



# CLIMATE CHANGE & WATER

## U.S. EPA National Water Program Strategy: Response to Climate Change 2010 - 2011 National and Regional Highlights of Progress

### Introduction

#### The National Water Program Strategy: Response to Climate Change

(<http://water.epa.gov/scitech/climatechange/strategy.cfm>), published in September 2008, was an initial effort to describe climate change impacts on water programs, define goals and objectives for responding to climate change, and identify a set of key actions that could be undertaken in 2008 and 2009 under level resources. The strategy was organized into five areas: mitigation, adaptation, research, education, and management. Subsequently, the EPA Office of Water published a “Key Action Update for 2010 and 2011” (<http://water.epa.gov/scitech/climatechange/upload/2010-2011-Key-Action-Update.pdf>). This “2010-2011 National and Regional Highlights of Progress” is the third progress report, highlighting accomplishments of the National Water Program in 2010 and 2011.

The National Water Program includes the EPA Office of Water, EPA Regional Water Divisions, and the EPA Large Aquatic Ecosystem Programs.

### Goal 1: Water Program Mitigation of Greenhouse Gases

The water sector has many opportunities to reduce energy use and to reduce emissions of greenhouse gases. This section describes the following National Water Program activities:

- Improving energy management at water and wastewater utilities;
- Implementing the WaterSense program;
- Implementing the Green Infrastructure Initiative;
- Developing technical guidance for water reuse;
- Promoting technologies to address water leakage from pipes and other conveyances; and
- Developing carbon sequestration regulations under the Safe Drinking Water Act’s Underground Injection Control program.

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### Energy Management

Delivering water and wastewater services is an energy-intensive effort, as the water is treated, pumped to our homes and businesses, then pumped to wastewater facilities to be treated again. Water and wastewater utilities are typically the largest consumers of energy in municipalities, often accounting for 30 to 40 percent of total energy consumed. Pursuing energy efficiency at our water sector systems can significantly reduce operating costs, while mitigating the effects of climate change. The “Energy Management Guidebook for Wastewater and Water Utilities,” developed by the EPA Office of Water and EPA Region 1, provides utility managers with a step-by-step method to identify, implement, measure, and improve energy efficiency and renewable energy opportunities. (<http://www.epa.gov/owm/>)

[waterinfrastructure/pdfs/guidebook\\_si\\_energymanagement.pdf](http://waterinfrastructure/pdfs/guidebook_si_energymanagement.pdf)) As of December 2010, the EPA Office of Water has worked with nine EPA Regions to co-sponsor introductory energy management workshops based on the Guidebook. As a result, eight EPA Regions are working with over 150 utilities to help implement energy management programs. For more information on EPA's efforts to help water utilities conserve energy, see <http://water.epa.gov/infrastructure/sustain/waterefficiency.cfm>.

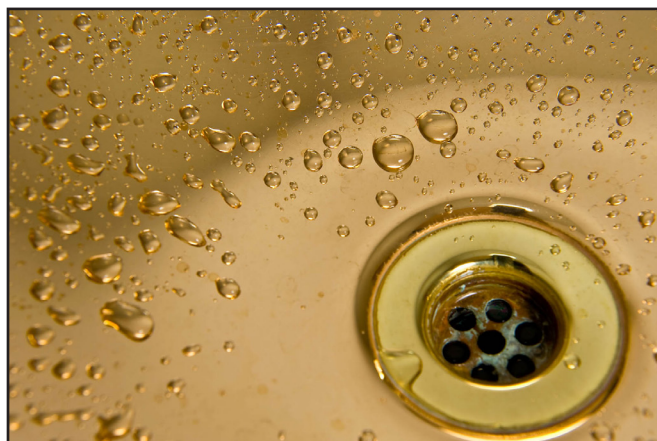
### Water Conservation

The EPA Office of Water continues to implement the

**WaterSense** program (<http://www.epa.gov/watersense/>),

a partnership program

promoting water efficiency and enhancing the market for water-efficient products, programs, and practices. In fiscal year 2010, the program released final specifications for new homes, urinals, and showerheads. Since it was launched in 2006, the WaterSense program has seen more than 125 billion gallons of water and 17 billion kilowatt hours in savings associated with shipped WaterSense labeled products, helping consumers realize more than \$2 billion in water and energy bill savings, and has worked with more than 2,000 program partners.



### Green Infrastructure/Green Buildings

Many of the actions to adapt to climate change impacts are also greenhouse gas mitigation measures. EPA's green building, green infrastructure, and low impact development programs are cross-office efforts that address both nonpoint source runoff and stormwater management while also reducing energy and water consumption. These efforts continue, consistent with EPA's January 2008 green infrastructure action strategy entitled "Managing Wet Weather with Green Infrastructure" ([http://cfpub.epa.gov/npdes/home.cfm?program\\_id=298](http://cfpub.epa.gov/npdes/home.cfm?program_id=298)). In April 2011, EPA released the new "Strategic Agenda to Protect Waters and Build More Livable Communities through Green Infrastructure," which outlines activities to help communities implement green infrastructure approaches. EPA's green infrastructure community partnership has also introduced the first ten communities that will work with EPA on green infrastructure implementation issues. Concurrently, a memorandum was issued encouraging communities to use green infrastructure to manage wet weather and meet Clean Water Act requirements.

### Water Reuse

The EPA Office of Water funded a study by the Water Science and Technology Board (<http://dels.nas.edu/wstb>), of the National Research Council's Division on Earth and Life Sciences, on "Assessment of Water Reuse as an Approach for Meeting Future Water Supply Needs" (<http://www8.nationalacademies.org/cp/projectview.aspx?key=48995>). The study is still underway, and the results of the study will be incorporated into case studies, fact sheets, and technical guidance.

### Leak Prevention

An estimated 880,000 miles of drinking water infrastructure in the United States, much of which has been in service for decades, experiences water loss due to breaks in pipes and conveyances. Loss of treated water wastes both the water and the energy used to treat it, resulting in revenue losses of

upwards of \$3 billion annually. To reduce water loss, the EPA Office of Water has been promoting the use of tools and techniques to allow utilities to identify and implement effective water loss mitigation programs. A guidance document entitled “Control & Mitigation of Drinking Water Losses in Distribution Systems” was released in November 2010 ([http://water.epa.gov/type/drink/pws/smallsystems/upload/Water\\_Loss\\_Control\\_508\\_FINALDec.pdf](http://water.epa.gov/type/drink/pws/smallsystems/upload/Water_Loss_Control_508_FINALDec.pdf)).

### Carbon Sequestration

The EPA Office of Water finalized regulations for geologic sequestration of carbon dioxide under the Safe Drinking Water Act Underground Injection Control program to ensure protection of underground sources of drinking water. EPA Administrator Lisa P. Jackson signed the regulation on November 22, 2010, and it was published in the Federal Register on December 10, 2010 (<http://www.gpo.gov/fdsys/pkg/FR-2010-12-10/pdf/2010-29954.pdf>). The final requirements and proposal were informed by public and stakeholder comments. To support implementation of the final Class VI rule, the EPA Office of Water conducted implementation workshops and webinars in early 2011 and continues to develop technical guidance documents for owners or operators and Underground Injection Control program directors to facilitate Class VI permitting.

## Goal 2: Water Program Adaptation to Climate Change

Climate change will have far-reaching implications for water resources and water programs, requiring EPA to evaluate and adapt its programs and develop new tools. This section describes some of the activities underway throughout the National Water Program in each of the following program areas, including:

- Water Infrastructure
  - Establishing a Climate Ready Water Utilities program and developing tools for water and wastewater utilities;
  - Implementing the Green Infrastructure Initiative; and
  - Promoting the use of the clean water and drinking water state revolving funds for green projects.
- Watersheds and Wetlands
  - Launching the Healthy Watersheds Initiative; and
  - Completion of the National Wetlands Mapping Standard.
- Coastal and Ocean Waters
  - Implementing the Climate Ready Estuaries program;
  - Provide information for coral reef managers on coral reef biological criteria;
  - Participating in the U.S. Coral Reef Task Force;
  - Developing and issuing a November 2010 memorandum on ocean acidification and the Clean Water Act Section 303(d) listing of threatened and impaired waters program; and
  - Developing a new Coastal Wetlands Initiative.

- Water Quality
  - Assessing clean water microbial criteria and risks of waterborne disease;
  - Examining the policy and technical implications of velocity or flow standards;
  - Improving biological indicators for climate change;
  - Integrating the Soil-Water Assessment Tool into the BASINS 4.0 decision support system;
  - Completing the Climate Assessment Tool training module; and
  - Evaluating the potential for the National Pollutant Discharge Elimination System program to consider climate change impacts.



## Water Infrastructure

### EPA's Climate Ready Water Utilities

(<http://water.epa.gov/infrastructure/watersecurity/climate>) provides tools and technical assistance for drinking water and wastewater utilities to develop and implement long-range plans that account for climate change impacts. This effort is an outgrowth of recommendations made by the Climate Ready Water Utilities Working Group (<http://water.epa.gov/drink/ndwac/fact.cfm>) that was established under the National Drinking Water Advisory Council to help inform the development of an effective program for drinking water and wastewater utilities to integrate climate change adaptation and mitigation strategies into utility management. The working group held five in-person meetings and reached full consensus on a report that was provided to the National Drinking Water Advisory Council and EPA. To date, EPA has developed several tools and collaborative opportunities, and continues to develop tools, training, outreach materials, and technical assistance resources based on the recommendations of the Working Group Report (<http://water.epa.gov/drink/ndwac/climatechange/upload/CRWU-NDWAC-Final-Report-12-09-10-2.pdf>).

