Chesapeake Bay Watershed Wastewater Treatment Story: Three Decades and Counting

BACWA *Watershed Management Case Studies*
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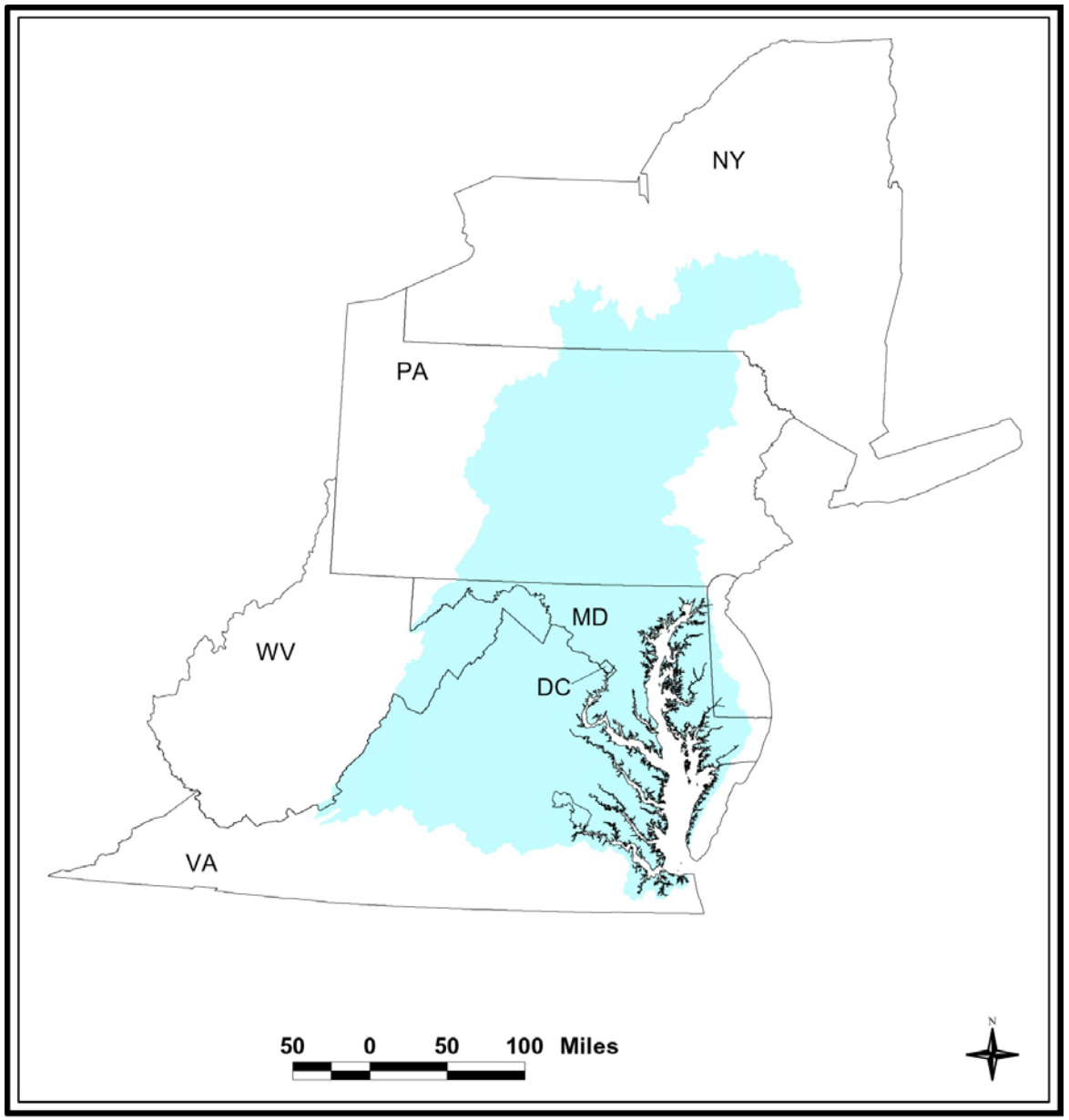
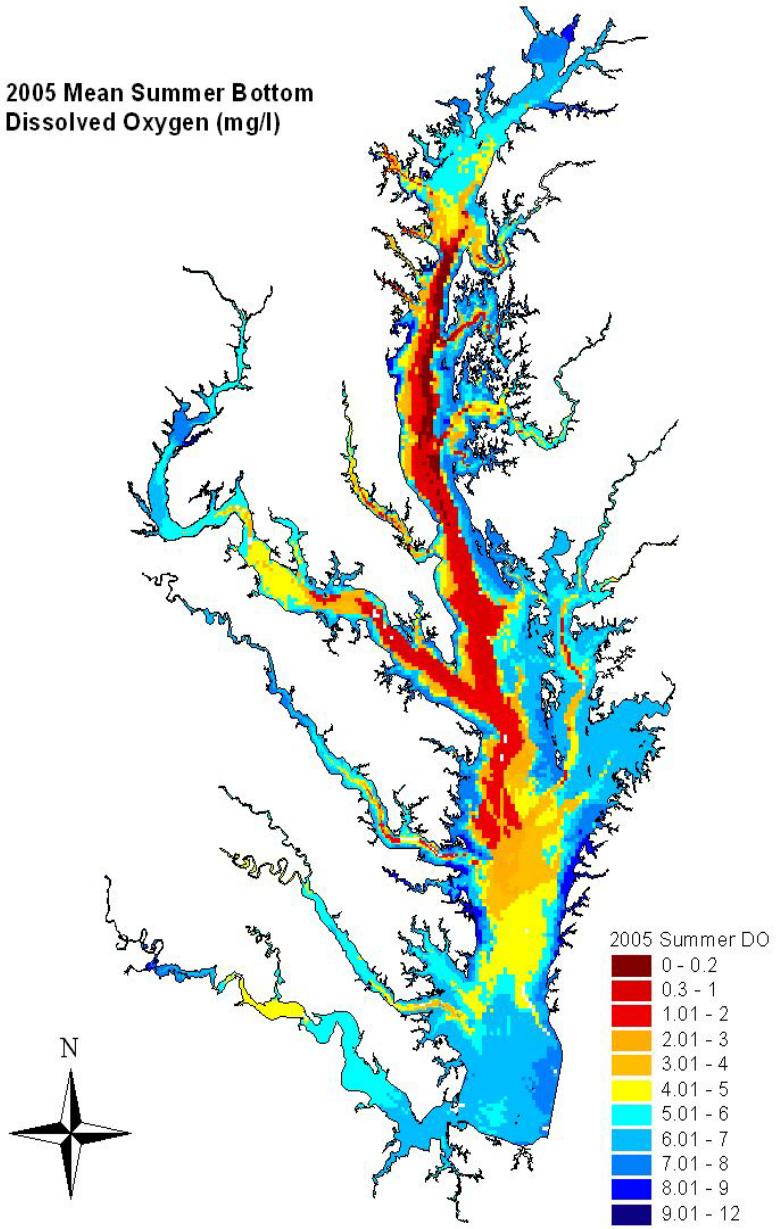
Chesapeake Bay Watershed

- 6 States and District of Columbia
- 64,000 sq miles or 166,000 sq km
- 17 million population
- Largest estuary in the US
- Very productive Estuary
- Several major river tributaries



