

2016  
**STATE** OF THE  
**BAY**

health index  
**34/C-**



*Save the Bay*

CELEBRATING  
50 YEARS

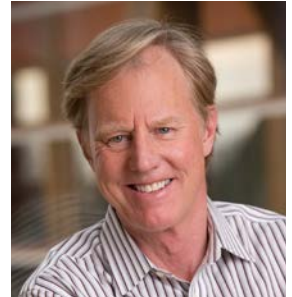


Save the Bay

CELEBRATING  
50 YEARS

## President's Message

As CBF enters its 50th year, we celebrate progress. We also demand an acceleration of pollution reduction, further protection and restoration of vital natural filters and habitat, and the very best, science-based fisheries management possible.



We are pleased that our bi-annual State of the Bay health index score has increased again, this time by over six percent, to a C-, better than the D+ from 2014 but still a grade that is far from acceptable.

Here are the facts:

- Science has drawn a clear road map for saving the Bay.
- All of the states in the watershed and several federal agencies have endorsed the science.
- The states and federal agencies have committed to achieve specific pollution-reduction targets by 2025.
- An interim deadline requires the partnership to achieve 60 percent of the targets by 2017.

As we go to press, the state and federal partnership has 12 months to meet its self-imposed interim benchmark. While that will be a heavy lift, it is imperative for all 18 million of us who live in the Bay watershed to keep the pressure on. Our elected and appointed leaders need to build on the momentum that has been achieved thus far and do everything possible to succeed. The fate of one of our nation's most iconic national treasures is at stake.

Save the Bay!

A handwritten signature in blue ink that reads 'Willie'.

William C. Baker, President

## How We Create Our Report

The *State of the Bay* report is based on the best available information about the Chesapeake for indicators representing three major categories: pollution, habitat, and fisheries. Monitoring data serve as the primary foundation for the report, supplemented by in-the-field observations.

We measure the current state of the Bay against the healthiest Chesapeake we can describe—the Bay Captain John Smith depicted in his exploration narratives from the early 1600s, a theoretical 100.

We assign each indicator a score and then average the scores in the three categories to determine the overall state of the Chesapeake Bay. Our number scores correlate with letter grades as show below. Note that the grading scale has been improved to include both “plus” and “minus” grades.

- 70 or better ..... A
- 65–69 ..... A–
- 60–64 ..... B+
- 55–59 ..... B
- 50–54 ..... B–
- 45–49 ..... C+
- 40–44 ..... C
- 34–39 ..... C–
- 30–33 ..... D+
- 25–29 ..... D
- 20–24 ..... D–
- 19 or below ..... F

# 2016 STATE OF THE BAY

**HEALTH INDEX**

**34 C–**

+2 from 2014

## SUMMARY

	Indicator	2016 Score	Change From 2014	Grade
<b>POLLUTION</b>	Nitrogen	17	+1	F
	Phosphorus	28	+3	D
	Dissolved Oxygen	40	+3	C
	Water Clarity	20	+2	D–
	Toxics	28	0	D
<b>HABITAT</b>	Forested Buffers	57	-1	B
	Wetlands	42	0	C
	Underwater Grasses	24	+2	D–
	Resource Lands	32	0	D+
<b>FISHERIES</b>	Rockfish	66	+2	A–
	Blue Crabs	55	+10	B
	Oysters	10	+2	F
	Shad	11	+2	F

The urban and suburban polluted runoff (stormwater) challenge is **great**, but many solutions reduce pollution and create good jobs.



**pollution**



## Infrastructure Innovation

**Don't Dump: Chesapeake Bay Drainage!** When these words started showing up painted on storm drains in the early 1990s, it was easy to visualize the effects of oil and trash rushing directly down drain pipes to Bay tributaries. For many, those messages were the beginning of awareness that urban and suburban polluted runoff (stormwater) could hurt our beloved waterways. Much less obvious, though, is toxic dust and fluids from automobile brake pads, tailpipes, and engines; forgotten pet poop; or excess lawn fertilizer. These things can make us sick and destroy animal habitat. Rain flowing downhill across impervious (non-porous) surfaces like rooftops, parking lots, and roadways gathers speed carrying material to drain pipes that lead directly to our rivers, streams, and ultimately the Bay.

Contrast that scenario with the way rainwater fell on the Chesapeake's 64,000-square-mile watershed 400 years ago, when this land was 95 percent old-growth forest. Trees broke the fall of that rain. Water soaked into the soil below, which slowly filtered it as it moved underground to streams, creeks, rivers, and the Bay. We sometimes refer to that process as the Great Green Filter. We have developed much of our land in the intervening centuries, changing the Great Green Filter to the Gray Funnel in many cases. Today, runoff pollution from impervious surfaces continues to increase, while thanks to major efforts by municipalities and farmers, pollution from wastewater plants and agriculture is decreasing.

