



# Climate Ready Estuaries

## Ten Year Progress Report, 2008-2018



Cover photograph of the Piscataqua River, © Daine Doucett.  
Used with permission.



# Ten years of helping coastal communities prepare for and adapt to climate change

In 2008 a handful of coastal communities were beginning to grapple with the impacts that climate change would have on their livelihoods, built infrastructure, natural resources, and economic wellbeing. Studies were being published pointing to the importance of anticipating and addressing threats related to climate change in the coastal environment. Prompted to get ahead of the curve, state and local scientists and practitioners sought the EPA's expertise.

Climate Ready Estuaries was born to provide the technical and financial assistance that were needed. It was the first federal program that focused exclusively on climate adaptation. It was designed specifically to help local communities understand and anticipate coastal problems. Through the development of practical and risk-based climate adaptation tools and strategies, the EPA sought to show how the climate assessment literature could be used in coastal watershed management.

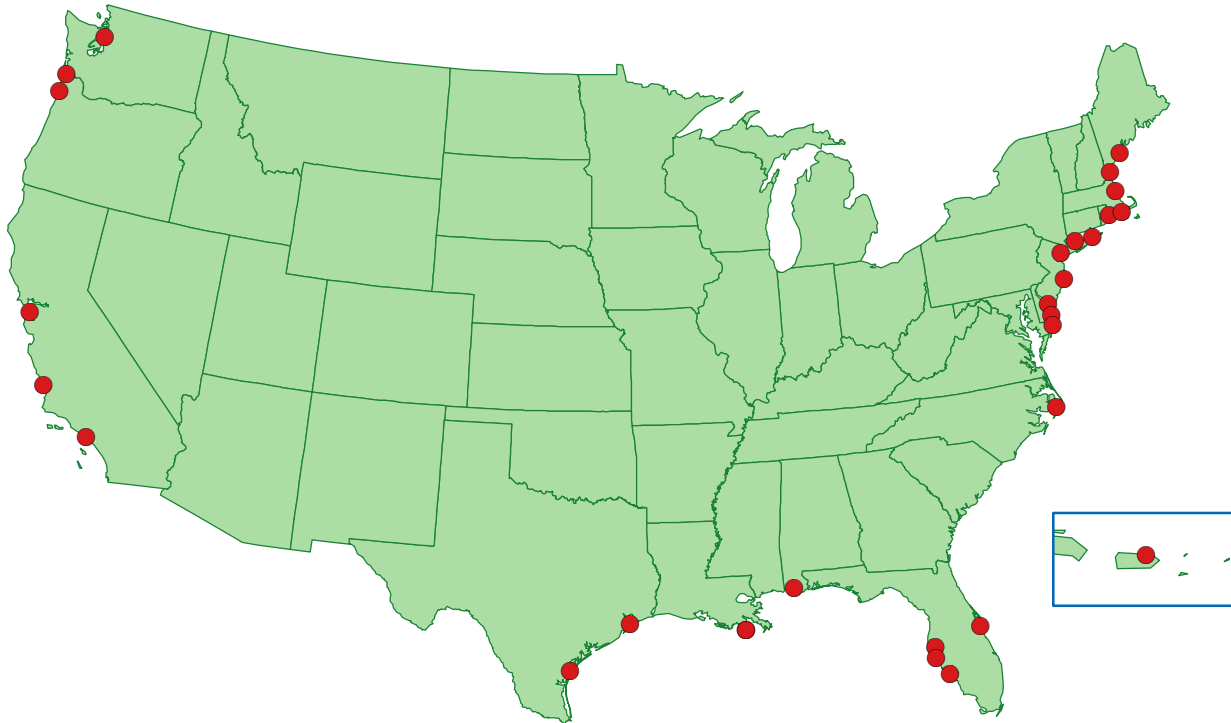
Coasts and estuaries are vital resources. Because we love and depend on these places, over half of the U.S. population lives within 100 miles of a coast, including the shores of estuaries. The pressures on these environments are significant, however, and the impacts to the blue economy considerable. Coasts already face many stressors including: large and growing human populations; degradation of habitat and water quality; high loads of nutrient, pathogen and sediment contaminants that are detrimental to aquatic life and recreation in and on the water; deterioration of fish and wildlife health that have an adverse impact on commercial

and subsistence fishing; and natural hazards such as storms and hurricanes—and these are all exacerbated by climate changes.