- 1998 – Chesapeake Bay and tidal tributaries added to list of impaired waters
- Due to low dissolved oxygen levels, poor water clarity & chlorophyll a
- All related to nutrient TN & TP) and sediment (TSS) pollution
- Integrated water quality standards & coordinated allocation effort - precursor to TMDL
- Over 90% of Bay and tidal rivers impaired



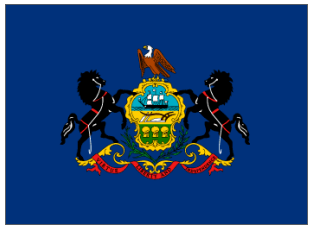
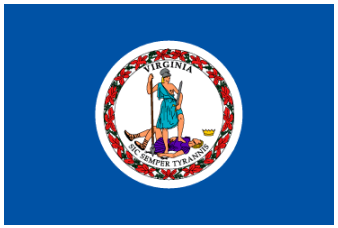
Chesapeake Bay Watershed Partners

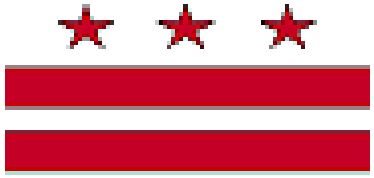
Signatories to the Chesapeake Bay agreement

EPA (representing the Federal government and 25+ other federal agencies)

Maryland, Virginia, Pennsylvania and the District of Columbia

Chesapeake Bay Commission (representing MD, PA and VA state legislatures)




Headwater Partners through a 6 State-EPA Water Quality Memorandum of Understanding

Delaware, West Virginia and New York

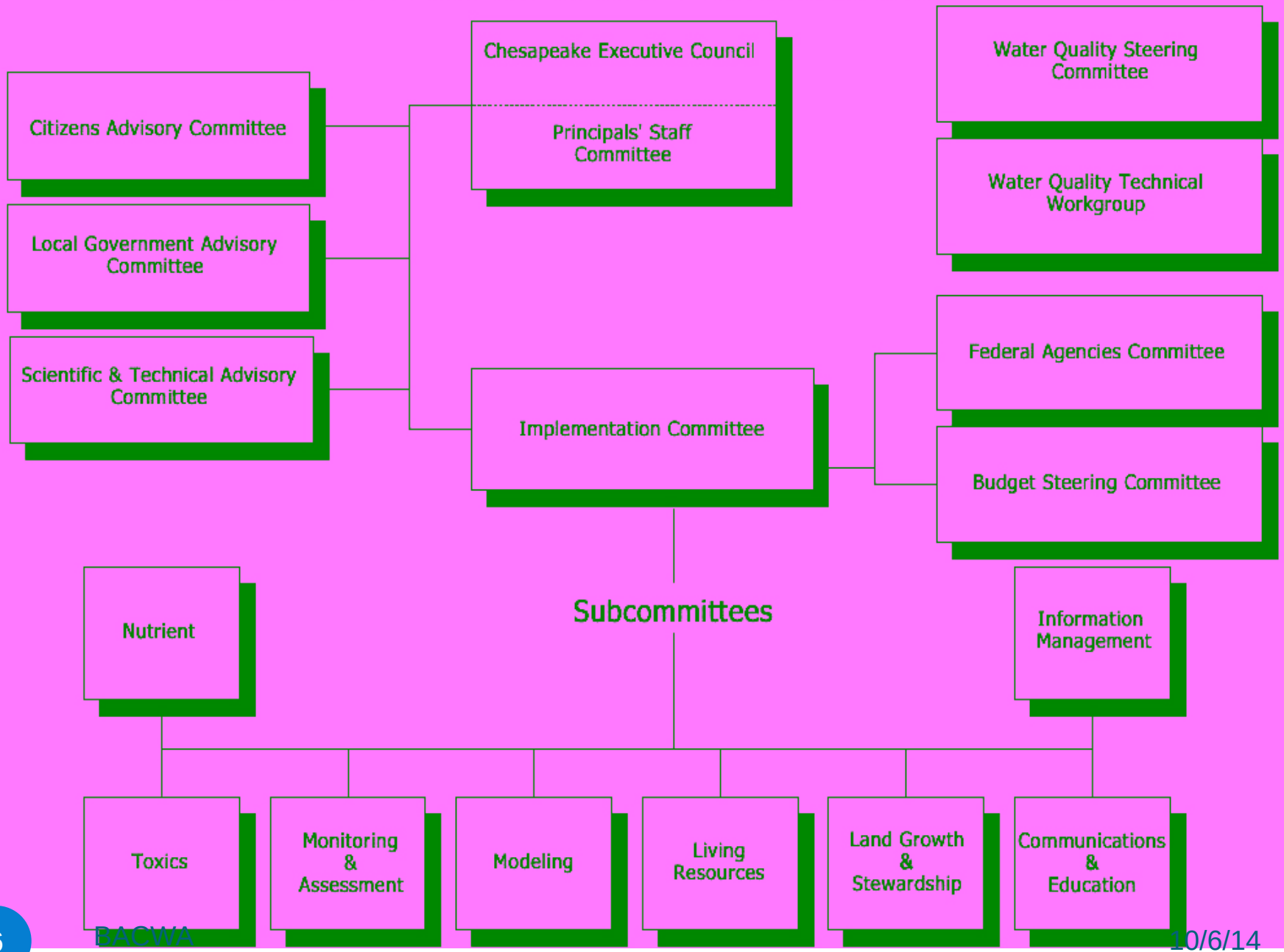

High Level Federal Support

Resolution to Enhance Federal Cooperative Conservation in the Chesapeake Bay Program

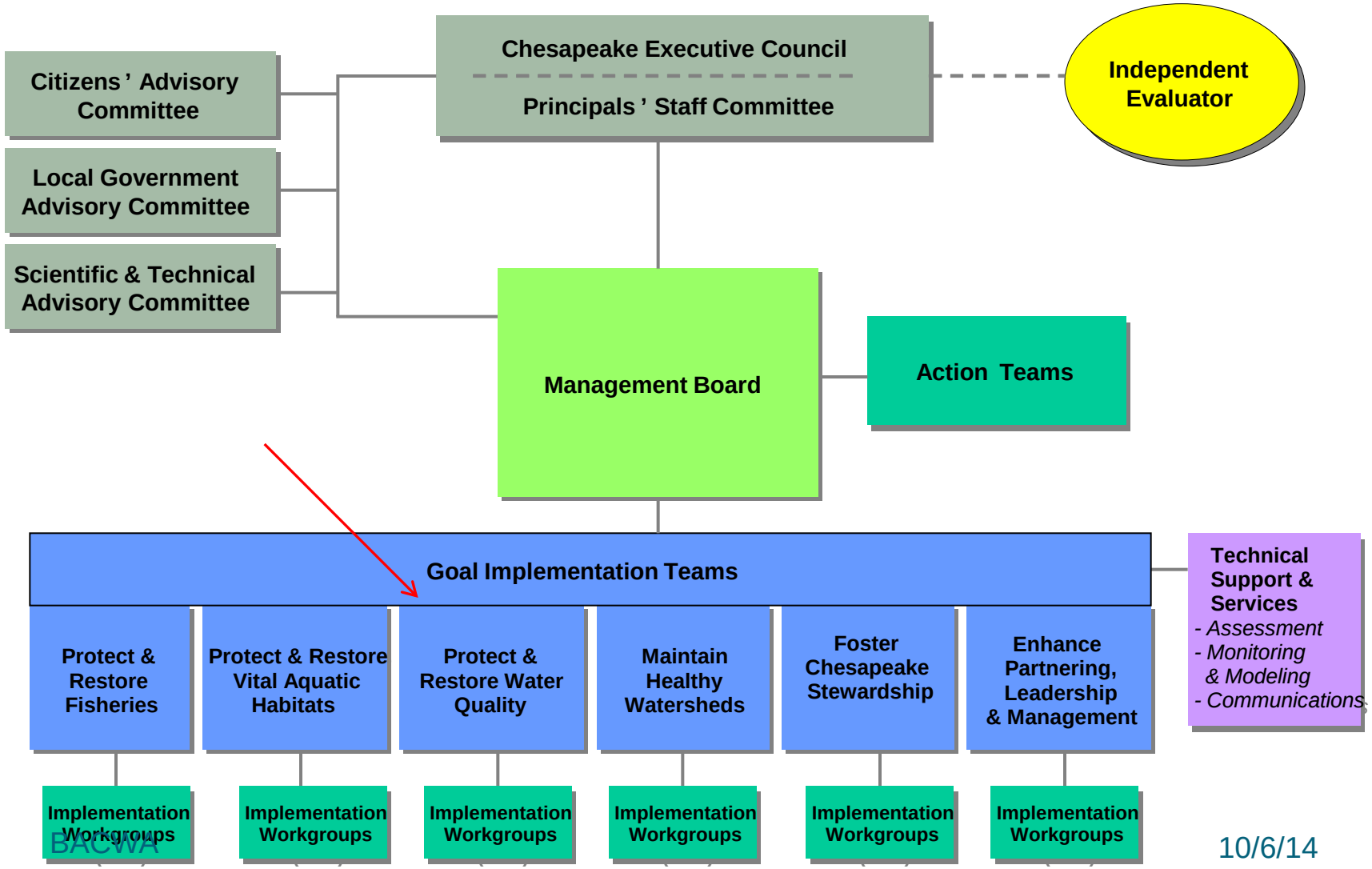
- signed by 17 Agencies at first Federal Principals' Meeting in October 2005 -