Restoring the Chesapeake's entire Great Green Filter is obviously not an option, but engineers, landscape architects, contractors, municipal officials, and private landowners are devoting genuinely creative thinking to rebuilding infrastructure that allows rainwater to filter through natural systems, while local and regional governments work out ways to finance the work. DC Water is an example of applying innovative solutions and financing to help address polluted runoff in Washington, D.C. While the challenge is great, many of these solutions create jobs. It's imperative that we find and implement these types of solutions if we want a healthy Chesapeake.



## Nitrogen: 17

(+1 from 2014)

## Phosphorus: 28

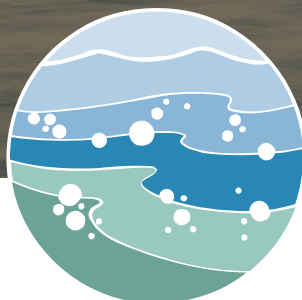
(+3 from 2014)

Bay-wide nitrogen and phosphorus pollution decreased since 2014. Excess nitrogen and phosphorus fuel algal blooms that contribute to dead zones. As algae die and decompose, they consume oxygen in the water.

These scores' improvements are partly a reflection of less-than-average precipitation, resulting in less-than-average pollution flowing into some rivers, including the Susquehanna. The reduction in nitrogen and phosphorus is also an indication that we may be seeing the benefits of implementing management actions.

According to the U.S. Geological Survey, long-term (1985-2015) trends in nitrogen pollution at monitoring stations on the nine main rivers feeding the Bay indicate improving conditions.<sup>1</sup> The Choptank River in Maryland is the only station whose data indicate degrading conditions over the long-term period. Long-term trends in total phosphorus pollution are not as rosy, indicating improving conditions at only three stations and degrading conditions at five (one station had no trend).

1 U.S. Geological Survey, *Summary of Nitrogen, Phosphorus, and Suspended-Sediment Loads and Trends Measured in Nine Chesapeake Bay Tributaries: Water Year 2015 Update* by Douglas L. Moyer and Joel D. Blomquist, 2016.



## Dissolved Oxygen: 40

(+3 from 2014)

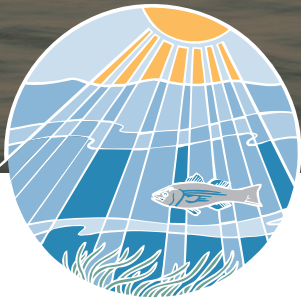
There is good news here. Analysis of the size and extent of the dead zone (areas in the Bay of no or low dissolved oxygen) during the summer of 2016 suggests reasons for optimism about the Bay's recovery. For the second time in two years there were no measured anoxic areas (defined as less than 0.2 milligrams per liter of oxygen) in the mainstem of the Bay.<sup>2</sup> More importantly, these last two years are the only ones on record since 1985 to have no recorded summertime anoxia.<sup>3</sup> This trend, if real, will be very good news for ecosystem recovery.

Each year, federal and state scientists forecast the size of the summer dead zone based largely on pollution coming from the Susquehanna and Potomac Rivers from January through May. In 2016, they predicted an "average to slightly smaller than average" dead zone. In fact, the dead zone observed in June was much smaller than expected. Although conditions deteriorated in late July and August, scientists declared that the "average early and late August conditions were promising."<sup>4</sup> Their reason was that the record high summer temperatures could have exacerbated the dead zones more significantly, but they did not. The overall size of the dead zone remained average—a possible sign of increased resilience.

2 Maryland Department of Natural Resources, *2016 Chesapeake Bay Hypoxia Report—Late August Update*, September 12, 2016.

3 University of Maryland Center for Environmental Science, Integration & Application Network.

4 See Footnote 2



## Water Clarity: 20

(+2 from 2014)

The last two summers' improving water clarity provide visible signs of Bay recovery. CBF field educators, our members, and even Bay scientists reported greatly improved water clarity.<sup>5</sup> In 2016, the underwater grass growing season started out very promising. Water clarity at most monitoring stations was above average through June. Though clarity generally decreased later in the summer, overall conditions were improved.

These observations give us reason for hope and portend what a future "saved Bay" might look like.

Though we have seen improvements in water clarity, the conditions are still far from what is needed for a healthy Bay. Suspended sediments and algal blooms, some of them toxic, fueled by nitrogen and phosphorus pollution are at levels that reduce water clarity and block sunlight needed for underwater grasses to flourish. These high levels of suspended sediments also cause problems for filter feeders such as oysters. We must continue to implement the Chesapeake Clean Water Blueprint to reduce the amount of nitrogen, phosphorus, and sediment that runs off agricultural and urban lands into our local streams, rivers, and ultimately the Chesapeake Bay.

<sup>5</sup> The Hull Truth Boating and Fishing Forum.



