

NOAA Chesapeake Bay Office Biennial Report to Congress FY 2009–2010



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Executive Summary

The NOAA Chesapeake Bay Office (NCBO) is a key partner in the Chesapeake Bay Program and plays a critical part in the collaborative effort to protect and restore the Chesapeake Bay. This report to Congress for fiscal year (FY) 2009–2010 details NCBO’s accomplishments during this timeframe and is submitted in accordance with NCBO’s authorization, enacted by Congress in 1992 (Public Law No. 98-210) and reauthorized in 2002 (Public Law No. 107-372). During FY 2009–2010, NCBO played a major role in overseeing and coordinating NOAA’s response to Executive Order 13508 on Chesapeake Bay Protection and Restoration, including helping to produce the Strategy for Protecting and Restoring the Chesapeake Bay Watershed (released May 2010) and the Fiscal Year 2011 Chesapeake Bay Action Plan (released September 2010). Many of the NCBO accomplishments in this Biennial Report to Congress also support implementation of the Executive Order and will have a direct effect on the future success of the Action Plan. This report details NCBO’s activities for FY 2009–2010 through its three primary program areas of Ecosystem Science, Coastal and Living Resource Management, and Environmental Literacy.

The NCBO Ecosystem Science program focuses on collecting data and observations as well as analyzing and organizing information critical to understanding Bay health and restoration needs. NCBO undertakes these activities directly through its own field program, indirectly by supporting regional academic partners, and collaboratively with other NOAA offices, the Chesapeake Bay Program, and state partners. In 2009 and 2010, specific efforts included:

- Monitoring the Bay’s health and improving boater safety through operation and maintenance of the Chesapeake Bay Interpretive Buoy System (CBIBS).
- Surveying bottom habitat to collaborate with state and other partners in identifying prime locations for oyster restoration, sturgeon spawning habitat restoration, and derelict crab pot removal efforts.
- Developing decision-support models for fisheries managers to evaluate different management options.

The NCBO Coastal and Living Resource Management program provides resource managers and decision makers with sound science and interpretation to develop and implement policy. NCBO fosters the use of ecosystem-based management approaches for the protection and restoration of key species (including oysters, blue crabs, menhaden, and striped bass) and their habitats. These species play key ecological and economic roles in the region. In 2009 and 2010, specific efforts included:

- Providing states with funding, technical assistance, and data to restore native oysters in Chesapeake Bay, including support for aquaculture efforts.
- Improving Blue Crab Management by providing key blue crab data and survey information to marine resource managers.
- Supporting Chesapeake Bay Ecosystem-based Management Approaches by providing biological information and life history characteristics for important individual Bay fisheries stocks.
- Leading a new Sustainable Fisheries Goal Team focused on fishery management issues that cross state and other jurisdictional boundaries and better connecting science to management decisions.

The NCBO Environmental Literacy program fosters Bay stewardship through focused education and outreach. In FY 2009 and 2010, specific efforts included:

- Providing hands-on learning as part of NCBO’s Bay Watershed Education and Training (B-WET) Chesapeake Program.
- Creating a New Environmental Science Training Center for environmental education professionals.
- Informing citizens via a new NCBO website (www.chesapeakebay.noaa.gov) and the Chesapeake Bay Report Card, completed in partnership with EcoCheck.

In FY 2011 and beyond, NOAA’s Chesapeake Bay Office will implement its authorizing mandate via targeted efforts identified under the President’s Chesapeake Bay Executive Order, with particular emphasis on improving habitat restoration, sustaining fisheries, strengthening science, and expanding environmental literacy.

Introduction

The mission of the National Oceanic and Atmospheric Administration (NOAA) is “to understand and predict changes in Earth’s environment and conserve and manage coastal and marine resources to meet our Nation’s economic, social, and environmental needs.” In applying this mission to North America’s largest estuary, NOAA’s Chesapeake Bay Office (NCBO) has achieved significant advances in science, service, and stewardship to address the challenges facing the Chesapeake Bay, including the human-induced impacts of degraded water quality, overharvesting of fisheries, and habitat destruction.

NCBO is a key partner in the Chesapeake Bay Program and plays a critical part in the collaborative effort to protect and restore the Chesapeake Bay. This report to Congress for FY 2009–2010 details NCBO’s accomplishments during this timeframe and is submitted in accordance with NCBO’s authorization, enacted by Congress in 1992 (Public Law No. 98-210) and reauthorized in 2002 (Public Law No. 107-372). This law requires “a biennial report to Congress and the Secretary of Commerce with respect to the activities of the Office and on the progress made in protecting and restoring the living resources and habitats of the Chesapeake Bay.” In accordance with these statutes, this report includes descriptions of programs and projects supported, developed, and implemented by NCBO in order to protect and restore the Chesapeake Bay.

NCBO is organized around three primary functions:

- **Ecosystem Science**—collecting data and observations as well as analyzing and organizing information critical to understand Bay health and restoration needs.
- **Coastal and Living Resources Management**—providing resource managers and decision makers with sound science and interpretation to develop and implement policy.
- **Environmental Literacy**—fostering Bay stewardship through focused education and outreach.

This biennial report highlights NCBO’s activities in these areas and also describes the Office’s work to implement the President’s Chesapeake Bay Executive Order.

Summary of NOAA Chesapeake Bay Office Accomplishments, FY 2009–2010

Executive Order

NCBO played a major role in overseeing and coordinating NOAA's response to Executive Order 13508 on Chesapeake Bay Protection and Restoration, including helping to produce the *Strategy for Protecting and Restoring the Chesapeake Bay Watershed* (released May 2010) and the Fiscal Year 2011 Chesapeake Bay Action Plan (released September 2010).