- Shared goals and performance measures within mutual strategic areas of *Chesapeake 2000*
- Cooperate with Chesapeake Bay Watershed Assistance Network
- Meet annually – interagency initiatives, geographic targeting

Chesapeake Bay Program Organizational Chart



Chesapeake Bay Program Organization Re-Aligned with Strategy Goals & TMDL



The Bay Cleanup Involves Partners at All Levels

FEDERAL GOVERNMENT: USEPA, USGS, USFWS, NRCS, FS, NPS, NOAA, DOD, USCG

STATE/DISTRICT GOVERNMENT: MD, PA, VA, DC, NY, WV, DE ICPRB & SRBC

LOCAL GOVERNMENT

PRIVATE INDUSTRY

CHESAPEAKE BAY CLEANUP

Chesapeake Bay Program
A Watershed Partnership

ENVIRONMENTAL ORGANIZATIONS

UNIVERSITIES & RESEARCHERS

CONCERNED CITIZENS

Bay Restoration: 50-Year History & Challenging Future

- 1960s-70s Visible decline in Bay resources
- 1967 Chesapeake Bay Foundation established
- 1976-1982 EPA conducts 5-year Bay study
- 1980 Chesapeake Bay Commission established
- 1983 **1st Bay Agreement – Chesapeake Bay Program created**
- 1985 – Baseline for reductions
- 1987 **2nd Bay Agreement – WQ Goals** (40% red. by 2000/BNR)
- 1992 Amendments to Agreement – Tributary Strategies
- 1998 – Impaired waters listings
- 2000 **3rd Bay Agreement – Precursor to TMDL** ('by 2010')
- 2008 Acknowledged Bay impairments will not be addressed by 2010
- 2010 Chesapeake Bay **TMDL established** (ENR/ w/ 2017 & 2025 goals)
- 2011 Watershed jurisdictions adopt Watershed Implementation Plans
- 2014 **4th Bay Agreement – TMDL implem. underway (new -toxics & climate)**
- 2017 60% of Bay TMDL loads achieved
- 2025 100% of practices implemented to achieve TMDL allocations

Phased Approach Has Worked for the Partnership to Ramp Up Permitting, Funding, and Technological Treatment Advances

Establish agreement on needed nutrient reductions

- Builds the foundation/rationale for seeking reductions
- Provides the rationale for setting up funding mechanisms

Require nutrient monitoring in NPDES permits

- Establishes a solid baseline on which to build performance targets and then enforceable limits
- Enables prioritization to focus on the most significant contributors

Place performance targets in permits

- Sends clear signal of expectations for future treatment upgrades

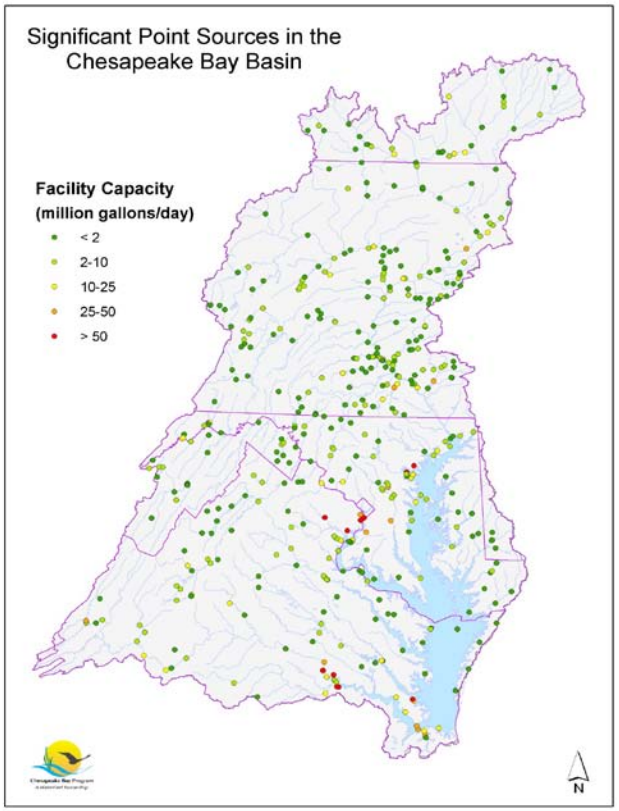
Place enforceable limits in permits

- Provides assurance that reductions will be carried out

Dimensions of the Challenge of Wastewater Treatment in the Chesapeake Bay Watershed

- Significant Municipal and Industrial Facility Statistics

Size (mgd)	Number
<2	276
2-10	143
10-25	38
25-50	15
>50	10



What is a Significant Wastewater Treatment Facility?

