

IMPLEMENTING THE
NATIONAL WATER PROGRAM
STRATEGY:
RESPONSE TO CLIMATE CHANGE

PROGRESS REPORT
FOR 2009



Office of Water
U.S. Environmental Protection Agency
January 2010

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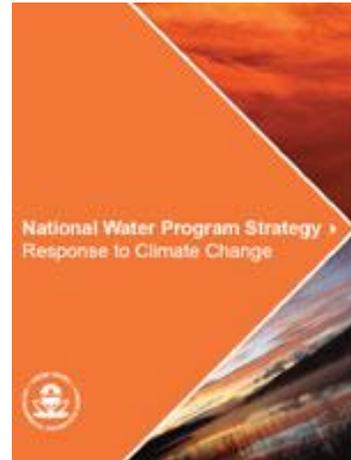
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I. Introduction

This document is the second annual report describing progress made by EPA to implement the *National Water Program Strategy: Response to Climate Change*. It describes activities undertaken by EPA Headquarters program offices and EPA Regions during 2009 to meet the commitments made in the 2008 *Strategy*.

The *Strategy* was developed by the National Water Program Climate Change Workgroup, which began work in March 2007, and was published in September 2008. It provides an overview of the major impacts of a changing climate on water resources and water programs and describes overall goals for the water program response to climate change. It includes forty-four “Key Actions” that the Workgroup planned to undertake during 2008 and 2009 that could be initiated with existing resources.



Report Organization

This 2009 progress report provides information on three major categories of activity:

1. Implementation of the forty-four Key Actions by the National Program Offices located in EPA’s Headquarters in Washington, DC;
2. Implementation of water-related climate change activities in EPA Regional Offices; and
3. Climate change activities in EPA’s Large Aquatic Ecosystem Programs.

The discussion of implementation activity is organized into five major goals described in the 2008 *Strategy*:

Goal 1: Water Program Mitigation of Greenhouse Gases: Use core water programs to contribute to greenhouse gas mitigation

Goal 2: Water Program Adaptation to Climate Change: Adapt implementation of core water programs to maintain and improve program effectiveness in the context of a changing climate and assist States and communities in this effort.

Goal 3: Climate Change Research Related to Water: Strengthen the link between EPA water programs and climate change research.

Goal 4: Water Program Education on Climate Change: Educate water program professionals and stakeholders on climate change impacts on water resources and water programs.

Goal 5: Water Program Management of Climate Change: Establish the management capability within the National Water Program to engage climate change challenges on a sustained basis.

As indicated in the chart to the right, most of the key actions identified in 2007 addressed greenhouse gas mitigation (11 of the 44) or adaptation to climate change (22 of the 44). The remaining 11 key actions were roughly evenly distributed across the research, education, and management goals.

Some of the key actions involved existing water program work that have climate change implications, while others involved new activities, or changes in the direction of existing activities, in response to climate change. Implementation of these new key actions was planned with an assumption of level funding, and activities that could not be supported with available resources were deferred.

Finally, the narrative portion of this report is supplemented with appendices summarizing and comparing the implementation status and progress of each key action in 2008 and 2009, as well as the distribution of activity in EPA regional offices by key action area.

How to Use This Report

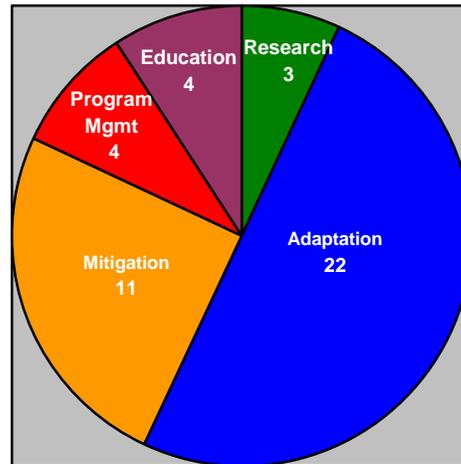
This Progress Report is intended to ensure transparency about EPA's commitment to addressing climate change and to convey the scope of the National Water Program's activities and progress achieving stated goals. The length of the report may dissuade readers from reviewing it in its entirety. However, for those interested in particular topics, or in particular Regions, this report can serve as a useful reference. The Table of Contents is 'hotlinked' for easy navigation, and as much as possible live internet links are provided for more information.

The reader is directed to the Office of Water Climate Change website for more information, headquarters and regional contacts, and other links: <http://www.epa.gov/water/climatechange>.

Summary of Implementation Progress and Status for 2009

EPA's progress in implementing the *Strategy* can be evaluated both quantitatively and qualitatively. Counting the numbers, all but one key action have been undertaken, and some additional activities were implemented that were not anticipated when the *Strategy* was written. Examining progress qualitatively reveals that, despite initiating work under a 'level budget'

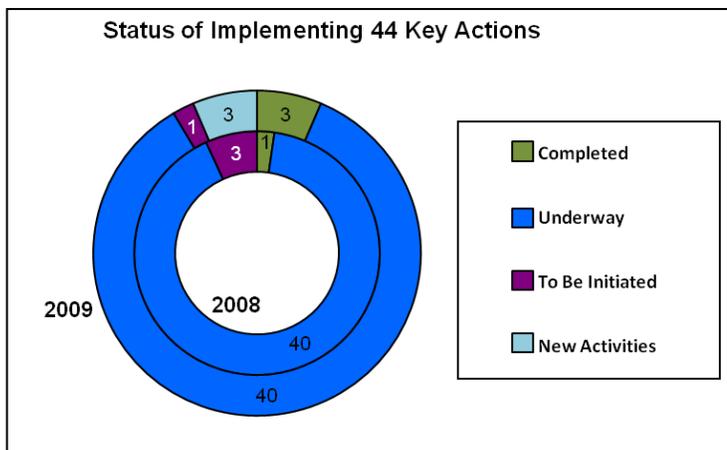
44 Key Actions Support Five Goals



scenario without an infusion of new resources to address climate change, EPA has succeeded in building momentum, key programs are underway, and a strong foundation has been laid for moving forward.

To quantify implementation of the key actions, two metrics were utilized in the 2008 progress report and carried forward here. First, the *status* of implementation is described as being “completed”, “underway”, or “to be initiated”. Second, the progress of implementation is described as “on schedule” or “behind schedule”.

In the 2008 progress report, the *status* of implementation was summarized as follows: one key action was complete, 40 key actions were underway, and three key actions were yet to be initiated. By contrast, the 2009 status of implementation indicates that three key actions are complete, 40 key actions are partially or substantially underway, and one key action has yet to be initiated. Thus, during 2009, two additional projects were completed, while the majority of projects, many with on-going activities that will never achieve “completed” status, continued to move forward as intended. In addition, work began on three new actions not initially anticipated.



As for the *progress* of implementation, in 2008, 38 key actions were on schedule, while six were behind schedule; in 2009, 40 key actions are on schedule and 4 behind schedule. It is worth noting, though, that the six key actions that were behind schedule in 2008 are now all on schedule in 2009. By contrast, the four key actions that are behind schedule in 2009 fell behind this year as resource constraints, changes in priorities, and reassessments of implementation plans led program managers to delay or stop progress on the projects. Emergence of three unanticipated projects can be attributed to the ability of the Office of Water to take advantage of the momentum generated by early efforts of the workgroup along with burgeoning interest among our stakeholders.

Stepping back to examine the scope of progress qualitatively reveals particular progress and investment in several of the Key Actions (KAs).

Under Goal 1, Mitigation, activity in four areas stands out. Three are programs that are not only growing within the headquarters program offices, but are being embraced in most if not every Region. **KA1 Energy Efficiency at Water and Wastewater Utilities, KA2 WaterSense, and KA7 Green Infrastructure and Green Buildings** each contribute to reducing greenhouse gas (GHG) emissions and offer multiple co-benefits to adopters, such as improved asset management of utilities, conservation of water, and improvements to ecosystems and quality of life. While in many cases these programs were started for purposes other than to address climate change, the need to reduce GHGs is creating more demand for these programs. **KA8 Geological**

Sequestration of carbon dioxide, was specifically developed as a response to the need to reduce GHG emissions, and to ensure the protection of ground water supplies in doing so.

Accomplishments under Goal 2, Adaptation, are gaining momentum and evolving. Some of the KAs to note were developed specifically in response to climate change impacts (e.g., **KA22 Climate Ready Estuaries and KA25 Review NPDES Permit Program**). Some reflect revisions to existing activities to incorporate climate change factors (e.g., **KA28 Sustainable Water Infrastructure Initiative and KA30 Use of State Revolving Fund for climate change**). Other KAs were activities already planned but have increased salience in light of climate change impacts (e.g., **KA14 Criteria for Sedimentation and Velocity**, and **KA33 National Wetlands Mapping Standard**).

In addition, significant progress has been made on three efforts not explicitly identified in the *Strategy*. Two are outgrowths of **KA31 Emergency Response Planning** and **KA29 Vulnerability Assessment**. In 2009, the Climate Ready Water Utilities (CRWU) working group was charged by the National Drinking Water Advisory Council to evaluate the concept of *Climate Ready Water Utilities*. The Office of Ground Water and Drinking Water is also developing a Climate Change Risk Assessment and Awareness Tool (CC Tool) to aid drinking water and wastewater operators with assessing climate change threats, threshold levels for asset failures, and consequences. Another new project, the *Coastal Wetlands Initiative*, will help EPA and stakeholders to understand stressors threatening coastal wetlands including threats posed by climate change, and to develop strategies to protect and restore coastal wetland resources.

KAs under Goals 3, 4 and 5, respectively Research, Education and Program Management, are all underway. The challenge here is to keep up with the phenomenal growth of activity and information and to effectively target EPA's work relative to what our stakeholders are doing and what other Agencies are doing, as well as to meet near term information needs. EPA is collaborating with other Federal Agencies in an effort to improve such coordination, per **KA44 Federal Agency Coordination**. Relative to **KA39, Outreach** to aid and inform EPA's efforts moving forward, a *State-Tribal Climate Change Council* comprising governmental co-regulators was formed, complementing the *CRWU* working group mentioned above.

As the national dialogue on climate change expands with stakeholders and inter-governmental partners, programs and opportunities not envisioned when the *Strategy* was developed have actually gained more momentum than some of the KAs initially envisioned. For example, while there is an important role for headquarters offices to develop national policies, new tools and information, we have come to understand that the impacts of climate change are regionally and locally specific, and therefore adaptation is locally specific. We are witnessing a growth of regional, local and inter-governmental forums to tackle climate challenges, and EPA efforts at those levels are widespread. Every EPA Region has engaged with stakeholders on both mitigation and adaptation programs per **KA43 Regional Additions**, and as described in Sections III and IV of this report.

Scientific and Other Developments: An Update

In June 2009 the U.S. Global Change Research Program published a report titled “*Global Climate Change Impacts in the United States.*” The report reviews the scientific findings of the 2007 and earlier IPCC reports as well as more recent scientific findings. It describes both ongoing and expected future impacts of climate change for the United States and provides a region and sectoral assessment (available at: <http://www.globalchange.gov/whats-new/286-new-assessment-climate-impacts-us>).

In December 2009, the EPA issued the “*Endangerment and Cause or Contribute Findings for Greenhouse Gases under the Clean Air Act.*” The finding and the supporting *Technical Support Documents* and the *Response to Comments* also discuss observed and expected impacts of climate change in the U.S. (available at: <http://www.epa.gov/climatechange/endangerment.html>).

A review of these documents reinforces the findings that climate change has significant implications for water resources and water programs, and the conclusions of the National Water Program Climate Change Workgroup that these implications need to be addressed in each part of the National Water Program in order to continue to achieve EPA’s mission of protecting human health and the environment.

Next Steps

EPA is committed to sustaining efforts to tackle the challenges for water resources and water programs posed by climate change. The 2008 *Strategy* represents a strong first effort. Because the 2008 *Strategy* was intended to cover FY2008 and FY2009, EPA is working to update the key actions for FY2010 and FY2011. The experience gained by the National Water Program, and the new opportunities that have emerged, will enable EPA to identify priority activities on which to focus resources – specifically which of the current activities to continue, which to close out or discontinue, and what new actions are now called for. In addition, during 2010, EPA will work with stakeholders to further evaluate the implications of climate change on the National Water Program and will revise the *Strategy* with the goal of having a new strategy in place by FY2012.

More information about the 2008 *Strategy*, including information on its development and implementation, is available on the Office of Water Climate Change Website at: www.epa.gov/water/climatechange. In addition, the Office of Water has established a Water Program/Climate Change Listserve. Those interested in receiving emails providing periodic news on water and climate change topics, including on updates to the *Strategy*, can sign up for this Listserve, available at the link above.

II. Implementation of 2008 *Strategy* by National Water Program Offices

Implementation of the 44 Key Actions is being undertaken by the national program offices within the Office of Water located at EPA Headquarters in Washington, DC. These offices include:

- The Office of Science and Technology (OST);
- The Office of Wastewater Management (OWM);
- The Office of Wetlands, Ocean, and Watersheds (OWOW);
- The Office of Ground Water and Drinking Water (OGWDW); and
- The Office of the Assistant Administrator for Water, Immediate Office (OWIO).

The status of each Key Action is described below.

A. Implementation of Goal 1: Water Program Mitigation of Greenhouse Gases

The largest sources of greenhouse gas emissions are in the electricity generation, transportation and industrial sectors of the U.S. economy. Many of these sources are also pollution sources or consumers of water. In many cases, production synergies

Goal 1: Water Program Mitigation of Greenhouse Gases: use water programs to contribute to greenhouse gas mitigation.

mean that a single investment will have greenhouse gas, water supply, and water quality benefits, and will lead to economic savings and greater sustainability of water infrastructure.

The key actions related to water programs that lead to mitigation of greenhouse gases are described in this section and fall into several categories:

- Water-related energy conservation/production;
- Water conservation;
- “Green building” design and “smart growth;” and
- Direct greenhouse gas emissions mitigation from agriculture.

If creation of greenhouse gases cannot be avoided, some of these gases can be “sequestered” so that they are not released to the atmosphere. Carbon dioxide sequestration refers to the process

of capturing carbon dioxide at the production source or removing it from the atmosphere and sequestering it to prevent release to the atmosphere. Sequestration activities related to water programs include:

- Geologic sequestration of carbon through underground injection; and
- Biological carbon sequestration through forestry and agricultural practices.

Key actions in support of this goal are addressed below.

Key Action #1: Improve Energy Efficiency at Water and Wastewater Utilities.

The National Water Program will continue to work with the Office of Air and Radiation (OAR) to promote energy performance benchmarking programs, use of energy audits and energy tracking systems, use of alternative energy sources within plants (e.g., solar, wind, hydro), installation of Combined Heat and Power systems for heat and energy generation in facilities that use anaerobic digesters, and will provide State and local governments information on available and emerging treatment technology. **(Lead Office: OWM)**

Status: Underway

Progress: On schedule

OW recognized the importance of addressing the nexus between water and energy in February 2008, when the Assistant Administrator for Water issued a memo to the EPA Regions to elevate this issue. The memo solicited Regions' involvement in promoting residential and commercial water efficiency, as well as energy efficiency at water and wastewater treatment plants (The memo is available at:

http://www.epa.gov/waterinfrastructure/pdfs/memo_si_bengrumbles_nexus-between-water-energy_02142008.pdf). At the same time, OWM and OGWDW created a web page addressing water and energy resources to improve the sustainability of water infrastructure through Better Management (See: http://www.epa.gov/waterinfrastructure/bettermanagement_energy.html).

OWM and Region 1 also developed the *Energy Management Guidebook for Wastewater and Water Utilities* to help utilities address their key energy challenges through the PlanDoCheckAct approach embodied in environmental management systems. The Guidebook, released January 2008, can be found at:

http://www.epa.gov/waterinfrastructure/pdfs/guidebook_si_energymanagement.pdf.

Based on this Guide, in 2009, OWM conducted ten energy management training workshops across the country with EPA Regional offices and plans to conduct an additional workshop in early 2010. Over 1,000 people have participated in these workshops and a growing number of utilities are now working with the EPA regions to develop energy management plans based on the Guide. A summary of these efforts can be found at: <http://www.peercenter.net/>.

OWM is also collaborating with partners, including the EPA Office of Air and Radiation (OAR) and Water Environment Research Foundation (WERF) to pursue activities related to energy

conservation and biogas use at publicly owned treatment works (POTWs) and the reduction or offsetting of greenhouse gas (GHG) emissions from POTWs, where possible. The goals are to significantly improve energy use efficiency, expand onsite methane to energy production, and reduce and offset GHG emissions.

A key step toward strengthening work on the energy/water nexus involves continued cooperation, initially codified November 2008 with the signing of a joint Memorandum of Understanding between OAR and OW (including both OWM and OGWDW) on energy efficiency at water facilities. This MOU can be found on the internet at: www.epa.gov/water/climatechange/implementation.html. OWM will continue to work with OAR to apply several of their programs to the wastewater sector, including:

- Energy Star Program to promote energy performance benchmarking: 1) strengthen the energy bench marking tool to expand benchmarking capability to various plant process configurations and advanced treatment processes and incorporate biosolids management, handling and disposal options for wastewater facilities; and 2) help develop OAR's guide to improve energy efficiency and implement cost saving opportunities for the municipal wastewater industry;
- Combined Heat and Power Partnership to 1) promote the beneficial use of digester gas to produce power and heat for wastewater operations; and 2) promote ways to reduce greenhouse gas emissions for wastewater treatment and biosolids operations; and
- Development of fact sheets and case studies for municipal wastewater treatment plant operators on energy conservation and alternative energy sources. OWM is also working within OAR's schedule, and we anticipate that OAR will produce an Energy Star energy management guide for the wastewater industry and case studies and fact sheets within the next several years.

OWM is currently developing guidance documents for POTW decision makers to demonstrate the economic feasibility and greenhouse gas reduction benefits of energy conservation and CHP (combined heat and power) production projects that result in energy savings with reasonable payback periods. These documents will include:

- Case studies on successful POTW energy conservation projects;
- Compilation of project information on various energy conservation measures and biogas power generation technologies, including conventional and advanced engines, fuel cells and microturbines, and clean-up of biogas to pipeline quality natural gas for use as a renewable fuel; and
- Data on GHG emissions, electrical efficiency, power production capacity, capital and O&M costs, and costs for digester gas scrubbing systems and power generation air pollution reduction equipment, etc..

OWM is also supporting the activities of our key stakeholders, such as the Water Environment Federation (WEF) and the Water Environment Research Foundation (WERF) to promote energy conservation and recovery at wastewater treatment plants including:

- WERF's Issue Area Team (IAT) to coordinate priority research needs in energy management, solids volume reduction, and resource recovery; and
- WEF technical programs at the 2009 Water Environment Federation Technical Exhibition and Conference (WEFTEC) on energy management and recovery.

For example, OWM is collaborating with WERF on developing, methods, processes, and tools for energy management, such as biogas utilization, energy conservation, and determining carbon footprints. Examples of projects underway include:

- Characterization of Greenhouse Nitrogen Emissions from Wastewater Treatment;
- Green Energy Life Cycle Assessment Tool;
- Life Cycle Assessment Manager for Energy Recovery (LCAMER) from POTW Anaerobic Digestion; and
- Develop Sustainable Energy Optimization Tool.

Key Action #2: Implement the WaterSense Program.

EPA will continue its current efforts to implement the WaterSense program and will incorporate educational information about related reductions in energy use. **(Lead Office: OWM)**

Status: Underway

Progress: On Schedule

WaterSense is an ongoing partnership program sponsored by EPA, seeking to protect the future of our nation's water supply by promoting water efficiency and enhancing the market for water-efficient products, programs, and practices. Although initial tasks identified in the "*National Water Program Strategy: Response to Climate Change*" have been completed, EPA will continue its efforts through the WaterSense program to inform the public about the associated energy saving benefits that occur when water is used more efficiently. Information is available at: <http://www.epa.gov/watersense>.

In 2008, WaterSense and its partners across the country helped Americans reduce their water use and utility bills. Achievements include:

- Saving 9.3 billion gallons of water and 1 billion kWh through use of WaterSense labeled products;
- Helping consumers realize more than \$55 million in water and sewer bill savings; and

- Doubling the number of program partners.

The program released several draft and final specifications during 2009 and carried out other activities to increase public awareness of the need to use water more efficiently. These include:

- On January 8, 2009, EPA released draft specifications for High-Efficiency flushing Urinals. EPA released the final specification on October 8, 2009 (See: <http://www.epa.gov/watersense/products/urinals.html>);
- On March 16, 2009, EPA launched "Fix a Leak Week" to remind Americans of the environmental and economic benefits to fixing leaks from household plumbing fixtures and irrigation systems, complete with a demonstration project in Phoenix, AZ and a podcast available for continued viewing (See: http://www.epa.gov/watersense/water_efficiency/fix_a_leak.html);
- On March 31, 2009, Acting Assistant Administrator for Water, Michael Shapiro testified before the Senate Environment and Public Works Committee, Subcommittee on Water and Wildlife on "EPA's Role in Promoting Water Use Efficiency." Mr. Shapiro's testimony focused on the WaterSense program (See: http://epw.senate.gov/public/index.cfm?FuseAction=Hearings.Hearing&Hearing_ID=3aebcf6c-802a-23ad-4859-ebf9c54463d7);
- On May 8, 2009, WaterSense released the revised draft specification for water-efficient single-family new homes. A final specification was released on December 10, 2009 (See: http://www.epa.gov/watersense/spaces/new_homes.html);
- On July 10, 2009, WaterSense issued a Notification of Intent (NOI) indicating that it would work with the ENERGY STAR program to develop specifications for pre-rinse spray valves to improve water and energy efficiency. EPA has identified its approach to developing the draft specification, outlined efficiency and performance criteria, and the technical issues that still need to be resolved related to these products (See: <http://www.epa.gov/watersense/products/prsv.html>);
- On September 24, 2009, WaterSense released a draft Specification for Showerheads. The draft specification was open for review and comment (See: <http://www.epa.gov/watersense/products/showerheads.html>);
- On October 7, 2009, the U.S. Environmental Protection Agency recognized its second group of WaterSense Partners of the Year for their outstanding accomplishments and efforts in water efficiency. Information about the awards program and winners is available at: http://www.epa.gov/watersense/partners/winners_2009.html; and
- On November 19, 2009, WaterSense released a draft specification for weather-based irrigation controllers for public review and comment (See: <http://www.epa.gov/watersense/partners/controltech.html>).

Key Action #3: Water Conservation and Management for Drinking Water Systems.

The National Water Program will explore opportunities with States and drinking water systems to better address expected impacts of climate change on water supply and water usage rates through water conservation and water resources management. (Lead Office: OGWDW)

Status: Underway

Progress: On schedule

OGWDW is providing support for states' efforts through the Association of State Drinking Water Administrators (ASDWA) to explore water conservation and resource management issues and options related to source water availability, variability and sustainability. In May 2007, OGWDW participated in two state listening sessions with ASDWA and the Ground Water Protection Council (GWPC) on water availability, variability and sustainability (WAVS) issues. Findings from the state listening sessions were presented and additional listening sessions were held at ASDWA and GWPC annual meetings. ASDWA's work that OGWDW supported in 2009 includes:

- ASDWA completed a national survey of state water management issues, practices and water conservation policies, programs and implementation mechanisms in Spring 2008. Survey findings were summarized in a white paper that was released in February, 2009. The white paper will guide further work by ASDWA;
- ASDWA sponsored a WAVS Work Shop in Denver on September 29 thru October 1, 2009. The purpose was to "provide a catalyst for state drinking water programs to come away with action items to help them begin or continue working with their state water resource managers and drinking water utilities to understand and ensure the sustainability of drinking water supplies and protection of public health;" and
- ASDWA is considering its next steps in light of the forgoing activities and will explore opportunities to partner with, initiatives by EPA, USGS, USACE, NOAA and USBR as well as those of organizations like the Association of Municipal Water Agencies (AMWA), the Ground Water Protection Council (GWPC), the National Ground Water Association (NGWA), the American Water Resources Association (AWRA) and the Western States Water Council (WSWC). ASDWA's web site has begun highlighting WAVS issues at:
<http://www.asdwa.org/index.cfm?fuseaction=Page.viewPage&pageId=526&parentID=473&nodeID=1>.

Key Action #4: Water Conveyance Leak Detection and Remediation.

The National Water Program will promote technologies to identify and address leakage from water pipes and other conveyances. (Lead Office: OGWDW with OWM)

Status: Underway

Progress: On schedule

EPA is collecting and compiling information on tools and techniques to conduct water audits and to identify and repair leaks in drinking water distribution systems. The information will be summarized in a document (hardcopy and web version) using decision tree and matrix formats to allow utilities to identify and implement effective water loss mitigation tools.

Key milestones in this work include:

- Developing and launching dedicated web page for water loss document, general water loss mitigation information, available research, links to state programs and utility organization resources. Guidance document *Control & Mitigation of Drinking Water Losses in Distribution Systems* is expected to be released in early 2010; and
- Delivering a one-hour webinar to promote water loss mitigation and provide a synopsis of the information contained in the water loss mitigation document. The Webinar, guidance and fact sheets will be available in early 2010.

Key Action #5: Industrial Water Conservation, Reuse and Recycling Technology Transfer.

The National Water Program will identify industries and facilities that best maximize their water efficiency and develop a technical guide for control authorities and industry for promoting water minimization, reuse, and recycling. (Lead Office: OST/OWM)

Status: Underway

Progress: On schedule

OW is funding the Water Science and Technology Board of the National Research Council of the National Academy of Sciences (NRC/NAS) to conduct study on “*Assessment of Water Reuse as an Approach for Meeting Future Water Supply Needs.*” The study began in 2009 and the report is expected by the end of 2010, at which time the results will be incorporated into case studies, fact sheets and technical guidance (Information about the study is available at: <http://www8.nationalacademies.org/cp/projectview.aspx?key=48995>).

The study is assessing the current state-of-the-technology in wastewater treatment and production of reclaimed water; how available treatment technologies compare in terms of treatment performance, cost, energy use, and environmental impacts; challenges and limitations; infrastructure requirements of water reuse for various purposes; life cycle costs; benefits of water

reclamation; and how reuse compares with other supply alternatives. More specifically, results of this study will be used to:

- Update and revise its “2004 Guidelines for Water Reuse” (available at: <http://www.epa.gov/nrmrl/pubs/625r04108/625r04108.pdf>);
- Develop a comparison of performance, costs, energy requirements and greenhouse gas releases for different levels of wastewater treatment;
- Develop a comparison of costs, energy requirements and greenhouse gas releases for water reclamation/reuse vs. desalination vs. long distance transport of water supplies and vs. pumping from deep aquifers, including case studies;
- Update the comparison of wastewater treatment systems’ performance, costs and energy use included in the 1993 report issued by the Water Science Technology Board on Managing Wastewater in Coastal Urban Areas (available at: <http://lab.nap.edu/openbook.php?isbn=0309048265>); and
- Develop case examples of the use of reclaimed municipal effluent as an alternative water supply by various types of industries.

Key Action #6: Federal Agency Water Conservation Guidance.

The National Water Program will develop Water Efficiency Implementation Guidance for all Federal agencies under Executive Order 13423. (Lead Office: OWM)

Status: Completed

Progress: On schedule

EPA has completed necessary actions under this Executive Order to provide guidance for all Federal Agencies. In addition, EPA continues to implement the WaterSense program and welcomed the Centers for Disease Control and Prevention as a WaterSense partner in June 2008. The program is working with other federal agencies to encourage them to become WaterSense program partners.

