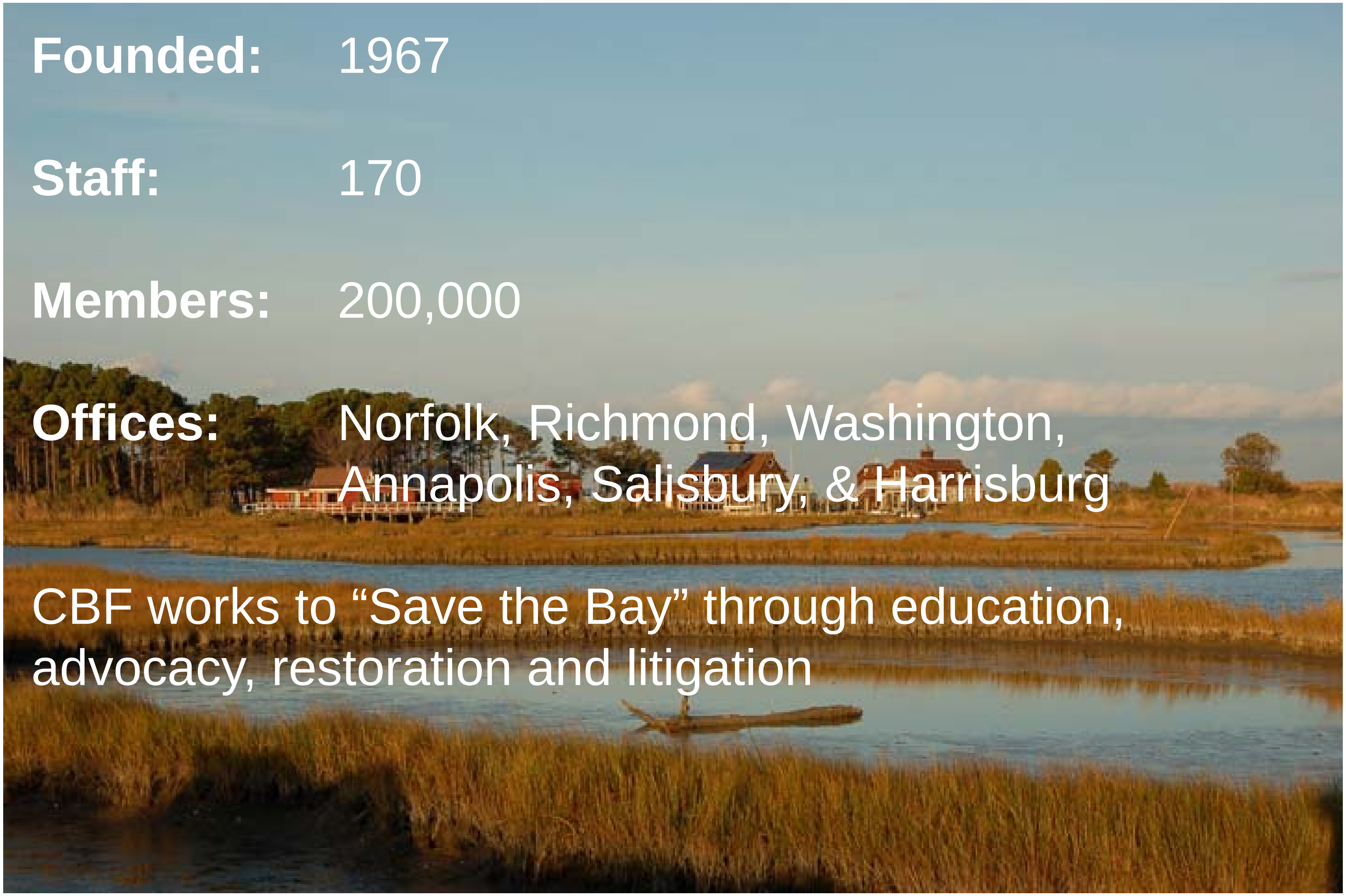
CHESAPEAKE BAY FOUNDATION

Saving a National Treasure

Co-benefits of Agricultural Conservation Practices: What's in it for the Bay? Part 1

Beth McGee

Chesapeake Bay Foundation



Founded: 1967

Staff: 170

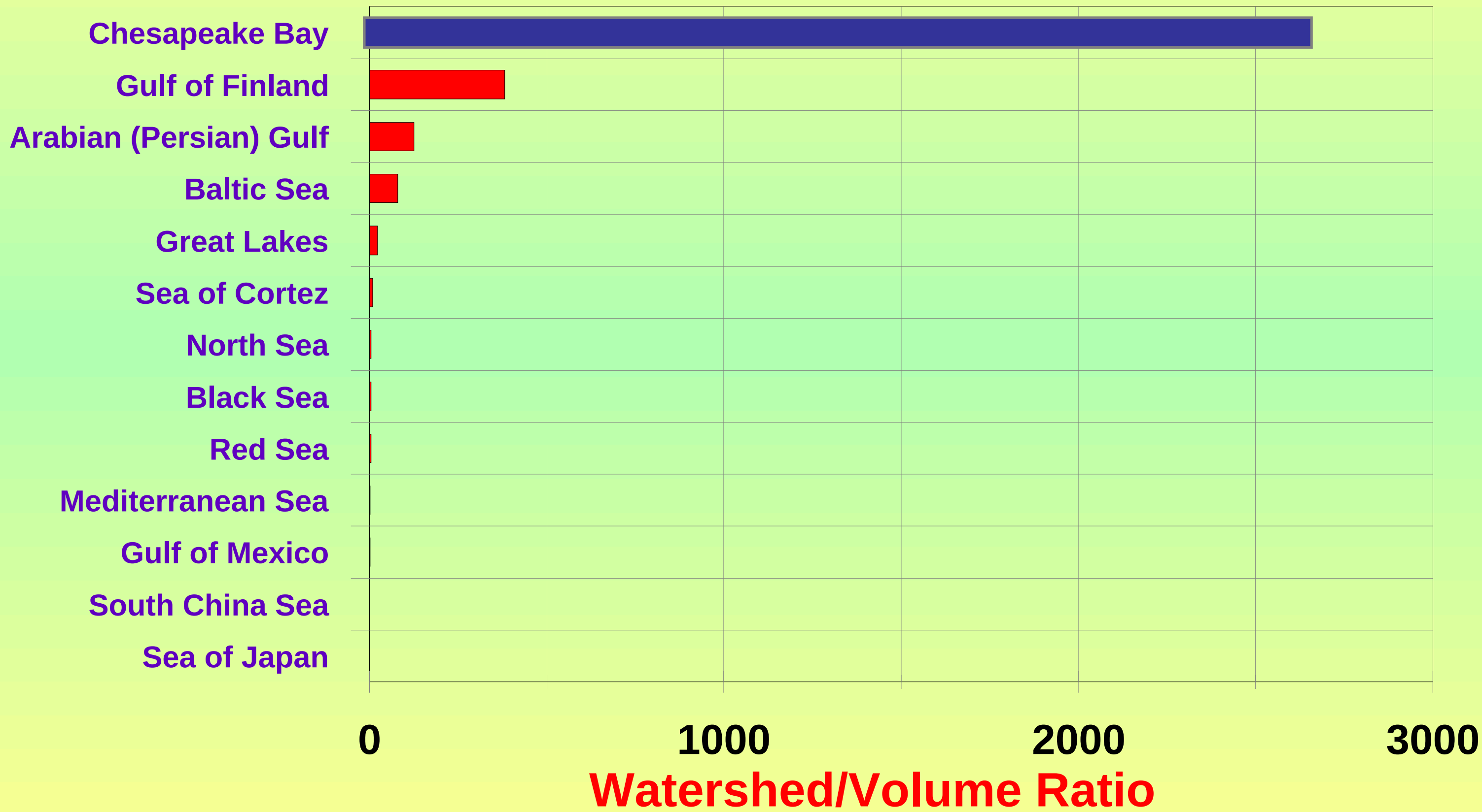
Members: 200,000

Offices: Norfolk, Richmond, Washington, Annapolis, Salisbury, & Harrisburg

CBF works to “Save the Bay” through education, advocacy, restoration and litigation

