

Bay Barometer

A Health and Restoration Assessment of
the Chesapeake Bay and Watershed in 2009



The Chesapeake Bay watershed is one of the most extraordinary places in America. This unique estuary and its network of streams, creeks and rivers have tremendous ecological, cultural, economic, historic and recreational value to the region and the entire country.

For more than 25 years, the Chesapeake Bay Program has worked to protect and restore the Bay and its 64,000-square-mile watershed. *Bay Barometer* is the annual assessment of the Bay Program partnership's progress toward meeting its health and restoration goals.



Chesapeake Bay Program
A Watershed Partnership

www.chesapeakebay.net



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Message from the Director

On behalf of the Chesapeake Bay Program partnership, I'm pleased to present *Bay Barometer: A Health and Restoration Assessment of the Chesapeake Bay and Watershed in 2009*.

Bay Barometer is split into two distinct parts:

- **Bay Health**, which provides information about the status of Bay water quality, habitats and lower food web, and fish and shellfish abundance
- **Restoration and Protection Efforts**, a summary of the Bay Program's efforts to reduce pollution, restore habitats, manage fisheries, protect watersheds and foster stewardship.

Additionally, *Bay Barometer* includes sections on the health of freshwater streams and rivers throughout the 64,000-square-mile watershed, factors that affect the health of our waters, and what the 17 million residents of the Bay watershed can do to make a difference in the restoration effort.

You will notice that the *2009 Bay Barometer* comes to you in the style of an executive summary. It is our hope that this new, simpler printed version will make the extensive information collected and analyzed by the Bay Program partnership available to more people and organizations throughout the watershed. For those interested in exploring more details about these indicators, including geographic maps, long-term trends and downloadable data, please visit our website, www.chesapeakebay.net.

In my letter in last year's *Bay Barometer*, I affirmed "the need to take bolder actions and involve a wider network to achieve sharp improvements" in the Bay's health. While the 2009 *Bay Barometer* shows slight progress toward our health and restoration goals, the truth is that the Chesapeake Bay is still degraded. However, the "bolder actions" and "wider network" have begun to take shape, and I look to the future with enthusiasm.

2009 was indeed a banner year for the Chesapeake Bay in many ways.

- At its annual meeting in May, the Chesapeake Executive Council began charting a new course for recovery of the Bay and its watershed by **setting short-term goals to accelerate cleanup and increase accountability**. Under these "milestones," the six Bay watershed states and the District of Columbia will put actions into place to reduce a projected 15.8 million pounds of nitrogen and 1.1 million pounds of phosphorus by the end of 2011.
- We also saw the beginning of a new era of federal leadership on the Chesapeake Bay with the **signing of President Obama's Executive Order on Chesapeake Bay Restoration and Protection**. Eleven federal agencies are working together to reduce pollution to our waterways; restore fish, wildlife and habitats; conserve land; and expand public access.

And so we must keep moving on the path of forward-thinking actions and expansive involvement. These and other critical initiatives will help us continue marching toward our restoration goals with each passing year. But we can't do it alone.

I urge everybody reading this report to get involved today in restoring our Bay and its thousands of streams, creeks and rivers. Let's all take the small steps listed on page 11 of this report to reduce pollution from our homes and backyards and make a difference in our communities. Most importantly, tell your friends and families that they, too, can bring positive change for the Bay by lending a hand to help restore and protect it.

As Margaret Mead, the well-known scholar of American culture, said, "Never doubt that a small group of thoughtful, committed citizens can change the world."

Jeffrey Lape

Director, Chesapeake Bay Program



Alicia Pimental/Chesapeake Bay Program



Alicia Pimental



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The Year in Review

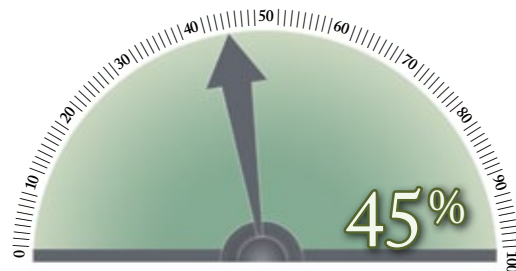
Despite small successes in certain areas, the overall health of the Chesapeake Bay remains degraded. Bay Program partners put new restoration programs and projects in place in 2009, but more work is needed to restore the estuary and its network of local waterways.

Bay Health

45 percent

Although there were improvements in some areas of the Bay's health in 2009, the ecosystem remains in poor condition. The overall health of the Bay averaged 45 percent based on goals for water quality, habitats and lower food web, and fish and shellfish abundance. This was a 6 percent increase from 2008.

- 12 percent of the Bay and its tidal tributaries met Clean Water Act standards for **dissolved oxygen** between 2007-2009, a decrease of 5 percent from 2006-2008.
- 26 percent of tidal waters met or exceeded guidelines for **water clarity**, a 12 percent increase from 2008.
- **Underwater bay grasses** covered 9,039 more acres of the Bay's shallows for a total of 85,899 acres, 46 percent of the Bay-wide goal.
- The health of the Bay's **bottom-dwelling species** reached a record high of 56 percent of the goal, improving by approximately 15 percent Bay-wide.
- The adult **blue crab** population increased to 223 million, its highest level since 1993.



Restoration and Protection Efforts

64 percent

The Bay Program partnership achieved 64 percent of its goals to reduce pollution, restore habitats, manage fisheries, protect watersheds and foster stewardship. Human activities continue to contribute more pollution, offsetting many of the accomplishments restoration projects have made.