### The Climate Resilience Education and Awareness Tool

(<http://water.epa.gov/infrastructure/watersecurity/climate/creat.cfm>) assists drinking water and wastewater utility owners and operators in understanding potential climate change impacts and in assessing the related risks at their individual utilities. This tool provides users with access to the most recent national assessment of climate change impacts on a regional and local level to gain a better understanding of how these impacts will affect utility operations and missions. This tool allows users to evaluate adaptation options to address these impacts using both



traditional risk assessment and scenario-based decision making. EPA provides training and outreach on the tool, and will continue to work with stakeholders to improve its functionality.

#### **The Climate Ready Water Utilities Toolbox**

(<http://www.epa.gov/safewater/watersecurity/climate/toolbox.html>) provides information on resources and tools to support utilities responding to climate change in all stages of the decision process. The toolbox has a search function and highlighted resources lists that include: reports; articles; publications; grant programs that could support utility and municipality climate-related actions; government activities related to climate change impacts on water resources; seminars; workshops; and training sessions. The toolbox is continuously updated with additional resources and features.



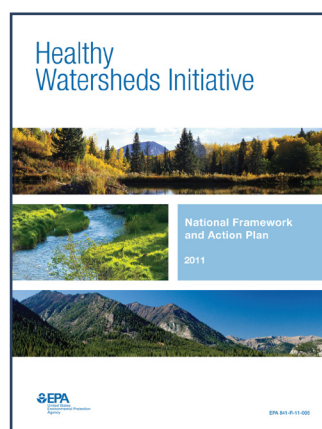
**Green Infrastructure** continues to be a priority within the stormwater National Pollutant Discharge Elimination System permitting program to reduce overflows from storm sewers and combined sewers, and to garner a variety of additional co-benefits including reducing energy used for wastewater treatment and for cooling urban heat islands. EPA 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 (<http://greenvalues.cnt.org/national/calculator.php>). EPA also provided support to the Water Environment Research Foundation to develop the “Green Infrastructure Cost Tool.” This tool 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 (<http://www.werf.org/AM/Template.cfm?Section=Stormwater3&TEMPLATE=/CM/ContentDisplay.cfm&CONTENTID=10836>). The Agency additionally provided information in its “Green Infrastructure Municipal Handbook” encouraging communities to consider rainwater harvesting as a sustainable source of water and an approach to reducing the energy used to supply and treat drinking

water (<http://cfpub.epa.gov/npdes/greeninfrastructure/munichandbook.cfm>). The Agency has also conducted an analysis of the monetary and environmental costs and benefits of green infrastructure developments funded by the American Recovery and Reinvestment Act and the Green Project Reserve. A report on this project is expected to be finalized in the spring of 2012.

#### **The State Revolving Funds for both Clean Water and Drinking Water.**

The EPA Office of Water continues to work with partners to determine climate change related project eligibility for Clean Water and Drinking Water State Revolving Funds financial assistance. The American Recovery and Reinvestment Act provided a 20 percent Green Project Reserve (<http://www.epa.gov/water/eparecovery/>) that directed funds to capital projects, such as green stormwater infrastructure projects, water efficiency and reuse projects, projects to improve the energy efficiency of water utilities and publicly-owned treatment works, or that generate clean energy for publicly owned treatment works, and other innovative environmental projects. The appropriations for the state revolving funds for both fiscal years 2010 and 2011 contain an identical Green Project Reserve requirement.

## **Watersheds and Wetlands**



**The Healthy Watersheds Initiative** was launched by the EPA Office of Water in 2011 (<http://water.epa.gov/polwaste/nps/watershed/index.cfm>). The Initiative is a collaborative product that presents a non-regulatory implementation framework for actions by EPA Headquarters, EPA Regions, and States. The Initiative acknowledges that our waters and aquatic

ecosystems are dynamic systems that are interconnected in the landscape; and that it is important to protect them as whole, interconnected systems that include all integral hydrologic, geomorphic and other processes. Protecting an integrated ecological network or infrastructure of healthy watersheds, in addition to removing and reducing the causes of degradation, is important to sustaining healthy watershed processes and ensuring successful restoration, and is essential for building resilience to climate change impacts.

In 2010, the planning for the **National Wetland Condition Assessment** was largely completed, with a suite of indicators and field methods finalized. Indicators include soil characteristics, hydrology, algae, and extensive vegetation assessments, all of which can provide insights to changes to wetland condition over time as a result of climate change.

In 2011, field work was completed, with 56 field crews sampling 1,178 unique wetland sites across the conterminous United States and the north coast of Alaska. Approximately 50 percent of these sites were located in the Atlantic Coastal plain and 332 were estuarine (coastal) wetland types. Data analysis will be carried out over the next two years with a final report expected by December 2013. EPA expects the report to provide an overall assessment of wetland conditions nationally and regionally and an evaluation of the relative extent of key stressors impacting wetland conditions. The data analysis team will also explore the potential for assessing wetland ecosystem services such as nutrient assimilative capacity. In addition, EPA collaborated with the U.S. Fish and Wildlife Service on the 2004-2009 National Wetlands Inventory, released in October 2011 (<http://www.fws.gov/wetlands/StatusAndTrends2009/index.html>).

**The National Wetlands Mapping Standard** was finalized and approved on July 7, 2009 ([www.fws.gov/wetlands/\\_documents/gNSDI/FGDCWetlandsMappingStandard.pdf](http://www.fws.gov/wetlands/_documents/gNSDI/FGDCWetlandsMappingStandard.pdf)) by the Federal Geospatial Data Committee, chaired by EPA's Office of Wetlands, Oceans, and Watersheds. In 2010, EPA provided contract funds to support the Wetland Mapping Coalition which is developing resources such as web-based tools for wetland mapping by interested States, Tribes, local governments, and others. Stakeholder groups, including the Association of State Wetland Managers, continue to work to implement the mapping standard and to advance better and more extensive wetland mapping. In addition, any state using federal funding to map their wetlands is required to adhere to the standard.

## Coastal and Ocean Waters

**The Climate Ready Estuaries** program is a cooperative joint effort between the EPA Office of Water,



EPA Office of Air and Radiation, and EPA Office of Research and Development (<http://www.epa.gov/cre/>). The program helps National Estuary Programs to assess climate change vulnerabilities, develop and implement adaptation strategies, engage and educate stakeholders, and share lessons learned with other coastal managers. Since its inception in 2008, the Climate Ready Estuaries program has supported 19 National Estuary Programs by providing funding and direct technical assistance. The Climate Ready Estuaries program publishes annual progress reports and information about responding to the challenges of climate change. National Estuary Program partners also publish and post reports on climate impacts, outreach efforts, and adaptation strategies in their individual watersheds. The Climate Ready Estuaries program is working on technical guidance for developing vulnerability assessments and on synthesizing lessons learned from its projects.

**The Coastal Wetlands Initiative** was launched in response to the results of "Status and Trends of Wetlands in the Coastal Watersheds of the Eastern United States 1998 to 2004," a report by the U.S. Fish and Wildlife Service and the National Oceanic and Atmospheric Administration which found that the coastal watersheds of the Atlantic and Gulf of Mexico lost over 360,000 acres of wetlands from 1998-2004, over 60,000 acres per year. Additionally, the devastation caused by Hurricanes Katrina and Rita in 2005, and Ike in 2008, called attention to the severe threats to coastal areas posed by the interaction between development, storms, and climate change. The Initiative has the goals of:

- Confirming wetland loss and gaining a better understanding of contributing stressors;
- Identifying and disseminating tools, strategies, policies, and information to protect and restore coastal wetland resources; and
- Raising awareness of coastal wetlands to include their function and value, potential threats, and opportunities for protection and restoration.

The Coastal Wetlands Team, which carries out the actions of the Coastal Wetlands Initiative, has conducted seven focal watershed reviews in the Mid-Atlantic, South Atlantic, North Atlantic, and Gulf of Mexico regions in order to identify regional stressors, restoration and conservation strategies, and gaps in coastal wetlands protection. Findings from these reviews will help identify effective approaches for reducing or reversing coastal wetlands losses nationally.

**Ocean Acidification.** EPA published a document in July 2010 that provides assistance to coral reef managers on how to use the Clean Water Act and coral reef biological criteria (biocriteria) as part of a comprehensive framework to organize their protection efforts and make them more meaningful through enforceable coastal and watershed regulations ([http://www.epa.gov/bioindicators/pdf/EPA-600-R-10-054\\_CoralReefBiologicalCriteria\\_UsingtheCleanWaterActtoProtectaNationalTreasure.pdf](http://www.epa.gov/bioindicators/pdf/EPA-600-R-10-054_CoralReefBiologicalCriteria_UsingtheCleanWaterActtoProtectaNationalTreasure.pdf)). The EPA Office of Research and Development also has been studying the effects of atmospheric carbon dioxide on the life cycle and fitness of the mysid shrimp (*Americamysis bahia*). The EPA Office of Water continues to participate in the Coral Reef Task Force (<http://coralreef.gov/>) and on the National Oceanic and Atmospheric Administration Coral Reef Conservation Program's land based sources of pollution working group, which is tasked with recommending goals and objectives to better address this major threat to coral reef ecosystems.