The Executive Order (EO) 13423, Strengthening Federal Environmental, Energy and Transportation Management (<http://edocket.access.gpo.gov/2007/pdf/07-374.pdf>), issued on January 29, 2007, superseded EO 13123 which was issued under the previous administration. The EO directed each agency to develop water management plans and, beginning in FY 2008, to reduce water consumption intensity, relative to the baseline of the agency's water consumption in FY 2007, through lifecycle cost effective measures by 2% annually through the end of the fiscal year 2015 or 16 percent by the end of FY 2015. EO 13423 also directed Federal sites to conduct water audits of at least 10% of facility square footage annually and to conduct audits at least every 10 years. Federal agencies were encouraged to purchase water efficient products and services, including WaterSense labeled products, and use contractors who are certified through a

WaterSense labeled program, where applicable. More information on the EPA Water Sense program may be found in KA2.

EPA worked with other federal agencies to update existing, or develop new, guidance and Best Management Practices to facilitate implementation of the EO. For more information about the guidelines for meeting these goals, see the Water Efficiency Goals Guidance: http://www1.eere.energy.gov/femp/program/waterefficiency_goalguidance.html and http://www1.eere.energy.gov/femp/program/waterefficiency_bmp.html. See also DOE guidance at: http://www1.eere.energy.gov/femp/pdfs/water_guidance.pdf.

In October 2009, President Obama issued EO 13514: Federal Leadership in Environmental, Energy, and Economic Performance. The EO extends the timeframe for reducing water consumption through FY 2020 and adds requirements for reducing water used for industrial, landscaping, and agricultural uses. EPA and other agencies are working to develop additional guidance to support the EO, as needed. For additional EO 13423 activities, see KA7, discussing Section 438.

Key Action #7: Promote Energy Saving/Generating “Green Buildings” and “Green Infrastructure.”

The National Water Program will work with other EPA offices to support States, Tribes, and local governments and the private sector in promoting the “green buildings” rating systems, with a focus on saving water and energy and will work to integrate “green infrastructure” practices into stormwater permits. **(Lead Office: OWOW with OWM)**

Status: Underway

Progress: On schedule

EPA’s Green Buildings and Green Infrastructure programs are cross-Office efforts that address both nonpoint source runoff and stormwater management. OWOW promotes the “green buildings” and “smart growth” programs to focus efforts on reducing nonpoint source pollution while reducing energy and water consumption. OWM supports municipal, State, and Regional efforts within the stormwater NPDES permitting program to reduce overflows from storm sewers and combined sewers, and to garner a variety of additional co-benefits including reducing energy used in treating wastewater.

OWOW has promoted “green buildings” and “smart growth” to reduce energy and water needs through the following projects:

- **Green Calculator** – EPA has provided support for the Center for Neighborhood Technology to enhance a web-based stormwater calculator tool for quickly comparing the performance, costs, and benefits of Green Infrastructure to conventional stormwater practices. The tool is a step-by-step process for determining the average precipitation at your site, choosing a stormwater runoff volume reduction goal, defining the impervious areas of your site under a conventional development scheme, and then choosing from a range of green infrastructure management practices to find the combination that meets the

necessary runoff volume reduction goal in a cost-effective way. Engineers, architects, planners, land owners and others can see how various green infrastructure practices can achieve runoff volume reductions. The tool is available for use at: <http://www.CNT.org>;

- GI Cost Tool – EPA provided support to WERF to develop the Green Infrastructure Cost Tool. This suite of tools addresses the costs associated with vegetative roofs, rainwater catchment systems, and bioretention facilities by providing a framework for estimating capital costs, operation and maintenance costs, and life-cycle net present value. The tools can serve as a format for cost reporting for past, current, and future projects. They also provide users with planning-level cost estimates and concise literature review. These tools complement an existing suite of BMP whole life cost models for retention ponds, extended detention basins, swales, and permeable pavement developed under a previous WERF project. The complete set of tools and accompanying user’s guide can be found on EPA’s Green Infrastructure website or <http://www.werf.org/bmpcost>; and
- EO 13423, Section 438 Guidance – Section 438 of the Energy and Independence Act requires that strategies be in place to protect pre-existing hydrology when developing or redeveloping any Federal facility. EPA has been charged by the Federal Interagency Sustainability Work Group to develop technical guidance and background information to assist federal agencies in implementing this mandate. Each Agency or Department is individually responsible for ensuring compliance with EISA Section 438. The document, released on December 8, 2009, contains guidance on how compliance with Section 438 can be achieved, measured, evaluated, and reported. It is available at: <http://www.epa.gov/owow/nps/lid/section438/>.

OWM has continued to lead efforts to incorporate green infrastructure into NPDES stormwater permits, consistent with EPA’s January 2008 Green Infrastructure (GI) Action Strategy entitled *Managing Wet Weather with Green Infrastructure*. Several of the framework items were completed in 2008 (e.g., memorandum for the “Use of Green Infrastructure in NPDES Permits and Enforcement” and the guidance for Underground injection control). EPA continues to assist State/Regional activities for incorporating green infrastructure into NPDES stormwater permits, including technical support to States for permit writing and training, as well as publications. For example:

- Technical support continues to be provided to States for customized permit language for municipal separate storm sewer system (MS4) permits and fact sheets. 2009 highlights include the issuance of West Virginia’s MS4 general permit, finalized in June 2009. EPA also supported Kentucky which proposed its small MS4 general permits in July 2009. Tennessee and Oregon plan to propose MS4 permits in 2010;
- Specific training events for municipal officials who operate MS4s, CSOs, and other wet weather programs conducted in 2009 included Richfield, OH; Toledo, OH; Hartford, CT; Charleston, WV; and Stevenson, WA. Webcast training and other workshop materials are available at: <http://cfpub.epa.gov/npdes/greeninfrastructure/gitrainings.cfm>; and

- EPA continues to add to its “Managing Wet Weather with Green Infrastructure Municipal Handbooks” series, available at <http://cfpub.epa.gov/npdes/greeninfrastructure/munichandbook.cfm>.

Documents published in 2009 include:

- “Incentive Mechanisms” (June 2009) to encourage the use of green infrastructure practices on private properties, including retrofitting properties that do not currently contain green practices and guidance on how to incorporate incentives into building permits, stormwater permits, and other developmental codes and practices;
- “Water Quality Scorecard” (August 2009) to help local governments identify opportunities to remove barriers, revise and create codes, ordinances, and incentives for better water quality protection; and
- “Green Streets: A Conceptual Guide to Effective Green Streets Design Solutions” (August 2009).

Key Action #8: Develop Geologic Sequestration Regulations.

In 2008, EPA will work with stakeholders to consider comments on regulations, proposed in July 2008, for siting and managing geologic sequestration (GS) projects to prevent endangerment of underground sources of drinking water. **(Lead Office: OGWDW)**

Status: Underway

Progress: On schedule

OGWDW is developing regulations under the Safe Drinking Water Act’s (SDWA) underground injection control (UIC) program. A key need is to build technical capacity in the states and direct implementation (DI) Regions. OGWDW met its 2008 goal by publishing a Notice of Proposed Rulemaking (NPRM) in July 2008, conducting four public stakeholder meetings, and accepting comments on the proposal. In August 2009, OGWDW published a Notice of Data Availability (NODA) and held a public hearing in September, 2009 soliciting comments on new sequestration research and on an alternative to the injection depth requirement of the 2008 NPRM. OGWDW is currently developing the Response to Comment documents for both the NPRM and NODA.

OGWDW is moving forward with the rule-making process in anticipation of finalizing the UIC geologic sequestration rule in late 2010 or early 2011. OGWDW will continue to coordinate closely with the Office of Air and Radiation on this rulemaking and other GS activities.

Key Action #9: Continue Technical Sequestration Workshops.

The National Water Program will continue to coordinate with EPA’s Office of Research and Development and Office of Air and Radiation, the Department of Energy, and National Laboratories on geologic sequestration research and hold public meetings and workshops with experts and stakeholders. **(Lead Office: OGWDW)**

Status: Completed

Progress: On schedule

OGWDW held a series of seven technical and two public workshops prior to publishing the proposed rule in 2008.

Key Action #10: Support Evaluation of Sub-seabed and Ocean Sequestration of CO2.

EPA will work with other interested agencies and the international community to develop guidance on sub-seabed carbon sequestration and will address any requests for carbon sequestration in the sub-seabed or “fertilization” of the ocean, including any permitting under the Marine Protection, Research, and Sanctuaries Act (MPRSA) or the Underground Injection Control program that may be required. **(Lead Office: OWOW)**

Status: Underway

Progress: On schedule

OWOW will address requests for permits under the MPRSA for carbon sequestration in the sub-seabed or for fertilization of the ocean for the purpose of sequestration. However, no requests are pending or expected at this time.

PurGen, a company in New Jersey, has been working with Minerals Management Service on a permit for sequestration in the ocean off New Jersey under the Outer Continental Lands Act. EPA is considering whether this project should also be regulated under the Marine Protection, Research and Sanctuaries Act. EPA has not received a formal permit application.

Under the chairmanship of the United States, parties to the London Convention and London Protocol completed international guidance for sub-seabed carbon sequestration. The guidance, entitled “Specific Guidelines for Assessment of Carbon Dioxide Streams for Disposal into Sub-seabed Geological Formations,” was adopted by the 2nd meeting of Contracting Parties to the London Protocol in November 2007. The guidance is posted on the International Maritime Organization’s website: http://www.imo.org/includes/blastDataOnly.asp/data_id%3D25527/9-CO2SequestrationEnglish.pdf. The London Convention/London Protocol Scientific Groups continue to work on a framework to assess scientific research proposals for ocean fertilization projects. Extensive coordination is needed within EPA (especially with the UIC program and the Climate Change Program), as well as with interested Federal agencies (such as DOE, NOAA, and DOS), state agencies, international bodies (such as the London Convention/London Protocol Scientific Groups), and other stakeholders.

Key Action #11: Pilot Marketing of Nonpoint Source Biological Sequestration.

The National Water Program will support cooperative pilot projects with selected State section 319 nonpoint pollution control programs to demonstrate the potential for the cumulative results of 319 programs to provide carbon sequestration benefits. **(Lead Office: OWOW)**

Status: Underway

Progress: On schedule

This action is to promote practices, mainly through agriculture and forestry, to protect water quality and wetlands by reducing nonpoint pollution incorporating carbon sequestration activities. OWOW agreed to support states that chose to fund, through CWA Section 319, and implement such projects that are within a watershed plan to improve water quality. However, to date, no states have requested funding for this type of work through the 319 program. It is anticipated that these projects are more likely to be included in watershed restoration efforts when offset markets and accountability mechanisms are established to sequester carbon and other greenhouse gases.

B. Implementation of Goal 2: Water Program Adaptation to Climate Change

As the climate changes, the National Water Program has an obligation to continue to ensure that water is safe to drink and that the health of aquatic ecosystems is protected. To meet this challenge, Federal, State and Tribal managers of clean water and drinking water programs will engage in an on-going process to adapt the implementation of the programs in light of the changing climate. Implementation of the key actions described in the Adaptation section of the 2008 *Strategy* are described below

Goal 2: Water Program Adaptation to Climate Change: adapt implementation of core water programs to maintain and improve program effectiveness in the context of a changing climate.

Key Action #12: Address Impacts of Climate Change on Potential Contamination of Drinking Water Sources.

The National Water Program will evaluate, as part of the contaminant occurrence analyses supporting the EPA six year review of drinking water standards and the contaminant candidate list, the potential for projected climate change to increase the nature and extent of contaminants in drinking water supplies and systems. **(Lead Office: OGWDW)**

Status: Underway

Progress: On schedule

The second Six Year Review is expected to be published in early 2010. The Federal Register Notice will invite the public to submit information about the effects of climate change on drinking water contaminants regulated under section 1421 of the Safe Drinking Water Act.

Key Action #13: Assess Need for New or Revised Clean Water Microbial Criteria and Risks of Waterborne Disease.

The National Water Program will assess the potential for increases in waterborne disease and other water-related disease vectors as a result of climate change, including recommendations for appropriate responses (e.g., publish new or revised biological/pathogen criteria for surface waters). **(Lead Office: OST)**

Status: Underway

Progress: On schedule

OST completed a literature review of re-growth of pathogens and pathogen indicators in tropical climates (December 2007) and reviewed this information in 2009 to determine relationships between pathogens and changing environmental parameters.

OST is assessing effects of changes in environmental parameters (e.g., temperature and rainfall) on recreational waters and will study tropical climates as a surrogate for waterbodies affected by climate change. This effort is ongoing.

OST investigated quantitative microbial risk assessment approaches to better understand the relationship of pathogens and changing environmental parameters and their effect on human health. This is an ongoing effort.

OST conducted an epidemiological study to determine if the risks to human health when recreating in tropical waters are different from risks to human health when recreating in other recreation waters. The study is expected to be completed in December 2010.

Key Action #14: Clean Water Criteria for Sedimentation/Velocity.

In anticipation of increased flow and velocity and sediment loadings in some streams, rivers, and estuaries, the National Water Program will review the potential for development of criteria for sediment and velocity in streams that are appropriate to these changing conditions. (**Lead Office: OST**)

Status: Underway

Progress: On schedule

OST has examined the policy and technical implications of velocity or flow standards, and provided technical and policy support to Regions and states interested in developing flow criteria, including helping Region 1 develop flow-based biological criteria. In 2009, OST compiled information on current state and regional sedimentation/velocity initiatives, programs and standards in order to develop a white paper on the subject.

Key Action #15: Develop Biological Indicators and Methods.

The National Water Program will improve the biological information base to better manage water resources in a changing climate, including developing guidance on coral reef bioassessments and biological criteria. (**Lead Office: OST**)

Status: Underway

Progress: On schedule

OST conducted a scoping exercise to determine which states/regions have developed, or are developing, biological indicators of climate change, followed by an ORD workshop in February 2008 in which states reported on their biological baselines and biological indicators related to climate change (See: <http://www.epa.gov/ncea/workshop>). ORD then initiated four pilot studies on adaptation options with bioassessment programs with four states in different climatic regions (Ohio, North Carolina, Utah and Maine). OST works closely with ORD in this area.

OST, in cooperation with ORD, completed the Stony Coral Rapid Bioassessment protocol in July 2007. ORD is taking the lead in the development of the draft biocriteria technical guidance manual for stony corals for OST. It is expected to be completed in 2010.

OST is coordinating with ORD's National Center for Environmental Assessment (NCEA), which is leading the effort to assess state biocriteria programs and climate change. OST is also coordinating with ORD's National Health and Environmental Effects Research Laboratory (NHEERL) on the development of the stony coral biocriteria technical methods manual.

Key Action #16: Link Ecological and Landscape Models.

The National Water program will work with the Office of Research and Development and the Office of Air and Radiation and Federal partners to invest in refinement of models of ecological process and landscape hydrology. **(Lead Office: OST)**

Status: Underway

Progress: On schedule

OST integrated the Surface Water Assessment Tool (SWAT) into BASINS. At the present time, SWAT does not provide the capability to readily address climate change scenarios in any of the other GIS platforms through which it is available (Information about BASINS is available at: <http://www.epa.gov/waterscience/basins/>).

In 2009, OST integrated the Climate Assessment Tool (CAT) into SWAT BASINS 4.0 system will allow the public substantially greater access to the environmental impact forecasting capabilities that the CAT can provide when linked to this popular and widely used watershed model (See: <http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=198586>).

OST expects to release an update of the BASINS model with integrated SWAT and CAT-SWAT capabilities in early 2010.

Key Action #17: Evaluate New Industry Sectors.

The National Water Program will evaluate new industry sectors (including biofuels) and existing effluent guidelines for industrial categories to determine potential NPDES permitting needs and assess the need for new or revised technology-based performance standards. **(Lead Office: OST)**

Status: Underway

Progress: On schedule

In 2009, as part of its annual 304(m) effluent guideline planning process, OST evaluated potential climate impacts, including water conservation and reuse. To aid this review, in 2008 EPA solicited information on industrial sectors that use water efficiency practices that promote water efficiency, re-use, or recycling, however, EPA received no public comments. OST is

currently evaluating water efficiency processes (See: <http://www.epa.gov/fedrgstr/EPA-WATER/2008/September/Day-15/w21484.htm>).

As described under KA25, below, OW evaluated how various facilities, permit parameters, and permit conditions may be affected by climate change. The results of that study will inform future evaluation of the implications of climate change for the effluent guideline and water quality standards programs.

Key Action #18: Watershed Climate Change Policy Memo.

The Office of Wetlands, Oceans and Watersheds will develop a Climate Change Policy memo that promotes the incorporation of responses to climate change into these core programs. (Lead Office: OWOW)

Status: Underway

Progress: Behind schedule

Several planning sessions were held in Spring 2009 to discuss the scope and content of a watershed climate change policy memo. No further action has occurred. OWOW believes that the underlying purpose of such a broad policy memo should be revisited and the need re-evaluated within the context of other initiatives. EPA is working to implement the Chesapeake Bay Executive Order 13508 (see Section V of this report) and to develop the National Ocean Policy (See: <http://www.whitehouse.gov/administration/eop/ceq/initiatives/oceans/>), both of which include climate change. While a policy memo may have been seen as useful a few years ago when little guidance was available for incorporating climate science into on-going decisions, the program now believes such a memo is no longer needed or should be reconsidered as the larger efforts to define EPA's role in adaptation further developed. In the interim, OWOW and Regional watershed programs already incorporate flexibility and EPA staff are accommodating climate change variability into on-going and planned activities by creating incentives to examine changing conditions in its program, such as through periodic grant solicitation. EPA staff are also beginning to incorporate climate change considerations in NPDES permit and TMDL renewals and program reviews.

Key Action #19: Expand National Water Resource Surveys to Include Climate Change Indicators.

The National Water Program will expand the national water resources surveys, such as the recent assessment of wadeable streams and the Coastal Condition Report, to address climate change issues and information. (Lead Office: OWOW)

Status: Underway

Progress: On schedule

National water resource surveys provide an opportunity to track shifts in the occurrence, distribution and composition of aquatic communities as well as the extent of waters across the US, and the values of parameters such as temperature, discharge, etc. As currently implemented,

the Surveys are useful in tracking long-term trends at a low level of resolution; they are not currently implemented at a level of resolution that will facilitate documentation of incremental changes in the near term. Researchers in ORD's climate research program believe sampling for indicators of biological condition of aquatic communities should be conducted annually to provide a sufficient sample size to assess the short-term effects of climate change. Physical and chemical stressors, like temperature and flow need to be measured concurrent with biology. Additional stratification and intensification of the survey designs may also be needed to focus effectively on some relevant scales of interest. For example, the program may want to monitor the least-disturbed reference sites more frequently and use them as sentinels of climate change as they are least affected by other human activities. Implementation of this action item will require additional resources at the national, regional and state scale.

National survey staff participated in the ORD meeting on biological indicators of climate change in Feb. 2008. Additionally, OWOW, ORD, and OAR are pursuing resources through the Advanced Monitoring Initiative (AMI) to develop a pilot program to study the influence of climate change on freshwater ecosystems. The initial phase will utilize EPA's TIME/LTM project sites from the National Acid Precipitation Assessment Program (NAPAP), including both lake and stream ecosystems from the Northeast and Mid-Atlantic states. Using the existing network provides a unique opportunity to test the efficacy of temperature loggers for the long-term deployment needed to make a climate network affordable. Additional water chemistry variables will be collected to complement the continuation of the NAPAP. The relatively remote and least-disturbed characteristics of these sites provide a unique opportunity to pilot the potential to identify climate-related changes to biology in lakes over time using sediment diatoms collected from sediment cores. Information gained will be used to determine what biological indicators will be best to use in streams and lakes across the US.

National Wetlands Survey – Parameters Relevant to Assessing Climate Change Impacts

EPA has begun to collaborate with states, tribes, federal agencies, and other partners to implement a field survey of the nation's wetlands in 2011 as part of EPA's on-going series of National Aquatic Resource Surveys (NARS). The results will be used to judge progress toward the national goal of increasing the quantity and quality of the nation's wetlands. The findings will help ensure technical and financial resources are most efficiently allocated to address the greatest risks that confront wetland resources. We will sample 900 random sites using standardized monitoring protocols to characterize the vegetative and algal community, soil condition, and hydrology of each sample location. In 2013, EPA will produce a statistically-valid assessment of wetland ecological integrity and the stressors most commonly associated with degraded wetlands. We will also explore ways to quantify the ecosystem services that are derived from wetlands and provide the framework for the continued study of how climate change is impacting wetland quality. Preliminary discussions with EPA ORD suggested that many of the parameters we plan to collect in 2011 are relevant to the study of climate change impacts, including: vegetation species composition and abundance, alien species cover, extent of hydric soils, soil characteristics, relative saturation, and relative inundation. The 2011 monitoring will provide a baseline data layer that, in subsequent years, could be used to judge the impacts of climate change on wetland ecological integrity at multiple spatial scales.

Key Action #20: Assess Waterbody Spatial Changes Due to Climate Change.

In cooperation with USGS, explore opportunities and needs to assess change in the spatial characteristics of fresh waters due to climate change and summarize any findings. (Lead Office: OWIO)

Status: To Be Initiated

Progress: Behind schedule

OWIO had planned to work with USGS and other Federal agencies to identify key baselines describing the location of freshwater resources, and waters for which boundaries may change in response to a warmer climate (e.g., changes in the size of the Great Lakes). However, this key action has not been initiated due to resource and technical limitations. As OW engages more fully with other Federal Agencies (see KA44), the feasibility of assessing waterbody spatial changes due to climate change will be revisited.

Key Action #21: BASINS Climate Assessment Tool.

The Office of Water will develop training sessions in Washington, DC and selected Regions to assist EPA, State, Tribal and other government staffs in using the CAT element of the BASINS decision support tool. (Lead Office: OST)

Status: Underway

Progress: On schedule

The development of training materials was initiated in 2009 and is expected to be completed by Spring 2010.

Key Action #22: “Climate Ready Estuaries”.

The National Water Program will establish a Climate Ready Estuaries Program in partnership with the Office of Air and Radiation’s Climate Change Division. (Lead Office: OWOW)

Status: Underway

Progress: On schedule

OWOW and OAR are jointly working with interested National Estuary Programs (NEPs) to develop and implement the “Climate Ready Estuaries” program (ORD is also providing support). Since its inception in 2007, CRE and its partners have achieved significant progress in improving the “climate readiness” of participating NEPs and their surrounding communities. A Progress Report was published in December 2009, available at: <http://www.epa.gov/cre/downloads/2009-CRE-Progress-Report.pdf>. Highlights of accomplishments are described below:

▪ *Adaptation & Coastal Climate Change Awareness*

CRE has spurred the development of adaptation plans among its pilot partners. Through targeted grants and technical support, these estuary programs are completing adaptation strategies and plans that are a first key step toward resiliency to climate change. The program has also begun improving awareness of the need for coastal climate change adaptation through the Coastal Toolkit, the CRE website, publications, and workshops.

The existence of the CRE program itself, supported by efforts by staff and Partners to spread the word, has created a new “buzz” on issues associated with climate change and estuaries—as evidenced by great interest in the CRE program by NEPs as well as others.

CRE Partners

- Albemarle-Pamlico National Estuary Program
- Barnegat Bay National Estuary Program
- Casco Bay Estuary Partnership
- Charlotte Harbor National Estuary Program
- Coastal Bend Bays and Estuaries Program
- Indian River Lagoon National Estuary Program
- Long Island Sound Study
- Massachusetts Bays Program
- Partnership for the Delaware Estuary
- Piscataqua Region Estuaries Partnership
- San Francisco Estuary Partnership
- Tampa Bay Estuary Program

▪ *Place-Based Support: CRE Partner Network*

CRE is not a “one-size-fits-all” program for NEPs. It allows each to pursue its own ecosystem- and estuary-specific goals. CRE grants and/or direct technical assistance to selected NEP partners in 2008 and 2009 have spurred a growing number of on-the-ground accomplishments for site-specific approaches to assessing vulnerability, communicating with stakeholders, preparing adaptation plans and implementing actions to protect critical built and natural infrastructure. Details on these accomplishments can be found on the CRE website (<http://www.epa.gov/cre>).

▪ *CRE Partner Workshop*

The first CRE Partner Workshop was held June 23–24, 2009, in Washington, DC. Attendees included representatives from all 12 NEP partners participating in CRE, EPA regional representatives, and EPA headquarters staff from the Office of Air and the Office of Water. The workshop represented an opportunity for 2008 pilot partners to share their experiences and discuss lessons learned with 2009 partners. Each NEP CRE representative presented their project and participated in focused discussions and strategy sessions. CRE’s 2009 Progress Report includes a summary of key lessons learned and challenges discussed at that workshop, available at: <http://www.epa.gov/cre/downloads/2009-CRE-Progress-Report.pdf>.

- *Toolkit and Supporting Resources*

The Coastal Toolkit (<http://www.epa.gov/cre/toolkit.html>), launched in August 2008, provides useful resources for estuaries and coastal programs that are interested in learning more about climate change impacts and adaptation. The Toolkit provides information and links to websites, reports, and other resources related to the following areas:

- Adaptation Planning;
- Coastal Vulnerability and Adaptation Tools;
- Communications and Outreach Materials;
- Monitoring Climate Change;
- Smart Growth in the Context of Climate Change;
- Sustainable Financing Options; and
- Where to Find Data.

Over the first full year of CRE, the program has developed several additional resources for the Toolkit, including the following:

- *Synthesis of Adaptation Options for Coastal Areas* – Published in both print and Web-based versions, the Synthesis document brings together information on climate change effects and applications to coastal areas. It is a first in a relatively unexplored area of literature. This document has been downloaded more than 13,000 times by users of the CRE website. Other organizations such as NOAA and USAID have also highlighted it in their websites and publications. The Synthesis is available at: http://www.epa.gov/cre/downloads/CRE_Synthesis_1.09.pdf;
- *Adaptation Planning for the National Estuary Program* – A web-based resource tailored for NEPs describing the five critical elements of adaptation planning, this guide provides examples of these elements and suggestions for additional resources. This guide has proven useful to the NEPs, and has potential wide applicability to a number of other coastal management programs. The guide is available at: <http://www.epa.gov/cre/downloads/CREAdaptationPlanning-Final.pdf>;
- *“READY” Newsletter* – CRE has distributed three issues of this electronic newsletter to date. The newsletter chronicles program developments and news from CRE Partners, highlights relevant resources, and announces key meetings and workshops; and
- *Program Brochure and Fact Sheet*

See also the discussion of the new *Coastal Wetlands Initiative* described under KA32.

Key Action #23: Continue Coral Reef Protections.

The National Water Program will continue participation in the U.S. Coral Reef Task Force and support related efforts to protect coral reefs. (Lead Office: OWOW)

Status: Underway

Progress: On schedule

The National Water Program continues to participate in the U.S. Coral Reef Task Force (CRTF). Recent activities related to the Task Force include the following:

- OW is one of three federal agencies invited to participate on the NOAA Coral Reef Conservation Program's (CRCP) Land Based Sources of Pollution Working Group, which is tasked with recommending goals and objectives for the CRCP to better address this major threat to coral reef ecosystems; and
- The Coral Reef Task Force established a Climate Change Working group. One key effort is preparing a response to the "Honolulu Declaration on Ocean Acidification" presented by the Nature Conservancy to the Task Force last August. Part of that response is to develop a summary of Agency actions related to the issues raised in Honolulu. The response was presented at the CRTF meeting in October 2009 in Puerto Rico.

Key Action #24: Review/Revise Nonpoint Pollution Management Measures.