## Toxics: 28

(no change from 2014)

The 2014 Chesapeake Watershed Agreement included a goal ensuring that the Bay and its rivers are free of the effects of toxic contaminants on living resources and human health.

Despite the commitment made in the Chesapeake Watershed Agreement, progress continues to be slow. New reports document additional threats, exacerbating the region's toxics problem.

In 2015, Pennsylvania released a report that identified herbicides and endocrine-disrupting chemicals as likely causes of the smallmouth bass decline in the Susquehanna River.<sup>6</sup> And a recent review by scientists warned of the dangers of "microplastics" both within the Chesapeake Bay and globally. Microplastics include small particles formed from the degradation of larger plastic items like trash bags and those intentionally added to toothpaste, facial scrubs, and even fleece clothing. The threats are largely unknown, but their persistence and prevalence in the Bay, and beyond, is disturbing. On the positive side, recent federal and state (Maryland) legislation restricts the use of micro-beads. And, studies have shown that many best management practices that help reduce nutrient and sediment pollution can also reduce runoff of toxic chemicals.<sup>7</sup>

<sup>6</sup> It is worth noting that parasites were also thought to be a causal factor and other water-quality problems like algae blooms and low dissolved oxygen were not ruled out.

<sup>7</sup> Tom Schueler and Anna Youngk, *Potential Benefits of Nutrient and Sediment Practices to Reduce Toxic Contaminants in the Chesapeake Bay Watershed Part 1: Removal Of Urban Toxic Contaminants*, 2015.

**“If we clean it, they will come”**  
appears to be the  
most effective strategy.



**habitat**





## Live Green Bottom

When Captain John Smith and his crews explored the Chesapeake and its tributaries in the early 17th century, they sailed and rowed over several hundred thousand acres of underwater grass meadows between the Virginia Capes and the Susquehanna Flats. These shallow-water meadows, made up of a dozen grass species, created another keystone community that served as a complement to the deeper bottom oyster reefs. Both communities teem with life, from microorganisms, worms, tiny crustaceans, mud crabs, and small fish up to blue crabs, predator fish, and water birds, including, in winter, migratory waterfowl that may have flown several thousand miles to feed here. Grass beds contain literally billions of tiny, ecologically intertwining creatures. And like oyster reefs, they perform important functions that improve water quality.

The Chesapeake's oyster reefs and underwater grasses have suffered from our heavy human footprint in succeeding centuries. Grass beds require ambient light to grow. Given polluting levels of nitrogen and phosphorus, simple algae cells can grow and cloud the water creating a barrier between light and grasses.

The good news is that the Chesapeake Clean Water Blueprint is finally beginning to yield results. Pollution levels are falling, water clarity is improving, and thus our underwater grass meadows are beginning to grow back. Our score indicates only a 24 out of 100, just a quarter of the acreage that we believe Captain Smith saw, but the trend is positive, and the life we see in the growing beds is impressive.

Restoring grass beds by re-planting has met with limited success; improving water quality appears to be the key to success. "If we clean it [the water], they [the grasses] will come [back]" appears to be the most effective strategy for bringing back the Chesapeake's essential grass beds.



## Forested Buffers: 57

(-1 from 2014)

For the first time, we are lowering the score for forest buffers—those strips of trees near waterways that protect them from soil erosion and other pollutants. Stalled buffer implementation and a recent CBF analysis indicating the region is losing buffers account for the declining score.

Despite federal and state commitments to accelerate implementation, forest buffer plantings in 2015 (the most recent data) were the lowest in the last 16 years. The states planted only about 440 streamside acres (versus a Clean Water Blueprint goal of 14,000 acres annually) along the Chesapeake Bay and its rivers and streams. The lack of progress is alarming.

Using the U.S. Department of Agriculture's National Agriculture Imagery Program, CBF analyzed forested buffers gains and losses from 2005 to 2015 in one stream basin in each of the principle Bay states. We found a net gain in buffers, but it came as a result of a combination of 475 acres gained and 386 acres lost. States typically report only planted buffers, not those that are removed, suggesting reported data may be overestimating progress over time.



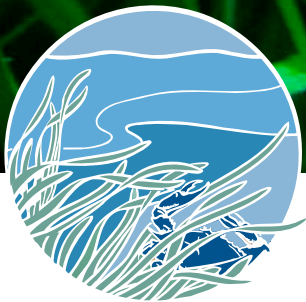
## Wetlands: 42

(no change from 2014)

Tidal and non-tidal wetlands are among the most important natural resources in the Chesapeake Bay region. Wetlands—swamps; bogs; salt marshes; many shallow areas of our rivers, creeks, and the Bay; and even some forested areas—provide valuable wildlife habitat and act as natural filters. They improve water quality by trapping and treating polluted runoff. The signers of the 2014 Chesapeake Watershed Agreement committed to a goal of restoring 85,000 acres of wetlands by 2025. The most recent data (2015) suggests the states have achieved only 10 percent of that goal.