- Bay Program partners have implemented 62 percent of needed **pollution reduction** efforts, a 3 percent increase from 2008. While progress was made reducing nutrients in **wastewater**, there was little progress toward **agricultural** and **air** pollution control goals.
- Bay Program partners surpassed the 2010 target of treating 2,466 acres of **oyster reefs** with habitat restoration techniques such as planting spat and adding shells for oysters to grow on. Since 2007, partners have implemented reef restoration practices on a total of 2,867 acres.
- 722 miles of **forest buffers** were planted along the Bay watershed's streams and rivers, a 7 percent increase toward the goal. The bulk of these – 653 miles – were planted in Pennsylvania, achieving the state's forest buffer restoration goal.
- 80 percent of elementary, middle and high school students in the Bay watershed received a **Meaningful Watershed Educational Experience** during the 2008-2009 school year, up 7 percent from the previous school year.

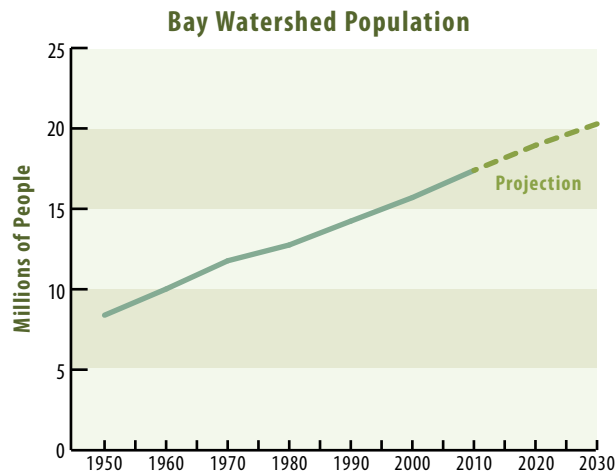


Factors Impacting the Bay and Watershed

Land Use

The Bay's decline is directly linked to the rise in population in the watershed; since 1950, the number of residents has more than doubled. As of 2008, 16.9 million people were estimated to live in the Bay watershed. Projections through 2030 show the watershed's population climbing above 20 million.

Corresponding development has severely affected the Bay's health. When farms, forests and other natural areas are paved over to make way for houses, shopping centers and parking lots, water cannot soak into the ground and instead runs off, picking up pollution and quickly carrying it into local waterways.



River Flow and Pollutant Loads

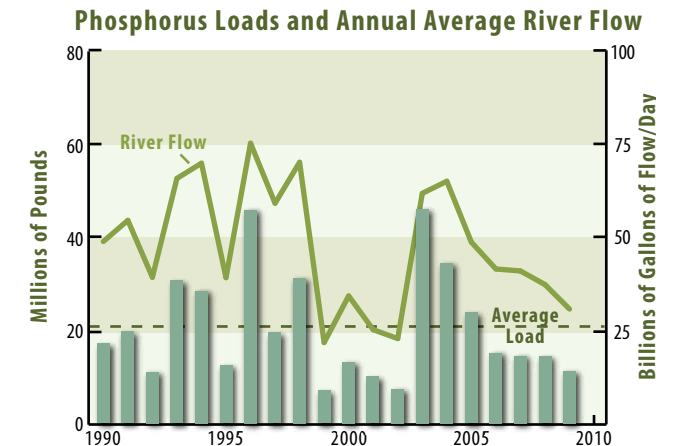
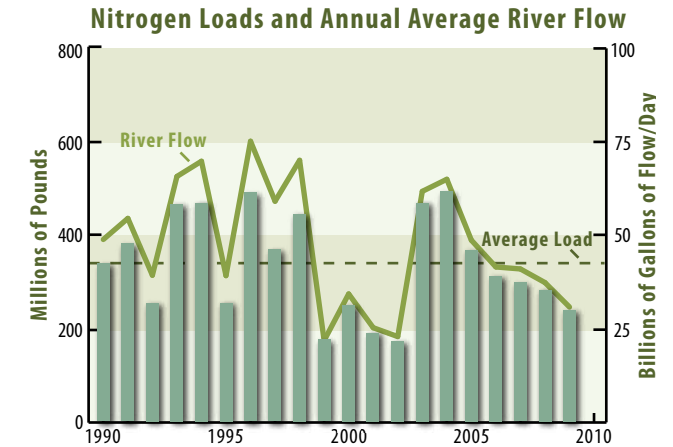
Annual rain and snowfall influence the amount of water that flows in rivers. Pollution entering the Bay each year generally corresponds with the volume of water that flows from its tributaries and the concentration of pollutants in that water.

River Flow: Annual average river flow to the Bay during the 2009 water year (October 2008–September 2009) was 31 billion gallons per day. This is 7 billion gallons per day less than 2008 and 18 billion gallons per day less than the 48 billion gallon per day average flow from 1938–2009.

Nitrogen: Preliminary estimates show that 240 million pounds of nitrogen reached the Bay during the 2009 water year. This is 43 million pounds less than 2008 and 98 million pounds less than the 338 million pound average load from 1990–2009.

Phosphorus: Preliminary estimates show that 11 million pounds of phosphorus reached the Bay during the 2009 water year. This is 3 million pounds less than 2008 and 10 million pounds less than the 21 million pound average load from 1990–2009.