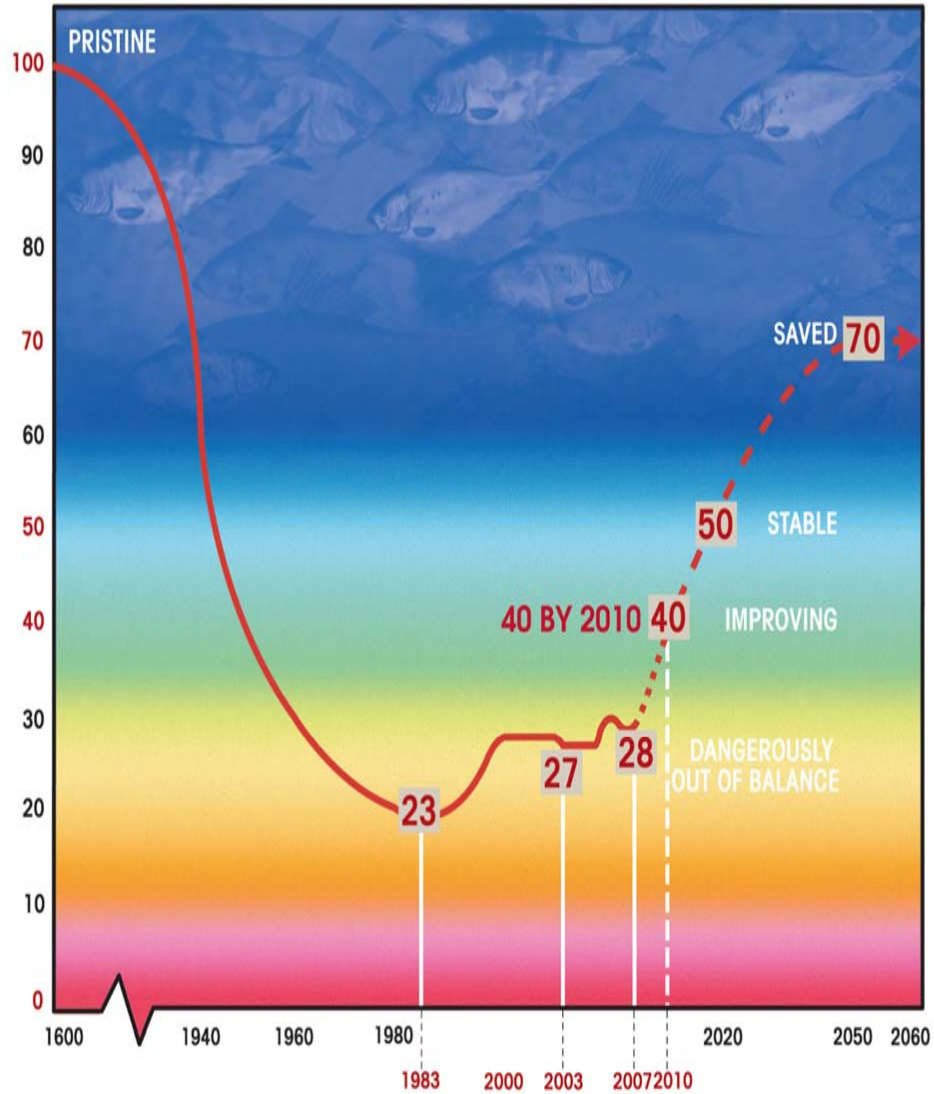
North America's largest and most productive estuary

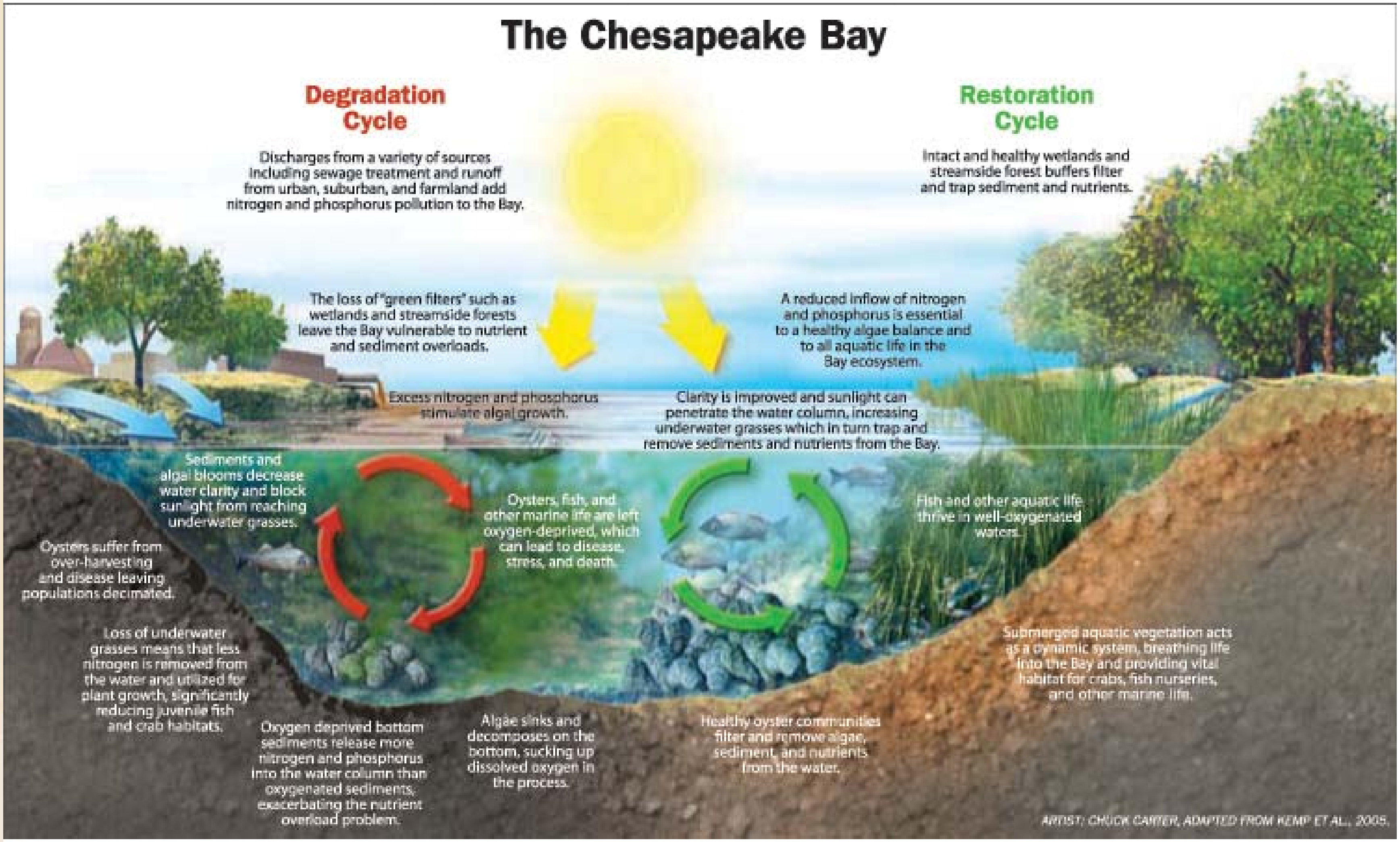
Relative Watershed Sizes
(metric units)