This report describes the accomplishments of Climate Ready Estuaries during the past ten years in working with coastal communities in the National Estuary Program. Overall, the focus during that time was to conduct vulnerability assessments for climate change and begin to address risks. EPA's National Estuary Program is a non-regulatory, place-based program to protect and restore the water quality and ecological integrity of estuaries of national significance. The 28 estuaries are located along the Atlantic, Gulf of Mexico, and Pacific coasts and in Puerto Rico. Each National Estuary Program has a study area that includes the estuary and surrounding watershed. A National Estuary Program's priorities are decided together by local, city, state, federal, private and non-profit stakeholders.

In 2018, EPA celebrates the achievements of Climate Ready Estuaries and the National Estuary Programs. The National Estuary Programs are important EPA partners and National Estuary Program communities are more prepared now than they were when Climate Ready Estuaries was formed ten years ago. In the future, the goals of the program will continue to be to assess coastal vulnerabilities, develop and implement hazard adaptation strategies, and engage with and educate stakeholders on the importance of addressing coastal challenges. There was and remains a need for the EPA to respond to the needs of our partners and support the blue economy.

# National Estuary Programs



## Pacific

- Puget Sound Partnership (Wash.)
- Lower Columbia Estuary Partnership (Wash./Ore.)
- Tillamook Estuaries Partnership (Ore.)
- San Francisco Estuary Partnership (Calif.)
- Morro Bay National Estuary Program (Calif.)
- Santa Monica Bay Restoration Commission (Calif.)

## Gulf of Mexico

- Coastal Bend Bays & Estuaries Program (Texas)
- Galveston Bay Estuary Program (Texas)
- Barataria–Terrebonne NEP (La.)
- Mobile Bay National Estuary Program (Ala.)
- Tampa Bay Estuary Program (Fla.)
- Sarasota Bay Estuary Program (Fla.)
- Charlotte Harbor National Estuary Program (Fla.)

## Atlantic

- Casco Bay Estuary Partnership (Maine)
- Piscataqua Region Estuaries Partnership (N.H.)
- Massachusetts Bays Program (Mass.)
- Buzzards Bay National Estuary Program (Mass.)
- Narragansett Bay Estuary Program (R.I.)
- Long Island Sound Study (Conn./N.Y.)
- Peconic Estuary Program (N.Y.)
- N.Y.–N.J. Harbor and Estuary Program (N.Y./N.J.)
- Barneget Bay Partnership (N.J.)
- Partnership for the Delaware Estuary (N.J./Pa./Del.)
- Delaware Center for the Inland Bays (Del.)
- Maryland Coastal Bays Program (Md.)
- Albemarle–Pamlico National Estuary Program (N.C.)
- Indian River Lagoon National Estuary Program (Fla.)
- San Juan Bay Estuary Program (P.R.)

# Resources for Environmental Managers

## Being Prepared for Climate Change family of products

---

*Being Prepared for Climate Change: A Workbook for Developing Risk-Based Adaptation Plans* (2014)

*Checklists of Potential Climate Change Risks, 1 ed.* (2014)

An online companion Risk Based Planning Tool, which includes five videos about workbook steps 1-5

### Videos

Climate Change Vulnerability Assessment for San Juan Bay, Puerto Rico (2015)  
<http://youtu.be/rdlWakSnvww>

Preparing for Climate Change in Eastern Long Island, New York (2015)  
<https://youtu.be/Pw--gmZacTY>

Being Prepared for Climate Change (2014)  
<https://youtu.be/Pw--gmZacTY>

### Blogs

Being Prepared for Climate Change: A Workbook for Developing Risk-Based Adaptation Plans (2016)  
<https://blog.epa.gov/blog/2016/08/ej-climate-ready-estuaries/>

Helping Communities Plan for Climate Change (2014)  
<https://blog.epa.gov/blog/2014/10/helping-communities-plan-for-climate-change/>

## Technical Reports

---

*Climate Change and Coastal Watersheds: Adaptation to Attain Clean Water Goals and Sustainable Coasts* (2012)

Vulnerability Assessments in Support of the Climate Ready Estuaries Program: A Novel Approach to using Expert Judgement (2012)

- *Volume I: Results for the San Francisco Estuary Partnership*
- *Volume II: Results for the Massachusetts Bays National Estuary Program*

*Climate Change Risk Management: CRE Adaptation Projects and the Risk Management Process* (2011)

