

Chesapeake Bay Report Card 2015



University of Maryland Center for Environmental Science

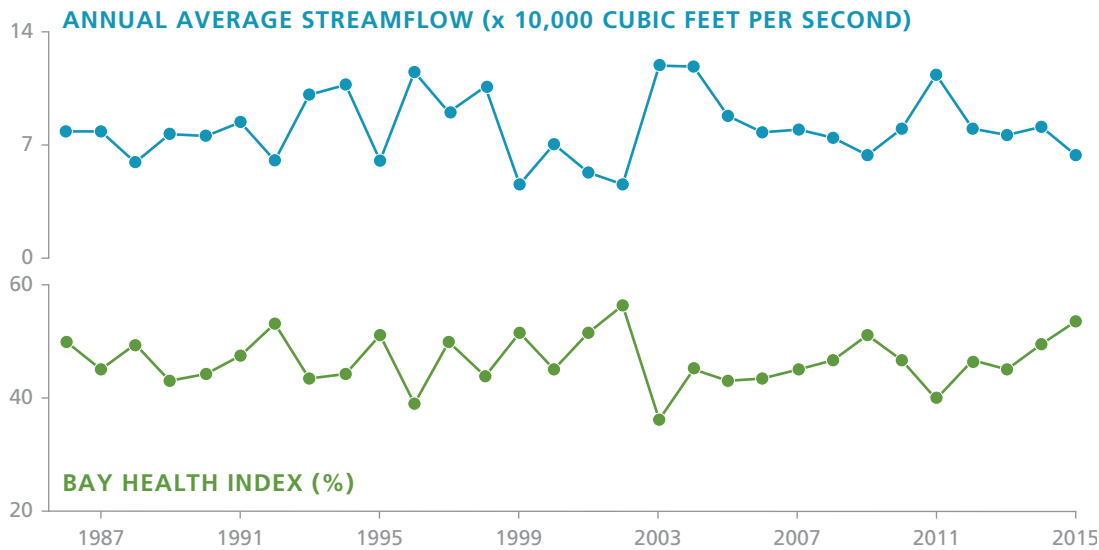


Bay Health improved without a long-term drought

The overall Bay Health score (53%) in 2015 was one of the highest recorded. Only 1992 and 2002 scored as high or higher. Both 1992 and 2002 were major drought years that also followed either drought or regular flow years. 2015 was not a major drought year, nor were the previous years. Since rainfall leads to increased nutrient and sediment runoff from land, it is not surprising that drought leads to improvements in Bay Health. Overall, the streamflow was below normal for 2015, but nowhere near the drought

conditions in 1992 and 2002. So, the high score for 2015 was particularly noteworthy. Bay Health is also increasingly influenced by high summer temperatures. For example, high water temperatures in 2005 and 2010 led to declines in aquatic grasses. Dissolved oxygen levels are influenced by high water temperatures as well. In 2015, summer water temperatures in Chesapeake Bay were relatively mild, even though 2015 was overall the hottest year on record for air temperatures.

Streamflow and the Bay Health Index, 1986–2015



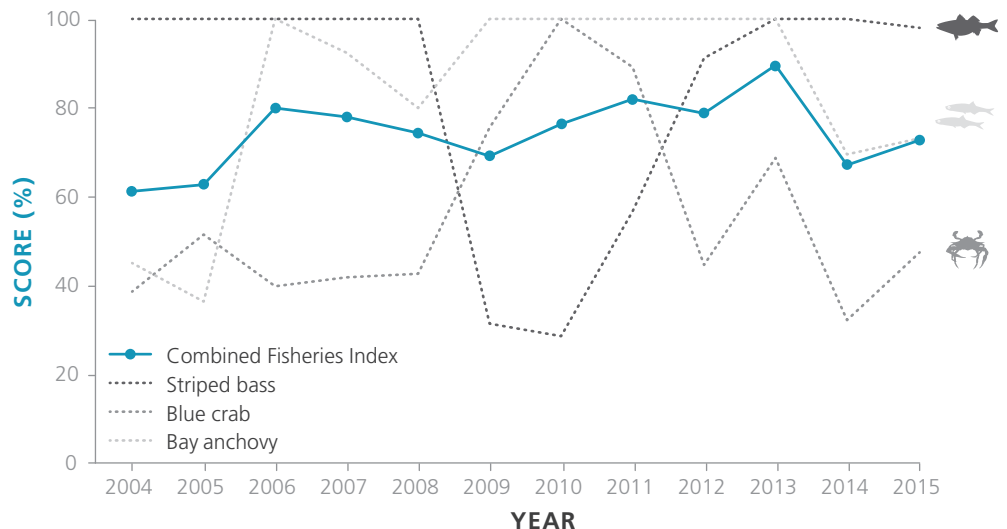
Streamflow compared to the Bay Health Index from 1986–2015. Increased streamflow often results in decreased Bay Health.

