Chesapeake Bay Program

A Watershed Partnership

How the Chesapeake Bay Watershed Partners Reached Agreement on Nutrient and Sediment Load Reductions and Caps

Richard Batiuk

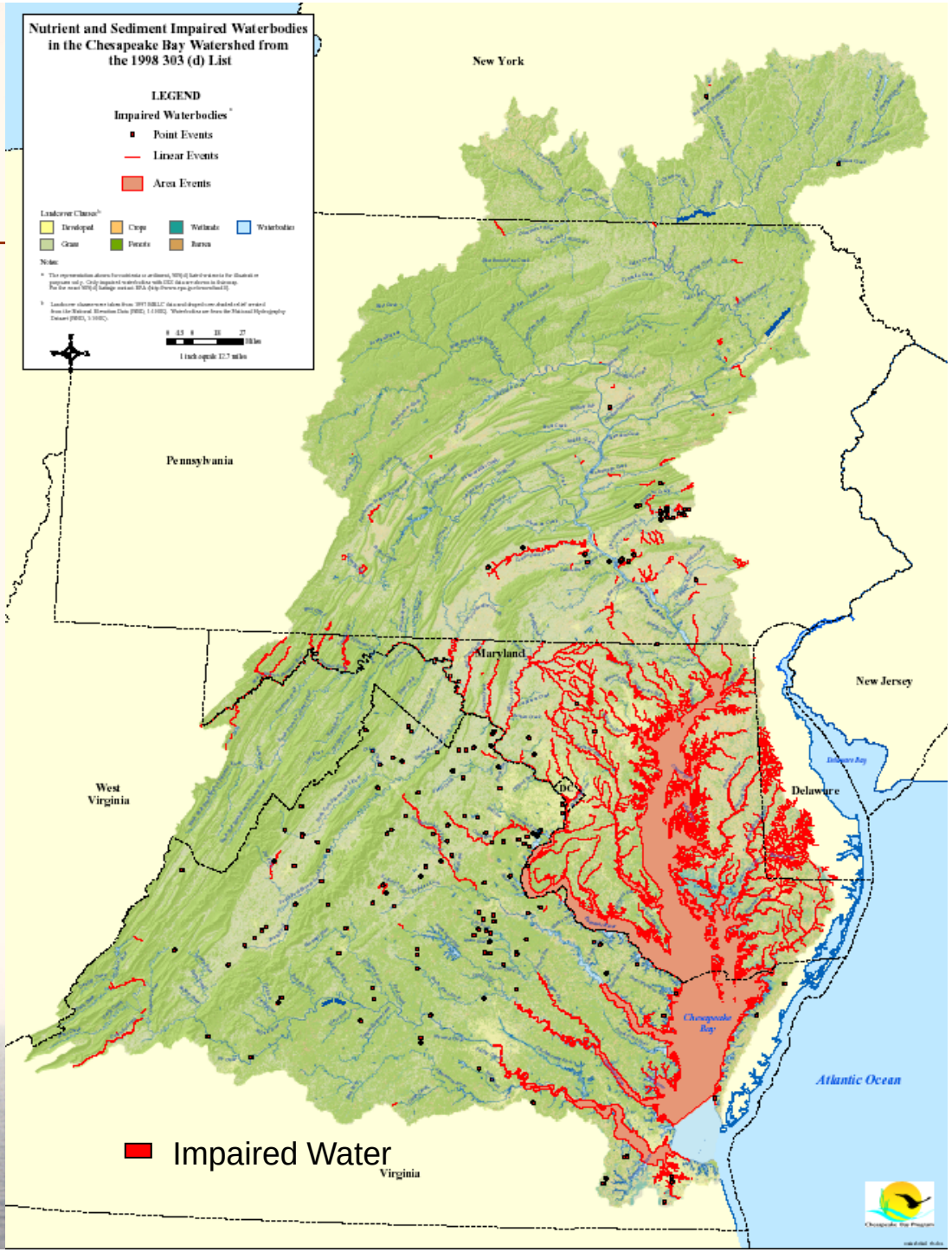
Associate Director for Science

U.S. EPA Chesapeake Bay Program Office

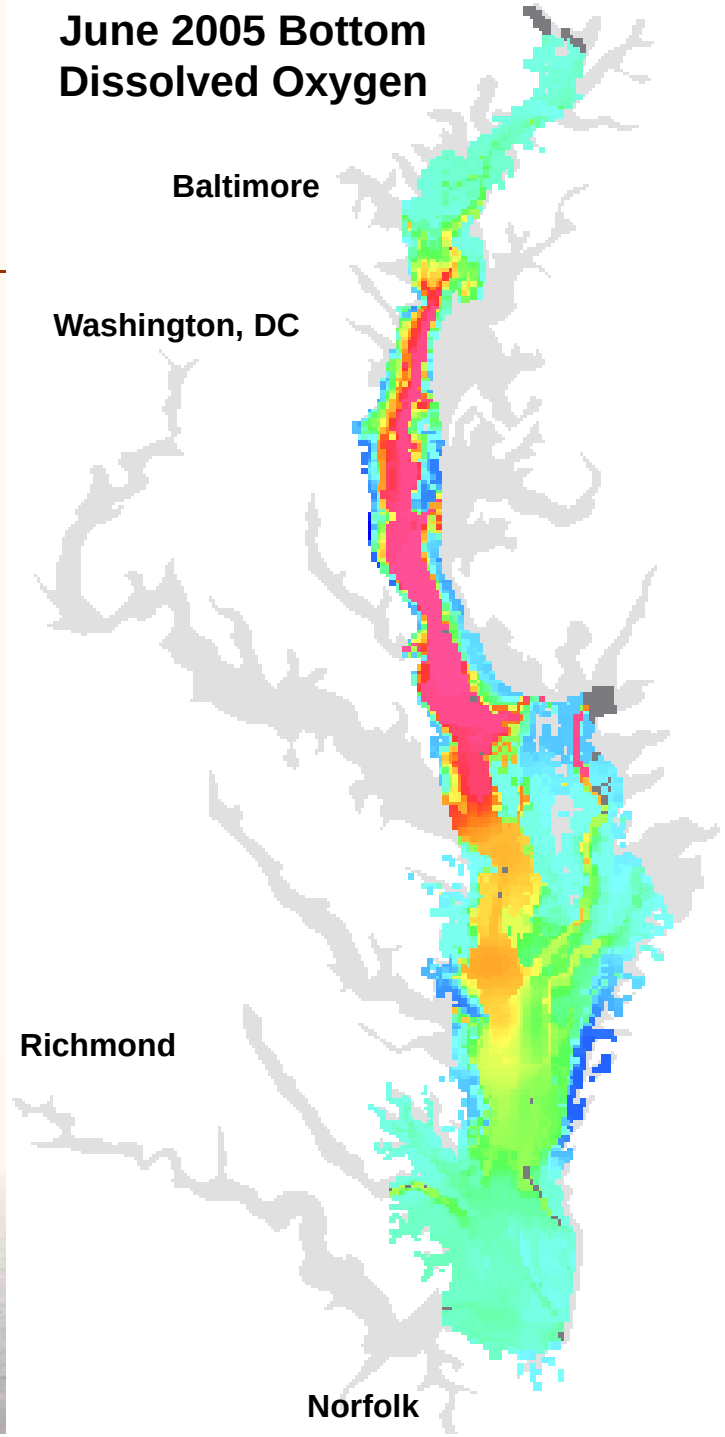
January 24, 2005

Over 90% of the Bay and its tidal rivers are impaired due to low dissolved oxygen levels and poor water clarity, all related to nutrient and sediment pollution.

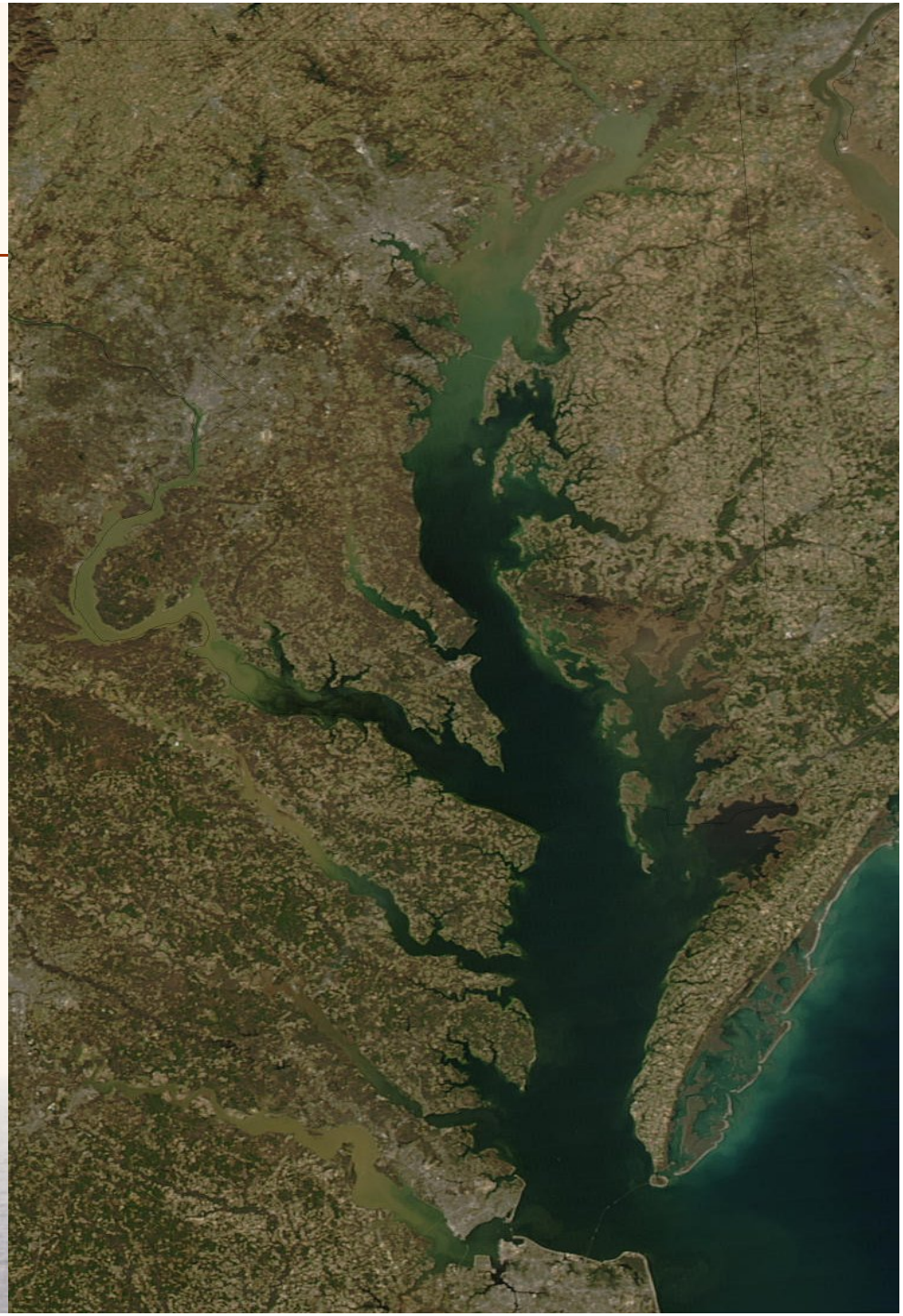
Without oxygen and grasses, the Bay's crabs, oysters, and fish cannot survive and thrive.