Tidal wetlands are particularly vulnerable to sea level rise and, thus, among the most threatened natural resources in the Chesapeake. In this region, sea level has risen three times faster during the past two decades than the worldwide average.<sup>1</sup> There is some good news: In 2015, the Environmental Protection Agency finalized rules that will help ensure protection of non-tidal wetland habitats. We are hopeful that there will be ongoing support for these needed protections.

<sup>1</sup> Scientific and Technical Working Group Maryland Climate Change Commission, *Updating Maryland's Sea-Level Rise Projections*, 2013.



## Underwater Grasses: 24

(+2 from 2014)

Growing mostly in shallow water, underwater grass beds are critical to the restoration of the Chesapeake Bay. They provide habitat for fish and crabs, add oxygen to the water, help remove pollutants from the water, and trap sediment. Underwater grass abundance is a good indicator of water quality because grasses need clear water and sunlight to survive and thrive.

This year's increased score reflects the continued resurgence of underwater grasses in the Bay and its tidal rivers and may be one of the clearest signs that the Bay is on the road to recovery.

Between 2014 and 2015, underwater grasses increased by 21 percent to 91,621 acres. This represents the highest value in the last three decades and the highest ever-recorded by the Virginia Institute of Marine Science's annual aerial survey. Monitoring reports from 2016 indicate grasses from the Susquehanna Flats in Maryland to Tangier Island on the Eastern Shore of Virginia remain healthy and robust. We are concerned, however, that funding shortfalls for the Virginia Institute of Marine Science's survey threaten the future of this important monitoring program. We encourage federal and state agencies to ensure the continuation of this survey that is so critical to assessing the Bay's condition and recovery.



## Resource Lands: 32


(no change from 2014)

Resource lands are those critical land uses—including forests and well-managed agricultural lands—that actually contribute to good water quality. Since 2012, development has continued to increase and much of it is spreading out in an environmentally damaging way. However, the most recent data from 2014 demonstrate a slight slowdown. Additionally, some urban areas are seeing increases in redevelopment rather than new development.

Since 2002, the amount of farmland has decreased in Pennsylvania, Maryland, and Virginia by more than 600,000 acres or about half the size of Delaware. Virginia has lost the most farmland.

The good news is there was an overall gain of more than a half million forested acres between 2007 and 2014 in these three states. Of that, 127,000 acres occurred in Virginia between 2013 and 2014. Alternatively, Pennsylvania, experienced a decrease of 100,000 forested acres from 2013 to 2015.

At the same time, the annual protection of resource lands has continued a downward slide in Maryland. In 2015, the state added only 6,388 acres of protected lands compared to 25,000 in 2010; 19,500 in 2012; and 8,928 in 2013. Fortunately, Pennsylvania is continuing to protect farmlands with easements, averaging nearly 15,000 acres per year, while Virginia permanently preserved 40,000 acres of forest and farmland in 2015.

A man wearing sunglasses and a light blue shirt is crouching in a marshy area. He is holding several oysters in his hands, looking at them with a smile. The background is filled with tall, green grasses. The foreground shows a shallow stream of water with many oysters scattered on the rocks and mud.

**Meaningful oyster restoration  
in the Chesapeake Bay is  
critical to our environment,  
our economy, and our culture.**

**fisheries**



## Meaningful Progress

The Chesapeake's native oyster plays a critical role in improving water quality and supporting ecosystem health. And, it has, for centuries, been central to our region's economic and cultural success. Overfishing, habitat loss, and disease have reduced the oyster population to just a tiny fraction of its historic levels.

Together with partners across the watershed, CBF is intensifying efforts to restore a sustainable oyster population in the Chesapeake Bay—one that will benefit the Bay and its people, today and for future generations. Achieving such an outcome will require the long-term commitment of governments and citizens and dedicated funding to support a three-pronged restoration approach.

First, sanctuary-based restoration—creating and protecting large areas where oysters can thrive and help seed neighboring reefs with baby oysters—is the best way to encourage repopulation. In addition, the public fisheries—those open to harvest—in Maryland and Virginia must be more scientifically managed to protect habitat and populations. This means developing and implementing a science-based management system for oyster harvest that will ensure existing and resurging populations are not overfished.

Lastly, continuing the Chesapeake Bay's transition to aquaculture is key to providing jobs and boosting the seafood industry's economy. Just as sanctuary and wild populations improve water quality and larvae expansion, aquaculture provides these same benefits locally.

Because the ultimate benefits of meaningful oyster restoration in the Chesapeake Bay are critical to our environment, our economy, and our culture; so must our restoration efforts be a critical priority, focusing on sanctuary-based restoration, public fisheries management, and aquaculture.