The EPA Office of Water issued a memorandum on November 15th, 2010, providing information to assist EPA Regions and States in preparing and reviewing Integrated Reports related to ocean acidification impacts under Sections 303(d), 305(b), and 314 of the Clean Water Act



([http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/oa\\_memo\\_nov2010.cfm](http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/oa_memo_nov2010.cfm)). This memorandum recognizes the seriousness of aquatic life impacts associated with ocean acidification and describes how States can move forward, where information exists, to address ocean acidification during the 303(d) 2012 listing cycle using the current 303(d) Integrated Reporting framework. At the same time, this memorandum also acknowledges and recognizes that information to support the listing of waters threatened or impaired by ocean acidification is limited at this point in time in many States.

## Water Quality



**Biological Indicators.** The EPA Office of Water has been working closely with EPA's Office of Research and Development to improve biological indicators for climate change. After holding a joint workshop in February 2008, "Climate Change Effects on Biological Indicators: Rivers, Streams and Lakes" (<http://cfpub.epa.gov/ncea/global/recordisplay.cfm?deid=190304>), the EPA Office of Research and Development initiated four pilot studies with bioassessment programs in Ohio, North Carolina, Utah, and Maine. Additionally, the EPA Office of Water worked with the EPA Office of Research and Development in the development of "Coral Reef Biological Criteria: Using the Clean Water Act to Protect a National Treasure," published in August 2010 (<http://www.epa.gov/ord/docs/coralAug2010final.pdf>). The scientific recommendations serve as an example of better measurement and assessment of biological conditions, which will improve adaptation management.

In addition, in anticipation of increased flow, velocity, and sediment loadings in some streams, rivers, and estuaries, the EPA Office of Water has examined the policy and technical implications of criteria for hydrologic conditions to support designated uses, and is developing technical and policy support for EPA Regions and States interested in developing such criteria.

**National Pollutant Discharge Elimination System (NPDES) Program.** In 2008-2009, the EPA Office of Wastewater Management examined the NPDES permit program's flexibility and available data sources to address potential impacts from climate change when developing NPDES permits. Based on that analysis, in fiscal year 2010, the EPA Office of Wastewater Management included basic climate change information in the updated "NPDES Permit Writers' Manual" (September 2010) ([http://cfpub.epa.gov/npdes/writermanual.cfm?program\\_id=45](http://cfpub.epa.gov/npdes/writermanual.cfm?program_id=45)). The EPA Office

of Wastewater Management also worked on developing a climate change checklist, which will identify climate change considerations to take into account during the NPDES Action Development process.

**BASINS Analysis System.** EPA integrated its "Soil & Water Assessment Tool" into the "Better Assessment Science Integrating point and Nonpoint Sources" (BASINS 4.0) decision support system ([http://water.epa.gov/scitech/datait/models/basins/BASINS4\\_index.cfm](http://water.epa.gov/scitech/datait/models/basins/BASINS4_index.cfm)). BASINS integrates a geographical information system with geophysical, meteorologic, hydrologic and water quality data, as well as watershed and water quality models, in one package. The integration of the "Climate Assessment Tool" into the BASINS system extends the existing capabilities of BASINS to incorporate climate change and variability into modeling scenarios. The EPA Office of Water and the National Aeronautics and Space Administration have partnered to update BASINS, introducing plug-ins that can download precipitation data from the North American Land Data Assimilation System Phase 2, a gridded precipitation data access and processing tool (<http://ldas.gsfc.nasa.gov/nldas/>). Training modules are available to assist BASINS users, including how to employ the Climate Assessment Tool to simulate impacts of modified climate with BASINS watershed models (<http://water.epa.gov/scitech/datait/models/basins/training.cfm>).

## Goal 3: Climate Change Research Related to Water

EPA's Office of Water and EPA's Office of Research and Development continue to collaborate in a number of areas, in addition to that described throughout this document. In addition, the EPA Office of Water has been working with the EPA Office of Research and Development to align water program priorities, including support for climate change adaptation and mitigation in the water sector, with EPA Office of Research and Development workplans (<http://www.epa.gov/research/>). Search the science inventory for research conducted on specific topics of interest: <http://cfpub.epa.gov/si/>.

Building on the collaboration with the EPA Office of Research and Development in 2009 for the "First National Expert and Stakeholder Workshop on Water Infrastructure Sustainability and Adaptation to Climate Change," (<http://www.epa.gov/nrmrl/wswrd/wq/wrap/workshop.html>), the National Water Program collaborated in 2010 with the EPA Office of Research and Development, the National Oceanic and Atmospheric Administration, the National Aeronautics and Space Administration, the Water Environment Research Foundation, and the Water Research Foundation to convene a research forum, entitled "A View of the Future for Research on Climate Change Impacts on Water." The report details research needs in light of climate change impacts

on wet weather and flooding, water quality, coastal zone management, water supply and drought, and the water-energy nexus (<http://www.waterrf.org/ProjectsReports/PublicReportLibrary/4340.pdf>). EPA, the National Oceanic and Atmospheric Administration, the National Aeronautics and Space Administration, the Water Environment Research Foundation, and the Water Research Foundation have continued to explore and pursue common priorities, including an upcoming series of workshops on extreme events and adopting the energy/water nexus as an area of focus for stimulating innovation.

EPA is an active participant in the U.S. Global Change Research Program (<http://www.globalchange.gov/>) and the ongoing National Climate Assessment ([http://www.globalchange.gov/index.php?option=com\\_content&view=article&id=417&Itemid=401](http://www.globalchange.gov/index.php?option=com_content&view=article&id=417&Itemid=401)), both of which are increasing their focus on research to support adaptation.

#### Goal 4: Water Program Education on Climate Change

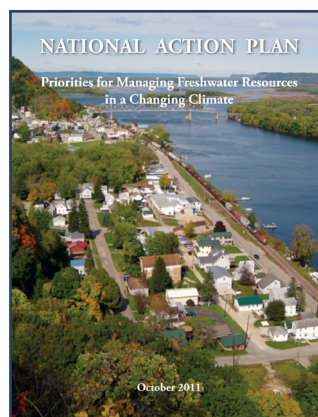
As the National Water Program moves forward to develop a new Climate Strategy, the EPA Office of Water has established a State-Tribal Climate Change Council to share information with States and Tribes on future activities. Other venues for sharing and disseminating information include the EPA Climate Change and Water website (<http://water.epa.gov/scitech/climatechange/index.cfm>) and the EPA Climate Change and Water News e-newsletter that distributes news to over 2,300 subscribers (<http://water.epa.gov/scitech/climatechange/index.cfm>). The EPA Office of Water has also developed a training module, “The Effects of Climate Change on Water Resources and Programs” ([http://www.epa.gov/watertrain/climate\\_water/](http://www.epa.gov/watertrain/climate_water/)), and hosted several webcast seminars for the EPA Watershed Academy Program. Those webinars include: “Saving Water and Energy – Reducing Greenhouse Gases by Improving Efficiency” (May 2011) and “Climate Change Adaptation Tools for Addressing Water Issues” (December 2010). They can be found at: [http://water.epa.gov/learn/training/wacademy/webcasts\\_index.cfm#change](http://water.epa.gov/learn/training/wacademy/webcasts_index.cfm#change). In addition, a climate change section has been added to the presentations given as part of the EPA Water Quality Standards Academy.

#### Goal 5: Water Program Management of Climate Change

To ensure that climate change efforts are sustained as part of the National Water Program, the EPA Office of Water continues to convene the National Water Program Climate Change Workgroup and participating in federal interagency coordination activities and groups.

The **National Water Program Climate Change Workgroup** is chaired by the Deputy Assistant Administrator of the EPA Office of Water, and is comprised of managers and senior staff from throughout the Office of Water, the ten EPA Regions and several of the EPA Large Aquatic Ecosystem program offices. The Workgroup ensures communication, coordination, and ongoing program development to integrate climate change into EPA’s water programs. In addition to monitoring implementation of the “National Water Program Strategy: Response to Climate Change” (2008) and the “National Water Program Strategy: Response to Climate Change, Key Action Update for 2010-2011,” the Workgroup is working to revise the “National Water Program 2012 Strategy: Response to Climate Change,” projected for release in early 2012.

The EPA Office of Water has also been working with other federal agencies to ensure government-wide coordination. The EPA Office of Water has been active on the Interagency Climate Change Adaptation Task Force, and co-chairs the Task Force’s Water Workgroup. The Task Force released its second annual interagency progress report on October 28, 2011. The first report, released on October 5, 2010, outlined recommendations to the President of the United States on how federal agency policies and programs can better prepare



the nation to respond to the impacts of climate change (<http://www.whitehouse.gov/administration/eop/ceq/initiatives/adaptation>), including several water-related recommendations that the National Water Program will help to implement. The 2011 progress report provides examples of federal agencies working to respond to climate change.

Concurrently, the Interagency Climate Change Adaptation Task Force released the Freshwater National Action Plan, the first of three National Action Plans under development. The Freshwater National Action Plan lays out a plan that federal agencies intend to undertake to work toward building adaptive preparedness and resilience in the water sector.