Significant Municipal Facilities:

WV, DE, PA and NY: Design Flow >= 0.4 MGD

MD: Design Flow >= 0.5 MGD

VA: Existing Design Flow above fall line >= 0.5 MGD
Existing Design Flow below fall line >= 0.1 MGD
New or Expanding Facilities >= 0.04 MGD

DC: Blue Plains (370 MGD – 387 MGD w/ CSO LTCP flows)

Significant Industrial Facilities:

Load equivalent >= 27,000 total nitrogen (TN) lbs/year
or 3,800 total phosphorus (TP) lbs/year

Non-significant Facilities:

The rest are non-significant facilities

Chesapeake Bay Program Partnership Wastewater Treatment Timeline

1983	Chesapeake Bay Program established
1984	BNR technology was introduced to the Chesapeake Bay facilities via EPA funded VA pilot facility
1985	Implementation of phosphate detergent bans (MD: 1985, DC: 1986, VA: 1988, PA: 1990)
1987	1987 Chesapeake Bay Agreement 40% goal N and P reduction goal the year 2000
1992	Bay Agreement 1992 amendments allocate 40% nutrient reductions by state-tributary basins; amendments call for a permanent nutrient cap after 2000.
1995-96	Tributary Strategies were developed by MD, PA, VA and DC which call for the voluntary nutrient removal upgrades with BNR for significant WWTPs.
1997	Virginia passes the Water Quality Improvement Act, setting a process for establishing goals and providing funds for both point source and non-point source improvements.
2000	Chesapeake 2000 agreement sets a goal to reduce nutrient and sediment pollution enough to remove the Bay and its tidal rivers from the EPA's “impaired” water body listing by 2010.
2003	All watershed jurisdictions start development of Tributary Strategies for the 2010 goals, set the permit targets for significant facilities and call for enhance nutrient removal (ENR) upgrades in tidal water states.
2004	Maryland Bay Restoration Fund was signed into law to fund upgrading MD’s WWTP with ENR.
2004	EPA, six states and DC all sign off Basinwide Nutrient Permitting Approach
2010	Watershed jurisdictions’ Phase I Watershed Implementation Plans define Bay TMDL WLAs
2010	Chesapeake Bay TMDL development through the Partnership and published by EPA

Basinwide Nutrient Permitting Approach

NPDES Permitting Approach for Discharges of Nutrients in the Chesapeake Bay Watershed

December 2004

I. PURPOSE

In accordance with the requirements of the Clean Water Act (CWA) and the goals of the *Chesapeake 2000* agreement, this paper describes an approach that the US Environmental Protection Agency Regions II and III (EPA) and Chesapeake Bay partner jurisdictions will take to develop and issue appropriate National Pollutant Discharge Elimination System (NPDES) permits for significant point source discharges of nutrients to the Chesapeake Bay watershed. EPA's Bay partner jurisdictions consist of the States of New York (NY), Pennsylvania (PA), Maryland (MD), Delaware (DE), Virginia (VA) and West Virginia (WV), and the District of Columbia (DC).

II. PROBLEM

Excessive nutrient loading is the most critical problem affecting the Chesapeake Bay. Excess nutrients cause water quality conditions that are harmful to aquatic living resources. While there has been substantial progress in reducing the annual loads of nutrients to the Bay and tidal waters from both point and nonpoint sources in the past twenty years, an additional annual load reduction of 6.7 million pounds of phosphorus and 103 million pounds of nitrogen is needed to achieve the water quality goals of the Chesapeake Bay and its tidal tributaries.

State Funding Programs Ramp Up to Meet the Challenge

- **State Executive and Legislative Branches Respond to the Challenge with new or expanded Funding Programs**
  - Supplement EPA's State Revolving Loan Fund Program
  - Total state funding helped communities meet the challenge on time

- **Examples:**
  - Maryland: Bay Restoration Fund via Flush Fee Legislation
  - Virginia: Water Quality Improvement Fund built on budget surplus
  - Pennsylvania: Infrastructure Funding Program – grants dedicated for Bay Upgrades
  - Washington DC: SRF and Special Appropriations funding
  - West Virginia: POTW Grant Program tied to lottery profits
  - New York: SRF and Environmental Protection Funds
  - Delaware: SRF

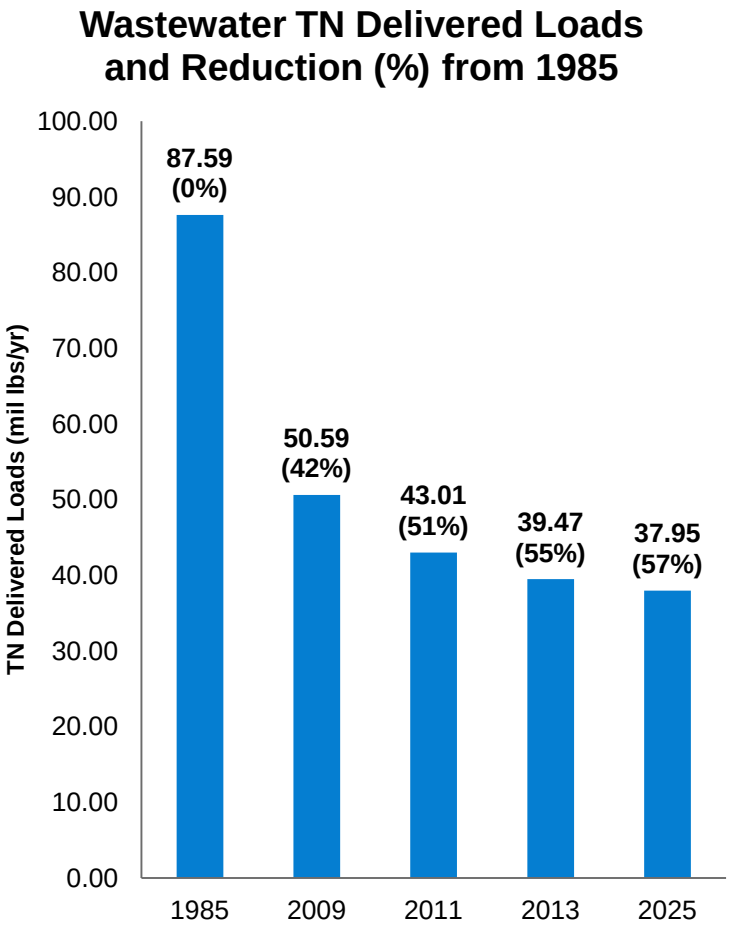
Wastewater Leads the Way

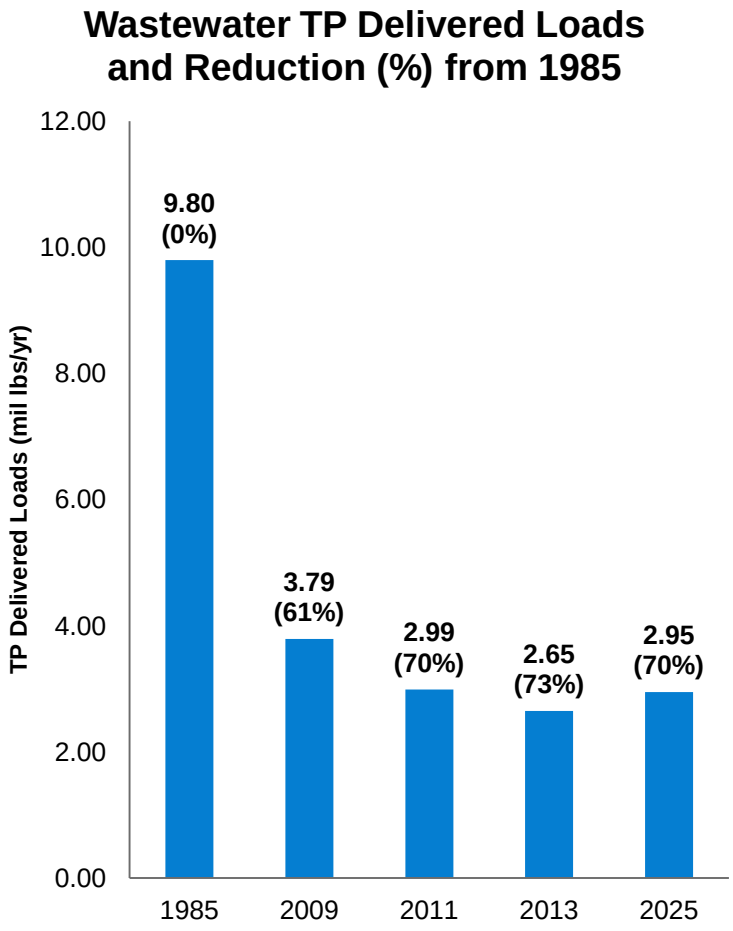
- Remarkable Nutrient Reduction Progress
  - 55% Reduction in TN from 1985 to the present
  - 73% Reduction of TP from 1985 to the present
  - Achieved in the face of > 30% Population Growth!
  - 80%+ Design Flow Covered by Enforceable Permit Limits