Extensive low to no dissolved oxygen conditions persist throughout the Chesapeake Bay



Sediments from the Susquehanna can impact Bay grass bay beds throughout the upper Chesapeake Bay



What Do We Want to Achieve?

Chesapeake Bay Program
A Watershed Partnership

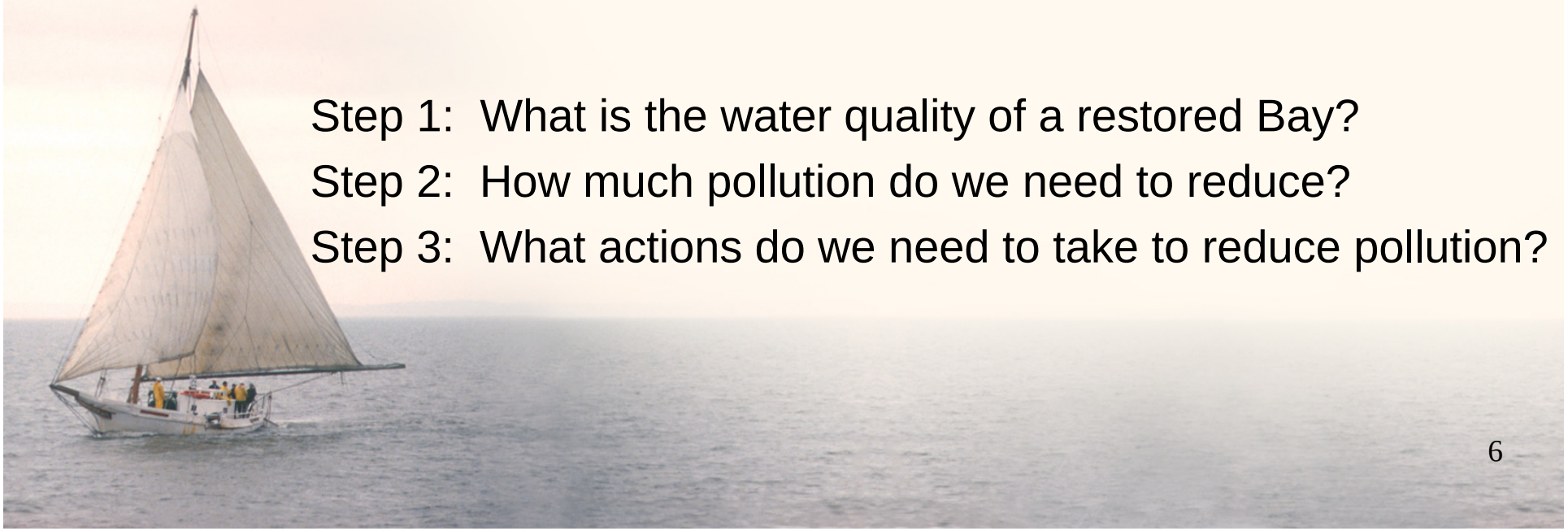
Water quality that supports abundant fish, crabs, oysters and underwater grasses in the Bay and its rivers.

Partners Commitment to Restored Bay Water Quality

Chesapeake Bay Program
A Watershed Partnership

CHESAPEAKE 2000
The Renewed Agreement

"By 2010, correct the nutrient- and sediment-related problems in the Chesapeake Bay and its tidal tributaries..."



Step 1: What is the water quality of a restored Bay?

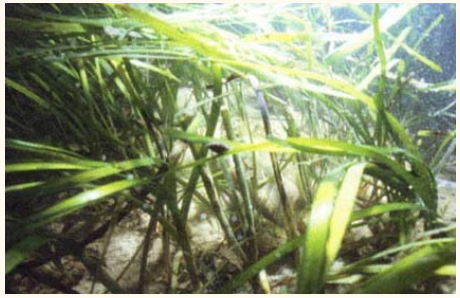
Step 2: How much pollution do we need to reduce?

Step 3: What actions do we need to take to reduce pollution?

Water Quality in a Restored Bay

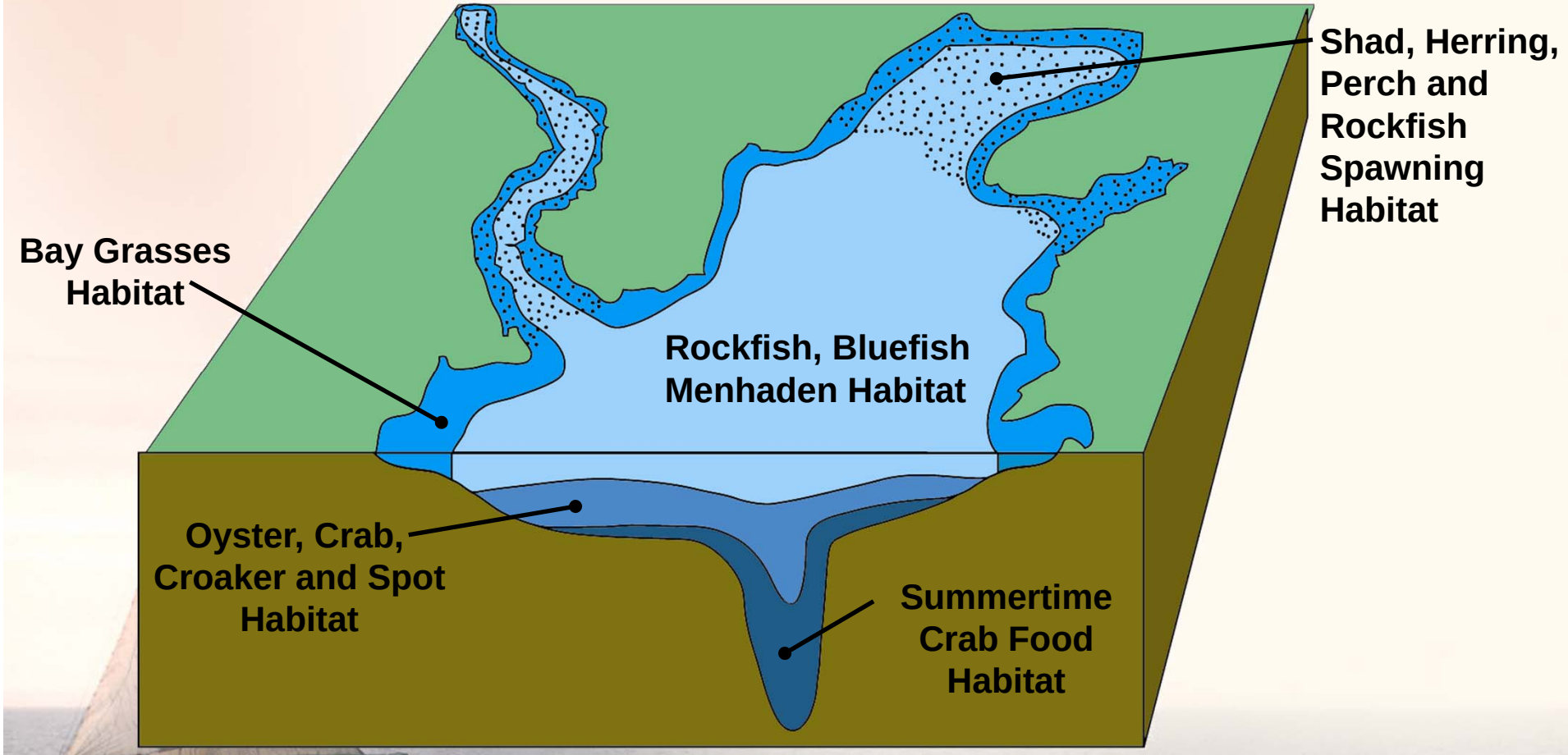
Chesapeake Bay Program
A Watershed Partnership

- **Fewer algae blooms and better fish food.**
- **Clearer water and more underwater Bay grasses.**
- **More oxygen and improved habitat for more fish, crabs and oysters.**



