CHESAPEAKE BAY FOUNDATION

Saving a National Treasure

REPORTS

Bad Waters:

Dead Zones, Algal Blooms, and Fish Kills in the Chesapeake Bay Region in 2007

ABOUT THE COVER:

Top Left/Bottom Right: In late June, nearly 20,000 dead fish littered Weems Creek in Anne Arundel County, Maryland. A mahogany tide caused by the harmful algae *Karlodinium venificum* was blamed for the kill.

Top Right: August 28, 2007. A deep red-brown algal bloom (*Cochlodinium polykrikoides*) overtakes the water on the Lafayette River near the Jamestown Crescent area of Norfolk, Virginia. The bloom was also documented in that area on August 9, 2007.

Bottom Left: Another mahogany tide discolors the water near Cape Henry Lighthouse in Virginia Beach, Virginia, at the mouth of the Chesapeake Bay. Citizens reported a foul smell near the lighthouse on the evening of August 27, 2007.

EXECUTIVE SUMMARY

Is clean water no longer a right?
Should we come to accept dead water, beach closures, and dying fish as normal?
Is this what our government officials mean when they call conditions like this "average"?

At the beginning of the summer, the Environmental Protection Agency predicted that this would be an "average" year for water quality conditions in the Chesapeake Bay. Throughout the summer, CBF has collected reports from citizens, government officials and agencies, partner groups, and our own employees' first-hand experience to determine just what an "average" year looks like.

Here's what we found:

Blooms of often-harmful, toxic algae were reported from Baltimore to Hampton Roads, often accompanied by dangerously low levels of life-sustaining dissolved oxygen. In Maryland, from June to early August there were 45 fish kills due to algae or oxygen-deprived dead zones, ranging in intensity from approximately 20,000 dead in Weems Creek in Anne Arundel County to fewer than 50 near the mouth of the Chester River. Between Maryland and Virginia, an algal bloom lasted for more than two months on the Potomac River, eventually killing over 300,000 fish. Fish kills of smallmouth bass and redbreast sunfish reported for the last four years in the Shenandoah River system have now jumped to another watershed: the upper James and its beautiful Cowpasture and Maury river tributaries.

This is an "average" year?

Perhaps even more alarming is evidence that the Chesapeake Bay ecosystem and many of its rivers and streams are losing their resiliency. After years of pollution, sprawling growth, and loss of habitat, the Bay's systems have become more unbalanced and, in the process, are losing their ability to recover from continued pollution.

To protect and reinvigorate the Bay's ability to heal itself, our leaders, specifically the governors of Maryland, Virginia, and Pennsylvania, must act today. Well-developed plans to reduce the nitrogen and phosphorus pollution that is choking the Bay and its rivers and streams are in place. What we need now is the will to get the job done.

This is our chance: Will our elected leaders saddle future generations with the sullied Bay conditions that the EPA calls "average"? Or will elected leadership realize a vision of clean, safe, and healthy water for the people, animals, and environment of the Chesapeake Bay?

BAD WATERS:
DEAD ZONES, ALGAL BLOOMS, AND FISH KILLS IN THE CHESAPEAKE BAY REGION IN 2007

"In spite of our best efforts, the Bay is not what it once was. Today's younger generation has no memory of the Bay I can recall, one full of crabs, underwater grasses, and clear water."

-W. Tayloe Murphy, Jr., former Virginia Secretary of Natural Resources

The Chesapeake Bay is an iconic landscape. It is North America's largest estuary, a center of recreational and economic activity, and home to over 17 million people and the nation's capital, Washington, D.C. It is also ranked among the most polluted estuaries in the nation, and conditions in many areas are expected to worsen as the area's population grows (National Oceanic and Atmospheric Administration 2007). The primary cause? Nitrogen and phosphorus pollution from human activities that, each summer, result in algal blooms, dead zones, and fish kills across the Chesapeake Bay and its rivers and streams.

Even more disturbing is evidence that the Bay's resiliency is at risk. After years of pollution, sprawling growth, and loss of habitat, the Chesapeake Bay's natural ability to restore itself has become compromised.

An Average Year?

At the beginning of the 2007 summer, the Environmental Protection Agency Chesapeake Bay Program's Summer Ecological Forecast predicted that the area of the Bay that would be completely devoid of life-sustaining oxygen would be "average." Using history as a guide, this projection meant that more than three-quarters of the Chesapeake's main body and tidal tributaries would not meet standards scientists say are necessary to support aquatic life.

The EPA's "average" also meant the lush sea grass beds that provide critical habitat for juvenile crabs and fish would remain at a fraction of their historical acreage, and continue to struggle to recover from a significant die-off that occurred in 2005. This reflects a massive amount of lost habitat, and the destruction of a significant pollution filter contributing to the accelerated cycle of oxygen loss. While the Chesapeake Bay Program may label this "average," it is far from the Chesapeake Bay Foundation's vision of a restored and healthy Bay.

2007: Bad News Across the Watershed

Over the course of the summer, CBF has collected evidence—from citizens, government officials and agencies, partner groups, and our own employees' first-hand experience—of the dead zones, algal blooms, and fish kills that are appearing across the area.

From June 3, 2007 through early August, the Maryland Department of the Environment (MDE) investigated 45 reports of localized fish kills in the Maryland portion of the Bay. A significant portion of these incidents involved blooms of *Karlodinium venificum*, microscopic algae that can cause mahogany tides and produce a toxin that kills fish. (Scientists agree that *Karlodinium* is not dangerous for humans.) Fish kills ranged in intensity from fewer than 50 fish near

the mouth of the Chester River to approximately 20,000 in Weems Creek in northern Anne Arundel County. In some instances, trapped fish and crabs suffocated when oxygen-deprived conditions moved into shallow waters.