The EPA Office of Water is also collaborating on other interagency efforts, such as the inter-agency Climate Change and Water Working Group, the Western Federal Agency Support Team, and bilateral arrangements including with National Oceanic and Atmospheric Administration. The Climate Change and Water Working Group published a report “Addressing Climate Change in Long-Term water Resources Planning and Management: User Needs for Improving Tools and Information” and is working on a similar document for short term planning (<http://www.usbr.gov/research/climate/long-term/partnerships.html>). The EPA



Office of Water continues to seek opportunities to collaborate across the federal government.

Finally, climate change adaptation and mitigation activities are now built into EPA's 5-year Strategic Plan, 2011-2015, (<http://www.epa.gov/planandbudget/strategicplan.html>). The Agency has set a goal of incorporating climate change science and trends into five rules or policies, five major tools or models, and five funding or technical assistance programs. The National Water Program Guidance ([http://water.epa.gov/grants\\_funding/cwf/upload/nwp\\_program\\_guidance508\\_050510.pdf](http://water.epa.gov/grants_funding/cwf/upload/nwp_program_guidance508_050510.pdf)) also discusses incorporating climate change considerations when implementing water programs. Further, an Agency-wide workgroup is developing a climate adaptation strategy, under guidance from the White House Council on Environmental Quality.

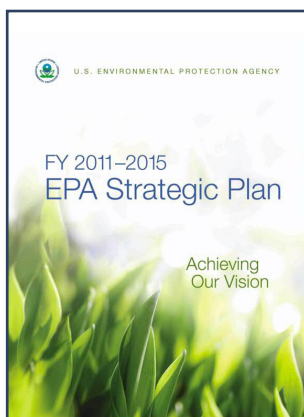
## Summary

The "National Water Program Strategy: Response to Climate Change, Key Action Update for 2010-2011" listed 44 key actions that the National Water Program planned to undertake in 2010 and 2011. These and other activities are all underway, building on the momentum and experience gained since 2007. They have set the stage for updating the National Water Program Climate Strategy for 2012 and beyond. The actions described here reflect EPA's commitment to addressing the risk that climate change poses to water resources and EPA's water programs, in order to continue protecting public health and the environment and to preserve the gains we have achieved in the past 40 years.

For more information on the impacts of climate change on water resources and EPA's water programs, please see the "National Water Program Strategy: Response to Climate Change" (2008) as well as other documents listed in the references section below.

## References

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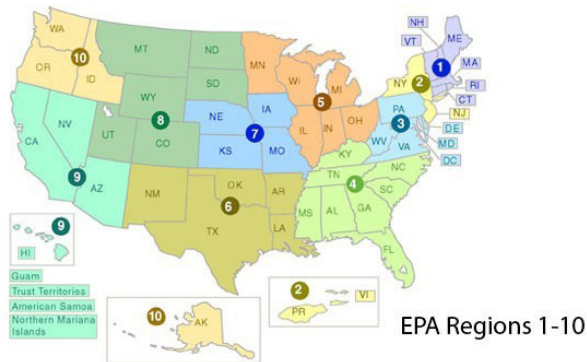
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## EPA Regional Highlights of Progress



## EPA Region 1

EPA Region 1 has been involved in a wide range of mitigation and adaption planning activities and continues to work closely with other federal agencies, state and local governments, and non-governmental organizations through a variety of networks and partnerships.

The Region continued to promote energy efficiency at wastewater treatment facilities through the EPA Office of Water Energy Management Planning tools and the ENERGY STAR Portfolio Manager, EPA's on-line benchmarking tool. The Region conducted workshops and provided hands-on training in all six New England states, assisting over 100 facilities in energy efficiency benchmarking and determining how they can further reduce energy use.

Region 1 continued to work with Massachusetts, Rhode Island, and Maine on long-term energy management planning programs in the water sector, which have already resulted in significant energy savings and carbon dioxide emission reductions. In Massachusetts, 21 projects totaling \$68.6 million were funded through the American Recovery and Reinvestment Act, resulting in an estimated annual reduction of 22,000 tons of carbon dioxide emissions.

The Region continued to promote the use of state revolving fund programs to address energy efficiency, use of renewable energy, water conservation, and reuse. In 2009, a statement of intent was signed by EPA and several regional water utility and management associations to promote an effective utility management approach for the water sector. In May 2010 the Region hosted a successful, well-attended national asset management workshop.

A region-wide mapping project was conducted to identify wastewater treatment plants that were at risk of flooding and overlaid with a map showing auxiliary power capability. Next steps in this project will be to work with States and

technical assistance providers to help make the high-risk utilities more “climate ready.” In 2012, the Region will dedicate a full-time staff position to effective utility management to assist with this effort.

Region 1 also produced flood maps using Federal Emergency Management Agency data to identify water infrastructure at risk of flooding and shared the maps with New England states to then develop outreach programs to systems most in need of assistance. The Region worked with the Federal Emergency Management Agency and the U.S. Army Corps of Engineers to deploy the Corps’

**In the spotlight:** EPA Region 1 actively participated in the Northeast Regional Ocean Council and helped establish a New England Federal Partners group to coordinate efforts on climate change mitigation and adaptation, as well as coastal and marine spatial planning.

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249th Engineering Battalion to assess critical drinking water facilities for generator capabilities. Three flood training exercises were held for water system operators and managers, one of which was a functional exercise involving deployment of the Region 1 Water Team in Groton, Connecticut later impacted by Tropical Storm Irene.



Region 1 continued to actively participate in the Climate Ready Estuaries Program jointly led by EPA's Office of Water and Office of Air and Radiation. Projects funded in 2008-2010 were completed by the Piscataqua Region Estuaries Partnership, the Massachusetts Bays Program, the Casco Bay Estuary Partnership, and the Long Island Sound Study. In addition, 2011 funds were awarded for new projects with the Piscataqua Region Estuaries Partnership, the Casco Bay Estuary Partnership, and the Narragansett Bay Estuary Program.

Region 1 also continued to participate in the Gulf of Maine Council's Climate Change Network and Ecosystem Indicators Partnership, which coordinated climate change adaptation efforts by U.S. and Canadian agencies and organizations and supported the development of climate change indicators to assess the status and trends of the Gulf's resources.

For additional information regarding EPA Region 1's water and climate programs, visit: <http://www.epa.gov/region1/climatechange/index.html>, or contact Mel Cote, e-mail: [cote.mel@epa.gov](mailto:cote.mel@epa.gov); phone: (617) 918-1553.

## EPA Region 2

Through workshops begun in 2011, EPA Region 2 is conducting outreach and providing training to wastewater and water utilities and their plant operators regarding methods and tools -- such as ENERGY STAR Portfolio Manager -- that will assist them in increasing their plants' energy efficiency. In addition, Region 2 is working with the EPA Office of Water and the New York/New Jersey Harbor Estuary Program to pilot the Climate Resilience Evaluation and Awareness Tool with the North Hudson Wastewater Treatment Plant in Hoboken, New Jersey under the Climate Ready Water Utilities program. This tool has been developed to assist water sector utilities with familiarizing themselves with regional-specific climate impacts and conducting a climate change risk assessment. Region 2 is also forming a federal interagency working group dealing with climate change adaptation and mitigation in New York and New Jersey.



Region 2's climate change workgroup has continued to coordinate and track energy and climate change activities and train regional employees on climate issues. Since June 2010, almost 100 Region 2 staff have taken the "Climate Change Short Course" prepared by the workgroup and have participated in the Region's "Elevate Your Climate IQ" speaker events.

Region 2 continued to focus 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 have played an important role in efforts to characterize impacts to coral degradation from both local and global stressors, including land-based sources of pollution and climate change.

**In the spotlight:** Based on its work with Groton, Connecticut, EPA Regions 1 and 2 have been developing an adaptation resource toolbox to assist other municipalities in their climate change adaptation efforts. A federal, state, and local steering committee has been formed and is providing guidance on content to maximize the toolbox's utility.

Three Climate Ready Estuaries projects are underway in Region 2: the Barnegat Bay Partnership; the Long Island Sound Study, a Region 1 and 2 National Estuary Program; and the Partnership for the Delaware Estuary, a Region 2 and 3 National Estuary Program. The Partnership for the Delaware Estuary released its Climate Ready Estuaries Report and continued implementation of the 'living shorelines' technique for wetland protection/restoration as an adaptation for climate change effects. The Partnership for the Delaware Estuary has also developed a public-friendly booklet to effectively translate climate adaptation findings for the general public as well as local decision makers. The Barnegat Bay Partnership held climate change listening sessions and is now planning a more targeted survey approach. For the Long Island Sound Study, three coastal climate adaptation workshops were held to identify federal, state, and local roles that can be taken to increase the resilience in Groton, Connecticut. Details for the Long Island Sound Study may be found in the Large Aquatic Ecosystem program section of this update. In addition, in 2011 the New York/New Jersey Harbor Estuary Program was selected to be included in the Climate Ready Estuary program. A project concept was developed that would evaluate the vulnerability of a portion of the estuary to climate change, with an emphasis on impacts to public access areas. A partner to implement the project will be selected via a Request for Proposals in 2012.

