

***2013 HIGHLIGHTS OF PROGRESS
and
2014 IMPLEMENTATION PLAN***

for the

***National Action Plan:
Priorities for Managing Freshwater Resources
in a Changing Climate***

March 26, 2014

**Prepared by the
Water Resources Workgroup**

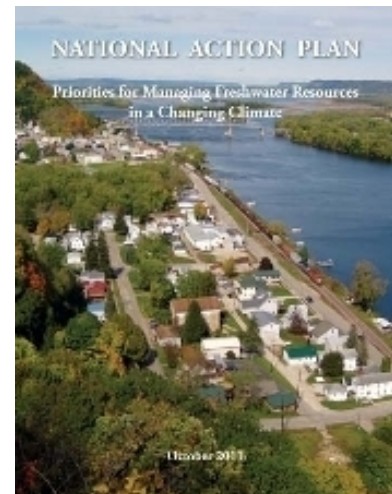
**Supporting the
Council on Climate Change Preparedness and Resilience**

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Introduction

In October 2011, the Interagency Climate Change Adaptation Task Force published a *National Action Plan: Priorities for Managing Freshwater Resources in a Changing Climate* (http://www.whitehouse.gov/sites/default/files/microsites/ceq/2011_national_action_plan.pdf). Developed by a Workgroup made up of Federal agencies with responsibilities for water management, the *Plan* provides an overview of the challenges that a changing climate presents for the management of the Nation's freshwater resources and describes actions Federal agencies will take to support water resource managers in understanding and reducing the risks of climate change.



This report describes both some highlights of progress in implementing the *National Action Plan* in 2013 as well as the specific tasks that Federal agencies will take to implement the *Plan* between January 2014 and September 2014. Future reports will be on a federal fiscal year basis (October through September).

In 2013, the participating Federal agencies published a report describing 2012 highlights of progress in implementing the *Plan* (see http://acwi.gov/climate_wkg/nap_2012_highlights_3.5.13_final.pdf). In addition, the agencies published a Workplan for 2013 (http://acwi.gov/climate_wkg/nap_2013_implementation_plan_final.pdf). Taken together, the work described in these earlier reports, along with the work described in this report, describe a comprehensive and coordinated effort by Federal agencies to improve response to the challenges posed to water resources management by a changing climate.

Six recommendations to improve water resources management in a changing climate were presented in the *National Action Plan*. Federal agencies are implementing some 24 more specific “supporting actions,” which are summarized in Table 1 below. Tasks supporting each recommendation are managed by a team of Workgroup members most closely associated with the recommendation.

An important development in 2013 was the release in June of the President's *Climate Action Plan* and Executive Order 13653, *Preparing the United States for the Impacts of Climate Change*, which implements the *Plan*. Under Executive Order 13653, the Interagency Climate Change Adaptation Task Force was replaced by a new, expanded interagency group called the Council on Climate Change Preparedness and Resilience (Council). In addition, a new Climate Natural Resources Working Group (CNRWG) was created to address the full range of climate change and natural resources issues by developing a priority agenda within nine-months (late summer

2014). The Water Resources Workgroup was retained under this new structure and informs both the Council and the CNRWG.

Some of the most significant 2013 highlights of progress described in this report include:

- ✓ Developing an expanded surveillance system for tracking waterborne disease threats;
- ✓ Developing an internet portal on water resources and climate change as part of a “Toolbox” managed by the Army Corps of Engineers;
- ✓ Developing and implementing vulnerability assessments of National Forests;
- ✓ Working with States to review flood management and drought management planning to identify best practices; and
- ✓ Engagement of Federal agencies and stakeholders interested in climate change and water resources in the Climate Change Workgroup of the Advisory Committee on Water Information, including development of a two-day meeting of the group.

For 2014, some of the most significant implementation actions described in this report are:

- ✓ Work with stakeholder organizations represented on the climate workgroup of the Advisory committee on Water Information;
- ✓ Continue and expand waterborne disease surveillance capacity in States;
- ✓ Improve integration of wetlands mapping in the National Spatial Data Infrastructure;
- ✓ Provide technical assistance in use of vulnerability assessment and planning tools such as the Climate Resilience, Evaluation and Awareness Tool (CREAT) for water utilities;
- ✓ Integrate Forest Service vulnerability assessments into forest climate adaptation strategies;
- ✓ Develop Agency-specific procedures for implementing water planning Principles and Requirements;
- ✓ Initiate new Integrated Water Resources Management climate adaptation pilot studies;
- ✓ Develop climate adaptation training programs as part of Agency climate adaptation plans; and
- ✓ Continue work with University Corporation for Atmospheric Research (UCAR) to develop climate change and water resources training.

As a result of over two years of implementation effort, Federal agencies have been able to complete or substantially implement several of the 24 specific supporting actions identified in the *National Action Plan*. Specifically, the Workgroup considers the following actions identified below to be substantially complete, although some work to keep the action current may continue:

- ✓ **Supporting Action 1:** Establish a planning process with the capability to identify priority adaptation actions and promote their implementation;
- ✓ **Supporting Action 2:** Establish an organizational framework to promote effective management of water resources in a changing climate;

- ✓ **Supporting Action 7:** Establish interagency effort to expedite implementation of the newly developed wetlands mapping standard;
- ✓ **Supporting Action 9:** Develop an internet portal on water resources and climate change;
- ✓ **Supporting Action 13:** Promote free and open access to authoritative climate change-science and water resources data;
- ✓ **Supporting Action 18:** Revise Federal water project planning standards to address climate changes; and
- ✓ **Supporting Action 20:** Develop benchmarks for incorporating adaptive management into water project designs, operational procedures, and planning strategies.

In addition, two years of experience in efforts to advance implementation of the supporting actions in very difficult budget circumstances, including a shutdown of the government, has resulted in agencies, and the Workgroup as a whole, rethinking the feasibility of some supporting actions and deciding to stop or delay work with respect to some supporting actions, including:

- ✓ **Supporting Action 23:** Engage Water Resources Research Institutes at land grant colleges in climate change adaptation research; and
- ✓ **Supporting Action 24:** Increase graduate fellowships in water management and climate change.

Table 1: Summary of Recommendations and Supporting Actions Action Substantially Complete; Action Stopped/Delayed Indefinitely	
Recommendation 1: Establish a Planning Process	
Action 1: Establish a planning process	
Action 2: Establish an organizational framework	
Recommendation 2: Improve Water Resources and Climate Data	
Action 3: Strengthen data for understanding climate change impacts on water	
Action 4: Create a program to align “hydroclimatic” statistics	
Action 5: Implement surveillance system for tracking waterborne disease threats	
Action 6: Provide information to identify areas likely to be inundated by sea level rise	
Action 7: Expedite implementation of wetlands mapping standard	
Recommendation 3: Strengthen Assessment of Vulnerability	
Action 8: Publish guidance on use of modeled projections for water resource applications	
Action 9: Develop an internet portal on water resources and climate change	
Action 10: Develop a pilot climate change/freshwater vulnerability index	
Action 11: Develop tools to build capacity for vulnerability assessments	
Action 12: Assess vulnerability of National Forests and Grasslands	
Action 13: Promote free and open access to water resources data	
Recommendation 4: Improve Water Use Efficiency	
Action 14: Develop nationally consistent metrics for water use efficiency	
Action 15: Make water use efficiency an explicit consideration in the revision of Principles and Standards for water resources projects and in new NEPA guidance on climate change	
Action 16: Enhance agency coordination and create a “toolbox” of water efficiency practices	
Recommendation 5: Support Integrated Water Resources Management	
Action 17: Strengthen the role of interstate bodies in climate change adaptation	
Action 18: Revise Federal water project planning standards to address climate change	
Action 19: Working with States, review flood risk management and drought management planning and identify “best practices”	
Action 20: Develop benchmarks for incorporating adaptive management into water project designs, operational procedures, and planning strategies	
Recommendation 6: Educate Water Resource Managers and Build Capacity	
Action 21: Establish a core training program on climate change science	
Action 22: Focus existing youth outreach programs on climate change and water issues	
Action 23: Engage land grant colleges in climate change adaptation research	
Action 24: Increase graduate level fellowships in water management and climate change	

Recommendation 1: Establish a Planning Process and Organizational Framework

The *National Action Plan* was an initial step to respond to the challenges to freshwater resource management posed by a changing climate. Its recommendations, however, need to be evaluated and updated over time. In addition, a formal organizational framework is needed to oversee implementation of the *Plan* and strengthen links to Federal agencies with State, tribal and local governments and other interested parties.