Other Significant Actions

- Launching three new Chesapeake Bay Interpretive Buoys (Annapolis, Upper Potomac, and Dominion Gooses Reef) and maintaining the nine-buoy observational system.
- Perfecting a new habitat characterization and mapping technique that uses multibeam sonar, side-scan sonar, and video to map and describe specific bottom habitat for restoration projects.
- Applying this mapping capability to support oyster and sturgeon habitat restoration in several Virginia rivers, including the Great Wicomico River (almost 1,800 acres mapped/characterized), the York River (more than 700 acres mapped /characterized), and the James River (more than 4,100 acres).
- Surveying the Severn River near Annapolis to support a U.S. Army Corps of Engineers alternative substrate oyster reef restoration project.
- Surveying the main stem of the Bay near four Maryland tributaries (Rhode/West/South river system, mouth of the Patapsco River, mouth of Chester River, and the Northeast River) to pinpoint areas with high numbers of abandoned crab traps.
- Making significant progress toward completion of the Chesapeake Atlantis Model, a valuable science-based tool for fisheries managers.
- Providing funding to support oyster restoration projects in Maryland (\$4.6 million) and Virginia (\$3 million).
- Supporting native oyster aquaculture, including funding the building of a small-scale oyster hatchery at the Morgan State University Estuarine Research Center on the lower Patuxent River.
- Providing research and analysis that led NOAA to formally oppose introducing the non-native oyster *C. ariakensis* into the Bay and instead support a native-only oyster restoration strategy.
- Providing science that led to the interjurisdictional agreement to restrict female harvest and to allow for a yearly assessment of blue crab population.
- Completing a retrospective report that highlights key research findings from more than two decades (FY 1985–2008) of the NCBO Fisheries Research Program.
- Supporting significant fisheries research relating to the status of the menhaden stock in the Chesapeake Bay, the potential development of a cownose ray fishery, the causes of clam disease, and the impacts of fish-eating birds on Bay fish.
- Leading a new Chesapeake Bay Sustainable Fisheries Goal Implementation Team to facilitate fisheries management.
- Providing \$6.8 million in grant funding to support hands-on watershed education for 124,000 students and 5,000 teachers through the Bay Watershed Education and Training (B-WET) Chesapeake Program.
- Creating a new NOAA Environmental Science Training Center for environmental education professionals at the Cooperative Oxford Laboratory campus.
- Communicating about NOAA science with the public and professional peers through NCBO's second-generation website (www.chesapeakebay.noaa.gov) as well as through lecture series, museum exhibits, and participating in professional conferences and festivals.

NCBO and the Chesapeake Bay Executive Order

On May 15, 2009, President Obama issued Executive Order 13508 on Chesapeake Bay Protection and Restoration. In 2009 and 2010, NCBO played a major role in overseeing and coordinating NOAA's response to the Executive Order. NCBO staff with expertise in fisheries, ecosystem science, climate change, and environmental literacy helped produce the *Strategy for Protecting and Restoring the Chesapeake Bay Watershed*, which was released in May 2010. The Strategy identified four specific goals:

- Restore Water Quality
- Recover Habitat
- Sustain Fish and Wildlife
- Conserve Land and Increase Public Access

and four supporting strategies that cut across the goals:

- Expand Citizen Stewardship
- Develop Environmental Markets
- Respond to Climate Change
- Strengthen Science

Within each of the goals and supporting strategies, specific "Strategy Actions" were identified to meet stated objectives and outcomes.

In September 2010, NOAA and its Federal partners released the Fiscal Year 2011 Chesapeake Bay Action Plan. NCBO played a key role in coordinating within NOAA and with other Federal agencies to identify 115 specific on-the-ground and in-the-water efforts that federal agencies will undertake to advance Bay protection and restoration in FY 2011. Sixty of the proposed actions will involve NOAA either as a leader, co-leader, or contributing agency.

Many of the NCBO ecosystem science, coastal and living resource management, and environmental literacy activities discussed in this Biennial Report informed the formulation of the Executive Order Strategy and will have a direct effect on the future success of the Action Plan.

Ecosystem Science

The NCBO Ecosystem Science program focuses on applied research and monitoring; integrated coastal observations; and synthesis, analysis, and modeling to describe and predict Bay ecosystem processes. NCBO undertakes these activities directly through its own field program, indirectly by supporting regional academic partners, and collaboratively with other NOAA offices, the Chesapeake Bay Program, and state partners. In 2009 and 2010, NCBO science supported a better understanding of the Bay ecosystem, which enhanced restoration and protection of the Bay's resources.

Monitoring the Bay's Health and Improving Boater Safety

The Chesapeake Bay Interpretive Buoy System (CBIBS) is a network of observing platforms that collect and transmit real-time environmental data to a variety of users—including scientists, marine safety personnel, commercial and recreational boaters, teachers and students, and natural resource managers. The current system consists of nine buoys placed at strategic observation points around the Bay where they monitor changing weather, oceanographic, and water-quality conditions.

Three of these buoys were deployed during the biennium: one at the mouth of the Severn River near Annapolis, Maryland, in late 2009, one in the upper Potomac River near Washington, D.C., in spring 2010, and at Gooses Reef in the main stem of the Bay off of Calvert County, Maryland, in summer 2010. The Gooses Reef buoy featured the first deployment of a water-quality sensor that can measure dissolved oxygen and other factors at depths of over 10 meters. This capability will allow scientists to develop a better understanding of hypoxia (low dissolved oxygen) and provide managers with new insights for managing species like crabs and oysters.

In 2011, NCBO plans to deploy a buoy at the mouth of the Bay, which will complete the 10-buoy “backbone” of the Chesapeake Bay Interpretive Buoy System in the main stem of the Bay. The office is investigating the use of smaller, less-expensive observational buoys in lower-energy, upstream areas of key rivers to further minimize real-time observational gaps.