EPA will review the sector specific series "National Management Measures to Control Nonpoint Source Pollution" based on emerging information related to climate change impacts. (Lead Office: OWOW)

Status: Underway

Progress: Behind schedule

Current NPS Guidelines help the states assess the nature and extent of nonpoint sources of pollutants, methods to control them, and management measures to track progress. For this action item, OWOW is to take a new look at its existing nonpoint source program guidance to states in light of emerging climate changes issues and impacts. This activity, however, is a substantial undertaking in both resources and time required. Therefore, this project is being merged with broader efforts to address multiple advances in the management measures guidance for the Chesapeake Bay EO and under CZARA.

Key Action #25: Review and Adapt NPDES Permit Program Tools.

Conduct an internal review of the flexibilities and tools in the NPDES program that can be used to respond to changing water quality/quantity conditions and new technologies; collaborate with programs within the Office of Water and across the Agency, modify and expand training to reflect climate change, and provide technical assistance to permit authorities and permit writers. (Lead Office: OWM)

Status: Underway

Progress: On schedule

The Water Permits Division evaluated every aspect of the NPDES program to examine the flexibilities of the program to consider climate change when developing NPDES permits, and to identify the areas in which new methods, improved data, or training would be needed to ensure that NPDES permits continue to be protective of water quality. The draft report is undergoing review and will be available in early 2010.

Key Action #26: Evaluate Wet Weather/Climate Impacts at Municipal and Industrial Operations.

The National Water Program will evaluate the wet weather program to identify initiatives to effectively address increases in precipitation due to climate change. Actions will include identifying best practices for characterizing design storms that take climate change into account, incorporating climate change into outreach and training materials, and promoting Green Infrastructure and Sustainable Infrastructure. (Lead Office: OWM)

Status: Underway

Progress: On schedule

The evaluation of the NPDES program referenced in KA25 includes an evaluation of the wet weather NPDES program, and conclusions of that study with regard to methods, data sources, and permit writers' information needs are applicable in this sector.

Key Action #27: Assess Climate Impacts at Animal Feeding Operations.

The National Water Program will work with USDA to evaluate climate change impacts, such as increases in wet weather, at animal feeding operations. (Lead Office: OWM)

Status: Underway

Progress: Behind schedule

Activities described under KA17 will provide the basis to evaluate the effectiveness of using the current effluent guidelines for concentrated animal feeding operations (CAFOs) and to evaluate potential future revisions to the standard.

EPA is discussing with USDA the potential to incorporate climate change into the development of the Soil-Plant-Air-Water (SPAW) Regional Water Impacts Model (available at <http://wmc.ar.nrcs.usda.gov/technical/WQ/mmp.html>) that will be used to help CAFO operators develop protective manure management plans.

In addition, OW is staying abreast of work underway to encourage the use of methane recovery (biogas) technologies at the CAFOs)i.e., the Office of Air and Radiation's "Methane to Markets" Partnership at: <http://www.epa.gov/methanetomarkets> and USDA's AgStar partnership at: <http://www.epa.gov/agstar/>).

Key Action #28: Implement the Sustainable Water Infrastructure Initiative and Adapt Decision Support Tools.

The National Water Program will continue the implementation of the Sustainable Infrastructure (SI) Initiative and incorporate climate change into its activities, including incorporating climate change considerations in a range of new and existing sustainable infrastructure tools and outreach efforts. **(Lead Office: OWM)**

Status: Underway

Progress: On schedule

The Sustainable Infrastructure (SI) Initiative is designed to help move utilities to sustainable practices which, in and of themselves, will help them to adapt to climate change. However, adapting to climate change will put an additional strain on our aging infrastructure and adds additional factors for water and wastewater managers to consider. The additional challenge posed by climate change will be integrated into SI work as opportunities arise.

Some examples of how SI tools are addressing climate change can be found in the following Key Actions:

- Key Action #1: Energy Management Guidebook and Workshops;
- Key Action #4: Leak Detection;
- Key Action #2: Implement the WaterSense Program;
- Key Action #6: Federal Agency Water Conservation Guidance;
- Key Action #7: Promote Green Buildings and Green Infrastructure;
- Key Action #26: Evaluate Climate impacts on the Wet Weather Program;
- Key Action #29: Sustainability Handbook and Climate Vulnerability Analysis; and
- Key Action #31: Clarify Use of SRFs for Climate Related Projects.

The main website for the Sustainable Infrastructure activities for the water and wastewater programs may be found at: <http://www.epa.gov/waterinfrastructure/index.html>. A summary of available tools developed within the Sustainable Water Infrastructure program may be found at: <http://www.epa.gov/waterinfrastructure/toolkit.html>.

Key Action #29: Develop a Sustainability/Vulnerability Analysis Handbook.

Work to publish a document describing a process through which utilities can conduct a self analysis of sustainability, including a climate change–specific vulnerability analysis. (**Lead Office: OWM**)

Status: Underway

Progress: On schedule

This Key Action comprises two parts – the first being a Sustainability Handbook for water and wastewater utilities, the second being a vulnerability assessment tool. Work on the Handbook was merged with the work on Effective Utility Management, which includes ten attributes that incorporate consideration of climate change. Development of a separate Handbook will not be undertaken.

Work on the vulnerability assessment tool as been underway since May 2008, when planning began for EPA’s National Expert workshop on Water Infrastructure Adaptation to Climate Change, held January 6-7, 2009. The results of that workshop are being incorporated into a road map, or decision tool, to help utility managers approach vulnerability and risk assessments. That tool will be available in early 2010.

In addition, significant progress has been made on two efforts not explicitly identified in the 2008 *Strategy*, but that are outgrowths of this Key Action on Vulnerability Assessment and KA31 on Emergency Response Planning: (1) the Climate Ready Water Utilities (CRWU) working group and (2) the Climate Change Risk Assessment and Awareness Tool. In 2009, the CRWU working group was established and charged by the National Drinking Water Advisory Council (NDWAC) to evaluate the concept of “Climate Ready Water Utilities” and provide findings and recommendations on the development of an effective program that will enable water and wastewater utilities to develop and implement long-range plans that account for climate change impacts. The CRWU working group will meet five times between December 2009 and September 2010 and will present its findings and recommendations to the NDWAC in the form of a written report for the Council’s consideration. Additional information on the CRWU working group can be found at: www.epa.gov/safewater/ndwac. EPA’s Office of Ground Water and Drinking Water also convened a workgroup to assist with development of a framework to inform design of a Climate Change Risk Assessment and Awareness Tool (CC Tool). The CC Tool is intended to increase drinking water and wastewater operator awareness of potential climate change impacts on utility operations and missions by assessing climate change threats, threshold levels for asset failures, and consequences; and help utilities better understand these impacts by supporting adaptation decisions with analyses of adaptation options that can reduce the identified risks and an examination of the costs of these adaptations. Design and development of the tool is planned for 2010.

Key Action #30: Clarify Use of the Clean Water and Drinking Water SRFs to Support Adaptation.

Work with State partners to clarify what types of climate change–related infrastructure expenditures are eligible for State Revolving Fund (SRF) assistance. **(Lead Office: OWM and OGWDW, Co-Leads)**

Status: Underway

Progress: On schedule

Clean Water State Revolving Fund (CWSRF):

OWM has worked with partners to determine what types of projects are eligible for CWSRF financial assistance. Eligibility was analyzed from both the perspective of reacting to conditions caused by climate change and reducing the emission of greenhouse gases (GHG). The American Recovery and Reinvestment Act (ARRA) provided a 20 percent Green Project Reserve that has helped states highlight ongoing investments in climate related work and direct additional funding to capital projects that affect climate. The ARRA guidance issued in March 2009 articulated the types of capital water quality projects that are eligible for the GPR, including water efficiency and reuse projects, projects to improve the energy efficiency of POTWs or that generate clean energy for POTWs, green stormwater infrastructure, and other innovative environmental projects.

Drinking Water State Revolving Fund (DWSRF):

OGWDW clarified the broad range of climate change related projects and activities that can be supported by the DWSRF Program in a July 7, 2008 memo to the Regions for distribution to States and other stakeholders. A range of potential utility and State responses to climate change may be supported through the DWSRF fund itself or through State set-asides. The set-asides can fund a "broad range of potential uses, covering any aspects of comprehensive, integrated water system planning and management that address the components of delivering a safe and affordable supply of drinking water." Examples include:

- Certain infrastructure investments in response to climate change;
- Incorporating climate change impact mitigation/prevention in short- and long-term DWSRF program planning and implementation;
- State-wide or regional water supply planning and studies, in which the State drinking water programs "have a significant continuing role and involvement;"
- Drinking water source assessment and planning activities that address projected climate change impacts under State capacity development strategies;

- Assist water utilities in planning for and adapting to the effects of climate change on their infrastructure and other water resources;
- Energy efficiency assessments and improvements (including operations monitoring and water pumping) in public water systems; and
- Leak detection and remediation.

Key Action #31: Develop and Expand Emergency Response Planning.

The National Water Program will implement a range of actions to ensure existing emergency response planning considers impacts from climate change, and will work with federal partners to promote adoption of sustainable practices during recovery and rebuilding. **(Lead Office: OGWDW)**

Status: Underway

Progress: On schedule

Existing programs will serve as the basis for fulfilling the goal of providing utilities with tools, training, and resources to respond to potentially more catastrophic storms and droughts caused by climate change. As outlined in the Water Sector Specific Plan portion of the National Infrastructure Protection Plan, a number of activities can be conducted to make the water sector more resilient when facing the impacts of an emergency. To assist with preparedness training, OGWDW developed a tool to prepare utility managers for climate change impacts by providing discussion based tabletop exercise materials that include climate related scenarios. The tool will be available in early 2010.

Also see discussion under KA29 about the CRWU working group and the CC Tool for vulnerability assessment and awareness.

Key Action #32: Evaluate Opportunities to Refine Implementation of the 404 Regulatory Framework.

The National Water Program will work with the Army Corps of Engineers to ensure the effective implementation of the regulatory framework under section 404 of the Clean Water Act in a way that considers the effects of climate change and will explore the need for additional guidance on avoiding or minimizing impacts, defining “significant degradation” and “unacceptable adverse impact”, and/or implementing compensatory mitigation. **(Lead Office: OWOW)**

Status: Underway

Progress: On schedule

OWOW endeavors to ensure effective implementation of the regulatory framework under section 404 of the Clean Water Act to account for the effects of climate change. Thus far, a number of relevant activities have been initiated or completed as part of that effort, and we continue to seek opportunities to invest strategically. Activities to date include the following:

- Initial review of the 50 nationwide general permits issued by Army Corps of Engineers. This includes a general analysis of the types of impacts resulting from climate change that may be considered in permitting decisions, as well as identification of general permits that are likely to be particularly affected by climate change impacts;
- Mitigation Rule provision supporting mitigation projects that provide the resilience needed to address climate change, such as coastal restoration projects designed to take into account reasonably foreseeable rises in sea level (completed March 2008); and
- Coordination with external stakeholders including the Association of State Wetland Managers, and identifying points of collaboration for their September 2008 conference, which was focused on climate change.

There is no plan at this time for additional, stand-alone guidance.

Coastal Wetlands Initiative

This activity was not contemplated when the 2008 *Strategy* was developed, but has emerged as an important new initiative. Growing awareness of severe threats to coastal areas posed by climate change, devastation caused by Hurricanes Katrina and Rita in 2005 and Ike in 2008, and two recent reports have prompted EPA to form a Coastal Wetlands Team. The first report by the Association of State Wetland Managers (ASWM) recommends a national wetlands and climate change initiative to reduce impacts to wetlands, help wetlands to adapt and respond to climate change and provide leadership among programs.¹ ASWM calls for the initiative to include facilitation among climate, watershed and coastal zone programs; a survey of wetlands and climate policies, programs and other efforts; a comprehensive wetlands and climate change website; and identification and dissemination of best management practices to protect and help wetlands adapt to impacts of climate change. The second report by the National Oceanic and Atmospheric Administration (NOAA) and the US Fish and Wildlife Service (USFWS) finds that from 1998 to 2004, wetlands in coastal watersheds in the Great Lakes, Atlantic and Gulf coasts have experienced an average net decrease of 59,000 acres per year.²

EPA's Wetlands Division and Oceans and Coastal Protection Division formed a Coastal Wetlands Team with the goals of:

- Confirming wetland loss and better understanding contributing stressors;
- Identifying and disseminating tools, strategies, policies and information to protect and restore coastal wetland resources; and

¹ Association of State Wetland Managers (unpublished), Recommendations for a National Wetlands and Climate Change Initiative, January 12, 2009 draft.

² Stedman and Dahl (2008), Status and Trends of Wetlands in the Coastal Watersheds of the Eastern United States: 1998-2004.

- Raising awareness of the functions and values of, threats to, and opportunities to protect and restore coastal wetlands.

One significant undertaking of the Coastal Wetlands Team will be to conduct seven regional reviews of coastal wetlands to understand the stressors as well as restoration and protection strategies to reduce or reverse loss. Each review will contain “snapshot” analyses of one to three coastal watersheds representative of the region. The analyses will start with an introductory meeting in which the Team solicits existing reports on wetlands condition, extent and protection and restoration efforts in the study area. After reviewing available information, the Team will speak with key stakeholders to (1) better understand coastal wetland condition and trends; (2) gain additional insights into stressors currently affecting or expected to threaten coastal wetlands; (3) identify existing tools, actions, strategies and policies to reduce or reverse wetland losses and adapt to changing conditions; and (4) identify data or analysis gaps that limit managers’ ability to understand or address coastal wetland losses. EPA will use the regional reviews and follow-up workshops to gather on-the-ground input and to stimulate dialogue among stakeholders that will eventually lead to more coordinated, robust efforts to protect and restore coastal wetlands.

Key Action #33: Finalize National Wetlands Mapping Standard.

Work with other Federal agencies to finalize the National Wetlands Mapping Standard and work with Federal partners to fund updates of arid west maps. **(Lead Office: OWOW)**

Status: Completed

Progress: On schedule

The wetlands mapping standard was finalized and subsequently approved by the Federal Geospatial Data Committee (FGDC) on July 7, 2009. OWOW chaired the FGDC workgroup which developed and finalized the National Wetlands Mapping Standard. The workgroup continues to work with partners, including Federal Agencies, States, local governments and NGOs to complete an Implementation Strategy which will pursue ways to fund/encourage statewide wetland mapping efforts. This Implementation Strategy is ongoing and will continue over the next two years.

C. Implementation of Goal 3: Strengthen Climate Change Research Related to Water

Research on climate change issues related to water is occurring both internationally and in the United States. Much of this research is being managed by Federal agencies, including EPA.

Goal 3: Climate Change Research Related to Water: strengthen the link between EPA water programs and climate change research.

The National Water Program will benefit from this research, while also playing a growing role in defining research priorities, and working with the research community to make research results as useful as possible. The status of the three research-related key actions is described below.

Key Action #34: Monitoring of Water Related CCSP Reports.

The National Water Program will monitor the development of reports by the Climate Change Science Program and name a representative to join an ORD representative on the CCSP Water Cycle Working Group. (**Lead Office: OST**)

Status: Underway

Progress: On schedule

Note that the CCSP has been renamed the U.S. Global Change Research Program (USGCRP). OST has monitored the development of the CCSP/USGCRP reports throughout 2009 and has coordinated reviews with OW program offices and EPA Regions. Comments on draft Synthesis and Assessment Products (SAPs) have been provided to CCSP/USGCRP through ORD, EPA's lead liaison office. The SAPs relevant to the Office of Water have been monitored closely, including the following:

- SAP#3.3 – Weather and Climate Extremes in a Changing Climate: Focus on North America, Hawaii, Caribbean, and the U.S. Pacific Islands (NOAA), available at: <http://www.climatescience.gov/Library/sap/sap3-3/final-report/default.htm>;
- SAP#4.1 – Coastal Elevation and Sea Level Rise (EPA), available at: <http://www.climatescience.gov/Library/sap/sap4-1/default.php>;
- SAP#4.2 – Thresholds of Change in Ecosystems (USGS), available at: <http://www.climatescience.gov/Library/sap/sap4-2/default.php>;
- SAP#4.3 – Effects of Climate Change on Agriculture, Land Resources, Water Resources and Biodiversity (USDA), available at: <http://www.climatescience.gov/Library/sap/sap4-3/final-report/default.htm>;
- SAP#4.4 – Review of Adaptation Options for Climate Sensitive Ecosystems and Resources (EPA), available at: <http://www.climatescience.gov/Library/sap/sap4-4/final-report/default.htm>;

- SAP#4.5 – Effects of Climate Change on Energy Production and Use (DOE), available at: <http://www.climatescience.gov/Library/sap/sap4-5/final-report/default.htm>;
- SAP#4.6 – Analyses of the Effects of Global Climate Change on Human Health and Welfare and Human Systems (EPA), available at: <http://www.climatescience.gov/Library/sap/sap4-6/final-report/default.htm>; and
- SAP#4.7 – Impacts of Climate Change and Variability on Transportation and Infrastructure – Gulf Coast Study (DOT), available at: <http://www.climatescience.gov/Library/sap/sap4-7/final-report/default.htm>.

All of the SAPs are now final, along with a June 2009 report by the USGCRP titled “*Global Climate Change Impacts in the United States*.” However, OST will continue to monitor developments in the research field pertaining to climate change.

Key Action #35: Climate Research in Water Related ORD Research.

The National Water Program will work with the EPA Office of Research and Development in development of water research related to climate change and will also coordinate with external research foundations engaged in water and climate change related research.

(Lead Office: OST)

Status: Underway

Progress: On schedule

In September 2009, EPA published the “National Water Program Research Strategy,” articulating the research needed throughout the National Water Program to achieve EPA’ goals, meet statutory obligations, and fulfill court mandates. OST worked with program offices throughout OW to develop the Research Strategy, which identifies research needed to address the impacts of climate change. It is available at: <http://www.epa.gov/waterscience/strategy>.

OW collaborates with ORD on a variety of projects. For example, ORD and OW convened an expert workshop in January 2009 addressing water and wastewater infrastructure adaptation (See: <http://www.epa.gov/nrmrl/wswrd/wqm/wrap/pdf/workshop/600r09010.pdf>). ORD and OW are continuing to draw on the information presented at the workshop in subsequent activities, including additional research, journal articles, and development of tools, described under KA29. ORD also supports the Climate Ready Estuaries program, described under KA22.

OST has also taken the lead to begin organizing a “Research Forum” to engage stakeholders, OW, ORD and other EPA programs in an ongoing dialogue about research to improve coordination and to share information.

Key Action #36: Revision of ORD Global Change Multi-Year Plan.

The Office of Water will appoint a representative to participate in the ORD revision of the Global Change Multi-Year Plan (MYP). **(Lead Office: OST)**

Status: Underway

Progress: On schedule

OST represents OW on the review team for developing the ORD Global Change Program Multiyear Plan. In addition, OW continues to provide reviews and input on the selection of climate-related Science to Achieve Results (STAR) Grants.

Throughout 2009, OST also worked with ORD to help them plan and target water-related climate change research. For example, OST worked with the ORD NCEA program to refine the design of projects such as a study integrating impacts of climate change and land use on water quality. In other work, OST and the OWIO worked with ORD NRML to refined studies of climate impacts and adaptation strategies for waster infrastructure.

In some cases, climate-related research needs may be included in other multiyear plans (MYPs), such as the drinking water research MYP, the ecosystem services research MYP and others. For example research activities that may be covered by other MYPs include potential impacts of carbon sequestration on ground water quality; potential climate change impacts on growth and migration of drinking water pathogens; and ecological impacts due to climate change-induced hydrology and temperature changes.

D. Implementation of Goal 4: Educate Water Program Managers on Climate Change

Climate change science and policy is evolving rapidly and the current understanding of climate change impacts on water resources, and conclusions about the needed response actions, may change over time.

Goal 4: Water Program Education on Climate Change: educate water program professionals and stakeholders on climate change impacts on water resources and programs.

In order for the National Water Program to stay current with climate change issues, new practices are needed to strengthen outreach to partners and stakeholders on climate change–related water program issues and educate water program professionals on climate change generally. This communication needs to involve both EPA informing others about new issues and activities, and EPA listening to and learning from others.

The status of each of the four key actions addressing the education of water program managers on climate change is described below.

Key Action #37: Clearinghouse Website/Listserve.

The Office of Water will work with other EPA offices to establish a website to provide documents related to water and climate change, including research products, and offer as part of this site, a “listserve” to send update emails to interested parties. **(Lead Office: OWAA)**

Status: Underway

Progress: On schedule

EPA continues to update and maintain a website on climate change and water. This website provides information on the 2008 *Strategy* and its implementation, resources on climate change and water related to regional/state/local interests, upcoming conferences, key climate change and water organizations, and basic information about the impacts of climate change on water programs. To view the website, visit <http://www.epa.gov/ow/climatechange>.

In April 2009, the OWIO released the first EPA Climate Change and Water News e-newsletter (electronic newsletter) or listserve. The e-newsletter provides periodic e-mail updates and information on EPA climate change and water describing program and regional office work, as well as other climate change and water news from outside the Agency. The e-newsletter had approximately 1,200 subscribers as of October 2009.

EPA intends to improve and update the website over the next year as well as continue to send out the e-newsletter bi-weekly.

Key Action #38: Annual Public Reports on Strategy Implementation.

The Office of Water will publish annual reports describing progress in implementing the Strategy. **(Lead Office: OWAA)**

Status: Underway

Progress: On schedule

OWIO is publishing this annual report describing the work done in Fiscal Year 2009 by EPA Headquarters Office of Water Program Offices as well as EPA Regions. The report, similar to the one published for Fiscal Year 2008, reflects progress made towards the key actions identified in the 2008 *Strategy*.

Key Action #39: Outreach to Partners.

The Office of Water will provide material and briefings on the National Water Program climate change response actions periodically to a wide variety of EPA advisory groups, State and Tribal organizations, and stakeholder organizations. **(Lead Office: OWIO)**

Status: Underway

Progress: On schedule

Since the publication of the *Strategy* in September 2008, EPA has convened meetings and workshops with States and Tribes, State/Tribal organizations, and other stakeholders to review the *Strategy* and the implementation of specific key actions, and to engage in dialogue about climate change issues.

Examples of outreach in 2009 include:

- 2-day National Expert workshop on Water Infrastructure Adaptation to Climate Change (January 6-7, 2009);
- Climate Southeast Partnership, Climate Change and Water, Atlanta, GA (Feb. 24, 2009);
- Southeast Land Trust, Climate Change and Estuaries, Auburn AL (March 26, 2009);
- National Tribal Water Council (May 21, 2009 and October 7, 2009);
- Teleconference with environmental groups (May 29, 2009);
- New England Federal Partners Interagency Meeting on Climate Change Adaptation (June 2-4, 2009);
- ASIWPCA (August 27, 2009);
- TriState Watershed Symposium, Climate Change and EPA Water Programs, Marietta, GA (Sept. 10, 2009);

- Workshop on Sustainable Water Resources (September 29-October 1, 2009);
- Webinar: "Working Together to Address the Effects of Climate Change on Water Resources;" and
-
- Water Quality Standards Academy presentation, December, 1, 2009.

In addition to attending conferences, workshops, and ad hoc meetings, EPA has established the Climate Ready Water Utilities advisory working group of the National Drinking Water Advisory Council and the State-Tribal Climate Change Council. EPA will continue to reach out to stakeholders to engage in an on-going dialogue to further inform EPA's efforts to meet the challenges posed by climate change.

Key Action #40: Expand Water Training on Climate Change.

EPA will revise existing training programs to include attention to the impacts of climate change on water programs and will offer training on water-related climate change impacts to national and Regional offices. **(Lead Office: OWIO)**

Status: Underway

Progress: On schedule

OWIO is promoting the inclusion of basic information about climate change in various training programs to help build understanding of climate change issues among water program staff and progress is being made. OWIO developed a stand-alone training module addressing climate change and water issues that is now included in the Watershed Academy program. This module is available on the EPA Office of Water Climate Change website for use by individuals or groups who wish to tailor their own training programs.

Other progress on expanding training on climate change is being made, including segments on climate change being incorporated into OW-training programs such as the Water Quality Standards Academy, Green Infrastructure Training, Tribal Training, Effective Utility Management Energy Efficiency training, etc..

In addition, new training programs are being planned for 2010.

E. Implementation of Goal 5: Establish Climate Change Management in Water Program

Climate change poses significant and long-term challenges for the National Water Program. The development of the 2008 *Strategy* is a first step in understanding climate change impacts on water programs and the beginning of the process of implementing response actions. To sustain this focus on climate change, the National Water Program will need to establish management practices to build on this initial assessment of climate change impacts, including the following four key actions.

Goal 5: Water Program Management of Climate Change: establish the management capability within the National Water Program to address climate change challenges on a sustained basis.

Key Action #41: Maintain Office of Water Climate Change Workgroup.

The Office of Water will maintain the National Water Program Climate Change Workgroup. (Lead Office: OWAA)

Status: Underway

Progress: On schedule

The National Water Program has maintained its Climate Change Workgroup throughout 2009 to facilitate information exchange and coordination of collective action. This group is chaired by the Deputy Assistant Administrator for Water and includes senior managers from national and EPA Regional offices as well as representatives of the Office of Air and Radiation and the Office of Research and Development.

Since the publication of the *Strategy* in September 2008, the Workgroup has worked together to implement the *Strategy* and has continued its role of maintaining good communication among EPA Offices and Regions on climate change issues. The Workgroup has recently been begun focusing on a new cycle of planning to update the *Strategy*.

Key Action #42: Agency Strategic Plan and Water Program Annual Guidance.

The Office of Water will include key actions from the *Strategy* in the FY 2010 annual National Water Program guidance, and when appropriate, make needed changes to the water elements of the EPA *Strategic Plan*. (Lead Office: OWAA)

Status: Underway

Progress: On schedule

The National Water Program is working to integrate climate-related key actions with the established water program management tools, including the EPA Strategic Plan and the annual National Water Program Guidance. Discussion of the National Water Program's commitment to

address impacts of climate change was included in the 2009–2014 EPA Strategic Plan Change Document, issued September 30, 2008. As the Agency moves toward developing a new Strategic Plan and related Program Guidance, the National Water Program will further integrate climate considerations into priorities and commitments.

Key Action #43: Regional Additions to National Water Climate Strategy.

Each EPA Regional Water Division will review climate change impacts in the Region, identify impacts of special concern to that Region, and develop Region-specific additions to this national Strategy as needed. (Lead Office: OWAA)

Status: Underway

Progress: On schedule

Some Regions have developed Regional Climate Strategies, such as Regions 1, 4, 8, 9 and 10 (available on most Regional web sites) and others have supplemented the *Strategy* with key actions designed to more specifically address the needs in the Region. The next section of this report provides additional information about each Region’s climate change activities, with the activities organized by key action topic.

Key Action #44: Federal Agency Water/Climate Coordination Group.

The Office of Water will work with other Federal agencies with a significant interest in the water-related impacts of climate change through creation of a staff level coordination group. (Lead Office: OWIO)

Status: Underway

Progress: On schedule

In 2007, senior managers of five Federal agencies with substantial interests in climate change impacts on water resources signed a Memorandum of Understanding to establish an interagency workgroup to identify and address issues of common interest (See: http://www.epa.gov/water/climatechange/docs/Agency_Senior_Staff_Fed_Agency_Coop_re_Adaptation_of_Water-Related_Programs.pdf). While this forum did not meet during 2009, OW has been actively interacting with other federal in a number of inter-agency workgroups and forums that have emerged to address climate change.