cbf.org

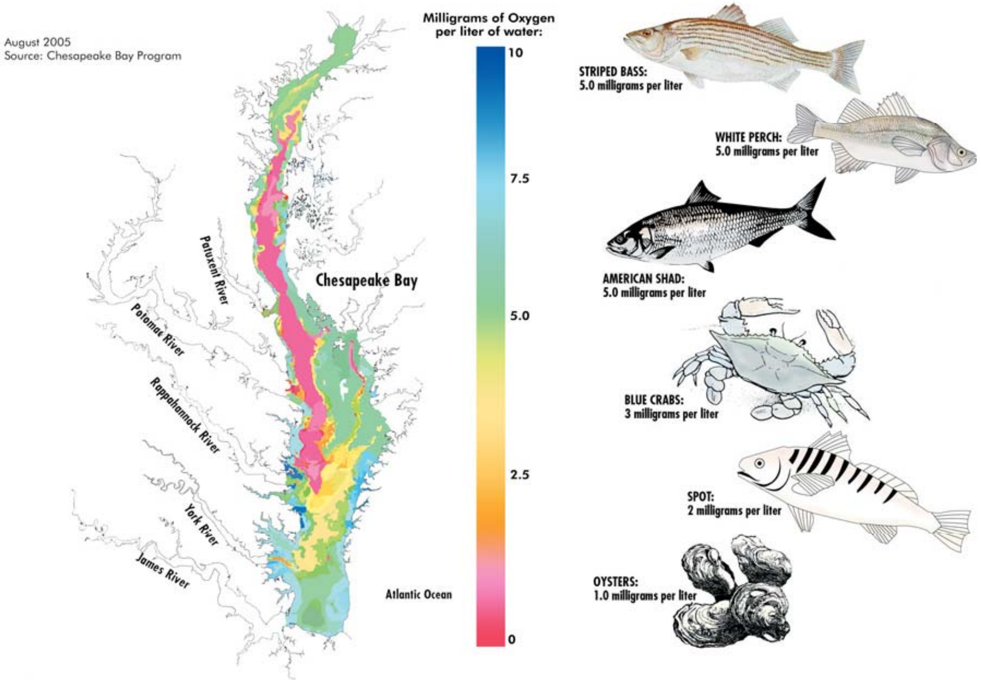
CHESAPEAKE BAY FOUNDATION
Saving a National Treasure


PRISTINE
100
90
80
70
60
50
40
30
20
10
0
SAVED 70
50 STABLE
40 BY 2010 40 IMPROVING
28
27
23
DANGEROUSLY OUT OF BALANCE
1600
1940
1960
1980
2020
2050
2060
1983
2000
2003
2007
2010