## Rockfish: 66

(+2 from 2014)

The coast-wide rockfish (striped bass) population appears to have stabilized after a ten-year decline that was documented in 2013. States tightened their fishing rules in 2015, resulting in a 23 percent reduction in catch. These new rules should boost the spawning potential of the population as originally intended. Even at reduced capacity, the population produced very good numbers of young fish in 2011, thanks in part to favorable weather. Those fish, now five years old, are maturing and becoming spawners themselves, helping reverse the decline. There was another good hatch of young fish in 2015 that will help, too, in coming years.

Three quarters of the rockfish caught along the Atlantic Coast are spawned in the Chesapeake Bay. They spend their first four to six years in the Bay before joining their older cohorts and migrating as far north as Maine in the summer, following schools of their favorite food, Atlantic menhaden. While in the Bay as young fish, rockfish are exposed to challenging conditions including poor water quality and low numbers of menhaden. These stresses are thought to be the reason for the outbreak of a serious disease called *Mycobacteriosis*, seen in resident rockfish since 1997. Fewer rockfish survive their years in the Bay as a result, so improvements in water quality and menhaden management should lead to more rockfish.



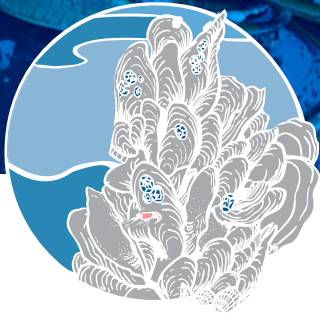
## Blue Crabs: 55

(+10 from 2014)

The total number of crabs has increased dramatically since 2014, from 297 to 553 million, as estimated from the annual winter survey. The total fell short of the peak of 779 million in 2012, the highest in twenty years. However, the recent number reflects a more resilient population because all categories—males, females, and juveniles—increased, whereas the 2012 peak was driven by high numbers of young crabs. While young crabs are key to the future, their numbers can drop quickly as they are susceptible to predation from striped bass and other predator fish species, as happened in 2012.

Numbers of adult crabs have roughly tripled since 2014, helped by better winter survival and continued management of crabbing activities. Wide fluctuations in blue crab numbers in past years is partly due to degraded habitat, particularly in slowly recovering underwater grass beds that provide essential cover for avoiding predators. Thus, the recent improvement may also be related to expanded grass beds seen in the Bay in 2014 and 2015.

The increase in mature female crabs, i.e. the “spawning stock,” pushed their numbers closer to the level that managers have set as the target population level for the Bay. The population will need to reach and maintain that level for several years before it can be considered healthy.



## Oysters: 10

(+2 from 2014)

Oyster harvests exceeded one million bushels in 2015 for the first time in thirty years, but they started dropping again in 2016. Good oyster reproduction in 2010 and 2012 increased the number of oysters on public bars, but their numbers didn't last due to greater harvest pressure from watermen.

There are no scientific estimates of the number of oysters Baywide, but the scale of ongoing restoration has led to increasing numbers in sanctuaries closed to harvest. In Harris Creek, the first tributary targeted for large-scale restoration in Maryland, all planted bars met the desired oyster density. If protected from harvest indefinitely, oysters in sanctuaries will slowly rebuild the three-dimensional reefs once common in the Bay, provide additional filtering and habitat benefits, and help repopulate other areas through reproduction. To fully gauge the success of both reproduction and harvest management, scientific assessments of the Bay's oyster population are essential.