In particular, in response to Section 16 of Executive Order 13423, the White House Council on Environmental Quality (CEQ) and Office of Science and Technology Policy (OSTP), along with the National Oceanic and Atmospheric Administration (NOAA), formed an Interagency Workgroup on Climate Change Adaptation involving at least a dozen different federal agencies and departments, including EPA. As part of that activity, EPA Office of Water co-chairs the Water Workgroup, one of several workgroups tasked with making recommendations to CEQ on national adaptation strategies to address a variety of issues, including water resources. CEQ is expected to produce an integrated report on the findings and recommendations by fall 2010.

EPA also participates on other interagency collaborations, such as the Western States Federal Agency Support Team (WestFAST), assisting western states with water resource management strategies, including those that address climate change.

III. Climate Change and Water Activities in EPA Regions

EPA's regional offices have played an important role in developing and implementing the 2008 *Strategy*. The following sections describe the climate change and water activities taking place in each of the ten EPA regions. To enable assessment within and between regions, and with the 2008 *Strategy*, the regional activities are organized by strategic goal and key action.

Region 1 (Boston)

Region 1 is supporting the EPA Office of Water Climate Change Strategy through programs that address both climate change mitigation and adaptation needs and resources. Region 1 is internally addressing climate change through establishing a Climate Change Network, holding "Climate 101" seminars, and hosting a regional conference on climate change impacts. Region 1 has also conducted extensive education and outreach, holding a series of workshops, conferences, and meetings.

There are four Climate Ready Estuary (CRE) pilot projects underway with the Casco Bay Estuary Partnership, the Massachusetts Bays Program, the Piscataqua Region Estuaries Partnership, and, in partnership with Region 2, the Long Island Sound Study. In addition, the New England Environmental Finance Center is piloting the COAST sea level rise action evaluation tool. Region 1 is also working with the Gulf of Maine Council's Climate Change Network and Ecosystem Indicators Partnership to develop climate change indicators based on sea level rise, air temperature, and precipitation data.

The Region released "A Guide to Residential Green Building in New England in March 2008 and has a popular Green Building website:

<http://www.epa.gov/region1/topics/envpractice/gbuildings.html>. The new Region 1 office and regional laboratory also incorporate green building design

EPA Region 1 has numerous activities underway that support implementation of the 2008 *Strategy*. This summary describes work that has taken place in 2008 and 2009.

Goal 1: Water Program Mitigation of Greenhouse Gases

Key Action #1: Improve Energy Efficiency at Water and Wastewater Utilities

New England has among the highest energy rates in the nation and water and wastewater utilities are often the largest single energy cost in a municipality. Many facilities were built several decades ago to meet water permit requirements and energy efficiency was not a consideration.

Energy Star

One of EPA Region 1's initial energy efficiency efforts was piloting the new Energy Star Portfolio Manager benchmarking tool for WWTPs, which has assisted over 75 regional facilities in benchmarking their facilities to determine the energy efficiency of their plant and where they should look to reduce their energy use.

ARRA Green Project Reserve

The American Recovery and Reinvestment Act (ARRA) directs states to use at least 20 percent of their allotted funds as a Green Project Reserve (GPR). Projects funded under the Green Reserve can include water or energy efficiency improvements, green infrastructure to manage stormwater, and other environmentally innovative activities. Region 1 states have submitted projects under the GPR that include water conservation; a green roof; energy efficiency; energy production from clean, renewable sources; and low impact development. Several of the energy projects resulted from utility participation in Energy Management Roundtables, which provided a forum for facilities to explore potential projects including renewable energy, green roofs, inflow and infiltration, and improved operations and maintenance. Massachusetts is using all of its GPR to fund energy projects with a total estimated annual reduction in CO² of over 22,000 tons and a savings of 28 million kWh which equates to \$4.8 million in energy costs saved.

Energy Efficiency at Water and Wastewater Facilities

Following up on the energy management roundtable and associated workshops conducted in the past, Region 1 is partnering with New England Water Works Association (NEWWA) to advance climate change awareness and promote water/energy efficiency and adaptation efforts at wastewater and drinking water systems. Planning has been completed for the "Water Resiliency: Adapting Water Supply to Changing Climate, Land Use, and Regulation Conference," which was held on November 3, 2009 with a focus on climate change in New England. With NEWWA, EPA also will conduct 3-4 energy efficiency workshops. The Region is also developing a Top Ten List for small and large systems – "Top Ten Things Water Systems can do to Save Water, Save Energy and Save Money." In the area of green jobs, Region 1 is working with water associations and other partners (e.g., Department of Labor) to expand existing water operators training to include water efficiency and climate change awareness.

Key Action #2: Implement the WaterSense Program

EPA Region 1 is promoting the WaterSense Program and water conservation in general through a wide range of drinking water and green building programs and initiatives. The Region continues to recruit WaterSense partners across New England by distributing outreach materials, taking calls from media or from potential partners, and by doing presentations and booths at various events. In FY09, the Region has been involved with 11 events and now has a total of 100 WaterSense partners (including irrigation partners).

Key Action #3: Water Conservation and Management for Drinking Water Systems

Using funds provided through DWSRF set-asides, the state of MA has implemented a “Water Loss Conservation Program” over the past five years which has resulted in a savings of millions of gallons of water as well as the associated energy necessary for treatment and pumping.

Key Action #7: Promote Energy Saving/Generating “Green Buildings” and “Green Infrastructure”

EPA Region 1 released *A Guide to Residential Green Building in New England* in March 2008. The guide provides information and resources to homeowners, contractors, or any New England resident interested in environmentally responsible residential renovation and construction. The Region also has a very popular Green Building Web site (see <http://www.epa.gov/region1/topics/envpractice/gbuildings.html>), which has the guide and a variety of other information, including a description of their green building – the New England Regional Laboratory in Chelmsford, MA.

EPA Region 1 recently moved to a renovated federal office building. The building has low-flow urinals, dual flush toilets, and water efficient faucets and showers. All plumbing features are designed to achieve at least 32 percent higher efficiency than is required by code. The building also has a green roof that will reduce stormwater runoff. If the native drought resistant plants need to be irrigated, it will be done from cisterns holding up to 5,500 gallons of water from roof runoff and air conditioning condensate and pumped from a solar powered pump.

Goal 2: Water Program Adaptation to Climate Change

Key Action #15: Develop Biological Indicators and Methods

EPA Region 1 worked with EPA’s Office of Science Policy (OSP) and the University of Massachusetts Amherst to convene a one-day workshop entitled *Data Needs to Monitor and Respond to Climate Change Impacts on Water Resources in New England*, held at the University of Massachusetts Amherst on September 30, 2009. Workshop participants included experts, senior scientists and researchers from federal and state government, academia, NGOs, and other stakeholders with expert knowledge regarding the monitoring approaches and data sets currently used by their agencies. While state and federal agencies and non-profit organizations collect data that may be valuable in detecting impacts to the environment due to climate changes, a comprehensive list of available data and data gaps across the region is not readily available, particularly on a watershed basis. A goal of the workshop was to identify appropriate environmental indicators of climate impacts on waterbodies, available data sets, key data gaps, and potential uses of the data. Discussions laid a framework for facilitating adequate planning and response to global change in New England water bodies by identifying critical monitoring, modeling and detection needs.

Key Action #19: Expand National Water Resource Surveys to Include Climate Change Indicators

Through involvement with the Gulf of Maine Council's (GOMC) Climate Change Network and Ecosystem Indicators Partnership, Region 1 is coordinating climate change adaptation efforts by GOMC partners and supporting the development of climate change indicators to assess the status and trends of the Gulf's resources. The three climate change indicators selected by ESIP are sea level rise, air temperature, and precipitation. EPA Region 1 provided a summer intern during 2008 to assist with the analysis of these data, and has provided approximately \$25,000 in grant funds to support the overall effort. These indicators will be used as part of a "State of the Gulf of Maine" report and conference in 2010.

Key Action #22: "Climate Ready Estuaries"

In 2008, two of the six pilot Climate Ready Estuaries (CRE) projects were initiated in New England and are currently being administered by the Piscataqua Region Estuaries Partnership and the Massachusetts Bays Program. In May 2009, the Casco Bay Estuary Partnership and Long Island Sound Study were selected to join the CRE program in the second round of projects.

Piscataqua Region Estuaries Partnership (PREP)

The PREP pilot project is identifying road culverts in the Oyster River watershed that may be subject to failure and cause flooding during the increasingly extreme storm events projected for New England by climate change scientists. The project team has completed an assessment of culverts throughout the watershed, utilized GIS to model changes in storm water runoff in the watershed due to extreme storm events, and developed recommendations for culvert improvements based on risk analysis and cost estimates, utilizing a methodology developed for a similar project in Keene, NH. The project also will recommend low impact development (LID) strategies to communities to help reduce anticipated increases in stormwater flows. The analysis will result in the development of adaptation and mitigation strategies to be included in PREP's 2010 Comprehensive Conservation and Management Plan update. EPA New England is managing a \$50,000 grant from EPA HQ to support the project, and will be involved through the participation and oversight by the EPA Regional Coordinator and through participation on the PREP Management Committee.

Massachusetts Bays Program

The MBP's pilot project is one of two, along with the San Francisco Estuary Project, that is receiving \$200,000 worth of technical support from the EPA Office of Research and Development (ORD) for the development of a vulnerability assessment focusing on salt marshes. ORD has developed a conceptual model for salt marsh ecosystems that outlines linkages between climate drivers (e.g., changes in storms, sea level, and air temperature), stressor interactions, and key ecosystem processes, and identifies appropriate endpoints or indicators. Sub-models have also been developed for two of the ecosystem processes perceived to be most critical and/or easily monitored: sediment retention and community/trophic structure. Although the MBP will not be positioned to immediately revise its CCMP or develop a comprehensive adaptation plan

for the entire region, it anticipates being able to make recommendation for how specific salt march management plans/policies (e.g., CCMP, strategic plan, other CZM plans/policies (may be improved. EPA New England will be involved through the participation and oversight of the EPA Regional Coordinator and through participation in the MBP Management Committee.

Casco Bay Estuary Partnership (CBEP)

The CBEP will receive \$75,000 in technical assistance from the CRE program to develop a climate change outreach plan that: (1) targets local decision makers and (2) integrates consideration of ecosystem resilience into broader messages about climate change. EPA New England will be involved through the participation and oversight of the EPA Regional Coordinator and through participation in the CBEP Management Committee.

The CBEP already is working with Cameron Wake, UNH, Katherine Hayhoe, ATMOS and Ellen Douglas, UMass, to develop a report on historical climate trends and climate projections in Casco Bay. EPA is providing \$20,000 for the project through the annual NEP grant to the CBEP. In addition, CBEP is working with Peter Slovinsky of Maine Geological Survey to use LiDAR data to begin mapping wetlands vulnerable to sea level rise and identifying areas of upland where wetlands could migrate inland.

Long Island Sound Study (LISS)

The LISS will receive a Partner Startup Grant and a Direct Technical Assistance Grant through the CRE program. The Partner Start-up Grant will be used to develop a coastal climate adaptation plan to define the roles of the various levels of government in climate adaptation. This will be accomplished through a series of workshops and establishment of four work groups: infrastructure; natural resources and ecological habitats; agriculture; and health. Key partners include International Council for Local Environmental Initiatives (ICLEI) and town of Groton.

The Direct Technical Assistance Grant will be used for a project titled “Climate Change Vulnerability Assessment for Long Island Sound via Sentinel Monitoring”. The objective of this project is to develop a strategy to quantify, via sentinel monitoring, the impacts of climate change on Long Island Sound, as well as to assess the Sound’s vulnerability to those impacts. This strategy will identify and prioritize indicators, or sentinels, of climate vulnerability within the Long Island Sound estuary and the potential resiliency of critical systems. These indicators will, in turn, direct priorities for adaptation planning by the states of Connecticut and New York, local municipalities, and other partner organizations. EPA New England will be involved through the participation and oversight of the EPA Regional Coordinator and through participation in the LISS Management Committee.

Key Action #28: Implement the Sustainable Water Infrastructure Initiative and Adapt Decision Support Tools

Through its role in promoting Effective Utility Management, the Region has provided states and professional organizations with tools and information to improve the overall capabilities of water and wastewater facilities to address threats such as climate change by improving infrastructure

stability and increasing operational resiliency. A Statement of Intent was signed by EPA New England, the New England Interstate Water Pollution Control Commission, the New England Chapter of American Public Works Association, the New England Water Works Association, and the New England Water Environment Association to promote effective utility management through a strong partnership and the utilization of specific practices, principles and performance measures.

In order to position utilities to respond optimally to impacts from climate change and to identify and protect critical assets, the Region continues to provide technical assistance and training on Asset Management. Over the past year, the region has sponsored an Advanced Asset Management workshop and several trainings for an asset management software program (Check Up Program for Small Systems, or CUPSS) with states, utilities and third party technical assistance providers.

The Region is working to assess the potential impacts of climate change on water infrastructure in New England, convey these risks to drinking water and waste water suppliers, and provide a framework with which they can prepare and adapt to changes in the New England climate in the coming century. Climate changes of interest to the drinking water and wastewater communities include, but are not limited to: changes in precipitation levels and timing, temperature, sea level, and inland flood risk. This work complements and is aided by initiatives to increase energy efficiency in treatment plants, asset management, and the climate ready estuaries program. EPA Region 1 provided a summer intern during 2009 to assist with research on the impact of climate change on water infrastructure, and co-sponsored a climate change adaptation conference with NEWWA in October 2009.

Key Action #30: Clarify Use of the Clean and Drinking Water SRFs to Support Adaptation

The Region continues to promote the use of both SRF programs to address energy efficiency, the use of clean energy, and water conservation and reuse. The Region has widely circulated OW's CWSRF White Paper which details program eligibilities including actions and projects that could be funded to address climate change. Projects proposed for funding in state Intended Use Plans this year included those for energy efficiency and clean energy generation at water and wastewater facilities, leak detection, and water conservation.

Goal 3: Strengthen Climate Change Research Related to Water

Key Action #35: Climate Research in Water Related ORD Research

The Region is working closely with the ORD's Atlantic Ecology Division and Headquarters to help identify research needs and set priorities.

New England Climate Change Forum

On June 19, 2008, EPA Region 1 held a conference on climate change at the University of New Hampshire in Durham, NH. The conference was co-sponsored by ORD, the Northeast States for

Coordinated Air Use Management (NESCAUM), the New England Interstate Water Pollution Control Commission (NEIWPCC), and Carbon Solutions New England.

About 200 scientists/experts from federal, regional, state and municipal government, interstate and nongovernmental organizations, and academia came together to share and discuss the latest scientific research on the impacts of climate change and what can be done to plan and prepare for them. Speakers gave presentations on the impact to coastal areas, health and air quality, water resources and infrastructure, as well as the tools and opportunities to prepare for impacts. In addition, EPA announced the two New England estuaries (Massachusetts Bays Program and the New Hampshire Estuaries Project) that were selected in the first round of the Climate Ready Estuaries projects.

Goal 4: Educate Water Program Managers on Climate Change

Key Action #39: Outreach to Partners

The Office of Ecosystem Protection and New England Regional Laboratory senior management team and staff have conducted regular meetings since the June 2008 Forum at the University of New Hampshire to coordinate and ensure follow-up efforts. Based on discussions at the Forum with participants and internal dialog, the Region has begun to define roles for the Regional Office related to providing support to communities' water infrastructure-related climate issues where Region 1 has expertise, management, and regulatory authority.

The Region is also conducting a series of Forum follow-up meetings and conference calls with key presenters and representatives of stakeholders, including other federal agencies, states, regional associations (NESCAUM, NEIWPCC), non-government organizations, and local climate organizations specifically to identify and assess existing and needed capacity and expertise, decision support tools, resources and science research relating to assisting communities with vulnerabilities and adaptation planning, specifically related to water infrastructure, such as waste water treatment, drinking water, CSOs, and stormwater infrastructure. For example, the need for coastal LiDAR data is frequently cited. The Region is participating in discussions to determine which agencies will take the lead on meeting this and other needs.

New England Governors Council/Eastern Canadian Premiers (NEGC/ECP)

The Region remains in contact with the NEGC/ECP Steering Committee for its regional climate change action process. At the NEGC/ECP annual meeting in September, a resolution calling on increased emphasis on planning and adaptation was passed. This will involve initiatives with local government and planning support, outreach and education.

National Estuary Program

As previously described (under KA22), four of the Region's six NEPs have received financial and/or technical assistance from the Climate Ready Estuaries Program. Prior to being selected this year for CRE funding, the Casco Bay Estuary Partnership mapped fringing wetlands around

Casco Bay and is using the data to assess vulnerabilities to sea level rise and identify areas where upland should be protected to allow marsh advancement.

Gulf of Maine Council (GMC)

Through involvement with the Gulf of Maine Council's Climate Change Network and Ecosystem Indicators Partnership, Region 1 is coordinating climate change adaptation efforts by GOMC partners and supporting the development of climate change indicators to assess the status and trends of the Gulf's resources.

Northeast Regional Ocean Council (NROC)

NROC is a state-federal partnership established in August 2005 by a New England Governors Council resolution in response to the call by the U.S. Ocean Action Plan (see: <http://oceancommission.gov/>) to take a regional approach to ocean governance and planning efforts. At the October 28, 2008, NROC Federal Partners meeting, EPA made a presentation on the OW Climate Change Strategy to help kick off a discussion on coordinating climate change activities. NROC has formed three committees to develop work plans for Ocean and Coastal Ecosystem Health (chaired by EPA and MCZM), Coastal Hazards Resiliency (chaired by USGS, NOAA, and CT DEP), and Ocean Energy Planning (chaired by USCG and RI DEM). Climate change is an overarching issue for all three work plans being integrated into a single action plan; NROC is drafting a climate change position statement as foreword to the 2009 action plan. The NROC Federal Partners conducted a federal interagency meeting on June 2-4, 2009, to coordinate adaptation planning by federal agencies working in New England (see KA44).

New England Environmental Finance Center (NEEFC)

In 2009, the NEEFC worked with Dr. Paul Kirshen to pilot the COAST sea level rise action evaluation tool in Portland and Old Orchard Beach, ME. In addition, they are working with the ICLEI on strategies for financial adaptation to sea level rise (building on the ICLEI approach as implemented in Keene) and are working on a renewable power generation pilot with LL Bean, Inc. and the town of Freeport, ME. Other recent work includes the papers "Readiness for Sea-level Rise: A Planner's Prescription" (which includes financial planning) and "Sizing up the (Dry for Now) Terrain: Economic Implications of Climate Change in Coastal New England." These two papers are part of a 2008 special edition of the *Maine Policy Review* organized around New England-specific challenges of climate change for state and local policy-makers.

Northeast States for Coordinated Air Use Management (NESCAUM)

NESCAUM has played a key role on climate issues for a number of years, particularly on the mitigation front and from the air and energy perspectives, but also with respect to transportation measures and a low carbon fuel initiative. In 2009, EPA provided funding to NESCAUM to convene a workgroup to develop a regional adaptation framework to complement active statewide adaptation planning in Maine, Massachusetts, and Connecticut (EPA Region 1 is represented on the respective advisory committees to these statewide efforts) and the New England Federal Partners adaptation activities (see KA44, below). The NESCAUM regional

adaptation framework workgroup consists of representatives of some federal agencies (USFW, EPA, NOAA, USGS), NEIWPC, ICLEI, and regional NGOs (The Nature Conservancy, Union of Concerned Scientists, other groups). Recently, the workgroup was expanded to include representatives from the eight northeast states.

New England Interstate Water Pollution Control Commission (NEIWPC)

EPA Region 1 is a member of the recently established NEIWPC Climate Change Workgroup along with state, regional agencies and organizations, research community, and other federal agencies such as U.S. Army Corps, NOAA, USGC, FEMA, etc.

New England Water Works Association (NEWWA)

As previously described, Region 1 is partnering with NEWWA to advance climate change awareness and promote water/energy efficiency and adaptation efforts at wastewater and drinking water systems.

Goal 5: Establish Climate Change Management in Water Programs

Key Action #41: Maintain Office of Water Climate Change Workgroup

EPA Region 1 has been, and will continue to be, an active participant on the National Water Program Climate Change workgroup. Region 1 staff regularly participate in the monthly national climate change sub-lead calls.

In addition, in November 2008, Region 1 formed a cross-organizational Global Climate Change Network (GCCN) of 28 managers and staff to educate, inform, and coordinate its activities. One of the GCCN's first steps was development of an inventory of 130 current climate change-related programs and projects, and establishment of a regular monthly meeting schedule. Experts are regularly invited to speak to the group to expand its knowledge-base.

In January 2009, Region 1 launched a monthly Climate Change 101 Seminar Series to educate EPA employees about climate issues. Each seminar runs 1½ hours and features outside climate experts on various topics. The series has been very popular and audience numbers have ranged from about 70 to 100. Typically, an informal lunch is arranged with the guest speaker with the regional administrator, the deputy regional administrator, their immediate staff, key program managers and climate lead staff.

Key Action #44: Federal Agency Water/Climate Coordination Group

New England Federal Partners Interagency Meeting on Climate Change Adaptation

On June 2-4, 2009, approximately 70 representatives of 12 federal agencies in New England met at the National Marine Fisheries Service's Northeast Regional Office in Gloucester, Massachusetts to share information about their respective climate change planning efforts, and to identify opportunities for coordination and collaboration. Because the idea for the meeting

originated from discussions among the federal agencies participating on the Northeast Regional Ocean Council, the initial focus was on adapting to climate change impacts on ocean and coastal areas. However, the scope was expanded to include inland watersheds to attract greater participation from federal agencies without a strong ocean and coastal mission. The goals of the meeting were to:

- Identify federal responsibilities for addressing climate change issues in New England and reach consensus on regional federal interagency priorities;
- Develop a framework to communicate regional issues to the national level considering federal interagency priorities; and
- Identify opportunities to collaborate among federal agencies that will facilitate assistance to stakeholders in the region.

The key outcomes and next steps included:

- Agreeing that federal interagency coordination should continue through a reestablished ad-hoc New England Federal Partners group;
- Developing a regional agreement among federal agencies modeled on the August 2008 “memorandum of cooperation” signed by five agencies;
- Gaining consensus on climate scenarios, data sets, models, and projections for New England;
- Participating in the next Congressionally-mandated National Assessment of Climate Vulnerability;
- Updating and synthesizing the New England Federal Climate Activities inventory, compiling a “points of contact” list for the agencies, and a contact list of names and associated expertise for the region on climate issues; and
- Continuing to support regional efforts on climate including: NEWIPCC, NESCAUM, GOMC and GOMC Climate Network, NEG/ECP and state adaptation planning teams.

For more information, including agency briefs and PowerPoint presentations, please visit <http://community.csc.noaa.gov/nroc/>. A final meeting summary report and other information will be posted soon.

Region 2 (New York)

Region 2 is focusing their climate change and water programs on the protection of coral reefs in the Caribbean through promoting the Coral Reef Team and providing grants for outreach and education that support the 2008 International Year of the Reef. Region 2 and EPA's Office of Research and Development (ORD) efforts have been important to the characterization of impacts to coral degradation from both local and global stressors, including land-based sources of pollution and climate change.

There are three CRE projects underway in Region 2: the Barnegat Bay Estuary Program, the Long Island Sound Study, in partnership with Region 1, and the Partnership for the Delaware Estuary (PDE), in partnership with Region 3. PDE has created a team to estimate the value of losses/changes in natural capital from climate change and demonstrate how ecosystem services valuation can be used in adaptation planning.

A Green Team has been established to coordinate green initiatives, including green buildings and to implement the WaterSense Program. Region 2 has also established a Climate Change/Energy Workgroup to coordinate and track energy and climate change activities.

*Additional information on Region 2's climate change activities may be found at:
<http://www.epa.gov/region2/climate/>.*

Goal 1: Water Program Mitigation of Greenhouse Gasses

Key Action #1: Improve Energy Efficiency at Water and Wastewater Utilities

Region 2 has funded the use of wind turbines to pump halite mine runoff from sinkholes to relieve the underground pressure causing mud boils, and to prevent further degradation of Onondaga Lake.

Key Action #2: Implement the WaterSense Program

Region 2 will continue to implement the WaterSense Program as one of its "Green Team" objectives. Region 2's Green Team is a team of experts that helps developers incorporate sustainable construction, operation and maintenance practices into their projects through voluntary agreements. The Green Team has tailored project specific information on the technologies and practices that can help project sponsors improve energy and water efficiency, increase recycling and waste, incorporate the use of clean fuels, and use environmentally friendly building materials and landscaping practices. Since 2006, the Region 2 Green Team has signed agreements with local professional sports teams, major real estate firms and developers, and colleges/universities to reduce the impacts of buildings and projects. The Green Team is also working with state and local governments to incorporate green concepts into building codes.

Key Action #5: Industrial Water Conservation, Reuse and Recycling Technology Transfer

Region 2 is co-chairing a cross-Agency workgroup that has developed a wiki (a collaborative website) on the topic of measuring greenhouse gases. This website includes techniques and links to tools that translate water efficiency into reductions in energy use and greenhouse gas emissions. It promotes the conservation of water resources as a method to slow global climate change.

Key Action #6: Federal Agency Water Conservation Guidance

Water savings techniques were implemented at Regional EMS facilities. This included the use of efficient dishwashers, autoclaves and labs. Outdoor maintenance improvements included xeriscaping to prevent soil erosion and water smart landscaping. Water conservation also arises during inspection and through implementation of maintenance procedures of safety equipment.

Key Action #7: Promote Energy Savings/Generating “Green Buildings” and “Green Infrastructure”

Region 2 promoted innovative stormwater and water conservation techniques by holding a green building competition in partnership with NYC. It also funded a university grant to develop teacher trainings, public lectures, and demonstration projects to highlight green building design at the Meadowlands Environmental Center's new sustainability education centers; and outreach to major developers regarding water conservation, water recycling, and stormwater management techniques for development.

Region 2 also promoted innovative water and storm water conservation techniques through pollution prevention (P2) inspections of the regulated community emphasizing water re-use, recovery, and conservation through source reduction using approaches such as material recycling, re-use, and recovery, and process modification. Additional work has been accomplished through P2 Outreach to the States, counties, regulated community, and other organizations. A presentation at a Rutgers University conference discussed P2 methods and provided technical/compliance assistance (that included water conservation) to regulatory agencies, industry, and other stakeholder groups.

Region 2 awarded a pollution prevention grant for a rain barrel demonstration project in Niagara River region of New York.

Key Action #8: Develop Geologic Sequestration Regulations

Region 2 is participating in the Underground Injection Control (UIC) Workgroup on Geologic Sequestration and participating in technical discussions through the air permits and NEPA processes with developers of a proposed power plant in Jamestown, NY that would employ carbon capture and storage.

Goal 2: Water Program Adaptation to Climate Change

Key Action #13: Assess Need for Clean Water Microbial Criteria and Risks of Waterborne Disease

Region 2 is funding a project to install two on-farm mortality compost projects. These projects will remove dead cows from water bodies in upstate NY located near intensive cattle farming. Region 2 is funding a project with Onondaga County to collect waste tires from agricultural and rural areas. Removal of waste tires reduces breeding grounds for disease-carrying pests such as rodents and mosquitoes. Additionally, Region 2 is funding a project that will assist NYS or other public or nonprofit organizations to develop, implement and demonstrate innovative approaches relating the causes, effects, prevention, reduction and elimination of water pollution through both permitted and nonpermitted on-site wastewater treatment systems throughout NYS.

