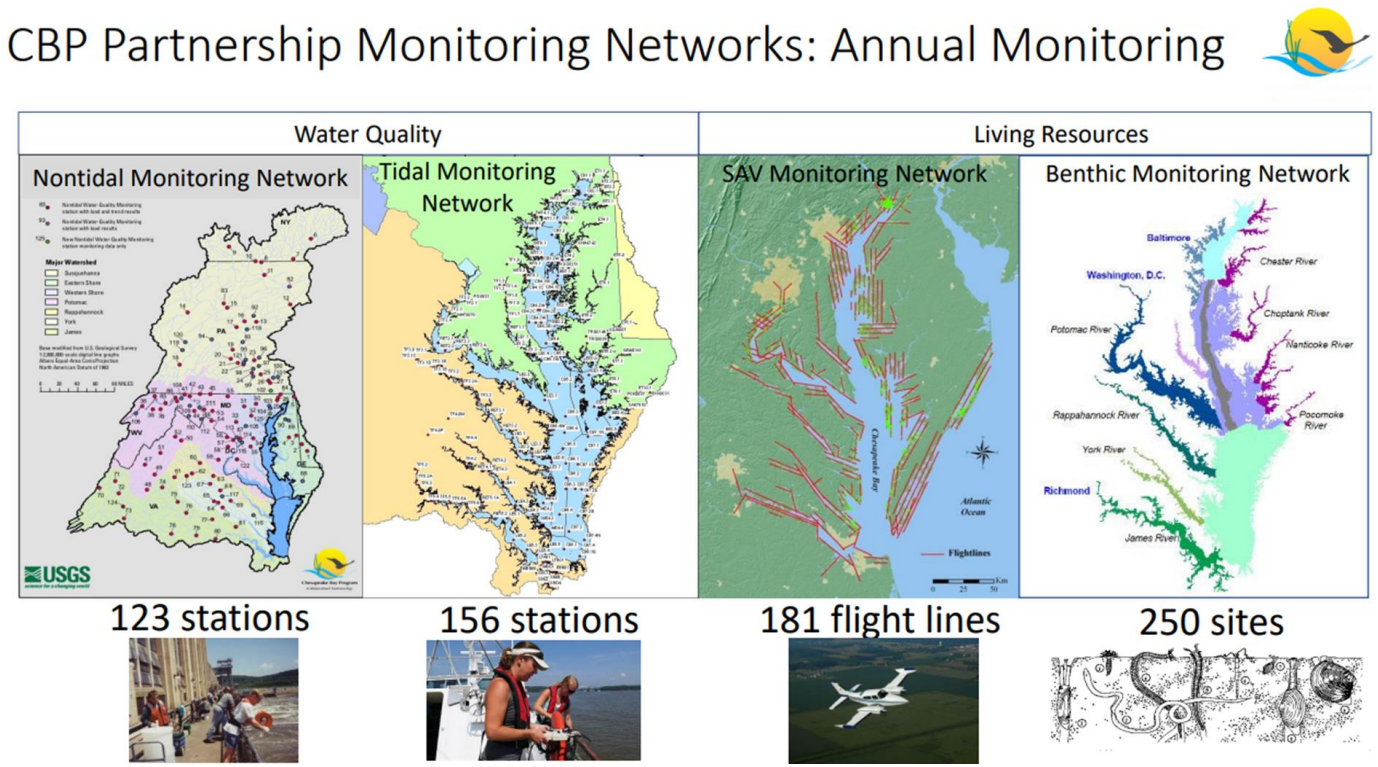
Overview of Our Chesapeake Bay and Watershed Monitoring Programs



