional needs of Americans
- sustain a competitive agricultural economy
- enhance the natural resource base and the environment, and
- provide economic opportunities for rural citizens, communities, and society as a whole.

ARS Goals and Strategic Approaches: ARS is the U.S. Department of Agriculture's (USDA) chief in-house research agency. It is one of the four component agencies of the Research, Education, and Economics (REE) mission area. Congress first authorized Federally-supported agricultural research in the Organic Act of 1862, which established what is now USDA. That statute directed the Commissioner of Agriculture "... To acquire and preserve in his Department all information he can obtain by means of books and correspondence, and by practical and scientific experiments,..." The scope of USDA's agricultural research programs has been expanded and extended many times since the Department was first created. Today ARS has a workforce of approximately 6,200 employees including 2,200 scientists.
and post docs representing a wide range of disciplines. ARS has 800 research projects working at 90+ locations, including overseas labs.

To achieve its mission, the agency identifies critical problems affecting American agriculture, plans and executes the strategies needed to address these problems by: mobilizing resources (both human and financial); fostering multi-disciplinary research; linking research to program and policy objectives; and communicating and interacting with customers, stakeholders, partners, and beneficiaries to insure program relevancy. Currently, ARS research is organized into 18 National Programs that provide a coordinating structure that ensures the most important research is conducted with minimal risk of redundancy. ARS also works to ensure the timely transfer of new knowledge and technologies to potential users, and to broaden public understanding of the value of agriculture and agricultural research to ensure the continued primacy of the U.S. agriculture in the 21st century.

ARS’s current Strategic Plan is in effect for fiscal years 2012 through 2017. Echoing ARS’ National Program structure, the agency’s Strategic Plan is organized into four main Goal Areas: Nutrition, Food Safety, and Quality, Natural Resources and Sustainable Agricultural Systems, Crop Production and Protection, and Animal Production and Protection. These Goal Areas—and the goals, performance measures, and actionable strategies identified within them—align with the components of the USDA Strategic Plan Goals as follows:

<table>
<thead>
<tr>
<th>ARS Goal Area</th>
<th>ARS Strategic Goal</th>
<th>USDA Strategic Goal Objective(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Nutrition, Food Safety &amp; Quality</td>
<td>1.1 Human Nutrition</td>
<td>4.2</td>
</tr>
<tr>
<td>1.2 Food Safety</td>
<td>4.3</td>
<td></td>
</tr>
<tr>
<td>1.3 Quality &amp; Utilization of Ag Products</td>
<td>1.3</td>
<td></td>
</tr>
<tr>
<td>2: Natural Resources &amp; Sustainable Ag Systems</td>
<td>2.1 Water Availability &amp; Watershed Mgmt</td>
<td>2.2 &amp; 2.3</td>
</tr>
<tr>
<td>2.2 Climate Change, Soils &amp; Emissions Research</td>
<td>2.1, 2.2 &amp; 2.3</td>
<td></td>
</tr>
<tr>
<td>2.3 Bioenergy</td>
<td>1.1</td>
<td></td>
</tr>
<tr>
<td>2.4 Agricultural &amp; Industrial Byproducts</td>
<td>1.3, 2.1 &amp; 4.3</td>
<td></td>
</tr>
<tr>
<td>2.5 Rangeland, Pasture &amp; Forages</td>
<td>2.1</td>
<td></td>
</tr>
<tr>
<td>2.6 Agricultural Competitiveness &amp; Sustainability</td>
<td>3.1, 2.1, 2.2 &amp; 2.3</td>
<td></td>
</tr>
<tr>
<td>3: Crop Production &amp; Protection</td>
<td>3.1 Plant Genetic Resources, Genomics, Genetic Improvement, and Crop Production</td>
<td>3.3, 3.1 &amp; 4.4</td>
</tr>
<tr>
<td>3.2 Plant Diseases, Crop Protection &amp; Quarantine, and Methyl Bromide Alternatives</td>
<td>4.4</td>
<td></td>
</tr>
<tr>
<td>4: Animal Production &amp; Protection</td>
<td>4.1 Animal Production</td>
<td>1.3 &amp; 3.1</td>
</tr>
<tr>
<td>4.2 Prevention and Control of Pests and Animal Disease that Threaten Agriculture</td>
<td>1.3, 3.1, 4.3 &amp; 4.4</td>
<td></td>
</tr>
</tbody>
</table>