Supporting Action 1: Establish a planning process with the capability to identify priority adaptation actions and promote their implementation **(COMPLETE)**

Supporting Action 2: Establish an organizational framework to promote effective management of water resources in a changing climate **(COMPLETE)**

During 2013, the Water Resources Workgroup co-chairs (i.e., USGS, EPA, and CEQ) managed the implementation of actions and tasks to support this recommendation in conjunction with the agency members of the Workgroup. The co-chairs believe that the initial tasks of establishing a planning process and organizational framework have been successfully completed, although continued work will be needed in 2014 and future years to use the organizational framework to implement the planning process.


It is also important to note that the organization and planning process described will evolve as new interagency initiatives related to the President's Climate Action Plan, released in June 2013, and new Climate Change Executive Order (EO 13653) are implemented. For example, the Climate Change Preparedness and Resilience Council established under EO 13653 created several working groups, including one focused on natural resources (land and water) and the Water Resources Workgroup supports these new groups.

2013 HIGHLIGHTS OF PROGRESS FOR RECOMMENDATION 1:

Key accomplishments in 2013 related to recommendation include:

1. **Publish a 2012 Highlights of Progress:** In March 2013, the Workgroup published an annual progress report describing actions to implement the *National Action Plan*; see http://acwi.gov/climate_wkg/nap_2012_highlights_3.5.13_final.pdf
2. **Publish 2013 Workplan:** In March 2013, the Workgroup published a workplan describing actions to be implemented to advance the work described in the *National Action Plan*; see http://acwi.gov/climate_wkg/nap_2013_implementation_plan_final.pdf
3. **Holding Regular Workgroup Meetings:** The Climate Change and Water Resources Workgroup met monthly in 2013. These meetings provided for exchange of information among participating agencies concerning developments related to climate change

adaptation, coordination with related projects, and review of progress implementing the *National Action Plan*.

4. **Coordinate with Related Climate Change and Water Plans and Projects:** Throughout 2013, the Workgroup participated in a range of related programs and projects including:
- Contributing to efforts leading to the President's *Climate Action Plan* released in June of 2013;
 - Contributing to the development of the Climate Change Preparedness Executive Order, released in November 2013;
 - Preparing a Federal Technical Input Document for Water and the Water Chapter of the draft *National Climate Assessment*;
 - Developing the Climate Change chapter of the Implementation Plan for the *National Ocean Policy*;
 - Contributing to the water related elements of the *National Fish, Wildlife and Plants Climate Change Adaptation Strategy*;
 - Commenting on documents developed by the Climate Change and Water Working Group (CCAWWG); and
 - Reviewing and commenting on draft agency climate change adaptation strategies to provide input to CEQ as it created guidance to agencies for improving strategies.
5. **Cooperate with the National Science and Technology Council (NSTC) Committee on Environment, Natural Resources, and Sustainability's (CENRS), Subcommittee on Water Availability and Quality (SWAQ) and CCAWWG:** Throughout 2013, the Workgroup co-chairs and members participated in monthly meetings of the Committee on the Environment, Natural Resources, and Sustainability's SWAQ and the work of the interagency CCAWWG.
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6. **Support Operation of External Stakeholder Workgroup:** A significant accomplishment of 2012 was the formal establishment of a new Climate Change and Water Workgroup of the Advisory Committee on Water Information (ACWI). The ACWI is a Federal Advisory Committee that provides advice and guidance on water issues to Federal agencies. The *National Action Plan* includes a recommendation that ACWI serve as a vehicle for engaging stakeholders on climate change and water issues. Some 26 organizations representing States, Tribes, and public interest groups are members of the Climate Change and Water Resources Workgroup along with 14 Federal agencies.

In 2013, this Climate Change Workgroup of the ACWI met on a monthly basis and provided feedback on matters related to the *National Action Plan*. EPA is the Federal agency co-chair of the Workgroup and the Water Environment Federation is the non-Federal co-chair. Materials related to the workgroup are posted on the ACWI website:

http://acwi.gov/climate_wkg/index.html. The 2013 Workplan developed by the ACWI Climate Change Workgroup is posted at: http://acwi.gov/climate_wkg/2013_workplan_wraccw_final.pdf. A report describing the actions of the ACWI Climate Change Workgroup in 2013 is posted at http://acwi.gov/climate_wkg/index.html.



2014 WORKPLAN FOR RECOMMENDATION 1:

Task Number	Task	Projected Completion
1	Publish final 2013 Highlights of Progress Report and 2014 Implementation Plan (this document)	March
2	Support the Council and participate in interagency work to implement Section 3 of EO 13653, which addresses land and water resilience issues	Ongoing
3	Outreach to Federal agency officials developing climate change adaptation plans to assure that adaptation plans implement key actions in the <i>National Action Plan</i> : <ul style="list-style-type: none"> ○ Provide Workgroup comments on draft agency strategies ○ Include review of agency climate adaptation plans in Workgroup meeting agendas 	Ongoing Ongoing
4	Develop program and outcome measures for evaluating progress on water resources climate adaptation: <ul style="list-style-type: none"> ○ Draft measures for comment ○ Final measures 	June September
5	Continue Water Resources Workgroup meetings to share information concerning agency work related to climate change and water and implementation of the <i>National Action Plan</i>	Monthly
6	Continue to work with and support the Climate Change and Water Resources Workgroup of ACWI to hear comments and suggestions related to the need for Federal actions on climate change and water, including actions to implement the EO 13653	Ongoing
7	Participate in meetings of the SWAQ and provide comments on climate change related reports	Monthly

8	Coordinate with Joint Implementation Working Group (JWIG) set up to implement the <i>National Fish, Wildlife and Plants Climate Change Adaptation Strategy</i>	Ongoing
9	Coordinate with efforts to implement the climate change elements of the Implementation Plan for the <i>National Ocean Policy</i>	Ongoing
10	Participate in meetings of the CCAWWG and provide comments on reports and products	Monthly
11	Participate in development of regional collaborations on climate change science and services	Ongoing

Recommendation 2: Improve Water and Climate Change Information for Decision-Making

Current decision-making tools and policies for water resources management rely on historical water data to estimate future variations in water availability and quality. In a changing climate, however, water data used in decision-making tools need to be more complete and current. In addition, new insights from predictive models and vulnerability and assessment tools need to be applied to key decisions.

The Data and Information Team, led by US Geological Survey, manages the implementation of actions and tasks to support this recommendation in conjunction with the agency members of the Workgroup.

2013 HIGHLIGHTS OF PROGRESS FOR RECOMMENDATION 2:

Key accomplishments in 2013 related to this recommendation include:

Supporting Action 3: Strengthen data for understanding climate change impacts on water

Supporting Action 4: Create a program to align “hydroclimatic” statistics with today’s climate and anticipate future changes

Supporting Action 5: Implement an active, reliable surveillance system for tracking waterborne disease and public health threats relevant to climate change

Supporting Action 6: Provide coastal states and communities with essential information to identify areas likely to be inundated by sea level rise

Supporting Action 7: Establish interagency effort to expedite implementation of the newly developed wetlands mapping standard
(COMPLETED)

- 1. Contributing to the National Climate Assessment (NCA) Water Resources Chapter:** USGS and the US Army Corps of Engineers (USACE) co-led development of a technical input report to the NCA’s water resources chapter which summarized current observations of effects of climate change on the water cycle, anticipated effects based on climate modeling, and identified adaptation strategies. The technical report was reviewed in 2013 and is expected to be published in 2014 as a USGS Circular. This report served as a key input to the water resources Chapter of the National Climate Assessment, which is expected to be released in the spring of 2014.
- 2. Publish Short-Term Water Management Decision Needs Report:** Adapting to future climate change impacts requires capabilities in hydroclimate monitoring, short-term prediction and application of such information to support contemporary water management decisions. These needs were identified in a January 2013 report, "[Short-Term Water Management Decisions: User Needs for Improved Climate, Weather, and Hydrologic Information](#)," published by the Bureau of Reclamation and the U.S. Army Corps of Engineers with the National Oceanic and Atmospheric Administration. The report identifies how Federal agencies, along with state, local, tribal and non-governmental organizations and agencies are working together to

identify and respond to the needs of water resource managers in the face of a changing climate. The report is broken into four categories:

- Monitoring Product Needs,
- Forecasting Product Needs,
- Understanding and Using Information Products in Water Management, and
- Information Services Enterprise

3. Release Scenarios of Climate Change Impacts: The US Global Change Research Program released a series of climate scenarios. Scenarios are quantitative and narrative descriptions of plausible future conditions that provide assumptions for analyses of potential impacts and responses to climate change. Scenarios are ways to help understand what future conditions might be, with each scenario as an example of what might happen under different assumptions. Scenarios are not predictions or forecasts, and no probabilities are associated with them. Instead, they provide a range of future conditions to bound uncertainty. They are based on peer-reviewed, published sources, including materials prepared by the Intergovernmental Panel on Climate Change (IPCC). The scenarios include:

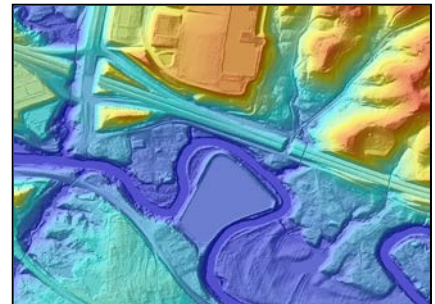
- climate,
- sea level change,
- land use, and
- socio-economic conditions.