*Rolling Easements* (2011)

*Synthesis of Adaptation Options for Coastal Areas* (2009)

## Lessons Learned

---

*Lessons Learned from the Climate Ready Estuaries Program: Southeastern U.S. Climate Ready Estuaries* (2014)

*Lessons Learned from the Climate Ready Estuaries Program: New England Climate Ready Estuaries* (2012)

*Lessons Learned from the Climate Ready Estuaries Program* (2011)

## Climate Ready Estuaries Progress Reports

---

*Ten-Year Progress Report* (2019)

*2012 Progress Report*

*2011 Progress Report*

*2010 Progress Report*

*2009 Progress Report*

## King Tide Blogs

---

Photography Tips for Citizen Scientists Capturing the 2015 King Tide  
<https://blog.epa.gov/blog/2015/10/photography-tips-for-citizen-scientists-capturing-the-2015-king-tide/>

King Tides and Sea Level Rise (2013)  
<https://blog.epa.gov/blog/2013/06/king-tides-and-sea-level-rise/>

King Tides and Sea Level Rise, Part 2 (2013)  
<https://blog.epa.gov/blog/2013/06/king-tides-and-sea-level-rise-part-2/>

King Tides and Sea Level Rise, Part 3 (2013)  
<https://blog.epa.gov/blog/2013/07/king-tides-and-sea-level-rise-part-3/>

A Peek into Our Future (2013)  
<https://blog.epa.gov/epplocations/2013/07/a-peek-into-our-future/>

"King Tides" for the U.S. State Dept's Our Planet blog (2012)  
<http://ourplanet.infocentral.state.gov/2012/09/19/king-tides/>



[www.epa.gov/cre](http://www.epa.gov/cre)

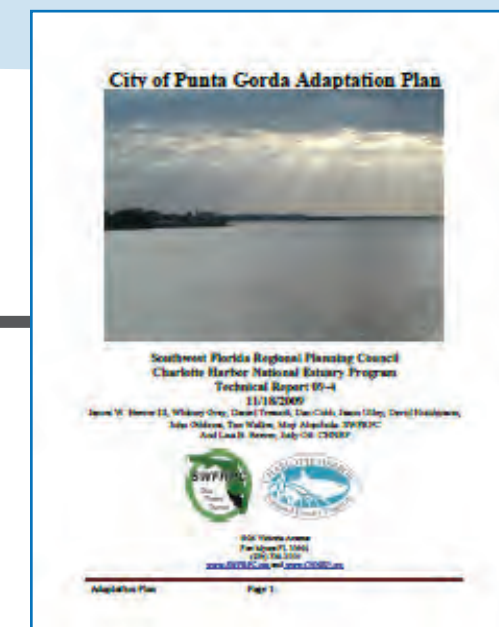


The Climate Ready Estuaries program works with the National Estuary Programs and the coastal management community to:

- Assess climate change vulnerabilities,
- Develop and implement adaptation strategies, and
- Engage and educate stakeholders.

CRE shares NEP examples to help other coastal managers, and provides technical guidance and assistance about climate change adaptation.

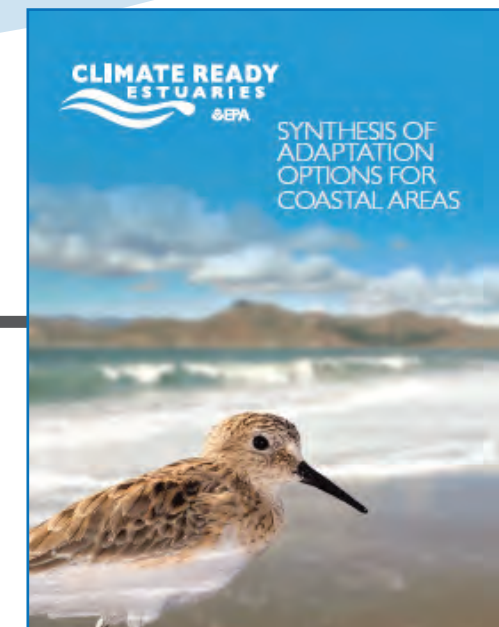
Highlights from Climate Ready Estuaries activities and published resources are in this 2008–2017 timeline of CRE's first ten years. Many of CRE's 72 National Estuary Program partnership projects to help restore and maintain the chemical, physical and biological integrity of these estuaries of national significance are also featured. The Climate Ready Estuaries website has more information about these activities and other products, [www.epa.gov/cre](http://www.epa.gov/cre)