Each ARS Goal Area includes specific goals that are aligned groupings of ARS’ 18 National Programs, derived from the Agency’s specific mission, as outlined in each National Program’s five-year Action Plan. In developing their individual Project Plans, each ARS scientist will, in turn, align his or her research objectives with the overarching goals identified in this portion of the ARS Strategic Plan, thereby ensuring continuity with the USDA, REE, and ARS vision for agricultural research.
ARS will utilize its existing organizational structure to accomplish these goals so as to incorporate them into the core activities of the Agency.

Responses to changing climate and weather extremes and variability will be assessed annually in terms of the effectiveness of meeting expected research milestones as specified in peer-reviewed project plans. The degree of achievement of expected research milestones versus weather and climate related interference with research progress, personnel safety and health, and facilities management and costs will be reflected in the allocation of resources in subsequent years’ evaluation process for each management unit. When weather and climate interfere substantially with research, personnel, or facilities, increased resources will be allocated for appropriate mitigation. Assessments and responses are expected to be iterative as required.

**Identification and assessment of climate change related impacts on and risks to the agency’s ability to accomplish its missions, operations, and programs;**

ARS is the largest research agency in USDA and has experimental stations and field plots throughout the United States. Extreme weather events have recently and will continue to damage research facilities and infrastructure. Experiments have been disrupted due to plant and animal loss. Heavy snowfall and rain events leading to flooding have impacted ability to care for animals, and greenhouse plants. Flooding of research facilities and fields has occurred. Drought has impacted experimental fields and animal facilities. Energy and water use has varied considerably from past experience due to prolonged high and low temperatures and drought. Heating and cooling expenses for workers, laboratories, and greenhouses have varied such that projecting needs and costs is increasingly difficult. Increased vigor of weeds and appearance of invasive species have required additional resources to control in experimental plots and fields. Wide temperature and precipitation swings affect work force health and food safety and increase likelihood of pathogens and skin irritants. Water quantity and quality needed to maintain research may become an issue for locations where prolonged drought occurs or where water-treatment plants are compromised by weather events. These occurrences may require a shift in research priorities. Incorporating additional environmental factors related to climate change must be considered in research planning for developing new crop varieties, management strategies, and conservation practices. Water is not only needed for buildings but for agricultural uses including irrigation, aquaculture and animal watering and cooling.

Thus, the ability of ARS to meet its mission can be compromised by climate change in several general ways:

- Reduced ability to conduct mission research at some current locations because environmental changes exceed the resilience of the agricultural systems under study at those locations.
Changes in budget allocations to research topics, made necessary because new environmental conditions have unexpected or unmitigated impacts on agricultural production systems and resources, thus diverting resources from current high-priority research.

Threats to personnel arising from extreme weather conditions, e.g., extreme temperatures, severe storms, flooding.

Increased costs of heating, cooling, and other “overhead” costs to mitigating untenable conditions for employees or research material, thus diverting resources from mission research itself.

Increased costs of buildings and facilities that must withstand extreme and variable conditions, including retrofitting existing facilities and costs of building new ones.

The following examples of these kinds of events and impacts illustrate the risks to ARS’s capacity to meet its mission.