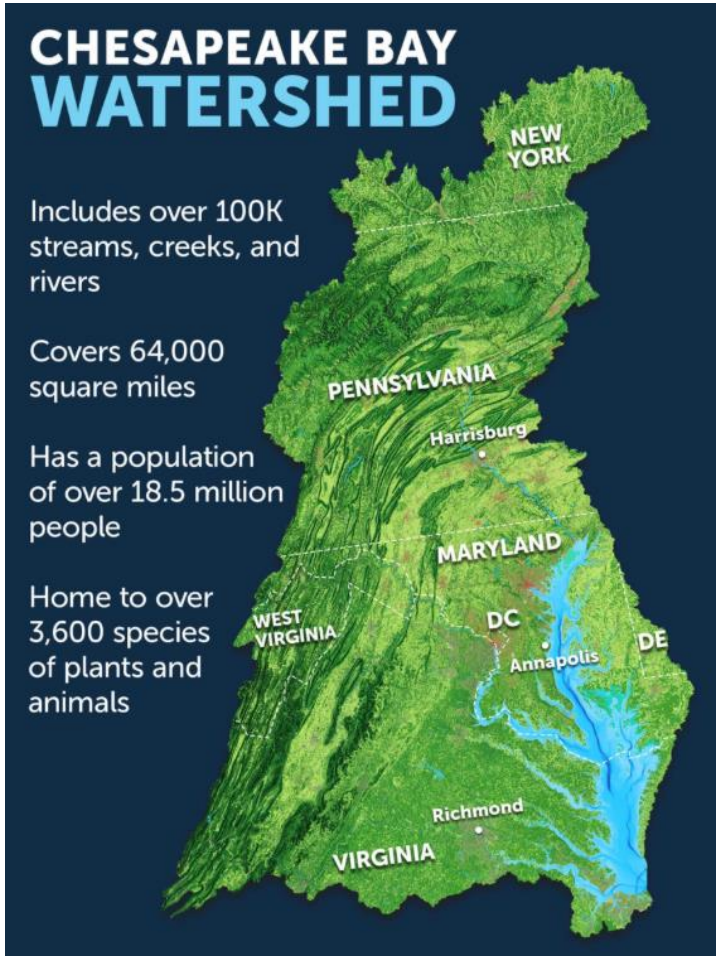
Peter Tango
USGS@CBPO

Chesapeake Bay Monitoring Coordinator

July 17, 2025

Agriculture Workgroup Meeting

Everyone wants to know…

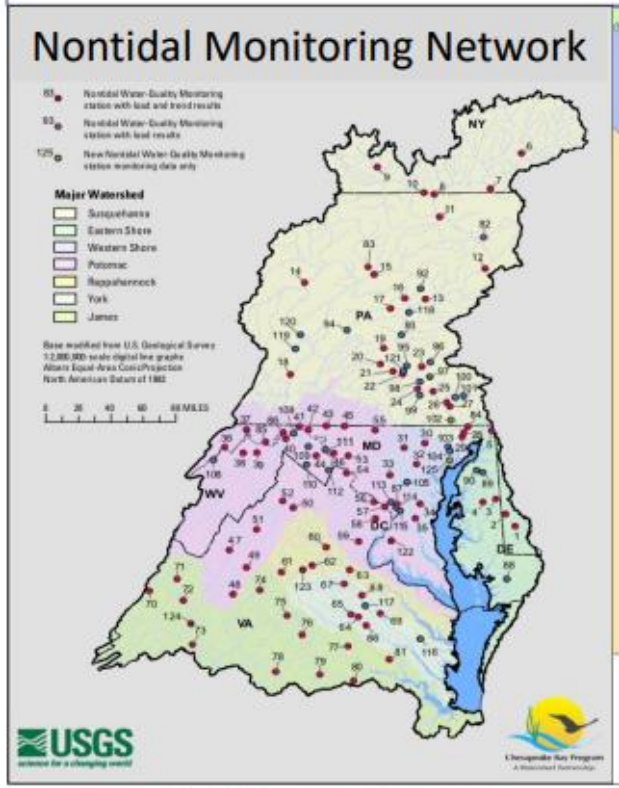


- How healthy are our rivers and streams? How are they changing with management?
- How healthy is the bay? How is it changing with management?
- How healthy is the aquatic life? How is it changing over time?