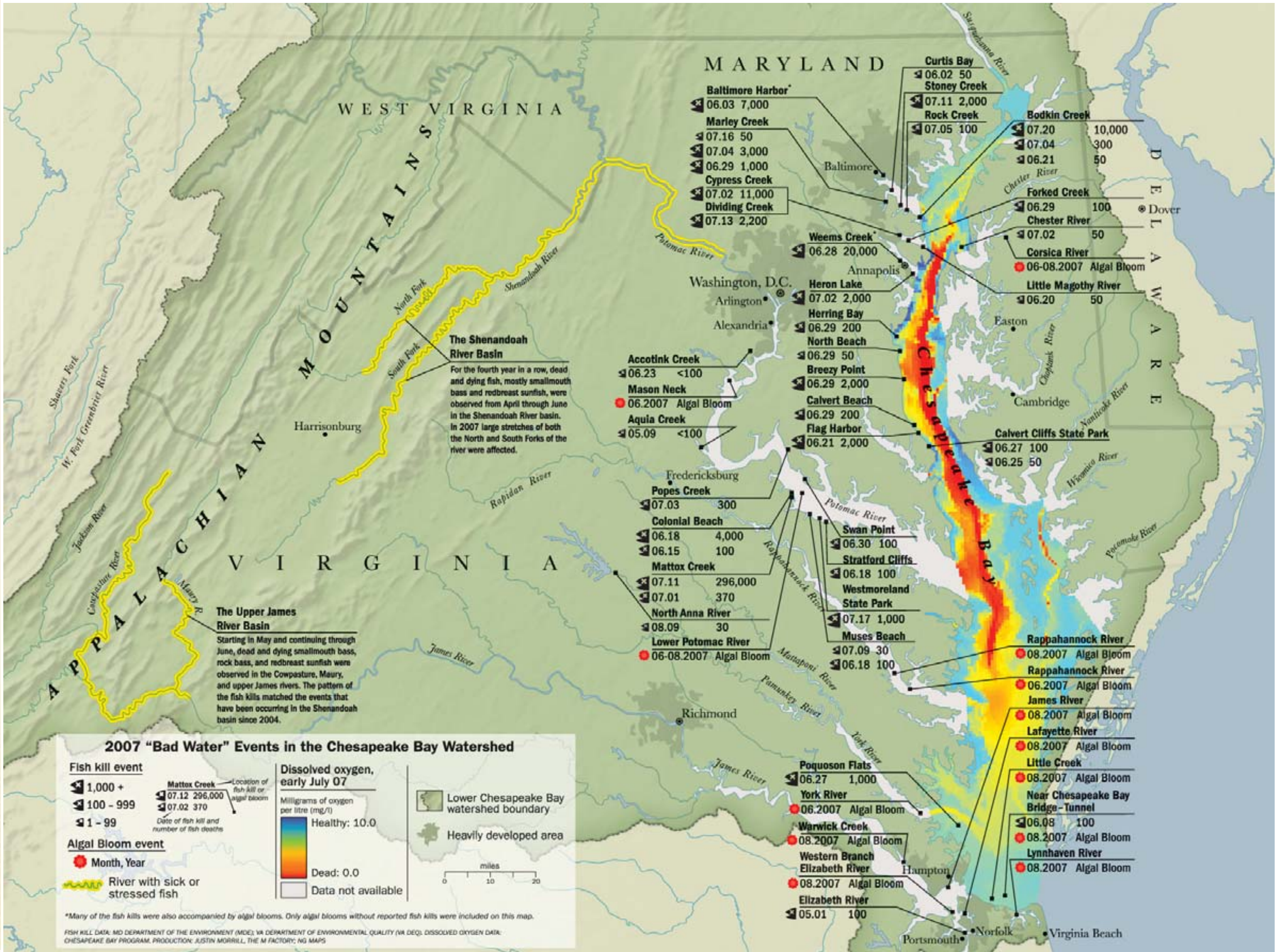

The Chesapeake Bay
Degradation Cycle
Discharges from a variety of sources including sewage treatment and runoff from urban, suburban, and farmland add nitrogen and phosphorus pollution to the Bay.
Restoration Cycle
Intact and healthy wetlands and streamside forest buffers filter and trap sediment and nutrients.
The loss of "green filters" such as wetlands and streamside forests leave the Bay vulnerable to nutrient and sediment overloads.
A reduced inflow of nitrogen and phosphorus is essential to a healthy algae balance and to all aquatic life in the Bay ecosystem.
Excess nitrogen and phosphorus stimulate algal growth.
Clarity is improved and sunlight can penetrate the water column, increasing underwater grasses which in turn trap and remove sediments and nutrients from the Bay.
Sediments and algal blooms decrease water clarity and block sunlight from reaching underwater grasses.
Oysters, fish, and other marine life are left oxygen-deprived, which can lead to disease, stress, and death.
Fish and other aquatic life thrive in well-oxygenated waters.
Oysters suffer from over-harvesting and disease leaving populations decimated.
Loss of underwater grasses means that less nitrogen is removed from the water and utilized for plant growth, significantly reducing juvenile fish and crab habitats.
Submerged aquatic vegetation acts as a dynamic system, breathing life into the Bay and providing vital habitat for crabs, fish nurseries, and other marine life.
Oxygen deprived bottom sediments release more nitrogen and phosphorus into the water column than oxygenated sediments, exacerbating the nutrient overload problem.
Algae sinks and decomposes on the bottom, sucking up dissolved oxygen in the process.
Healthy oyster communities filter and remove algae, sediment, and nutrients from the water.
ARTIST: CHUCK CARTER, ADAPTED FROM KEMP ET AL., 2005.

CHESAPEAKE BAY DEAD ZONE

AUGUST 2005



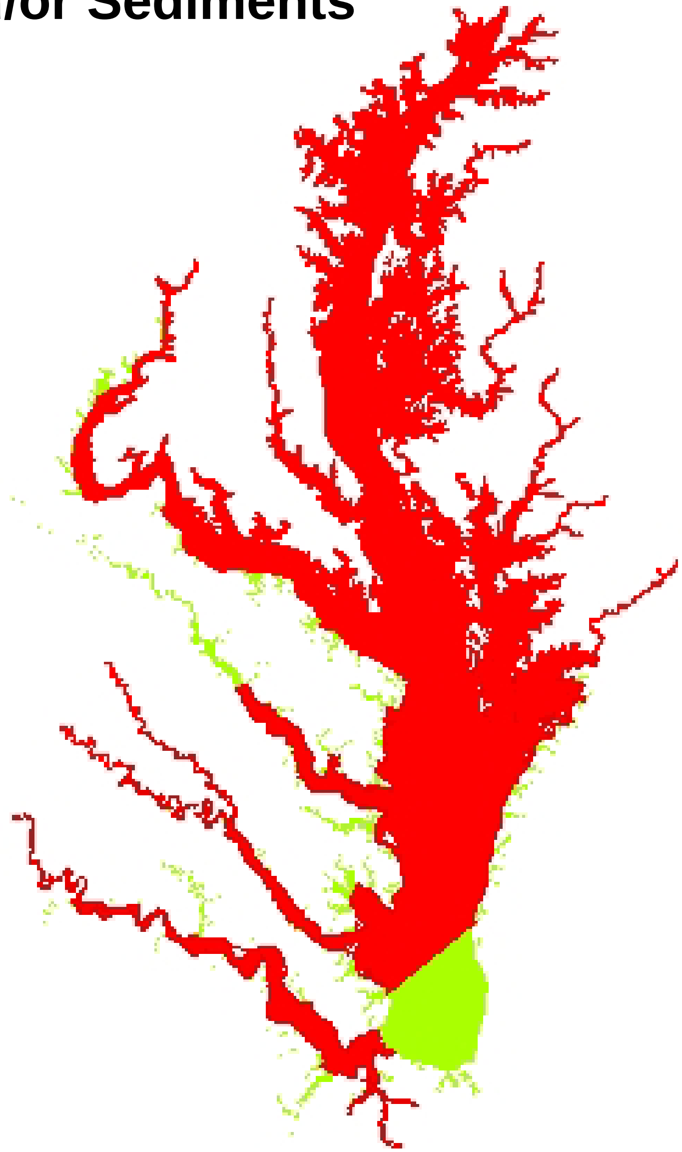
In August 2005, 41 percent of the volume of the Chesapeake Bay had too little oxygen to support a healthy ecosystem.


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
MARYLAND
WEST VIRGINIA
VIRGINIA
DELAWARE
APPALACHIAN MOUNTAINS
Chesapeake Bay
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.
Baltimore Harbor*
06.03 7,000
Marley Creek
07.16 50
07.04 3,000
06.29 1,000
Cypress Creek
07.02 11,000
Dividing Creek
07.13 2,200
Weems Creek*
06.28 20,000
Heron Lake
07.02 2,000
Herring Bay
06.29 200
North Beach
06.29 50
Breezy Point
06.29 2,000
Calvert Beach
06.29 200
Flag Harbor
06.21 2,000
Curtis Bay
06.02 50
Stoney Creek
07.11 2,000
Rock Creek
07.05 100
Bodkin Creek
07.20 10,000
07.04 300
06.21 50
Forked Creek
06.29 100
Chester River
07.02 50
Corsica River
06-08.2007 Algal Bloom
Little Magothy River
06.20 50
Calvert Cliffs State Park
06.27 100
06.25 50
Accotink Creek
06.23 <100
Mason Neck
06.2007 Algal Bloom
Aquia Creek
05.09 <100
Popes Creek
07.03 300
Colonial Beach
06.18 4,000
06.15 100
Mattox Creek
07.11 296,000
07.01 370
North Anna River
08.09 30
Lower Potomac River
06-08.2007 Algal Bloom
Swan Point
06.30 100
Stratford Cliffs
06.18 100
Westmoreland State Park
07.17 1,000
Muses Beach
07.09 30
06.18 100
Rappahannock River
08.2007 Algal Bloom
Rappahannock River
06.2007 Algal Bloom
James River
08.2007 Algal Bloom
Lafayette River
08.2007 Algal Bloom
Little Creek
08.2007 Algal Bloom
Near Chesapeake Bay Bridge-Tunnel
06.08 100
08.2007 Algal Bloom
Lynnhaven River
08.2007 Algal Bloom
Poquoson Flats
06.27 1,000
York River
06.2007 Algal Bloom
Warwick Creek
08.2007 Algal Bloom
Western Branch Elizabeth River
08.2007 Algal Bloom
Elizabeth River
05.01 100
Baltimore
Annapolis
Washington, D.C.
Arlington
Alexandria
Fredericksburg
Richmond
Harrisonburg
Hampton
Norfolk
Portsmouth
Virginia Beach
Easton
Cambridge
Dover
Potomac River
Shenandoah River
North Fork
South Fork
Rapidan River
Rappahannock River
Mattaponi River
Pamunkey River
York River
James River
Jackson River
Cowpasture River
Maury R.
Shavers Fork
W. Fork Greenbrier River
Susquehanna River
Chester River
Choptank River
Nanticoke River
Wicomico River
Pocomoke River