**Charlotte Harbor NEP**  
City of Punta Gorda Adaptation Plan

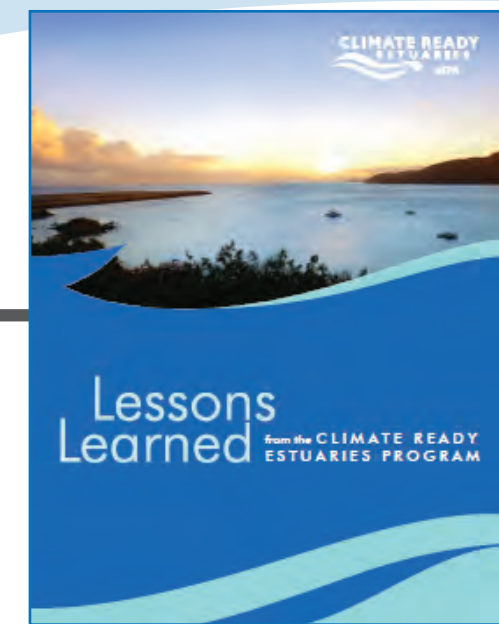


**2009**



**Synthesis & Toolkit**

Climate Ready Estuaries developed two resources to assist the National Estuary Programs and the broader coastal management community. The program compiled a Synthesis of Adaptation Options for Coastal Areas (2009) and launched an online toolkit. These were featured in National Academy of Sciences, White House and GAO reports as evidence of federal progress in helping local efforts. NOAA and USAID also included the Climate Ready Estuaries toolkit and the synthesis in their adaptation guides for stakeholders.



**Lessons Learned**

National Estuary Program partners were accumulating understanding and accomplishments that were the basis for three publications. The EPA issued lessons learned documents in 2011, 2012 and 2014 to spread awareness of what the National Estuary Programs were discovering about adaptation.