**Extreme conditions and animal research:** Extreme conditions associated with climate change impact livestock, and potential impacts on ARS research may be significant. Direct effects are related to the intensity and frequency of animal summer heat stress. Heat stress in dairy cattle can have an effect lasting weeks to months on reproduction and milk production; milk production declines at temperatures above 24°C and is worsened by high humidity. Under severe conditions, milk production may be reduced by as much as 20 percent per day. Poultry also are sensitive to stress from high heat and humidity. Although chickens can acclimate to heat, sudden heat waves significantly lower production (growth rate, egg production, hatching rate) and egg quality (smaller eggs, thinner egg shells, poor internal quality). Increased frequency and severity of heat waves can thus jeopardize ARS research on livestock and require ARS research locations to divert resources into mitigation costs such as increased energy costs for cooling, construction of facilities and equipment designed to keep research animals cool in hot conditions, and even relocation of research to cooler regions.

Indirectly, climate change can affect livestock research via increased costs of animal feed, as yields of grain, forages, and silage are suppressed by heat, drought, or heavy or ill-timed precipitation. The need for research on mitigating heat stress will divert resources from research on other aspects of livestock production and health. To better address extreme heat events in confined animal production operations, ARS devotes resources at the U.S. Meat Animal Research Center (USMARC) in Lincoln, Nebraska, to research focused on managing heat stress in confined livestock operations, in partnership with the National Weather Service. A website was developed which incorporates the Geographic Resources Analysis Support System and provides daily heat stress forecasts for livestock producers on line through the ARS USMARC website (http://www.ars.usda.gov/Main/docs.htm?docid=21306). Additional research identified as necessary is focused on developing precision animal management technologies to enable livestock producers to monitor the health and heat stress levels of individual animals housed in large groups typical of modern animal production.
Impact of climate change on crop research: There are many ways that climate change and weather extremes may affect ARS crop research and allocation of resources to crop research. Included are the many documented impacts of increasing CO₂ concentrations, heat, precipitation extremes, and the various combinations on crop growth, reproduction, and yield. Greater uncertainties are associated with the effects on pests and pathogens. In general, the geographic distribution of pests is largely dependent upon climate, whereas the incidence and severity of outbreaks are largely dependent upon weather. Consequently, there is broad agreement that climate change will have substantial ramifications for pest control in crop systems. While more rainfall increases the protection needed for cereals and root crops against many pathogens, higher temperatures are likely to increase pesticide applications needed to protect fruits, vegetables, and beans. Under projected climate change, the total external costs over all pesticide classes for U.S. agriculture per hectare could increase up to 70 percent from 2000 to 2100. Higher CO₂ concentrations provide a “fertilizer effect” to most plants, including crops, but there is likely to be a need for increasing rates of herbicide applications to control weeds because increased biomass of weeds requires more herbicide to kill them; ARS research has already demonstrated this.

In addition, climate change is anticipated to result in changes in predominant weed populations within a region as the weather and climate conditions become more favorable for some weed species and not others. In rhizomatous perennial weeds, this could be the result of combinations of CO₂ and weather conditions favorable for increased carbohydrate storage in rhizomes that may benefit overwintering and vegetative spread. However, ARS research has demonstrated that effects on weeds are not uniform for all weed species and all parts of the country. Plant invasions in pasture and rangeland are often preceded by major disturbances, such as wildfires. The incidence of wildfires is predicted to increase in areas of the south and west as precipitation in these regions declines with climate change. In general, adaptation to climate change probably will require more intensive pest management to protect crops. All this will mean new challenges for ARS in locating, designing, and conducting research programs on improving cropping systems – including the increasing costs of managing pests in research crops – to ensure that production and product quality of U.S. crops meet the needs of our citizens and on preserving our natural resources, while ensuring that our food supply is safe and our environment remains healthy.

Impact on food safety research: Flooding can have a major food safety impact, as has been evident by the many produce-related food safety outbreaks originating in the Salinas area of California. A notable example occurred with a particular ranch, which periodically flooded from overflow water from the Santa Rita Creek that bordered the property. This event led directly to a collaboration of ARS, the State of California, and academic institutions to redirect resources to an environmental study of the impact of flooding. To conduct this work, ARS redirected its produce-related food safety research portfolio at the Western Regional Research Center, Albany, California, and realigned staff assignments from other research. Studies on significant events in 2003-2005, 2006, and 2011 indicated that flooding of small and major waterways, including the Salinas...
River, have major consequences to the economy (hundreds of millions of dollars) and public health (hundreds of illnesses and many deaths). A Food and Drug Administration (FDA) rule now considers ready-to-eat crops that have been in contact with flood waters to be adulterated due to potential exposure to sewage, animal waste, heavy metals, pathogenic microorganisms, or other contaminants.