4. Study of Climate Change in 20 Watersheds: EPA released in March 2013 for independent external peer review and public comment a draft report titled, *Watershed Modeling to Assess the Sensitivity of Streamflow, Nutrient, and Sediment Loads to Potential Climate Change and Urban Development in 20 U.S. Watersheds*. This is a draft document that characterizes the sensitivity of streamflow, nutrient (nitrogen and phosphorus) and sediment loading in different regions of the nation to a range of plausible mid-21st Century climate change and urban development scenarios. Simulation results provided in the draft report, show a high degree of variability in the response throughout the nation. Study results provide guidance for improving how existing models and datasets can be used for assessing climate change impacts on watersheds.

5. Bureau of Reclamation Synthesis Report: The third edition of the *Literature Synthesis on Climate Change Implications for Water and Environmental Resources* from the Bureau of Reclamation was published in October 2013 (see <http://www.usbr.gov/climate/docs/ClimateChangeLiteratureSynthesis3.pdf>). The report offers a summary of recent literature on the current and projected effects of climate change on hydrology and water resources and is organized around the five Reclamation regions, which correspond roughly with the Columbia River basin, the Sacramento-San Joaquin River basin, the upper Colorado River basin, the lower Colorado River basin, and the Great Plains. The information in this report is meant for use in a range of planning studies including environmental impact statements,

biological assessments, and feasibility studies. Previous versions were published in 2011 and 2009.

6. **New USGS Climate Data Website:** USGS launched an innovative, new climate website showing county-by-county maps and information of historical and 21st century projections of temperature and precipitation (see <http://regclim.coas.oregonstate.edu/gccv/index.html>). USGS scientists used data from 31 phase 5 Coupled Model Intercomparison Project (CMIP5) and IPCC climate models and created a user-friendly interface to view the climate information from downscaled NASA datasets. The information will be of use to land and water managers and of interest to the general public.
7. **First Waterborne Disease Capacity Grants:** CDC supports all state health departments through its epidemiology and laboratory capacity building grant. In 2012, for the first time, the ELC grant began funding small waterborne disease response capacity building grants in seven states: Arizona, Florida, Ohio, South Carolina, Washington, New Hampshire, and Louisiana. In 2013, CDC continued to provide funding for these states and added Maine to the program.
8. **Enhanced Waterborne Disease Outbreak Reporting:** CDC transitioned to electronic reporting of waterborne outbreaks in 2009 by launching the National Outbreak Reporting System (NORS), enabling health departments in 50 states and nine U.S. jurisdictions to more quickly report and access detailed information about waterborne disease outbreaks. In 2013, national data from the first two years of electronic reporting were reviewed by CDC and EPA for publication, and CDC partnered with multiple state health departments to start piloting a new database upload feature. A user training website was launched in January 2013 to improve the speed, accuracy, and ease of reporting of information about outbreak etiologies, contributing factors, and antecedent causes.
9. **Grants to Great Lakes States:** CDC obtained funding from the Great Lakes Restoration Initiative to start building state capacity for detection, investigation, and reporting of waterborne disease and outbreaks related to ambient water exposure in all eight Great Lakes states (Minnesota, Wisconsin, Illinois, Indiana, Michigan, Ohio, Pennsylvania, and New York). In 2013, by partnering with the Council of State and Territorial Epidemiologists (CSTE), four CSTE fellows (Masters and Doctoral level) were placed in Minnesota, Wisconsin, Indiana, Ohio to improve the detection, investigation and reporting of waterborne disease outbreaks, with a particular focus on harmful algal blooms.
10. **Tracking Harmful Algal Blooms:** In 2013, the first CDC report focused on outbreaks associated with harmful algal bloom exposure was published in the Morbidity and Mortality Weekly Report (MMWR).



- 11. Map Inundation and Shoreline Change:** Prior to Hurricane Sandy, USGS and NOAA conducted LiDAR shoreline mapping from North Carolina to New York (see <http://coastal.er.usgs.gov/hurricanes/sandy/>). Immediately following the landfall, the mapping was repeated in order to document the impact of major storms on shoreline change (see <https://water.usgs.gov/floods/events/2012/sandy/>). In addition, USGS mapped high-water levels resulting from Sandy at more than 1,000 points in the impact zone. These data, along with data from more than 200 recoding water level gages, are being used to document the magnitude and extent of inundation and to improve NOAA and FEMA surge forecast models. Reports are anticipated on each of these activities.
- 12. Completion of Digitizing Wetlands Maps:** The Fish and Wildlife Service completed in 2013 digitizing of the wetlands layer of the National Spatial Data Infrastructure. Working with the US Park Service, the Fish and Wildlife Service was able to advance mapping of Alaska wetlands so that 35 percent of Alaska is now mapped. Additional work in 2014 is needed to process mapping data and load maps to the Wetland Mapper.

2014 WORKPLAN FOR RECOMMENDATION 2:

Task Number	Task	Projected Completion
1	Complete review and publish National Climate Assessment Water Resources chapter	Spring
2	Produce a summary report on Section 9506 agency activities	Winter 2014
3	Update precipitation intensity-duration-frequency (IDF) statistics to improve water resource management	Ongoing
4	Continue waterborne disease capacity grant funding in Arizona, Florida, Ohio, South Carolina, Washington, New Hampshire, Louisiana, and Maine	Ongoing
5	Support waterborne disease surveillance capacity in the Great Lakes states with Epidemiology and Laboratory Capacity funding to focus on waterborne disease surveillance and prevention issues focused on ambient water quality	Ongoing
6	Collaborate with state and federal partners to integrate surveillance of public health data on harmful algal blooms into the National Outbreak Reporting System (NORS), CDC's largest electronic outbreak reporting system	

7	Use LiDAR data from before and after Hurricane Sandy to improve NOAA and FEMA surge forecast models. Reports forthcoming	Ongoing
8	Publish online the final digitized version of the wetlands data layer of the National Spatial Data Infrastructure (NSDI) for the conterminous US, Hawaii, Puerto Rico and the Virgin Islands; continue work to finalize wetland mapping for Alaska	April
9	Develop interagency plan for integration the wetlands data layer of the National Spatial Data Infrastructure (NSDI) supporting the Fish and Wildlife Service National Wetland Inventory with the wetlands mapping contained in the National Hydrologic Dataset (NHD)	September

Recommendation 3:

Strengthen Assessment of Vulnerability of Water Resources to Climate Change

Extreme weather events, sea level rise, shifting precipitation and runoff patterns, temperature changes, and resulting changes in water quality and availability all have potentially significant implications for the operations of water sector utilities. To adapt to climate change, water resource managers must first determine the degrees of risk and vulnerability in their systems.

Throughout 2013, the Vulnerability Assessment Team, led by NOAA, managed the implementation of actions and tasks to support this recommendation in conjunction with the agency members of the Workgroup.

Each agency has significant work underway. Some of the projects have timeframes that, by necessity, extend beyond the shorter time frame contemplated by the action plan. Given other priorities and resource constraints, deadlines for tasks fluctuate based on agency support. Committing to ongoing coordination and collaboration to keep other agencies aware of these and other efforts will provide significant benefits to stakeholders.