Lessons Learned from the Climate Ready Estuaries Program



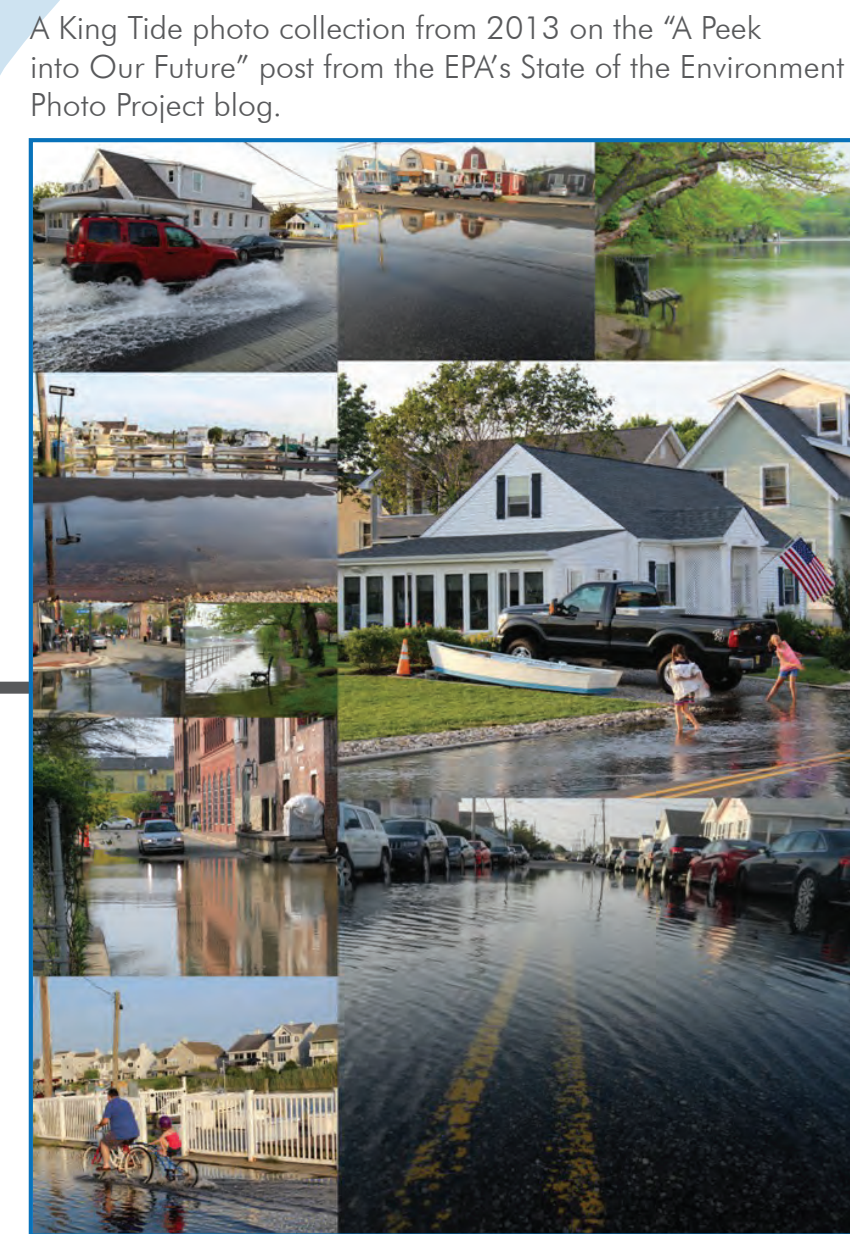
**2011**

**King Tides**

Sea level rise will make today's King Tides become the future's everyday tides.

The challenges of sea level rise are easily seen in many coastal towns and cities every month during spring tide flooding. Observing—and documenting—those occurrences was the idea behind the King Tide campaigns. A king tide is the highest tide of the year, and the high tide on that day gives people a glimpse of the future. In 2011, 2013 and 2015 National Estuary Programs on the Atlantic and Gulf shorelines joined with Climate Ready Estuaries in coast-wide efforts to take a picture of the future to raise awareness of the coming changes.

Several National Estuary Programs offered prizes for the best King Tide photo in their watersheds. Stories about National Estuary Program King Tide campaigns appeared in The New York Times, The Washington Post, NPR and numerous local newspapers and television news broadcasts.

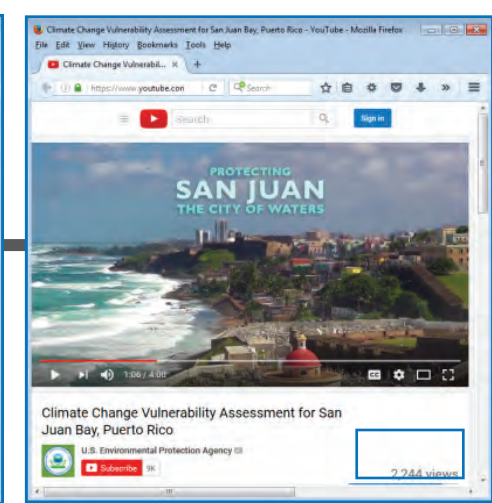
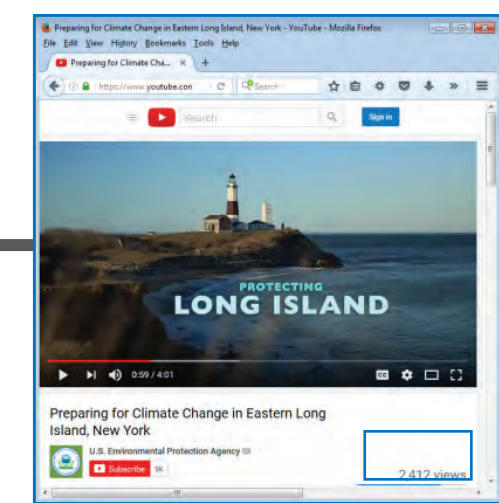


**The First Risk-Based Vulnerability Assessment**

San Juan Bay NEP's 2012 Climate Ready Estuaries project was a pilot test of the methodology that was coming together in the EPA's Being Prepared for Climate Change workbook. In 2013 they completed, Assessing the San Juan Bay Estuary Program's Vulnerabilities to Climate Change. This is the first broad, risk-based vulnerability assessment that was published. Their involvement improved the forthcoming workbook, and blazed a path that many other National Estuary Programs and place-based organizations are following.