Key Action #15: Develop Biological Indicators and Methods

Region 2 is involved with the development of several biological indicators and methods. They include:

- Spatial and Temporal Monitoring of Dissolved Oxygen in the Near-Coastal Waters of New Jersey using an Autonomous Underwater Vehicle (AUV) - A RARE/RMI/CWA 106 Project. The entire coastal zone of NJ is considered impaired for the purposes of CWA §303d, based on limited dissolved oxygen (DO) data. Monitoring DO effectively is a complicated endeavor, as the levels vary temporally and spatially. Conducting the necessary sampling over the appropriate timeframe and space scale is prohibitively expensive and resource intensive. In 2010, an autonomous underwater vehicle (AUV) or ocean glider will be used to collect DO throughout the coastal zone of NJ. The glider has the advantage of being able to cost-effectively cover large distances and can provide real-time temperature, depth and salinity data in addition to DO. Information from this project can be used to develop accurate estimates of dissolved oxygen conditions and possibly develop a water quality criterion for DO. EPA-Region 2 will work with NJDEP, Rutgers University, and EPA-ORD to develop a sampling design and implement the monitoring;
- Development of Benthic Indicators for Nearshore Coastal Waters of New Jersey - A REMAP Project. New Jersey currently bases its measure of the ecological health of its coastal waters solely on dissolved oxygen measurements. The primary goal of a Regional Environmental Monitoring and Assessment Program (REMAP) grant to NJDEP, made possible by Region 2, is to provide funding and regional technical expertise to develop an indicator of health for the benthic community in the estuarine and near-shore ocean waters of New Jersey. New Jersey ultimately plans to include ecological assessment of benthic communities in its CWA §106 Integrated Report (IR) that is submitted to EPA. EPA-Region 2 is working with NJDEP, Rutgers University, and EPA-ORD to develop an appropriate indicator;

- Quantitative Polymerase Chain Reaction (qPCR) at Marine Bathing Beaches using the Indicator Enterococcus. Region 2 has collaborated with NJDEP and the Monmouth County and Ocean County Health Departments (MCHD and OCHD) for the third year on a comparison study of a qPCR method with conventional microbiological techniques. In 2007, a large scale study at 20 bathing beaches along the NJ coast was performed. Variability among and between methods was evaluated. In 2008, the project objectives focused on spatial and temporal variability of results between qPCR and conventional membrane filtration. For 2009, a study too evaluate qPCR results using instruments from 2 different manufacturers will be evaluated; and
- In addition to the technology benefits, qPCR has a positive impact with regards to environmental stewardship. The qPCR method reduces the footprint for chemical usage and sample size. In addition to the environmental benefits and the rapidness of the method, the cost per sample is up to 50 percent less than the currently employed technology.

Key Action #22: “Climate Ready Estuaries”

Partnership for Delaware Estuary

The Partnership for the Delaware Estuary was chosen as one of six NEP pilots for the Climate Ready Estuaries program receiving targeted support from OCPD and CCD. Work continues in 2009 on this project with three case studies chosen and workgroups formed: drinking water, shellfish and wetlands. Ecosystem services assessments will be incorporated into these case studies.

Additionally, Region 2 garnered funding from HQ CCD for a project to implement a methodology for identifying and valuing the ecological impacts of sea level rise on the NJ portion of the Estuary incorporating ecosystem services impacts. Region 2 is working closely with PDE and Region 3 on this effort. Additional funds from HQ were acquired for continuation/refinement of this project in 2009. The Partnership was selected in 2009 for a Climate Ready Estuaries Technical Assistance agreement that will provide contract support on technical tasks relating to “Valuing Sea Level Rise Effects on Ecosystem Services in the Delaware Estuary”. The Office of Air and Radiation’s Climate Change Division is continuing work with Industrial Economics, Regions 2 and 3, and the Partnership to develop and implement a methodology for identifying and valuing the cumulative ecological impacts of sea level rise on selected ecosystem services in the NJ portion of the Delaware Estuary. The results of this study will support the Climate Ready Estuaries pilot study on the Delaware Estuary.

The program involves on-going work in developing climate change indicators: Precipitation and Flooding; Temperature; Sea Level and Salinity Rise and the 2007-2012 Strategic Plan includes developing and implementing a strategy to address impacts of climate change.

Long Island Sound Study (LISS)

The LISS was selected for a 2009 Climate Ready Estuaries Start-up grant to evaluate federal, state, and local roles in climate change adaptation through a pilot project working with the City of Groton, CT. The LISS is developing a “sentinel site monitoring” program to establish fixed stations that will be monitored to evaluate changes due to climate change and other factors. Changes to be monitored include: sea level rise, wetland vegetative response, patterns of settling organisms, and species changes in the rocky intertidal zone. LISS is working with their STAC to develop a book for publication that will synthesize information on the LIS ecosystem, including how climate change has and could effect changes in the system. The 2009 LIS Agreement will be asking the states to review their coastal zone and wildlife management plans for climate change impacts.

Barnegat Bay Estuary Program (BBNEP)

BBNEP was the recipient of 2009 Climate Ready Estuaries funding. The project will: establish a climate change workgroup to include federal, state, academic, county and NGOs; conduct a complete needs assessment and identify gaps/needs for BBEP; and facilitate a technical workshop to examine climate change impacts and adaptation on an ecosystem scale (fall 2009/winter 2010)

Other Region 2 NEP’s Climate Change Related Activities

The San Juan Bay Estuary Program (SJBEP) will update their CCMP to include issues such as climate change. SJBEP participated in a project to examine impacts of climate change on the Metro Area of PR and several sea level rise projection maps. The maps and the synthesis report were published in local newspapers and a copy of both the maps and the study were delivered, by hand, to the Governor of Puerto Rico. They also developed a partnership with the President of Sacred Heart University to design a public service campaign on Climate Change in 2007.

The New York/New Jersey Harbor Estuary Program (NY/NJHEP) partnered with Interstate Environmental Commission and NY/NJ Baykeeper to fund design and construction of green infrastructure through a stormwater control demonstration in Newark. Components will likely include a water garden and other stormwater retention capabilities. Outreach at a local school and monitoring of water quality changes are also planned. They held a Climate Change conference (November 2007) which included discussion of sea level rise and the urban coast; preparedness and international case studies; and economics and infrastructure. Several RFPs have come out of the program and include climate change impacts as a review criterion.

The Peconic Estuary Program, in the 2009-2010 timeframe, will begin focusing specifically on climate change topics though a contract with a program partner. Potential issues to be pursued include: rising sea level and flooding of coastal infrastructure, particularly effects on individual on-site wastewater disposal systems; stresses to, or overwhelming of, existing infrastructure and natural systems due to more frequent/violent storms; impacts of bulkheads and shoreline hardening structures on the ability for beaches and wetlands to retreat/mitigate landward; and

impacts on native species due to rising temperatures with respect to nuisance/invasive species and other effects.

Key Action #23: Continue Coral Reef Protections

Region 2 has been promoting coral reef protection throughout the Caribbean with the Coral Reef Team and grants for outreach and education that support the 2008 International Year of the Reef.

Key Action #26: Evaluate Wet Weather/Climate Impacts at Municipal and Industrial Operations

Region 2, working jointly with ORD's National Risk Management Research Laboratory's Urban Watershed Research Branch in Edison, NJ, is presently installing an active, 100,000 square foot Green Parking Lot at EPA's Edison, NJ facility. The Green Parking Lot will be fully equipped with monitoring equipment and holding tanks to enable ORD to study the percolation rates of various types of permeable paving by collecting and analyzing the stormwater that leaches into the soil from the four types of permeable surfaces under investigation. The parking lot will also be equipped with a rain garden that will receive stormwater runoff from a portion of the study site, which will be studied to evaluate its capture and treatment effectiveness.

Key Action #28: Implement Sustainable Water Infrastructure Initiative and Adapt Decision Tools

Region 2 has been promoting public outreach of SI initiatives through seminars and conferences; by incorporating SI into operator training courses; through the efforts of R2s Green Team and through performance track for water and wastewater utilities.

Additional initiatives include institutionalizing SI concepts through the SRF program, piloting regionalized approaches to SI and finding opportunities for energy efficiency and renewable energy.

Key Action #30: Clarify the Use of the Clean Water and Drinking Water SRFs to Support Adaptation

Region 2's CWSRF and DWSRF support many actions of the Climate Change Strategy. The NJ-SRF currently provides for additional ranking points that consider things like reduction of water consumption, energy efficiency, alternate power, Smart Growth, green design. The NYSRF has a preference for Smart Growth and energy efficiency initiatives that are integral components of water quality infrastructure projects such as rebuilding and improving existing infrastructure over construction of new infrastructure.

Key Action #33: Finalize National Wetlands Mapping Standard

The Region's GIS team supports Region 2 Emergency Operations Center's capacity for GIS support during incidents of national significance (INS). The incidents include the types of scenarios predicted by climate change such as increased frequency of large storms.

Key Action #35: Climate Research in Water Related ORD Research

Region 2, along with Regions 3 and 9, have received ORD funding to hold the following joint-Regional Science Workshop in FY10: *Resilient Water Management Strategies for a Changing Climate: Developing decision-support tools that use a risk management approach*. The workshop will convene experts from ORD, Regions, states, academia and others to identify ongoing research on how climate change affects water resource quality and quantity in the Nation; to determine how on-going research in risk management and other innovative fields can support protection and management of national water resources; to foster collaboration between practitioners, regulators and researchers that leads to cooperative research efforts and the development of decision-support tools.

Goal 3: Strengthen Climate Change Research Related to Water

Key Action #34: Monitoring of Water Related CCSP Reports

Dr. Danielle Kreeger, Science Director, Partnership for the Delaware Estuary, is a contributing author to the Delaware Estuary case study (Appendix D) in the Coastal Sensitivity to Sea-Level Rise: A Focus on the Mid-Atlantic Region; Synthesis and Assessment Product 4.1 (in draft, final due 12/08) which is a publication of the U.S. Climate Change Science Program. In addition, Dr. Kreeger's published work on the Estuary is also cited.

Key Action #35: Climate Research Water Related ORD Research

The Office of Air and Radiation's Climate Change Division is working with Industrial Economics, Regions 2 and 3, and the Partnership for the Delaware Estuary on a new project to develop and implement a methodology for identifying and valuing the cumulative ecological impacts of sea level rise on selected ecosystem services in the NJ portion of the Delaware Estuary. The results of this study will support the Climate Ready Estuaries pilot study on the Delaware Estuary.

Region 2 continually identifies opportunities for pursuing research in program areas or through funding mechanisms. Potential examples include promoting assessment of green roof performance in abating stormwater runoff, and/or monitoring performance of permeable surfaces such as the green parking lot in EPA facilities in Edison, NJ that is currently under construction.

Goal 4: Educate Water Program Managers on Climate Change

Key Action #39: Outreach to Partners

Region 2 is developing materials for homeowners on reducing combined sewer overflow through property upgrades and maintenance. Region 2 will continue to contribute to outreach efforts to the construction industry regarding water savings, and resource management strategies. OPM works through funding mechanisms with a variety of partners to advance water resource conservation and sustainable management techniques. OPM is funding institutions to develop educational materials and trainings on water savings topics such as green remodeling, green roofs, water saving appliances, and green property management, among other topics.

Key Action #40: Expand Existing Training on Climate Change

Region 2 developed a manual for municipalities and communities with information on water conservation and water resources management strategies. Additionally, it is coordinating with program offices and other regions to develop trainings for local governments and community members.

Goal 5: Establish Climate Change Management in Water Programs

Key Action #41: Maintain Office of Water Climate Change Workgroup

Region 2 has been and will continue to be an active participant on this workgroup. Region 2 has also established a Climate Change/Energy Workgroup to coordinate and track energy and climate change activities throughout the Region. The workgroup's mission is to act in the capacity of a coordinating body to advise regional managers on opportunities to integrate energy conservation, greenhouse gas control, mitigation and adaptation, and awareness of potential climate change effects into specific programs. The workgroup will facilitate the education of all Region 2 employees on cross-media issues associated with energy conservation and climate change.

Key Action #43: Regional Additions to National Water Climate Strategy

Region 2 promoted the use of Low-Impact Development (LID) practices in outreach to developers, and municipalities.

Region 3 (Philadelphia)

Region 3 is focusing their water and climate change programs on reaching out to wastewater and water treatment plants, by conducting multiple workshops on energy and water use for water/wastewater infrastructure. Region 3's Underground Injection Control Program (UIC) is also working with energy companies on permit requirements for the construction and operation of coal bed sequestration sites as part of a U.S. Department of Energy research program.

The Partnership for the Delaware Estuary was chosen as one of six National Estuary Program pilot projects, receiving targeted support from EPA's Ocean and Coastal Protection Division (OCPD) and the Office of Air and Radiation's Climate Change Division (OAR CCD). Region 3 is collaborating with Region 2, the Partnership for the Delaware Estuary, OAR CCD, and a contractor on a project to implement a methodology for identifying and valuing the ecological impacts of sea level rise on the NJ portion of the Delaware Estuary incorporating ecosystem services impacts.

The Region has begun to integrate regional programs through a monthly Energy Team meeting. Region 3 is also collaborating with Regions 2, 9 and EPA ORD to develop a Climate Change Adaptation Workshop, tentatively planned for June 2010.

For additional information regarding Region 3's water and climate programs, visit: <http://www.epa.gov/reg3wapd/index.htm>.

Goal 1: Water Program Mitigation of Greenhouse Gases

Key Action #1: Improve Energy Efficiency at Water and Wastewater Utilities

“Ensuring a Sustainable Future: An Energy Management Workshop for Water and Wastewater Utilities” was held September 9, 2009 at Delaware Technical & Community College, Carter Partnership Center in Georgetown, DE. The objectives of the workshop include: (1) to meet and learn from peers about their efforts to improve energy management; (2) to learn how the steps and tools in the “Energy Management Guide” can be applied to challenges utilities; (3) to become familiar with EPA and State tools and resources to support energy improvements; (4) to take information, experiences, tools and resources and turn into actions to improve energy management; and (5) to encourage utilities to seek assistance from EPA and states after the workshop, consistent with the overall project goals and with the “Energy Management Guide”. Follow-up assistance on energy audits will be conducted in FY10.

Region 3 promoted (and will continue to promote) WaterSense at events such as the Flower Show, Earth Day, Coast Day, and Township Supervisor meetings. Also, the American Recovery and Reinvestment Act of 2009 (ARRA) provided \$434.1 million for the Clean Water State Revolving Loan Fund (CWSRF) and \$172.7 million for the Drinking Water SRF. Twenty percent of funds are directed for “green” projects (green infrastructure, water and energy efficiency, and environmentally innovative projects) provided there are sufficient eligible projects. All Region 3 states are expected to invest at least 20 percent of the available funding in “green projects”.

Key Action #3: Water Conservation and Management for Drinking Water Systems

Region 3's drinking water program is prioritizing outreach efforts to utilities on emergency preparedness and promoting the concept of Climate Ready Utilities. Region 3 conducted several presentations on climate change, their strategy and the adaptation and mitigation activities utilities can undertake. The Region stresses that many of these are actions already carried out by utilities, but fit under climate change as well, and that climate change should be considered when revising emergency response plans and conducting exercises.

Goal 2: Water Program Adaptation to Climate Change

Key Action #22: "Climate Ready Estuaries"

Partnership for the Delaware Estuary (Climate Ready Estuaries Program Pilot)

The Partnership for the Delaware Estuary was chosen as one of six NEP pilots for the Climate Ready Estuaries program and received targeted support from OCPD and CCD. Work continues in 2009 with three case studies chosen and workgroups formed to study drinking water, shellfish and wetlands. Ecosystems services assessments will be incorporated into these case studies, with draft reports expected in March 2010.

Region 3 is collaborating with Region 2, the Partnership for the Delaware Estuary, the Office of Air and Radiation's Climate Change Division, and Industrial Economics (HQs' contractor) on a project called "Valuing Sea Level Rise Effects on Ecosystem Services in the Delaware Estuary" to implement a methodology for identifying and valuing the ecological impacts of sea level rise on the NJ portion of the Estuary. The project will contribute to the development of climate change indicators (e.g., precipitation, flooding, temperature, sea level and salinity rise), the development and implementation of a strategy to address impacts of climate change on the Estuary, and educational outreach to the public on climate change issues through events, Estuary News publications, and other media-based efforts. In 2009, additional funds from HQ were acquired for continuation and refinement of this project.

Region 3 co-sponsored a Climate Change Workshop with the Academy of Natural Sciences in Philadelphia on May 6th, 2007 to:

- Discuss regional impacts and adaptation options;
- Assess consensus on the most pressing science & management needs; and
- Summarize a course of action for addressing climate change.

Maryland Coastal Bays Program (MCBP)

The MCBP is educating the public on climate change and what people can do to address it through newspaper articles, homeowner guides and other mail media. Presentations were given

at the Hotel-Motel-Restaurant annual meeting, where water and energy conservation issues were discussed. The MCBP also worked with Growing Berlin Green to implement burlap bag programs, energy audits, and the distribution of energy saving bulbs, and to develop and submit a proposal to the Fish and Wildlife Service to create BMPs to counter sea-level rise. The Program also supported the installation of sills on tiny inundated islands to protect against storm surge and sea-level rise.

Delaware Center for the Inland Bays (DCIB)

DCIB is continuing to 'go green' by reducing its ecological footprint and contribution to greenhouse gas emissions by making changes to its building, its adjacent site (with rain garden and rain barrels), and now with wind power. Two wind turbines are now in operation and generating electricity when the wind blows greater than eight mph. The average wind speed at Indian River Inlet is 12-14 mph. It is projected that each of these units will produce about 470 kilowatt hours each month. During periods of stronger winds, the turbines can produce excess electricity, giving CIB an energy credit when the turbine produces more than CIB is using.

DCIB is continuing to study “sudden wetland dieback”. Without marsh grasses, storm surge, rapid erosion, and sea level rise could permanently transition the salt marshes into open water.

Region 4 (Atlanta)

Highlights: Region 4 is focusing climate change and water work in three key areas: preparing the Southeast for adaptation, supporting energy efficiency at Southeastern utilities, and demonstrating the potential for geologic sequestration of carbon dioxide.

Key Regional activities include:

- *Over 100 local officials attended a training workshop that presented the energy-water relationships for water/wastewater infrastructure and discussed grant eligibility of energy management project elements and actions;*
- *Region 4 has issued two UIC Class V permits for CO2 experimental/test wells in the Commonwealth of Kentucky to Kentucky Geologic Survey and Duke Energy;*
- *The Region has five CRE projects underway. The Charlotte Harbor National Estuary Program has prepared the first CRE Regional product, a Climate Change Adaptation Plan for the City of Punta Gorda, Florida; and*
- *The Region also delivered 17 Sustainable Infrastructure/Energy Management presentations and provided outreach material at workshops and conferences in six states.*

Additional information can be found at:

http://www.epa.gov/Region4/clean_energy/climatechange.html.

Specific activities for each key action follow.

Goal 1: Water Program Mitigation of Greenhouse Gases

Key Action #1: Improve Energy Efficiency at Water and Wastewater Utilities

The Southeastern US has among the lowest energy rates in the nation which has led water and wastewater utilities to be relatively less concerned about energy efficiency than in other parts of the country. Region 4 is working with State and local partners to elevate interest in improving energy efficiency at Southeastern utilities.

A Training Workshop was held in Atlanta for EPA Special Appropriations Act grantees that presented the energy-water relationships for water/wastewater infrastructure, and discussed how energy management project could be eligible for grants. Approximately 100 local officials and their representatives from all eight Region 4 states attended.

Region 4 formed a working group with University of Georgia and the River Basin Initiative to develop a Utility Management Guidebook for Local Governments in Georgia. Energy efficiency in water/wastewater infrastructure is topic being examined by the working group.

Region 4 developed a work plan for the Appalachian Regional Commission that includes a series of five workshops to be held in underserved, distressed counties in Regions 4 and 5 that will

focus on sustainable approaches for water/wastewater infrastructure and energy management in water/wastewater utilities. The workshop outline and agenda were developed in consultation with ARC (Washington DC).

Key Action #2: Implement the WaterSense Program

Region 4 attended and gave presentations at fourteen workshops and conferences in FY09 addressing WaterSense. Region 4 established 49 new WaterSense partners in FY09.

Key Action #7: Promote Energy Saving/Generating “Green Buildings” and “Green Infrastructure”

The following presentations were given during FY 09:

- Presentation on Green Infrastructure (GI) at the EPA/DOD conference in Atlanta GA in June 2009 where 50 persons were in attendance;
- Presentation on GI at Lifecycle Construction Conference in Atlanta, GA, 2/09 where 100 were in attendance;
- Presentation on GI at State Stormwater/ TMDL Coordinators meeting in Atlanta, GA in March 2009 where 60 were in attendance; and
- Presentation on GI in Charleston, SC in Nov. 2008 where 100 were in attendance.

Region 4’s Water Protection Division has been developing, in cooperation with its RCRA Materials Management Section, a methodology for local governments to review and revise their codes and ordinances to promote green development.

Key Action #8: Develop Geologic Sequestration Regulations

Region 4 has reviewed permit applications and issued UIC permits for test wells to demonstrate safe carbon dioxide sequestration in Kentucky, a Direct Implementation State. The Region issued a Class V UIC permit to Duke Power on 2/26/2009, for the test project in Boone County, KY. The permit became effective on 3/26/2009. Injection of carbon dioxide has not yet been initiated.

The Region issued a Class V UIC permit to the Kentucky Geological Survey (KGS) on 3/11/2009, for the project in Hancock County, KY. The permit became effective on 4/10/2009. The operator is currently drilling this well. The injection test was recently completed and KGS is currently conducting required monitoring and analyzing information collected.

Both of these permits include conditions which will protect underground sources of drinking water, including requirements for construction, operation, monitoring, plugging and abandonment, and submitting financial responsibility. Region 4 has UIC program implementation responsibility in the Kentucky.

The Region also provides grants and has oversight responsibility for the UIC programs in the States of Mississippi and Alabama which are in the process of issuing Class II and Class V UIC permits for five geologic sequestration pilot projects.

Region 4 has assisted EPA Headquarters with addressing public comments on a proposed geologic sequestration (GS) rule by participation in workgroups and meetings. The proposed GS rule comment period ended on December 24, 2008. Region 4 participated in four webinars regarding the rule, and gave a presentation regarding the rule during the March 2009 annual SECARB meeting in Atlanta. Region 4 also provided comments on EPA Headquarters draft Notice of Data Availability.

Goal 2: Water Program Adaptation to Climate Change

Key Action #22: “Climate Ready Estuaries”

Region 4 has five Climate Ready Estuaries (CRE) projects underway:

- Punta Gorda Adaptation Plan
 - The Charlotte Harbor NEP is preparing a climate change adaptation plan with the City of Punta Gorda. The plan identifies options for modifying the city’s comprehensive plan to address climate change effects. A draft plan has been produced and the final is expected by the end of this calendar year.
- Charlotte Harbor NEP Monitoring and Ordinance Development
 - The Charlotte Harbor NEP is utilizing the CRE to modify their monitoring program to include climate change indicators and to create a sea level rise development ordinance. These efforts are expected to be completed late next year.
- Albemarle Pamlico NEP Climate Change Outreach
 - The Albemarle Pamlico NEP is informing the public about the vulnerabilities of the North Carolina coast to rising sea level and initiating a dialog on options to address this issue.
- Satellite Beach Comprehensive Plan
 - The Indian River Lagoon NEP is assisting the City of Satellite Beach in updating their comprehensive plan to address climate change. Modifications to the plan are expected to be completed late next year.
- Coastal Wetlands Climate Change Handbook
 - The Tampa Bay Estuary Program is preparing a handbook addressing the effects of climate change on, and options for the protection of, coastal wetlands. The handbook is expected to be completed in 2011.

Key Action #30: Clarify Use of the Clean Water and Drinking Water SRFs to Support Adaptation

Region 4 continues to promote the use of both SRF programs to address energy efficiency, the use of clean energy, and water conservation and reuse. Region 4 has widely circulated OW's CWSRF White Paper which details program eligibilities including actions and projects that could be funded to address climate change, and it has used SRF training and annual overviews to encourage states to move towards funding energy audits and water efficiency plans.

Goal 4: Educate Water Program Managers on Climate Change

Key Action #39: Outreach to Partners

Region 4 is working with the Office of Water and the Office of Air and Radiation to bring together a workshop of federal, state and local practitioners and principals to assess and develop options for communities to use in adapting to the inevitable changes brought on by climate change. A grant has been awarded to Stratus, Inc to prepare two documents: *Synthesis of Expected Climate Change Impacts in the U.S. Southeast* and *Challenges and Options for Enabling Climate Change Adaptation in the U.S. Southeast*, and to facilitate a workshop.

A draft of the *Synthesis* document has been produced and the *Challenges and Options* paper is expected to be completed by the end of the CY 2009. The workshop is scheduled for February 2010 and will focus on synthesizing climate change impacts and scoping adaptation planning and management options for the U.S. Southeast. The planning and management lessons learned from the project will be available to be applied in other parts of the country.

Region 4 Regional Geographic Initiative grant funds were awarded to the Charlotte Harbor National Estuary Program to prepare a climate change vulnerability assessment for the Southwest Florida coastal area. A draft document has been completed and a final document is expected to be completed by the end of the calendar year.

National Estuary Program

As previously described (under KA22), four of Region 4's six NEPs have received financial and/or technical assistance from the Climate Ready Estuaries Program. Region 4 has worked with NEP Directors and staff to transfer knowledge and lessons learned regarding sea level rise and climate change among Region 4 NEPs and other coastal communities.

The Albemarle-Pamlico NEP (APNEP) is coordinating a program to bring together community leaders and conservationists in the A-P region on a regular basis to discuss common concerns and develop solutions related to climate change/sea level rise. A symposium was held on Oct. 17, 2008 and seven public listening sessions were conducted.

The Water Quality Protection Program (WQPP) for the Florida Keys National Marine Sanctuary is considering the impacts of sea level rise due to climate change on coral reef ecosystems. The

WQPP Steering Committee recently held a meeting where climate change and sea level were addressed. Future meetings will regularly have agenda items regarding climate change.

Goal 5: Establish Climate Change Management in Water Programs

Key Action #41: Maintain Office of Water Climate Change Workgroup

EPA Region 4 has been and will continue to be an active participant on the Office of Water workgroup and on strategy development sub committees. Region 4 Water Protection Division has helped create and participate in the Region 4 Energy and Climate Change (EC2) Steering Committee and Workgroup. The Steering Committee includes a Deputy Division Director or other senior management appointee from each Division. The Steering Committee functions to guide policy and to assure each Division's participation in EC2 activities. Each Steering Committee member reports regularly to its divisional management team. The Workgroup provides a venue to bring together staff on an on-going basis from the various Regional programs involved with energy and climate issues. The Workgroup includes representatives from each division who were appointed by the Division Director.

Region 5 (Chicago)

Region 5 is addressing climate change through a variety of outreach and educational efforts, as well as through pilot projects that assist public utilities in their efforts to improve water efficiency and reduce the amount of energy used to transport and treat drinking water and wastewater.

The Region's Water Division has focused on several mitigation related activities including energy management at water and wastewater facilities, water conservation through the promotion of WaterSense, Green Infrastructure initiatives, and involvement in developing geologic sequestration regulations. In addition, the Region focused on several activities related to adaptation including evaluating opportunities to address climate change impacts at municipalities, sustainable water infrastructure, and emergency response planning.

Region 5 will continue outreach and technical assistance efforts with state and local partners in 2010, as well as work to incorporate climate change activities into daily program work.

For additional information, visit: <http://www.epa.gov/r5water/>.