Chesapeake Bay and Tidal Tributaries Listed on the CWA 303 (d) List as Impaired for Nutrients and/or Sediments

- *Chesapeake 2000 Agreement* – Bay signatories agreed to work to remove the Bay from the list by 2010

- Consent decree requires the development of a Bay-wide TMDL, if Bay is not removed from the 303(d) list by 2010



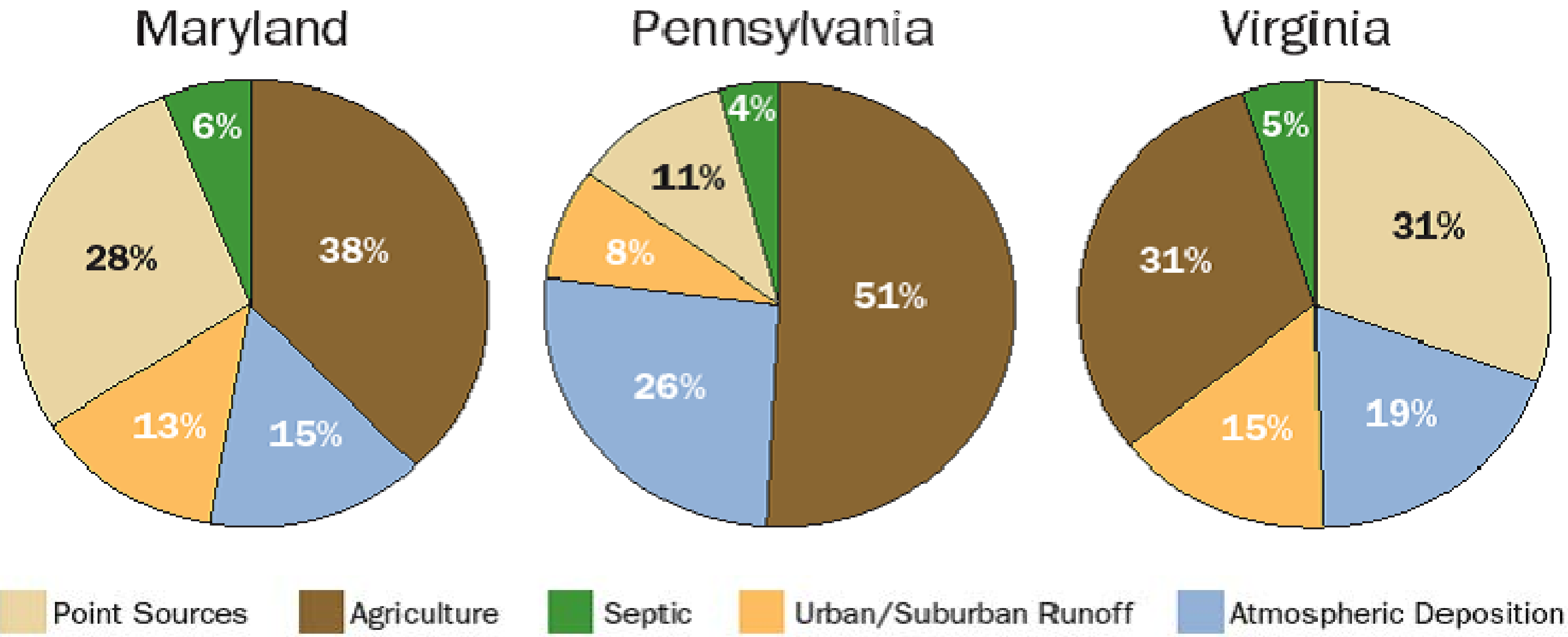
How do we define restored water quality?

Under the Clean Water Act:

- *Map out the "designated uses" (habitat zones) for the Bay's different living resource communities e.g.,*
  - *shallow water*
  - *spawning areas*

- *Determine the water quality conditions or "criteria" necessary to protect those "uses" e.g.,*
  - *depth of water clarity*
  - *concentrations of dissolved oxygen*

Principal Bay States Nitrogen Pollution Loads
by Source



Based on Chesapeake Bay Program 2005 modeled loads.
Agriculture sector includes air emissions from agricultural sources.

July 2007

CHESAPEAKE BAY FOUNDATION
Saving a National Treasure

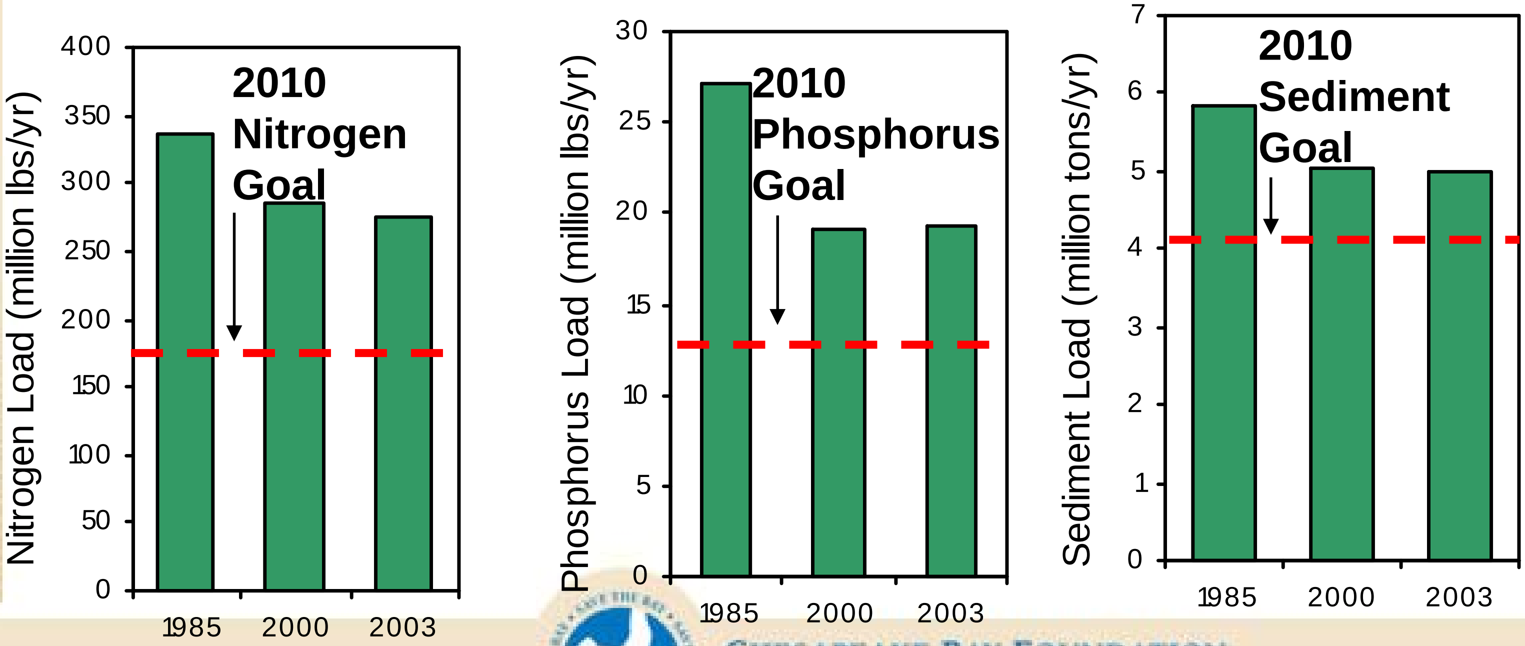
Nutrient and Sediment Load Reduction Goals

The 2010 pollutant reduction goals are:

Nitrogen - Reduce annual loads to no more than 175 million pounds.