- Wastewater Reductions Have Led Bay Restoration!
  - Percent of the Total Load < 17%; much smaller than in 1985
  - Investments in Advanced Wastewater Treatment have topped an estimated $4 billion in the Bay watershed leveraging federal, state and local resources

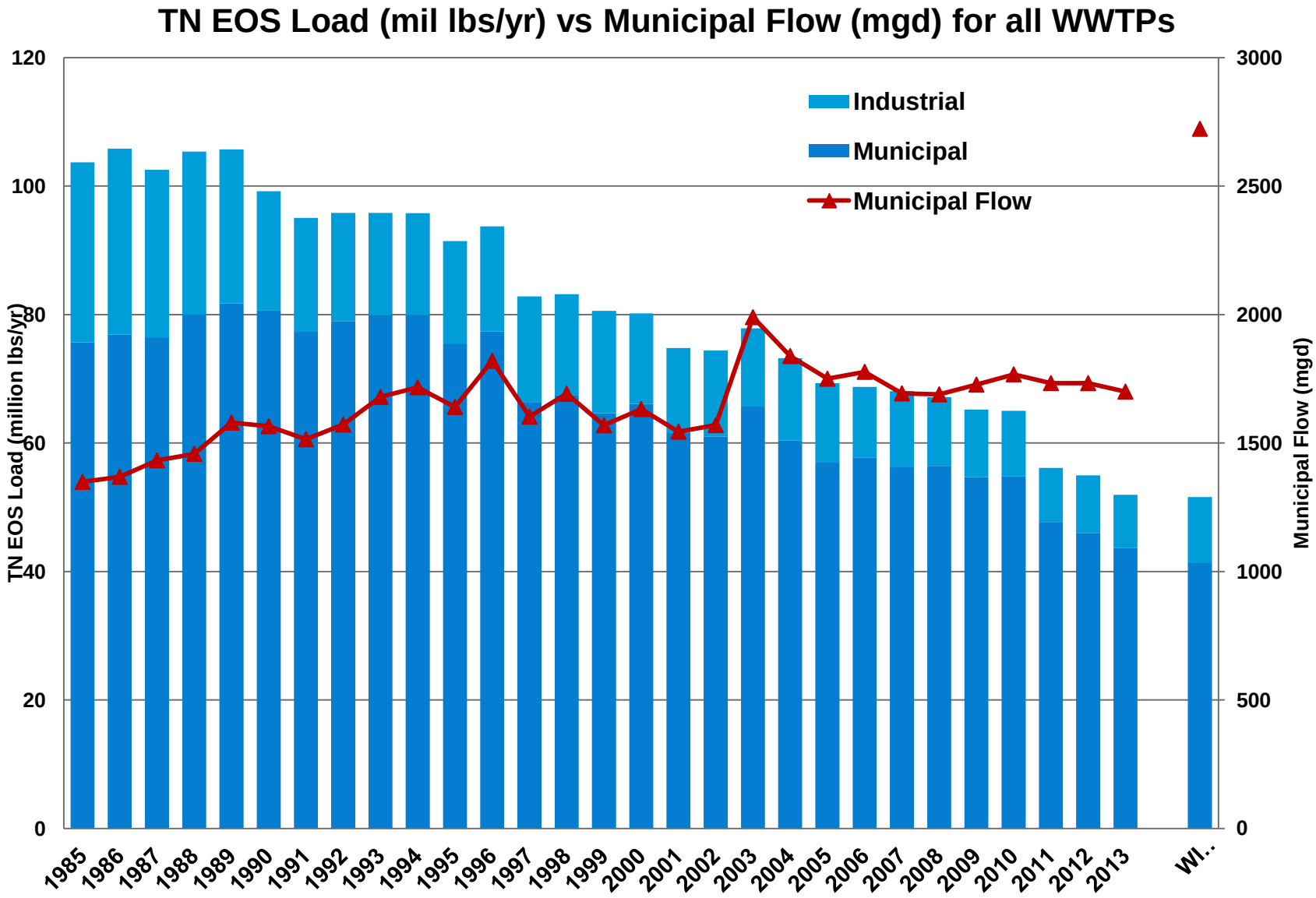
- All controls in place by 2017, ahead of 2025 Bay TMDL deadline