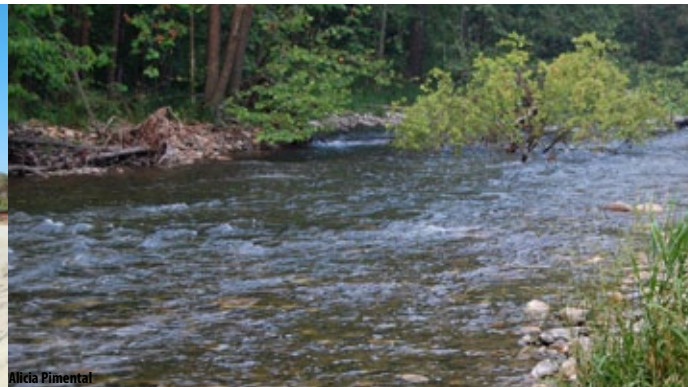
Sediment: Preliminary estimates show that 2 million tons of sediment from non-tidal rivers reached the Bay during the 2009 water year. This is 2 million tons less than 2008 and 2 million tons less than the 4 million ton average load from 1990–2009.



Visit www.chesapeakebay.net/status_factorsimpacting.aspx for more information about these indicators, including data and methods.



Alicia Pimental/Chesapeake Bay Program



Alicia Pimental



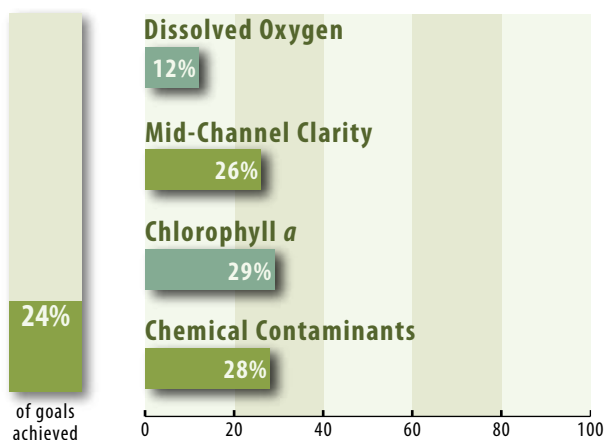
Jane Thomas/IAN Image Library

Despite a 6 percent improvement in health since 2008, the Bay continues to have poor water quality, degraded habitats and low populations of many fish and shellfish species. The modest gain in the health score was due to a large increase in the adult blue crab population, expansions of underwater grass beds growing in the Bay's shallows, and improvements in water clarity and bottom habitat health.

Water Quality

24 percent

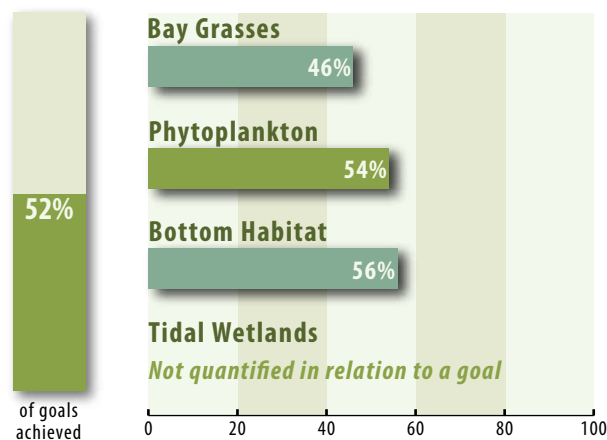
Water quality was again very poor in 2009, meeting just 24 percent of health goals, a 2 percent increase from 2008. Rain washes nitrogen, phosphorus and sediment off the land and into streams, rivers and the Bay. These pollutants harm aquatic life by clouding the water and fueling the growth of algae blooms that reduce oxygen needed by aquatic life. To improve water quality, pollution loads must continue to be reduced.



Habitats and Lower Food Web

52 percent

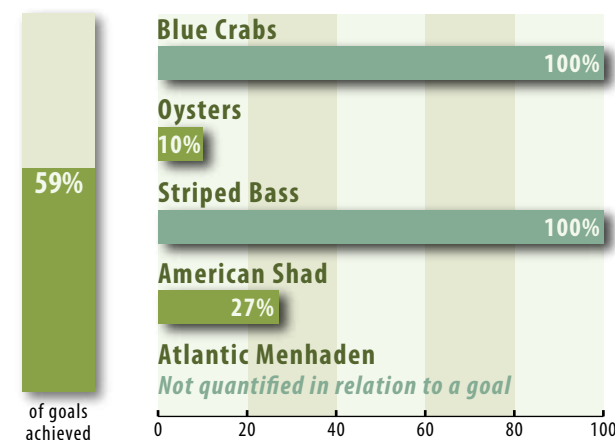
The Bay's critical habitats and lower food web showed signs of improvement in 2009, increasing by 7 percent from 2008. However, they remain far below what is needed to support thriving populations of underwater life. Bay grasses covered 9,039 more acres of the Bay's shallows than in 2008. Bottom habitat health – a good indicator of overall Bay conditions – reached a record high of 56 percent goal achievement, increasing by about 15 percent Bay-wide.



Fish and Shellfish

59 percent

The score for fish and shellfish abundance in the Bay improved by 9 percent in 2009, mostly due to a 70 percent increase in the Bay's adult blue crab population. There were 223 million spawning-age blue crabs in the Bay in 2009, the highest population recorded since 1993. The primary reason for the boost was an increase in adult female crabs. Oyster and shad populations increased slightly, but remain at low levels.



Visit www.chesapeakebay.net/status_bayhealth.aspx for more information about these indicators, including data and methods.





Watershed Health

Health of Freshwater Streams

Healthy freshwater streams are intrinsically linked to a healthy Chesapeake Bay. The watershed's streams, creeks and rivers eventually flow into the Bay, so their water quality has a direct effect on the entire Bay. Clean local waterways also support a diversity of fish and wildlife and are essential to residents who use them as a source of public drinking water and a place for family and recreational activities.