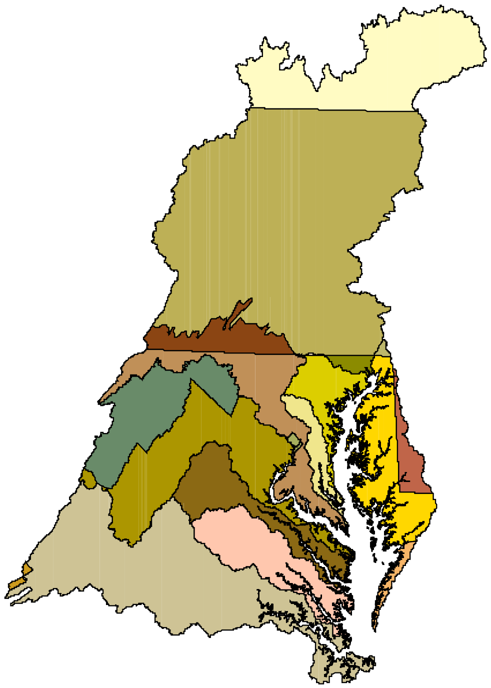
Phosphorus - Reduce annual loads to no more than 12.8 million pounds.

Land-based Sediment - Reduce annual loads to no more than 4.15 million tons.



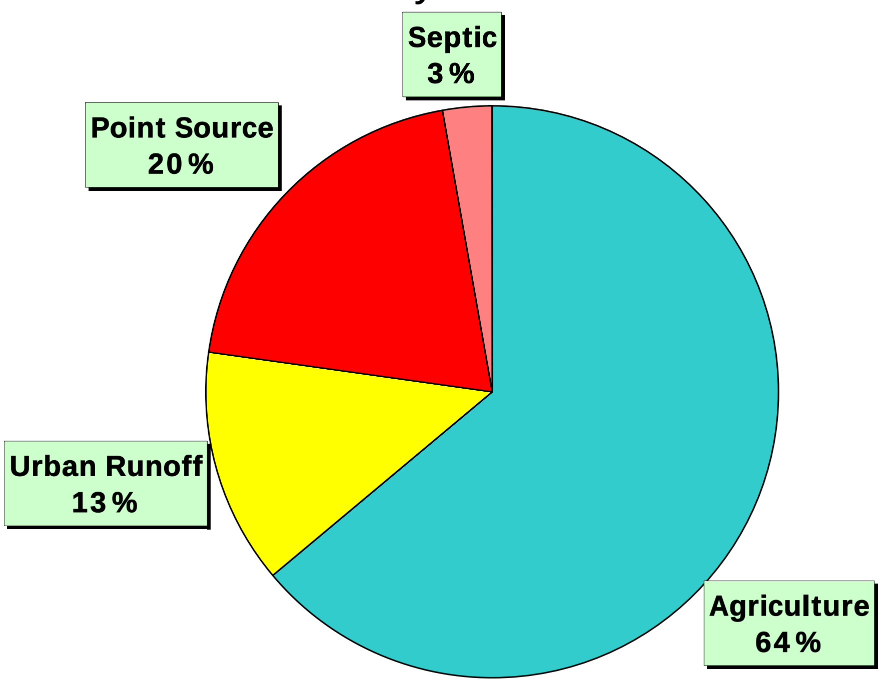
Pollutant Load Allocations For Each State in the Bay's Nine Major Basins

- These allocations have been subdivided among 36 individual basins
- "Tributary Strategies" developed for each basin, listing the actions to be implemented to achieve the pollution load caps
- Actions include point source upgrades and best management practices (e.g., wetland restoration, forested buffers, nutrient management plans) to control NPS runoff

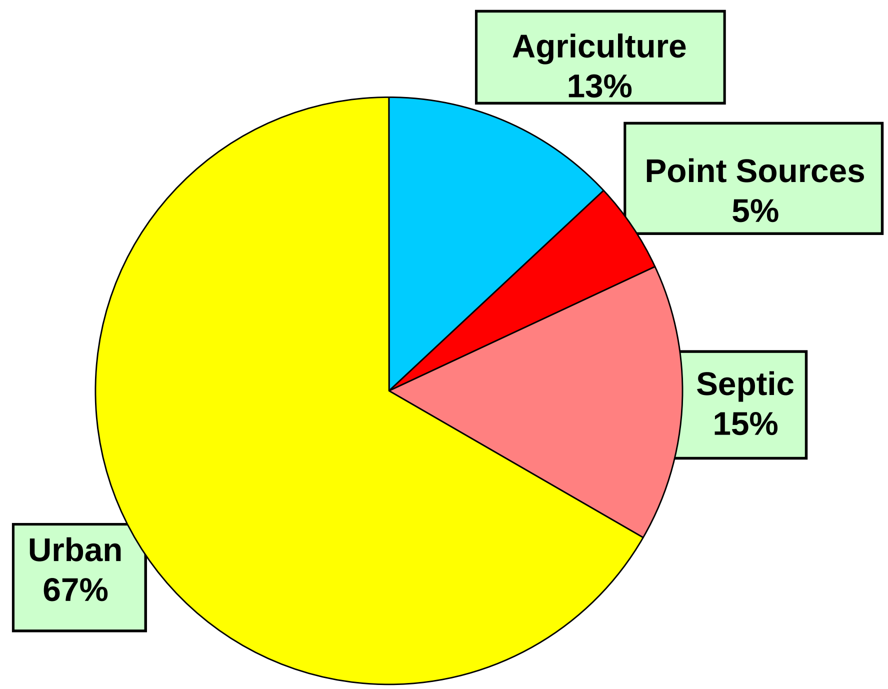


Agricultural conservation practices are among the most cost-effective ways to get N and P pollution reductions

Nitrogen Load Reduction
Percent of Nitrogen Load Reduction
from Tributary Strategies* from 2002 to 2010
By Source



Annualized Cost
Percent of Total Annualized Cost
of Tributary Strategy Implementation*
By Source