CBP Partnership Monitoring Networks: Annual Monitoring

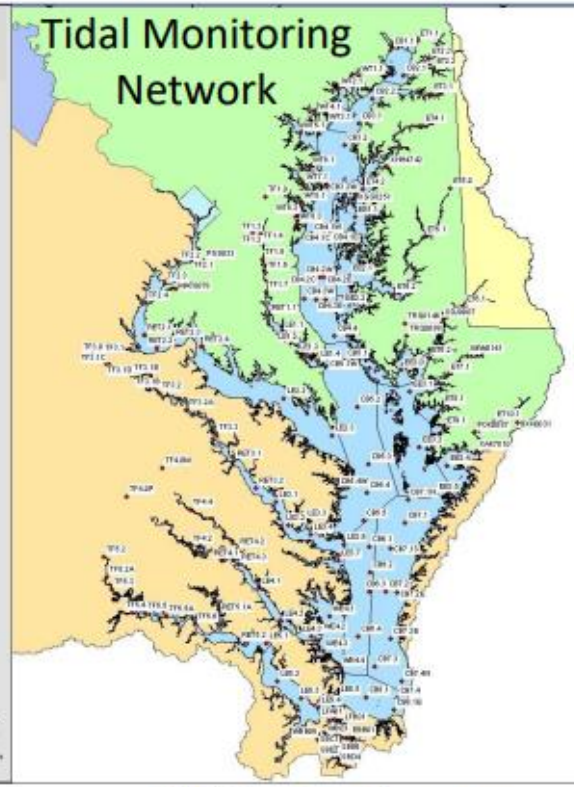
Water Quality

Nontidal Monitoring Network



123 stations

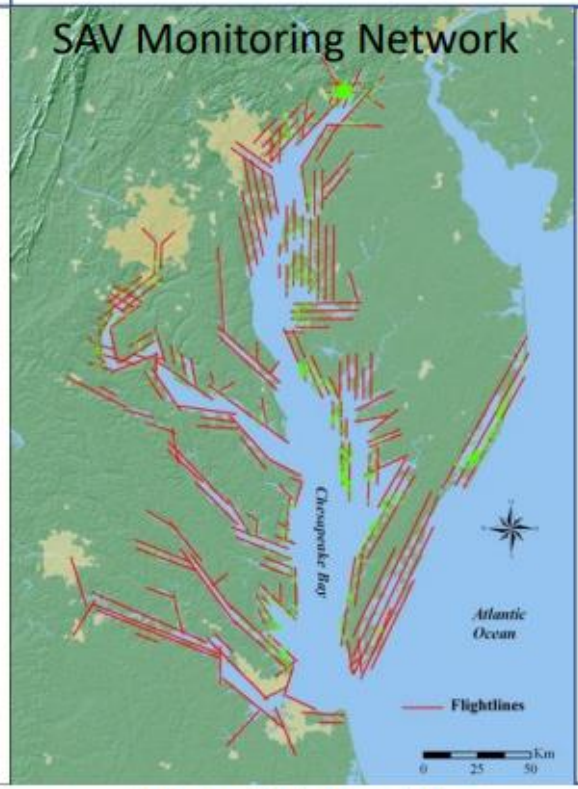
Tidal Monitoring Network



156 stations

Living Resources

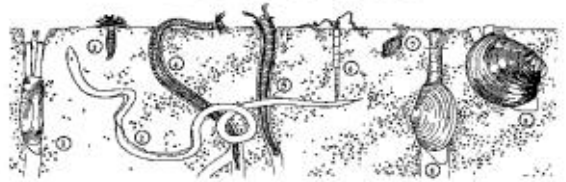
SAV Monitoring Network



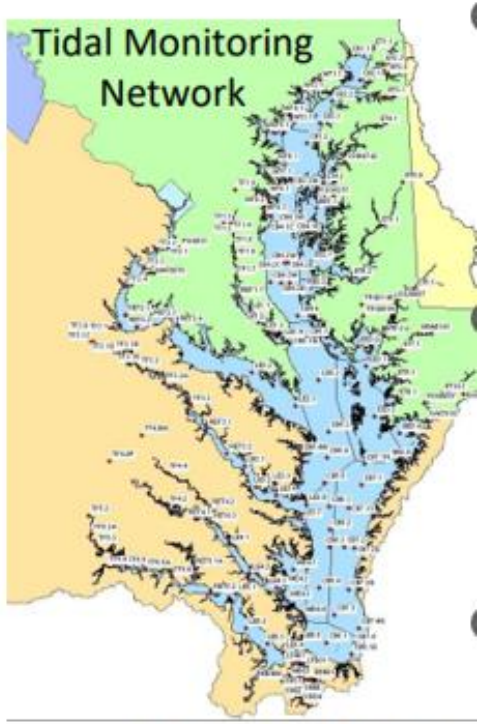
181 flight lines

Benthic Monitoring Network