**2013**



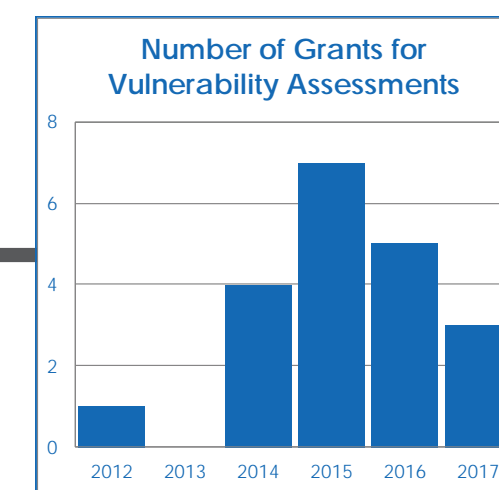
**Video success stories**

The EPA produced videos featuring the San Juan Bay Estuary Program and the Peconic Estuary Program to highlight the successes they were having in preparing for climate challenges. They explained why they are conducting a vulnerability assessment, what some climate change impacts are that already affect their communities, as well as some of the ways they are choosing to respond to their risks.



**San Juan Bay Estuary Program, NEP**

San Juan Bay Estuary Climate Change Adaptation Plan



**National Estuary Program Vulnerability Assessments**

The San Juan Bay Estuary Program's vulnerability assessment project ran from 2012 through 2013. By September 2014 other National Estuary Programs had started risk-based projects too. After the workbook was published in the fall of 2014, the EPA committed to helping all of the National Estuary Programs complete a broad, risk-based vulnerability assessment of their Comprehensive Conservation and Management Plans. This became the main Climate Ready Estuaries emphasis in 2015–2017. Workshops, a companion online tool, conference sessions, videos and webinars aided in the effort. By 2017 Climate Ready Estuaries had supported 25 of the National Estuary Programs vulnerability assessments through grants or direct technical assistance.

**2015**

**2008**

**Climate Ready Estuaries Launched**

The June 2008 press release that announced the initial Climate Ready Estuaries partnerships with six National Estuary Programs says,

*"Our aim is to build capacity for local decision makers and resource managers to help take pro-active, practical steps for bays at risk."*

It goes on,

*"The Climate Ready Estuaries effort will take the lessons learned from the pilots to provide information and leadership to other coastal communities around the nation. Under the Climate Ready Estuaries framework, EPA will use the 28 National Estuary Programs, Web-based resources and other means identified through the initial pilots to support local efforts in all of the nation's coastal communities to effectively plan and adapt to climate change."*



**Initial Partnerships & Workshops**

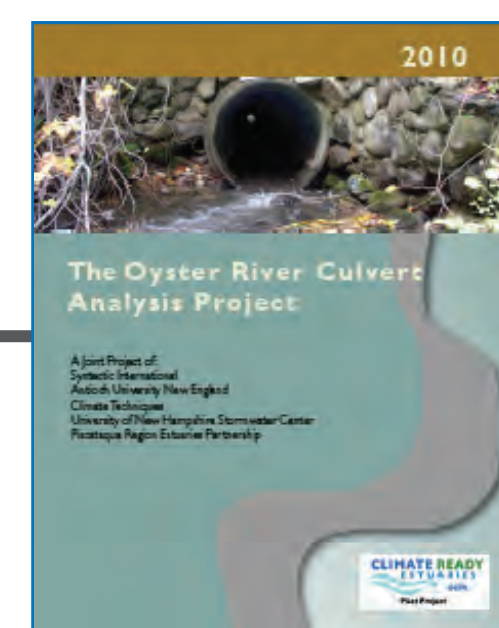
In 2008–2010 Climate Ready Estuaries began its initial National Estuary Program partnerships and hosted annual workshops.

The first projects in 2008 supported climate change adaptation with six National Estuary Programs. In June 2009 representatives from that class and a new group of 2009 National Estuary Program partners came together. They shared perspectives on impacts and coastal adaptation, and discussed benchmarking progress towards their own goals for adaptation.

Representatives from each program talked about their Climate Ready Estuaries project efforts, including lessons learned and initial successes. They also identified barriers, needs and opportunities facing Climate Ready Estuaries and their own estuaries.