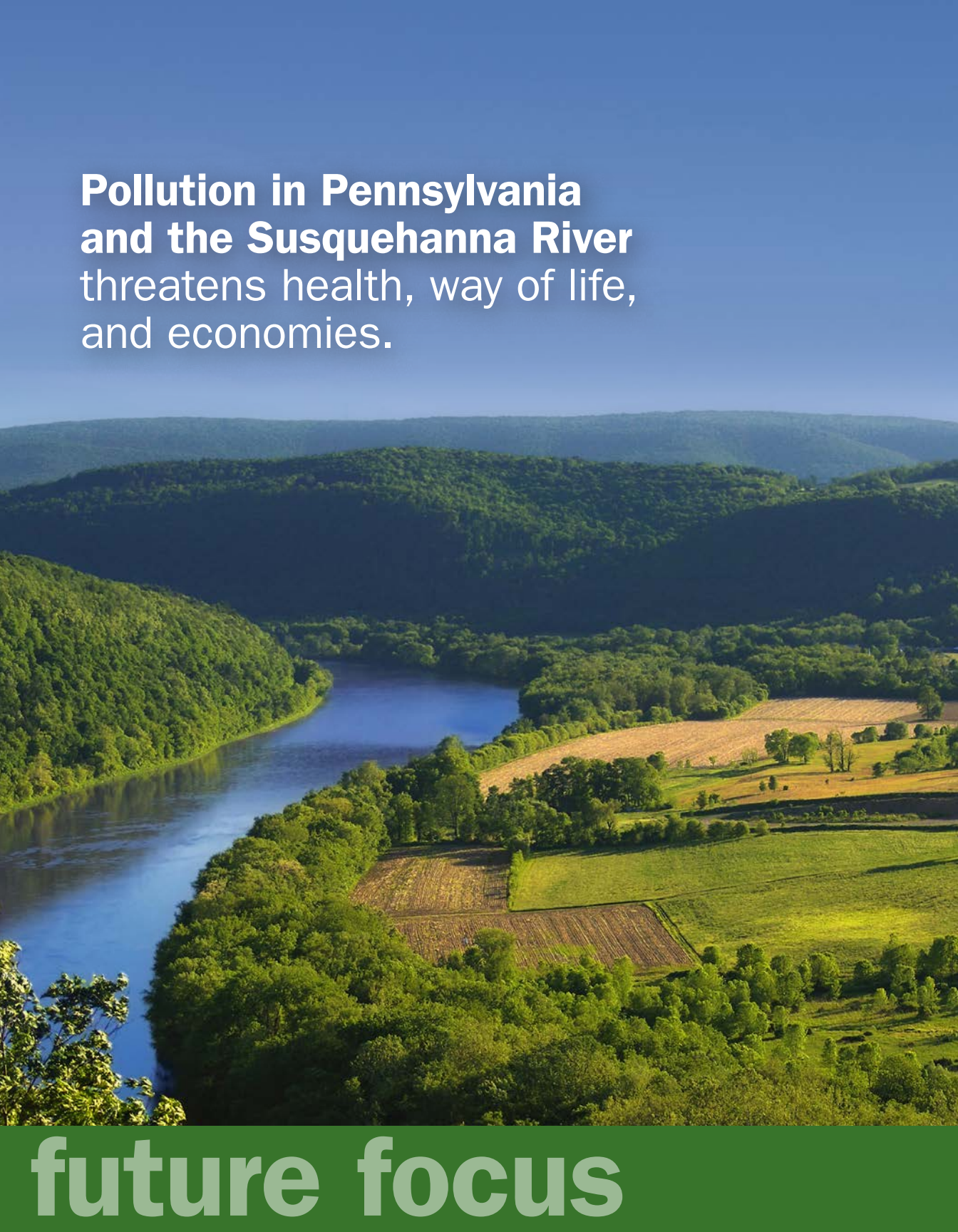
## Shad: 11

(+2 from 2014)

Spring runs of migratory American shad up Chesapeake rivers are legendary, having supported valuable fisheries for centuries until their decline in the twentieth century due to overfishing, pollution, and dams blocking upriver migrations. As a result, the traditional fisheries in the Bay and its tributaries have been shut down for decades. Shad numbers still remain very low, but a few bright spots give hope.

The return of shad to the Susquehanna River improved slightly in 2016 as did the number of juveniles hatched in the river. A new agreement to improve fish passage at the Conowingo Dam holds great promise, after fifteen years of poor returns of shad to the dam. The James River has seen improved returns in recent years due to consistent efforts to restock with hatchery-reared young. The brightest spot is the Potomac River, where shad are still netted to provide eggs for restocking efforts. Maryland's juvenile fish survey documented a record number of baby shad in 2015, driven primarily by numbers in the Potomac.

Another impediment to recovery still awaiting resolution is the accidental catch of shad in large-scale fisheries in the ocean for other species. Recovery of runs will continue to be slow until this ocean bycatch is controlled.