Local "Zoning" for Bay and River Fish, Crab and Grasses Habitats

Chesapeake Bay Program
A Watershed Partnership



Bay Dissolved Oxygen Criteria

Minimum Amount of Oxygen (mg/L) Needed to Survive by Species

Chesapeake Bay Program
A Watershed Partnership

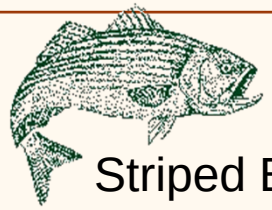
Migratory Fish Spawning & Nursery Areas

Shallow and Open Water Areas

Deep Water

Deep Channel

6	
5	
4	
3	
2	
1	
0	



Striped Bass: 5-6

American Shad: 5

White Perch: 5

Yellow Perch: 5

Hard Clams: 5

Alewife: 3.6

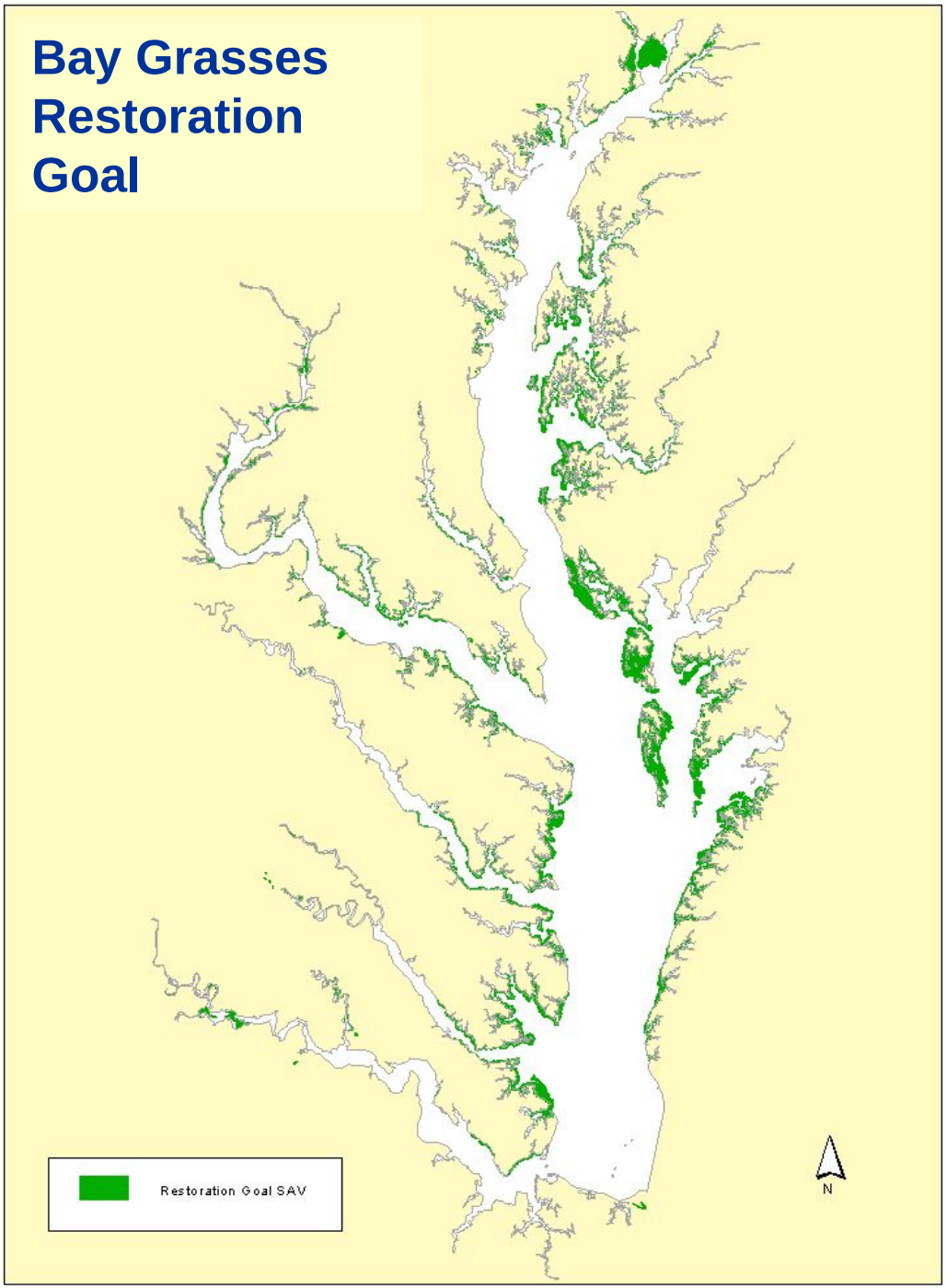
Crabs: 3

Bay Anchovy: 3

Spot: 2

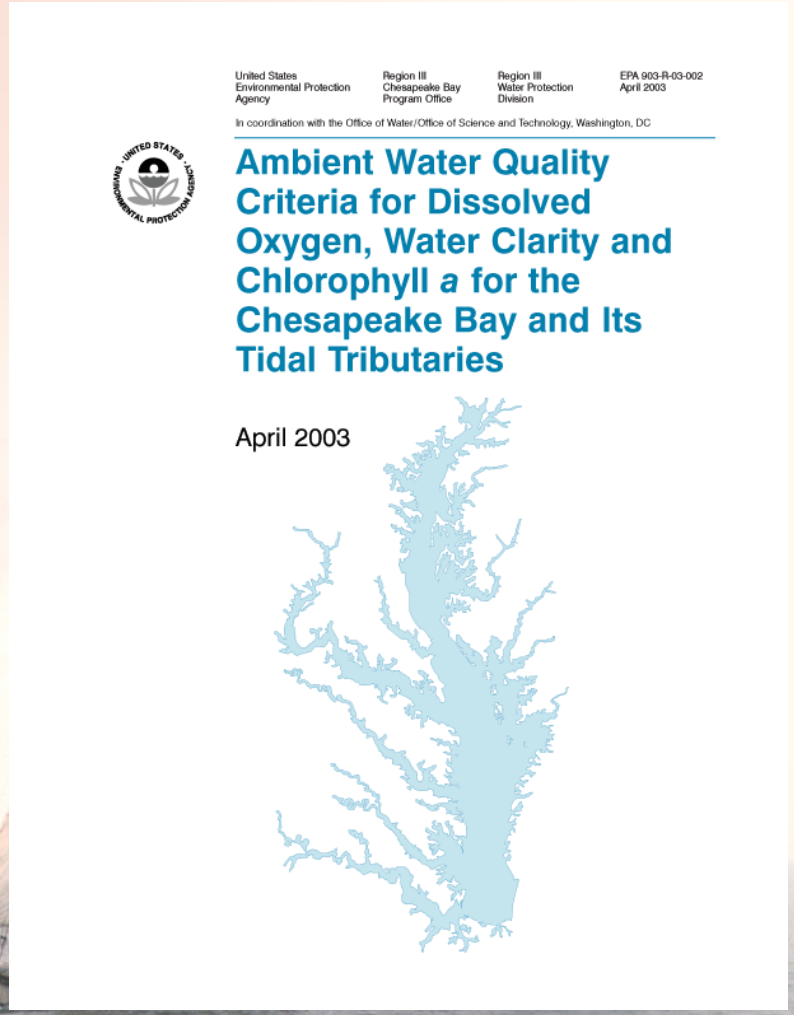
Worms: 1

MD, VA, DE and DC have adopted the 185,000 acre Bay grasses restoration goal into their state water quality standard regulations



Scientific Basis for Decisions was Documented by the Partners

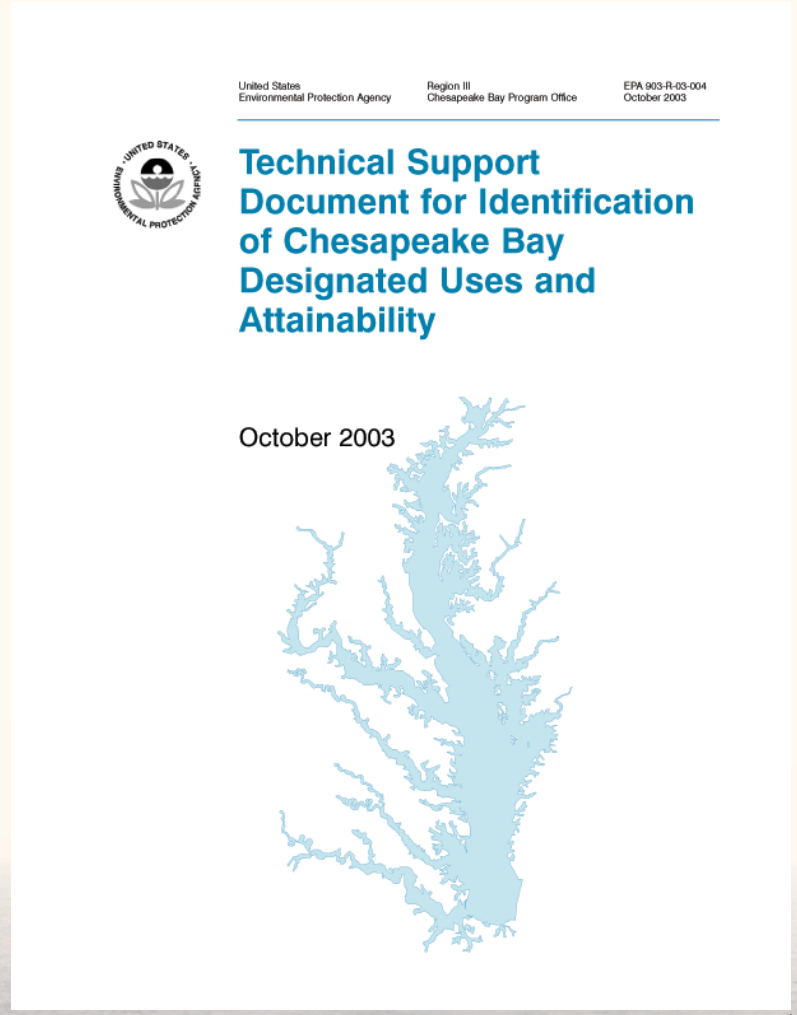
Chesapeake Bay Program
A Watershed Partnership


United States Environmental Protection Agency | Region III Chesapeake Bay Program Office | Region III Water Protection Division | EPA 903-R-03-002 April 2003

In coordination with the Office of Water/Office of Science and Technology, Washington, DC

Ambient Water Quality Criteria for Dissolved Oxygen, Water Clarity and Chlorophyll *a* for the Chesapeake Bay and Its Tidal Tributaries