Key fish populations remain healthy

Striped bass, bay anchovy, and blue crab are ecologically, economically, and socially important fish species in Chesapeake Bay and together, they make up the Fisheries Index. While the Fisheries Index is variable over time, the 2015 score of 73% was an improvement over the previous year's score of 67%. This is a moderately good score.

The Index is an average of all three species scores. Striped bass held steady with a 98% score, while both blue crab and bay anchovy improved. Blue crab scored a 47% and bay anchovy scored a 73%. Fisheries indicators can have large variation from year to year since these species move throughout the Bay and are highly managed.

Health of Fisheries Indicators, 2004–2015

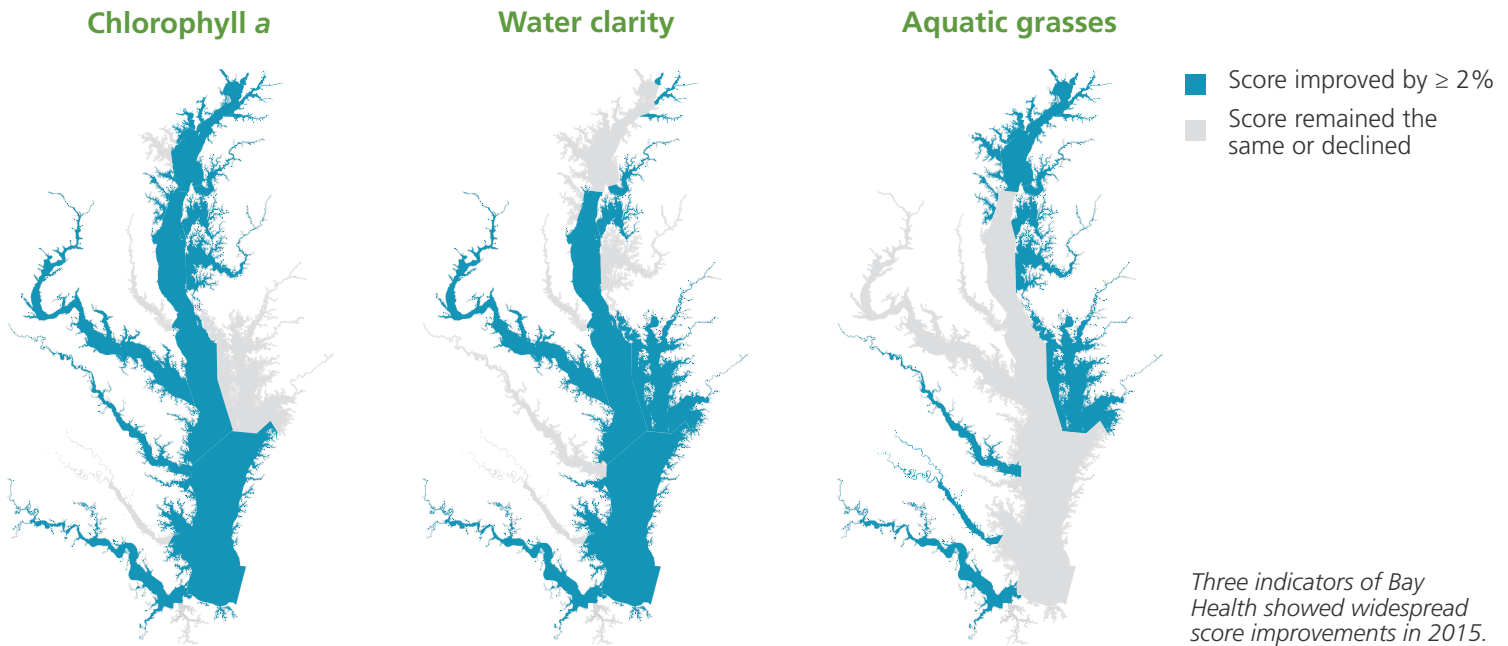


Fisheries indicators are variable over time. In 2015, the Fisheries Index improved over the previous year.