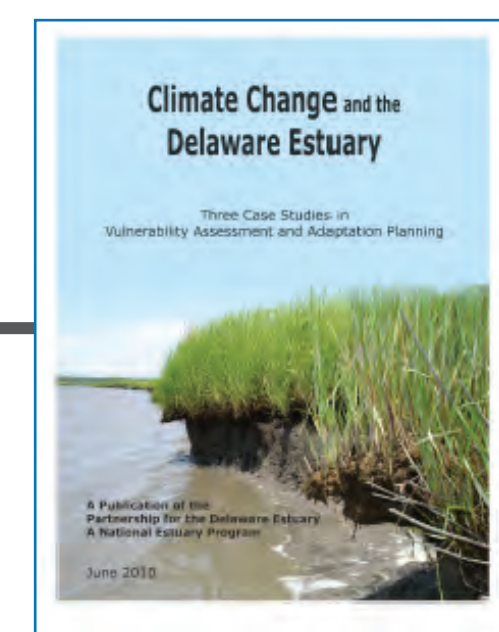
A year later, fourteen representatives from the 2008 pilot National Estuary Programs, 2009 partners and new 2010 National Estuary Program partners convened. EPA regional and headquarters staff, as well as representatives from Sea Grant and the National Estuarine Research Reserve System attended.

**2010**



**Piscataqua Region Estuaries Partnership, NEP**

The Oyster River Culvert Analysis Project



**Partnership for the Delaware Estuary, NEP**

Climate Change and the Delaware Estuary



**Other National Estuary Programs join in**

The Climate Ready Estuaries 2010 Progress Report related the experience and knowledge gained by the National Estuary Programs in their 2008 and 2009 projects.

Initial successes were a springboard for further achievement and were inspiring other National Estuary Programs to pay attention. By the third year, 2010, more than half of the National Estuary Programs had started a climate adaptation project with Climate Ready Estuaries support.

**2012**



**NY-NJ Harbor & Estuary Program, NEP**

Case studies in Sea Level Rise Planning: Public Access in the NY-NJ Harbor Estuary



**Casco Bay Estuary Partnership, NEP and Piscataqua Region Estuaries Partnership, NEP**

COAST in Action: 2012 Projects from Maine and New Hampshire

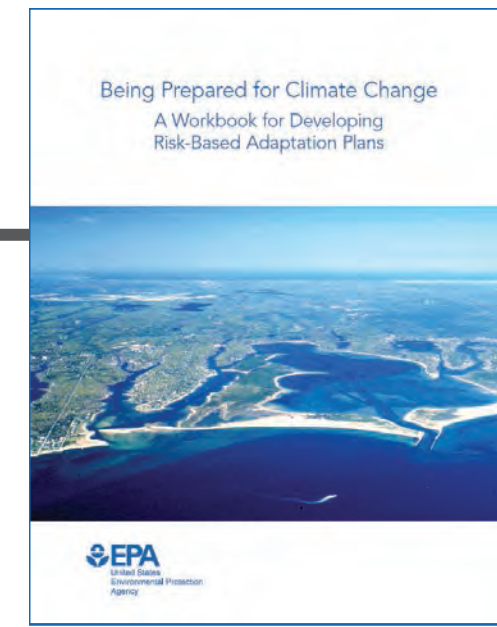


**Lessons Learned**

Climate Ready Estuaries Program: New England Climate Ready Estuaries

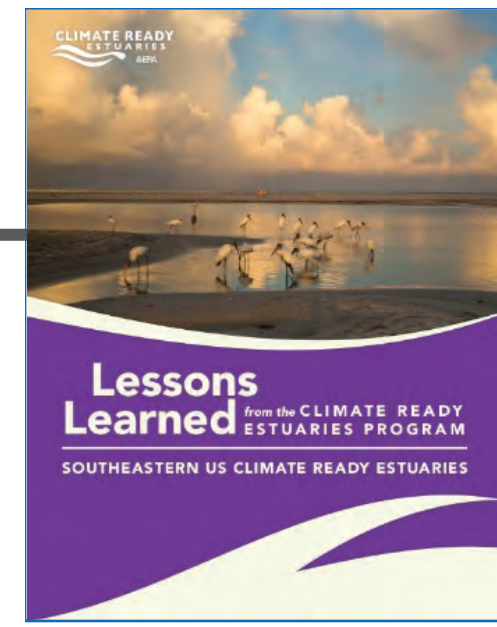


**2014**



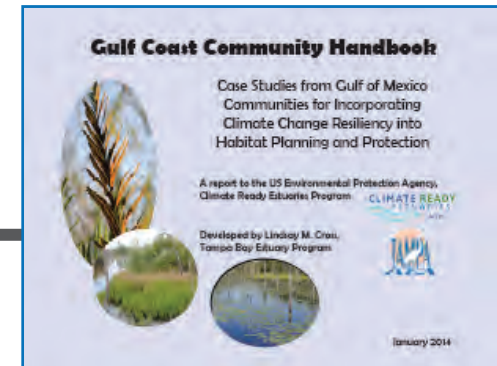
**The Being Prepared for Climate Change Workbook**

The workbook is designed to assist organizations that manage environmental resources. It is a step-by-step guide for conducting risk-based climate change vulnerability assessments and developing adaptation action plans.