To better communicate with users of the buoy system, NCBO launched a CBIBS Facebook page and Android (smart phone) application. These communication efforts have allowed NCBO to better understand how members of the public are using the data and to improve the data products that CBIBS



The Upper Potomac buoy was deployed in May 2010.



This map shows locations of the nine CBIBS buoys that had been deployed as of December 2010.

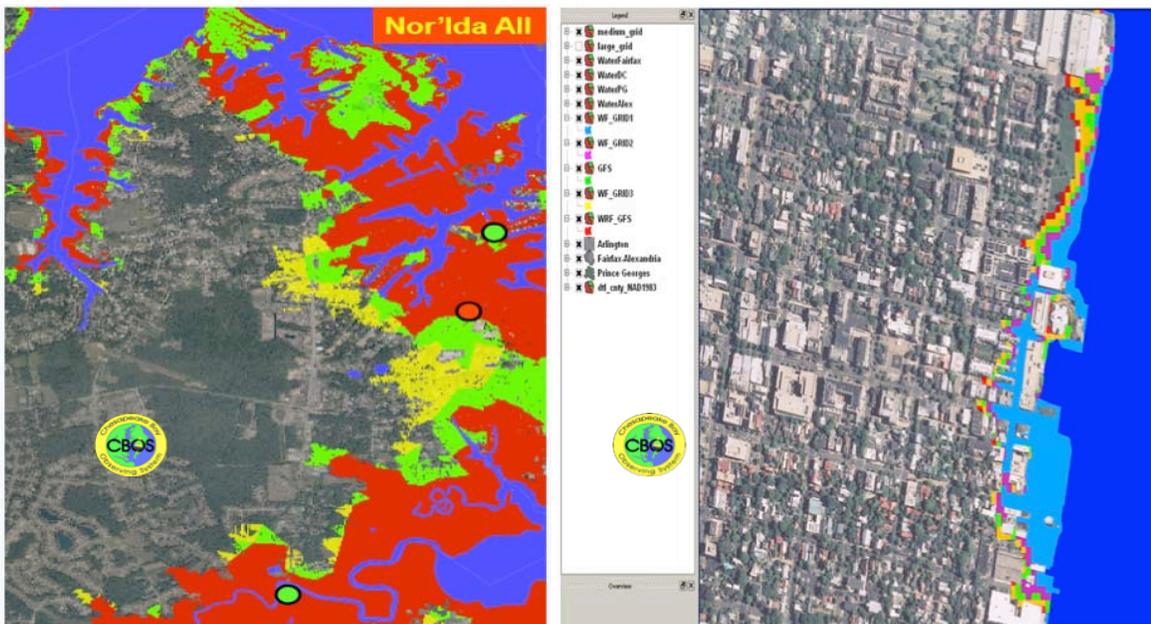
delivers. In 2011, NOAA will launch a new, streamlined CBIBS website and an exciting new high school curriculum, *Chesapeake Exploration*, based on data from CBIBS and other key observational platforms in the Bay. These interactive formats have greatly expanded the user base of buoy data. As a result, NCBO receives regular feedback from commercial vessel captains, recreational boaters, the U.S. Coast Guard, and a variety of federal and state agencies that rely increasingly on CBIBS data.

The buoys also mark and interpret the Captain John Smith Chesapeake National Historic Trail, administered by the National Park Service. In late 2008, NOAA and the National Park Service signed a Memorandum of Agreement, pledging mutual cooperation on activities and programs related to the Chesapeake Bay, including CBIBS, the Trail, and educational programs.

Data from the CBIBS buoy network is constantly attracting new users. Whether they are students in a classroom in Washington, D.C., ferry captains on the James River, or water-quality managers in Annapolis, CBIBS has a broad and growing appeal.

Helping Communities Adapt to a Changing Climate

Climate change is a serious issue facing the Chesapeake Bay ecosystem and the human communities in the Bay watershed. Sea level in the Bay has risen approximately 1 foot over the past century, with slightly higher rates in the southern Bay. This is about twice the global average and is believed to be a result of a combination of global sea level rise and regional and local sinking or “subsidence” of the land. Many Chesapeake Bay communities will be more prone to flooding as sea level rises. The Hampton Roads area of Virginia is the U.S.’ second-largest population center at risk from sea level rise (second to New Orleans). To prepare for this, NOAA—together with the U.S. Geological Survey, Old Dominion University, the Virginia Institute of Marine Science, and others—developed the Coastal Inundation Prediction System (CIPS), which is modeling how storm surge and other inundations can affect the Chesapeake region. This demonstration project allowed emergency managers to see a computer visualization of coastal flooding for a locality (i.e., what streets or neighborhoods were at risk for inundation). CIPS successfully demonstrated that it is far easier for emergency managers to understand and act on a graphical flood warning than on the existing NOAA method of using a text-only Coastal Flood Warning product.



These images show examples of CIPS high-resolution flood forecast visualizations.

In addition, NCBO partnered with a host of Federal, State, and nonprofit partners, including National Geographic and The Conservation Fund, to produce a series of climate-related educational products. These products include an interactive map illustrating the ecological and economic impacts of sea level rise and increased flooding generated from storms in the Chesapeake.