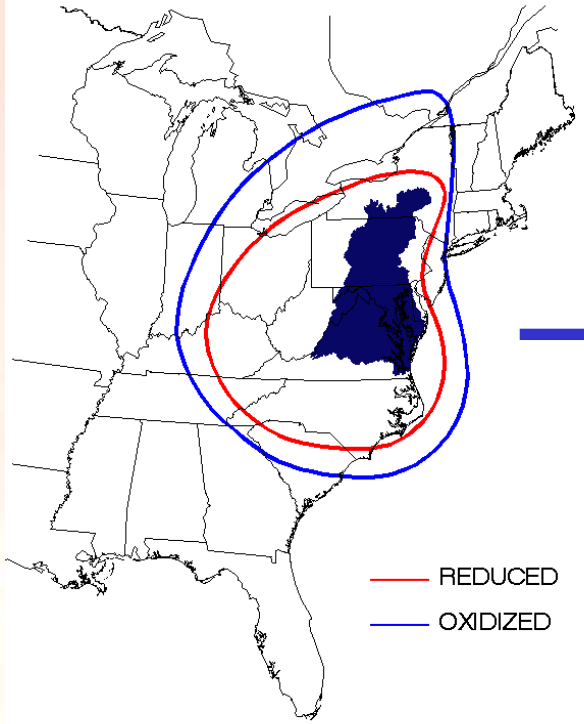
April 2003

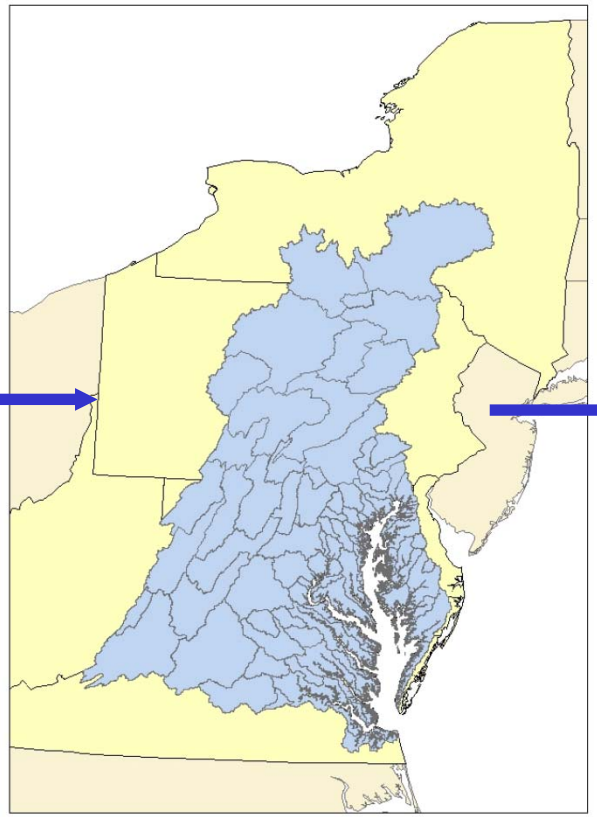

United States Environmental Protection Agency | Region III Chesapeake Bay Program Office | EPA 903-R-03-004 October 2003

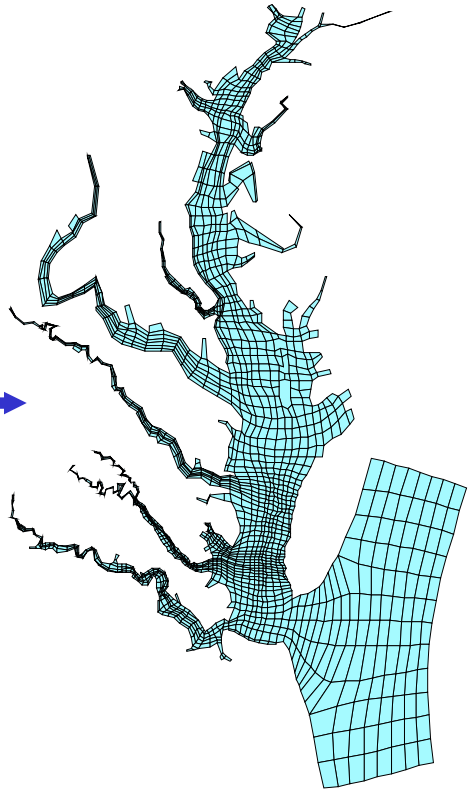
Technical Support Document for Identification of Chesapeake Bay Designated Uses and Attainability

October 2003

Chesapeake Bay Program - Current Models







Nitrate and ammonia deposition from Regression Model (NADP concentrations, precipitation, time, and latitude) applied to precipitation data from gauging stations.

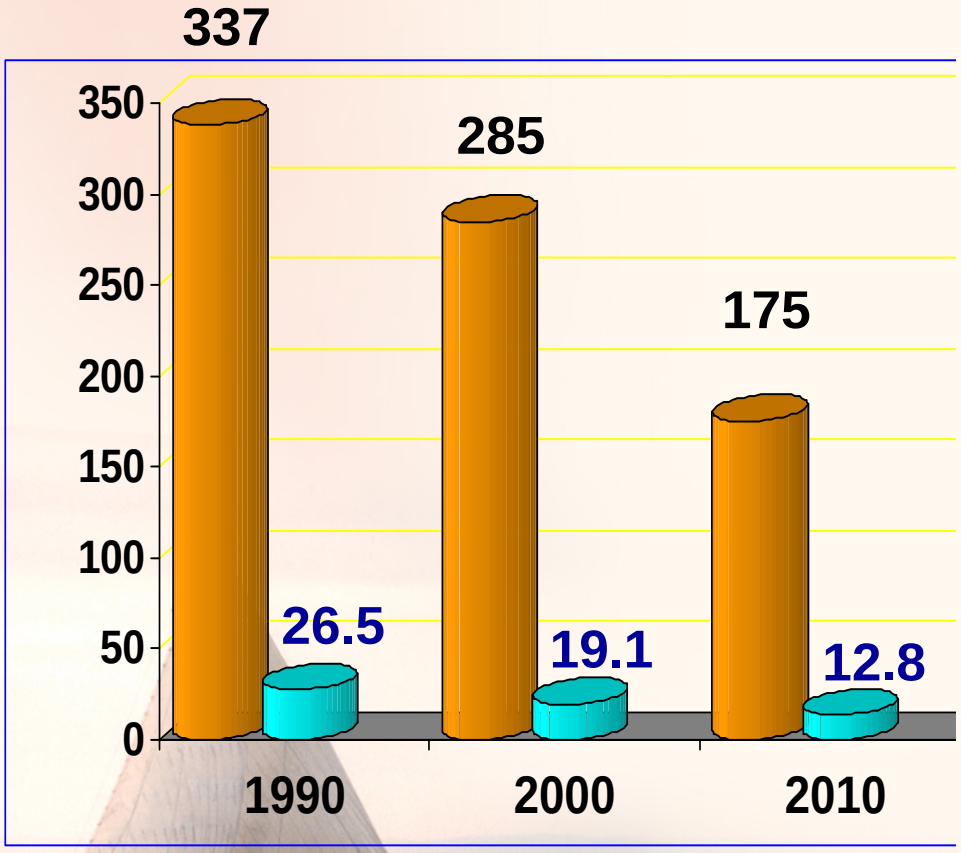
Adjustments to deposition from Regional Acid Deposition Model (RADM)

Chesapeake Bay Watershed Model
Lumped-parameter, physically-based Land and water simulation, Nutrient and sediment simulation

Chesapeake Bay Estuary Model Package
Hydrodynamic Model, Sediment Benthic Model, and Submerged Aquatic Vegetation

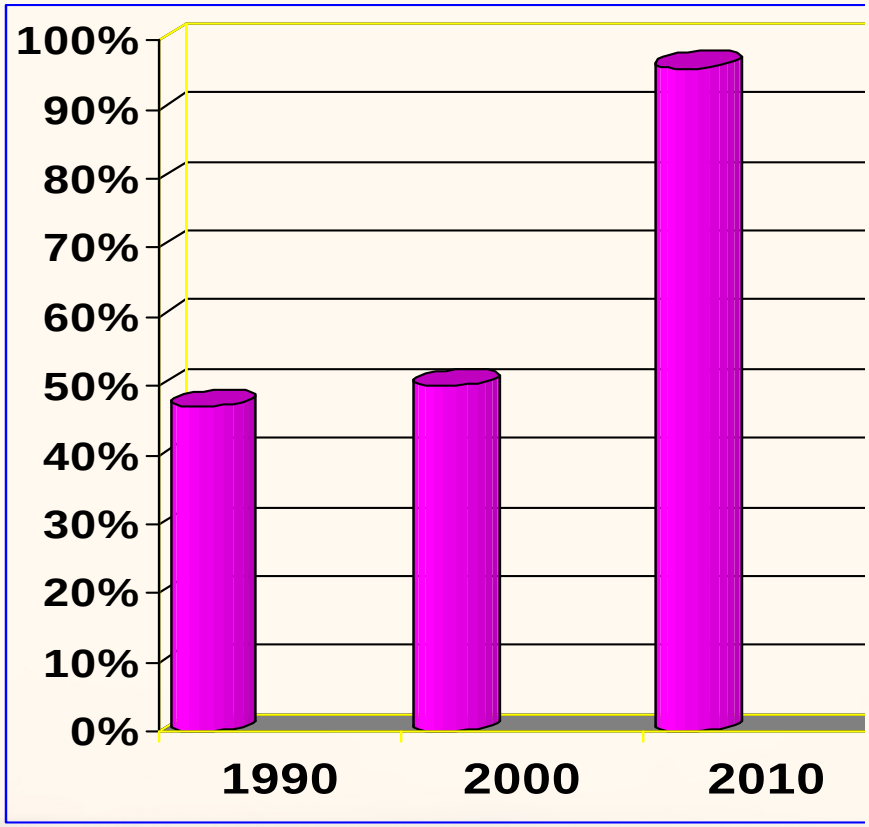
Nutrient Loadings vs. Dissolved Oxygen Criteria Attainment