Chesapeake Bay WWTP Nutrient Loading Trends and TMDL Allocations





Wastewater TN Load Reduction Progress



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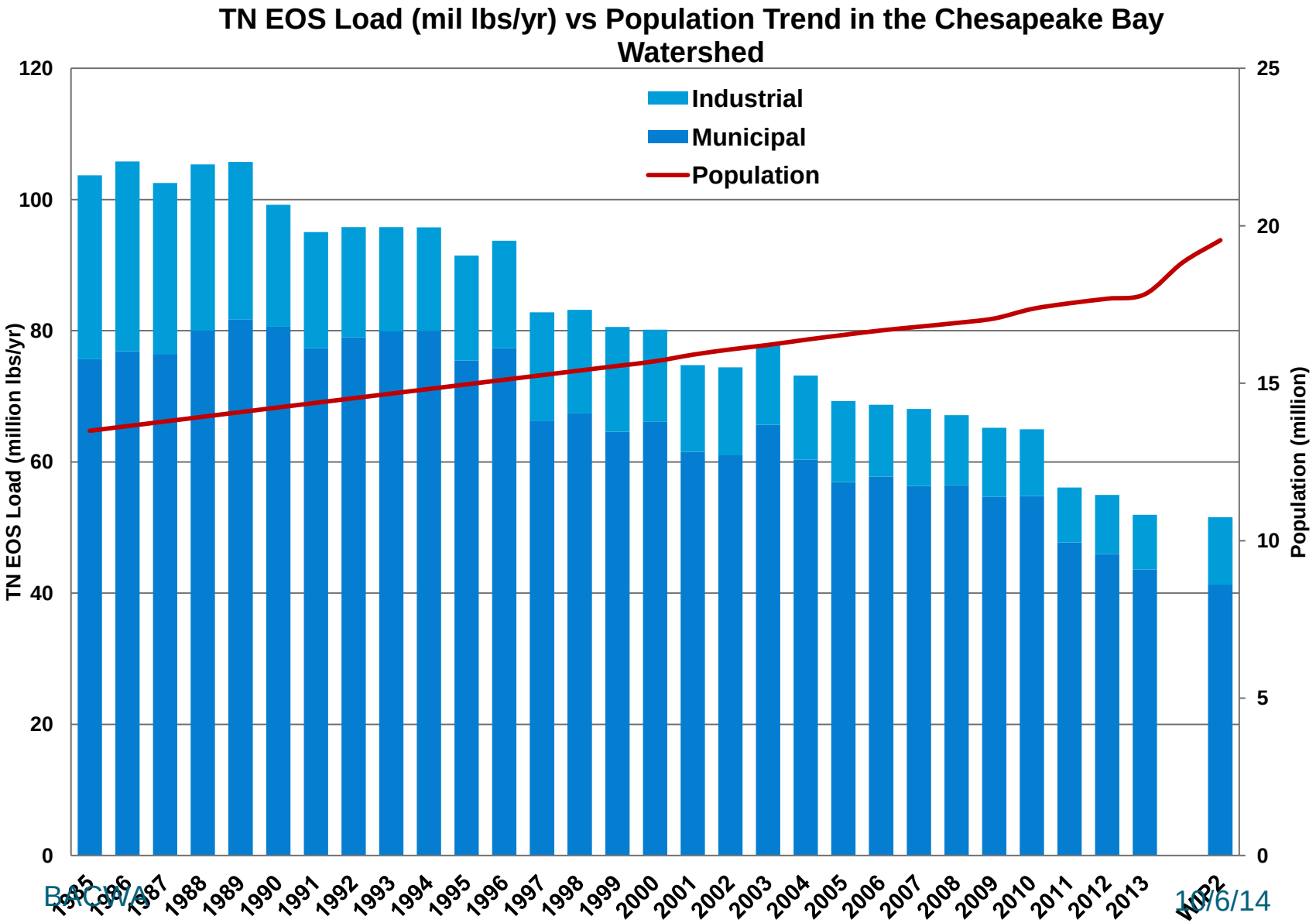
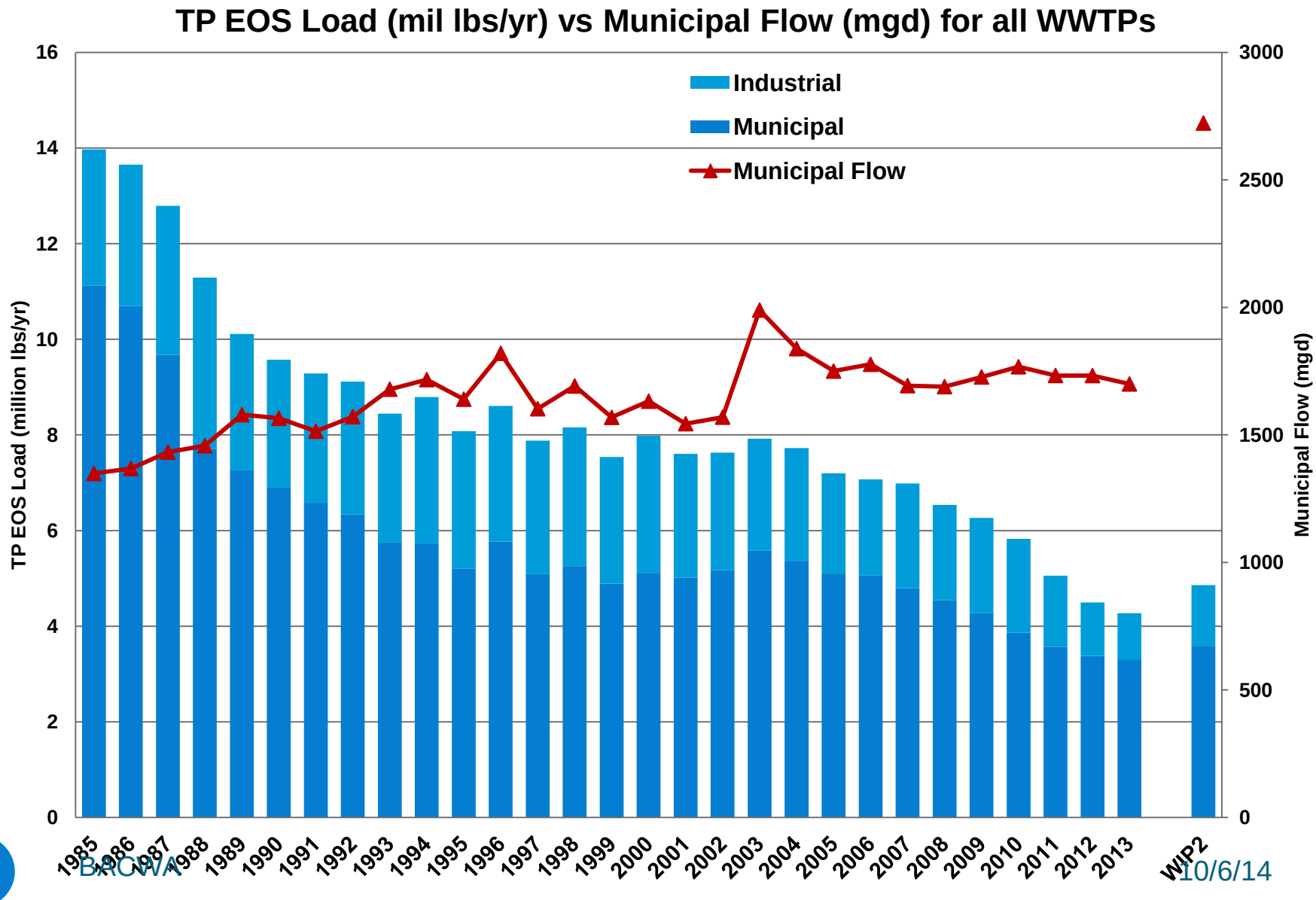