Existing efforts to develop vulnerability tools have focused on categories of infrastructure that may be at risk as a result of climate change or may need to change operations. These infrastructure facilities are often critical to protecting human health, life and property. At the same time, more attention will need to be given in the future to vulnerability assessment tools for ecosystems and the services they provide.

Supporting Action 8: Publish long-term plan for Federal “downscaling” of climate model projections

Supporting Action 9: Develop a Federal internet portal to provide information on water resources and climate change
(COMPLETED)

Supporting Action 10: Develop a pilot climate change vulnerability index for a major category of water facilities

Supporting Action 11: Continue development of tools and approaches that build capacity for water institutions to conduct vulnerability assessments and implement responses

Supporting Action 12: Assess vulnerability of watersheds and aquatic systems on National Forests and Grasslands

Supporting Action 13: Promote free and open access to authoritative climate change-science and water resources data
(COMPLETED)

2013 HIGHLIGHTS OF PROGRESS FOR RECOMMENDATION 3:

Key accomplishments in 2013 related to this recommendation include:

- 1. Developing a Compendium of Uses of Downscaled Climate Data:** As part of the National Climate Assessment, scientists at the NOAA Cooperative Institute for Climate and Satellites

are developing a compendium of uses of downscaled climate information applicable to all climate applications, including water, that have been used in the Assessment and have passed peer review. The first step in moving toward this goal was accomplished in 2013 in conjunction with the USGS. A detailed dataset of downscaled climate variables developed to meet user requirements has been developed based on a recent USGS downscaled dataset. This dataset is expected to be released in conjunction with the National Climate Assessment in early 2014.

2. Federal Toolbox for Integrated Water Resources Management (IWRM)/Climate Change:

The Army Corps of Engineers is developing a “Toolbox” that provides a comprehensive hub of information and capabilities through a common data portal across Federal agencies. It provides state, tribes, federal, regional, and local water resources agencies with a system to readily access Federal water resources information, planning assistance, and capabilities to optimize the planning and management of water resources through an IWRM approach. The Toolbox includes climate change information and takes advantage of current activities in improving hydrostatistics, new information available through the National Climate Assessment, data integration mechanisms such as the Hydrologic Information System (HIS) developed by the Consortium of Universities for the Advancement of Hydrologic Science, Inc. (CUAHSI), and data visualization techniques such as those developed for “CalAdapt” by the California Energy Commission and the California Natural Resources Agency. The Toolbox should also take advantage of other climate information collaboration activities such as the NOAA Climate Portal.

3. Examine Low Flow and Drought Impacts on Colorado River: The interagency National Integrated Drought Information System (NIDIS) and NOAA supported the examination of low flow and drought in the Colorado River Basin on junior water rights holders. This work was completed in the summer of 2013. NIDIS is now working to integrate these new findings into the Colorado River Basin Drought Early Warning System to give advance warning of potential water shortages during a developing drought. This work is supported by a grant, and is expected to be completed in summer 2014.

4. Issue Water Utility Climate Tool Version 2.0:

EPA’s Climate Ready Water Utilities (CRWU) program developed the Climate Resilience Evaluation and Awareness Tool (CREAT), which assists users in conducting climate change risk assessments and promotes a general understanding of climate change impacts for water utility owners and operators. A new version of CREAT was released in January 2013. CREAT 2.0 features more robust scenario-based planning, extreme events data, and energy management capabilities. CREAT also includes embedded basic and advanced video training modules and allows utilities to conduct analysis comparison scenarios for multiple time periods. The final version of CREAT available for download at:

<http://water.epa.gov/infrastructure/watersecurity/climate/creat.cfm>.



5. **Publishing a Planning Tool for Extreme Weather Events: Workshop Planner for the Water Sector:** Completed in 2013, the EPA CRWU's Extreme Events Workshop Planner includes everything a utility needs to plan, customize, and conduct a workshop focused on planning for more frequent and more intense extreme events. Five extreme event scenarios are included in the Workshop Planner, which are: 1) flooding; 2) drought; 3) sea level rise; 4) wildfire; and 5) reduced snowpack. Each scenario walks users through a long-term planning exercise in which workshop participants gain a better understanding of how projected changes in the frequency and intensity of extreme events can impact their utility and community, and how they can begin to prepare for these changes.

6. **Updating the CRWU Adaptation Strategies**

Guide: EPA CRWU's *Adaptation Strategies*

Guide serves as an introduction to climate change adaptation planning for drinking water, wastewater, and stormwater utilities. Originally published in 2012, the guide comprises a series

of briefs organized by region and associated climate-related impacts to provide a better understanding of what challenges utilities can expect to face along with adaptation strategies that can be used to prepare their systems for those impacts. An updated version of the *Guide* was released in March of 2013. The new *Guide* includes new sections on green infrastructure and energy management, which contribute to a more comprehensive adaptation planning process.



7. **NASA Downscaled Climate Projections:** Global models of the climate system are now the foundation for many important climate studies, but they typically show climate changes at very large geographic scales on the order of 100 to 250 kilometers. Some data sets have scaled that down to about 10 kilometers, but even these make it difficult to analyze climate change impacts on a local or regional scale. In September 2013, a team of scientists from NASA released monthly climate projections for the coterminous United States at a scale of one-half mile (800 meters), or approximately the size of a neighborhood. These climate projections provide a view of future U.S. temperature and precipitation patterns based on four different greenhouse gas emissions scenarios, spanning the period from 1950 to 2099; see <http://www.nasa.gov/content/nasa-supercomputer-generates-closer-look-at-future-climate-conditions-in-us/>
8. **U.S. Geological Survey Proposes to Create a Climate Change Vulnerability Database:** The USGS is moving to create a registry of climate change vulnerability to better protect wildlife, ecosystems, and dams. The registry will collect and display information on climate change adaptation projects underway across the country and will pool from federal, state, local, and tribal governments. A notice to gather information for the registry was filed on August 15, 2013 in the Federal Register for a 60-day comment period.
9. **Publish Report on National Forest Watershed Vulnerability Assessments:** In July 2013, the Forest Service published a report describing pilot vulnerability assessments in National

Forests (<http://www.fs.fed.us/ccrc/wva/PilotNFWatershedVulnerabilityReport.pdf>).

Eleven national forests from throughout the United States, representing each of the nine Forest Service regions, conducted assessments of potential hydrologic change resulting from ongoing and expected climate warming. A pilot assessment approach was developed and implemented. Each national forest identified water resources important in that area, assessed climate change exposure and watershed sensitivity, and evaluated the relative vulnerabilities of watersheds to climate change. The assessments provided management recommendations to anticipate and respond to projected climate-hydrologic changes. Completed assessments differed in level of detail, but all assessments identified priority areas and management actions to maintain or improve watershed resilience in response to a changing climate. The pilot efforts also identified key principles important to conducting future vulnerability assessments, and contributes directly to the Forest Service Watershed Condition Framework (WCF); a systematic, six-step process for determining watershed condition class that all National Forests and Grasslands can apply consistently (<http://www.fs.fed.us/publications/watershed/WatershedConditionFramework.pdf>).

- 10. FEMA Climate Change Impacts on National Flood Insurance Program:** The Federal Emergency Management Administration (FEMA) released a report in June 2013 evaluating potential long-term implications of climate change on the National Flood Insurance Program (NFIP). The climate change impact assessment includes all 50 states, as well as consideration of the U.S. territories. FEMA intends to use the findings of this study to assist in the development of recommendations addressing the impacts of climate change and future development on Flood Insurance Rate Maps (FIRMs). The study, *The Impact of Climate Change and Population Growth on the National Flood Insurance Program*, is available at <http://www.aecom.com/deployedfiles/Internet/News/Sustainability/FEMAClimateChangeReport/ClimateChangeReportAECOM2013-06-11.pdf>.
- 11. EPA Workbook for Watershed Based Climate Change Vulnerability Assessments and Adaptation Plans:** In October 2013, EPA released for public comment a draft of [*Being Prepared for Climate Change: A Workbook for Developing Risk-Based Adaptation Plans*](#). This Workbook provides users at the watershed level with a step-by-step guide to understanding climate impacts on local water resources and developing plans to adapt to these impacts.
- 12. Removing Charges for Access to Climate Data:** Data and information should be available to decision-makers, researchers, and the public freely and openly and in formats that readily fit the needs of users. In 2012, NOAA's National Climatic Data Center began moving toward providing free access to all climate data obtained online via the internet. In 2013, this activity was completed. Cost recovery is still in place for data requiring manual intervention and for official or certified data.