An effective way to measure the health of freshwater streams and rivers is to study the many tiny creatures that live in these waters. The abundance and diversity of snails, mussels, insects and other bottom-dwelling organisms – known as benthic macroinvertebrates – are good indicators of the health of streams because these creatures can't move very far and they respond to pollution and environmental stresses.

Between 2000 and 2008, the average stream health scores in 10,452 sampling locations indicated that 5,459 were in very poor or poor condition and 4,656 were in fair, good or excellent condition. In general, it can be said that a healthy Bay watershed would have a majority of streams ranked as fair, good or excellent.

Some generalizations can be made about the health of the watershed's streams:

- Streams tend to be in very poor to fair condition around large urban areas, such as metropolitan Washington, D.C. (see map inset). Streams in heavily farmed or mined areas are also often in very poor to fair condition.
- In contrast, streams tend to be in good to excellent condition in forested areas with ample natural habitat and low levels of pollution, such as in the southwestern Pennsylvania portion of the watershed (see map inset).

Flow-Adjusted Pollutant Trends

Concentrations of nitrogen, phosphorus and sediment are highly variable, depending on the amount of water flowing in streams and rivers throughout the Bay watershed. Therefore, scientists calculate flow-adjusted trends for these pollutants to determine whether concentrations have changed over time. By removing the effects of natural variations in stream flow, resource managers can evaluate the changes in stream health that may result from pollution reduction actions or other changes in the watershed.

Since the 1980s, Bay Program partners have collected data on stream flow and water quality near the head of tide in nine of the Bay's tributaries, and at 25 upstream locations across the watershed. The tributary monitoring sites collectively represent 78 percent of the area of the Bay watershed and range in size from the 100-square-mile Choptank River watershed to the Susquehanna River's 27,000 square mile watershed.

The Bay Program's goal is to observe downward trends in flow-adjusted nitrogen, phosphorus and sediment concentrations at most monitoring sites in the Bay watershed. The majority of long-term stream monitoring sites show downward trends in flow-adjusted nitrogen and phosphorus concentrations, reflecting an improvement in conditions since the mid 1980s.

Between 1985 and 2008:

- 25 out of 34 sites showed downward flow-adjusted trends for **nitrogen** concentrations, while two sites showed upward trends.
- 22 out of 34 sites showed downward flow-adjusted trends for **phosphorus** concentrations, while four sites showed upward trends.
- 13 out of 34 sites showed downward flow-adjusted trends for suspended **sediment** concentrations, while two sites showed upward trends.

At many monitored locations, long-term trends indicate that management actions, such as improved pollution controls, have reduced concentrations of nitrogen, phosphorus and sediment in streams.

Visit www.chesapeakebay.net/status_watershedhealth.aspx for more information about these indicators and links to state assessments.

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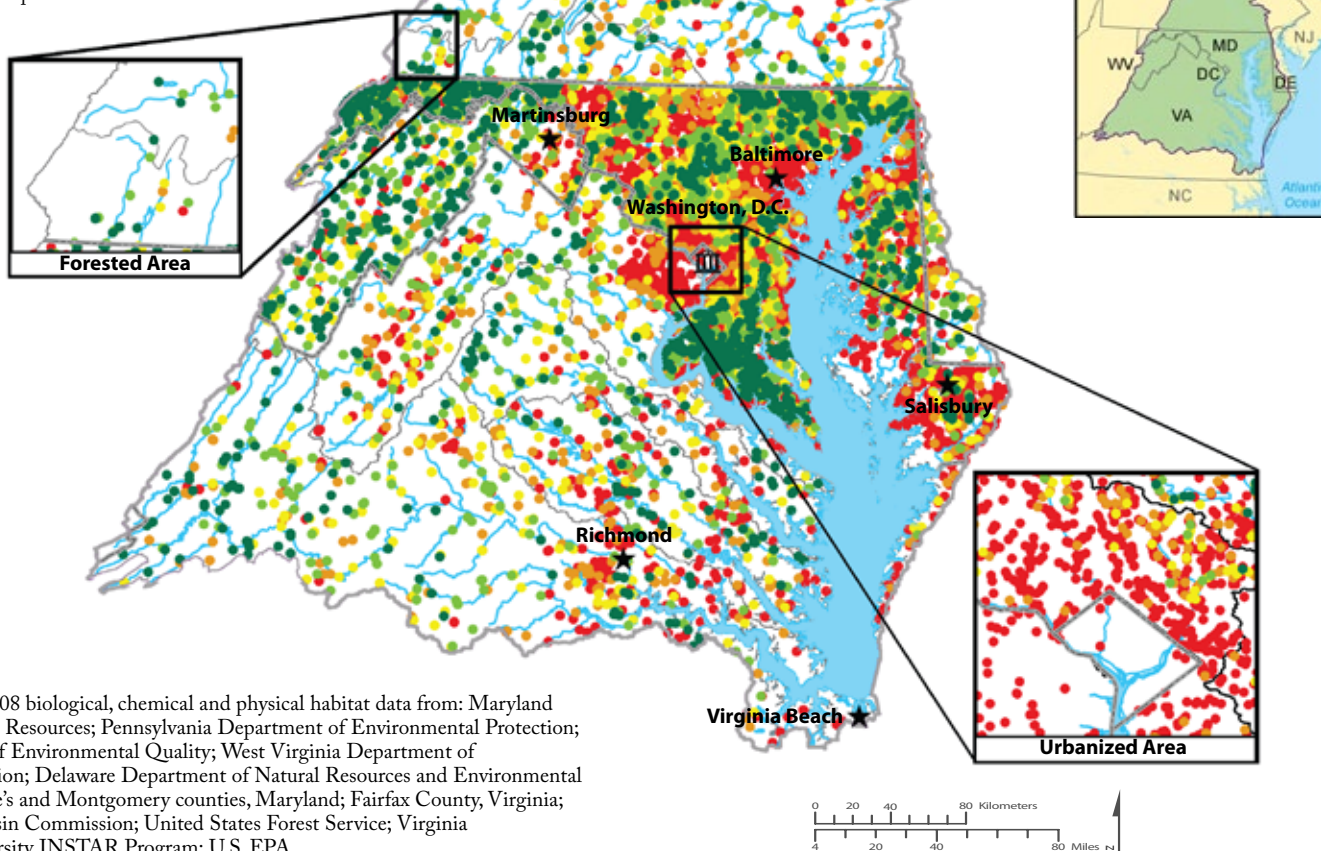
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Benthic Macroinvertebrate Index of Biotic Integrity