Bay Health improvements were widespread

- **Chlorophyll a** improvements were widespread, extending from the Upper Bay to the mouth of Chesapeake Bay. Improvements in major tributaries like the Potomac, Rappahannock, James, and Choptank Rivers were also seen.
- **Water clarity** improvements were also widespread, but more pronounced in the central and lower Bay.
- **Aquatic grass** improvements were primarily associated with the freshwater species in the Upper Bay and at the head of tributaries. In addition, widgeon grass expanded in the mid-range salinity areas of the Bay.

The causes of these improvements could be related to the successive years of moderate weather, the continuing sewage treatment upgrades, widespread use of winter cover crops, and reductions in atmospheric nitrogen deposition. However, the exact degree to which each of these factors contributed individually or cumulatively to the improvements is unknown.



Lower phosphorus scores in 2015 are unexplained






Despite overall improvements in Bay Health and improvements in almost every other Bay Health indicator, the score for total phosphorus worsened to 70% in 2015, down from 79% the previous year. This indicator is a measure of total phosphorus concentrations in the water at over 130 stations throughout the tidal waters of Chesapeake Bay. Although modeled estimates showed a decrease in phosphorus loadings from the watershed, phosphorus concentrations in the Bay increased, causing the scores to go down. This disconnect is difficult to explain—lower inputs to the Bay should result in less phosphorus in the water. And, while scores decreased from 2014-2015, phosphorus scores are showing a long-term improving trend from 1986-2015. Further research, like the study underway at UMCES on the Conowingo Dam, is needed to answer this question.



Conowingo Dam stores and releases phosphorus to the Bay from the Susquehanna River. Photo by Jane Thomas.

Improving trends throughout the Bay

Bay Health trends

-  Significantly improving
-  Slightly improving
-  No change
-  Slightly declining
-  Significantly declining

Upper Western Shore

Moderate ecosystem health. Improved the most in total nitrogen and aquatic grasses and had a perfect dissolved oxygen score. Over time, this region is showing a significantly improving trend.

**2015
Chesapeake
Bay Health:**



Patapsco and Back Rivers

Poor ecosystem health. There were strong improvements in total phosphorus, benthic community, and aquatic grasses. Overall this region is showing a significantly improving trend.

Upper Bay

Moderate ecosystem health. This area had improvement with gains in chlorophyll a and total nitrogen scores. Over time, this region is showing a significantly improving trend.

Lower Western Shore (MD)

Poor ecosystem health. Large improvements in chlorophyll a and benthic community and slight increases or no change in other indicators led to better scores. Over time, this region is showing a slightly improving trend.

Patuxent River

Poor ecosystem health. This region remains steady. While some indicators improved, others declined. This region had the lowest aquatic grass score.

Potomac River

Moderately poor ecosystem health. This region's score remained steady from the previous year. Improvements in chlorophyll a were offset by declines in total phosphorus.

Rappahannock River

Moderate ecosystem health. Scores improved from the previous year. There were large improvements in benthic community, total nitrogen, and chlorophyll a.

York River

Poor ecosystem health. Declines in total phosphorus were balanced by strong increases in total nitrogen. Over time, this region is showing a slightly improving trend.

James River

Moderate ecosystem health. Improvements in chlorophyll a were balanced by declines in total phosphorus. This region is showing a significantly improving trend.

Upper Eastern Shore

Moderate ecosystem health. Improvements in six out of seven indicators. The aquatic grass score increased the most out of any region. However, this region is still very close to showing a slightly declining trend.

Choptank River

Moderate ecosystem health. Overall health improved the most out of all regions due to increases in benthic community, aquatic grass, and chlorophyll a scores.

Lower Eastern Shore (Tangier)

Moderate ecosystem health. Health remained steady. While some indicators improved, others declined. Over time, this region is showing a significantly improving trend.