Between Maryland and Virginia, a persistent algal bloom accompanied by low dissolved oxygen began in the Lower Potomac River in mid-June and extended over 30 miles between Mathias Point and Nomini Bay at the Maryland-Virginia line. The unhealthy bloom continued in this area of the Potomac into early August.

In mid-July, the Potomac bloom killed over 300,000 fish, including about 296,000 fish in Mattox Creek, Virginia, alone. Most of the dead fish were menhaden, white perch, and croaker; other species included gizzard shad, mummichog, catfish, American eel, hogchoker, largemouth bass, and blue crabs.

"There were dead fish on the boat ramp eight inches thick. It's just awful. Kids water ski out there."

—Judy Bowie, Mattox Creek homeowner

Across Virginia, the situation was no better. Fish kills were observed in Aquia and Accotink creeks on the Potomac and in North Anna River in the York River basin. Blooms of other algae species, including *Cochlodinium polykrikoides* that can also cause mahogany tides, occurred throughout the summer on the York, Rappahannock, and James rivers. In many cases, dissolved oxygen was also dangerously low.

There's bad news from Virginia's Blue Ridge Mountains as well. In the Shenandoah River system near the western and southern reaches of the Bay's watershed, fish kills of smallmouth bass and redbreast sunfish have been reported for the last four years. Although at any one time only small numbers of fish may be dying, these deadly events typically begin in the spring and last for two to three months. The kills add up. During this time, many fish look visibly sick, often covered with lesions and cotton-like patches of fungus.

In 2007, both forks of the Shenandoah River were affected. In addition, die-offs were also discovered in another watershed: the upper James River, where beautiful tributaries like the Cowpasture and Maury rivers near Lexington were spotted with dead and dying fish.

HARMFUL ALGAE

Algae are microscopic, single-celled plants found in fresh and salt waters worldwide. Algae are major producers of oxygen, and serve as food for many fish and shellfish. Like most plants, they grow using nitrogen and phosphorus as building blocks. As such, they are vital to the natural cycle of most ecosystems. Over 700 species of algae live in the Chesapeake Bay.

When there are excessive loads of nitrogen and phosphorus, however, algae can "bloom" to harmful levels, changing water color and eventually stripping dissolved oxygen from the water when they die, fall to the bottom, and decay. Low oxygen levels stress fish, making them more susceptible to disease, and can "suffocate" whole areas that serve as nurseries for young fish and crabs.

Algal blooms can also block sunlight to underwater grasses. Certain species of algae produce toxins that can kill or sicken fish, shellfish, humans, and pets. Although some blooms are natural, their frequency, duration, and intensity are increased where human activities have led to nitrogen and phosphorus pollution overloads.

Today, two algae groups constitute most of the Bay's harmful blooms:

Dinoflagellates like *Cochlodinium polykrikoides* and *Karlodinium venificum* cause mahogany tides that can be toxic to fish and shellfish.

Microcystis aeruginosa and other blue-green algae (a fluorescent green when blooming) also can be toxic to mammals like humans and dogs.

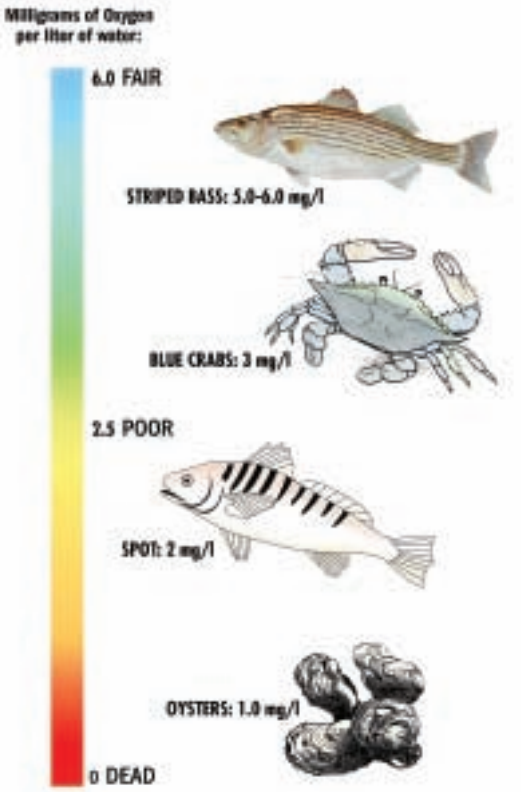
Although the specific cause of each fish kill is unknown, water quality is clearly playing a role. Some scientists speculate that Chesapeake rivers have reached an ecological tipping point—that environmental conditions have deteriorated to the point that fish are now susceptible to infections that they could withstand under "normal" conditions.

Pennsylvania also suffers from "bad water." Of the approximately 86,000 miles of streams in the Commonwealth, nearly 15,000 miles display water quality problems of one kind or another—and just under 60% percent of Pennsylvania residents consume drinking water from streams, rivers, and lakes.

This year, for the second time in three years, young-of-the-year smallmouth bass in the Susquehanna and Juniata river basins evidenced infections due to high levels of the bacteria *Flavobacterium*. In addition, 70 percent of Pennsylvania's brook trout streams—Pennsylvania's fishing industry is valued at over $1.6 billion annually—hold many fewer, and sometimes no, brook trout when compared to the stocks of the past.

The resiliency of aquatic systems across the Bay region are stressed and underscore the need for increased restoration now.