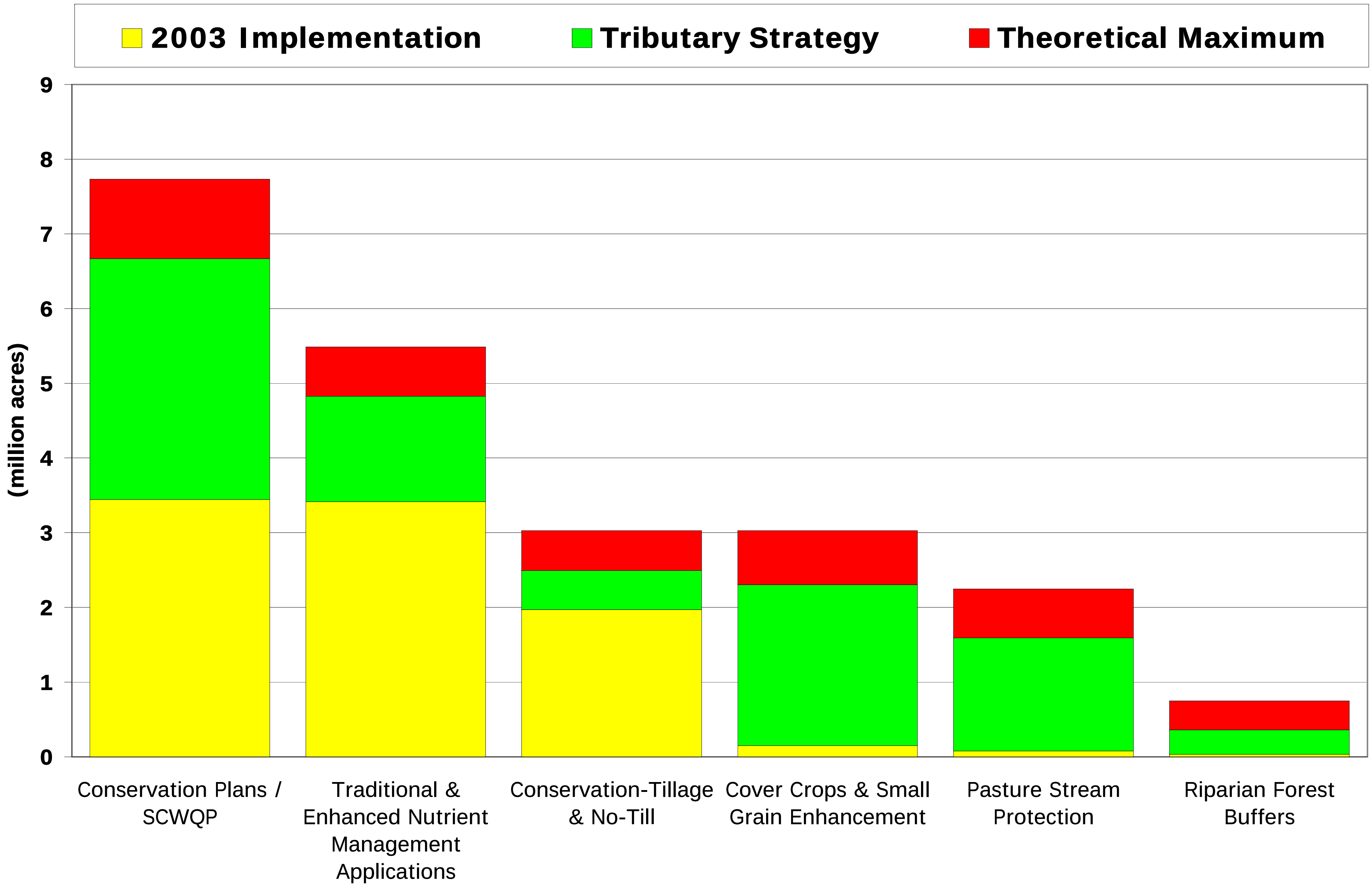


* The District of Columbia, Delaware, and West Virginia draft tributary strategies do not meet all of the cap load allocations; these jurisdictions are refining their strategies. Load reductions will increase and costs are likely to change. Because the New York Tributary Strategy has not been finalized, we assumed that the load reductions are based on the strategy meeting the state's nitrogen goal.

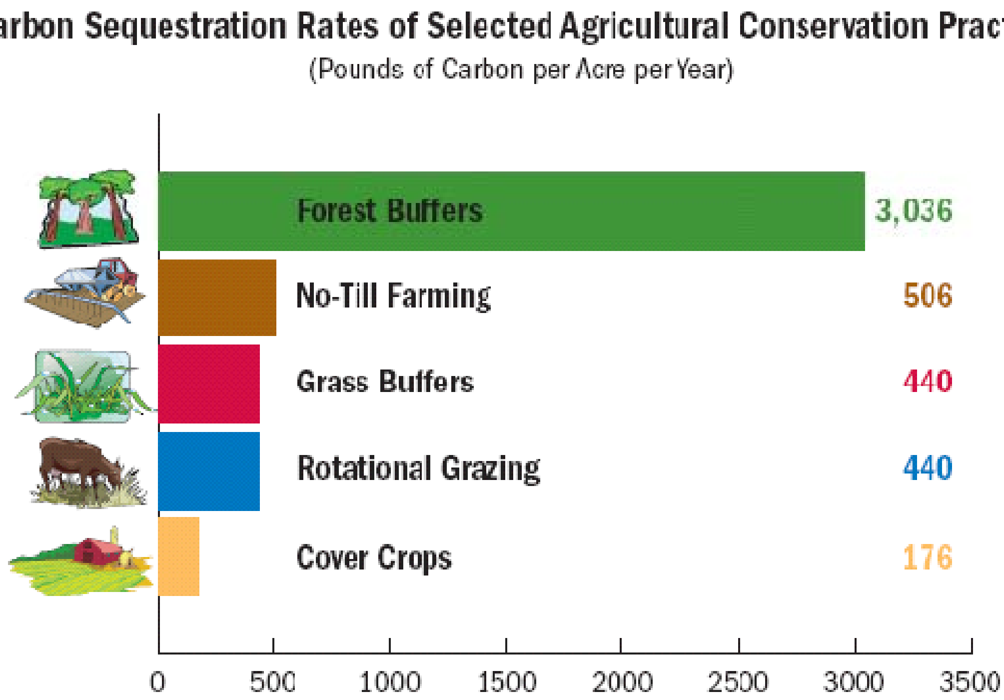
To achieve water quality goals, implementation of States' Tributary Strategies on agricultural lands will include the following:

- 360,000 acres of forested buffers
- 225,000 acres of grassed buffers
- 225,000 acres of forest
- 520,000 acres converted to no-till
- 2.3 million acres of cover crops
- 47,000 acres of rotational grazing

Agricultural BMPs in the Chesapeake Bay Watershed



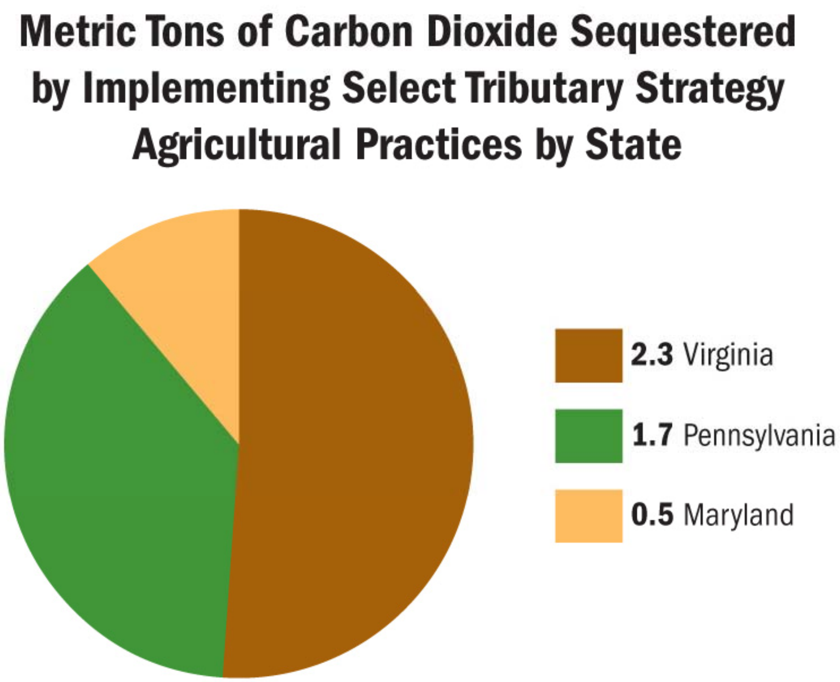
CBF partnered with Yale School of Forestry and Environmental Studies to quantify the GHG benefits of implementing the agricultural components of State Tributary Strategies