Actions taken on these programs are as follows:

Goal 1: Water Program Mitigation of Greenhouse Gases

Key Action #1: Improve Energy Efficiency at Water and Wastewater Utilities

Energy Star & Energy Efficiency at Water and Wastewater Facilities

Region 5 participated in three energy workshops in 2008, two of which were developed through OWM, to guide water and wastewater managers and operators toward a proven process to identify, measure, and reduce energy consumption at their facilities. Region 5 also used these workshops as opportunities for outreach on energy conservation practices such as WaterSense and Combined Heat and Power. The third workshop was a POTW Nutrient Reduction and Energy Efficiency Workshop. Co-sponsored by Region 5 and State agencies and associations, this workshop provided assistance to wastewater treatment plant operators and consultants to improve energy efficiency while managing and controlling the discharge of nutrients.

As follow-up to the energy workshops, Region 5 partnered with IDEM and OW to initiate an energy management pilot project. During the two-year project, twelve water and wastewater facilities in Indiana will benchmark energy use with the EnergyStar PortfolioManager database, complete or update energy audits, develop an energy program, and document results in terms of energy savings.

ARRA Green Project Reserve:

The American Recovery and Reinvestment Act directs states to use at least 20 percent of their allotted funds as a Green Project Reserve (GPR). Projects funded under the Green Reserve can

include water or energy efficiency improvements, green infrastructure to manage storm water, and other environmentally innovative activities. Region 5 states have submitted projects under the GPR that include water conservation, energy efficiency, energy production from clean, renewable sources, and low impact development.

Key Action #2: Implement the WaterSense Program

EPA Region 5 is promoting the WaterSense Program within the water/wastewater utility sector and through sustainable development/green building programs and initiatives. The Region continues to recruit WaterSense partners by presenting at conferences and distributing outreach materials at workshops and events. In 2009, the Region has participated in 12 events and added 37 WaterSense partners (not including irrigation partners).

Key Action #7: Promote Energy Saving/Generating “Green Buildings” and “Green Infrastructure”

Region 5 recognizes that using green infrastructure approaches to address wet weather control objectives is a climate change mitigation strategy. Relatively less energy is used in constructing and operating green infrastructure control measures, as compared to grey infrastructure controls, and green infrastructure practices can help reduce Urban Heat Island effects and can sequester carbon. As rainfall patterns change in the Midwest, green infrastructure may also be an important adaptation strategy. The Region is working on voluntary approaches to accelerate use of green infrastructure practices, and also is also seeking to set the stage for using regulatory and permit approaches to support green infrastructure approaches.

In April 2008, Region 5 and Headquarters completed a policy paper on Green Infrastructure/LID and TMDLs. The Region is currently working on 3 pilot projects for waters impaired due to stormwater sources to develop TMDLs that will look explicitly at flows, hydrology, and the appropriateness of green infrastructure for restoring the impaired waters. In September 2008 the Region and HQ hosted a workshop on green infrastructure approaches for addressing CSO control needs. The Region is currently working with OWM and OECA on a Green Infrastructure Permitting and Enforcement Guide. A comprehensive second draft has been circulated widely for review, and work is underway to revise the document and get it ready for circulation to external stakeholders. Several stormwater permits issued in Region 5 in 2008 and 2009 have features which foster green infrastructure practices.

In the summer and fall of 2009, the Water Division and GLNPO, working in partnership with the Chicago Wilderness coalition, are once again implementing a conservation and native landscaping awards program. This program recognizes sites that are exemplary in terms of green infrastructure, sustainable stormwater management, and use of native plants. In addition, Region 5 worked with Chicago Wilderness, the City of Chicago, the Nature Conservancy, and the Center for Neighborhood Technology to convene a one day workshop on climate change, biodiversity, and stormwater. Green infrastructure was highlighted as a mitigation and adaptation strategy. The Region is also coordinating several projects to measure/quantify the performance of green infrastructure BMPs and to share research findings. This data is needed to help address lingering

uncertainty about the performance of green infrastructure approaches for meeting wet weather control needs.

Key Action #8: Develop Geologic Sequestration Regulations

Region 5 has had two very active members on both the Tier II rule making workgroup as well as the Tier III Geologic Sequestration workgroup that is working on non-rule making efforts. Region 5 played host to one of the two national public hearings on the proposed rule in September 2008. The Region has also supplied OGWDW with examples of experimental technology injection well permits issued by the Illinois EPA, the Ohio EPA, and the Region 5 office. These have been helpful to HQ and have resulted in the Region playing a lead role in a potential mock permitting exercise. The Region also has been speaking at national and international meetings on CCS. At the 9th International Conference on Greenhouse Gas Control Technologies held in Washington, DC in November 2008, Region 5 supplied a panelist to present the U.S. efforts on GS rule development along with the EU, Australia, and Japan.

Key Action #9: Continue Technical Sequestration Workshops

As a part of the nationwide effort to advance CO₂ sequestration, the DOE has sponsored seven public/private partnerships to determine sequestration opportunities in various regions of the country. Region 5 has two DOE partnerships actively conducting research injecting CO₂ in the Region. Region 5's Underground Injection Control program has permitted an experimental test well in Michigan for one of the partnerships. The UIC Branch is working with primacy state programs to assist in the application review and permitting of experimental CO₂ injection projects as well as facilitating discussion between state programs. Two large scale CO₂ injection projects are planned for Illinois and Ohio. Region 5 represented the U.S. EPA at the groundbreaking ceremony held at the Illinois site along with the president of ADM, Senator Durbin, Rep. Hare, and others. FutureGen is a near zero emission power plant that is proposed for construction in Mattoon, IL. Region 5 commented on the EIS and has been working with the State of Illinois and the FutureGen Alliance regarding the project.

Region 5 hosted a regional meeting on CCS in 2007 with participation of every Region 5 state UIC program, the DOE, their research partnerships, as well as representatives of some oil and gas and power generation companies. Region 5 co-hosted, with the State of Indiana's DNR, another regional CCS meeting in late July 2009. The meeting had representatives from DOE regional partnership programs; an environmental NGO; public utility commissioners; U.S. congressional staffers; the Canadian government; universities; state regulators from OH, IN, IL and MI; energy companies; and injection well consultants. The meeting lasted 1½ days and covered a wide array of topics related to CCS in the Midwest. Some of the discussions worth noting were: updates from House and Senate staffers on pending climate legislation; the need for early public outreach and education with detailed public participation plans; research plans and updates from the DOE regional partnerships and U.S. EPA ORD; and some of the significant issues that the proposed geologic sequestration rule may or may not address.

Goal 2: Water Program Adaptation to Climate Change

Key Action #26: Evaluate Wet Weather/Climate Impacts at Municipal and Industrial Operations

The Region is actively working with two major metropolitan sewer districts to consider green infrastructure components in CSO Long Term Control Plans. See also “Green Infrastructure” discussion under KA7.

Key Action #28: Implement the Sustainable Water Infrastructure Initiative and Adapt Decision Support Tools

Region 5 has been raising awareness of water and wastewater infrastructure needs and promoting practices to ensure that water and wastewater infrastructure is properly operated and maintained. Through the promotion of asset management, the region has provided states and professional organizations with tools and information to improve operational resiliency.

Key Action #31: Develop and Expand Emergency Response Planning

The Region has helped to enhance the all-hazards security and resiliency of the water sector by hosting three major meetings on water sector resiliency, interdependencies, and emergency planning in the Chicago area. The meetings can serve as models for other locations across the country. In addition, Region 5 is promoting water conservation as part of the overall water security and resiliency messages to utilities and their customers.

Region 5 is assisting utilities in developing and launching their state Water/Wastewater Agency Response Network (WARN), and supporting their efforts to expand their membership. All Region 5 WARN's are operational and growing. In addition, Region 5 is supporting states' use of their EPA security grants to fund local table-top exercises, and to support development and expansion of state WARN's. Finally, the region is establishing, training, and expanding a Regional Water Team whose members can assist states' responses to water sector emergencies. Water Team members participate in state or locally-led table top exercises to increase their ICS knowledge, and to network with utilities, and local and state officials with whom they'd be likely to work in an emergency.

Goal 5: Establish Climate Change Management in Water Programs

Key Action #41: Maintain Office of Water Climate Change Workgroup

Region 5 has been and will continue to be an active participant on the workgroup. The region also regularly participates in the monthly national climate change sub-lead calls.

Region 6 (Dallas)

Recently, Region 6 finished the development of a multi-media Clean Energy and Climate Change Strategy, available at: <http://www.epa.gov/region6/climatechange/strategy.htm>. The cross-program strategy prioritizes activities to conserve energy and resources, reduce greenhouse gases, adapt to climate change impacts, and promote clean/renewable energy sources.

Region 6 hosted the first Climate Change Summit with state partners for senior managers from state environmental, agricultural, energy, conservation, and water resource development to discuss clean energy and climate change.

An inventory of climate change adaptation and mitigation projects in TX and LA is also under development and review by members of the Region 6 Climate Change Workgroup. The pilot-scale initiative will enhance Region 6 and its partners' collective ability to identify the types of climate change projects to target.

Region 6 has also been focused on improving energy efficiency at water and waste water utilities, developing geological CO₂ sequestration regulations, and developing responses to sea level rise and coastal land loss.

For additional information regarding Region 6's water and climate programs, visit: <http://www.epa.gov/Region6/climatechange/water.htm>.

EPA Region 6 is committed to meet the challenges of climate change and will work to lay the groundwork for that effort and to promote innovative approaches to clean energy and greenhouse gas (GHG) emission reductions.

Goal 1: Water Program Mitigation of Greenhouse Gases

Key Action #1: Improve Energy Efficiency at Water and Wastewater Utilities

Sustainable development, green building and value engineering (mitigation and adaptation) are part of the Project Development that is undertaken in the US-Mexico Border area. During the FY07-08 prioritization call for project proposals, two projects were given additional points for including sustainable development as part of the project proposals. Anthony WSD, Anthony, NM is proposing a drinking water project that will incorporate high efficiency pump motors, photovoltaic electricity to supply pumps, SCADA system and site lighting. The other project that is proposing to use sustainable development is the Sunland Park, NM North Wastewater Treatment Plant replacement project. The project if selected will install photovoltaic cells to run UV disinfection, SCADA and site lighting; effluent re-use to irrigate medians and parks, for construction and industry wash water; Bio-Solids Re-use as compost (pending) and simultaneous nitrification and denitrification to save energy in the aeration process.

Key Action #2: Implement WaterSense Program

EPA Region 6 promoted the WaterSense program by enlisting 36 new partners. Currently, Region 6 has 66 WaterSense Promotional Partners and 40 Irrigation Partners.

Key Action #8: Develop Geologic Sequestration Regulations

Since its inception in August 2004, Region 6 has been an influential member of EPA's National CO₂ Geologic Sequestration workgroup. Recently, this workgroup developed and released a guidance to assist in evaluating permit applications for injection wells associated with CO₂ sequestration pilot studies. Region 6 provided the majority of the comments incorporated into the final document. Several Region 6 staff members have oil and gas reservoir engineering experience directly applicable to CO₂ sequestration. This staff also has specialized technical expertise related to deep injection wells through the implementation of the RCRA Land Disposal Restrictions for hazardous waste injection wells. Nationally, most of these hazardous waste injection wells are located in Region 6 along the Gulf Coast of Texas and Louisiana and are required to make "10,000-year no migration demonstrations." This technical expertise has been and continues to be used by other EPA Regions, Headquarters, and states across the country. Therefore, Region 6 is recognized as the Agency's technical authority on deep injection wells.

Goal 2: Water Program Adaptation to Climate Change

Sea Level Rise/Coastal Land Loss

Region 6 has been responding to dramatic coastal land loss for many years. Eustatic sea level rise is but one of a number of interacting causative agents. On the TX and LA shores, the same types of land submersion and erosion impacts are expected. From the seaward side, it is important to be prepared for increasing risks of exposure to hurricanes. From the landward side, increased ecological stresses from changes in the timing and intensity of precipitation are expected.

In response, the Region is promoting landscape scale coastal protection projects. At the end of 2008, Region 6 completed the engineering designs for a barrier island restoration project and a Mississippi River pipeline sediment delivery project. Together, these projects will restore 800 acres of coastal habitat.

By the end of 2009, plans are to be completed for the Nueces Delta shoreline stabilization project conceptual alternatives; to develop Portland Causeway shoreline erosion control and marsh restoration alternatives; to develop Matagorda Island adaptive restoration plan; and to create a geohazards map of Mustang and North Padre Island.

Wetlands Management - Barrier Island Reconstruction

In partnership with the State of Louisiana, Department of Natural Resources, EPA Region 6 successfully completed construction of a barrier island restoration project funded under the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA). The Timbalier Island

Dune and Marsh Creation CWPPRA project reconstructed approximately 273 acres of vegetated dune and marsh platform on the eastern end of the island, protecting oil and gas infrastructure as well as coastal properties by reducing storm surge. The designed level of protection is from a Category 3 Hurricane and the anticipated design life is 20 years. This project was completed on time and under budget. Project features included the placement of 4.1 million cubic yards of dredged material from a borrow site three miles away in the Gulf of Mexico, restoring about 11,300 feet of shoreline and an island width of about 1,600 feet. Additional project features included placing 22,500 linear feet of sand fencing, and planting 110,000 container grown plants consisting of eight species, the most diverse planting to date for a CWPPRA barrier island project. The Timbalier Island project survived hurricane Katrina with minimal damage. The island also survived hurricane Rita, even though it took more of a direct wave attack from the storm, and changes to the original project footprint are apparent from some aerial photography taken by the State of Louisiana. The barrier island helped dampen the storm surges associated with these hurricanes and protected valuable infrastructure and land structures on Louisiana's coast.

Sea Level Rise and its effects on Coastal Wetlands

In Region 6's work in coastal LA, the Region is dealing with the adverse effects of "relative sea level rise", i.e., the combined effect of the current eustatic sea level rise rate and subsidence. Louisiana faces the highest rates of relative sea level rise in the nation. If the Intergovernmental Panel on Climate Change's (IPCC) projections are accurate, other coastal areas will, within the next hundred years, start to experience eustatic sea level rise rates comparable to what Region 6 are currently experiencing. Louisiana is literally at the front line of sea level rise. How this issue is dealt with in the near term will likely provide important lessons for areas such as the Everglades, Chesapeake Bay, and many other coastal systems -- both in terms of human infrastructure and natural systems.

Region 6 is developing its expertise in dealing directly and indirectly with the affects of sea level rise. Through coastal restoration work Region 6 is planning and implementing projects that could help address the effects of sea level rise. The Region also involved in large-scale levee projects that must incorporate future projections for sea level rise. One primary goal with respect to levees is ensuring that they are built in a way that minimizes harm to the coastal environment and does not undermine or run counter to coastal restoration efforts. Highlights of a few major coastal restoration and protection projects are summarized below:

- Maurepas Swamp River Reintroduction Project – Pursuant to CWPPRA, EPA Region 6 is working with the Louisiana Department of Natural Resources on this coastal restoration project, which is intended to help offset the adverse effects of subsidence, sea level rise, and increased salinity by reintroducing the Mississippi River's freshwater, nutrients and sediments into the Maurepas Swamp;
- Louisiana Coastal Restoration and Protection Plan – EPA Region 6 is working with the Corps of Engineers and other stakeholders to help develop a combined coastal restoration and structural hurricane protection plan designed to protect against the most intense

hurricanes. Different future scenarios for sea level rise and hurricane intensity are currently being considered as part of this planning process;

- 4th Emergency Supplemental Authorization Levee Project – In the aftermath of hurricanes Katrina and Rita, the Corps of Engineers has received funding for the immediate repair and upgrade of the Federal levee system in the New Orleans metro area. These upgrades will be to a new “100-year” protection level, which is being calculated using data that includes recent hurricanes. EPA Region 6 is working with the Corps and other stakeholders to expedite the NEPA process for this work, while also avoiding and minimizing adverse impacts to wetlands; and
- New Cut Dune and Marsh Restoration – Barrier islands serve as natural storm protective buffers, providing protection to Louisiana’s coastal wetlands, bays, and estuaries by reducing wave energies. In addition, barrier islands limit storm surge heights and retard saltwater intrusion. The historic rates of land loss for Louisiana’s barrier islands are varied, and can average as high as 50 acres per year, over several decades. New Cut, a small tidal inlet that breached in 1974 during Hurricane Carmen, is located between East and Trinity Islands (formerly Isle Dernieres). Subsequent storm events in 1985 (Hurricane Juan) and in 1992 (Hurricane Andrew) widened the breach. In 1999, two Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) projects replenished East and Trinity leaving the narrow barrier spit (“New Cut”) connecting the two islands. This spit was susceptible to breaching during storms due to a low elevation. In response, the CWPPRA Task Force approved another project, New Cut Dune and Marsh Restoration (TE-37) to fill in and fortify the spit and once again connect the two islands. Region 6 was designated as the federal sponsor and EPA selected the Louisiana Department of Natural Resources (LDNR) as the design and construction agent.

The initial plans and specifications were completed in 2000 and the Task Force approved construction funding in January 2001. LDNR awarded a construction contract and issued a Notice to Proceed, however construction was halted due to local concerns over the borrow site. Additional geotechnical investigations were initiated by LDNR and another borrow source was identified approximately 4 miles away from the island in the Gulf of Mexico.

Plans/specifications were updated in December 2005. Project features include dune construction, unconfined beach fill, and marsh restoration by placing 830,650 cubic yards of sand from the offshore borrows area. Approximately 4,400 linear feet of sand fencing will be installed and 55 acres seeded until nine species of vegetative plantings are placed summer 2007.

Construction bids were not within the original budget, reflecting recent and future increases in the price of diesel fuel, weather risks, and the post hurricane busy work environment. In May 2006, the Task Force approved approximately \$2.7 million in additional funds. LDNR issued a Notice to Proceed to Weeks Marine on October 1, 2006 for the heavy construction (dredging/placement of material). The contract specified a 180-day construction window; with completion expected on or before March 30, 2007.

LDNR also contracted with T. Baker Smith to perform Construction Quality Assurance (on-site inspection). As of April 1, 2007, the containment dikes have been constructed and dredge pipes/lines are being laid. Dredging is anticipated to begin May 1, 2007. LDNR has also awarded a contract with Black Lake Marsh to install nearly 40,000 containers/plugs of barrier island vegetation.

This project is anticipated to restore approximately 160 acres of habitat by constructing 8,000 linear feet of dune at a +7 elevation, to match the adjacent dunes on Trinity and East Islands. Design features also include a bay berm, marsh creation and a gulf berm. The project has a 20-year design life.

Key Action #31: Develop and Expand Emergency Response Planning

Hurricane Response

Region 6 managed the response to Hurricanes Katrina and Rita, the largest natural disaster in the nation's history, and achieved extraordinary results: 20 million pounds of hazardous materials disposed, 400,000 white goods processed, over 700,000 electronic goods recycled, over 700 drinking water systems assessed, and almost 4 million informational fliers distributed to the public. Region 6 maintains a continuing presence today, including oversight of landfill sites and demolition activities.

Other Adaptation Measures: Water Reclamation

The Fred Hervey Water Reclamation Plant was constructed to beneficially reuse wastewater generated in the northeastern part of El Paso, Texas. Currently, the reclamation plant produces approximately 5.25 million gallons of recycled water per day. All of the wastewater is treated to drinking water standards. Upon leaving the reclamation plant, the recycled water is distributed to specific city customers for irrigation and industrial use and the remainder is placed in the Hueco Bolson aquifer through ten injection wells that are 800 feet deep.

The high level recycled water stays in the aquifer for six years while it blends with other water present in the aquifer. In 2005, 1,037 acre feet of recycled water were injected into the aquifer. The amount of recycled water injected has been as high as nearly 5,000 acre feet (prior to 1995). Customer demand for irrigation and industrial use determines what amount is available for injection.

The El Paso Water Utilities refers to the Fred Hervey Reclamation Plant as "two plants in one," because the tertiary level recycled water is processed further with filtration, disinfection, etc. to meet drinking water standards. When water is withdrawn from the aquifer, it is disinfected with chlorine before distribution, but no other treatment is necessary before delivery to customers' taps. Water quality is monitored by the State of Texas.

Goal 4: Educate Water Program Managers on Climate Change

Key Action #39: Outreach to Partners

Inventory of Adaptation and Mitigation Projects

An inventory of climate change adaptation and mitigation projects in TX and LA are under development and review by members of the Region 6 Climate Change workgroup. The draft inventory is a pilot-scale initiative which attempts to begin to catalogue projects of interest in Region 6. It is an outgrowth of a Climate Change "Legacy Initiative" started by the Water Quality Protection. To date, the inventory includes 502 projects. The largest categories include: adaptation to sea level rise and coastal land loss (145); wind power (65); LEED buildings (61); and solar (photovoltaic) projects (53).

The inventory will enhance the Region's collective ability to target and identify the types of climate change projects that will allow EPA to advance environmental science, to develop science to support policy decisions and to create tools for implementation. It also will provide EPA with a practical and specific understanding of how EPA investments in climate change projects can complement and leverage investments being made by other Federal Agencies, environmental groups, regional groups and states. The inventory will dramatically improve the specificity and quality of EPA's strategic thinking on where the Region can add the most value and make future agency-wide discussions on the topic far more meaningful. Ultimately the inventory will be featured on the Region's public web page, where interested parties can request that their climate change projects be added, thus providing a mechanism to further populate and update the inventory in the future.

First Climate Change Summit held in Region 6 with State Partners

Region 6 hosted a summit on August 5, 2008, for senior managers from State environmental, agricultural, energy, conservation, and water resource development agencies in Arkansas, Louisiana, New Mexico, Oklahoma and Texas. The purposes were to familiarize ourselves with State and federal perspectives on clean energy-climate change, for EPA to better understand State concerns about this issue, and to discuss follow-on needs and opportunities for State-EPA partnerships.

The meeting was divided into morning and afternoon sessions. The morning session focused on remarks by the EPA-Region 6's Regional Administrator and the Deputy Regional Administrator. This was followed by overviews of State policies, directions, and outlooks on clean energy-climate change delivered by senior managers of the States Departments of Environmental Quality. Later in the morning, a roundtable discussion was held, which included State managers from energy, agriculture, conservation, and water resource development agencies. The afternoon session included topical presentations by State managers and staff.

The following four themes characterized the discussions in clean energy and climate change:

- Regulatory clarity for government, industry and the public;

- Investment in collaborative efforts between States and EPA;
- Technical support on greenhouse gases emission standards and potential releases; and
- Research on climate change technology and standards.

Goal 5: Establish Climate Change Management in Water Programs

Key Action #43: Regional Additions to the National Water Climate Strategy

Since the publication of the 2008 *Strategy* in September 2008, Region 6 has been actively engaged on many fronts in climate change issues. Recently, EPA Region 6 finished the development of a multi-media “Clean Energy and Climate Change Strategy”, available at: <http://www.epa.gov/region6/climatechange/strategy.htm>.

To complete the strategy, a cross program team was formed. The team internally surveyed our employees, researched other EPA Regions, state and local efforts, analyzed the Region’s carbon sources, and formulated a strategy that prioritizes our activities across four, action-oriented categories:

- Conserving energy and resources;
- Reducing greenhouse gases;
- Adapting to climate change impacts; and
- Promoting clean/renewable energy sources.

Goals under each of these categories will be accomplished through implementing internal changes so the Region can lead by example, enhancing programs and policies and expanding partnerships, conducting aggressive outreach and education to stakeholders, and assessing new technologies and more effective ways of employ them with partners. In implementing the strategy, Region 6 will enhance their collaborative partnership efforts with State and Tribal partners, local governments, the private sector and the public at large, to leverage our resources in achieving our goals.

To facilitate these efforts, the Region will develop an Eco challenge network that will help publicize and market these partnership efforts so that interested organizations can more easily become active partners. Region 6 understands that clean energy and climate change will be an emerging and challenging aspect of environmental protection in the future and our strategy will be revised depending on enabling legislation and needs.

Region 7 (Kansas City)

Region 7's 2009 water and climate change work emphasized both mitigation and adaptation. Mitigation activities included improving energy management and water conservation by promoting the WaterSense program, promoting green infrastructure and supporting carbon sequestration research and development. Adaptation activities focused on source water protection, sustainable water infrastructure, and wetlands protection.

Some highlights of activities that will continue into 2010 include:

- *Region 7 is working with 12 communities as a pilot project to evaluate and improve energy management in order to reduce costs, improve treatment and reduce environmental impacts;*
- *Along with EP ORD, Region 7 is participating on the project team for Kansas City Missouri's Green Solutions Project, a research project to determine the effects of implementing various elements of green infrastructure in a 100-acre urban study area; and*
- *Region 7, Iowa Department of Agriculture and Land Stewardship, and other state and federal organizations are partnering to develop a pilot program for an integrated drainage and wetland landscape system.*

*For additional information regarding Region 7's water programs, visit:
<http://www.epa.gov/Region7/water/index.htm>.*

Summaries of Region 7's climate change projects are described below.

Goal 1: Water Program Mitigation of Greenhouse Gases

Key Action #1: Improve Energy Efficiency at Water and Waste Water Utilities

In 2009, Region 7 formed a partnership called the Missouri Water Utilities Partnership (MOWUP) to provide a coordinated approach to advanced municipal energy savings and greenhouse gas reductions. The initial members of MOWUP include the Missouri Department of Natural Resources (Energy Office and Environmental office), Missouri University of Science and Technology –Rolla, and Siemens Corporation. The Partnership's purpose is to:

- Help municipalities reduce utility costs in water and wastewater treatment plants;
- Improve the reliability and performance of those community assets;
- Minimize the impact of water treatment utilities on the environment; and

- Partner with 5-8 communities to substantially reduce energy use and costs by developing individual Energy Management Plans for their water treatment utilities through a pilot program in 2009/2010.

Twelve communities have signed up for a pilot program that is designed for two phases. In the first phase, the partnership will: conduct initial energy assessment and set up ENERGY STAR Portfolio Manager; provide results and initial recommendations to the communities; and determine the community's desire to become a full participant by moving into Phase II of the project. In the second phase, which will occur in 2010, the communities will:

- Implement one or more recommendations from the Initial Energy Assessment;
- Develop Energy Management Plan for their water and/or wastewater utilities;
- Participate in four workshops before May 2010 while developing an Energy Management Plan;
- Maintain and share data in ENERGY STAR Portfolio Manager;
- Assist in development of case studies; and
- Share results.

The Partnership agrees do the following with those communities implementing Phase II:

- Assist communities in planning for and identifying project financing;
- Conduct four workshops to help develop Energy Management Plans;
- Provide technical assistance throughout the Initiative;
- Develop and publish case studies;
- Facilitate communication among Initiative participants; and
- Share results on:
 - Energy and dollars saved;
 - Improved environmental and operational performance;
 - Community plans for sustainable operation of water utilities; and
 - Lessons learned.

There are three expected results from the Pilot program:

1. Pilot communities will become knowledgeable about their energy management, and have long-term plans in place to improve the energy and environmental performance of their water and wastewater utilities;
2. A set of case studies will be available to demonstrate the value of planning and measuring energy performance, and there will be a program in place to share these studies with communities and utilities across the Midwest; and
3. Communities and program participants will have developed a reputation as Midwest industry leaders with the capacity to address complex sustainability challenges on other fronts.

Key Action #2: Implement WaterSense Program

Region 7 continues to encourage organizations to become partners with WaterSense. Throughout the year WaterSense materials are handed out in outreach events reaching several thousands of people. The Region's most recent partner is the Missouri Department of Natural Resources.