The risks may be especially high for areas that have been under drought conditions immediately before flooding, since flood water can wash contaminants directly onto fields. To reduce the effect of seasonal extreme weather events, a significant amount of land susceptible to flooding has been taken out of production. This has affected ARS’ ability to continue some of its important produce-related research. This limits ARS’ capacity to provide research data to the FDA, which in turn uses such data with the produce industry and the State of California to develop actionable responses and corrective action plans through documents such as the Commodity Specific Food Safety Guidelines for the Production and Harvest of Lettuce and Leafy Greens. Unhindered research that allows the development of Good Agricultural Practices is at the heart of produce food safety, not only for California but for other fresh produce producing States such as Arizona, Colorado and the Delmarva Peninsula. Thus, extreme weather events affect not only food safety itself, but ARS’ abilities to conduct research that would mitigate food safety risks.

**Implications for natural resources in research:** Short and long-term water shortages (drought) and excesses (too much, too fast leading to floods) are expected to increase in frequency with changing climate. Research that has always been based on rain-fed plots may thus require irrigation for the first time, resulting in significant costs for irrigation equipment, energy to pump water, and water itself (if not drawn from wells or surface water). Even among field plots that have been irrigated all along, greater amounts of water may be required, which can alter or compromise research objectives and/or progress. Water shortages may result in the loss of experimental material (plants, soil, animals). Insufficient moisture may delay planting dates, suppress yield quantity and/or quality, and increase the threat of fire on grazing lands research locations. Water shortages will affect research priorities, especially when reduced water availability for research and industry alters what, where and how a crop or livestock can be grown. Continued shortages of water may dictate a shift of research priorities to emphasize reduced water use, more efficient water use, and gray water use.

Conversely, excess water may stress plant research plots via flooding. Excessive moisture during a growing season may shorten available time for field access to plant, manage (treat pests, apply fertilizers, etc.) or harvest. A major concern is the threat of heavy rainfall intensities that exacerbate soil erosion, thus leading to degradation of topsoil and environmental quality as sediment, nutrients and pesticides move offsite with runoff and/or subsurface flow. Such erosion may incur costs associated with mitigation of sediment deposition off-site. The timing of rainfall events may also create pest and pathogen problems, for example, as increased frequency of precipitation lengthens the persistence of free water on leaves, which promotes fungal growth on late-stage crops and/or recently harvested crops. Under such conditions, costs of pest management or
even complete loss of experiments may occur. Flooding can also cause serious problems for livestock research units. Storage lagoons for animal waste management are vulnerable to heavy rainfall and may require modification to prevent overflows or collapse. Livestock waste spills cause spread of pathogens and excess nutrients to waterways, resulting in major environmental impacts and significant mitigation costs.

Costs of mitigating weather-related damage to research facilities: During January 2014, the Midwest and Eastern United States experienced three periods of polar temperatures that stretched the natural gas and electric power distribution systems to their limits. The electric bills of some ARS locations tripled in January 2014. Utilities normally are one third of the operations and maintenance cost of a facility and increased operating costs take funding away from research.

In addition to storms, ARS facilities are located where they are vulnerable to flooding and wildfires, along the Mississippi and Red Rivers, the Florida coast and in forested areas. The Mississippi river floods of April and May 2011 approached ARS lands in Mississippi. When the Army Corp of Engineers opened the Morganza spillway to protect Baton Rouge and New Orleans as well as oil refineries and chemical plants, it flooded ARS lands near Houma, Louisiana.