Mapping the Bottom of the Bay to Improve Restoration

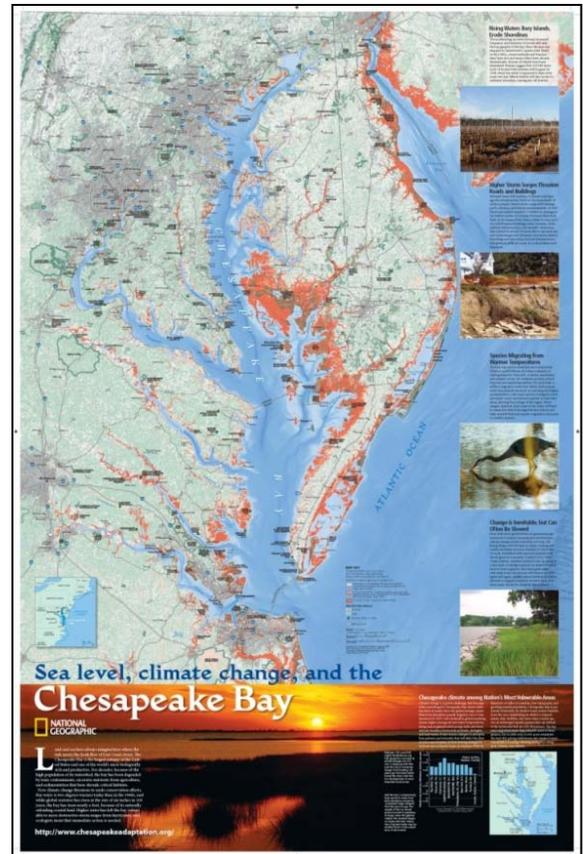
NCBO's field program uses a variety of vessels, technologies, and survey techniques to collect information on the Bay's benthos (the water depth, sediment types, habitat, and living resources in or near the bottom). During the biennium, the team perfected a multi-component "three-legged stool" technique to map, identify, and describe specific bottom habitat that could be suitable for restoration projects. This technique relies on multi-beam sonar to measure three-dimensional habitat complexity, side-scan sonar to determine bottom type, and underwater video footage and other direct sampling methods to verify the sonar data and to assess habitat condition.

NCBO applied this mapping capability in several Virginia rivers, including the Great Wicomico River and the York River, to pinpoint appropriate locations for oyster restoration, and in the James River to support Atlantic sturgeon habitat restoration.

NCBO staff mapped and characterized more than 723 acres of bottom habitat in the York River and 1,770 acres in the Great Wicomico River in 2009 and 2010. Beginning in 2009, the data from these surveys were processed and combined with water quality and oyster harvest information in an integrated database. Maps and analyses drawn from this database are playing a critical role guiding oyster restoration projects by ensuring reef building substrate is placed in locations with the highest likelihood of future success. This survey technique also provides a means to quickly and accurately evaluate that success by measuring growth and monitoring sedimentation of the reefs once they have been put in place. As a result of strong positive feedback on this effort from Maryland, Virginia, and the U.S. Army Corps of Engineers, this technique will be a key component used to prioritize oyster restoration sites Bay-wide in the future.

Alternative Substrate

Oyster shell is a key component in current restoration practices. These practices involve placing millions of hatchery-reared young oysters (called spat) on old oyster shells, where they grow and produce shells of their own. However, oyster shell is in limited supply. As a result, in early 2009, the NOAA Restoration Center and NCBO conducted a series of surveys in the Severn River near Annapolis, Maryland. NCBO collected data and constructed habitat maps to develop a geographic information system (GIS) and related imagery of the U.S. Army Corps of Engineers' alternative substrate oyster reef restoration project. Survey data collected before project initiation (baseline), immediately post-construction, and periodically over several seasons will be used to closely follow restoration progress. In consultation with key Federal and State partners, these analyses are being used to assess the efficacy of alternative restoration design and methods, and to adaptively manage future restoration efforts to maximize the use of limited oyster resources and funding.



NOAA and partners developed this educational map about sea level rise.



NCBO field scientists mapped potential sturgeon habitat features in the James River.

Sturgeon Restoration

In the winter of 2009, field staff surveyed 4,141 acres of benthic habitat in the James River. Digital mapping products were given to Federal, State, academic, and nongovernmental partners to describe habitats being used by tagged sturgeon and to identify sites for spawning habitat restoration activities. The proposed listing of Atlantic sturgeon as an endangered species has generated strong interest in gathering more information about Chesapeake Bay populations. Identifying places where they live and reproduce may help managers enhance their habitat and reduce harmful interactions such as boat strikes.

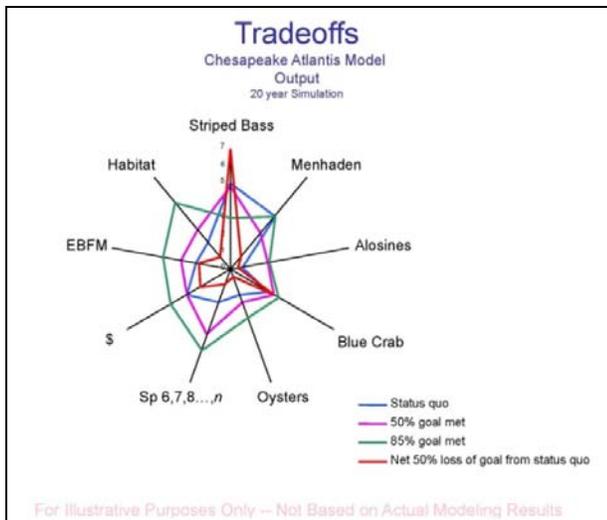
Derelict Fishing Gear

In the winter of 2009/2010, the NCBO field team also surveyed the benthos in the main stem of the Bay near four Maryland tributaries (Rhode/West/South river system, mouth of the Patapsco River, mouth of Chester River, and the Northeast River) with side-scan sonar to pinpoint areas with high numbers of abandoned crab traps. This project assisted

the Maryland Department of Natural Resources and local watermen with the information needed to carry out collaborative derelict crab trap removal efforts in order to mitigate the effects of “ghost fishing.” The retrieval of these derelict traps was funded by NOAA as a result of the 2008 blue crab commercial fishery disaster declaration and created jobs for industry suffering from the commercial fishery disaster on top of an already challenging economic climate. After the watermen removed the traps, biologists recorded the contents and other environmental parameters to assess the effect of derelict traps on fish and crab populations.

Using Fisheries Models to Evaluate Management Options

For several years, the NOAA Chesapeake Bay Office has invested in modeling designed to describe ecosystem interactions for use by scientists and resource managers.