2014 WORKPLAN FOR RECOMMENDATION 3:

Task Number	Task	Projected Completion
1	Publish guidance related to appropriate or best use of particular downscaling approaches for climate information based on user requirements	TBD
2	Release downscaled climate variables dataset developed by USGS including frost-free season length, heating and cooling degree days, frost days, very hot days, warm nights, consecutive dry days, very wet days, and maximum 5-day precipitation	TBD
3	Federal internet portal will be developed by the USACE through their Federal Toolbox for Integrated Water Resources Management (IWRM)	Summer 2013
4	Develop pilot index of vulnerability on Colorado River water rights (see details below)	Summer 2014
5	<p>Actions under the Climate Ready Utilities (CRWU) initiative for drinking water and wastewater utilities will include:</p> <ul style="list-style-type: none"> Continue to promote the water sector's adoption of version 2.0 of the Climate Resilience Evaluation and Awareness Tool (CREAT) Assemble working group to begin to explore improvements in user functionality, and other updates to the current version of CREAT Building off the completion of the Workshop Planner tool, EPA plans to assist communities across the nation in implementing Emergency Response/CRWU workshops Update Adaptation Strategies Guide, focusing on water conservation adaptation measures. <p>The CRWU toolbox now contains over 600 resources for utilities and communities. EPA plans to work with a water sector association interested in further updating and managing the toolbox</p>	<p>Ongoing</p> <p>Early 2014</p> <p>Fall</p> <p>Spring/Summer</p> <p>Spring/Summer</p>
6	<p>Support Climate Ready Estuaries in National Estuary Program estuaries, including:</p> <ul style="list-style-type: none"> Provide a biennial progress report of CRE activities and National Estuary Program adaptation projects in FY2013– 	Winter 2015

	2014 <ul style="list-style-type: none"> ○ Finalize the CRE Workbook “Being Prepared for Climate Change: A Workbook for Developing Risk-Based Adaptation Plans” ○ Initiate CRE climate change adaptation projects with new National Estuary Program partners ○ Develop list of programs that are candidates for application of the “Climate Ready” designation 	Spring 2014 Summer 2014 Ongoing
7	US Forest Service watershed vulnerability assessments will be integrated with assessments of the vulnerability of terrestrial resources, social, and economic attributes and used to guide adaptation strategies in forest planning (see details below)	Summer

Details, Task 5:

An index of vulnerability should be developed for a major category of water facilities or water managers. Through NIDIS, efforts are underway to determine the impact on junior water rights holders on the Colorado River when a compact call is made to upstream entities to demand water downstream. These junior rights holders represent a wide range of industry and agriculture and are vulnerable to reduced water availability, especially during a “call”. The results of this index assessment can be used to set priorities for implementation of climate adaptation responses. This pilot index should serve as a proof of concept for developing vulnerability indices to support assessments by a range of other water facilities and sectors. This work should be conducted in coordination with complementary vulnerability assessment activities, such as those identified in the MOU between DOI and DOC/NOAA, and EPA's Climate Ready Water Utilities efforts to support the water sector. Over the long term, this could support development of a database of vulnerable infrastructure to support prioritization for infrastructure investments.

Details, Task 8:

The U.S. Department of Agriculture’s (USDA) Forest Service is implementing assessments of the condition of forested watersheds in each of the agency regions. These condition assessments will be expanded into assessments of the vulnerability of watersheds and aquatic systems to climate and non-climate stresses in multiple future scenarios. The watershed vulnerability assessments will be integrated with assessments of the vulnerability of terrestrial resources, social, and economic attributes and used to guide adaptation strategies in forest planning.

Recommendation 4: Expand Water Use Efficiency (WUE)

Climate change will further challenge water resources that are already under stress because of growing populations, contamination, and demands to meet diverse human and ecosystem needs. Making more efficient use of water can extend the availability of current supplies, reduce competition among sectors, save energy, and reduce the cost of water system operations.

Throughout 2013, the Water Use Efficiency team, lead by EPA, managed the implementation of actions and tasks to support this recommendation in conjunction with the agency members of the Workgroup. Three supporting actions were established for this effort (see box).

These supporting actions are in various stages of implementation. Progress on the specific actions has been slow, largely due to other priority activities on which the different agencies are focused. However, those other activities are linked to this effort in that they are either directly furthering water use efficiency or laying a foundation for future efforts.

Of note, the need for nationally consistent water use metrics has now been recognized by other interagency groups, including the SWAQ. The combined call to improve water use measures extends far beyond the efforts of this Workgroup and has required additional coordination. In an effort to ensure that the improvements further the common goal, specific actions by individual groups have been delayed.

Supporting Action 14: Develop nationally consistent metrics for water use efficiency in key sectors and report water efficiency information in nationally consistent formats

Supporting Action 15: Make water use efficiency an explicit consideration in the revision of Principles and Standards for water resources projects and in new NEPA guidance on climate change

Supporting Action 16: Enhance coordination among Federal water efficiency programs and improve program effectiveness, including creating a “toolbox” of key practices

2013 HIGHLIGHTS OF PROGRESS FOR RECOMMENDATION 4:

A summary of 2013 efforts from the Water Use Efficiency Team and an overview of activities being carried out by each agency that support improvements in water efficiency is provided below. As can be seen by reviewing the activities that follow, each agency has significant work underway. Some of the projects, the results of which would be critical in advancing activity on metrics, have timeframes that, by necessity, extend beyond the shorter time frame contemplated by the action plan. However, committing to ongoing coordination and collaboration to keep other agencies aware of these and other efforts will provide significant benefits towards advancing water use efficiency efforts to support our respective stakeholders.

1. **Improving Water Use Assessment in the Water Census Program:** The U.S. Geological Survey (USGS) is conducting the Water Census under the umbrella of the DOI WaterSMART initiative. The project is wide-ranging and has subprojects that will build a foundation for development of metrics and better assessments of water use in different sectors. In April 2013, the USGS released an update on the progress of the Water Census in a Report to Congress entitled *Progress Toward Establishing a National Assessment of Water Availability and Use* (USGS Circular 1384). The report is available on a new website at <http://water.usgs.gov/watercensus/> that provides information about the Water Census and affiliated efforts.

- **Public Supplies.** WaterSMART is working on a five year effort to develop a site specific water use database for 55,000 public water systems that will be able to link with monthly withdrawal amounts by type of delivery (e.g., domestic, industrial, or cooling uses). After the database is completed, a consumption profile of each facility will be developed. This project is in coordination with EPA.



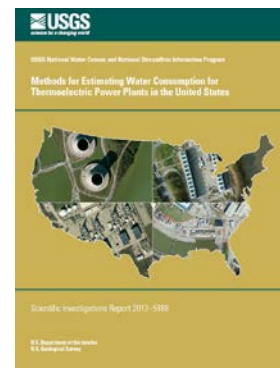
- **Irrigation.** WaterSMART is working on a large project looking at amount of evapotranspiration associated with irrigated crop land in order to develop a better sense of the consumptive use associated with irrigation (i.e., how much of a crop can we produce per a given amount of water consumed). The project is being piloted in the Colorado River basin, with results expected next year. An article documenting this work will be published in the Journal of the American Water Resources Association in 2014. This project is being coordinated with USDA NRCS and the Bureau of Reclamation, which is a large user of this information. The USGS also has a project underway with Utah State University to look at methodologies for evapotranspiration measurements. Many states have their own evapotranspiration methods, and want to incorporate this into the Water Census.

In an effort that is separate from the USGS Water Census, as part of ongoing USDA efforts to evaluate agricultural conservation programs, the Natural Resources Conservation Service (NRCS) began an evaluation on the effectiveness of Federal programs to reduce irrigation water withdrawals from the Ogallala Aquifer. The 2013 assessment phase of the evaluation found large reductions in water withdrawn and energy consumed from program implementation. In 2014, alternative program approaches will be evaluated against program objectives and alternative effectiveness measures, including water use efficiency.