Chesapeake Bay Program
A Watershed Partnership



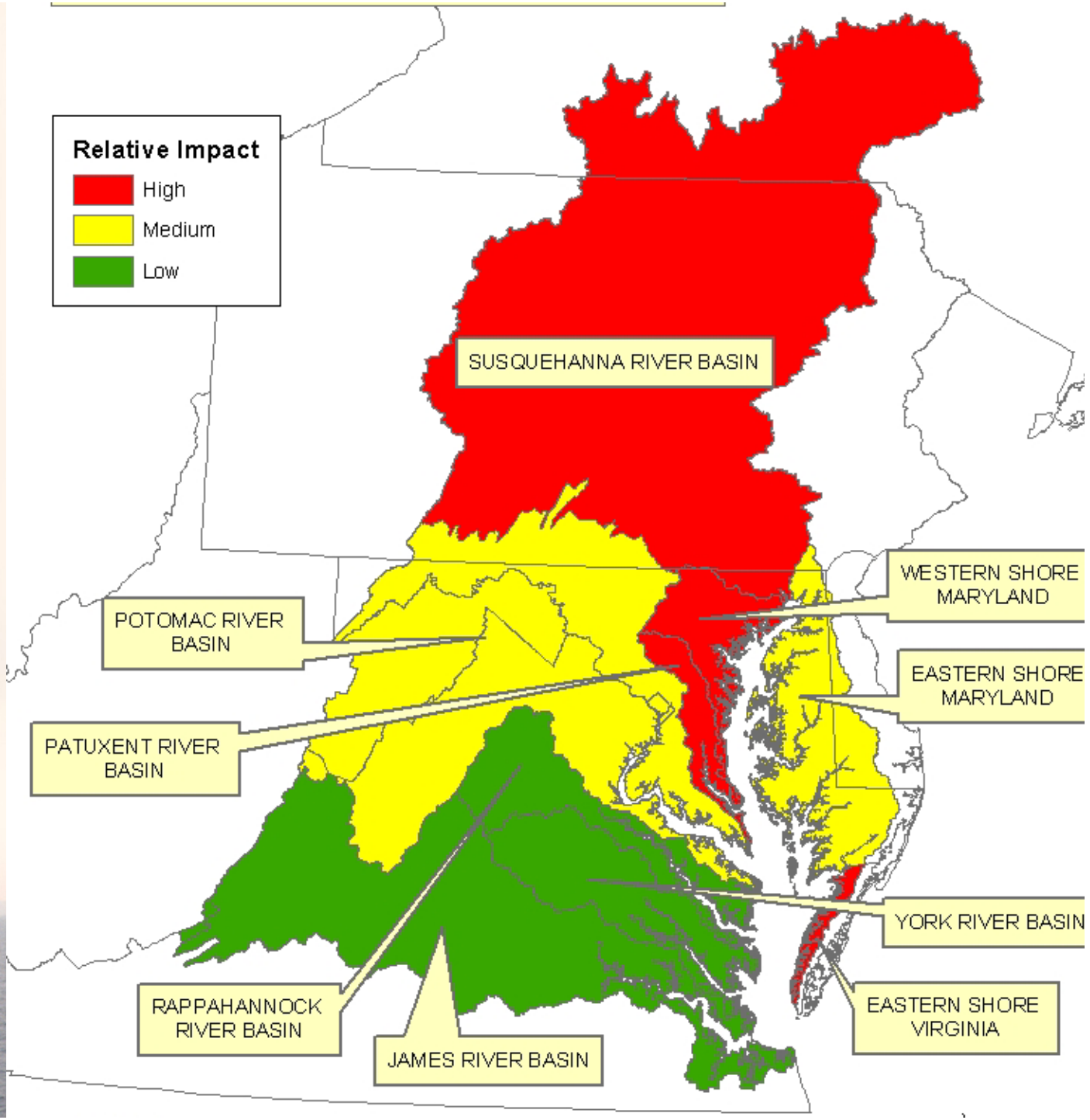
Millions of pounds per year

nitrogen *phosphorus*



% Dissolved Oxygen Criteria Attainment

Relative Impact on Dissolved Oxygen



Allocating the Cap Loads

Chesapeake Bay Program
A Watershed Partnership

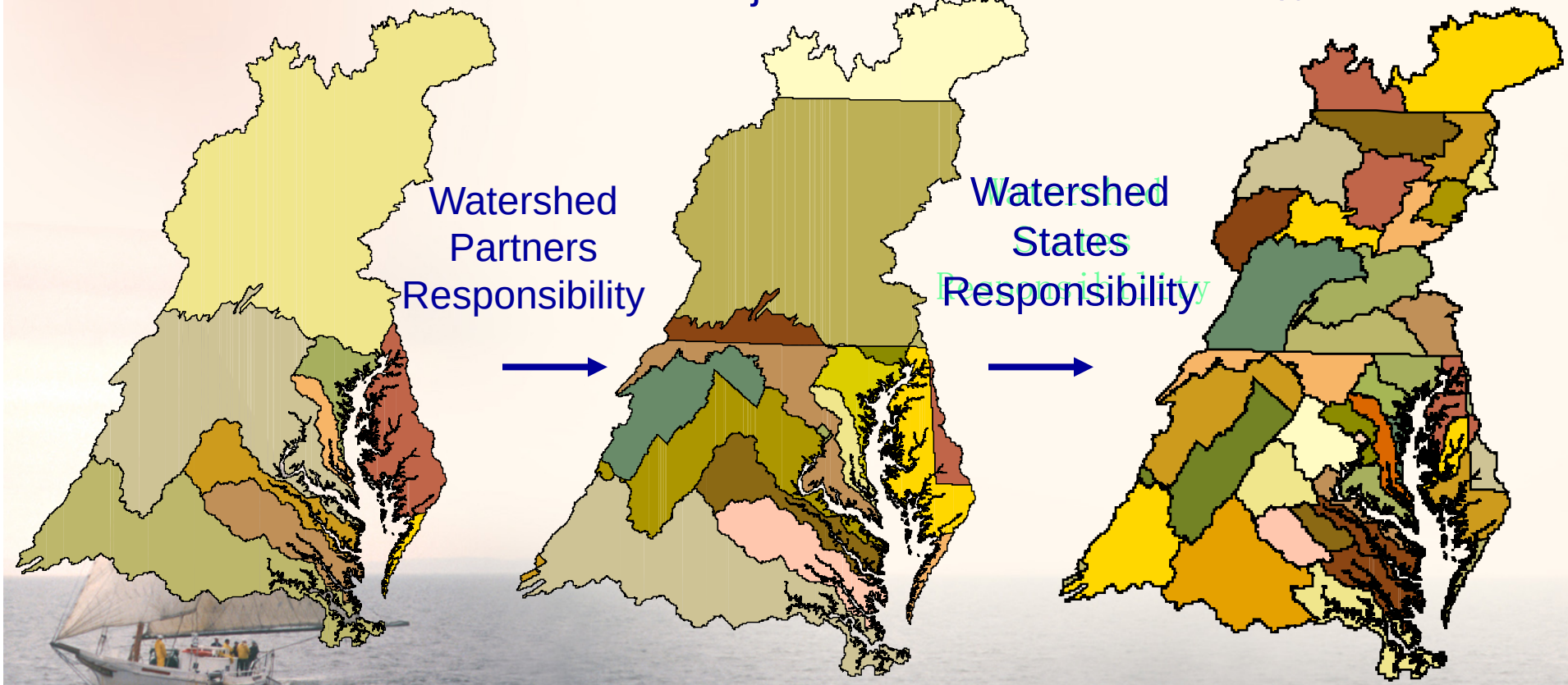
By **9** major river basins

Watershed Partners Responsibility

...then by **20** major tributary basins by jurisdiction

Watershed States Responsibility

…then by **44** state-defined tributary strategy subbasins

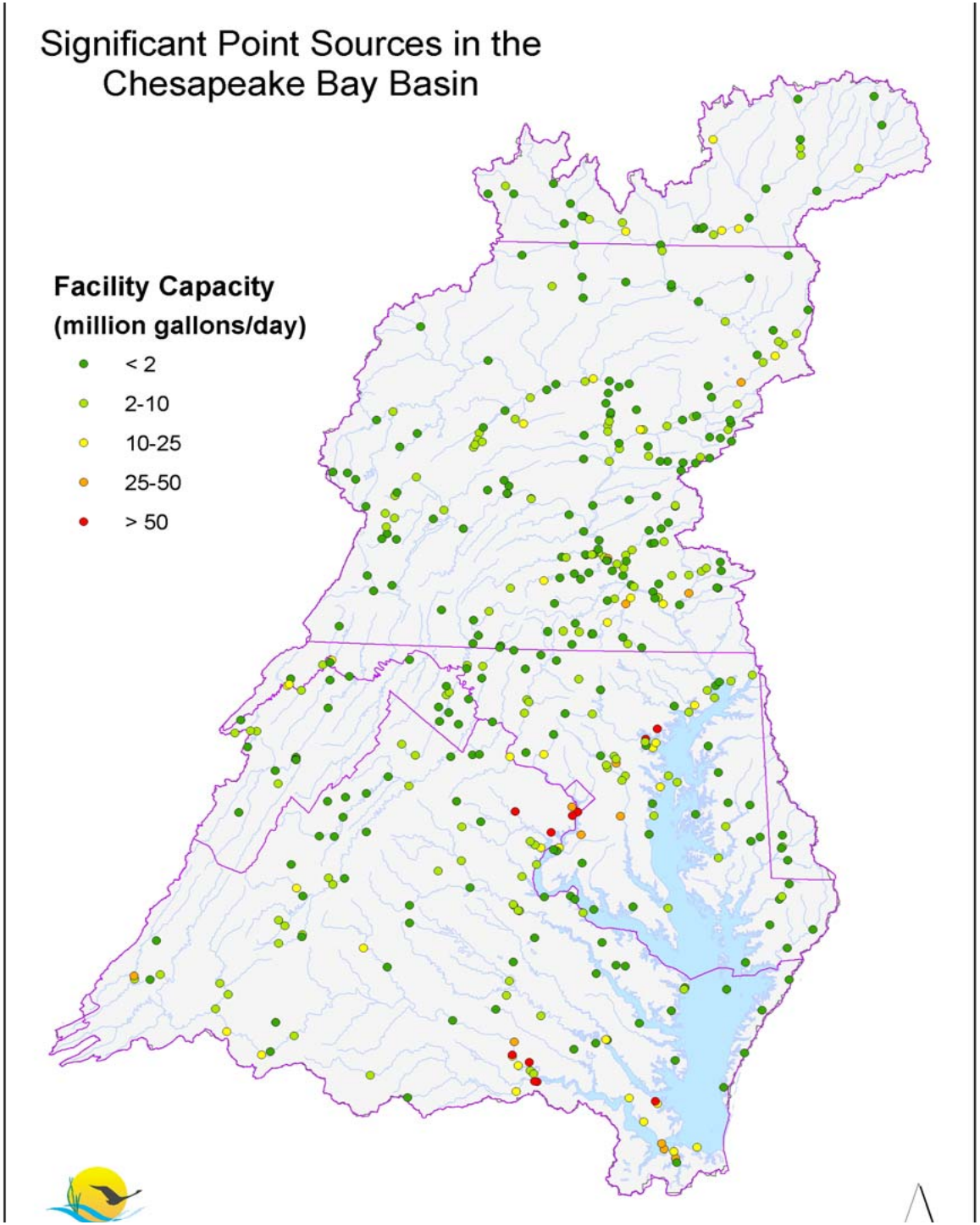


Final Allocations of Nutrient and Sediment Cap Loads

Chesapeake Bay Program
A Watershed Partnership

Basin/Jurisdiction	Nitrogen Allocation (million pounds/year)	Phosphorus Allocation (million pounds/year)	Upland Sediment Allocation (million tons/year)
SUSQUEHANNA			
PA	67.58	1.90	0.793
NY	12.58	0.59	0.131
MD	0.83	0.03	0.037
SUSQUEHANNA Total	80.99	2.52	0.962
EASTERN SHORE - MD			
MD	10.89	0.81	0.116
DE	2.88	0.30	0.042
PA	0.27	0.03	0.004
VA	0.06	0.01	0.001
EASTERN SHORE - MD Total	14.10	1.14	0.163
WESTERN SHORE			
MD	11.27	0.84	0.100
PA	0.02	0.00	0.001
WESTERN SHORE Total	11.29	0.84	0.100
PATUXENT			
MD	2.46	0.21	0.095
PATUXENT Total	2.46	0.21	0.095
POTOMAC			
VA	12.84	1.40	0.617
MD	11.81	1.04	0.364
WV	4.71	0.36	0.311
PA	4.02	0.33	0.197
DC	2.40	0.34	0.006
POTOMAC Total	35.78	3.48	1.494
RAPPAHANNOCK			
VA	5.24	0.62	0.288
RAPPAHANNOCK Total	5.24	0.62	0.288
YORK			
VA	5.70	0.48	0.103
YORK Total	5.70	0.48	0.103
JAMES			
VA	26.40	3.41	0.925
WV	0.03	0.01	0.010
JAMES Total	26.43	3.42	0.935
EASTERN SHORE - VA			
VA	1.16	0.08	0.008
EASTERN SHORE - VA Total	1.16	0.08	0.008
SUBTOTAL	183	12.8	4.15
CLEAR SKIES REDUCTION	-8		
BASIN-WIDE TOTAL	175	12.8	4.15

<u>All</u> 439 significant NPDES permitted facilities are now required to have annual N and P loads in their permits



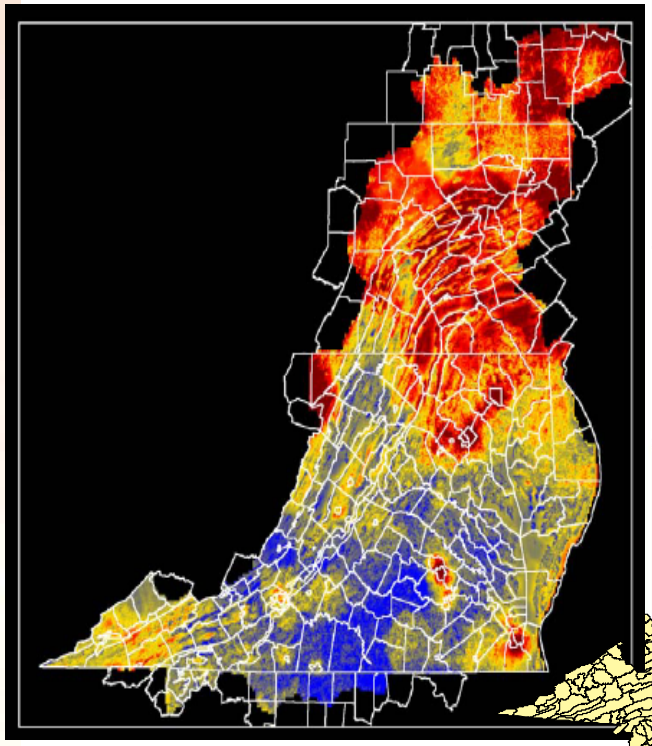