Wastewater TP Load Reduction Progress



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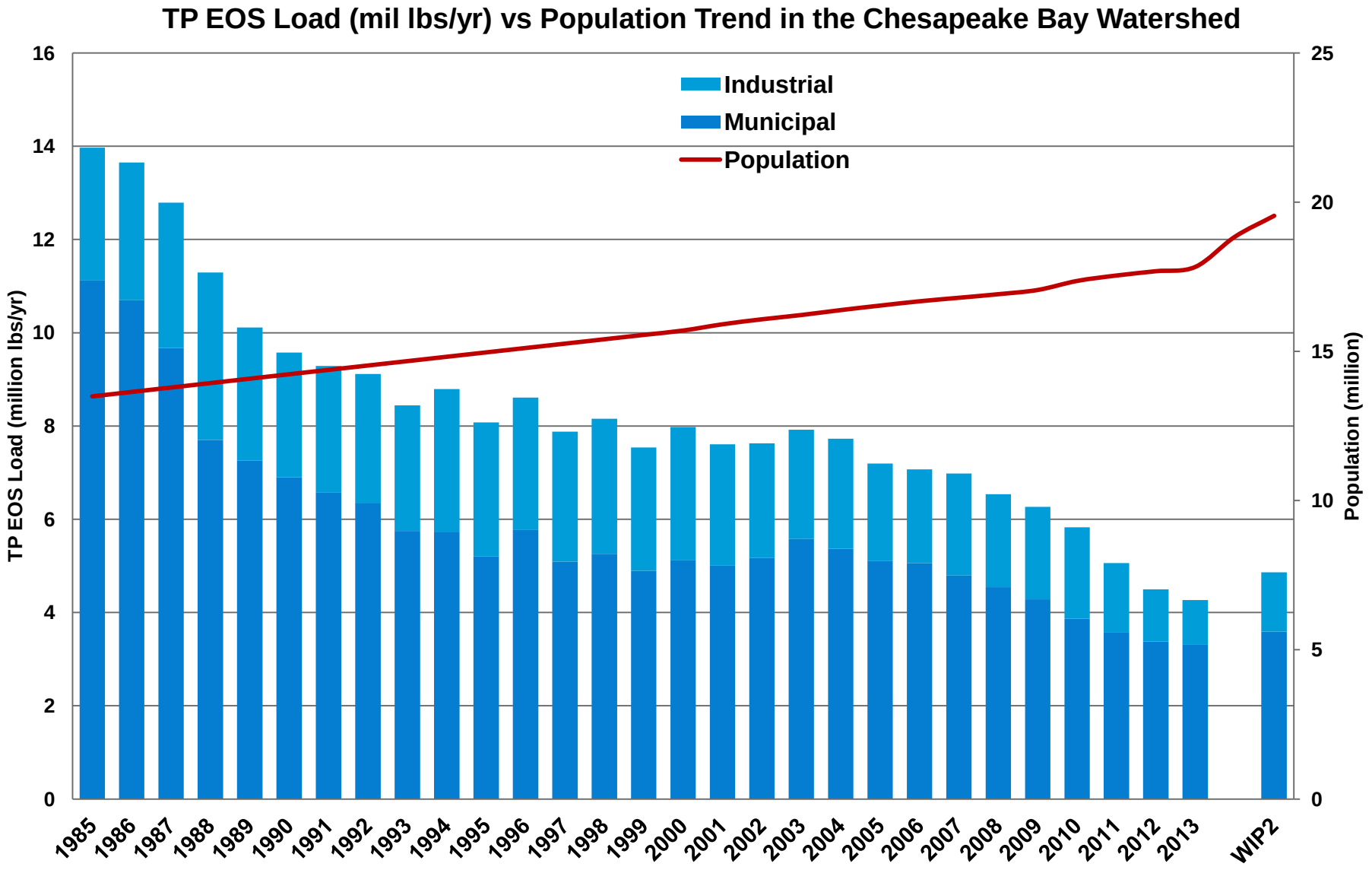
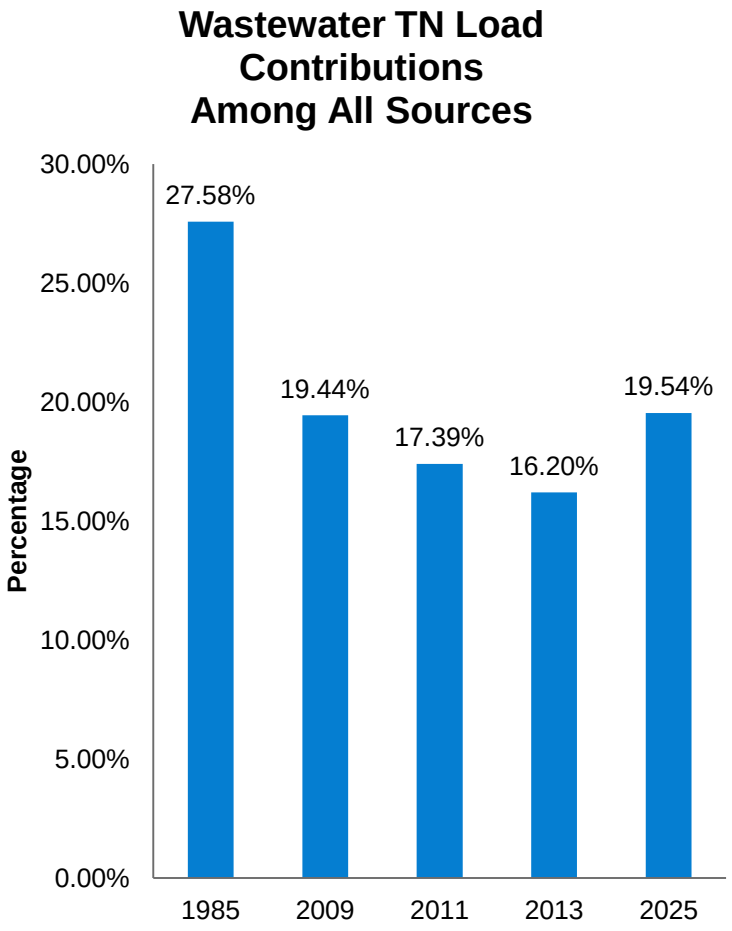
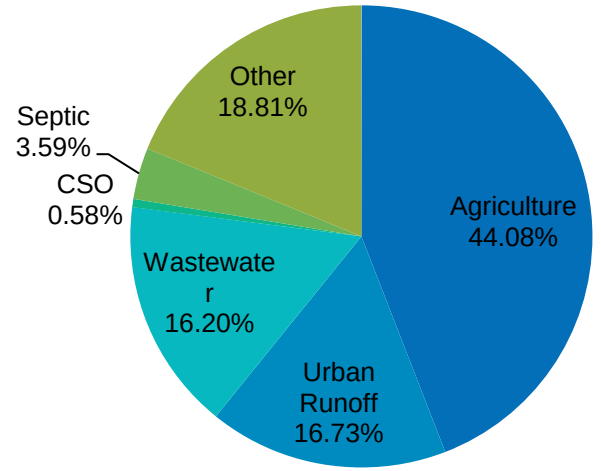
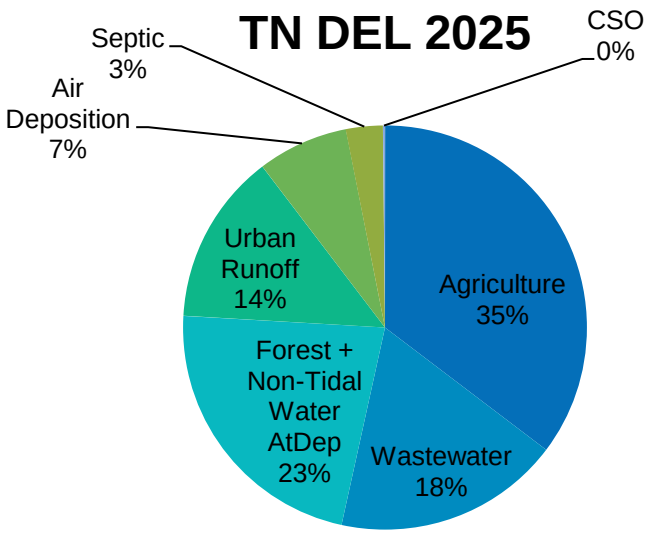


Wastewater TN Load Contributions Among All Sources







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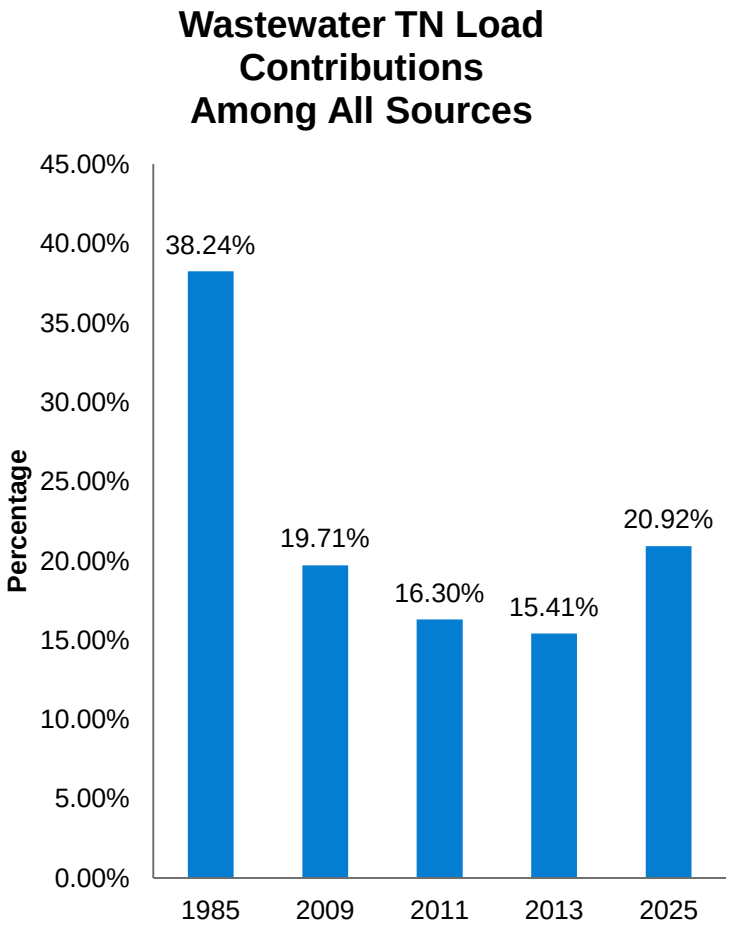