**Lessons Learned**

Climate Ready Estuaries Program: Southeastern US Climate Ready Estuaries



**Tampa Bay Estuary Program, NEP**

Gulf Coast Community Handbook



**2016**



**Lower Columbia Estuary Partnership, NEP**

Integrating Multi-Species and Climate Change Impacts into Restoring the Lower Columbia River Ecosystem



Climate Ready Estuaries has been at the forefront of climate adaptation and will strive to stay there by being true to the core features of the program: national in scope; responsive and driven by the stated needs of the communities served; leading the field in terms of both research and practice; focused on place-based organizations and coastal communities; and goal-oriented to improve habitat and water quality.

As its second decade commences, the Climate Ready Estuaries strategy is to continue providing science-based methods, technical assistance and support to place-based organizations, NEPs, and coastal communities as they act to address their climate-related risks.

We are one-fifth through the 21st century and the challenges are growing. Important questions are being raised about long-term sustainability as we come to terms with acute storms such as Katrina, Rita, Sandy, Harvey, Irma, Maria and Michael. The pace of sea level rise raises the same sustainability questions. Other stressors, such as warming water temperature, are leading to ecological change and exacerbating water quality problems.

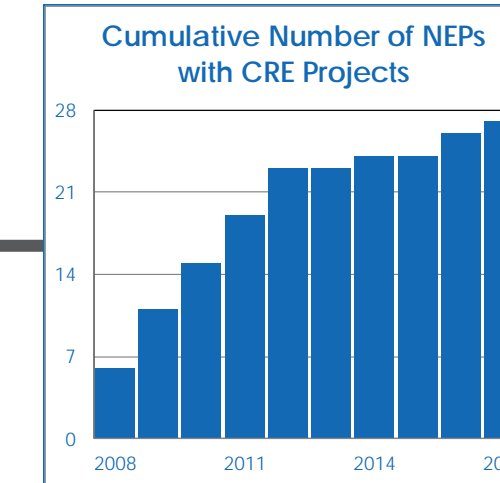
Climate Ready Estuaries will continue the necessary work of empowering community decision makers to be prepared for climate change—to understand their own situations and reach their own conclusions about risks and sustainable solutions.



EPA project



EPA + partner project

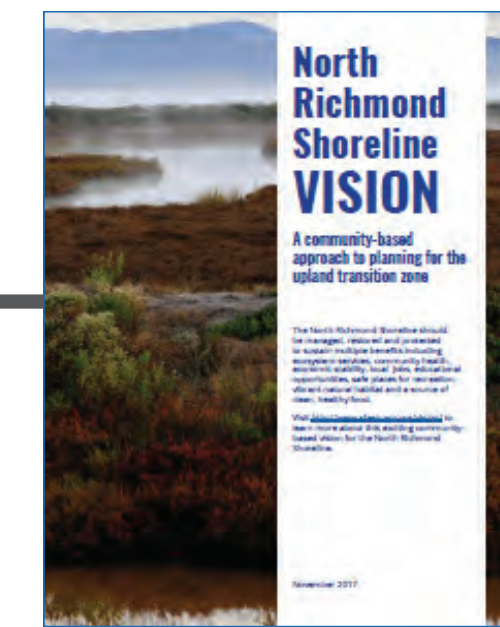


**Demonstration Projects & Capacity Building**

Over its first 10 years, Climate Ready Estuaries helped 27 National Estuary Programs, through technical assistance or supplemental awards, to begin 72 vulnerability assessments or adaptation projects. These projects fall into a variety of categories:

- State of the environment reports
- Indicators
- Stakeholder engagement
- Environmental justice
- Sea level rise and flooding
- Wildlife
- Wetlands
- Water management

More information about projects and partners is on the Climate Ready Estuaries website: [www.epa.gov/cre](http://www.epa.gov/cre)



**San Francisco Estuary Partnership, NEP**

North Richmond Shoreline VISION: A community-based approach to planning for the upland transition zone



**2017**