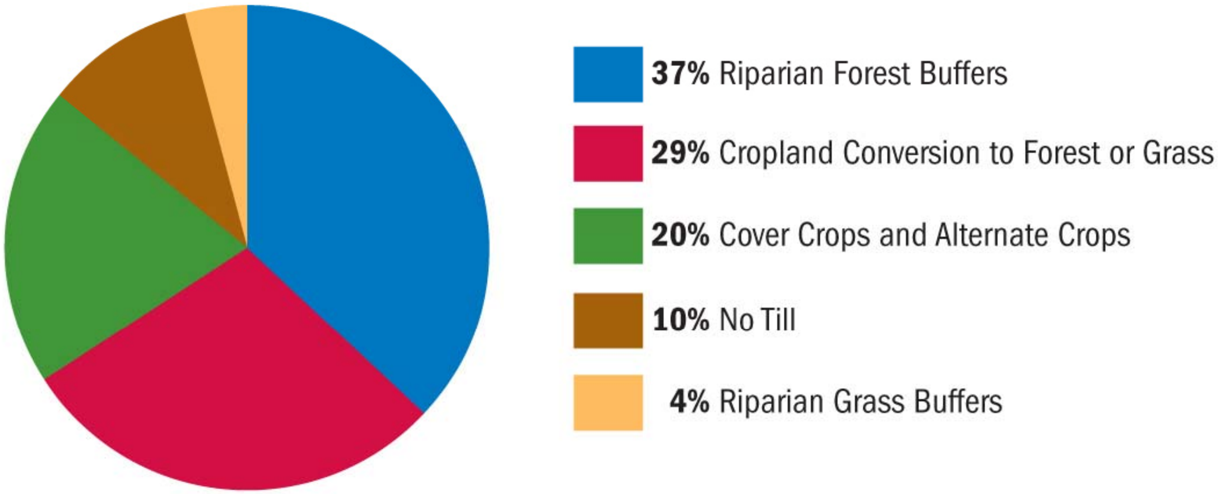
Estimates of sequestration rates were from the literature, where data were insufficient, benefits were not quantified.

Results

- 4.8 million metric tons of CO_2 eq sequestered annually over 15 years
- Roughly the equivalent of residential electricity use in Delaware
- Estimate could be conservative, doesn't include benefits from:
  - Enhanced NMP
  - Precision feeding
  - Reduced fuel use with no-till
  - etc



Relative Contribution of each Agricultural BMP to the Total Amount of Carbon Dioxide Sequestered

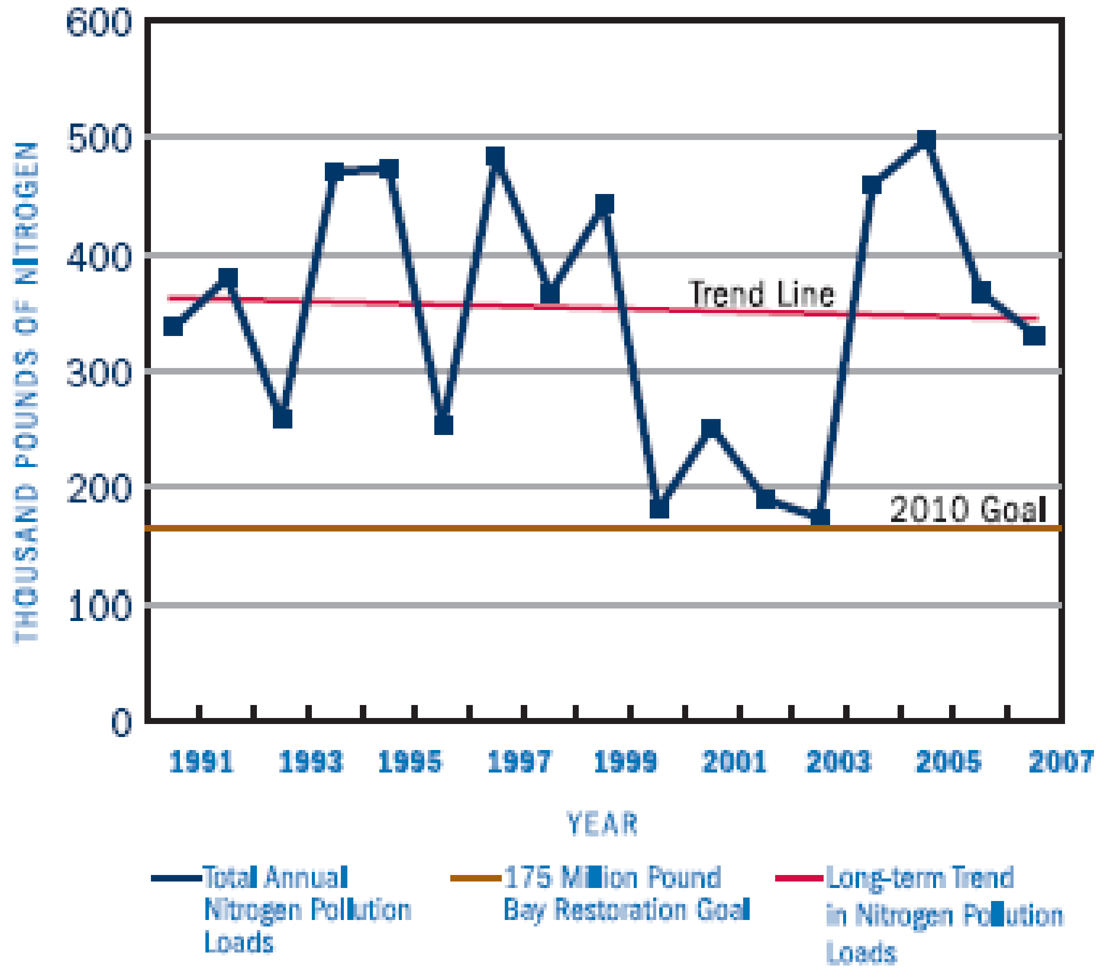


Rotational Grazing was not included because the contribution was less than 1%.

It is worth noting that with the exception of winter cover crops, these practices are included in the suite of eligible "offset projects" by the Chicago Climate Exchange, North America's only active voluntary, legally-binding, integrated greenhouse gas trading system (http://www.chicagoclimatex.com/)

TOTAL NITROGEN LOADS TO THE CHESAPEAKE BAY

1991-2006




Questions?