**Pollution in Pennsylvania  
and the Susquehanna River**  
threatens health, way of life,  
and economies.

**future focus**





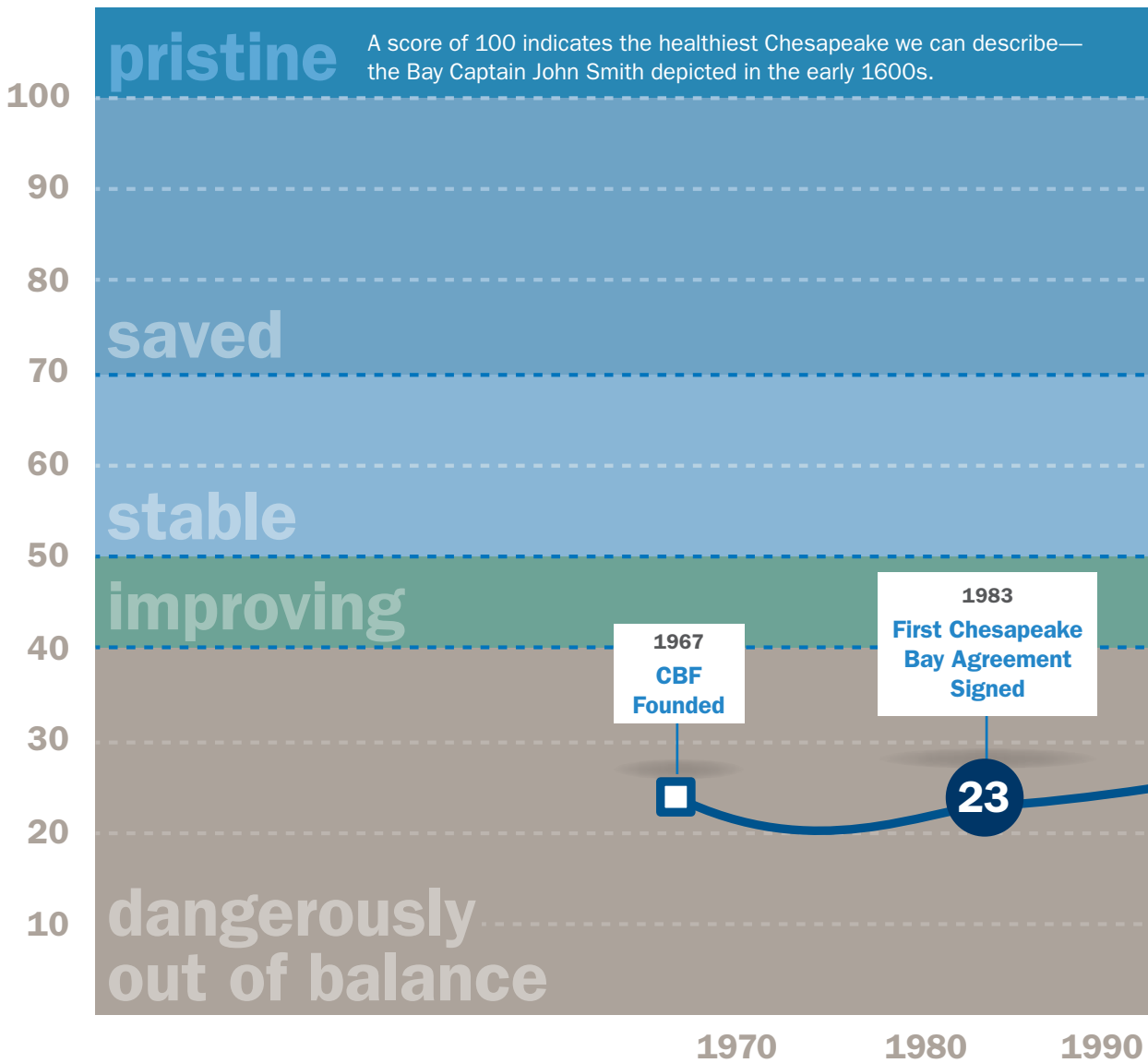
# A Healthy Susquehanna is Key to a Healthy Bay

The impact the Susquehanna River has on the Bay is hard to overestimate. Starting in Cooperstown, New York, and flowing 444 miles to the Chesapeake Bay, the Susquehanna River basin drains 27,500-square-miles of land and contains over 49,000 miles of rivers and streams. By the time it reaches the Chesapeake Bay the river has an average of 18 million gallons per minute flowing in it. Half of the freshwater in the Chesapeake is from the Susquehanna.

Although monitoring data by the U.S. Geological Survey is showing encouraging trends in decreasing pollution in several parts of the Susquehanna over the last several years, the river remains a significant source of pollution to the Bay. Polluted runoff coming from farm fields and urban and suburban developments are the primary sources affecting the health, way of life, and economies of people in the watershed portion of the Commonwealth and those downstream to the Chesapeake Bay.