MINIMUM DISSOLVED OXYGEN REQUIREMENTS FOR KEY BAY SPECIES



Source: Chesapeake Bay Program

BAD WATER

The EPA's Summer Ecological Forecast predicted an "average" year in the Chesapeake region, with large sections of the Potomac River off-limits to swimmers or kayakers due to harmful algae (including *Mycrocystis*, whose toxins can cause gastrointestinal problems). Although this prediction did not come true in 2007, unsafe levels of bacteria did cause beach closures from small public beaches on the Sassafras and Bohemia rivers in Maryland to Fairview, Colonial, and Virginia beaches in Virginia. Much of the bacteria came from the same sources—sewage, animal waste, and stormwater runoff—as nitrogen pollution.

A Broken Promise

Is clean water no longer a right? Should we come to accept dead water, beach closures, and dying fish as normal? Is this what our government officials mean when they call conditions like this "average?"

The Bay and its rivers violate the simple, fundamental goal that the Clean Water Act mandates: water quality in the U.S. must provide "…for the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water." This is often referred to as the "fishable/swimmable" goal.

More than seven years ago, the Governors of Virginia, Maryland, and Pennsylvania, the Mayor of the District of Columbia, the Administrator of the EPA, and the Chair of the Chesapeake Bay Commission signed the *Chesapeake 2000 Agreement* and committed to

restore the Bay and its tidal rivers to those "fishable/ swimmable" standards by 2010. That 2010 deadline, however, is three years away, and the Chesapeake remains only a fraction of the way toward that goal.

As Richie Gaines, a fishing guide who works out of the Chester River on the Eastern Shore, puts it: "It is frustrating to see the Bay dying slowly and so little being done about it. It's like heart disease. The Bay looks fine from atop the Bay Bridge or cruising along on the surface, but it is under the water where the problems are. Those of us who spend a lot of time on the Bay and interact with the fish, crabs, oysters, and other life there are well aware of how bad it is. There are sections of the Bay, large sections, that cannot sustain life. The critters that can swim, move; those that can't, die."

The EPA calls the Bay's unhealthy condition "average," and some officials claim that we will not be able to meet the 2010 deadline. Are these conditions acceptable? By a huge majority, the people of the region answer with a resounding "No," and CBF agrees. Working aggressively with local, state, and federal leaders, CBF believes funding and programs can be in place by 2010 to achieve a restored and healthy Bay.

The Bay's Resiliency at Risk

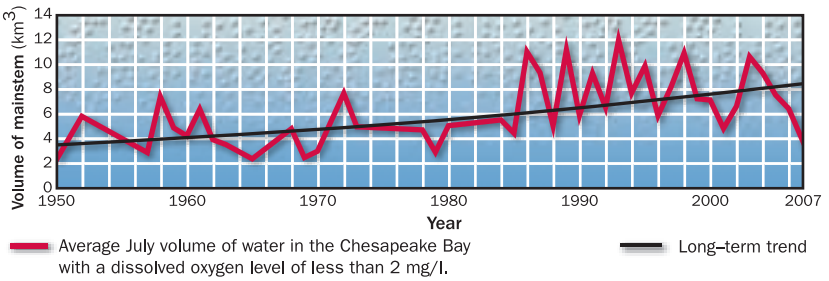
So the urgency is clear. To protect and reinvigorate the Bay's ability to heal itself, our elected leaders must act today. We must help the Bay get better, rather than accepting lethargic improvements or allowing it to get worse. CBF knows restoration is possible.

Despite years of effort to limit the amount of nitrogen pollution entering the Bay and its rivers and streams, and the implementaion of numerous successful programs to reduce sources of nitrogen pollution, the total "nitrogen load" entering the Bay has seen little to no change. Because the region's population has grown from 14 to 17 million since 1990, and more than doubled in the forty years CBF has been fighting to restore the Bay, this is a great accomplishment. Simply holding the line on pollution in the face of such massive population growth, however, is neither our vision of a restored Bay or our elected leaders' promise.

The alarm bells should be sounding. Despite the relatively static levels of pollutant loads, evidence suggests the dead zone—the areas of the bay where levels of oxygen are too low to support most aquatic life—has increased over time.