A tornado struck the Ohio Agricultural Research and Development Center in Wooster, Ohio on September 16, 2010, destroying the University-owned Ag Engineering Building that housed the ARS Application Technology Research Unit. The estimated cost to replace the structure is $11 million, in addition to the $260,000 worth of ARS equipment that was lost. The new facility will not be ready for occupancy before the end of 2014, and ARS research has been hindered by the loss of equipment and forced relocation to temporary space.

In El Reno, Oklahoma, a tornado struck the Grazinglands Research Laboratory on May 24, 2011. Five buildings were destroyed, nine buildings were heavily damaged, ten buildings sustained minor damage, expensive scientific equipment was damaged or destroyed, and more than 10 miles of fences were destroyed. The estimated funding needed to restore El Reno to its pre-tornado condition is $5.1 million, which has not been appropriated and thus must be diverted from research. On May 31, 2013 a large tornado again hit the lab in El Reno Oklahoma resulting in $132,000 in damage to windows, roofs, equipment and crops.

In September 2004 two major hurricanes hit Ft Pierce Florida 22 days apart, and while the ARS buildings survived with some damage, the research citrus groves suffered a big loss. April 14, 2012 a tornado damaged ARS fences and structures in Woodward Oklahoma as well as neighboring NRCS and FSA facilities and left a large amount of debris to remove from farmland.

On June 11, 2008, a tornado struck Manhattan, Kansas. It damaged or destroyed the ARS Center for Grain and Animal Health Research facilities, the Wind Erosion Research Laboratory, the laboratory’s attached greenhouse and a vehicle garage, and a greenhouse
used for Hessian fly research. Congress appropriated $2.8 million to replace the facilities, which took nearly four years.

In August 2005, Hurricane Katrina caused extensive damage to the 400,000 square-foot Southern Regional Research Center in New Orleans, Louisiana. A total of $32.5 million was invested through a Rapid Recovery Phase and subsequent Long Term Recovery to replace major mechanical and electrical systems and equipment, repair buildings, renovate completely flooded and destroyed areas in the basement, and repair damaged areas on upper floors in the Main Building. Although the SRRC became fully operational again in August 2006, a full year earlier than expected, total recovery took six years.

Other recent severe weather events that have damaged ARS facilities and incurred aggregate costs of more than $16 million to the agency include tornadoes in Houma, Louisiana; Beaumont, Texas, and Beltsville, Maryland; flooding in Grand Forks, North Dakota; and a hurricane in Miami, Florida In 2004 In addition to the cost to replace the facilities, there is significant impact on ARS’ research capacity through interruption or loss of millions of dollars invested in experiments that have been lost, delays in planned research, and the obstacles inevitable in placing research programs in temporary space.

**Impact to personnel and personnel-related costs:** As a research agency, ARS’ most valuable asset is its personnel, who apply their scientific, technical, and administrative expertise to accomplish the ARS mission. There are many weather and climate related impacts on personnel, and the exact kind and impacts vary across the country. Heat stress, severe cold, flooding, and wind all are examples of hazards to people working at ARS locations. Additional hazards arise from people whose performance may be compromised by such stresses or weather conditions, such as accidents associated with loss of control of heavy equipment, motor vehicles, hazardous chemicals, and others. Damage to ARS research facilities can result in major costs to the agency, diverting resources from research into emergency response. Included among such costs, aside from costs required for repair or replacement of facilities as discussed above, are those associated with personnel.

A striking example is the impact of Hurricane Katrina on the personnel associated with ARS facilities in Louisiana, especially the Southern Regional Research Center in New Orleans. Major damage and flooding of the Center occurred when Katrina made landfall in southeastern Louisiana on August 29, 2005, rendering the Center completely unusable. A total of 178 employees, along with their families, had to be relocated to 22 temporary duty stations in 12 states to maintain critical research projects and progress as much as possible. Personnel-related costs arising from Katrina totaled more than $4 million over three fiscal years.