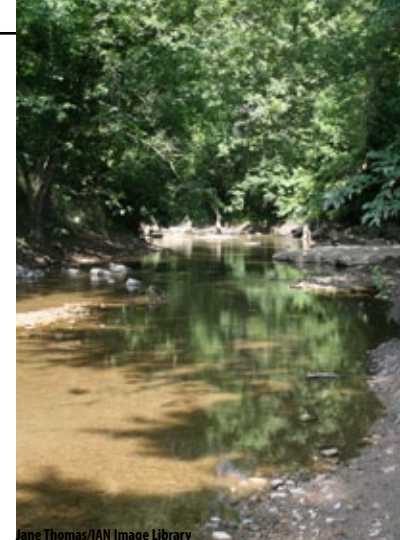


Note: District of Columbia and New York State data were not included in this analysis but will be in future assessments.

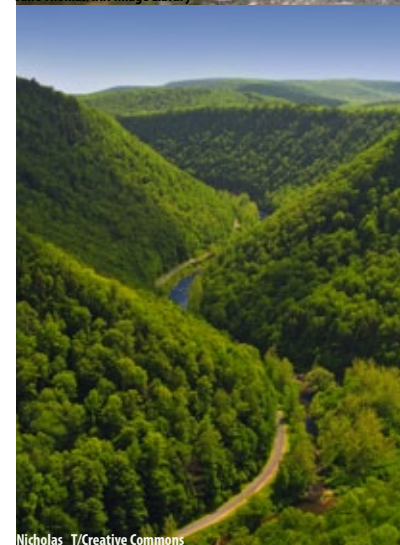
In this printed map, green dots are mapped last and may obscure some underlying dots. To view all dots, go to www.chesapeakebay.net/status_watershedhealth.aspx for an interactive map.



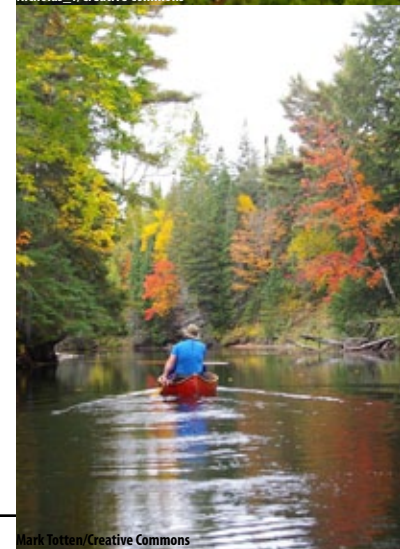
Data Sources: 2000-2008 biological, chemical and physical habitat data from: Maryland Department of Natural Resources; Pennsylvania Department of Environmental Protection; Virginia Department of Environmental Quality; West Virginia Department of Environmental Protection; Delaware Department of Natural Resources and Environmental Control; Prince George's and Montgomery counties, Maryland; Fairfax County, Virginia; Susquehanna River Basin Commission; United States Forest Service; Virginia Commonwealth University INSTAR Program; U.S. EPA.



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Tim McCabe/Natural Resources Conservation Service



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Restoration and Protection Efforts