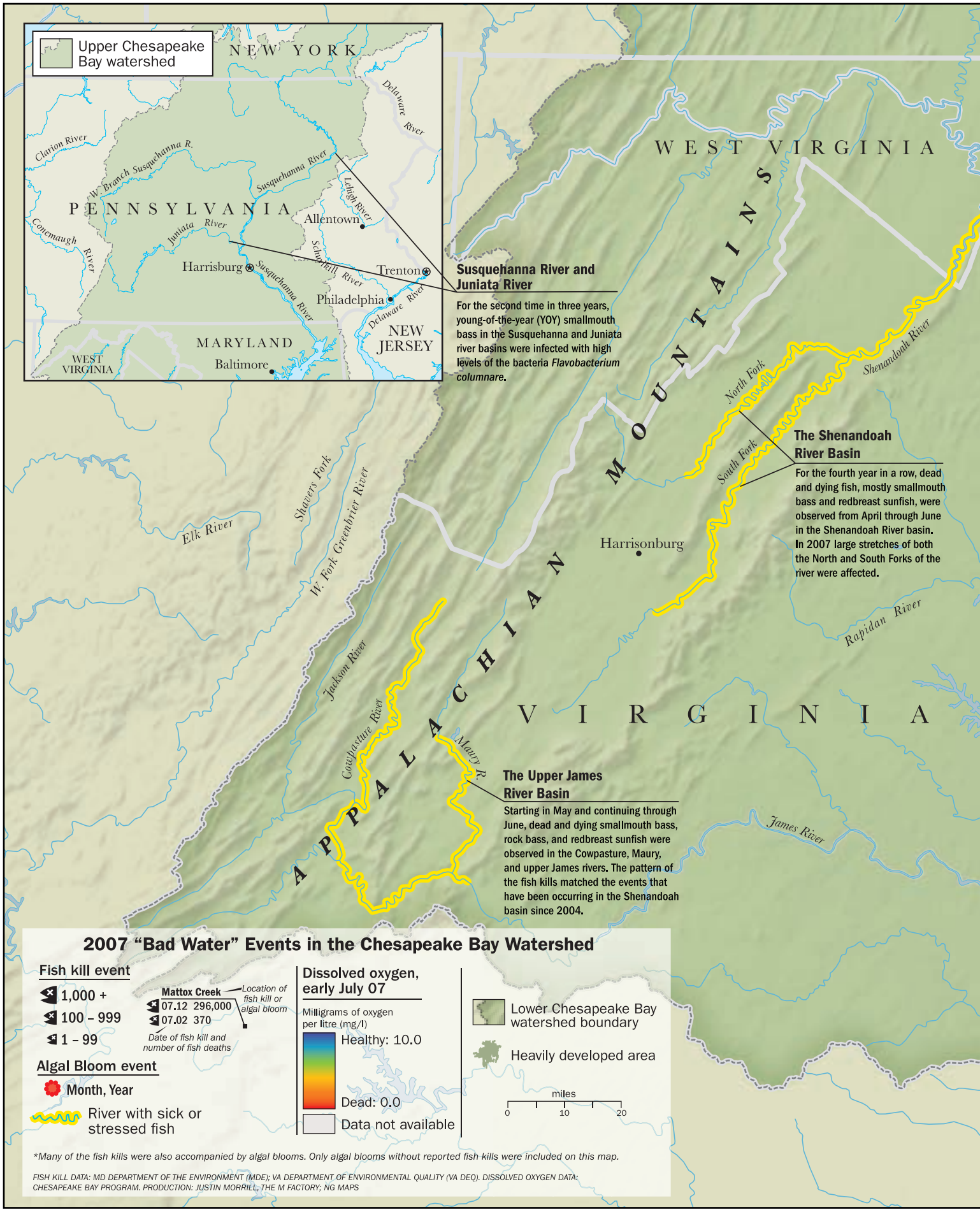
How does this happen? Why is it that even though annual pollutant loads haven't