For Illustrative Purposes Only -- Not Based on Actual Modeling Results

The Chesapeake Atlantis Model will enable resource managers to visualize results of differing management

In 2009 and 2010, NCBO made significant progress toward completion of the Chesapeake Atlantis Model (CAM). When completed, CAM will be a valuable science-based tool for fisheries managers that will directly compare tradeoffs of different management options. The CAM model uses biological, chemical, and physical factors to simulate how the Bay’s species would react to changes in their habitat and populations.

In 2009, NCBO hosted the second National Ecosystem Modeling Workshop, which was an important gathering of NOAA ecosystem modelers from around the country. Ecosystem modeling is a new and rapidly developing science often done on an ad hoc basis, and this meeting allowed NOAA ecosystem modelers from around the country to compare lessons learned to improve the efficiency and effectiveness of current applications.

NCBO also played a significant role at the 2010 Chesapeake Modeling Symposium by hosting a forum that brought together resource managers, biologists, and modelers to identify and discuss what practical steps need to be taken to improve the productivity of the working relationship between Bay resource managers and modelers. It was a first step in an ongoing effort to improve communication and collaboration among these groups.

During these meetings, managers gained a better understanding of how to address uncertainty associated with model runs and, therefore, how to apply the results more effectively to fisheries management questions. Modelers gained insight into tailoring existing models to address key management needs. As a result, Chesapeake Bay fisheries managers have turned to NOAA to learn new approaches to the management of species such as menhaden and blue catfish.

In 2009, NCBO modelers supported production of an animated short film, *Life in the Chesapeake Bay*, which shows species interactions and ecosystem challenges in the estuary. This film, which highlights the need for improved ecosystem modeling, is now on permanent display at the Nauticus museum in Norfolk, Virginia, and at The Mariners' Museum in Newport News, Virginia, where it helps to interpret Chesapeake Bay exhibits. It is also available on NCBO's website at www.chesapeakebay.noaa.gov.

Coastal and Living Resource Management

NCBO identifies and analyzes the needs of coastal and living resource managers and coordinates NOAA programs to deliver policy advice and technical assistance to Bay decision makers. NCBO fosters the use of ecosystem-based approaches to management for the protection and restoration of key ecological species (including oysters, blue crabs, menhaden, and striped bass) and their habitats. In 2009 and 2010, NCBO increased scientific knowledge among decision makers through the development of targeted tools and coordination of policy efforts.

Assisting States to Strengthen Native Oyster Restoration

Restoring native oysters is a key component of restoring the Chesapeake Bay. The President's Chesapeake Bay Executive Order calls for restoring oysters in 20 Bay tributaries by 2025. In 2009 and 2010, NCBO continued to provide funding to support oyster restoration projects in Maryland and Virginia. The Great Wicomico River in Virginia, in particular, has experienced promising results due to focused restoration efforts there supported by NOAA and many other agencies, including the U.S. Army Corps of Engineers.

NCBO also supported restoration strategies in Maryland by providing technical assistance and data to inform development of Governor Martin O'Malley's oyster restoration plan. NCBO convened an oyster restoration workshop in Virginia in 2010 to review successful strategies for oyster restoration and to aid future restoration projects.

In 2009 and 2010, NCBO supported native oyster aquaculture efforts as a key part of any oyster restoration strategy. NCBO funded the building of a small-scale oyster hatchery at the Morgan State University Estuarine Research Center on the lower Patuxent River. The Estuarine Research Center hatchery is a joint project with the Calvert County Watermen's Association and was designed to be a prototype for similar small hatcheries operated in partnership with local watermen. This



These oyster shells will be used as part of an oyster restoration project. (Photo Jane Thomas/IAN)

hatchery has a short-term goal of helping to stabilize the local seafood industry, and a long-term goal of helping to make the industry more self-sufficient. In 2010, its first year of operation, the hatchery spawned 80 million larvae in three production runs (spawns).

In fall 2009, NCBO organized a tour for NOAA Aquaculture Program staff of hatcheries and growers around the Chesapeake Bay, including oyster and clam aquaculture operations. NCBO staff worked throughout the year with the NOAA Aquaculture Program to help formulate their new national aquaculture policy, and plan how the policy will be implemented in the Chesapeake region.

Supporting the Science on Non-Native Oyster Decision

The U.S. Army Corps of Engineers was the lead agency in drafting a Programmatic Environmental Impact Statement (PEIS) to look at the potential effects of introducing *Crassostrea ariakensis*, an Asian species of oyster, into the Chesapeake Bay. In late 2008, based on analysis of research funded by NCBO, NOAA formally opposed introducing *C. ariakensis* into the Bay and instead supported a native-only oyster restoration strategy. The final Environmental Impact Statement released by the Army Corps and the States of Maryland and Virginia in 2009 reflected this position, which was also shared by NOAA's partners in the Chesapeake Bay Program.

Improving Blue Crab Management with Applied Science

In September 2008, the Secretary of Commerce made a disaster declaration for the blue crab commercial fishery due to the harvest value of soft shell and peeler blue crabs in Maryland and Virginia declining by 41 percent from the late 1990s. In response to this declaration, Congress provided \$15 million in funding for the States of Maryland and



NOAA science contributed to management decisions that supported a rebound in blue crab population numbers.

Virginia to assist watermen and rebuild the blue crab fishery. NCBO worked with NOAA's National Marine Fisheries Service (NMFS) Northeast Regional Office and state agencies to coordinate and develop the science-based plans for rebuilding this iconic Bay species and helped to guide and direct programs to aid communities affected by the fishery restrictions.

Some of the programs implemented by the states included paying watermen to remove abandoned crab traps, restructuring the blue crab fishery through a buy-back program for commercial crabbing licenses, and advancing oyster aquaculture as an employment opportunity.