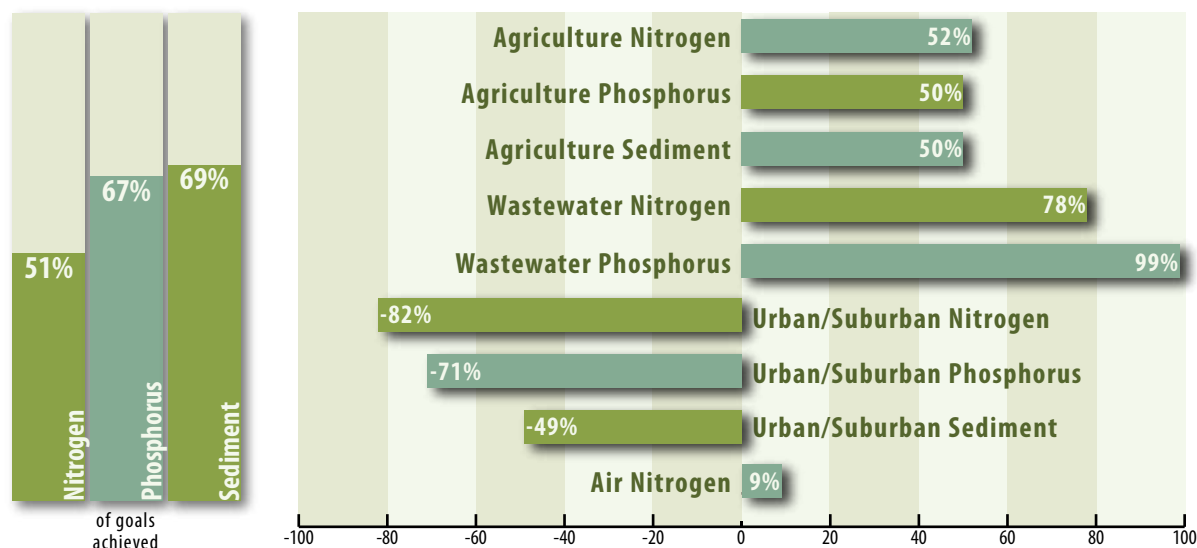
64 percent

Bay Program partners continued efforts to restore and protect the Bay and its watershed in 2009, increasing progress toward goals by 3 percent. However, pollution from urban and suburban areas continues to hinder the effectiveness of restoration efforts. The partnership planted more miles of forest buffers and exceeded its 2010 target to improve oyster reefs. Also in 2009, more of the watershed's students received a meaningful outdoor Bay or stream experience.

Reducing Pollution

62 percent

Bay Program partners have implemented 62 percent of needed efforts to reduce pollution from agriculture, wastewater, urban and suburban areas, and air deposition to achieve restoration goals, a 3 percent increase from 2008. Progress was made toward goals to reduce nitrogen and phosphorus from wastewater; however, there was little gain toward goals to reduce pollution from agriculture and air deposition. Nutrient pollution from the watershed's cities and suburbs continues to offset many pollution reduction gains.

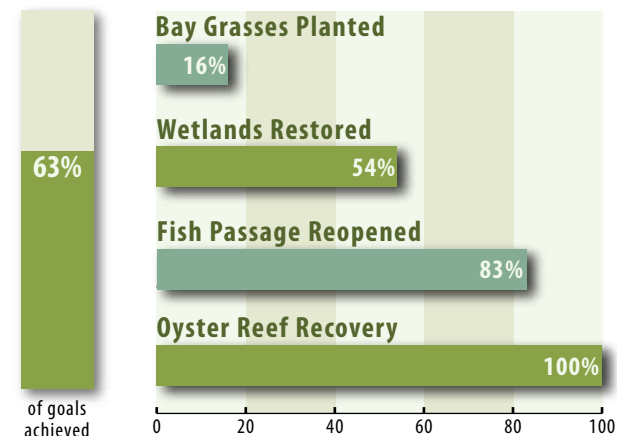


Note: Urban/suburban nitrogen includes both stormwater runoff and septic tank discharges. Some jurisdictions may be under-reporting existing stormwater management practices.

Restoring Habitats

63 percent

Efforts to restore critical wildlife habitats increased by 8 percent in 2009. The Bay Program partnership has surpassed its target of treating 2,466 acres of oyster reefs with habitat restoration techniques. Since 2007, partners have implemented reef restoration practices on 2,867 acres. While meeting this target is an important accomplishment, more work is needed. There were incremental gains in planting bay grasses, restoring wetlands and reopening fish passage.





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West Virginia Conservation Agency

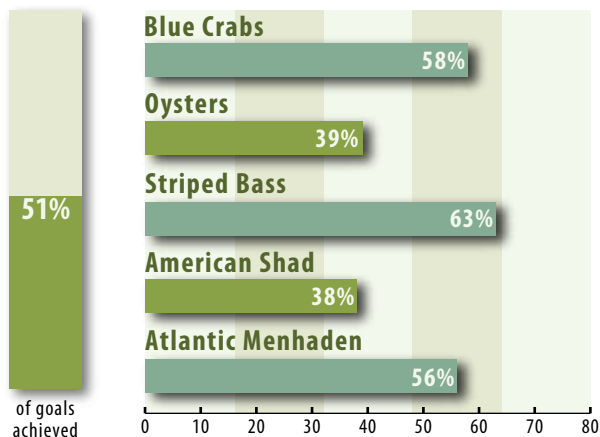


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Managing Fisheries

51 percent

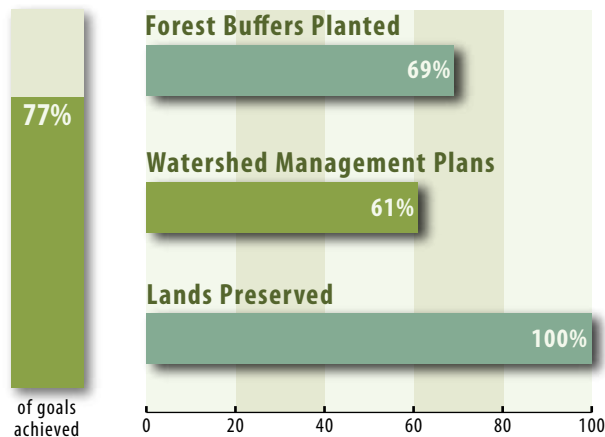
While significant effort went toward improving fisheries management in 2009, very few ecosystem-based actions were completed. Progress toward this goal has not changed since 2008 because the current fisheries management index does not fully capture the work being done to develop ecosystem-based fisheries management plans. In 2010, the Bay Program will create a new index for monitoring progress toward ecosystem-based fisheries management.