On the Horizon -- Looking Towards 2010

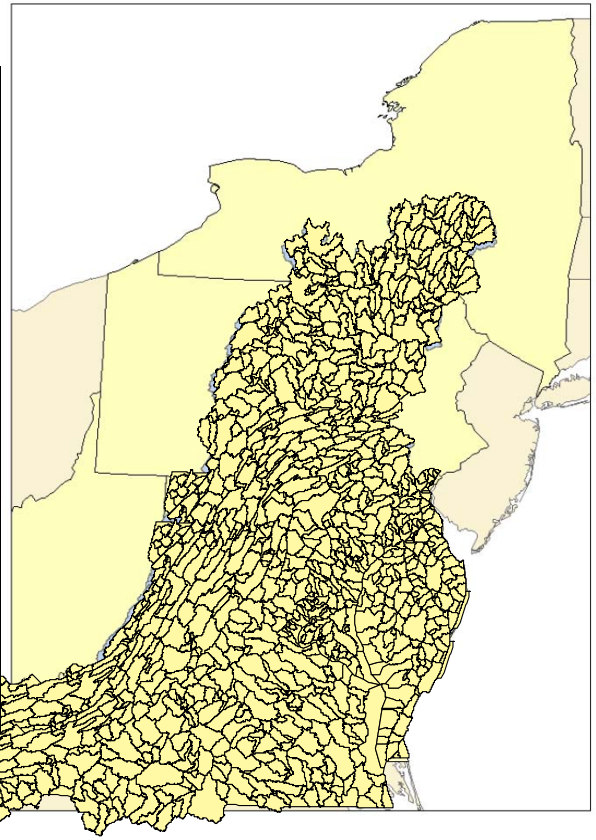
Chesapeake Bay Program
A Watershed Partnership

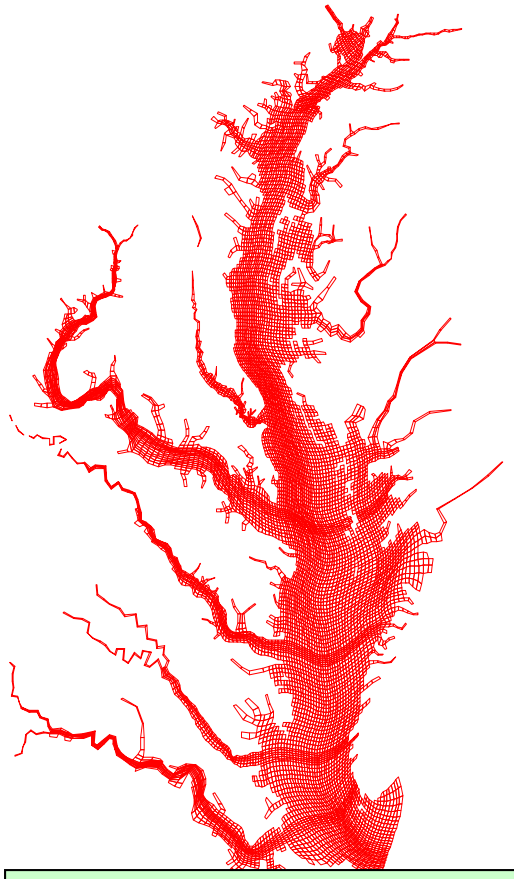
- **Refine nutrient cap load allocations to ensure achievement of the new state water quality standards**
- **New sediment cap load allocations to ensure achievement of the water clarity/Bay grass standards**
- **Partners must address Virginia TMDL court settlement and scheduled Maryland tidal water TMDLs by 2010**

Chesapeake Bay Program- New Models

Chesapeake Bay Program







Nitrate and ammonia deposition from improved Daily Nitrate and Ammonium Concentration Models

Adjustments to deposition from Models-3/Community Multi-scale Air Quality (CMAQ) Modeling System

Phase 5 Watershed Model
Better year-to-year simulation – mass balance modeling; Large aggregate land simulation with distributed rivers; Time series of management practices; Automated calibration

Chesapeake Bay Estuary Model
New grid; Bank loads; Nutrient controls on TSS and chlorophyll-a sinking/suspension; Hydrodynamic and Wave Models for sediment re-suspension in the Water Quality Model

Partnership at Work Towards 2010

Chesapeake Bay Program
A Watershed Partnership

- **2006: states' impaired waters lists updated, new Bay chlorophyll *a* criteria published, partners continue adopting new BMPs**
- **2007: new Bay watershed model, 2030 projections adopted, refinements to state WQ standards adopted**
- **2008: new Bay water quality/sediment transport model; states' updated impaired waters lists drives decision on watershed-wide TMDL**

Partnership at Work Towards 2010

Chesapeake Bay Program
A Watershed Partnership

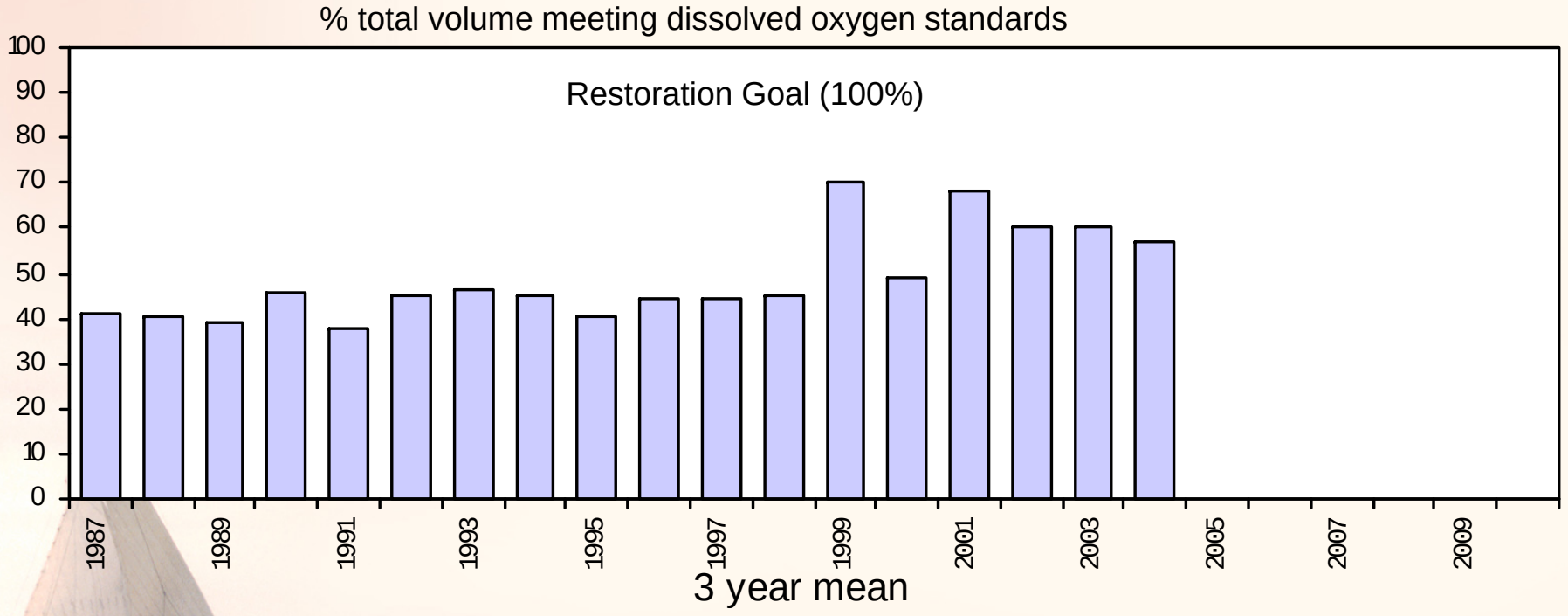
- **2009: partners agreement on draft revised nutrient and sediment cap load allocations, initiate public review of new allocations and draft revised tributary strategies**