NCBO supported research and advised the States of Maryland and Virginia as they maintained restrictions on crab harvest during the biennium, leading to a historic reduction in blue crab take and consequently, a rebound of the blue crab stock over the past 2 years (2009 and 2010). NCBO, working with the Chesapeake Bay Stock Assessment Committee (CBSAC), provided the science that led to the interjurisdictional agreement to restrict female harvest and allow for a yearly assessment of blue crab population health and sustainability. Each year CBSAC produces a Blue Crab Advisory Report that synthesizes key blue crab data and survey information so that marine resource agencies can make informed, science-based decisions and enable sustainable management of the stock.

In 2010, NCBO initiated development of a benchmark stock assessment for blue crab as well as a coordinated research program in partnership with Maryland and Virginia. This benchmark assessment will critically review all blue crab life history data, current reference points, and if applicable, recommend modifications to the interim abundance target established in 2008 to rebuild the stock. The assessment will undergo an international peer review through the Center for Independent Experts prior to being provided to Bay fisheries managers for their use.

Supporting Chesapeake Bay Ecosystem-based Management Approaches

NCBO has provided funding support for Chesapeake Bay fisheries management and research since 1992. Fisheries science supported by NCBO is competitively based and supports research, monitoring, modeling, and management addressing various aspects of Chesapeake Bay fisheries. Research projects foster knowledge and understanding of the Chesapeake Bay ecosystem by providing biological information and life history characteristics for many individual Bay fisheries stocks, and by broadening the multispecies knowledge base for development of Fisheries Ecosystem Planning.

In 2010, NCBO completed a retrospective report that highlights key research findings from more than 2 decades (FY 1985–2008) of the NCBO Fisheries Research Program. The document also describes how this scientific data has been used to support management and policy decision making around the Bay watershed. The report describes life history and overview biology for selected species; summarizes selected research on key commercial and recreational fisheries; and highlights the management implications of NCBO-funded research, monitoring, analysis, modeling, and assessment. This research has helped watermen, scientists, and resource managers find better ways to assess and sustain economically and ecologically important fisheries in the Chesapeake. For example, striped bass populations have recovered over the past several years due to strict regulations imposed coast-wide in the 1980s. However, there is concern that conservative management of striped bass, in combination with harvest of principal prey species such as Atlantic menhaden (*Brevoortia tyrannus*), may lead to a lack of food and slower growth rates in stripers, which may also make them more susceptible to disease. The retrospective summarized how NCBO-supported research and monitoring have informed past management and recovery of striped bass. The report also documented ongoing research to answer critical questions necessary to aid continued restoration of striped bass populations along the Atlantic coast and to sustain a healthy Chesapeake Bay ecosystem.

Atlantic menhaden have been a major focus of the fisheries research funded by NCBO during the biennium. NCBO worked with the Atlantic States Marine Fisheries Commission to fund a comprehensive research program to determine the status of the menhaden stock in the Chesapeake Bay. Results are providing key insights into how larval, juvenile, and adult menhaden use Chesapeake Bay habitats for growth and survival and the degree to which Chesapeake Bay menhaden populations contribute to the overall coastal stock. These findings are supplying resource managers the information needed to improve future stock assessments and sustainability of this important migratory species.

NCBO also supported other fisheries research activities during the biennium. Perceived increases in the population of cownose rays in the Bay, coupled with concerns that the rays are destroying shellfish aquaculture and oyster restoration projects, have generated growing interest in developing a commercial fishery for cownose rays. NCBO funded research to improve understanding of this species to inform discussions on how to mitigate potential harmful impacts of cownose rays and consider responsible exploitation or control measures. Before a fishery can be established, managers and scientists must evaluate what is known about the species, including reproductive capacity, diet composition, migration patterns, population, abundance, and other basic biological information. Without this critical information it is not possible to construct a scientifically based and sustainable fishery. NCBO has also funded work to consider alternative approaches to cownose ray control that do not entail developing a fishery, such as exclusion devices that can be used to protect oysters from ray predation. This work is important to protecting the investments of the aquaculture industry as well as the oyster restoration community.

Additional research during the biennium documented clam population declines due to disease and examined the impacts of fish-eating birds (i.e., cormorants, osprey, and eagles) on Bay fish stocks. Bird predation is not well understood and may be a significant source of mortality for fish such as menhaden. Knowing the relative impact of birds on fish mortality can improve our capacity to model food web dynamics in the Bay as well as lead to more informed and ecosystem-based decision making.

Leading a New Sustainable Fisheries Goal Team

In June 2010, a new “Sustainable Fisheries Goal Implementation Team (GIT)” met for the first time. Peyton Robertson, NCBO’s Director, chairs this group, which was established as part of the recent reorganization of the Chesapeake Bay Program. The Sustainable Fisheries GIT focuses on facilitating fisheries management that will lead to sustainable Chesapeake Bay fish populations, support viable recreational and commercial fisheries, and promote natural ecosystem function. The Sustainable Fisheries GIT provides a forum in which to discuss fishery management issues that cross state and other jurisdictional boundaries. It is also working to better connect science to management decisions and create a framework for implementing ecosystem-based approaches to fisheries management.

Environmental Literacy

The NCBO Environmental Literacy program provides a continuum of educational programming designed to increase awareness, build knowledge, and facilitate productive and lasting citizen involvement in stewardship of the Chesapeake Bay watershed. Over the past 2 years, NCBO’s Environmental Literacy program has had a significant impact on environmental education in the watershed.

Providing Experiential Learning for Bay Stewards

Through Congressionally directed funding the Bay Watershed Education and Training (B-WET) Chesapeake Program has provided hands-on watershed education for students and teachers to foster stewardship of the Chesapeake Bay. B-WET has supported states and school divisions in the region in planning and implementing school system-wide environmental education programs. Since 2002, NCBO’s administration of B-WET



One teacher training workshop held at the Environmental Science Training Center in 2010 included Maryland Department of Natural Resource scientists introducing educators to fish necropsy procedures.