Region 2's Pollution Prevention (P2) program promotes WaterSense directly, or through grants, and has developed partnerships with other relevant stakeholders (e.g., City of New York, academia, and public schools). Region 2's Green Memorandum of Understanding program (<http://www.epa.gov/region2/greenteam/index.html>) incorporates a number of "green" initiatives, including green buildings, Greenscapes, WaterSense, WasteWise, and ENERGY STAR. There are now twenty-one memorandum of understandings with local professional sports teams, major real estate firms and developers, retailers, hospitals, and federal facilities



to reduce the environmental impacts of their buildings and operations. The program has measured over 1 million metric tons of carbon dioxide equivalents reductions.

Region 2 has promoted the use of green infrastructure practices into permit and grant programs. Design standards for green infrastructure practices have been incorporated into New York State construction and municipal separate storm sewer system (MS4) permits for storm water. In partnership with Region 2, Onondaga County, New York was named one of the Top Ten green infrastructure communities in the United States for the comprehensive approach to incorporating both large and small scale infiltration practices into its infrastructure. Stormwater inspections throughout the region are increasing and enforcement actions are being taken to ensure that soil at sites are properly stabilized (biosequestration). Region 2 also continued to conduct MS4 field inspections and audits of the communities adjacent to Long Island Sound.

The New York State's Clean Water State Revolving Fund program promotes the State of New York's effort to meet 45 percent of its electricity needs through increased energy efficiency and renewable energy by 2015. The program does so by using energy efficient technologies in Clean Water State Revolving Fund financed projects. The New York Clean Water State Revolving Fund program is working with the New York State Energy Research and Development Authority to offer programs designed to assist municipalities in making sound energy decisions about their water and wastewater treatment facilities. These include support for customized energy evaluations through the FlexTech program, capital incentives for the installation of energy-efficient equipment and processes through the Existing Facilities program, and support for developing and demonstrating innovative technologies.

The New York State Department of Environmental Conservation, Department of Health, the Environmental Facilities Corporation, and the New York State Energy Research and Development Authority were charged by their respective commissioners/chairpersons with incorporating smart growth and energy efficiency into the administration of the Clean Water and Drinking Water State Revolving Fund. A workgroup representing these agencies examined how financing for water quality infrastructure can be better utilized to support and promote smart growth and energy efficiency in New York State.

**In the spotlight:**

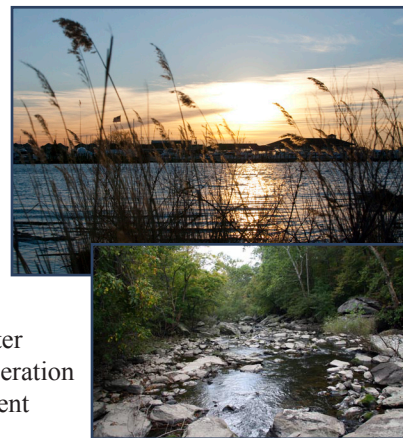
Through the Climate Ready Estuaries program, the Partnership for the Delaware Estuary in EPA Regions 2 and 3 has continued its efforts to incorporate ecosystems services impacts and implement a methodology for identifying and valuing the ecological impact of sea level rise in the Delaware Estuary.

Additional information on EPA Region 2's climate change activities can be found at: <http://www.epa.gov/region2/climate/> or contact Patricia Pechko, e-mail: [pechko.patricia@epa.gov](mailto:pechko.patricia@epa.gov); phone: (212) 637-3796.

## EPA Region 3

EPA Region 3 has focused their water and climate change programs on outreach to wastewater and water treatment plants by conducting multiple workshops on energy and water use for water/wastewater infrastructure. In cooperation with the U.S. Department of Energy, Region 3's

Underground Injection Program has been working with energy companies on permit requirements for the construction and operation of coal bed sequestration sites.



Region 3's Water Protection Division commenced a "Net Zero Energy" initiative for fiscal year 2011. The Initiative is designed to address the increased energy requirements of upgraded wastewater treatment facilities being designed for nutrient removal.

The initiative consists of three phases:

- Operations optimization – The Region is evaluating the use of a computer model that can predict the wastewater effluent pollutant concentrations based on the plant's operation. This will allow the operator to experiment with "what if" energy saving scenarios without risking a water quality violation.
- Energy monitoring – The Region is providing technical assistance and promoting the use of ENERGY STAR's Portfolio Manager to help facilities become aware of and benchmark their energy use.
- On-site generation – The Region is working to become a resource for on-site energy generation by collecting and distributing information on new technologies that can make a facility self-sufficient. The Region will be following facilities that are making that commitment.

Region 3's WaterSense program participated in a number of outreach activities in an effort to educate consumers about the importance of water efficiency, helping Americans reduce their water use and utility bills. A total of 17 new WaterSense promotional partners joined the program as a result of this outreach effort.

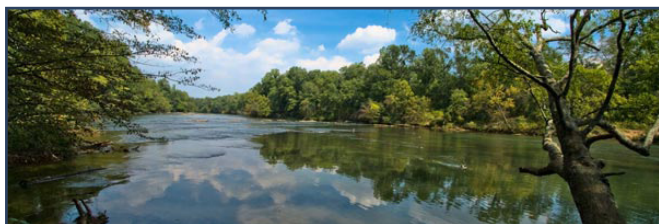
The Region has also begun developing a cross-program climate change strategy that will be ready for review in 2012.

For additional information regarding EPA Region 3's water and climate programs, visit: <http://www.epa.gov/region03/index.htm> or contact Joe Piotrowski, e-mail: [piotrowski.joe@epa.gov](mailto:piotrowski.joe@epa.gov); phone: (215) 814-5715.

## EPA Region 4

EPA Region 4 has focused their climate change and water work in three key areas: developing capacity and working with partners to reduce energy and water demand at water and wastewater facilities; promoting adaptation efforts with coastal partners; and, undertaking efforts to assess and regulate geologic sequestration of carbon dioxide.

Region 4 has continued to build internal capacity to assist water/wastewater facilities in the assessment of energy use and ways to reduce energy and water demand. The Region has established a Tennessee Water & Wastewater Utility Partnership that includes the Tennessee Department of Environment and Conservation, Tennessee Valley Authority, and Schneider Electric. The partnership will be conducting energy assessments and benchmarking. The goal is for each participating utility to have a specific energy management plan including specific energy conservation measures, financing plan, and implementation schedule. The Region is also developing green infrastructure training workshops, conducting site visits regarding state revolving fund green infrastructure projects and establishing a green infrastructure demonstration project for Jacksonville, Florida.



Region 4 is working cooperatively with four other federal agencies to support North Carolina's efforts to develop a climate strategy for the State. In addition, Region 4 is working in North Carolina with EPA's Office of Policy to implement a memorandum of understanding signed by EPA and the Federal Emergency Management Agency in 2010 to incorporate climate science, climate adaptation and smart growth principles into the Federal Emergency Management Agency pre-disaster planning process.

Region 4 has funded "Climate Change Vulnerability and Adaptation Opportunities for Salt Marsh Types in Southwest Florida" through a Regional Wetlands Program grant to the Southwest Florida Regional Planning Council. The salt marsh mapping data sets have been collected and are being evaluated.

Region 4 has been evaluating climate change and sea level rise and their potential impacts to the Florida Keys and the

**In the spotlight:** EPA Region 4 has funded a completed vulnerability assessment for Southwest Florida. The Region has supported adaptation planning for coastal communities through completion of nine National Estuary Program Climate Ready Estuary projects. In addition, the Region's National Estuary Programs have been selected for funding of three additional Climate Ready Estuary projects. The Region is specifically working with stakeholders to address sea level rise in Florida and North Carolina.

coral reef ecosystem through the Water Quality Protection Program for the Florida Keys National Marine Sanctuary.

The Region has continued reviewing permit applications and issuing underground injection control permits for carbon dioxide sequestration pilot projects in underground injection control direct implementation States.

Region 4 has also been coordinating water program climate change activities through a divisional workgroup and through national and regional climate change workgroup support.

For additional information regarding EPA Region 4's water and climate programs, visit: <http://www.epa.gov/region4/water> or contact Bob Howard, e-mail: [howard.bob@epa.gov](mailto:howard.bob@epa.gov), phone: (404) 562-9370.

## EPA Region 5

EPA Region 5 has been addressing climate change through a variety of mitigation and adaptation efforts. The Region's Water Division has focused on several 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. The Region has also worked on several activities including evaluating opportunities to address climate change impacts at municipalities, sustainable water infrastructure, and emergency response planning.

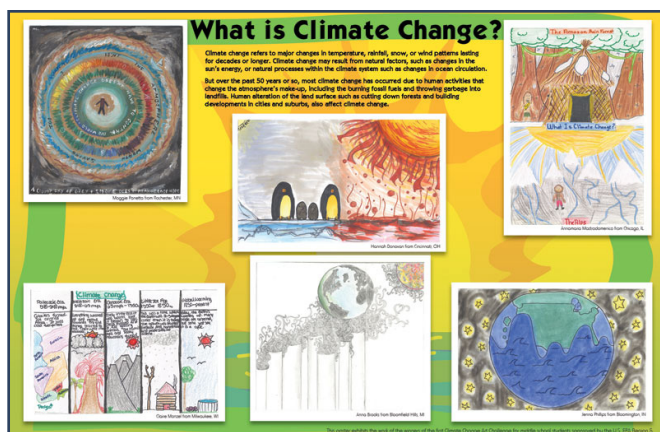
Region 5 recruited over 320 new WaterSense partners through various outreach activities and worked with existing partners on WaterSense fixture rebate programs, water conservation model ordinance language, and water efficiency retrofit options for large commercial buildings.