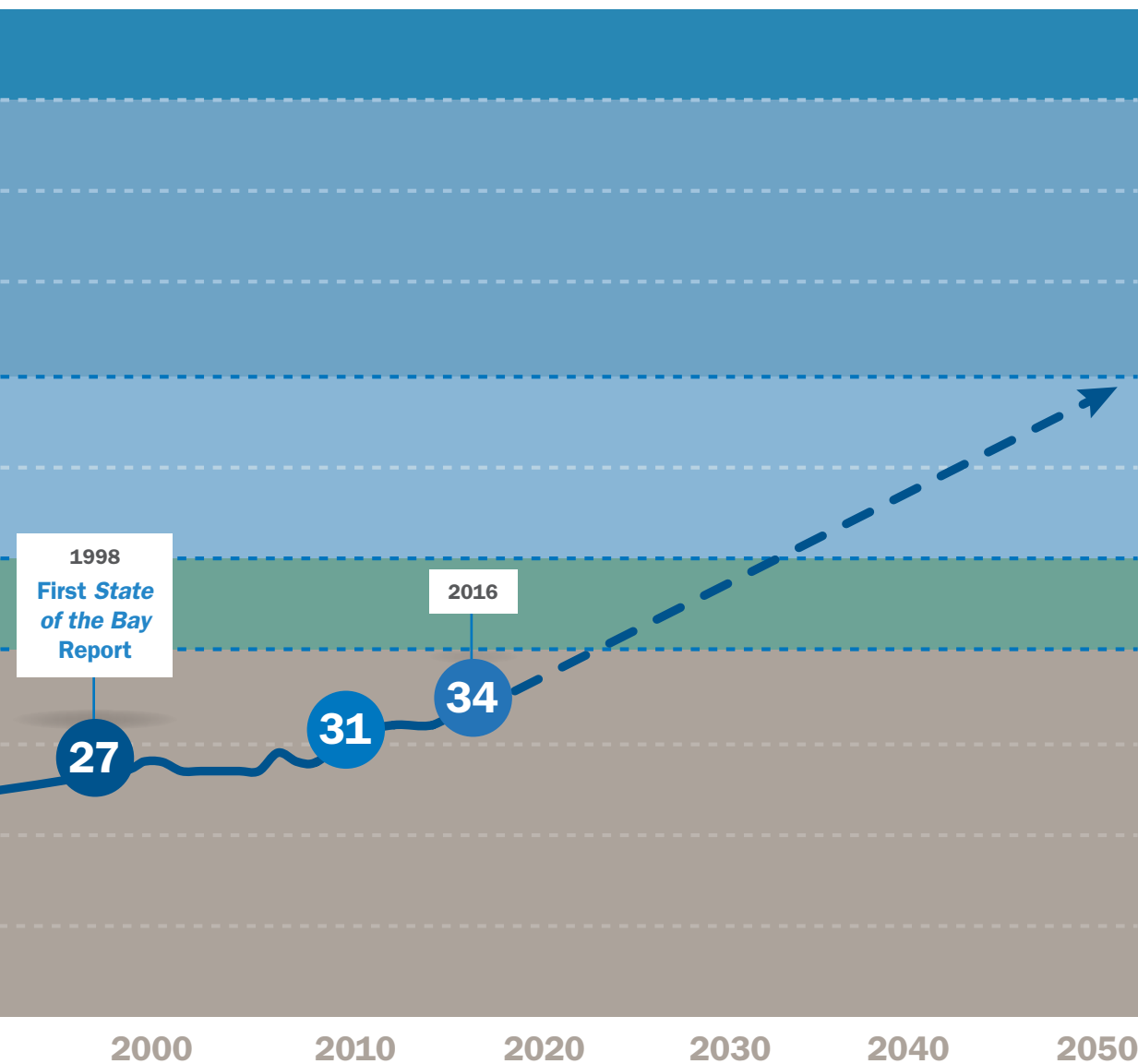
According to the Pennsylvania Department of Environmental Protection, roughly 19,000 miles, or nearly one-quarter, of rivers and streams in the Commonwealth are damaged by pollution. A large percentage of those are in the Susquehanna River basin. This is why CBF is focused on helping to reduce pollution entering the river from its tributaries. CBF called for additional funding to be committed to five high-priority counties in Pennsylvania. Although every county in the river basin must do its part, meeting 2025 Blueprint pollution-reduction commitments in these counties would represent a 14.1-million-pound nitrogen reduction. That is more than half of the agricultural 2025 nitrogen pollution-reduction goal.

In October 2016, the U.S. Department of Agriculture, the Commonwealth, and the Environmental Protection agency committed \$28.7 million in new federal and state funding. This critical funding will need to focus on the people, places, and practices that would accelerate pollution reductions from agriculture. This initial investment will help to jumpstart efforts to reduce pollution entering the Susquehanna but much more is needed.



## Moving Forward, Making Progress

The state of the Chesapeake Bay is improving. What we can control— pollution entering our waterways—is being reduced. But, the Bay is far from saved. Our 2016 report confirms that the Chesapeake and its rivers and streams remain a system dangerously out of balance, a system in crisis. We need to continue to make progress—even accelerate progress—otherwise, we will continue to have polluted water, human health risks, and declining economic benefits.



The good news is that we are on the right path. The Chesapeake Clean Water Blueprint is in place and working. All of us, including our elected officials, need to stay focused on the Blueprint, push harder, and keep moving forward. Saving the Bay and restoring local water quality will benefit each of us, our children, and future generations.

**Please contact your local, state, and federal officials and urge their unwavering support for the Chesapeake’s Clean Water Blueprint. You can find information on how to do this at [cbf.org/getinvolved](http://cbf.org/getinvolved).**



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*Saving a National Treasure*

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Clear water allows sunlight to penetrate  
the water and reach underwater grasses.  
When the water is clear like in this  
photograph, grasses thrive and rebound.

*Dave Harp*