**Description of programs, policies, and plans the agency has already put in place, as well as additional actions the agency will take, to manage climate risks in the near term and build resilience in the short and long term;**
ARS locations and specific operations are highly dispersed and heterogeneous with respect to activities conducted to meet the agency’s mission. ARS conducts research to address its mission at more than 90 locations in nearly all 50 states. Many locations have multiple research units with very different research (e.g., crop, livestock, natural resources, and/or post-harvest quality and safety research at a single location). Many ARS research units are co-located on university campuses, and at these locations, ARS research and personnel may be housed in facilities owned by the federal government, by the university, or some combination.

Other ARS units are housed in stand-alone, government-owned research facilities that may be in remote locations or in large cities. In addition, resources are allocated by Congress to the agency specific to locations for specific research. Thus, plans for adaptation to climate change must be highly specific and relevant for each research unit’s unique combination of resources, research mission, facilities type and ownership, geographic location and environment, and climate change and weather variability/extremes in evidence. Adaptation strategies and plans for a natural resources unit in the desert southwest would not be appropriate for a human nutrition unit in hospital-like facilities in a large eastern city, nor for a crop breeding program operated by scientists conducting research on a university campus in the Midwest where management plans for university-owned facilities are in place.

Implementation plans for application of congressionally appropriated resources in research are developed annually by the Research Leader of each research management unit in consultation with, and approval by, the relevant Area Director (the most senior line manager in each of ARS’ seven multi-state Areas and the Beltsville Agricultural Research Center). The Annual Resource Management Planning (ARMP) process includes allocation of resources for personnel, direct research costs, and indirect research costs (e.g., facilities management; safety, health, and environmental management). Allocation of appropriated resources among these and other aspects of the unit’s operations may be affected by climate change and weather variability and extremes.

Accordingly, Research Leaders will allocate resources as required to respond to direct research costs (e.g., pest management in crops, heat stress management for livestock) and indirect costs (e.g., energy costs for buildings, equipment and supplies for personnel safety and health), as affected by climate change within the context of their research activities, facilities, and locale. Allocations of costs to respond to changes in research needs, personnel needs, and facilities management will be reviewed and approved by Area Directors in the ARMP process.

ARS sets its research priorities, develops National and management unit-level research plans, and implements its plans through a highly developed process that includes established procedures for obtaining formal input from a wide variety of customers, stakeholders, and research partners. These include priorities and needs expressed by the Administration and Congress; other departments of the Federal government and other
agencies within USDA, including action and regulatory agencies; state governments and agencies; non-government organizations such as commodity organizations; universities and other non-government research organizations; individual farmers and land-owners; and others. The five-year research project plans developed by agency scientists in response to input from customers, stakeholders, and partners are peer-reviewed by non-ARS scientists for adequacy of research approaches and likelihood of success in achieving stated objectives. As climate change and weather variability are manifest through changing pressures and needs related to crop production and protection, animal production and protection, natural resources and sustainable agricultural systems, and nutrition, food safety, and quality, we anticipate that the agency’s customers, stakeholders, and partners will identify necessary changes to be recommended for research programs and changes in allocations of research resources to address any such issues that increase in importance.

One of ARS’ 18 National Programs is Climate Change, Soils, and Emissions. Goals of this National Program include adaptation of agricultural systems to climate change and mitigation of greenhouse gases, including mitigating those originating from agricultural production systems and offsetting agricultural and non-agricultural emissions with carbon sequestration in soils. Inherent in this research program is consideration of the likely magnitude of climate change and scenarios of impacts on crops, livestock, natural resources, and post-harvest product quality and safety. Resources allocated to ARS locations for climate change, soils, and emissions research are applied to research on impacts, adaptation, and mitigation, and results of this work informs all climate and weather related research throughout the agency.