Protecting Watersheds

77 percent

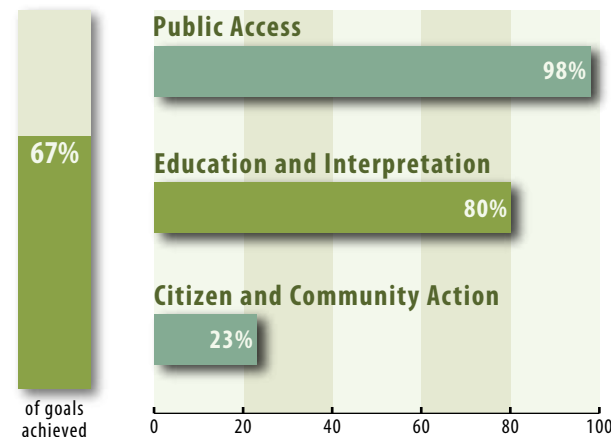
There was a 2 percent gain toward the goal to restore and protect the Bay region's thousands of small watersheds. Bay Program partners planted 722 miles of forest buffers along local waterways in 2009, increasing progress toward the forest buffer restoration goal by 7 percent. Another 132,873 acres of land were protected, bringing the total amount of land preserved in the watershed portions of Md., Pa., Va. and D.C. to 7.1 million acres.



Fostering Stewardship

67 percent

Programs to foster public stewardship of the Chesapeake Bay and its local waterways increased by 2 percent in 2009, achieving 67 percent of the goal. 80 percent of students in the Bay watershed received a Meaningful Watershed Educational Experience in elementary, middle and high school during the 2008-2009 school year, up from 73 percent the previous school year.



Visit www.chesapeakebay.net/status_restoration.aspx for more information about these indicators, including data and methods.

Partner Restoration Highlights

In 2009, Chesapeake Bay Program partners continued to make progress on goals and commitments while also focusing on new efforts to restore and protect the Bay and its local waterways. The following are some notable accomplishments that several Bay Program partners have achieved over the past year.

Chesapeake Bay Commission

The Chesapeake Bay Commission worked with the federal government on the development of the Chesapeake Bay Executive Order and sought new laws and funding to help the Bay jurisdictions meet their two-year milestones. Additionally, the Commission published *Chesapeake Biofuel Policies: Balancing Energy, Economy and Environment*, the third in a series of reports that show how increased plantings of next-generation biofuel crops could significantly reduce nitrogen pollution. View the full report at www.chesbay.state.va.us/biofuels.html. The Commission also joined an effort to create a nutrient credit trading program for the Bay watershed.

Delaware

2009 was a banner year for the Delaware Division of Fish and Wildlife's project to restore spawning American shad in the Nanticoke River. An estimated 713,000 three-day-old larvae were stocked in the river last year. To evaluate the project, staff sample juvenile shad in the summer and fall as they run downriver to the Chesapeake Bay. Because the larvae from Delaware's hatchery are marked with tetracycline, they can be distinguished from wild juveniles. In 2009, 22 percent of sampled returning adult American shad captured downriver in Maryland originated from the shad hatchery.

District of Columbia

The District of Columbia has made significant progress on green infrastructure. The District has installed 400 rain barrels and provided incentives for residents to implement other landscaping techniques such as shade trees and porous pavers. Learn more at ddoe.dc.gov/riversmarthomes. After one year of running the RiverSmart Rooftops incentive program, the city has supported the installation of green roofs at 15 properties covering 115,000 square feet. The District is now ranked second in the nation behind Chicago for the most green roof coverage. A new impervious area-based stormwater fee is helping to reduce polluted runoff, and the city is working to include low-impact treatments in road construction projects.

U.S. Department of Agriculture

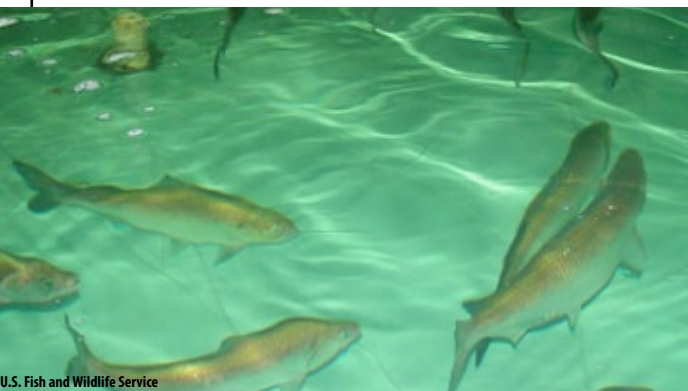
As part of the Chesapeake Bay Executive Order, the Department of Agriculture developed an initiative called Chesapeake Farms and Forests for the 21st Century. The initiative will identify high-priority watersheds to implement voluntary conservation actions, and accelerate the adoption of conservation programs and the development of new technologies. Also in 2009, the Natural Resources Conservation Service awarded a total of \$2.15 million in Conservation Innovation Grants to six Bay watershed projects that will use innovative approaches and technologies to protect the environment and enhance agricultural production.

U.S. Environmental Protection Agency

The U.S. Environmental Protection Agency has led work on President Obama's Executive Order, including the development of a new federal strategy for restoring and protecting the Chesapeake Bay. Working closely with the six Bay watershed states and the District of Columbia, the EPA continues to develop the Chesapeake Bay TMDL, a strict "pollution diet" for local waters and the Bay. Learn more about the TMDL at www.epa.gov/chesapeakebaytmdl. The EPA has initiated rulemaking to reduce pollution from Concentrated Animal Feeding Operations and stormwater runoff, and has more than doubled grant funding for permitting, enforcement and other regulatory activities.

Maryland

In 2009, Maryland farmers planted 239,000 acres of cover crops statewide. Doubling the acreage planted in cover crops is a prominent feature in Gov. Martin O'Malley's suite of 27 ambitious two-year milestones to accelerate Bay cleanup. Maryland's poultry farmers transported 52,000 tons of poultry litter out of the Bay watershed, exceeding the milestone goal by 168 percent. The state also fully funded Program Open Space for the third consecutive year and preserved more than 21,000 acres of vital natural landscape. The blue crab population is rebounding with the enactment of new regulations, and Maryland has taken action to rebuild native oyster populations.