Mid Bay

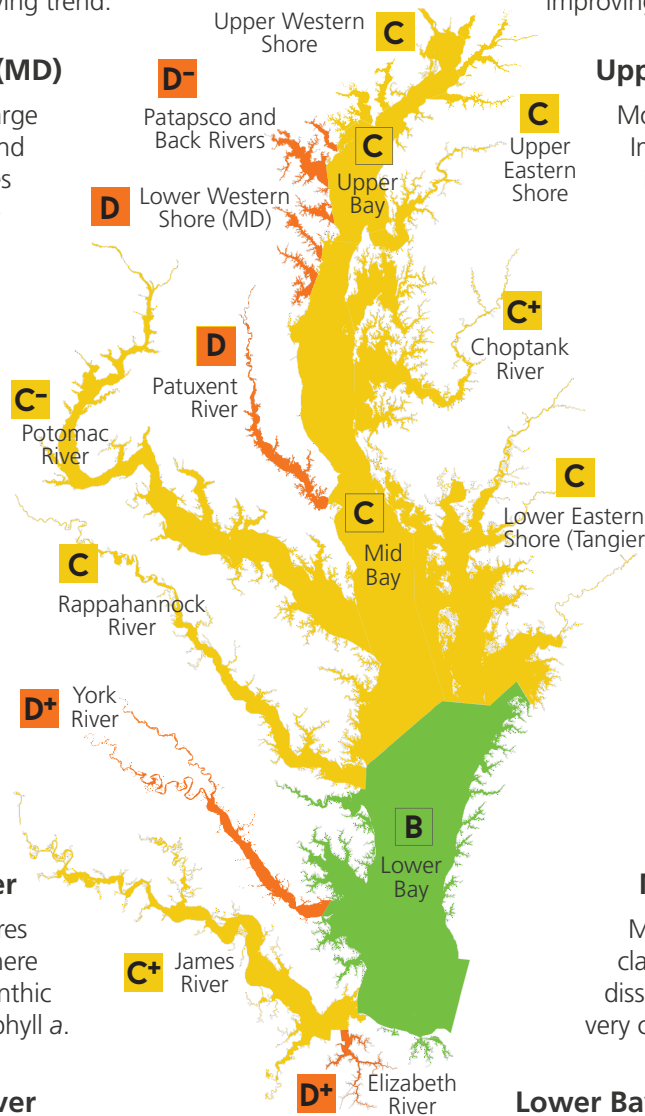
Moderate ecosystem health. While water clarity had the highest score of all regions, dissolved oxygen was lowest. This region is very close to showing a slightly declining trend.

Lower Bay

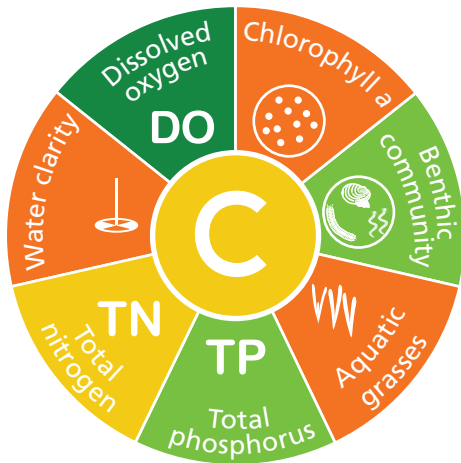
Moderately good ecosystem health. Continues to be the highest scoring region, especially for total nitrogen and total phosphorus. Chlorophyll a and water clarity also improved from the previous year.

Elizabeth River

Poor ecosystem health. Health remained steady. The high benthic community score offset indicators that declined. This region is showing a significantly improving trend.



Continued improvements in Bay Health



Bay Health scale





The overall score for the Chesapeake Bay Health Index for 2015 was 53%, compared with 50% in 2014 and 45% in 2013. This improvement is very encouraging. Improvements in Bay Health are Bay-wide; scores in almost every reporting region improved from 2014 to 2015.


Most of the indicators comprising the Chesapeake Bay Health Index improved in 2015. In particular, water clarity (23%) improved, which is a positive development considering the dramatic decline seen in water clarity over the past two decades. Chlorophyll a (35%), a measure of phytoplankton concentration, improved throughout the Bay. These improvements in water quality likely contributed to the resurgence in aquatic grasses (39%), which was particularly pronounced in the low and mid-salinity regions. Total nitrogen levels (58%) continued to improve throughout the Bay. Dissolved oxygen (88%) remained steady while the benthic index of biotic integrity (61%) showed improvement. The one indicator that declined was total phosphorus (70%).