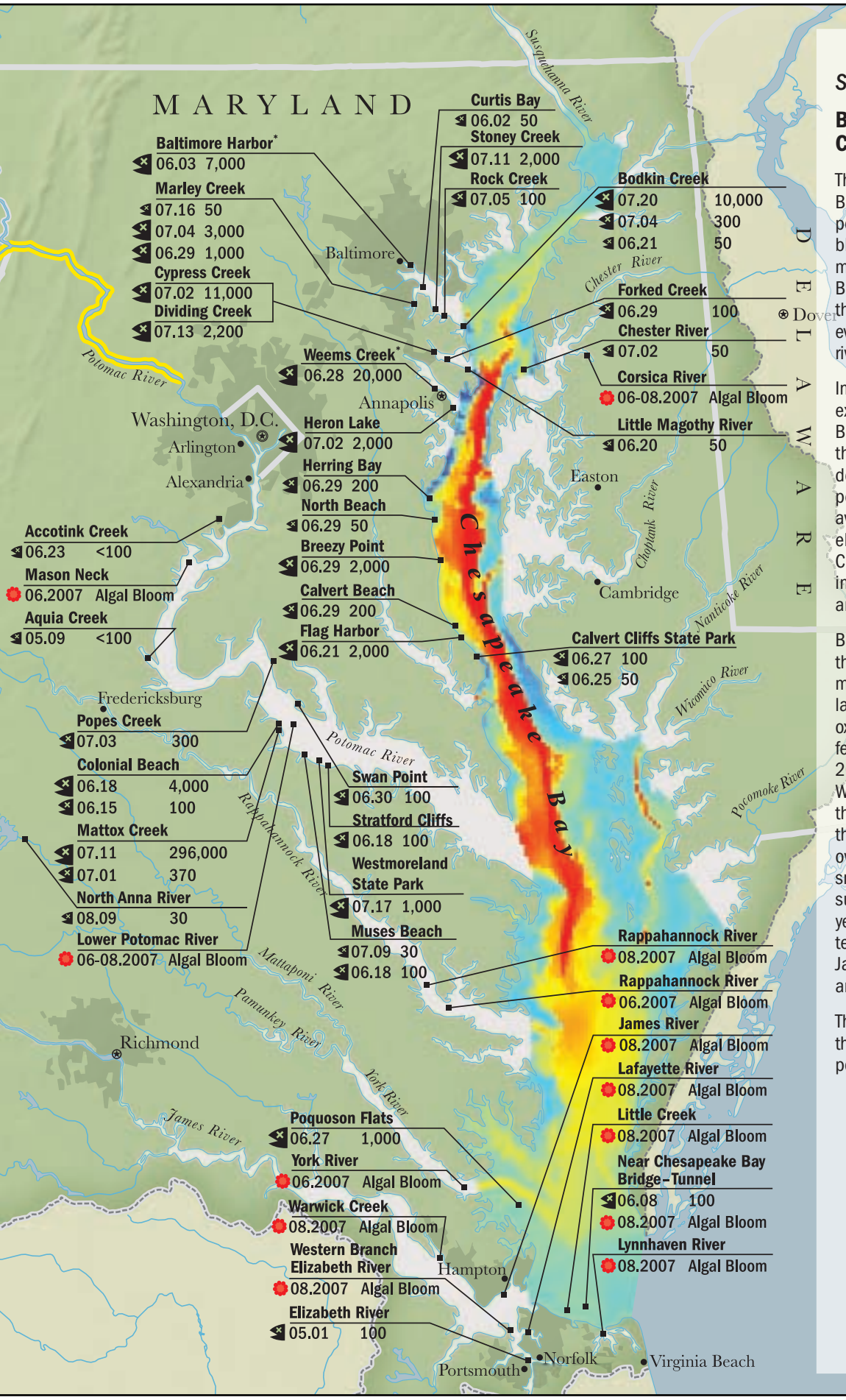
MAINSTEM CHESAPEAKE DEAD ZONE VOLUME: 1950-2007



From 1950 to the present day, the volume of the Bay's waters suffering from severely depleted oxygen has fluctuated annually, but overall the trend is increasing.

Source: Hagy et al. 2004 and Chesapeake Bay Program


Upper Chesapeake Bay watershed
NEW YORK
PENNSYLVANIA
MARYLAND
NEW JERSEY
WEST VIRGINIA
Clarion River
W. Branch Susquehanna R.
Susquehanna River
Lehigh River
Delaware River
Conemaugh River
Juniata River
Schuylkill River
Allentown
Harrisburg
Trenton
Philadelphia
Baltimore
Susquehanna River
Delaware River
WEST VIRGINIA
APPALACHIAN MOUNTAINS
VIRGINIA
Shenandoah River
North Fork
South Fork
Harrisonburg
Rapidan River
Shavers Fork
W. Fork Greenbrier River
Elk River
Jackson River
Cowpasture River
Maury R.
James River
Susquehanna River and Juniata River
For the second time in three years, young-of-the-year (YOY) smallmouth bass in the Susquehanna and Juniata river basins were infected with high levels of the bacteria Flavobacterium columnare.
The Shenandoah River Basin
For the fourth year in a row, dead and dying fish, mostly smallmouth bass and redbreast sunfish, were observed from April through June in the Shenandoah River basin. In 2007 large stretches of both the North and South Forks of the river were affected.
The Upper James River Basin
Starting in May and continuing through June, dead and dying smallmouth bass, rock bass, and redbreast sunfish were observed in the Cowpasture, Maury, and upper James rivers. The pattern of the fish kills matched the events that have been occurring in the Shenandoah basin since 2004.
2007 "Bad Water" Events in the Chesapeake Bay Watershed
Fish kill event
1,000 +
100 – 999
1 – 99
Mattox Creek
07.12 296,000
07.02 370
Location of fish kill or algal bloom
Date of fish kill and number of fish deaths
Algal Bloom event
Month, Year
River with sick or stressed fish
Dissolved oxygen, early July 07
Milligrams of oxygen per litre (mg/l)
Healthy: 10.0
Dead: 0.0
Data not available
Lower Chesapeake Bay watershed boundary
Heavily developed area
miles
0
10
20
*Many of the fish kills were also accompanied by algal blooms. Only algal blooms without reported fish kills were included on this map.
FISH KILL DATA: MD DEPARTMENT OF THE ENVIRONMENT (MDE); VA DEPARTMENT OF ENVIRONMENTAL QUALITY (VA DEQ). DISSOLVED OXYGEN DATA: CHESAPEAKE BAY PROGRAM. PRODUCTION: JUSTIN MORRILL, THE M FACTORY; NG MAPS



SUMMER 2007

Bad Water and the Chesapeake Bay Watershed

This past summer, the Chesapeake Bay Foundation (CBF) compiled reports of dead zones, fish kills, algal blooms, and distressed river segments from across the Chesapeake Bay watershed. Depicted here are the many documented bad water events that plagued our Bay and its rivers and streams.

In early July, the Bay's dead zone extended from just north of the Bay Bridge down to the mouth of the York River in Virginia. Similarly detailed information for the Chesapeake's main tributaries is not yet available, but dangerously low levels of oxygen were recorded by CBF staff in many places, including the Rappahannock, Potomac, and Severn rivers.

Blooms of toxic algae occurred throughout the summer from Baltimore to Hampton Roads. In Maryland, 45 fish kills—due to algae or oxygen-deprived waters—ranged from fewer than 50 dead to approximately 20,000 in Anne Arundel County's Weems Creek. An algal bloom on the Potomac River lasted for more than two months, eventually killing over 300,000 fish. Fish kills of smallmouth bass and redbreast sunfish, reported for the last four years in the Shenandoah River system, have now jumped to the upper James River's beautiful Cowpasture and Maury River tributaries.

The summer of 2007 reminds us of the need to act aggressively to stop pollution today.

CHESAPEAKE BAY FOUNDATION

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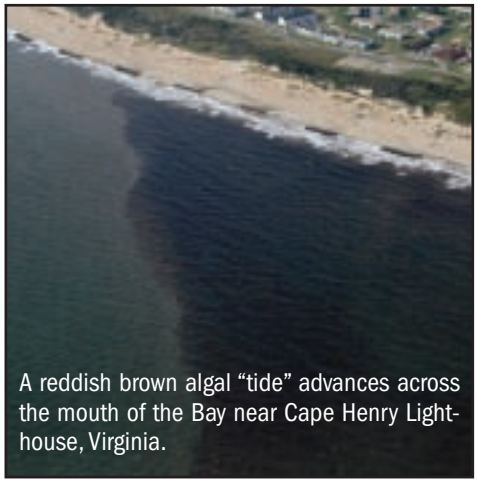
increased over time, the dead zone continues to grow?