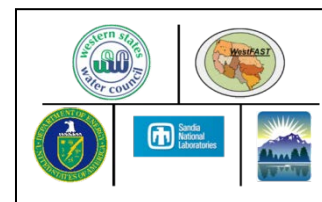
- **Thermoelectric Power.** As part of follow-up to recommendations from a GAO report in 2010, the USGS is working with the Energy Information Administration to improve the collection of water use data from thermoelectric power plants and

to better estimate the consumptive water use associated with plants, rather than just withdrawals. The first report from this effort was published and distributed in November 2013. The report, entitled *Methods for Estimating Water Consumption for Thermoelectric Power Plants in the United States* (USGS Scientific Investigations Report 2013-5188), presents a model for estimating the consumptive use of water at thermoelectric power plants. Tracking the consumptive use of water by thermoelectric power plants could allow water resource managers to evaluate the influence of this type of use on the overall water budget of a watershed. The use of heat and water budgets to estimate water consumption at individual thermoelectric plants provides a useful check on other estimation approaches and in many cases may be the most accurate method available. The report may be accessed at:

<http://pubs.usgs.gov/sir/2013/5188/pdf/sir2013-5188.pdf>.



2. **Developing State Water Data Exchange:** The Western States Federal Agency Support Team (WestFAST), in cooperation with the Western States Water Council (WSWC), is engaged in a major project to create a water data exchange that will enable states to share important water planning and use data to support studies that cross state borders



(<http://www.westernstateswater.org/wade/>). One goal of the project is to be able to obtain more comprehensive consumptive use data; however, at this time, many states do not collect this information and the methods used vary by state. The states have been surveyed on their water planning program approaches and the WSWC has developed a summary report to describe their findings. The WSWC hopes to pilot a data exchange network with 3-5 states over the next year and is building the system such that it could be expanded beyond the western states. The work will support both the Water Census and DOE studies looking at the availability of water for energy in the West.

3. **National Drought Resilience Partnership:** In November 2013, as part of President Obama's [Climate Action Plan](#), Federal agencies established the [National Drought Resilience Partnership](#) to help communities better prepare for future droughts and reduce the impact of drought events on livelihoods and the economy. Responding to requests from communities, businesses, and farmers and ranchers, the National Drought Resilience Partnership will make it easier to access Federal drought resources, and will help link information such as monitoring, forecasts, outlooks, and early warnings with longer-term drought resilience strategies in critical sectors such as agriculture, municipal water systems, energy, recreation, tourism and manufacturing.
4. **Impacts of Changes in Water Availability on the Energy Sector:** The Department of Energy Office of Policy and International Affairs, in collaboration with the National Renewable

Energy Laboratory, has been evaluating the impact of climate change, including drought, on the US energy sector, and developing recommendations to address knowledge, technology and policy gaps to building a secure and sustainable energy future.

In July 2013, DOE released the report *U.S. Energy Sector Vulnerabilities to Climate Change and Extreme Weather* (available at <http://energy.gov/downloads/us-energy-sector-vulnerabilities-climate-change-and-extreme-weather>). The report highlights the importance of assessing potential impacts of water availability on the energy sector and the importance of water use efficiency.

- 5. Adding Water Data to ENERGY STAR Surveys:** EPA's WaterSense program is working with the EPA ENERGYSTAR program to add questions asking about water use into the Energy Information Agency Commercial Building Energy Consumption Survey (CBECS) and other surveys that investigate energy use in buildings.

The ENERGY STAR program enhanced the collection of water information in its 2013 revisions to its Portfolio Manager tool which is used to track energy use with a goal of developing metrics to support performance benchmarking. The two programs are working to evaluate data collected by Fannie Mae for multifamily housing to determine if the data is sufficient to support benchmarking.



In April, 2013, ENERGY STAR also recognized a number of buildings for their water savings as part of its 2012 National Building Competition.

- 6. Monitoring Studies of Water Use Metrics:** EPA is following two significant projects that are underway by the Water Research Foundation.
- A project to update and expand the Residential End Uses of Water Study from 1999 is expected to be completed in 2014.
 - A project to develop and test methodologies to collect standardized data to determine the proportion of commercial, institutional, and industrial end uses of water. There is considerable inconsistency in how water utilities identify these types of facilities in their billing and water use records which hinders forecasting and benchmarking. A final report is expected in 2015.
- 7. Revising Water Efficiency Grants to Include Additional Water Savings Data:** The Bureau of Reclamation continues to review the process used to select water conservation grants they make for water conservation to assess the different measurements of success for water savings that grantees report. In 2012, significant revisions were made to the funding opportunity announcement for WaterSMART Grants to request more detailed support for applicants water savings estimates so that those estimates can be evaluated as effectively as possible. The Bureau is also conducting before and after visits to project sites for a

sample of funded projects to compare project sponsors' estimates of water savings with post-project results. This effort continues, with a preliminary report expected to be released in 2014. The information gathered during this process may be of benefit to the work on metrics.

- 8. Completed Army Net Zero Water Roadmaps for the Eight Net Zero Water Pilots:** The Army completed the remaining six water project roadmaps as part of its net zero initiative (<http://www.asaie.army.mil/Public/ES/netzero/index.html>). Each roadmap incorporates information from the previously completed water balance assessments. The assessment provided an analysis of total potable water currently being used and a sample of the kinds of uses occurring across different classes of installation facilities, e.g. barracks, dining halls, recreation centers, family housing. The roadmaps use the assessment information to create water conservation measures linked to specific projects spread across each fiscal year out to 2020, the current net zero water goal-year. When implemented, these water conservation measures will result in significant water efficiency gains.
- 9. Release of the Principles and Requirements for Water Resource Investments:** CEQ released an update of the Principles and Requirements for Water Resource Investments (formerly, Principles and Standards) in March 2013, making water use efficiency an explicit consideration in Federal water resources investment decisions. More information on the Principles and Requirements and a copy of the updated document can be found at <http://www.whitehouse.gov/administration/eop/ceq/initiatives/PandG>.
- 10. Expanding WaterSense Program:** Efficient use of water is a key strategy for managing water resources as supplies become more unpredictable as a result of climate change. In September 2013, EPA released a new specification for WaterSense labeled pre-rinse spray valves which are used in commercial kitchens. The program also continued to promote a guide released in late 2012, *WaterSense at Work: Best Management Practices for Commercial and Institutional Facilities*, to help businesses and institutions understand how they can better manage their water footprint through the use of water efficient products and practices. In 2014, the program will carry out a focused campaign with the hospitality sector to encourage them to use the best management practices as a means to track and reduce water use.
- 11. Maintaining Water Efficiency Web Clearinghouse:** The Bureau of Reclamation is maintaining DOI's WaterSMART Clearinghouse, a portal of water resource management resources that was "soft-launched" in 2011 (<http://www.doi.gov/watersmart>). Through the Clearinghouse, information on best practices, case studies, education and outreach, sources of grants and other financial resources, research, and water data are available to the public. The initial phase of the Clearinghouse has been limited to gathering information from governmental agencies and land grant universities.
- 12. Maintaining WaterSMART Grants for Water Efficiency:** The Bureau of Reclamation's WaterSMART Grants program offers cost-shared grants for water and energy efficiency

(<http://www.usbr.gov/WaterSMART/weeg/>). The grants cover water management improvements, including piping of channels to reduce seepage, installation of more advanced water management and irrigation devices, and municipal rebate programs for activities including metering and turf replacement. Approximately 162 projects have been funded since FY 2010. Projects funded under WaterSMART Grants and other water conservation programs FY 2010 through FY 2013 enable the capability to conserve 734,000 acre-feet of water, meeting the Department of the Interior's Priority Goal of 730,000 acre-feet for that period. An accomplishments report, *WaterSMART: A Three-Year Progress Report*, was published in October 2012, and is available at <http://www.usbr.gov/WaterSMART/docs/WaterSMART-three-year-progress-report.pdf>.

- 13. Developing Implementation Guidance for Sustainability Executive Order:** EPA and the Department of Energy co-chaired an interagency group to develop implementing guidance for the water provisions of Executive Order 13514 on Sustainability. The final guidance was released in July 2013 and can be accessed at <http://www.whitehouse.gov/administration/eop/ceq/sustainability/water-instructions>. Release of more detailed Interagency Guidelines and Agency-Specific Procedures for applying the broad policies in the Principles and Requirements are anticipated in FY 2014 and early FY 2015.
- 14. Implementing Net Zero Installation Program:** The U.S. Army Corps of Engineers Construction Engineering Research Lab is developing planning-scale tools to integrate Army installation actions that support net zero energy, water, and waste. The Net Zero Installation (NZI) tool includes multi-scale modeling and analyses of water conservation measures to document potential water and energy savings. During FY 2013 this research project captured useful capabilities of existing energy models. FY 2014 activities include deciding what water and waste capabilities should be included in the model.
- 15. Refinement of a Mobile Tablet Water Equipment Tracker:** The Army funded the Army Corps of Engineers Construction Engineering Research Lab to develop a mobile tablet Water Equipment Tracking (WET) application to be used to inventory and track water related equipment in individual facilities. The WET helps eliminate transfer error in auditing and provides an immediate estimate of building water consumption based on occupancy, use, and existing equipment. In FY 2014 the algorithms will be refined by comparing their accuracy against actual individual facility water meter data.