Region 5 was integral in finalizing the Safe Drinking Water Act and Clean Air Act rules for geologic sequestration, signed by EPA Administrator Lisa P. Jackson on November

**In the spotlight:** EPA Region 5 and the States have continued to work on National Pollutant Discharge Elimination System permits that include provisions to sustainably manage stormwater.



22, 2010 and published in the Federal Register in December 2010. (<http://water.epa.gov/type/groundwater/uic/class6/gsregulations.cfm#fr>).



Under the Great Lakes Restoration Initiative, Region 5 awarded several grants that will fund projects related to climate change adaptation, including modeling efforts to identify required pollutant reductions necessary to meet water quality standards, as well as downscaling climate prediction models for the Great Lakes region.

Region 5 has continued to conduct outreach, promote research, and share data on practices to foster green infrastructure implementation. Region 5 and the EPA Great Lakes National Program Office continued to implement an awards program that recognizes sites and projects that are exemplary in terms of native landscaping and green infrastructure. In addition, Region 5 is actively working with EPA Headquarters on a storm water rulemaking that is expected to expand green infrastructure implementation.

EPA, the U.S. Department of Justice, and the State of Ohio have completed negotiations with a major regional sewer district in the Great Lakes Basin on a combined sewer overflow settlement and long-term control plan which requires that over 40 million gallons of wet weather flows be managed via green infrastructure. In addition, the settlement allows for substitution of “green” elements for planned “gray infrastructure” elements if an equivalent level of control will be achieved. The settlement also calls for the permittee to evaluate the co-benefits (e.g., community benefits) of green infrastructure implementation.

The Region 5 Sustainable Water Infrastructure Team has identified strategies to incorporate sustainable water infrastructure practices into core regulatory programs. Each branch in the Water Division has identified one or more ways to incorporate these practices into their core programs.

The Region hosted its fourth Water Security and Community Resiliency Conference in November 2010 which focused on water security and interdependencies of the food processing industry.

EPA Region 5 continued outreach and technical assistance efforts with state and local partners in 2011, as well as work to incorporate climate change activities into daily programs. For additional information, visit: <http://www.epa.gov/r5water/>, <http://www.epa.gov/r5climatechange/> or contact: Kate Balasa, e-mail: [balasa.kate@epa.gov](mailto:balasa.kate@epa.gov); phone: (312) 886-6027.

## EPA Region 6

EPA Region 6 completed the development of a “Clean Energy and Climate Change Strategy” (<http://www.epa.gov/region6/climatechange/strategy.htm>) through internally surveying employees, researching other EPA Regions and state and local efforts, and analyzing the Region’s carbon sources by State. The Strategy prioritizes activities across four, action-oriented categories including: conserving energy and resources; reducing greenhouse gases; adapting to climate change impacts; and, promoting clean and renewable energy sources. Goals 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 to employ them with our partners.

**In the spotlight:** EPA Region 6 developed and maintains a web page (<http://www.epa.gov/region6/climatechange/>) to disseminate information and educational materials to stakeholders on climate change topics.

In implementing the “Clean Energy and Climate Change Strategy,” Region 6 intends to enhance collaborative partnership efforts with States and Tribes, local governments, the private sector, and the public at large to leverage resources in achieving identified goals.

Region 6 has participated in several intensive interagency Gulf of Mexico coastal partnerships, which are focusing on climate change and sea level rise resiliency through landscape scale coastal restoration. The Region continues to provide technical assistance to the U.S. Army Corps of Engineers in an unprecedented coastal construction project that is part of post-Hurricane Katrina hurricane and flood damage risk reduction work. As a key participant in the Gulf Coast Restoration Task Force, the Region is engaged in producing an implementation strategy that will incorporate sea level rise adaptation and mitigation measures. Similarly, project management and coastal adaptation technical assistance are being provided through the Coastal Wetlands, Planning, Protection and Restoration Task Force and the Gulf Alliance. In addition, coastal habitat vulnerability assessments and sea level rise adaptation planning are

supported through three National Estuary Programs for the Houston/Galveston area and the Coastal Bend of Texas, as well as for the Barataria and Terrebonne basins of Louisiana.

Region 6 has been committed to meeting these challenges and positioning itself as a leader in addressing climate change impacts, using its role as a regional environmental leader to promote innovative approaches to clean energy and greenhouse gas emission reductions. The Region 6 climate change website presents basic information about climate change, how it is predicted to affect the Region 6 States (Arkansas, Louisiana, Oklahoma, New Mexico, and Texas), and what the public can do to help.

For additional information regarding EPA Region 6's water and climate programs, visit: <http://www.epa.gov/region6/climatechange/water.htm> or contact Jim Brown, e-mail: [brown.jamesr@epa.gov](mailto:brown.jamesr@epa.gov); phone: (214) 665-3175.

## EPA Region 7

EPA Region 7's water and climate change work emphasized mitigation with activities that included improving energy management and water conservation by promoting the WaterSense program, promoting green infrastructure, and supporting carbon sequestration research and development.

Region 7 started the first Missouri Water Utilities Partnership in 2008 with seven pilot communities. These communities have begun to collectively reduce electricity use in Missouri by more than eight million kilowatt hours per year and reduce greenhouse gas production by 16 million pounds per year. Two additional partnerships in Missouri and Kansas were formed in 2011. The second Missouri Water Utilities Partnership includes seven water or wastewater utilities in Missouri. The Kansas Water & Energy Partnership is getting started with nine communities in the Wichita, Kansas area.

Region 7 partners include universities (including the Wichita State Environmental Finance Center), state government, energy providers, and energy service corporations. Their approach includes ENERGY STAR Portfolio Manager scoring, site visits, participant commitment in writing,



energy management plans, case study development, press coverage of results, and peer mentoring. Through their efforts, the Region has learned that initial site assessments are very important to spark utilities interests. Energy service companies and energy utilities can provide support for energy audits.

**In the spotlight:** The Missouri Water Utilities Partnership worked cooperatively with EPA to initiate the first Missouri Energy Management Initiative for water and wastewater utilities in eight communities in fiscal year 2010. The partners assisted communities in tracking their individual energy use, prioritizing energy saving opportunities, identifying funding options, developing communication networks, evaluating renewable energy options, and developing near and long term plans for energy management. These communities will collectively reduce electricity use in Missouri by more than eight million kilowatt hours per year and reduce greenhouse gas production by 16 million pounds per year. EPA Region 7 will work with the Missouri University of Science and Technology to develop case studies and initiate another round of pilot projects focused on energy and water efficiency.

Region 7 continued to provide support for green infrastructure nationally, and on the local level Region 7 supported the EPA Office of Research and Development Green Solutions Project in Kansas City, Missouri, particularly in developing and implementing a community engagement and green infrastructure demonstration program for private properties in the study area. A contractor was hired to complete eight rain gardens, 20 down spout disconnects and install 20 rain barrels. The contractor also provided significant community involvement support. A press conference was conducted which garnered strong media attention and news articles.

Region 7 also continues to recruit WaterSense partners. In 2011, seven new members in Region 7 joined the WaterSense program.

For additional information regarding EPA Region 7's water programs, visit: <http://www.epa.gov/region7/water/index.htm> or contact Mary Mindrup, e-mail: [mindrup.mary@epa.gov](mailto:mindrup.mary@epa.gov); phone: (913) 551-7431.

## EPA Region 8

EPA Region 8 has continued to facilitate climate change mitigation activities by providing comments on the National Environmental Policy Act evaluations for projects including water development and major oil and gas drilling projects. In addition, voluntary programs such as ENERGY



STAR, WasteWise, SmartWay, and the Federal Electronics Challenge were actively supported by the Region.

The climate change coordinator and team have developed a regional strategy to incorporate adaptation into each of the existing programs within the region. The internal planning process has been completed, identifying and prioritizing 97 climate change adaptation activities in 12 different program areas.



The water and ecosystem protection programs have focused efforts on the following adaptation activities:

- Encouraging water and wastewater utilities to consider and plan for a full range of climate change scenarios in their water infrastructure planning;
- Planning for the potential of decreased water availability due to climate change, through the National Environmental Policy Act review of energy development projects; and
- Encouraging consideration of the effectiveness and suitability of different water storage options under a range of climate scenarios, including natural water storage areas and wetlands that are essential for natural water recharge, through the National Environmental Policy Act review of water supply projects.

For additional information about EPA Region 8's climate change programs, visit: <http://www.epa.gov/region8/climatechange/> or contact Carol Russell, or Laura Farris, e-mail: [russell.carol@epa.gov](mailto:russell.carol@epa.gov), or [farris.laura@epa.gov](mailto:farris.laura@epa.gov); phone, respectively: (303) 312-6310 or (303) 312-6388.

**In the spotlight:** EPA Region 8 has been encouraging wastewater utilities to evaluate how extreme weather events could affect treatment operations and infrastructure, and how green infrastructure could mitigate these affects by coordinating with emergency preparedness and response staff.