Indicators in the Chesapeake Bay Report Card

There are seven indicators that make up the Bay Health Index for the Chesapeake Bay report card. Each indicator is compared to scientifically derived thresholds or goals and scored to determine the overall grade. Each indicator is scored by reporting region, and then the reporting regions are weighted by area to calculate the overall Bay Health Index. There are 15 reporting regions that make up Chesapeake Bay. There are also three fisheries indicators that make up the Fisheries Index; however, this index is not used in the overall Bay Health score.




 Chlorophyll a is used as a measure of phytoplankton (microalgae) biomass. High phytoplankton levels lead to reduced water clarity and decomposing phytoplankton result in reduced dissolved oxygen levels.

 Water clarity is a measure of how much light penetrates through the water column. Water clarity plays an important role in determining aquatic grasses and phytoplankton distribution and abundance.

 Aquatic grasses, or submerged aquatic vegetation, are one of the most important habitats in Chesapeake Bay. Aquatic grasses provide critical habitat to key species such as blue crab and striped bass, and can improve water clarity.

DO Dissolved oxygen is critical to the survival of Chesapeake Bay's aquatic life. The amount of dissolved oxygen needed before aquatic organisms are stressed, or even die, varies from species to species.

 The Benthic Index of Biotic Integrity measures the condition of the benthic community living in or on the bottom areas of the Bay. These organisms are a key food source for fish species.



 Striped bass, bay anchovy, and blue crab make up the Fisheries Index, which is not included in the Bay Health score. Bay anchovy are one of the most abundant schooling fishes in the Bay, providing an important food source for top predators. Striped bass is a key top predator, and uses the Bay as an important spawning and nursery area. Blue crabs are both predator and prey in the Bay's food web and use aquatic grasses as habitat.

TP Total phosphorus is an indicator of excess phosphorus in the Bay. Too much phosphorus can lead to algae blooms, which cause poor dissolved oxygen conditions and stresses Bay organisms.

TN Total nitrogen is an indicator of excess nitrogen in the Bay. Too much nitrogen can lead to algae blooms, which cause poor dissolved oxygen conditions and stresses Bay organisms.

For more information, visit chesapeakebay.ecoreportcard.org

You can help the Bay

The Chesapeake Bay is a large, complex estuary with many streams and rivers flowing into it. Solving the problems of the Bay takes hard work and investment by all levels of government and by many non-government groups. But achieving a clean, healthy Chesapeake Bay takes individual action, too. Here are some things you can do.

Know your Bay

It's easy and fun to show how much you care about the Chesapeake Bay. Paddling, fishing, bird watching, picnicking—enjoying this amazing resource is one of the best ways to show you care.

Make a change

Protecting the Chesapeake Bay is a daily exercise. At home, choose non-toxic household products that don't add harmful chemicals to our waters. Clean up after your pets to keep fecal bacteria out of the rivers and streams. Install a rain barrel or rain garden to prevent nutrients and sediments from washing off of your lawn and into the streams that flow to the Bay. Everyone can make a difference.

Join the movement

Find out who's working for clean water and healthy habitats in your neighborhood or community. Become a member, attend an event, or make a donation to show your support.

Celebrate success

There's good news, too. The Chesapeake Monitoring Cooperative (CMC) is a new initiative to incorporate citizen-based and non-traditional monitoring data into the Chesapeake Bay Program partnership. CMC envisions a Chesapeake community where all data of known quality are used to inform watershed management decisions and restoration efforts. You can help by joining your local watershed or volunteer monitoring program: chesmonitoringcoop.org.



Participating in tree plantings and trash pickups helps the Bay. Photos from Chesapeake Bay Program.

About the Chesapeake Bay Report Card

Report card produced and released in May 2016 by the Integration & Application Network, University of Maryland Center for Environmental Science. This report card provides a transparent, timely, and geographically detailed assessment of Chesapeake Bay. The data and methods underpinning this report card represent the collective effort of many individuals and organizations working within the Chesapeake Bay scientific and management community. The following organizations contributed significantly to the development of the report card: Chesapeake Bay Program, University of Maryland Center for Environmental Science (UMCES), National Oceanic and Atmospheric Administration, Maryland Department of Natural Resources, Virginia Department of Environmental Quality, Virginia Institute of Marine Science, Versar Incorporated, U.S. Environmental Protection Agency, Maryland Department of the Environment, Interstate Commission on the Potomac River Basin, Old Dominion University, Morgan State University, and U.S. Geological Survey. Cover photograph by Jay Fleming.

ian.umces.edu



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