Chesapeake has supported meaningful watershed educational experiences for more than 290,000 students and 23,000 teachers—including an estimated 124,000 students and 5,000 teachers during the biennium. In 2009, NOAA, in partnership with the Chesapeake Bay Trust, hosted the Chesapeake Bay Education Summit, which brought together representatives from Federal and State government and nonprofit organizations to discuss a coordinated approach to environmental literacy planning and implementation in the region.

To encourage new applicants to B-WET, the NCBO Environmental Literacy Program held informational grant workshops that attracted more than 100 participants in 2009 and 2010. NCBO also played a major role in planning and implementing a national B-WET conference for all grantees held in the Washington, DC, area in 2009.

NOAA has been identified as the lead for drafting an Elementary and Secondary Environmental Literacy Strategy in support of the Chesapeake Bay Executive Order. This strategy will build upon the Chesapeake Bay Program’s goal to reach every student in the Bay watershed with a “meaningful watershed educational experience by the time he or she graduates from high school.”

Creating a New Environmental Science Training Center

In September 2010, NCBO opened the NOAA Environmental Science Training Center located at the Cooperative Oxford Laboratory, a partnership among NOAA’s National Centers for Coastal Ocean Science, NCBO, and the Maryland Department of Natural Resources. The Center provides environmental education professionals—an audience with few opportunities for professional development and a pivotal role in environmental education—with training and in-depth experiences to advance their abilities to effectively convey the latest information on science, technology, engineering, and math (STEM) to teachers and students. The Training Center contributes to the goal of increasing training for educators as called for in the Executive Order 2011 Action Plan.

Trainings focus on integrating science into the classroom, drawing on NOAA and partner expertise and capabilities. Even before the facility was formally completed, the Training Center hosted workshops on phytoplankton monitoring and estuarine science. Plans for a climate science workshop series to be held in winter 2011 are well under way.

Illustrating the Significance of NOAA to the Public

The successful partnership between NOAA and Nauticus, a maritime museum in Norfolk, Virginia, continued in the biennium. In 2009 and 2010, NCBO and Nauticus partnered with the Chesapeake Bay Foundation and Old Dominion University to coproduce the Blue Planet Forum environmental lecture series, which featured speakers such as Governor Tim Kaine of Virginia and Bill Read, the director of NOAA’s National Hurricane Center. NOAA and Nauticus also premiered the first “NOAA Day at Nauticus” in 2009, which included public tours of the NOAA Ship *Thomas Jefferson* at the Nauticus pier, a NOAA film festival in the museum’s theater, and NOAA “docents for a day” staff who spoke with visitors about NOAA’s mission and services. NOAA plans for this to be an annual event and a great opportunity for the residents of Hampton Roads to get to know NOAA.

NOAA and Nauticus also worked together to produce a photographic exhibit on the Lynnhaven oyster, an interactive *Oceans Today* video kiosk, and a NOAA heritage interpretive sign that is now part of the city’s Cannonball Trail.

Explaining the Health of the Bay to Citizens

NCBO works closely with the University of Maryland Center for Environmental Science to produce the Chesapeake Bay Report Card. The report card can be found on the web at <http://www.eco-check.org/reportcard/chesapeake/2009/overview/>. It documents trends in the

overall health of the Chesapeake Bay by synthesizing relevant scientific results in a way that is easily understood by the public. The report card summarizes results from around the Bay and provides specific information for specific subregions. Recent results show the overall health score increased slightly in 2009 compared to 2008, raising the Bay’s letter grade from a C- to a C. This is the best bay-wide health score since 2002, before the wet conditions that caused the scores to decline in 2003. This year’s improvement is in keeping with the gradual recovery of the Bay from the wet conditions in 2003.

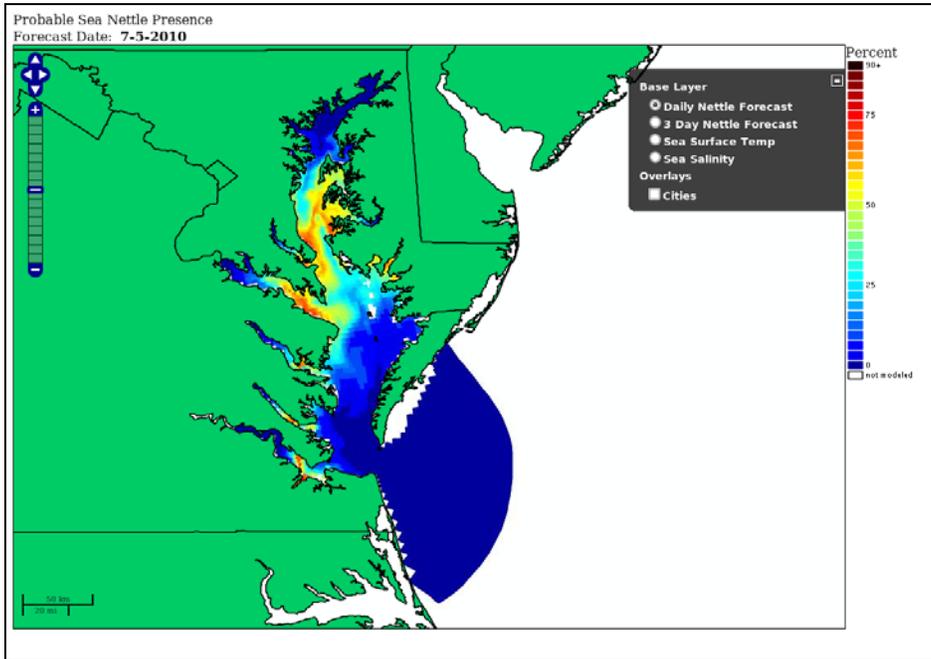


NCBO played a major role in planning and participating in NOAA Restoration Day in 2009 and 2010. In 2010, more than 220 NOAA employees participated in hands-on habitat restoration projects in Hampton Roads, Virginia, and Oxford, Maryland. NOAA Restoration Day in Maryland (pictured) focused on planting wetlands grass and trees along the shoreline of the NOAA Cooperative Oxford Laboratory. Participants in Virginia planted grasses and saplings to restore damaged dunes at