Key Action #7: Promote Energy Saving/Generating “Green Buildings” and “Green Infrastructure”

On September 11, 2009, Region 7 hosted a green infrastructure workshop designed for local government officials, consultants, contractors and others who plan or seek solutions for the long-term operation and maintenance (O&M) of green infrastructure (GI) in an urban setting. The workshop focused on the approach for stormwater management that utilizes natural or engineered systems that mimic natural landscapes to capture, cleanse and reduce storm water runoff. The common GI approaches presented included rain gardens, green roofs, permeable pavement, storm water wetlands, rain water harvesting, and urban forestry. Cost and maintenance information of these real practices were discussed and issues for future resolution identified.

The specific presentations included:

- Green infrastructure experiences from local experts, and Chicago and Seattle experts;
- Maintaining wet weather best management practices with plants, soils and hardscapes;
- O&M for golf courses, green roofs, parking lots, and rain gardens;
- Financial strategies for O&M;
- Maintaining community commitment;
- Kansas City's Green Solutions Pilot Project;

- Keys to success: partnerships, incentives and reporting; and
- State of GI science.

The workshop included opportunities for discussions with national experts, municipal and private sector managers, and state and federal agencies on the many facets of implementing a green infrastructure program.

Key Action #8: Develop Geologic Sequestration Regulations

Region 7 continues to support the development of the national regulation for geologic sequestration of carbon, as well as work with Kansas Corporation Commission and the Missouri Department of Natural resources in regulation development and engagement with interested parties for pilot testing of carbon injection.

Goal 2: Water Program Adaptation to Climate Change

Key Action #12: Address Impacts on Potential Contamination of Drinking Water Sources

Western Iowa Source Water Protection And Collaboration Workshop – EPA HQ and Region 7, Iowa Department of Natural Resources (IDNR), Iowa Department of Public Health, U.S. Department of Agriculture, Natural Resources Conservation Service, Iowa Department of Agriculture and Land Stewardship, Iowa Department of Education, Iowa Water Center, and Pheasant Forever sponsored a free, one-day workshop in Akron, IA. The workshop included one day of presentations and working sessions. Featured speakers and discussion panel members included agricultural practice experts, drinking water and ground water professionals, and staff members of the state and federal agencies. University Certified Operator training hours was included for Drinking Water Treatment Plant Operators.

Key Action #28: Implement the Sustainable Water Infrastructure Initiative and Adapt Decision Tools

Region 7's SI team focused on energy, asset management and green infrastructure in 2009 as part of its sustainable infrastructure focus. Along with EPA-ORD, the Region participated on the project team for Kansas City, MO's Green Solutions Project, a research project to determine the effects of implementing various elements of green infrastructure in a 100 acre urban study area. Region 7 also hosted a Green Infrastructure (GI) Workshop that focused on O&M for GI in September in Olathe, KS. Additionally, Region 7 promoted Asset Management to over 200 small systems and trainers by presenting the Checkup Program for Small Systems (CUPSS). CUPSS is a comprehensive computer software application that introduces the beginning steps to develop and implement an asset management program, budget tracking, and operation and maintenance scheduling. In 2008 and 2009, train-the-trainer sessions were provided to state and technical assistance providers and tribal leaders.

Additionally, the Region 7 SI team worked with the Water Division's SRF Program and the Region's Solid Waste and Pollution Prevention and Superfund Programs to encourage attention to SI when dealing with planning, waste, transportation, and construction management issues.

Key Action #32: Evaluate Opportunities to Refine Implementation of the 404 Regulatory Framework

Region 7, Iowa Department of Agriculture and Land Stewardship, and other state and federal organizations are partnering to develop a pilot program for integrated drainage and wetland landscape system. The goal of the program is to reduce surface runoff and field-to-stream transport of surface runoff contaminants, reduce export of subsurface flow contaminants (primarily nitrates), optimize crop production, and increase habitat and ecological functions in the landscape. The program will results in multiple pilot sites that include analysis of greenhouse gas emissions reduction from the constructed wetlands developed for nutrient reduction.

Region 8 (Denver)

Region 8 has been very active over the past year in facilitating mitigation activities throughout the Region. Region 8 is leading-by-example with their state-of-the-art green building, which has received a gold level of LEED (Leadership in Energy and Environmental Design) certification by the U.S. Green Building Council (USGBC) for new construction, and is being used as a laboratory for green building design and operating techniques. The Region is achieving results through EPA's voluntary partnership programs and initiatives, including ENERGY STAR®, WasteWise, the Coal Combustion Products Partnership, SmartWay, and the Federal Electronics Challenge. Region 8 is also achieving results through other means, such as revitalization of contaminated lands, enforcement actions, climate change education, and other ongoing program activities. Multiple trainings for municipalities to implement conservation measures at water treatment facilities are also being conducted.

Adaptation activities will be the focus of new efforts in the next year compiling common threads across the federal government and novel approaches undertaken by states and local communities. Specifically, Region 8 is in the process of developing a decision tree for addressing climate change considerations for National Environmental Policy Act (NEPA) reviews focusing on water-related projects. Also, Region 8 is evaluating methods for using environmental indicators to inform adaptation decision-making.

For additional information about Region 8's climate change programs, visit: <http://www.epa.gov/region8/climatechange/>.

Summaries of Region 8's climate change projects are described below.

Goal 1: Water Program Mitigation of Greenhouse Gases

Key Action #1: Improve Energy Efficiency at Water and Wastewater Utilities

Utility energy efficiency was identified as one of the activities of emphasis in the Region 8 climate change strategy. This activity addresses supporting the adoption and use of cost-effective technologies and management strategies to enhance energy efficiency at water and wastewater utilities through the Region 8 Sustainable Infrastructure Program. Support is demonstrated in outreach, training, workshops, and incentives. In October, a regional energy management workshop was held for water utility managers based on the Sustainable Infrastructure Energy Management Handbook and Guidelines and in coordination with the ENERGY STAR Program. The goal of the workshop was to train water utility managers on the importance of energy benchmarking/auditing, goal setting, and implementation of priority energy reduction projects. 75 participants attended and follow-up is in progress and may include documentation of actual greenhouse gas reductions, partnering with a select group of utilities to improve energy performance, and training and documentation of interest to utilities.

EPA Region 8 and Region 6 jointly hosted a Sustainable Water Infrastructure Forum in December 2008 (co-sponsored by American Water Works Association, American Planning Association, Water Environment Federation) to facilitate dialogue between a diverse array of

stakeholders, including municipal leaders and decision-makers, utility managers, land use planners, consultants, environmental advocacy groups, developers, and state, local, tribal and other federal partners to identify and address pressing issues and challenges faced by communities in ensuring the sustainability of their water and wastewater infrastructure. The three tracks at this Forum were: 1) Integrating Water and Land Use Decisions in the West, Strategies for a Sustainable Future, 2) Water Utility Planning under Climatic Uncertainty, and 3) Better Management.

Region 8 has promoted the use of ENERGY STAR in commercial building and plant design, including benchmarking tools, through outreach, training, and technical assistance to public and private entities, such as architects, engineers, building owners & operators, and utilities. A new emphasis as of August, 2009 includes sectoral work with water/wastewater and drinking water facilities, among others.

Key Action #3: Water Conservation and Management for Drinking Water Systems

Several regional and national conferences were held within Region 8 in 2009 that increased knowledge and implementation of water conservation in drinking water systems. Specifically, the Association of State Drinking Water Administrators (ASWDA) conducted a workshop on “Water Availability, Variability, and Sustainability (WAVS)” in late September 2009 at which Region 8 staff participated and presented; Regions 8 and 6 combined forces for a Sustainable Infrastructure Forum; The Western States Water Council 2009 Symposium focused on “Water & Land Use Planning for a Sustainable Future: Scaling and Integrating” at which Region 8 staff participated and presented; and the region also participated with the Western Governors’ Association in the recent publication entitled, “Water Needs and Strategies for a Sustainable Future”.

Key Action #4: Water Conveyance Leak Detection and Remediation

During drinking water sanitary surveys conducted in Region 8 special attention is being focused on leak detection with assistance from Rural Water for further investigations.

Key Action #7: Promote Energy Saving/Generating “Green Buildings” and “Green Infrastructure”

The Region 8 Denver office is housed in a new, high performance green building that has achieved the U.S. Green Building Council’s Leadership in Energy and Environmental Design gold rating. This building hosts a green roof to help control storm water runoff and lessen urban heat island effects. The building was outfitted with low-flow plumbing fixtures using high efficiency WaterSense labeled products. Baseline data is being established through measurement and reporting on the environmental performance of the building in preparation for the LEED EB certification in 2011. Educationally, there are multiple tours every week to educate the community about the qualities of green building. During the last fiscal year, 1,523 visitors toured the building and the total number since opening is 9,155. This year, approximately 10,500 requests for information about green building were received.

Region 8 has promoted the ENERGY STAR® program to builders, developers, and other partners in Region 8 States to increase the amount of ENERGY STAR® certified residential housing and use of ENERGY STAR® products. As of August 2009, Region 8 states have close to 800 partners, a 30% increase in new partners (builders, rating organizations, state governments, local governments, utilities, real estate agents, banks, financing institutions, suppliers, manufacturers, trade organizations).

Key Action #8: Develop Geologic Sequestration Regulations

Region 8 continues to support and participate in the OGWDW workgroup and Region 8 State efforts to develop new Underground Injection Control Program geologic sequestration (GS) regulations. On the State side, ND, WY, MT and UT have been directed by their legislatures to develop GS regulations. WY DEQ has made significant progress in regards to their GS rule-making. Wyoming has draft out for public input and could potentially issue their final regulations next summer.

Goal 2: Water Program Adaptation to Climate Change

Key Action #13: Assess Need for Clean Water Microbial Criteria and Risks of Waterborne Disease

The Region 8 interim Ground Water Rule (GWR) manager has been training Region 8 states for over two years on the GWR and its impact on the Total Coliform Rule (TCR) and Surface Water Treatment Rule (SWTR) sanitary surveys. As States undertake rulemaking, the GWR manager has been advising them regarding the disparate sanitary survey requirements among the GWR, TCR, and SWTR. Region 8 has received draft delegation packages from UT, CO, ND, and SD and negotiated extension agreements with MT and SD; whereby, each State will implement and Region 8, enforce. Rules are now in place in ND, CO, and UT with complete applications expected at any time. All delegated States will be implementing under interim primacy or Extension Agreements; however, Region 8 will provide formal enforcement.

Key Action #15: Develop Biological Indicators and Methods

Region 8 completed a draft summary of regional climate change indicators on 5/2009 that describes 18 indicators of a changing climate as well as indicators of societal responses to a changing climate. These come from both long-term data sets as well as emerging information. In the future, such indicators may be used to characterize climate change impacts in Region 8 and assist in adaptation planning.

Key Action #19: Expand National Water Source Surveys to Include Climate Change Indicators

Region 8 is in the process of compiling a bibliography of scientific studies within the Region where climate change indicators are being assessed.

Key Action #20: Assess Waterbody Spatial Changes Due to Climate Change

Climate change projections for the Rocky Mountains show temperature increases and reductions in precipitation which is likely to change the hydrologic character of Region 8 rivers and streams. An anticipated reduction of flow may result in decreases in length of perennial waters and potential elimination of ephemeral and intermittent waters. A RARE grant proposal with the Office of Research and Development was developed to evaluate the extent of waters potentially affected by temperature and flow reductions in relationship to jurisdictional decisions under the CWA.

Key Action #28: Implement the Sustainable Water Infrastructure Initiative and Adapt Decision Tools

The Region 8 focus has been on demonstrating the implementation of Sustainable Infrastructure through construction directly funded by EPA. Specifically, Region 8 has been working on projects to develop renewable energy on contaminated land. Summitville Mine Hydropower Project is an example. During the most recent construction season, the inlet works and penstock were constructed. The installation of the 40 KW turbine, and construction of the powerhouse, are scheduled for early summer 2010. This equates to approximately 140 metric tons CO₂e that could be avoided/year (this estimate is based on partial operation; however, the unit may be engineered to run year round).

Another example of renewable energy development on contaminated lands is Clear Creek/Central City PV panels on the Argo Water Treatment Plant. Region 8 has worked with the National Renewable Energy Lab to develop a request for proposals to have a 3rd party install, own and operate an 80 to 100 KW PV system on the Argo water treatment plant to meet approximately 25% of the facility's electricity load. The State of Colorado has reviewed the RFP, and is anticipated it issue it in the near future as it took over ownership of the plant from EPA in September, 2009. An 80 KW system would prevent 55 metric tons CO₂/year.

Key Action #29: Develop a Sustainability/Vulnerability Analysis Handbook

Region 8 is in the final stages of developing a methodology to strategically identify climate change adaptation activities to adopt. The strategy follows a pattern similar to that used to identify mitigation activities and focuses on eight criteria to determine ranking of Region 8 sectoral climate change impacts for prioritizing activities.

Key Action #32: Evaluate Opportunities to Refine Implementation of the 404 Regulatory Framework

Water efficiency and conservation were strongly promoted in the review of a number of water supply projects under NEPA and 404. A possible result is a stronger interest and focus on water conservation/efficiency efforts in communities planning on engaging in water development activities. In particular, the Northern Integrated Supply Project was one of the more recent projects in which conservation was promoted as a component of a "Least Environmentally Damaging Practicable Alternative."

In addition to conservation promotion through NEPA and 404, consideration of climate change is a new area of interest in Region 8. As most water supply projects enter the NEPA process because of 404 permitting decisions, Region 8 is in the process of developing an approach and checklist for Region 8 NEPA Reviewers to consider climate change. Currently, the informal process is focused on mitigating related activities. This approach will address adaptation issues more specific to water resources in Region 8.

Goal 4: Educate Water Program Managers on Climate Change

Key Action #39 and #40: Outreach to Partners and Expanding Water Training on Climate Change

Region 8 has been very active in providing opportunities for communication with partners. Many of the federal land management agencies are located in Denver and Region 8 has met numerous times with the Department of the Interior, especially with the Bureau of Reclamation and USGS, the Department of Agriculture, Forest Service, and State counterparts and local communities. Region 8 is working with two conferences to be held in the Region: 1) the American Water Resources Association (AWRA) Summer Conference on Adaptive Management of Water Resources, and 2) the National Water Quality Monitoring Conference Information and Results which will address climate, energy, water availability, and other emerging water issues.

Following suggestions from an Oct. 2008 meeting with Region 8 municipalities that are signatories to the Mayors' Climate Protection Agreement, a Region 8 Local Climate Action wiki was developed to promote and support climate change action at the local level. It is designed to showcase examples of municipal climate action plans, ordinances, policies, best practices, tools, and success stories. It also features EPA and other resources available to communities to assist with their efforts, such as programs, initiatives, scientific documents, grants, and inventory tools. Because the wiki is an interactive tool, it allows its members to upload their own information, share in document development or event planning, and post comments or questions to the user group.

A successful Sustainable Infrastructure Forum was held December 2-3, 2008, in Denver, CO. The forum was co-sponsored by AWWA, WEF, the Rocky Mountain Section of the AWWA/WEF, the Western States Water Council, and the American Planning Association. Almost 200 participants attended the event. Additional information is available at: <http://www.epa.gov/region8/water/si.html>. The LID/GI effort in Region 8 is in its early stage. This year, Region 8 staff has worked with the City and County of Denver and is developing regional contacts. Staff is also formulating a draft outreach strategy, training staff, and briefing ecosystems program management.

Goal 5: Establish Climate Change Management in Water Programs

Key Action #41: Maintain Office of Water Climate Change Workgroup

Region 8's Climate Change workgroup has an annual climate change strategy which can be viewed at: <http://epa.gov/region8/climatechange/index.html>. The Regional Climate Change and Water Workgroup will play a more active role in 2010 as the Adaptation Strategy is developed.

Key Action #43: Regional Additions to National Water Climate Strategy

EPA has joined with the Department of Housing and Urban Development and the Department of Transportation in the Sustainable Communities Partnership agreement with one and possibly two pilot projects located in Region 8 communities for implementation.

Region 9 (San Francisco)

Region 9's primary focus is on promoting sustainable infrastructure, especially through water and energy efficiency at water and wastewater facilities. This is accomplished through developing tools and conducting workshops and benchmarking classes. Over 200 facilities have attended workshops and 35 are using ENERGY STAR Portfolio Manager.

The Region has the only EPA website dedicated to water recycling focusing on recycled water from centralized wastewater treatment facilities. The website will be expanded to also cover grey water reuse from residential homes: www.epa.gov/region09/water/recycling/.

Region 9 also developed "EPA Recommended Green Practices for Federally Funded Projects" in the areas of diesel emission reduction strategies, smart energy practices, green remediation, green building and construction practices, water management and environmentally preferable purchasing. This list of environmental best practices was distributed to states and is intended to be used in regional grant awards in the future. It is available at: <http://www.epa.gov/recovery/recommendations.html>.

Other highlights of activities underway include promoting renewable energy production at wastewater treatment facilities; supporting the CRE program for San Francisco Bay; promoting green infrastructure practices through Municipal Separate Storm Sewer System (MS4) permits and American Recovery and Reinvestment Act (ARRA) funding; supporting the Region's climate change speaker series; and participating on California's Water/Energy Team to implement the state's climate change legislation.

Goal 1: Water Program Mitigation of Climate Change

Key Action #1: Improve Energy Efficiency at Water and Wastewater Utilities

The Pacific Southwest Region uses a large amount of energy to extract, treat, and convey (often long distances) water to a large population of people and industries (including agriculture) within the states of California, Arizona, Nevada, Hawaii, and the insular areas of the Pacific Islands. Increasing energy efficiency in the water sector has been one of Region 9's highest priorities because it reduces greenhouse gas emissions, utility operating costs, and energy demand. Region 9 created and has been implementing a three-step process to assist water and wastewater utilities in becoming more energy efficient:

- 1) Energy Star Benchmarking: The first step is to obtain a benchmark score and establish a baseline of energy use using ENERGY STAR Portfolio Manager (ESPM). Region 9 developed an ENERGY STAR Portfolio Manager Benchmarking Class and assisted 35 facilities in California to establish accounts with ESPM to identify their overall annual energy consumption and energy efficiency as compared to other similar facilities. These facilities were able to establish an automatic benchmarking service with their energy providers so their monthly energy use information is automatically entered into ESPM account each month allowing automated tracking and reporting;

- 2) Energy Audits: The second step is an energy audit. Pacific Gas and Electric Company offers free energy audits to facilities within their territory; approximately 20 facilities have been offered this service so far. Region 9 has partnered with DOE and the California Energy Commission to secure an energy audit of the only federally-owned wastewater treatment in the U.S., the International Treatment Plant located in San Ysidro, California. Region 9 is securing energy audits, in partnership with the USDOE, at four facilities in Oahu, Maui, Kauai, and Hawaii. A virtual tour of an energy audit will be incorporated into the agenda of the four “Innovative Energy Management” Workshops in Hawaii; and
- 3) Implementation: The third step is to implement audit recommendations, usually through the purchase of more efficient equipment, redesign of components or configurations to reduce energy demand, and/or update of standard operating procedures and staff training. A new website was recently established (see www.epa.gov/region09/waterinfrastructure), which provides detailed case studies of different energy efficiency and renewable energy projects at wastewater and water treatment facilities, benchmark training, a sample energy audit of a wastewater treatment facility, comprehensive funding opportunities including federal (DOI and DOE), Region 9 states, local government, and investor-owned utilities and other incentive opportunities to support implementation of energy efficient and renewable energy projects.

Region 9, in partnership with seven other co-sponsors, invited all California wastewater and water utilities to attend workshops on Energy Management System at locations in northern and southern California. Four more workshops are being planned for Hawaii, and one or two additional workshops will be offered for Arizona/Nevada. Region 9 is staying in contact with workshop participants to ensure they know about new funding opportunities and to provide support as they develop Energy Management Systems. Working with the Region 9 EMS Coordinator, they offer on-site follow-up assistance.

Region 9 is revising its multi-media “Energy and Climate Change Strategy” to include an effort to remove Clean Air Act regulatory barriers to generation of biogas at wastewater treatment facilities. In some instances, facilities are flaring methane gas (which is much more potent than CO₂) and shutting down their combined heat and power equipment because of strict air permit limits in non-attainment areas. This results in grant-funded equipment not being used, extra expense to the facility for purchasing energy to replace the energy they previously generated themselves, and increased GHG emissions.

ARRA requires states to use at least 20 percent of their ARRA SRF funding for a Green Project Reserve. Region 9 states have funded water/energy conservation projects through this program, including residential water meters, SCADA control equipment, and energy-efficient equipment. Arizona is also using ARRA funding to provide energy audits to water and wastewater utilities. Other ARRA projects include stormwater diversion and wetland retention, solar generation, and water reclamation.

Region 9 has incorporated climate change in NEPA evaluations of infrastructure projects funded under special appropriation grants. This has yielded tangible results, including: reducing by half

the proposed capacity of a wastewater treatment facility, changing the preferred alternative to a lower energy use treatment, proposed mitigation for anticipated GHG emissions, changes to treatment processes, purchase of more energy efficient equipment, and development of sustainable potable water pricing structures and water conservation plans.

Key Action #2: Implement the WaterSense Program

Region 9 is promoting the WaterSense Program through the distribution of program materials to municipalities and water utilities within California, Arizona, Nevada and Hawaii. The Region is also promoting WaterSense through their website (<http://www.epa.gov/region09/waterinfrastructure/index.html>), and through the NEPA review process of projects funded with special appropriation grants. WaterSense will also be promoted through Region 9's forthcoming "Cities for Climate Action" initiative. Since September 2008, Region 9 conducted outreach at eight local events. As of August 2009, Region 9 has a total of 187 irrigation partners and 121 promotional partners. The Region commented extensively on the WaterSense New Homes program, suggesting WaterSense incorporate rainwater harvesting and grey water systems into the specification. Lastly, Region 9 is beginning to work with community college horticulture programs to incorporate the specification for WaterSense labeling of Certification Programs for Irrigation System Installation and Maintenance Professionals into curriculum.

Key Action #3: Water Conservation and Management for Drinking Water Systems

Region 9 has worked with water districts to establish water conservation programs and conservation water pricing through infrastructure grant projects. The states and many local governments within Region 9 have established conservation programs to address a long-term drought. Significant ARRA funding, through the DWSRF, has gone to projects to support conservation, such as water meters.

Key Action #4: Water Conveyance Leak Detection and Remediation

Region 9 has spoken at water association conferences about water conveyance leak detection and remediation, citing case studies of Region 9 water districts who have achieved significant water savings through their leak detection programs.

Key Action #5: Industrial Water Conservation, Reuse, and Recycling Technology Transfer

Region 9 has the only EPA website (<http://www.epa.gov/region09/water/recycling/>) dedicated to water recycling. The website currently focuses on recycled water from wastewater treatment facilities but is being expanded to cover grey water reuse from residential homes. Region 9 was actively engaged with the Water Reuse Association in encouraging the California Department of Housing and Community Development to adopt final rules for grey water use in the State. These new rules, which ease the permitting burden for homeowners, have the potential to make a meaningful contribution to the state's water supply. About 50 percent of residential potable water use is used for landscape irrigation and most of this demand can be met through on-site grey water systems. Increased use of grey water also eliminates up to 50 percent of the water

requiring treatment at wastewater treatment facilities. In addition, the State of California recently adopted a Recycled Water Policy which requires water reuse plans when NPDES permits are reissued.

Key Action #6: Federal Agency Water Conservation Guidance

Region 9 continues to make strides in implementing its EMS program, working in conjunction with the building owner. Region 9 joined the Federal Green Challenge and has committed to reducing water and waste by five percent in 2009 from base year 2007. Region 9's office building owner has recently installed WaterSense-labeled high efficiency dual flush toilets in all the women's bathrooms. The building also achieved an EnergyStar score of 100 percent.

The Region's Environmental Review Office continues to provide guidance to Metropolitan Planning Organizations to develop and implement integrated regional plans that consider avoidance of environmental impacts, include water resources and is working on a partnership with HUD.

Key Action #7: Promote Energy Saving/Generating "Green Buildings" and "Green Infrastructure"

In FY09, Region 9 co-lead the National Green Building Workgroup where we emphasized priority actions focusing on climate. Region 9 has also convened a stakeholder partnership with municipalities, utilities, green building organizations and energy retrofit businesses to focus on best practices for weatherization and home energy retrofits and to educate local governments on how to most effectively use the stimulus funding available for retrofit programs. The Region is encouraging a "whole home" approach including energy retrofit, water conservation and indoor air quality improvement, with an eye toward reducing greenhouse gas emissions.

Key Action #8: Develop Geologic Sequestration Regulations

Region 9 is actively participating on the Tier II Geologic Sequestration Regulatory development workgroup.

Key Action #9: Continue Technical Sequestration Workshops

Region 9 is participating in workshops, including those sponsored by EPA, the International Energy Agency, the Society of Petroleum Engineers, the Ground Water Protection Council, and DOE's Carbon Sequestration Regional Partnerships (WESTCARB and Southwest Partnership).

Key Action #11: Pilot Marketing of Nonpoint Source Biological Sequestration

As part of the implementation of the Garcia River sediment TMDL, The Nature Conservancy (TNC) has purchased land within the watershed to help meet the TMDL sediment load reductions, which includes carbon sequestration credits. TNC is managing watershed forestry health which is linked to a carbon credit program.

Goal 2: Water Program Adaptation to Climate Change

Key Action #22: “Climate Ready Estuaries”

The San Francisco Estuary Partnership (SFEP), one of EPA's 28 National Estuary Programs, was selected as a pilot project by EPA for its Climate Ready Estuary (CRE) program, a program funded by the Office of Water/Office of Air and Radiation and staffed by EPA's Office of Research and Development (ORD). The goal of this pilot will be a vulnerability assessment that provides place-based information on the potential implications of climate change for estuarine processes, in a form that is directly relevant for adaptation planning in the estuary. Work to date has included: (1) selection of SFEP management goals under which to frame the assessment; (2) identification of key ecosystem processes essential to the attainment of those goals; (3) selection of salt marshes as the ecosystem for further assessment; and (4) conceptual models exploring the linkages among key ecosystem processes of salt marshes, climate drivers, and interacting stressors.

Key Action #23: Continue Coral Reef Protections

Region 9 is active in the U.S. Coral Reef Task Force and continues to work with Hawaii, Guam, CNMI, and American Samoa to implement Local Action Strategies to reduce climate change and pollution threats to reefs. Reducing pollution and other coral stressors improves reef resiliency and increases the likelihood that a reef can resist rising temperatures, rapid sea level rise, and ocean acidification resulting from climate change. The Region's wetlands regulatory program reviews coastal construction projects to avoid and minimize impacts to coral reefs and develops effective mitigation projects for unavoidable impacts. They also take rising sea levels into account in permitting coastal construction.

Key Action #26: Evaluate Opportunities to Address Wet Weather/Climate Impacts at Municipal and Industrial Operations

Region 9 routinely comments on proposed state municipal storm water (Phase I MS4) permits to encourage the incorporation of clear, enforceable provisions for low impact development. This has resulted in States, within the Region, more aggressively and consistently including such provisions in their permits.

Key Action #28: Implement the Sustainable Water Infrastructure Initiative and Adapt Decision Support Tools

Region 9's Sustainable Infrastructure Team has developed a strategy with 1- and 3-year goals. A large emphasis is on the use of auditing tools to benchmark water/wastewater facilities and continuing to monitor them to encourage energy management systems.

Key Action #29: Develop a Sustainability/Vulnerability Analysis Handbook for Climate Change Impacts

Region 9's website includes the suite of EPA-recommended tools, including the 4-step process in managing energy consumption, as well as case studies.