2014 WORKPLAN FOR RECOMMENDATION 4:

Task Number	Task	Projected Completion
1	For a major water use sector (e.g., agriculture, energy, municipal), identify policy gaps (e.g., science, policy, technology) and other barriers that hinder the ability to collect data that would facilitate assessment of water use, efficiency, and development of metrics (see Task Details)	Summer
2	Develop an initial strategy that, while recognizing gaps, would help to describe how to identify consistent metrics in a major water use sector. This initial strategy could be used as a template to address other sectors	Summer
3	Develop report describing findings and recommended actions for further efforts.	Late fall
4	Implement Principles and Requirements for Federal water projects including: <ul style="list-style-type: none"> • Publish final Interagency Guidelines for implementing the updated policy • Individual agencies publish final Agency-Specific Procedures 	June December
5	Release Revised Draft NEPA Greenhouse Gas Guidance for Public Review and Comment	Expected 2014
6	Build interagency team working on water use efficiency	Ongoing
7	Update inventory of key Federal programs that advance water efficiency	Spring
8	Initiate effort to develop inventory of Federal R&D projects that advance water efficiency and identify gaps, and future research needs.	Summer
9	The Drought Resilience Partnership will focus on: <ul style="list-style-type: none"> • creating a new, web-based portal to ease access to Federal agency drought recovery resources, • hosting more frequent regional drought outlook forums that provide access to experts and locally relevant information, • supporting the coordination of a national soil moisture monitoring network to help improve monitoring and forecasting drought conditions, • identifying a single point of contact for the public, and 	Ongoing

	<ul style="list-style-type: none"> in collaboration with local, state and regional governments, undertake a pilot project in a western area hard hit by drought to create a local-scale drought resilience plan that could be applied in other areas. 	
10	Continue development of Net Zero Installation Tool	Ongoing
11	<p>Create process to regularly update the Federal Support Toolbox, including by developing:</p> <ul style="list-style-type: none"> a. recommendations on how to strengthen coordination and adoption of “key practices”; b. a proposed process to maintain information about WUE programs/ projects 	<p>Fall</p> <p>Late Fall</p>

Recommendation 5: Support Integrated Water Resources Management (IWRM)

Management of the risks from a changing climate should not occur in isolation and should be integrated with efforts to address other freshwater resources management challenges. As models and methods for integrated water resources management are developed across the country, challenges posed by a changing climate should be incorporated.

The IWRM team led by USACE managed the implementation of actions and tasks to support this recommendation in conjunction with the agency members of the Workgroup. Four supporting actions were established for this effort (see box) and are in various stages of implementation. Progress on the specific actions has been steady and many interim milestones have been completed. Others should be finished in the very near future.

Outlined below is a summary of 2013 efforts from the IWRM team and an overview of activities being carried out under each supporting action. A number of agencies have significant work underway, some of which have extended schedules and several of which will advance development of metrics for documenting progress. Implementation of actions and tasks in support of this recommendation will be managed by a team of Workgroup members led by the Army Corps of Engineers within the Department of Defense.

Supporting Action 17: Work with States and interstate bodies (e.g., River Basin Commissions) to incorporate IWRM into planning and programs, paying particular attention to climate change adaptation issue

Supporting Action 18: Revise Federal water project planning standards to address climate changes **(COMPLETED)**

Supporting Action 19: Working with States, review flood risk management and drought management planning to identify “best practices” to prepare for hydrologic extremes

Supporting Action 20: Develop benchmarks for incorporating adaptive management into water project designs, operational procedures, and planning strategies **(COMPLETED)**

2013 ACCOMPLISHMENTS FOR RECOMMENDATION 5:

Key accomplishments in 2013 related to this recommendation include:

- 1. Adaptation Pilot Studies:** The Army Corps of Engineers funded several climate change adaptation pilot studies that address certain aspects of IWRM.

The goal of one pilot study in Hawaii was to collaboratively develop a climate change adaptation strategy for the **West Maui Watershed**. The objective of the West Maui Watershed Plan is to improve the overall quality of the West Maui Watershed, from the summit of Pu`u Kukui to the outer coral reef. Partners in the plan include USACE-Honolulu

District, the State of Hawaii Department of Land and Natural Resources (DLNR) and the Department of Health (DOH) with support from NOAA and EPA.

Another pilot study involved regional collaboration with the **Ohio River Basin (ORB)** Alliance. The alliance includes representatives from Federal agencies, States, non-governmental organizations (NGOs) and universities. The aim of the pilot study is to collaboratively develop mitigation and adaptation strategies with the ORB Alliance to counteract the anticipated water resources, ecological, and infrastructure impacts of climate change. One intended product is the formation of a permanent climate change working group within the ORB Alliance.



USACE is continuing to look for opportunities to conduct pilot studies with states and interstate bodies. USACE has agreed to do an IWRM pilot study with the **Delaware River Basin Commission (DRBC)**. Climate change adaptation would be one component of this study. USACE is also discussing a potential IWRM pilot study with the **Interstate Commission on the Potomac River Basin (ICPRB)**.

2. **Integrated Water Resources Science and Services (IWRSS):** USACE, USGS, and NOAA's National Weather Service established IWRSS to enable and demonstrate a broad, integrative national water resources information system to serve as a reliable and authoritative means for adaptive water-related planning. IWRSS held meetings with river basin commissions in the Northeast United States to determine stakeholder needs. The meetings allowed interstate river basin commissions and their partners to help define directions for pilot IWRSS activities. Meetings were held for the Delaware, Susquehanna, Potomac, and Hudson River basins and included DRBC, ICPRB, and the **Susquehanna River Basin Commission (SRBC)**.
3. **Release of the *Principles and Requirements for Water Resource Investments*:** The update to the *Principles and Requirements for Water Resource Investments* was published by CEQ in March 2013. The updated document includes climate change as a consideration for Federal water resource investments. More information on the Principles and Requirements and a copy of the updated document can be found at: <http://www.whitehouse.gov/administration/eop/ceq/initiatives/PandG>
4. **Report on State Hazard Mitigation Plans:** A contractor completed a review of State Hazard Mitigation Plans in 2012. The report has been written and published in 2013 and will be posted to the internet soon.
5. **Report on Survey of State Hazard Mitigation Officials:** The survey of State Hazard Mitigation Officials (SHMO) and State Floodplain Management Officials was completed in early 2013. In total, 46 SHMOs and 45 NFIP Coordinators responded to the survey. The report on the survey has been completed and has completed review by USACE and FEMA

and other Federal agencies and it will be published report as a joint USACE-FEMA report. This report will be posted to the internet soon.

- 6. Completed Inventory Report and Recommendations Report on Adaptive Management and Climate Change:** The IWRM Team prepared the report "Federal Agency Inventory of Adaptive Management Practices and Policies," which has completed agency review and is available at: <http://www.iwr.usace.army.mil/Portals/70/docs/iwrreports/2013-R-11 Benchmarks Adaptive Mgmt Report 1.pdf>. A related report on "Recommendations for Federal Agency Implementation of Adaptive Management for Climate Change Adaptation," also has completed agency review and is available at <http://www.iwr.usace.army.mil/Portals/70/docs/iwrreports/2013-R-12 Benchmarks Adaptive Mgmt Report 2.pdf>.