Most ARS locations have emergency generators fueled by diesel fuel, natural gas or gasoline. They can be operated in power outages, to reduce demand during the operation of certain equipment or when called on by utilities to reduce load on the grid during peak periods (demand response). Natural Gas microturbine powered generators at Ames, Iowa, have been decommissioned because they ceased to be cost effective. Often, however, due to budget constraints, this distributed generating capacity provides power to only the critical functions of a facility so systems like air conditioning may not be on emergency power. Property and research may be preserved but indoor air quality and working conditions may be compromised. Such measures are also dependent on a reliable supply of uncontaminated fuel after a weather event.

Some labs have changed their heating fuels. The New England Plant, Soil and Water Research Laboratory in Orono, Maine converted from burning fuel oil (kerosene) in its boilers to natural gas in 2013. Eastern Regional Research Center converted its backup fuel from #6 fuel oil to #2 fuel oil. These actions reduced Green House Gas (GHG) emissions, reduced energy costs, and increased energy efficiency among other things. Many locations have dual fuel boilers that can operate on fuel oil if there are utility curtailments in natural gas supply. But, fuel oil is more expensive and creates more greenhouse gas emissions than natural gas. There is also a disincentive to participate in demand response programs because 50 percent of utility incentives must be sent to Treasury which usually prevents demand response from being cost effective.
ARS is installing renewable energy as limited appropriated funds permit. Solar photovoltaic (PV) arrays are installed at several locations: Pendleton, Oregon – 7 KiloWatt (KW); Parlier, California – 96 KW; Washington, DC – 21.1 KW; Hilo, Hawaii – 40.46 KW; Tucson, Arizona – 5 KW; and Bushland, Texas – 2.4 KW. ARS is planning a 1,000 KW PV project in Maricopa, Arizona. Solar cells also used widely for remote telemetry. Solar hot water is used at Stoneville, Mississippi; Gainesville, Florida and Morris, Minnesota.

ARS is utilizing performance contracting to leverage private financing in order to make cost effective energy and water saving improvements to its facilities. Financed Utility Energy Service Contracts and Energy Savings Performance Contracts are being awarded that are currently saving $3.75 Million annually. These contracts have been used at 23 locations, representing 65 percent of ARS’ energy consumption.

ARS policy requires that all new construction and renovations follow the US Green Building Council Leadership in Energy and Environmental Design (LEED) methodology for a silver rating. ARS’ largest building which alone uses over 23 percent of the agency’s total energy consumption is LEED certified.

ARS voluntarily participated in the road test of the public sector protocol for tracking greenhouse gas emissions and still closely monitors and reports its GHG emissions. ARS has brought its Scope 1 and 2 GHG emissions down to 13.5 percent below the goal set by USDA and Executive Order 13514. This was accompanied by a $9.7 Million reduction in annual energy costs since FY 2008 from $47.2 Million to $37.3 Million.

ARS is changing the materials used for buildings in response to changes in hot and cold temperature extremes. For instance, reflective cool roofs are being installed when roofs are replaced. Biobased spray foam insulation is being added or increased in buildings.

Recovery of the SRRC in New Orleans, Louisiana after the flooding of Hurricane Katrina included raising equipment such as emergency generators above the flood level and changing the lower building level to limited use.

A description of how any climate change related risk identified pursuant to the first paragraph of this subsection that is deemed so significant that it impairs an agency’s statutory mission or operation will be addressed, including through the agency’s existing reporting requirements;

Funds intended to provide for mission support and the regular maintenance and replacement of equipment will need to be used for emergency replacement of equipment, facilities and infrastructures damaged or threatened by the more frequent and damaging storms and weather events. In the absence of increased appropriations this will create a larger backlog of deferred maintenance and decrease the operational life of equipment.
Facilities will be less viable into the future. In addition to emergency breakdown, ARS will be required to divert funds from research to pay for repair and replacement of facilities, fixtures and equipment damaged or destroyed by the impacts of climate change. The operating costs of ARS’ facilities will increase due to the increased cost of utilities, and the premium cost of providing energy through emergency methods and distributed generation and the increased operation and maintenance cost of aging equipment.