## EPA Region 9

EPA Region 9's primary focus has been on promoting sustainable infrastructure, especially through water and energy efficiency at water and wastewater facilities. This has been accomplished through developing tools, conducting workshops and webinars,

**In the spotlight:** EPA Region 9 has the only EPA website dedicated to water recycling focusing on recycled water from centralized wastewater treatment facilities ([www.epa.gov/region9/water/recycling/](http://www.epa.gov/region9/water/recycling/)). The website was recently expanded to include gray water reuse from residential homes.

benchmarking classes, and providing energy audits. Over 500 facilities have attended eight workshops held in each State in Region 9, and 45 have been benchmarked using the ENERGY STAR Portfolio Manager. A water infrastructure website (<http://www.epa.gov/region09/waterinfrastructure>) provides case studies of successful energy and water efficiency, conservation, and generation projects. The sustainable infrastructure program has also been promoting green infrastructure projects through the State Revolving Fund program, American Recovery and Reinvestment Act funding, and special appropriations grants using a Nation Environmental Policy Act checklist developed by Region 9. The Region has supported green infrastructure practices through municipal separate stormwater system (MS4) permits.

In partnership with the U.S. Army Corps of Engineers, the California Department of Water Resources, and the EPA Office of Research and Development, Region 9 drafted a manual to assist California local governments and water agencies to consider climate change in the development of their Integrated Regional Water Management Plans. The draft "Climate Change Handbook for Regional Water Planning" was released for comment in May 2011 and was finalized in Fall 2011.

The Region developed a "Cities for Climate Action" pilot program, beginning with six cities/counties. The multi-media effort to partner with local government on their

greenhouse gas reductions is designed to provide a “one-stop-shop” for accessing EPA resources and technical assistance.

Regions 2, 3, and 9 held a bi-coastal workshop in June 2010 to identify needed research and decision-making tools for local adaptation programs.

On September 15, 2010 a Region 9 employee received one of eight Service to America medals awarded to federal employees nationwide each year, recognizing her work to develop green building and recycling initiatives that reduce greenhouse gas emissions through innovative building and product design. A new field, Climaterials, was named to reduce pollution through designing materials from cradle to grave.



In November 2010, the Region 9 multi-media Biogas Workgroup released two new tools to help wastewater treatment facilities and dairies expand biogas production at their facilities:

1. Waste to Biogas Mapping Tool (<http://134.67.99.137/myenvtools/biogas/index.html>); and
2. Co-Digestion Economic Analysis Tool (<http://www.epa.gov/region9/organics/coeat/index.html>).

Region 9 developed “EPA Recommended Green Practices for Federally Funded Projects” (<http://www.epa.gov/recovery/recommendations.html>) 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.

Other activities underway include: supporting the Climate Ready Estuaries program for San Francisco Bay; supporting the Region’s climate change speaker series; and participating on California’s Water/Energy Team to implement the State’s climate change legislation. The Region recently adopted a Zero Waste and Carbon Neutral Policy for Regional operations, with a schedule of activities to meet its ambitious goal by 2012.

For additional information regarding EPA Region 9’s climate change programs, visit: <http://www.epa.gov/region09/climatechange/> or contact Cheryl McGovern, e-mail: [mcgovern.cheryl@epa.gov](mailto:mcgovern.cheryl@epa.gov); phone: (415) 972-3415.

## EPA Region 10

EPA Region 10 has been focused on improving energy efficiency at water and wastewater utilities, implementing the WaterSense program, and encouraging its national estuaries to become part of the Climate Ready Estuaries program. The Region has continued to build partnerships with other federal agencies that are working on climate change adaptation strategies in the Region.

Region 10 has been promoting the WaterSense program internally and at public events. As of July 2011, Region 10 has 68 promotional partners and 21 irrigation partners.

Region 10 has been collaborating with EPA’s Office of Research and Development’s Regional Applied Research Effort researching the relationship of leachate, groundwater, and thawing permafrost in five tribal governments in rural Alaska. The Tribes are White Mountain, Ekwok, Alakaket, Eek and Fort Yukon. This is a collaborative research effort featuring active partnerships with the tribal participants, the University of Alaska, Rural Alaska Community Action Program, and Agency for Toxic Substances and Disease Registry. When sampling is concluded, results will be released first to the tribal partners, then externally.

The Region has been actively partnering with other federal agencies working in the Pacific Northwest on climate change adaptation research and adaptation strategies and is part of the Pacific Northwest Climate Change Collaboration which meets regularly to share information regarding climate change work and research.

The Lower Columbia River Estuary Partnership and the Puget Sound Partnership received Climate Ready Estuary funds to incorporate climate change into their Comprehensive Conservation and Management Plans. The Puget Sound Partnership is receiving additional technical assistance to develop climate change indicators and climate-

**In the spotlight:** EPA Region 10 has been participating in five new Landscape Conservation Cooperatives (LCCs) launched by the U.S. Department of Interior (<http://www.doi.gov/lcc/index.cfm>). (There will eventually be 7 LCCs launched within Region 10’s boundaries, including five in Alaska.) The Landscape Conservation Cooperatives are management-science partnerships that inform resource management actions and provide needed tools to better understand climate change impacts and other landscape level stressors in the Region.



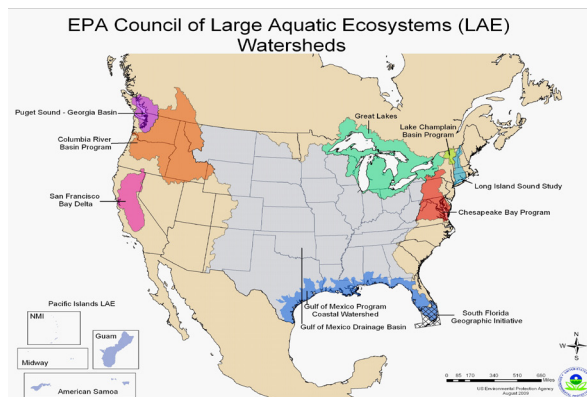


*Courtesy of Washington Department of Fish and Wildlife*

sensitive habitat restoration guidance. Tillamook Estuary Partnership will receive technical assistance in the form of an assessment of likely climate change impacts in the Tillamook Estuaries Partnership study area. This report will be used for local environmental education, to engage with stakeholders, and to assist with the potential update of its Comprehensive Conservation and Management Plan.

Region 10, in partnership with the Oregon Association of Clean Water Agencies, Energy Trust of Oregon, Zero Waste Alliance, and Bonneville Power Administration, worked with a group of 13 wastewater utilities striving to become energy independent using a comprehensive approach of management systems, energy efficiency tools, renewable energy technologies, climate action planning, and financing. While it is premature to identify energy and cost savings, the participants were excited by the program and are implementing what they have learned. Region 10 is now working with Zero Waste Alliance, Northwest Energy Efficiency Alliance, the Bonneville Power Administration, Washington State University Extension Energy Program, Washington Energy Services and others to develop a cohort of Washington drinking water and wastewater utilities to go through the energy management training program.

To learn more about EPA Region 10's water and climate change programs, visit: <http://yosemite.epa.gov/r10/water.nsf/homepage/water>, <http://yosemite.epa.gov/R10/ECOCOMM.NSF/climate+change/cc> or contact Paula VanHaagen, e-mail: [vanhaagen.paula@epa.gov](mailto:vanhaagen.paula@epa.gov); phone: (206) 553-6977.



## Large Aquatic Ecosystem Programs

The Council of Large Aquatic Ecosystems was created by EPA in 2008. The ten geographically-placed program members focus on protecting and restoring the health of critical aquatic ecosystems. The Council seeks to merge geographically-based efforts with national water programs to advance the health of the Nation's large aquatic ecosystems and strengthen national water programs.

For more information about climate change and EPA's Large Aquatic Ecosystem programs, please visit: [http://water.epa.gov/aboutow/owow/programs/large\\_aquatic.cfm](http://water.epa.gov/aboutow/owow/programs/large_aquatic.cfm).

## Chesapeake Bay

The Chesapeake Bay Protection and Restoration Executive Order 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. The Executive Order also required the development of an annual Chesapeake Bay Action Plan, describing how federal funds will be used to protect and restore the Bay. The first annual Action Plan was released for fiscal year 2011 and focused on four goal areas: restore water quality, recover habitat, sustain fish and wildlife, and conserve land and increase public access. Responding to climate change was identified as one of four supporting strategies.

In fiscal year 2011, the National Oceanic and Atmospheric Administration and the U.S. Geological Survey worked to establish mechanisms to ensure the results of federal agency climate efforts were delivered to States and communities to support implementation of adaptation work by Bay partners. Federal agencies focused on providing managers with updated assessments of risks from a range of potential climate effects on specific locations and resources in the Bay and watershed. Small demonstration projects are also underway in Maryland and Virginia which will provide credible, science-based information to inform management decisions and local solutions. The Fiscal Year 2011 Action Plan is available at: <http://executiveorder.chesapeakebay.net/category/Reports-Documents.aspx>.

## Columbia River Basin

The Columbia River Basin Large Aquatic Ecosystem has been focused on toxics reduction for human health and ecosystem protection and restoration. Toxics reduction actions through tributary restoration efforts may mitigate future climate change impacts.

For additional information, visit: [www.epa.gov/region10/columbia](http://www.epa.gov/region10/columbia).