2014 WORKPLAN FOR RECOMMENDATION 5:

Task Number	Task	Projected Completion
1	West Maui Watershed Study (IWRM activities continue, although climate adaptation funding is completed)	Ongoing
2	Ohio River Basin Alliance (IWRM activities continue, although climate adaptation funding is completed)	Ongoing
3	Initiate new IWRM/climate change adaptation pilot studies (number to be determined based on budget)	June 2014
4	Implement Principles and Requirements for Federal water projects including: <ul style="list-style-type: none"> • Publish final guidance for Federal agency procedures • Individual agencies publish final implementation procedures 	June December
5	USACE/FEMA develop plans and policies related to State Hazard mitigation <ul style="list-style-type: none"> • USACE/FEMA present results of State Hazard Mitigation reports to senior agency officials and Federal Interagency Floodplain Management Task Force (FIFMTF) • Results presented to State officials 	February April

6	The IWRM Team will work with ACWI Water Resources Adaptation to Climate Change Workgroup to identify opportunities for IWRM/ Climate Change Adaptation	Ongoing
7	The IWRM team will look to improve Federal-State coordination through collaboration with the Silver Jackets program, the FIFMTF, and the Association of State Floodplain Managers (ASFPM)	Ongoing
8	The IWRM team will meet with the implementation team of the National Fish, Wildlife and Plants Climate Adaptation Strategy to pursue joint adaptive management initiatives	Spring
9	Draft report describing “best practices” for Integrated Water Resources Management	Fall

Recommendation 6: Support Training and Outreach to Build Response Capability

Today, the workforce that manages water resources programs at all levels of government and in the private sector needs information and tools to address the implications of a changing climate or to make complex climate change adaptation decisions related to freshwater resources.

Implementation of actions and tasks in support of this recommendation were taken on by the full Water Resources and Climate Change Workgroup rather than an individual team.

Throughout 2013, the Workgroup co-chairs, in conjunction with the agency members of the Workgroup, managed the implementation of actions and tasks to support this recommendation. Four supporting actions were established for this effort (see box).

Supporting Action 21: Establish a training program that will increase the ability of technical practitioners to incorporate climate change information in the studies they conduct that inform water and water related resource management decisions

Supporting Action 22: Focus existing youth outreach programs on climate change and water issues

Supporting Action 23: Engage Water Resources Research Institutes at land grant colleges in climate change adaptation research **(DEFERRED)**

Supporting Action 24: Increase graduate fellowships in water management and climate change **(DEFERRED)**

2013 ACCOMPLISHMENTS FOR RECOMMENDATION 6:

Key accomplishments in 2013 related to this Recommendation include:

- 1. Developing Climate Change Training Capacity:** The Bureau of Reclamation worked with other Federal agencies, including USACE and EPA, and with the Western Water Assessment and the University Consortium of Atmospheric Research to develop a technical training curriculum that instructs water resources professionals how to incorporate climate science and its associated uncertainties into hydrologic assessment studies. Select key actions in 2013 included:

- Offer pilot residence course, “Preparing Hydrologic Impacts Under Climate Change,” (HIUCC) online course focused on the preparation of hydro-climate inputs for incorporating climate change in water resources planning;
- Offer pilot residence course, “Crop Irrigation Requirements Under Climate Change”



- Develop curricula plan for sedimentation/river hydraulics and ecosystems. See www.ccawwg.us for more information.
- 2. **Carrying-Out CRWU Webinars:** In 2013, EPA provided a series of seven (7) webinars, in which where more than 600 participants attended, on CRWU tools and resources for the water sector. Through these 60-minute webinars, participants developed a greater understanding of climate change, managing impacts and developing adaptation strategies. Webinar topics included climate change readiness and an introduction to climate science for the water sector, followed by more in depth discussions of CRWU tools, as well as building adaptation through decision-making and planning. The webinars feature case studies from utilities that have used CRWU tools to become more climate ready and are archived on EPA's website.
- 3. **Climate Information for Managing Risks in Water Resources:** The NOAA Sectoral Applications Research Program (SARP) is working with partners to provide a monthly series of webinars on climate change and water resources issues. Partners include the US National Integrated Drought Information System (NIDIS), Water Research Foundation, Water Environment Federation (WEF), Water Environment Research Foundation (WERF), and American Water Works Association (AWWA). More information is available at: <http://cpo.noaa.gov/ClimatePrograms/ClimateandSocietalInteractions/SARPPProgram/WebinarsandWorkshops.aspx>
- 4. **NOAA's Redesign of Climate.gov Website:** In 2013, NOAA completely re-designed the Climate.gov website based on public feedback. The site provides authoritative data and information about climate and serves people making climate related decisions with tools and resources.
- 5. **Fellowship Program Development:** The US Global Change Research Program is considering a proposal from the Woodrow Wilson Center to support a program of fellowships in climate change adaptation issues over the coming years. Some of these fellowships are expected to address climate change and water adaptation issues.
- 6. **UCAR Fellowships:** Federal agencies should look to trained graduate students as a recruitment mechanism to meet long term staffing needs related to water resources research and management. Two mechanisms currently addressing this recommendation are the University Center for Atmospheric Research's (UCAR) Advanced Study Program in Atmospheric, Earth System, Environmental, and Social Sciences and their postdoctoral Applying Climate Expertise Fellowship Program.
- 7. **ThinkWater:** The USDA National Integrated Water Quality Program (NIWQP)-funded efforts to enhance youth education in water. The *ThinkWater* team responsible for the Educational Materials component created an educational model and framework, educational outcomes, a suite of 21 activities, and a career feature. These were researched and tested as appropriate with youth and/or adults. *ThinkWater* produced a new website

and short film about the theory and practice of the NIFA-funded youth and water National Integrated Water Quality Program (NIWQP) project: <http://www.watertinkers.org/>. ThinkWater provides resources including new “water thinking” tools for teacher/leaders and youth such as:

- A free online idea/lesson mapping tool, ThinkMaps, which demonstrates a step-by-step process for building thinking skills;
- A free integrated online networking tool to build, improve, and comment on the ThinkWater versions of your favorite activities, lessons and curricula;
- Additional training tools (including online courses and tutorials), to support capacity to teach youth about water; and
- Youth-oriented messaging through spoken word and other non-traditional venues.

8. Climate Change Training - Pilot Demonstrates Promising Virtual Training Format: On January 22-24, Reclamation R&D, the Climate Change and Water Working Group, and the UCAR COMET office delivered, "Hydrologic Impacts Under Climate Change 2014" to 55 Federal and non-Federal students from across the U.S. and Canada. Students came from 24 agencies/companies and participated remotely from 36 remote locations. This was the third instructor-led effort in the pilot series (starting in 2012), and the first using a virtual (remote) learning format. Students survey ratings and feedback suggested that overall the course was a good experience and the format could be feasibly included in a sustained course delivery approach.

2014 WORKPLAN FOR RECOMMENDATION 6:

Task Number	Task	Projected Completion
1	EPA will continue to conduct webinars and training on the Climate Resilience, Evaluation and Awareness Tool (CREAT) and related water utility and climate issues	Ongoing
2	EPA will establish an online training program on climate change and water issues for water program staff and the public as part of the Watershed Academy network of training courses	Spring
3	NOAA will continue to conduct monthly webinars on water resources and climate change with partners	Ongoing
4	UCAR will continue delivery of climate change and water resources training programs. Planned offerings include: (1) Water Temperature Impacts under Climate Change, August 2014, residence, recruitment to start April 2014	Ongoing

	(2) Sedimentation Impacts under Climate Change, Winter/Spring 2015 (3) Hydrology Impacts virtual, second offering, Winter/Spring 2015	
5	Continue work with the Wilson Center to develop climate adaptation fellowships	Ongoing
6	Continue implementation of ThinkWater youth education	Ongoing

Appendix:
2013 - 2014 Membership of the
Water Resources Workgroup of the
Climate Change Preparedness and Resilience Council

Co-chairs:

Council on Environmental Quality
Chitra Kumar
Environmental Protection Agency
Michael Shapiro
U.S. Geological Survey
Matthew Larsen

Members:

Army Corps of Engineers Janet Cushing Rolf Olsen	U.S. Geological Survey Jerad Bales
Bureau of Reclamation Curt Brown Levi Brekke Chuck Hennig Dave Raff	National Aeronautics and Space Administration Bradley Doorn
Centers for Disease Control and Prevention Joan Brunkard	National Oceanic and Atmospheric Administration Michael Brewer Nancy Beller-Simms
Council on Environmental Quality Susan Ruffo	
Department of Agriculture Noel Gollehon	
Department of Energy Craig Zamuda	
Department of State Maria Placht Matt Robinson	
Environmental Protection Agency Veronica Blette Regina Lyons Jeff Peterson	
U.S. Forest Service Christopher Carlson	

**Prepared by the
Water Resources Workgroup**

**Supporting the
Council on Climate Change Preparedness and Resilience**

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