Key Action #30: Clarify Use of the Clean Water and Drinking Water SRFs to Support Adaptation

Region 9 is encouraging states to continue the ARRA Green Project Reserve concept in the base SRF Program. This includes identifying and promoting appropriate projects eligible for SRF funding. The California and Arizona State Revolving Fund Loan Programs have incorporated greenhouse gas emission reduction goals into their evaluation/award process.

Key Action #39: Outreach to Partners

The Region has developed a one-stop shop for all regional EPA climate change and energy information at: www.epa.gov/region09/climatechange.

They have also engaged with the various water and wastewater associations (CASA, TRI-TAC, SCAP, and local chapters of AWWA, WEA, and the Water Reuse Association) and presented several times at associations' conferences during each of the last few years.

Region 9 is working with each state within the Region to develop state-specific multi-media climate change strategies to ensure they are coordinating efforts, reducing duplication, and developing the role for Region 9 as it is most needed by each of state. They have actively participated on California's Water-Energy Climate Action Team, which includes all State agencies dealing with water or energy, to implement the State's GHG reduction efforts. Outreach has also included climate change education at Indian Tribal conferences in partnership with USDOE.

Region 9 participated in a Border 2012 Border States Climate Workshop with Region 6, BECC, SEMARNAT and representatives from all 10 Border States, local governments, non-profits, and other organizations, where the Region distributed a Region 9-sponsored report "U.S.-Mexico Border Region Greenhouse Gas Inventories and Policy." The Region is working with BECC to incorporate renewable energy and sustainable infrastructure at wastewater and water utilities funded through this program which will reduce water pollution and conserve resources.

Region 9 is developing a "Cities for Climate Action" pilot program with six cities. This is a multi-media effort to partner with cities on their greenhouse gas reduction efforts. Region 9 will provide information, tools, and technical assistance to encourage local adoption and implementation of one or more community-scale greenhouse gas reduction measures. Greenhouse gas reduction opportunities may include renewable energy, home energy retrofits, greening new development, smart land use, water efficiency, and composting.

Region 9's Sustainable Infrastructure Office and the Environmental Management Systems Coordinator conducted a meeting with a large wastewater treatment facility to assist them in developing an EMS program structure and mission statement and to define roles and responsibilities of the onsite team.

Key Action #40: Expand Water Training on Climate Change

Region 9 has been actively training all regional staff through a "Climate Change 101" course and through a Climate Change Speaker Series. In addition, Region 9 is working with California community colleges to develop a water-related green jobs curriculum and career development for future water/energy work.

Region 10 (Seattle)

Region 10 is supporting the Climate Change Strategy by focusing on improvements in energy efficiency at water and wastewater utilities, implementing the WaterSense program, and promoting energy savings through green buildings. The Region has partnered with the U.S. Geologic Survey and the U.S. Fish and Wildlife Service to create a climate change-oriented association of Federal agencies working in the Pacific Northwest. Region 10 has been working with partners to understand potential carbon offset measures and market mechanisms for biological sequestration through forest practices, and is collaborating with ORD's Regional Applied Research Effort in research on the relationship of leachate, groundwater, and thawing permafrost in up to five Tribal communities in rural Alaska.

Region 10 has also focused 2008 Puget Sound appropriations on watershed protection and land use impacts on water quality. These grants encourage local governments with land use authority to develop appropriate information and tools so they can make better decisions.

The Region developed its climate strategy in April 2008 and updated it in May 2009. In May 2009, Region 10 also developed a Sustainable Infrastructure (SI) strategy that is intended to accomplish many climate change objectives as well. The SI strategy was developed with significant external review.

To learn more about Region 10's water and climate programs, visit:
<http://yosemite.epa.gov/R10/WATER.NSF/homepage/water>.

Under the five goals of the 2008 Strategy, Region 10 implemented projects consistent with the following key actions:

Goal 1: Water Program Mitigation of Greenhouse Gases

Key Action #1: Improve Energy Efficiency at Water and Wastewater Utilities

Region 10's Sustainable Infrastructure team developed a strategy and action plan that will provide education and outreach on energy conservation and promote energy management to improve efficiency and reduce GHG emissions. Specific projects include the following:

Region 10 is also working with the Pacific Northwest chapter of AWWA to develop a Sustainable Infrastructure technical session at their May 2010 meeting.

Region 10 is partnering with Oregon ACWA, Bonneville Power Administration, and the Energy Trust of Oregon on an Oregon Energy Management Project for wastewater systems. Nine utilities have signed up to participate in a series of seven workshops that provide energy management systems training using the EPA Energy Management System Guidebook. The training will also include training in renewable technologies, field visits, and energy audits. The City of Lewiston, ID, is participating in this project. (Lewiston participated in the 2008 Idaho energy management workshop and did a pre-workshop pilot with the Region). They are expecting a kick-off shortly.

A Region 10 Sustainable Infrastructure Website is being developed.

Region 10 is working with the local Environmental Finance Center at Boise State University to conduct additional outreach related to its Financial Dashboard tool and to provide information about energy management. This tool is useful for asset management decisions.

Region 10 worked with the City of Weiser, ID to hire a summer intern to implement the CUPSS program (an asset management program for small utilities). After attending Region 10's Energy Management Workshop in 2008, the City of Weiser implemented energy use reductions city-wide. In just one year, Weiser observed an average energy reduction of seven percent.

Key Action #2: Implement Water Sense Program

Region 10 promoted the WaterSense program internally and at public events, including screenings of *Liquid Assets: The Story of Our Water Infrastructure*. Also, R10 provided literature about Water Sense at local public events.

Region 10 also recruited twenty new Water Sense partners in 2009. These new partners would be classified as follows: six irrigation and fourteen promotional partners (i.e., four retailers, two utilities, three distributors, four local governments, and one NGO).

Key Action #6: Federal Agency Water Conservation Guidance

EPA's building installed new lower flow water faucets.

Key Action #7: Promote Energy Saving/Generating "Green Buildings" and "Green Infrastructure"

As Region 10's building lease expired, GSA selected to have EPA remain in place. The almost 40-year old building is in the process of upgrading to LEED platinum. The building manager had a green roof installed in spring 2008, and in September 2009, a rainwater collection and an on-site re-use system was installed. EPA intends for the interiors to also qualify for LEED platinum.

Washington's Department of Ecology's MS4 permit was successfully appealed, requiring Ecology to consider incorporating LID in its permits. EPA is participating in a workgroup to help Ecology implement its approach.

Region 10 focused its 2008 Puget Sound appropriations on projects that enhance watershed protection by addressing land-use impacts on water quality. With increasing population and development, stormwater is the biggest threat to Puget Sound's water quality. These grants encourage local governments with land-use authority to develop appropriate information and tools to make better decisions.

Region 10 participated on the Stormwater Panel at the Climate Impacts Group and Washington Climate Assessment Update in January 2009, and discussed green infrastructure techniques as a way to address climate change impacts.

Key Action #8: Develop Geologic Sequestration Regulations

Region 10 is participating in the UIC Workgroup on Geologic Sequestration.

Key Action #11: Pilot Marketing of Nonpoint Source Biological Sequestration

Region 10 has been working with USFS, BLM, USGS, USFWS, EPA's Corvallis Lab and others to understand potential carbon offset measures and market mechanisms for biological sequestration through forest practices.

Key Action #28: Implement the Sustainable Water Infrastructure Initiative and Adapt Decision Support Tools

Region 10's SI team is implementing the Energy Management Guidebook and Energy Star's Utility benchmarking tool. EPA is partnering with EPA's energy efficiency peer network to explore further opportunities. The team will be providing additional training using CUPPs, an asset management tool for small utilities. See accomplishments listed under KA1.

Key Action #30: Clarify Use of the Clean Water and Drinking Water SRFs to Support Adaptation

Region 10 hosted a well-attended (including via video-conference) workshop on the draft OWM White Paper, "Tapping the Untapped Potential of the CWSRF."

The CWSRF and DWSRF programs in all four Region 10 states met the ARRA goal of 20% of funds used for "green" projects. These include water and energy efficiency, green infrastructure, and other innovative projects.

Goal 3: Strengthen Climate Change Research Related to Water

Key Action #35: Climate Research in Water Related ORD Research

Region 10 is collaborating with ORD's Regional Applied Research Effort in research on the relationship of leachate, groundwater, and thawing permafrost in up to five Tribal communities in rural Alaska. Region 10, USGS, and USFWS also led the creation of a climate change-oriented association of Federal agencies working in the Pacific Northwest. The Climate Change Collaboration meets regularly to share information regarding climate change work, particularly research.

Goal 5: Establish Climate Change Management in Water Program

Key Action #43: Regional Additions to National Water Climate Strategy

Region 10 developed its region-wide climate change strategy in April 2008. The Region updated its strategy in April 2009 and is undergoing another update in October 2009.

Key Action #44: Federal Agency Water/Climate Coordination Group

Region 10 has a similar Federal coordination group, the Climate Change Collaboration (C3). See discussion of KA35 above. Current C3 activities include: developing an inventory of research, tools, assessments and downscaled GCMs; working to define time and scale for climate change analysis of investments and projects; comparing Federal policy and guidance relating to climate change; and identifying education and outreach materials that could be bundled.

IV. Climate Change and Water Activities in Large Aquatic Ecosystem Programs

The large aquatic ecosystem (LAE) programs, ranging from the Chesapeake Bay to the Puget Sound, are addressing some of the Nation's most complex water resource management challenges that will be exacerbated by the effects of climate change. While these programs were not explicitly discussed in the 2008 *Strategy*, the program managers have nonetheless undertaken efforts to tackle this issue. Some of those efforts are described below.

Chesapeake Bay

The Chesapeake Bay Protection and Restoration Executive Order 13508, signed in May 2009, established a Federal Leadership Committee to oversee the development and coordination of reporting, data management and other activities by agencies involved in Bay restoration. Part of the work includes a concerted effort to coordinate climate change science and adaptation throughout the watershed. The EO charged NOAA and the U.S. Geological Survey (USGS) as well as EPA and other federal and state partners to coordinate existing state programs and regional climate programs to provide the science and assistance to adapt to potential impacts of climate change on the Bay and its watershed. Their work resulted in publication of the draft report, “*Responding to Climate Change in the Chesapeake Bay Watershed*” which is open for public comment through January 8, 2010. It is available at: <http://executiveorder.chesapeakebay.net/file.axd?file=2009%2f11%2f202d+Climate+Change+Report.pdf>.

Columbia River Basin

The Columbia River Basin LAE is focused on toxics reduction for human health and ecosystem protection and restoration. At this time, there is no direct effort to address climate change issues in the LAE work efforts. Toxics reduction efforts through tributary restoration may indirectly help mitigate future climate change impacts. The Columbia River Federal Caucus, of which EPA serves as a member, is currently exploring identifying climate change as a focus issue for FY 2010 Columbia River Federal agency integration and coordination efforts.

For additional information, visit: <http://yosemite.epa.gov/r10/ecocomm.nsf/Columbia/Columbia>.

Great Lakes Program

The Great Lakes Program’s primary focus has been on a multi-agency effort to coordinate federal work under the Great Lakes Restoration Initiative (GLRI) on impacts and adaptation information. The Understanding Climate Change Impacts (UCCI) to the Great Lakes initiative will focus on projects that have identified that 1) there is a clear need articulated by the Great Lakes community; 2) there is a gap in knowledge, decision support tools, or work being undertaken by partners; and 3) there is a federal comparative advantage in performing the work instead of other partners. These projects focus on baseline monitoring, data, and research;

downscaling models; education, outreach and communication; building capacity of end-users in the Great Lakes community; and engaging partners in steering this program.

For additional information on GLRI, visit: <http://www.epa.gov/glnpo/glri/>.

Gulf of Mexico Program

Building on successes of the first Action Plan (2006-2009), the Gulf of Mexico Alliance and their partners developed the Governors' Action Plan II, a farther reaching five-year regional plan developed to address the impacts of climate change and adaptation options for coastal communities in the Region. Strategic mitigation and planning can increase a community's resilience to climate change impacts. The specific actions provided in the Governors' Action Plan II presents a framework for ascertaining the ecological changes and enhancing both the natural and built resources, thus creating more sustainable coastal communities.

The Gulf of Mexico Program is a key federal partner supporting the Gulf of Mexico Alliance that works directly with the regional Sea-Grant Programs on their regional research initiatives. These initiatives focus on climate change impacts and review of federal and state coastal laws.

Key Action #22: Coastal Resilient Estuaries Assessment Tool

The EPA Gulf of Mexico Program, the Gulf of Mexico Alliance, and NOAA collaborated to create a Coastal Resilience Estuaries Assessment Tool that provides a simple, inexpensive method for community leaders to assess how resilient their community's infrastructure is to coastal hazards and how prepared the community is for sea level rise and storm events. It helps to identify weaknesses a community may want to address prior to the next hazard event. Twenty coastal communities have used a Resilience Index to self-assess their vulnerabilities and track progress towards greater resilience.

A risk and resilience-related management toolbox is being used by individuals, businesses, and communities. It includes:

- Recommendations for enhancements to existing resilience policies that local coastal communities have implemented;
- An initial assessment of Gulf-wide risks and resilience of natural, built, and social environments that is assisting planners to incorporate a better understanding of risk into the determination of appropriate land use;
- A region-wide geospatial infrastructure that is designed to obtain baseline data for monitoring local sea level rise trends;
- Wetlands dynamics models that are being used to demonstrate the ecological impacts of projected sea level rise on estuarine systems;

- Resilience information and tools that are available to all Gulf residents using a variety of communication methods;
- Resilience training workshops, of which twenty have been conducted across the Gulf States;
- Sea level rise modeling results from the Gulf region that are available via the Clearinghouse/Web portal, and enabling the exchange of information with other efforts around the country, thereby resulting in partnerships with Mexico and other nations bordering the Gulf;
- State-specific resilience guidebooks/handbooks that have been developed and distributed to more than 50 percent of local coastal communities; and
- An on-line Resilience Clearinghouse/Web portal that is available to all residents of and visitors to the Gulf region.

Additional information on the Gulf of Mexico program can be found at:

<http://www.epa.gov/gmpo/>.

Lake Champlain

The Lake Champlain LAE works closely with the Lake Champlain Basin Program (LCBP), a partnership of government agencies from New York, Vermont, and Quebec, private organizations, local communities, and individuals, working together to coordinate and fund efforts which benefit the Lake Champlain Basin's water quality, fisheries, wetlands, wildlife, recreation, and cultural resources. LCBP is in the process of developing a RFP (Request for Proposals) for addressing climate change adaptation in the Lake Champlain basin, specifically regarding changes in precipitation patterns and implications for the management of the lake.

Additional information regarding LCBP can be found at: <http://www.lcbp.org/>.

Long Island Sound

Long Island Sound, as both a National Estuary Program (NEP) and LAE, spans EPA Regions 1 and 2 in Connecticut and New York, with a watershed that includes the states of Massachusetts, New Hampshire and Vermont. EPA's Long Island Sound Study (LISS) program supports or enhances efforts in the Regions to address climate change in the Long Island Sound Study area. The LISS, with EPA funding, has initiated a Sentinel [Site] Monitoring program to identify early-warning indicators of climate change that may affect the ecology of the Sound. The LISS has established a Sentinel Monitoring work group to lead development and implementation of this effort through the states. Climate change and adaptation/planning are included in the LISS Futures Fund request for proposals, a project that is administered for the LISS by the National Fish and Wildlife Foundation. Several climate change/adaptation projects have been funded in partnership with local agencies and the results of these projects when completed will be available for technology transfer.

See KA22, and Regions 1 and 2 above for the CRE project description.

For additional information about LISS, visit: <http://www.longislandsoundstudy.net/index.htm>.

Pacific Islands

The Pacific Islands Office in Region 9 has been working to address climate change and water issues by focusing on three main areas in the Pacific Islands: water quality protection and improvement; outreach, education and collaboration on climate change issues; and sustainable military buildup on Guam. Projects include:

- Promoting water conservation and efficiency at public utilities through innovative State Revolving Fund (SRF) projects;
- Co-sponsoring the June 2009 Pacific Islands Environment Conference on Climate Change: Energizing a Sustainable Future for Pacific Islands. The conference, which took place on Saipan, CNMI, had sessions on various climate change and water issues including coral reef protection, adaptation strategies for Pacific Islands, and efficiency for water and wastewater services; and
- Working with the Department of Defense (DOD) and other federal resource agencies to ensure efficient, renewable and sustainable practices are included in the military buildup on Guam. This includes improving drinking water and wastewater compliance with environmental standards, utilizing low impact development and green infrastructure for new construction, and minimizing marine habitat disturbance.

For additional information on EPA's work in the Pacific Islands, please visit: <http://www.epa.gov/region09/islands/>.

Puget Sound - Georgia Basin

The Puget Sound Partnership's Action Agenda calls for actions to adapt to and mitigate for climate change. The Action Agenda recognizes that climate change will exacerbate the existing threats to Puget Sound. It expects climate change impacts to be considered when evaluating potential actions. In addition, many of the strategies and actions to protect and restore Puget Sound will also serve as mitigation and adaptation measures.

Region 10 included climate change as a factor in its November 2009 Request for Proposal for Puget Sound "Watershed Management Assistance" grants, which will provide approximately \$10 million in funding. It cites the following: "In all proposed projects, EPA encourages applicants to factor in the impacts of climate change. EPA recognizes that addressing climate change is broad and multifaceted. In the context of this RFP, climate change information would be an additional overlay in evaluating proposed activities and result in actions that mitigate climate change impacts. The actions would lead to more robust protection and restoration and more resilient watersheds and underlying hydrologic functions."

For additional information, please visit: <http://www.epa.gov/region10/psgb/>.

San Francisco

Within the San Francisco Bay LAE, the San Francisco Estuary Partnership, the Bay Conservation and Development Commission and EPA ORD's Global Change Research Program are working on a pilot project under the Climate Ready Estuaries Program to identify key vulnerabilities of the San Francisco Estuary to climate change. The assessment will take advantage of significant work that is already underway in the region, particularly on sea level rise, to support further analysis of climate drivers and ecosystem effects.

For additional information, please visit:
<http://www.sfestuary.org/projects/detail2.php?projectID=4>.

South Florida

To address the issues surrounding the South Florida ecosystem, the United States Environmental Protection Agency (EPA) is working in partnership with several local, regional, state and federal agencies. The goal is to assure the long-term sustainability of the region's varied natural resources while providing for the coexistence of extensive agricultural operations and a continually expanding human population. The EPA South Florida Geographic Initiative targets efforts to protect and restore various communities and ecosystems impacted by environmental problems. Under this initiative, Region 4 works with stakeholders to develop and implement community-based approaches to mitigate diffuse sources of pollution and cumulative risk.

For additional information, please visit: <http://www.epa.gov/Region4/water/southflorida/>.

Appendix – Summary Tables

Table 1 - Summary of Regional Implementation Organized by Key Actions

Goal/subcategory		Key Action	EPA Region										
			1	2	3	4	5	6	7	8	9	10	
GOAL 1 - Greenhouse Gas Mitigation	Energy Conservation/Production	1	X	X	X	X	X	X	X	X	X	X	X
	Water Conservation	2	X	X		X	X	X	X		X	X	
		3			X						X	X	
		4									X	X	
		5										X	
		6		X							X	X	X
	Green Building Design & Smart Growth	7	X	X		X	X		X	X	X	X	X
	Carbon Sequestration/Injection	8		X		X	X	X	X	X	X	X	X
		9					X					X	
		10										X	
	Biological Sequestration	11										X	X
GOAL 2 - Water Program Adaptation to Climate Change	Water Quality and Technology-Based Standards	12								X	X		
		13		X									
		14											
		15	X	X							X		
		16											
		17											
	Watershed Approach	18											
		19	X								X		
		20											
		21											
		22	X	X	X	X						X	
		23		X								X	
		24											
	NPDES Program	25											
		26		X			X					X	
	Water Infrastructure	27											
		28	X	X		X	X		X	X	X	X	
		29		X							X	X	
		30	X									X	
		31					X	X					
	Wetlands Protection	32								X	X		
		33		X									
	GOAL 3 – Water/Climate Related Research	34		X									
		35	X	X									
36													
GOAL 4 - Education on Climate Change	37												
	38												
	39	X	X		X		X		X	X			
	40		X							X	X		
GOAL 5 - Climate Change Management	41	X	X		X	X				X			
	42												
	43		X				X		X				
	44	X								X			

Table 2 – Summary of Progress and Status of Key Actions

Key Actions		OW Program Lead	2008		2009	
			Status	Progress	Status	Progress
GOAL 1 - Greenhouse Gas Mitigation						
Energy Conservation/Production						
1	Improve Energy Efficiency at Water and Wastewater Utilities	OWM (Note: OAR is Agency)	Underway	On schedule	Underway	On schedule
Water Conservation						
2	Implement Water Sense Program	OWM	Underway	On schedule	Underway	On schedule
3	Water Conservation at Drinking Water Facilities	OGWDW	Underway	On schedule	Underway	On schedule
4	Water Conveyance and Leak Detection Remedies	OGWDW with OWM	Underway	Behind schedule	Underway	On schedule
5	Industrial Water Conservation and Reuse	OST/OWM	Underway	On schedule	Underway	On schedule
6	Federal Agency Water Conservation Guidance	OWM	Underway	On schedule	Completed	Completed
Green Building Design and Smart Growth						
7	Promote Green Buildings	OWOW with OWM	Underway	On schedule	Underway	On schedule
Agriculture Related Mitigation						
Carbon Sequestration/Injection						
8	Develop Geologic Sequestration Regulations	OGWDW	Underway	On schedule	Underway	On schedule
9	Continue Technical Workshops	OGWDW	Completed	On schedule	Completed	Completed
10	Evaluate Ocean and Sub-seabed Sequestration	OWOW	Underway	On schedule	Underway	On schedule
Biological Sequestration						
11	Pilot Projects for Marketing NPS Biological Sequestration	OWOW	Underway	On schedule	Underway	Behind schedule
GOAL 2 - Water Program Adaptation to Climate Change						
Water Quality and Technology-Based Standards						
12	Address Impacts of Climate Change on Potential Contamination of Drinking Water Sources	OGWDW	Underway	On schedule	Underway	On schedule
13	Assess Clean Water Microbial Criteria and Risk of Waterborne Disease	OST	Underway	On schedule	Underway	On schedule
14	Consider Criteria for Sedimentation/Velocity	OST	Underway	On schedule	Underway	On schedule
15	Develop Biological Indicators and Methods	OST	Underway	On schedule	Underway	On schedule
16	Link Ecological and Landscape Models	OST	Underway	Behind schedule	Underway	On schedule
17	Evaluate New Industry Sectors	OST with OWM	Underway	On schedule	Underway	On schedule
Watershed Approach						
18	Watershed Climate Change Policy Memo	OWOW	Underway	On schedule	Underway	Behind schedule
19	Expand National Water Resource Surveys to Address Climate Change	OWOW	Underway	On schedule	Underway	Behind schedule
20	Assess Fresh Waterbody Spatial Changes Due to Climate Change	OW	To Be Initiated	On schedule	To Be Initiated	Behind schedule
21	Promote BASINS Climate Assessment Tool	OST	To Be Initiated	Behind schedule	Underway	On schedule
22	Climate Ready Estuaries	OWOW	Underway	On schedule	Underway	On schedule
23	Continue Coral Reef Protections	OWOW	Underway	On schedule	Underway	On schedule
24	Review/Revise NPS Guidelines	OWOW	Underway	On schedule	Underway	Behind schedule

Key Actions		OW Program Lead	2008		2009	
			Status	Progress	Status	Progress
NPDES Program						
25	Review Permit Program Tools	OWM	Underway	On schedule	Underway	On schedule
26	Evaluate Climate Impacts on Wet Weather Program	OWM	Underway	On schedule	Underway	On schedule
27	Assess Climate Impacts at Animal Feeding Operation	OWM with OWOW	To Be Initiated	On schedule	Underway	Behind schedule
Water Infrastructure						
28	Continue Implementing Sustainable Infrastructure Initiative	OWM with OGWDW &	Underway	On schedule	Underway	On schedule
29	Sustainability Handbook with Climate Impacts	OWM with OGWDW	Underway	On schedule	Underway	On schedule
30	Clarify Use of SRFs for Climate Change Related Projects	OWM with OGWDW	Underway	On schedule	Underway	On schedule
31	Expand Emergency Response Planning	OGWDW with OWM	Underway	On schedule	Underway	On schedule
Wetlands Protection						
32	Evaluate Changes to 404 Needed to Address Climate Change	OWOW	Underway	Behind schedule	Underway	On schedule
33	Complete National Wetlands Mapping Standard	OWOW	Underway	On schedule	Completed	Completed
GOAL 3 – Water/Climate Related Research						
34	Monitoring of Water Related CCSP Reports	OST	Underway	On schedule	Underway	On schedule
35	Add Climate Research in ORD Water Related Research Plans	OST	Underway	On schedule	Underway	On schedule
36	OW Role in Revision of Global Climate Research Plan	OST	Underway	On schedule	Underway	On schedule
GOAL 4 - Education on Climate Change						
37	Clearinghouse/Website	OWIO	Underway	Behind schedule	Underway	On schedule
38	Annual Public Reports on Strategy Implementation	OWIO	Underway	On schedule	Underway	On schedule
39	Outreach to Partners and Stakeholders	OWIO	Underway	On schedule	Underway	On schedule
40	Expand Existing Training Programs	OWIO	Underway	Behind schedule	Underway	On schedule
GOAL 5 - Climate Change Management						
41	Maintain Office of Water Climate Change Workgroup	OWIO	Underway	On schedule	Underway	On schedule
42	Strategic Plan and Annual Program Guidance	OWIO	Underway	On schedule	Underway	On schedule
43	Regional Additions to National Strategy	Regions with OW	Underway	On schedule	Underway	On schedule
44	Federal Agency Water Climate Coordination Group	OWIO	Underway	On schedule	Underway	On schedule

EPA Programs:

OAR Office of Air and Radiation
 OGWDW Office of Groundwater and Drinking Water (EPA's Office of Water)
 OST Office of Science and Technology (EPA's Office of Water)
 OWIO Office of Water, Immediate Office
 OWM Office of Wastewater Management (EPA's Office of Water)
 OWOW Office of Wetlands, Oceans, and Watersheds (EPA's Office of Water)

Table 3 - Tabulation of Key Action Status and Progress in 2008 and 2009

(Numbers in cells denote key action numbers)

Purpose: To Compare 2008 Status to 2009 Status		2009 Status			
		Completed	Underway	To Be Initiated	
2008 Status	Completed	9			<i>Count=1</i>
	Underway	6,33	1,2,3,4,5,7,8,10,11, 12,13,14,15,16,17, 18,19,22,23,24,25, 26,28,29,30,31,32, 34,35,36,37,38,39, 40,41,42,43,44		<i>Count=40</i>
	To Be Initiated		21,27	20	<i>Count=3</i>
		<i>Count=3</i>	<i>Count=40</i>	<i>Count=1</i>	

Comparing 2008 Progress To 2009 Progress		2009 Progress		
		On Schedule (bold=Completed)	Behind Schedule	
2008 Progress	On Schedule (bold= Completed)	1,2,3,5, 6 ,7,8, 9 ,10, 11,12,13,14,15,17, 19,22,23,25,26,28, 29,30,31, 33 ,34,35, 36,38,39,41,42,43,44	18,20,24,27	<i>Count=40</i>
	Behind Schedule	4,16,21,32,37,40		<i>Count=6</i>
		<i>Count=38</i>	<i>Count=4</i>	