## Great Lakes Program

The Great Lakes Program's primary focus regarding climate change has been on a multi-agency effort to coordinate federal work under the Great Lakes Restoration Initiative on impacts and adaptation information. In 2010, the agencies focused on a small number of 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 value in the Great Lakes Restoration Initiative performing the work instead of other partners. These projects focused 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. Looking forward, the agencies are concentrating on integrating sensitivity to the implications of climate change on the Great Lakes into all appropriate Great Lakes Restoration Initiative programs and projects.

For additional information on the Great Lakes Restoration Initiative, please visit: <http://www.epa.gov/glnpo/glri/>.

## Gulf of Mexico Program

Building on successes of the first Governors' 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 four major challenges to healthy and resilient communities in the Gulf of Mexico region: sustaining the Gulf economy; improving ecosystem health; mitigating the impacts of, and adapting to, climate change; and mitigating harmful effects to coastal water quality.

The specific actions provided in the Governors' Action Plan II present 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. Recent accomplishments include:

- A publication from Louisiana Sea Grant, "Hazard Mitigation and Land Use Planning in Coastal Louisiana: Recommendations for the Future" (<http://www.lsu.edu/sglegal/pdfs/CompPlanningReport.pdf>); and
- The National Oceanic and Atmospheric Administration's Storm Surge Partnership Project.

For additional information on the specific actions planned by the Gulf of Mexico Alliance's Coastal Community Resilience Team, visit: <http://gulfofmexicoalliance.org/issues/resilience.html> or contact Phil Bass, e-mail: [Phil.Bass@gomxa.org](mailto:Phil.Bass@gomxa.org); phone: (228) 523-4014; or Laura Bowie, e-mail: [Laura.Bowie@gomxa.org](mailto:Laura.Bowie@gomxa.org); phone: (228) 523-4013.

Additional information on the Gulf of Mexico program can be found at: <http://www.epa.gov/gmpo/>.

## Lake Champlain

The Lake Champlain Large Aquatic Ecosystem works closely with the Lake Champlain Basin Program, 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. The Lake Champlain Basin Program developed an Action Plan, which includes addressing a changing climate. Efforts focus on:

- Examining appropriate climate change scenarios for the Lake Champlain Basin;
- Adjusting management strategies as needed to reflect predictions from climate change scenarios;
- Developing adaptation strategies to minimize adverse ecological outcomes; and
- Expanding public education programs to improve climate change literacy.

Additional information regarding the Lake Champlain Basin Program can be found at: <http://www.lcbp.org>. For more information on EPA's Lake Champlain program, contact: Erik Beck, e-mail: [beck.erik@epa.gov](mailto:beck.erik@epa.gov); phone: (617) 918-1606.

**In the spotlight:** In partnership with the Gulf of Mexico Alliance, Texas Sea Grant published "The Resilient Coast: Policy Frameworks for Adapting The Built Environment to Climate Change and Growth in Coastal Areas of the U.S. Gulf of Mexico," available at: [http://www.urban-nature.org/publications/documents/TheBuiltEnvironment08-sm\\_000.pdf](http://www.urban-nature.org/publications/documents/TheBuiltEnvironment08-sm_000.pdf).



## Long Island Sound Study

The Long Island Sound Study received a Partner Startup Grant and a Direct Technical Assistance Grant through EPA's Climate Ready Estuaries program. The Partner Startup Grant was used to develop a coastal climate adaptation plan for the town of Groton, Connecticut. The Direct Technical Assistance Grant was used for a project titled "Climate Change Vulnerability Assessment for Long Island Sound via Sentinel Monitoring." The objective of this project was to develop a monitoring strategy to quantify the impacts of climate change on Long Island Sound, as well as to assess the Sound's vulnerability to those impacts. Identified indicators will be used to direct priorities for adaptation planning by the States of Connecticut and New York, local municipalities, and other partner organizations. "The Sentinel Monitoring for Climate Change in the Long Island Sound Estuarine and Coastal Ecosystems and Connecticut, Volume I" was released in spring 2011.

The climate adaptation plan developed by the Long Island Sound Study, in partnership with the International Council for Local Environmental Initiatives (ICLEI) - Local Governments for Sustainability, Connecticut Department of Environmental Protection, and the town of Groton, defines the roles of the various levels of government in climate adaptation. The partners lead workshops and established four workgroups on infrastructure, natural resources and ecological habitats, agriculture, and health. The effort was designed to complement the town's ongoing sustainability and development planning and to engage representatives from federal, state, and municipal governments in adaptation planning. The workshops were intended to identify and gain local support for the specific steps that Groton (or a similar community) would need to take to adapt to climate change and clarify roles of citizens as well as local, state, and federal levels of government to implement the plan. The workshops were also designed to test how stakeholders would respond to various presentations from local and national technical experts and planners, as a potential model for other local governments and adaptation initiatives.

A presentation on the final recommendations has been made to the town of Groton and a final report was completed. A follow-up project has since been initiated to create a climate change toolbox for local governments interested in adaptation planning.

For additional information, please visit: <http://longislandsoundstudy.net/> or contact the EPA Long Island Sound Office at (203) 977-1541.

## 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.

The Office promoted water conservation and efficiency at public utilities through innovative State Revolving Fund projects.

The Pacific Islands Office co-sponsored the June 2009 Pacific Islands Environment Conference on Climate Change: Energizing a Sustainable Future for Pacific Islands. The conference, which took place on Saipan, Northern Mariana Islands, hosted sessions on various climate change and water issues including coral reef protection, adaptation strategies for Pacific Islands, and efficiency for water and wastewater services.

The Office also continued to work with the U.S. Department of Defense and other federal resource agencies to ensure efficient, renewable and sustainable practices are included in the military buildup on Guam. This included 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 Large Aquatic Ecosystem has been incorporating climate change strategies in both targeted scientific and technical studies, and in pollution prevention projects to preserve and restore Puget Sound ecosystem services. For example, EPA is supporting a project that will integrate numerical models for freshwater water flow into Puget Sound under different climate scenarios, which will drive a decision support system for resource managers. This project will allow Puget Sound communities and agencies to better predict what might happen to nearshore habitats, water quality, and marine resources under potential climate change scenarios.

EPA has been supporting work for Puget Sound pathogen pollution prevention programs that recognize the potential for increased frequency and duration of certain types of pathogen outbreaks due to climate change. Subsequently these pollution prevention programs utilize regular monitoring of weather impacts, as well as drawing from scientific modeling similar to the project described above.

As mentioned in the Region 10 section, the Puget Sound Partnership received Climate Ready Estuary funds to incorporate climate change into their Comprehensive Conservation and Management Plans. The Puget Sound Partnership also received an additional technical assistance contract to develop climate change indicators and climate-sensitive habitat restoration guidance.

The Puget Sound Partnership's action agenda calls for actions to adapt to and mitigate 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.

For additional information, please visit: <http://www.epa.gov/pugetsound/> or contact Chris Castner, e-mail: [Castner.Chris@epa.gov](mailto:Castner.Chris@epa.gov); phone: (206)553-6517.

## San Francisco Bay

EPA Office of Research and Development's Global Change Research Program completed a draft vulnerability assessment of San Francisco Bay's salt marsh and mudflat ecosystems, using a new methodology called expert elicitation. This was a pilot project under the Climate Ready Estuaries program and was done in coordination with the San Francisco Estuary Partnership, the Bay Conservation and Development Commission, and EPA Region 9, taking advantage of significant work already underway in the region, particularly on sea level rise.

EPA also administers a competitive grant program, the San Francisco Bay Water Quality Improvement Fund, to protect and restore San Francisco Bay. Several projects have been funded which support climate adaptation, including low impact development, wetlands restoration in areas prone to flooding, and watershed resiliency.



*Courtesy of San Francisco Estuary Partnership*

## South Florida

EPA has been working in partnership with several local, regional, state and federal agencies to address the issues surrounding the South Florida ecosystem. 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.

The South Florida region is one of the most vulnerable areas in the United States regarding the consequences of climate change and sea level rise. Rising seas threaten the infrastructure, beaches, reefs, wetlands, flora and fauna and drinking water supplies of a unique ecosystem home to more than five million residents and supporting a multi-billion dollar economy.

Recognizing the threat to the only barrier reef in the continental United States, the National Oceanic and Atmospheric Administration and its partners developed a "Climate Change Action Plan for the Florida Reef System for 2010 – 2015" (<http://frfp.org/SLR%20documents/FL%20Reef%20Action%20Plan-WEB.pdf>). The plan calls for increasing reef resilience by providing research to identify the risks posed by climate change and developing strategies to minimize those risks.

The Nature Conservancy produced a report entitled "Initial Estimates of the Ecological and Economic Consequence of Sea Level Rise on the Florida Keys through the Year 2100" (<http://frfp.org/SLR%20documents/FINAL%20-%20Aug%2021%20-WITH%20COVER.pdf>). Findings from the study are being actively communicated to agencies, local governments, and citizens throughout the Keys.

Broward, Miami-Dade, Palm Beach and Monroe Counties have committed to working together to develop a Southeast Florida Regional Climate Change Action Plan.

For additional information, please visit: <http://www.epa.gov/region4/water/southflorida/> or contact Steve Blackburn, e-mail: [blackburn.steven@epa.gov](mailto:blackburn.steven@epa.gov); phone: (404) 562-9397.

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*For additional information or questions related to U.S. EPA National Water Program climate change activities, send an email to: [water\\_climate\\_change@epa.gov](mailto:water_climate_change@epa.gov).*