Scientists believe that the Bay's ecosystem may be becoming more and more unbalanced and, in the process, losing its ability to buffer itself against pollution (Kemp et al., 2005). In effect, since the 1980s, the same amounts of nitrogen and phosphorus pollution now cause worse dead zones than before (Boesch et al., 2001; Hagy et al., 2004).

Several factors and processes have contributed to this loss in resiliency. These include: decreases in water clarity due to algae and sediment overloads; the loss of filtering Bay grasses and marshland; struggling populations of oysters, menhaden, and other water-filtering animals; and sea level rise.



A reddish brown algal "tide" advances across the mouth of the Bay near Cape Henry Lighthouse, Virginia.

For example, underwater grasses remove substantial amounts of nitrogen and phosphorus from the water column through assimilation and by trapping sediment particles. They also provide important habitat for larval fish and crabs. But water clarity, decreased by algal blooms, reduces grass bed acreage and impairs the vegetation's role as a natural filter. As a result, more nitrogen and phosphorus are available to feed algae, causing even more blooms which further reduce water clarity, and the cycle continues.

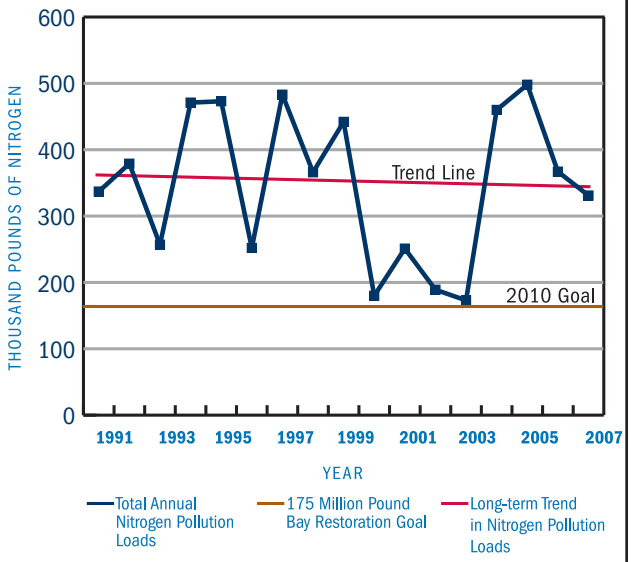
Another negative cycle occurs under low-oxygen conditions. In these situations, nitrogen and phosphorus escape from bottom sediments and become available for uptake by algae. More algae lead to bigger dead zones, which in turn means more nitrogen and phosphorus released from the sediments, and the downward spiral continues. In effect, the Bay is losing its ability to restore itself. The summer of 2007 provides a glimpse of what we might expect unless we reverse this trend, now.

Solutions at Hand

To clean up the Chesapeake and its rivers and streams, we must reduce nitrogen pollution by 110 million pounds per year. Pollutants enter the Bay through sewage discharges, urban

TOTAL NITROGEN LOADS TO THE CHESAPEAKE BAY

1991-2006



Over the last 15 years (1991–2006), annual "loads" of nitrogen pollution to the Chesapeake Bay have varied widely, mostly with annual rain fall levels. Two important truths stand out in these data. First, a balanced system—one with abundant and healthy buffers and natural filters—would be able to more easily withstand weather extremes. And second, over time the annual pollution loads have changed very little.

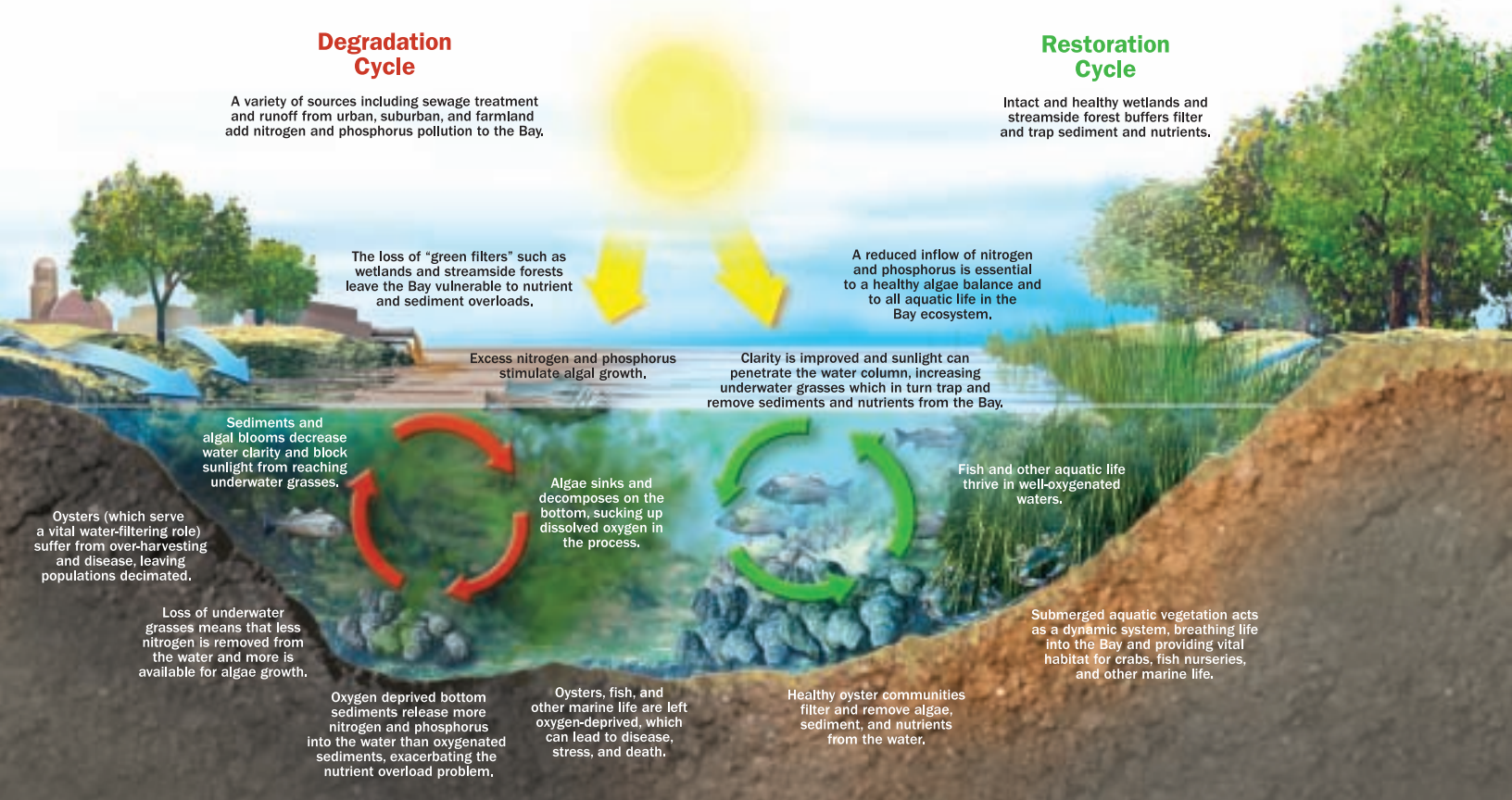
With three years left before the 2010 deadline, we are still far from reaching our goal.