Launching a New NOAA Chesapeake Bay Office Website

As part of NCBO's ongoing efforts to improve communications with our partners and stakeholders, in 2010 NCBO launched a new website, www.chesapeakebay.noaa.gov. It is now easier than ever to stay up-to-date on

the latest information about the habitat, fisheries, observations, and education projects under way at NOAA.



This map of probable sea nettle presence in the Bay is an example of one of the features available on the new NCBO website. NCBO processes the data and generates the forecast map on a daily basis as an experimental web-based product. The forecasting is provided through a partnership between NOAA and the University of Maryland.

Maryland and Virginia. Participants in these workshops received briefings on the latest NOAA climate science and communication tools and contributed to discussions about effective climate science resources in their states.

Enabling NOAA's Regional Collaboration

NOAA's North Atlantic region spans from Maine to Virginia, including many of the states in the Chesapeake Bay watershed. During the biennium, the NCBO Director Peyton Robertson served as the Team Lead for NOAA's North Atlantic Regional Team (NART), a group of NOAA employees based throughout the region who work to integrate NOAA services for our stakeholders and constituents. In 2010, the NART partnered with Sea Grant to create climate literacy workshops around the region, including events in

Looking Forward: NCBO Vision for 2011 and Beyond

In FY 2011 and beyond, NCBO will implement the President's Chesapeake Bay Protection and Restoration Executive Order, with particular emphasis on improving restoration of habitat, sustaining fisheries, strengthening science, and expanding environmental literacy. Specifically, NCBO will focus on the following:

1. **Significantly advance native oyster restoration in selected Chesapeake Bay tributaries**
 - Work with the U.S. Army Corps of Engineers, the states of Maryland and Virginia, and other stakeholders to develop a Bay-wide oyster restoration strategy.
 - Develop consistent metrics and monitoring protocols for oyster restoration.
 - Conduct baseline habitat characterization, mapping, and assessment of selected tributaries and support native oyster restoration in designated sanctuaries in Maryland and Virginia.
 - Deliver an operational oyster reporting tool for use by oyster restoration partners.
2. **Facilitate interjurisdictional, ecosystem-based fisheries management**
 - Use the Chesapeake Bay Sustainable Fisheries Goal Implementation Team to identify and prioritize fisheries research to improve understanding of fisheries status and trends to support management.
 - Evaluate and revise (if applicable) the current blue crab abundance target to ensure sustainability of the blue crab fishery and population.
 - Develop communication networks to incorporate fisheries impacts into land use and water quality decision making, and strengthen coordination of regional efforts with national policies and programs.
 - Revamp and enhance Bay-wide fisheries and plankton monitoring programs.
3. **Improve monitoring and modeling to document changes in ecosystem conditions and assess progress toward goals**
 - Complete the Chesapeake Bay Interpretive Buoy System in the Chesapeake Bay main stem and establish operation and maintenance agreements with state partners.
 - Facilitate the establishment of the Monitoring Alliance and Data Enterprise.
 - Develop and utilize ecosystem models to support decision making.
4. **Initiate a robust elementary and secondary environmental literacy initiative**
 - Develop a K-12 environmental literacy strategy that details how Federal agencies can best serve the needs of state and regional environmental education efforts in the Chesapeake Bay region.
 - Use the NOAA Environmental Science Training Center at the Cooperative Oxford Laboratory, offering programming that will strengthen the ability of environmental educators to teach Bay stewardship.

Appendix: NOAA Chesapeake Bay Office Appropriations History

Activity (Dollars in thousands)	FY2007 Enacted	FY2008 Enacted	FY2009 Enacted	FY2010 Enacted
Regional Studies - Chesapeake Bay Studies	\$3,486	\$1,918	\$2,950	\$2,085
Chesapeake Bay Multi-species Management	\$493	\$352	--	\$495
Chesapeake Bay Oyster Restoration, MD	\$2,995	\$1,784	\$2,600	\$2,000
Chesapeake Bay Oyster Restoration, VA	\$875	--	\$2,000	\$1,000
Blue Crab Advanced Research Consortium	\$3,825	--	\$50	--
Chesapeake Bay Blue Crab Research	--	--	\$550	--
Oyster Hatchery Economic Pilot Program, MD (Morgan State Oyster Pilot)	--	\$470	\$500	\$200
Bluefish/Striped Bass	\$692	--	--	--
Non-native Oyster Chesapeake Bay Program - VA	\$820	--	--	--
Virginia Fisheries Trawl Survey	\$494	\$446	\$150	\$300
National Aquarium In Baltimore (NAIB) Conservation and Education Programs	\$1001	\$893	--	--
Chesapeake Bay Interpretive Buoy System	\$300	\$447	\$500	\$500
Bay Watershed Education and Training Program (B-WET)	\$2,101	\$3,500	\$3,300	\$3,500
Metagenomic Analysis of Chesapeake Bay	--	--	--	\$100
Chesapeake Bay Environmental Center	--	--	--	\$250
Anacostia Watershed	--	\$134	--	--
Oxford Lab (transfer from National Ocean Service to NCBO)	~\$1,920 [NOS]	~\$1,600 [NOS]	~\$1,800 [NOS]	~\$1,500 [NOS]
Total	\$19,002	\$11,544	\$14,400	\$11,930