- **2010: partner approval of revised nutrient and sediment cap load allocations, state adoption of revised tributary strategies**

Dissolved Oxygen Standards Attainment

Chesapeake Bay Program
A Watershed Partnership

During June -September when water quality is poorest

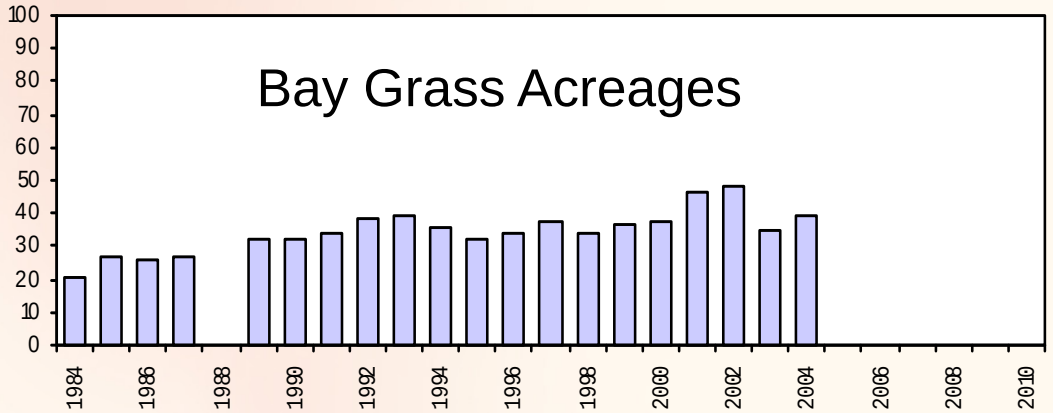


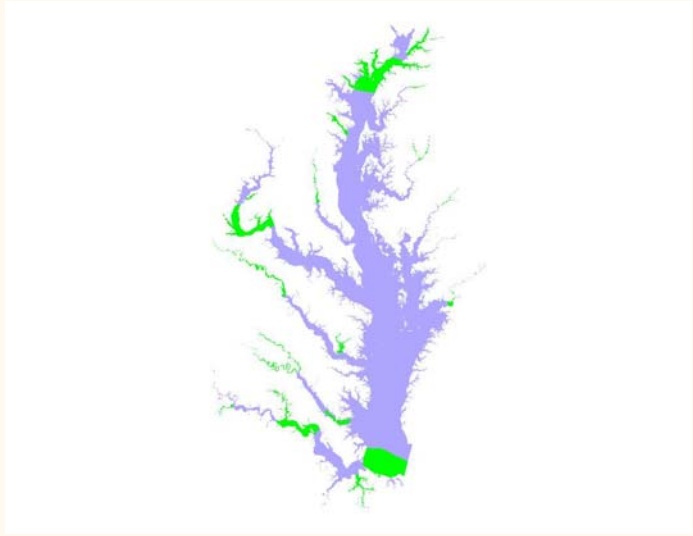
57% of dissolved oxygen goal achieved.

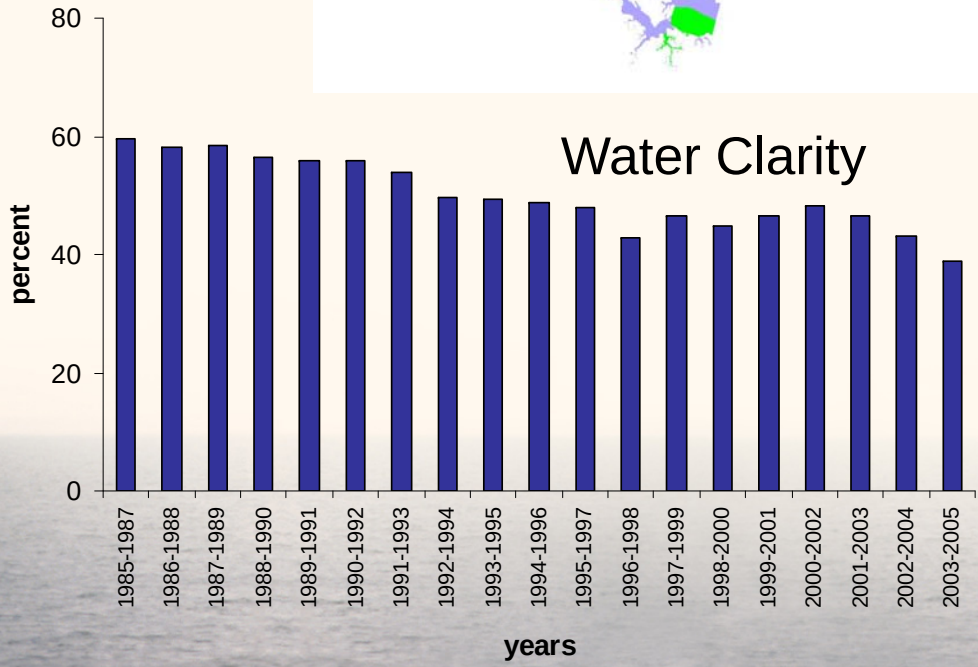
Water Clarity Standards Attainment

as measured by Bay grasses and clarity

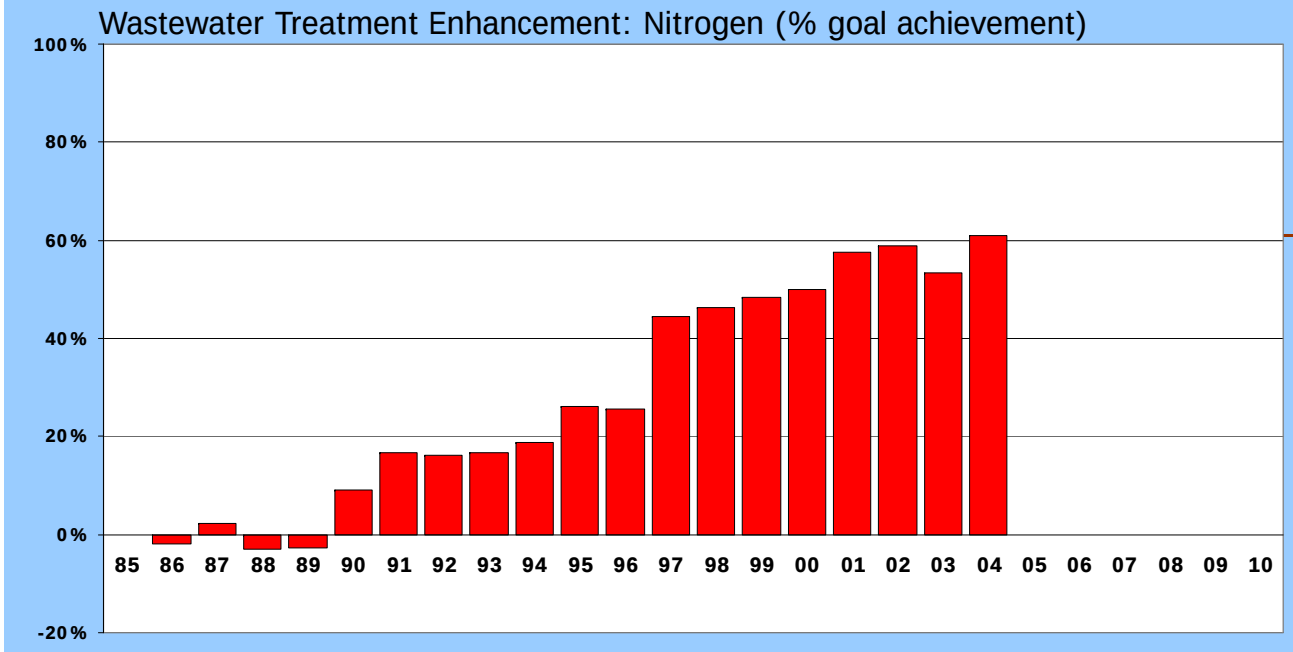
Chesapeake Bay Program
A Watershed Partnership