Source: Chesapeake Bay Program

and suburban stormwater, runoff from cropland and animal farms, and vehicle emissions and power plants. Fortunately, blueprints to reduce nitrogen and phosphorus overloads already exist in the river-specific Tributary Strategies developed by each Bay state and the District of Columbia. These are not problems in need of solutions; they are solutions in need of funding and political will.

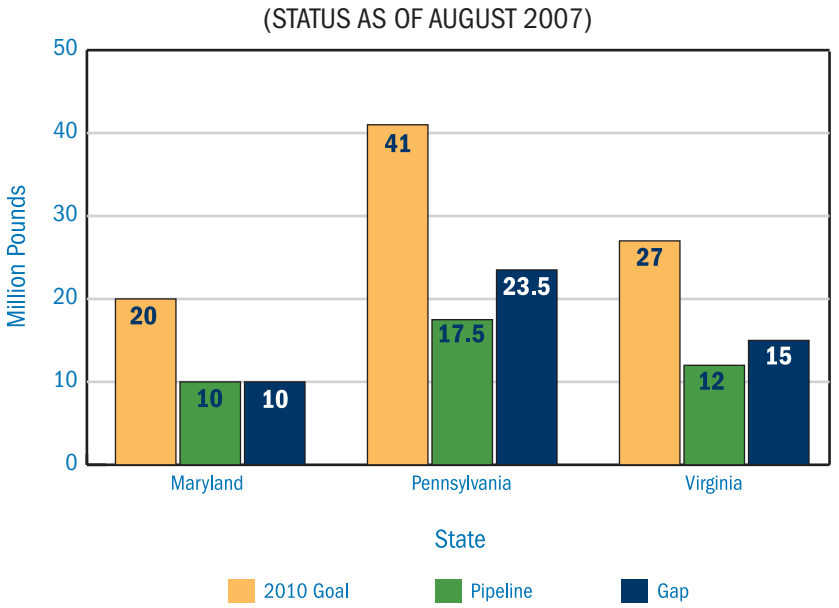
Upgrading sewage treatment plants and reducing runoff from farmland are the most cost-effective ways to reduce nitrogen and phosphorus pollution in the Bay watershed (Chesapeake Bay Commission, 2004). By implementing these measures, we can get roughly 80 percent of the necessary pollution reductions at a fraction of the overall cost. Consequently, restoration strategies have focused on putting the mechanisms in place to achieve reductions from these two sources.

THE CHESAPEAKE BAY ECOSYSTEM



Natural Filters: The Bay has a natural ability to absorb, process, and hold nutrients like nitrogen and phosphorus through the filtering action of certain plants and animals. Wetlands and underwater grasses take up nutrients from the water and hold them in stem and leaf tissue. Animals like oysters and menhaden filter algae and direct nutrients toward reef-building and fish biomass, and away from fueling more algal blooms. Conserving and restoring these "biofilters" are essential to maintaining a healthy and resilient Bay.

Artist: Chuck Carter, Adapted from Kemp et al., 2005.



The Bay states have set specific goals for reducing nitrogen pollution to the Chesapeake Bay and its rivers and streams. This graph shows (a) Bay Program's goals for Maryland, Pennsylvania and Virginia; (b) CBF's estimates of pollution reduction, in the pipeline, with existing programs and funds as of August 2007, and (c) CBF estimates the additional reduction necessary (the Gap) to reach the 2010 goal.

Sewage Treatment Plant Improvements

Under the Clean Water Act, sewage treatment plants in the Bay watershed must limit the amount of nitrogen and phosphorus pollution they discharge. Since 2005, Pennsylvania, Maryland, and Virginia have issued pollution permit limits for nitrogen and phosphorus that are generally consistent with reductions necessary to achieve Bay and tidal river restoration goals. Furthermore, both Maryland and Virginia have dedicated state funds to enable sewage plants to upgrade to state-of-the-art nutrient removal technology.