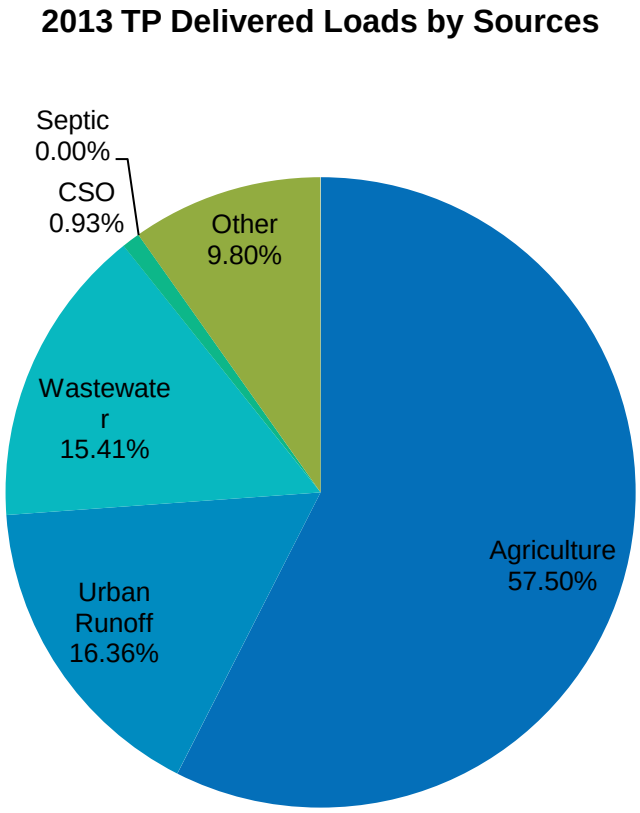

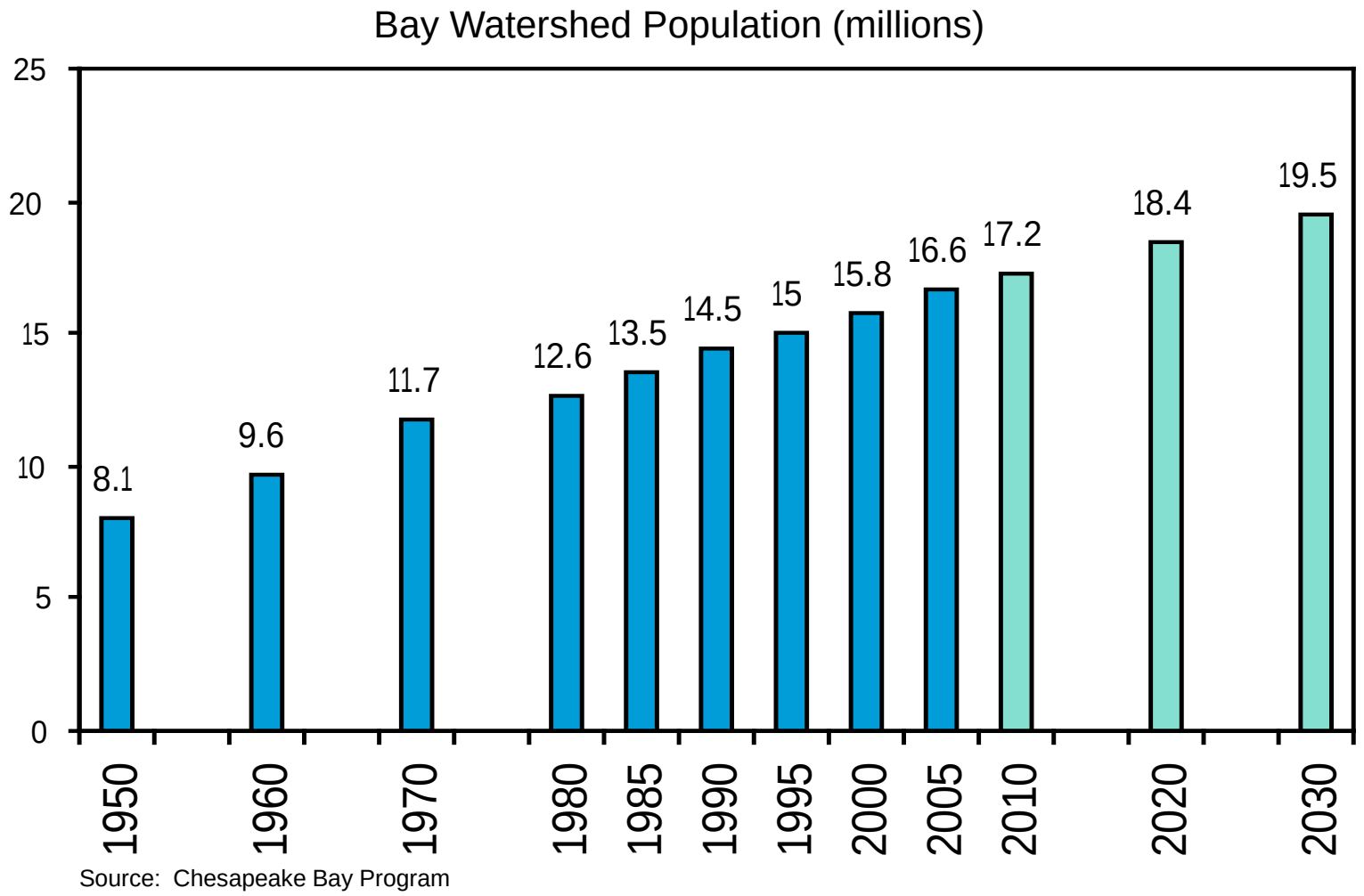

Source: Chesapeake Bay Program

Take Home Messages

Wastewater Implementation - Successes

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- Wastewater Reductions Have Led Bay Restoration!
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  - Investments in Advanced Wastewater Treatment topped an estimated $4 billion in the Bay watershed leveraging federal, state and local resources
- All controls in place by 2017, ahead of 2025 Bay TMDL deadline

Other Sectors – Still a challenge/evolving

Overall

- Watershed – What do you know, don't know? What is a realistic response period?
- Tools – Regulatory vs. Other mechanisms/Flexibility
- Funding – Availability/support has to be accounted for
- Adaptive Management – Make it real
- Governance – Who needs to involved/how?
- Accountability – How is progress measured, what is realistic in a given timeframe?
- Messaging – Need public support, need to communicate progress & realistic expectations