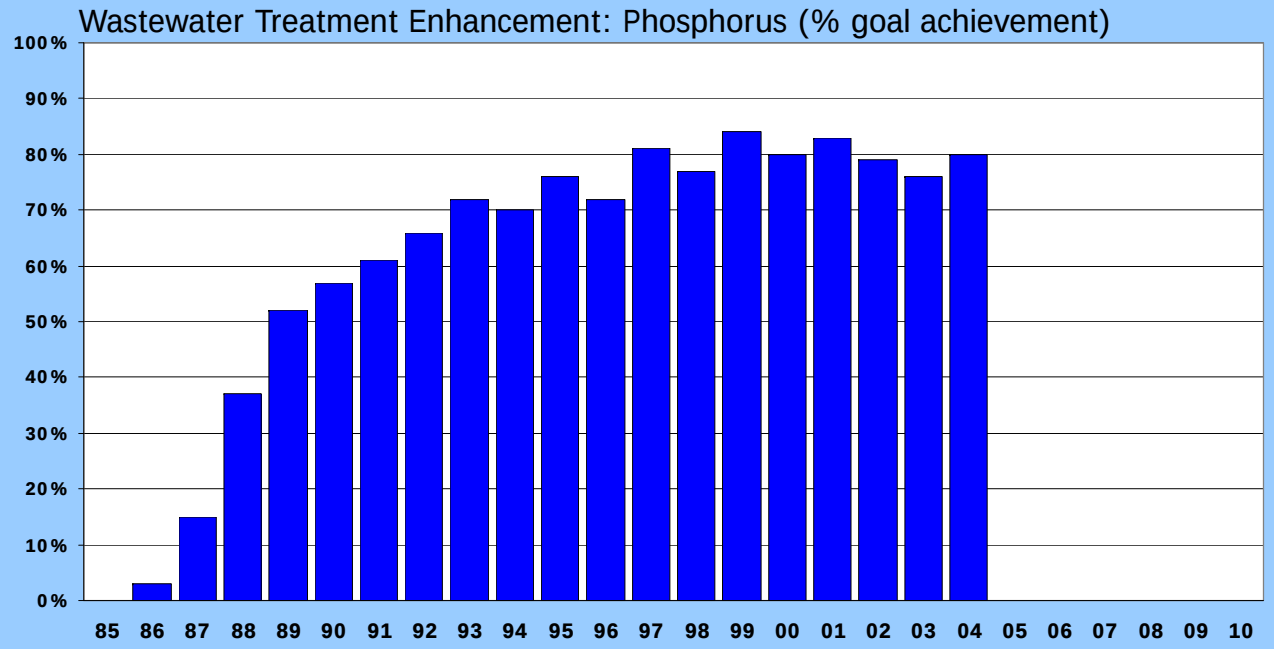






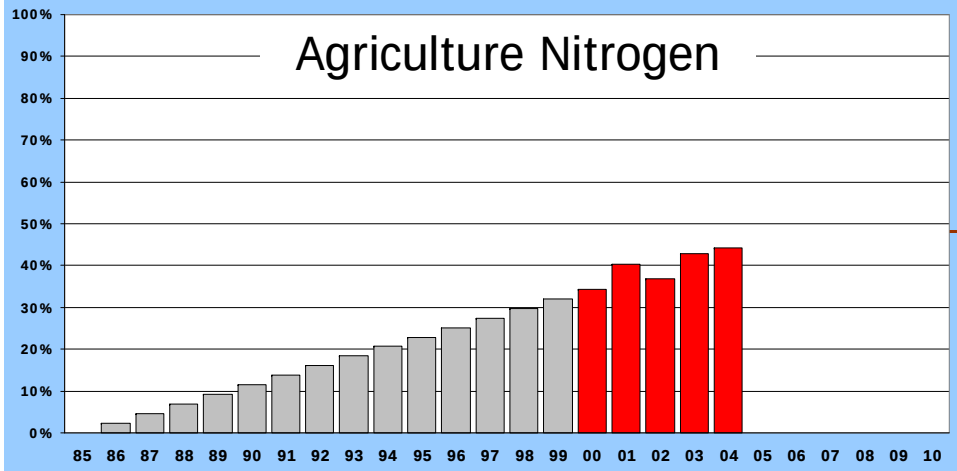
Wastewater Treatment Enhancement

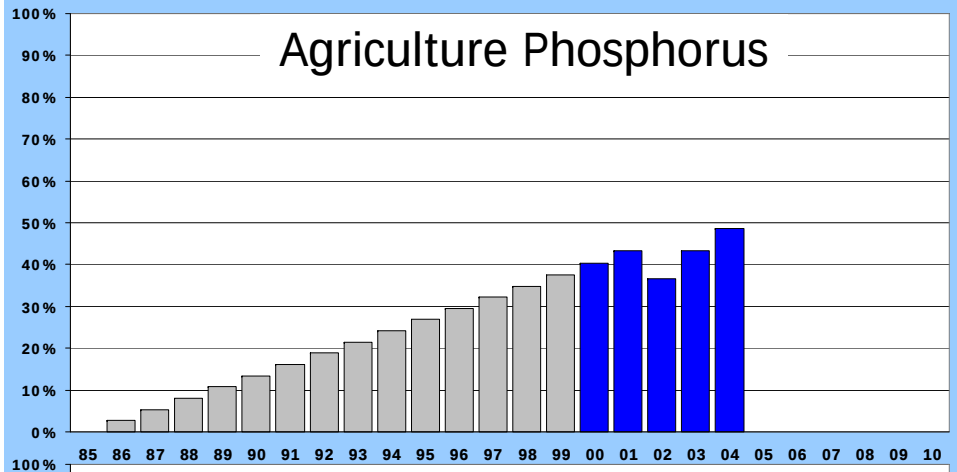


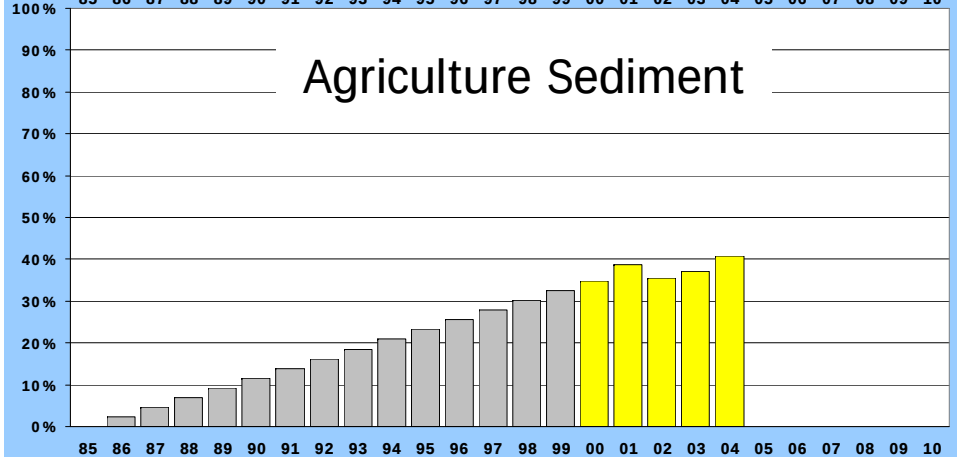


Goal achievement is measured relative to the 1985 base year and a load cap of 37.8 M lbs. nitrogen and 3.01 M lbs. phosphorus.

By 2004, 61% of the nitrogen goal and 80% of the phosphorus goal had been achieved.







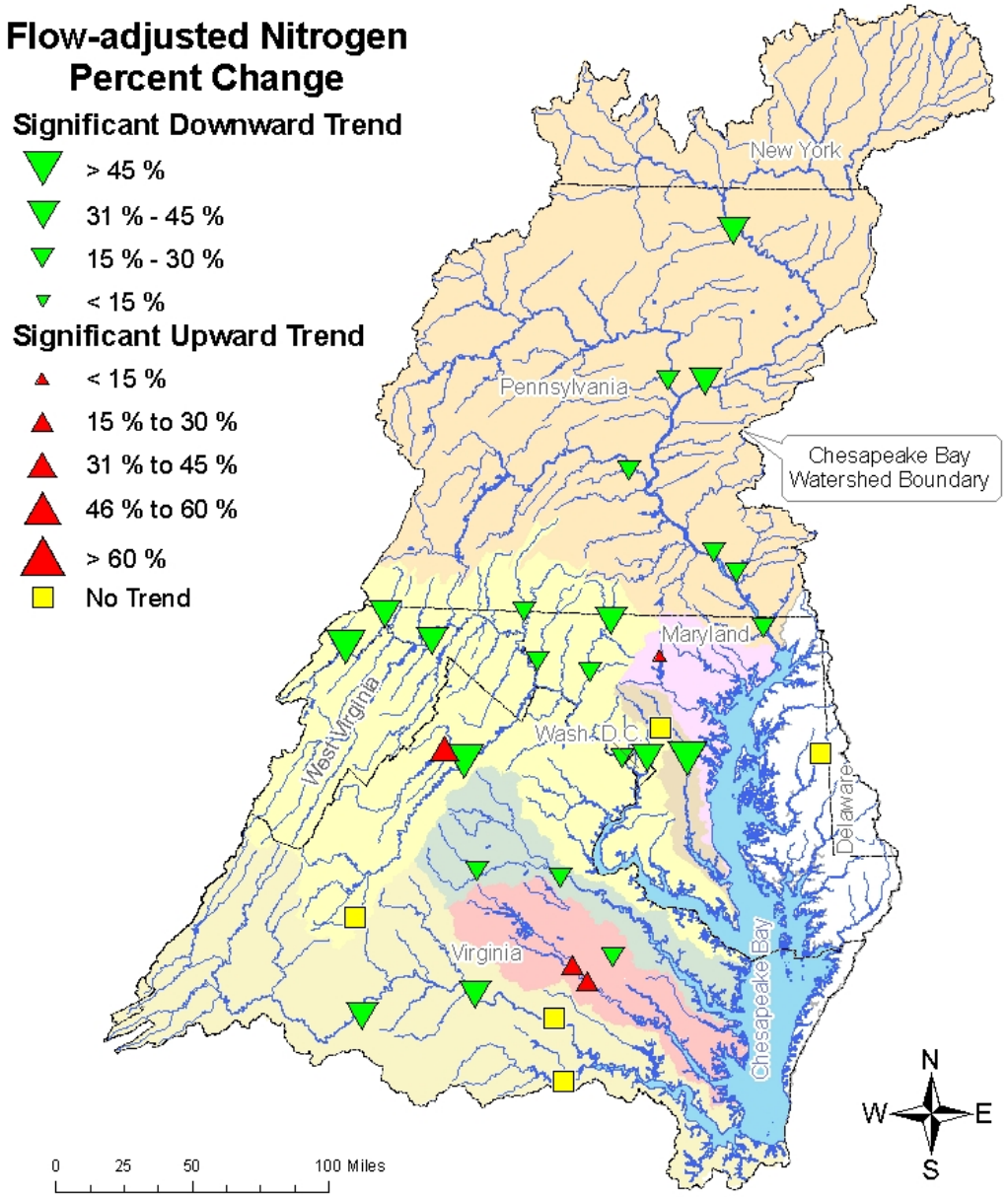
Tracking Reported Implementation of Agricultural Practices

Goal achievement level is an integration of implementation levels of agricultural BMPs reported by the states. Implementation is measured against Tributary Strategy goals with 1985 as the base year. Gray bars indicate a linear progression between years where data was available.

By 2004, 44% of the nitrogen implementation goal, 49% of the phosphorus implementation goal, and 41% of the sediment implementation goal had been achieved.

Our Rivers Are Showing Signs of Progress When River Flow is Accounted for

Flow-adjusted Nitrogen Concentration Trends in the Chesapeake Bay Watershed



Sources: CBP, USGS

Rich Batiuk

Associate Director for Science

U.S. Environmental Protection Agency
Chesapeake Bay Program Office

410-267-5731

batiuk.richard@epa.gov

www.chesapeakebay.net