U.S. Fish and Wildlife Service



Drew Saunders/Creative Commons



Maryland Department of Natural Resources

What You Can Do

The effort to restore and protect the Chesapeake Bay will never be successful without the active involvement of the watershed's nearly 17 million residents. Each one of us lives within a short distance of a stream, creek, river or the Bay, and everything we do on the land affects our nearby waterways.

Try taking these small steps at home, at work and in your community to help clean up streams, rivers and the Bay and keep them healthy for future generations.

- **Don't fertilize your lawn**, and eliminate a major source of nutrient pollution.
- **Pick up after your pet** to keep bacteria off the land and out of the water.
- **Use a phosphate-free dishwasher detergent** to reduce phosphorus in your wastewater.
- **Drive your car less** to reduce harmful emissions.
- **Plant native trees, shrubs and wildflowers** to filter pollution and attract beneficial wildlife.
- **Install a rain barrel and rain garden** to collect and absorb runoff.
- **Volunteer with your local watershed group** to clean up the stream, creek or river in your community.

Visit www.chesapeakebay.net/helpthebay.aspx for more ways you can make a difference.

New York

The Upper Susquehanna Coalition, the Natural Resources Conservation Service and land owners in New York continued to support implementation of the state's tributary strategy in 2009, restoring 322 acres of wetlands; installing 42,343 feet of stream fencing; planting 485 acres of forest buffers; constructing 18 separate animal waste systems; placing 8,177 acres under comprehensive nutrient management plans and 3,778 acres under prescribed grazing; and subscribing 3,160 cows to precision feeding and 1,397 cows to ammonia emission reduction plans. Additionally, regional land trusts protected 248 more acres of land.

Pennsylvania

Pennsylvania is developing its watershed implementation plan, which will build upon three core elements that have already shown success: milestone implementation, new technology and nutrient trading, and nonpoint source compliance. In 2009, Pennsylvania surpassed its goal to restore 3,736 miles of forest buffers; the state has planted 3,894 miles of buffers along waterways since 2002. Additionally, Pennsylvania is promoting enhanced regional methane digesters that digest manure, produce electricity and substantially reduce nutrients. To facilitate the nutrient trading market, efforts are underway to create a bank and exchange in PennVEST that would buy and sell nutrient credits, and eight contracts for private market nutrient trades have been signed.

Virginia

Virginia met its self-imposed statewide land conservation goal of 400,000 acres over the past four years, preserving 424,103 acres as of winter 2010. Specific land conservation accomplishments include the creation of two new state parks, six new state forests and 13 natural area preserves, and parts of 13 Civil War battlefields were protected. Gov. Bob McDonnell has established a new goal to preserve an additional 400,000 acres over the next four years.

West Virginia

West Virginia has launched a website, www.wvca.us/bay, to keep residents, local governments and other interested stakeholders informed about measures the state is taking to restore the local streams and rivers that flow to the Bay. The state's Eastern Panhandle introduced a pilot program to assist in implementing conservation practices on farms; in the first year, 84 farms enrolled in the program. In 2009, West Virginia also released the Potomac Headwaters Water Quality Report, which summarizes 10 years of monitoring data collected from 114 sites.

Visit www.chesapeakebay.net/partnerorganizations.aspx for a full list of Chesapeake Bay Program partners.



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The Chesapeake Bay Program is a regional partnership that has coordinated and conducted the restoration of the Chesapeake Bay since 1983. Partners include the U.S. Environmental Protection Agency; the U.S. Department of Agriculture; the states of Delaware, Maryland, New York, Pennsylvania, Virginia and West Virginia; the District of Columbia; the Chesapeake Bay Commission, a tri-state legislative body; and advisory groups of citizens, scientists and local government officials.

Many federal and state agencies, local governments, academic institutions and non-governmental organizations contributed data and analysis to this report, including: Alliance for the Chesapeake Bay; Anne Arundel Community College; Chesapeake Bay Commission; Chesapeake Research Consortium; Delaware Department of Natural Resources & Environmental Control; District of Columbia Department of the Environment; District of Columbia Department of Health; Fairfax County, Virginia; Interstate Commission on the Potomac River Basin; Maryland Department of Agriculture; Maryland State Department of Education; Maryland Department of the Environment; Maryland Department of Natural Resources; Montgomery County, Maryland; Morgan State University Estuarine Research Laboratory; National Aquarium in Baltimore; National Oceanic & Atmospheric Administration; National Park Service; New York State Department of Environmental Conservation; Old Dominion University; Oyster Recovery Partnership; Pennsylvania Department of Conservation & Natural Resources; Pennsylvania Department of Education; Pennsylvania Department of Environmental Protection; Pennsylvania Fish & Boat Commission; Prince George's County, Maryland; Susquehanna River Basin Commission; University of Maryland Center for Environmental Science; University of Maryland College Park; Upper Susquehanna Coalition; U.S. Army Corps of Engineers; U.S. Environmental Protection Agency; U.S. Fish & Wildlife Service; U.S. Forest Service; U.S. Geological Survey; USDA Natural Resources Conservation Service; Versar, Inc.; Virginia Department of Conservation & Recreation; Virginia Department of Education; Virginia Department of Environmental Quality; Virginia Department of Forestry; Virginia Department of Game & Inland Fisheries; Virginia Institute of Marine Science; Virginia Marine Resources Commission; Virginia Polytechnic Institute & State University; West Virginia Department of Agriculture; and West Virginia Department of Environmental Protection.

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