But not all the news is good. The watershed's largest sewage treatment plant, Blue Plains in Washington, D.C., is the single biggest source of nitrogen pollution to the Bay. Unfortunately, the EPA has refused to include the 2010 deadline—or any deadline—in the plant's permit. In response, CBF has taken legal action.

Blue Plains is only one example of growing efforts to extend pollution-reduction deadlines. State-level efforts to relax limits are also popping up across the region. CBF will remain vigilant to protect the states' dramatic successes in the area of reducing pollution from sewage treatment plants.

Agricultural Progress

Like sewage treatment, agriculture offers many opportunities to reduce the overflow of pollutants that are choking the Bay and its rivers and streams. Major agricultural keys to cleaning up the Bay's waterways focus on re-establishing natural filters: planting forested and grassy streamside buffers that filter pollutants and provide natural cooling and shade, restoring wetlands, and implementing agricultural conservation practices such as planting winter cover crops to soak up excess nitrogen pollution and hold soil in place.

These measures are cost-effective and produce multiple environmental benefits, from cleaning local waters and improving habitats to the removal of carbon dioxide from the air, which aids efforts to fight global climate change.

To date, however, efforts to put these practices on the ground have fallen woefully short of what is necessary to restore healthy waters across the Bay watershed. Although farmers are willing to implement conservation practices that will protect and improve water quality, they can't shoulder this burden alone. Technical and financial assistance has consistently fallen far short of demand.

Restoring Healthy Water Across the Chesapeake

The Chesapeake's story does not have to be one of fish kills, algal blooms, and dead zones. We know the steps to restoration. We have clearly developed, scientifically based strategies—Tributary Strategies—to clean up our waters. Our political leaders have committed to a 2010 deadline for a much healthier Chesapeake. We know what to do and what it will cost. Voters have repeatedly and overwhelmingly voiced their demand—and willingness to pay—for clean water.

Yes, this goal is expensive—estimated at $30 billion (Chesapeake Bay Watershed Blue Ribbon Finance Panel, 2004). But as this report details there is broad consensus that 80 percent of pollution reduction goals can be achieved for 20 percent of the cost ($6 billion). The Chesapeake Bay Commission reported that five of the most cost-efficient strategies for Bay restoration, as outlined in *Chesapeake 2000 Agreement* and detailed in the Tributary Strategies, are agricultural and rely on the work of the farming community. The other is wastewater treatment upgrades (Chesapeake Bay Commission, 2004).

The vision of a healthy Bay is in reach, but our governments are nowhere close to meeting their commitments, as the examples of "bad water" in this report make clear. Seven years into the ten-year plan—three years from the promised deadline—our governments have provided only about one-third of the necessary $6 billion to achieve approximately one-third of the Chesapeake's restoration goals. It's time to get on with the job.

It is up to Governors Kaine (VA), O'Malley (MD), and Rendell (PA). They can be environmental heroes for Saving the Bay. Or not. The Chesapeake Bay Foundation calls on these three governors to bring forward their plans to address the pressing water quality problems documented in this report.

Further, we call on Senator Mikulski and the other Bay senators* to fight to increase funding for Chesapeake Bay conservation programs in the federal Farm Bill. This will build upon the good work begun by Rep. Chris Van Hollen [D –Md] and a broad bi-partisan coalition of the region's Congressional delegation in the US House of Representatives.

No one wants to leave a legacy of dirty water for our children and grandchildren. Or a Bay of fish kills and beach closures. Will we saddle future generations with the "dead water" that EPA calls "average," and the huge economic, health, and other burdens associated with pollution? Or will we realize our vision of clean, safe, healthy water? The Chesapeake Bay Foundation, on behalf of 194,000 members, is determined to save the Bay. We urge our leaders to take strong, meaningful, and decisive action now.

**Senators Biden [D-DE], Byrd [D-WV], Cardin [D-MD], Carper [D-DE], Casey [D-PA], Clinton [D-NY], Rockefeller [D-WV], Schumer [D-NY], Specter [D-PA], Warner [R-VA], and Webb [D-VA].*

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Saving a National Treasure

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page 6-7: illustration: National Geographic Maps
page 4: bottom graph: National Geographic Maps
page 8: top: Christy Everett/CBF Staff; bottom illustration: National Geographic Maps

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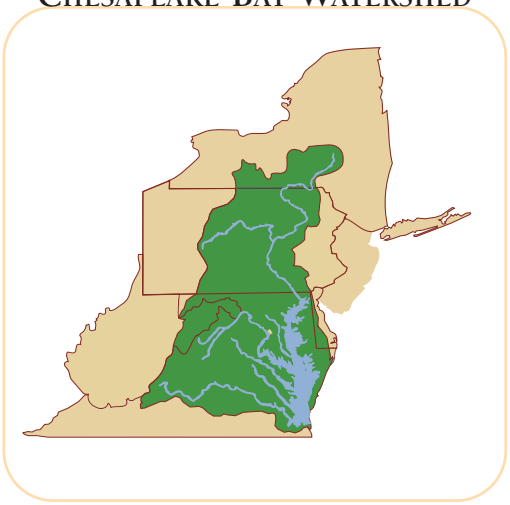
ACKNOWLEDGMENTS:

Our sincere thanks to the following people and agencies for graciously providing the information used in this report: Charlie Poukish and Chris Luckett, Maryland Department of the Environment; David Jasinsky, University of Maryland; Ellen Ginsky, Mark MIller, John Settle, Steve Morris, and Don Kain, Virginia Department of Environmental Quality; Harold Marshall, Old Dominion University.

September 2007

CHESAPEAKE BAY WATERSHED



The Chesapeake Bay's 64,000-square-mile watershed covers parts of six states and is home to more than 17 million people.