A description of how the agency will consider the need to improve climate 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

ARS Design Manual 242.1 and Policy and Procedure (P&P) 134.2 Energy Water and Sustainability, will be updated to incorporate the requirements of Executive Order 13653. New construction and renovation of existing facilities will incorporate provisions for climate change resiliency. Those two policies, which form the basis of facility design and sustainable operations in ARS, already incorporate requirements for energy, water, and resource conservation and environmentally preferable procurement that reduce the agency’s environmental footprint and greenhouse gas emissions. P&P 134.2 states the Agency’s policy as:

Consistent with REE’s mission and without compromising health and safety, it is REE policy to give energy and water conservation as well as sustainability, prime consideration in the acquisition, use, and disposal of all property and in the performance of all functions. This action will reduce the impact of our activities on the environment and help conserve resources. Efficiency and conservation shall be integrated into the core activities of the Agency. It shall be every employee’s responsibility to ensure that every reasonable effort is made to reduce operating costs and conserve energy, water, and resources.

Following the lead of the Secretary, and the Telework Enhancement Act of 2010, ARS is implementing an agency wide telework policy and encouraging employees to participate with several initiatives. 75 percent of USDA’s scope 3 GHG emissions were the result of commuting in FY 2008. ARS also encourages the use of public transportation and the reduction of business travel. USDA’s new goals are 60 percent participation in core telework and 50 percent participation in situational telework.

ARS uses the GSA Solicitation for Offers in leasing, which incorporates sustainability.

A description of how the agency will 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 coordinated development of information, data, and tools, consistent with section 4 of this order.
ARS participates actively in interagency working groups on energy, sustainability, greenhouse gas and water for its facilities and programs. ARS coordinates with other agencies to share information and cooperates in the development of guidance.

The US Meat Animal Research Center is working with the Army Corps of Engineers on a groundwater cleanup effort in Clay Center NE. Groundwater is contaminated by munitions from prior DoD use of the area. The Corps is pumping water from the plumes, cleaning it and providing it to ARS for irrigation. This allows the water to percolate back into the aquifer rather than be dumped into the West Fork of the Big Blue River where it will not recharge the aquifer. The Ogallala aquifer, much of which is under Nebraska, is stressed by drought and irrigation demands. They are pumping the north plume at a rate of 2,500 gallons per hour (gph) now and preparing to pump the south plume at 1,300 gph into about 300 acre feet of ponds to be completed by April, 2014. Six center pivot irrigation systems are using the water now and twelve more are in design to be installed March, 2015. This offsets a portion of the Center’s regular irrigation.

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;

Demand response programs, where facilities are paid by curtailment service providers to disconnect from the grid during times of high demand, are difficult to participate in, not only because research operations demand uninterrupted utility service but 50 percent of payments are required to be deposited in the general fund of the Treasury by Pub. L. 104-52, § 625, 42 U.S.C. 8256 note. And, 40 CFR Part 63 Subpart ZZZZ limits the hours diesel emergency generators are allowed to run.

Solar photovoltaic and wind projects are difficult for USDA to install at Federal facilities because they have a large upfront cost, require a 20 year payback, and USDA lacks authority for long term contracts, power purchase agreements and enhanced use leasing. Renewable energy projects make ESPCs nonviable and UESCs under a GSA areawide contract are limited to 10 year terms.

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;
Not Applicable.

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.
ARS is participating in the Agricultural Technology Innovation Partnership (ATIP) Foundation which will provide grants to implement agricultural research results. It will help scientists take their research to market. The ATIP foundation has formed the Resilient Economic Agricultural Practices public private partnership to sustain long term research on land management practices across the United States.

ARS will also be participating in the Foundation for Food and Agriculture Research established under the 2014 Farm Bill. The Foundation will advance research addressing key problems in plant and animal health and production, food safety, nutrition and health, renewable energy, natural resources and the environment, agricultural and food security, agricultural systems and technology and agricultural economics and rural communities, and to foster collaboration.