250 sites



CBP Partnership Monitoring Networks: Annual Monitoring



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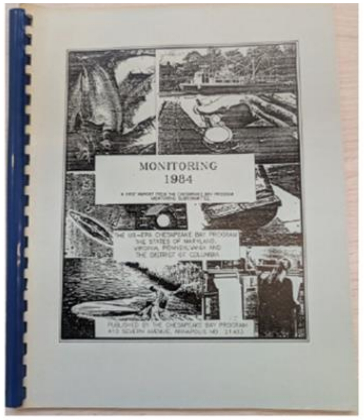
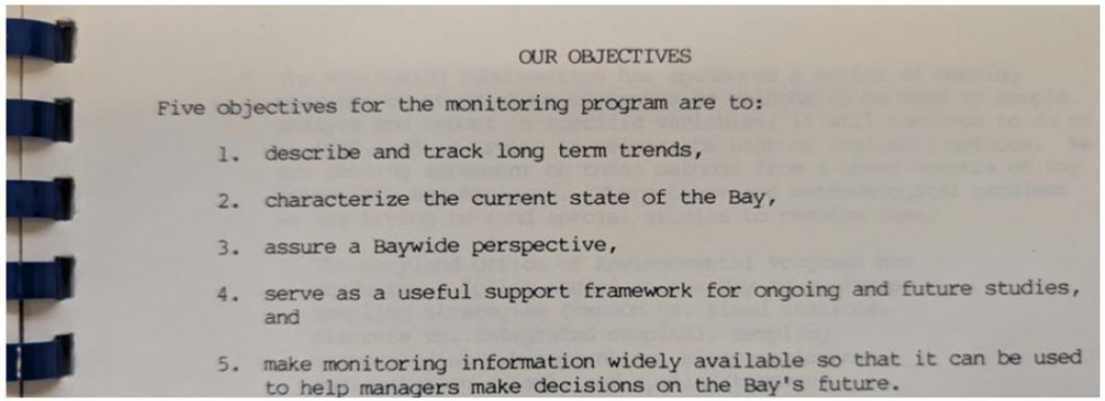


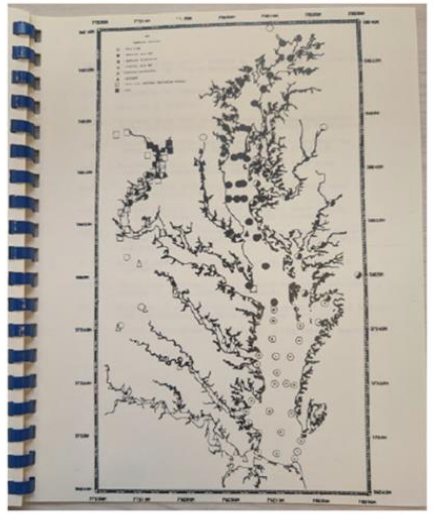
Tidal Bay:
CBP's First Monitoring Report
1984
describing the program



OUR OBJECTIVES

Five objectives for the monitoring program are to:

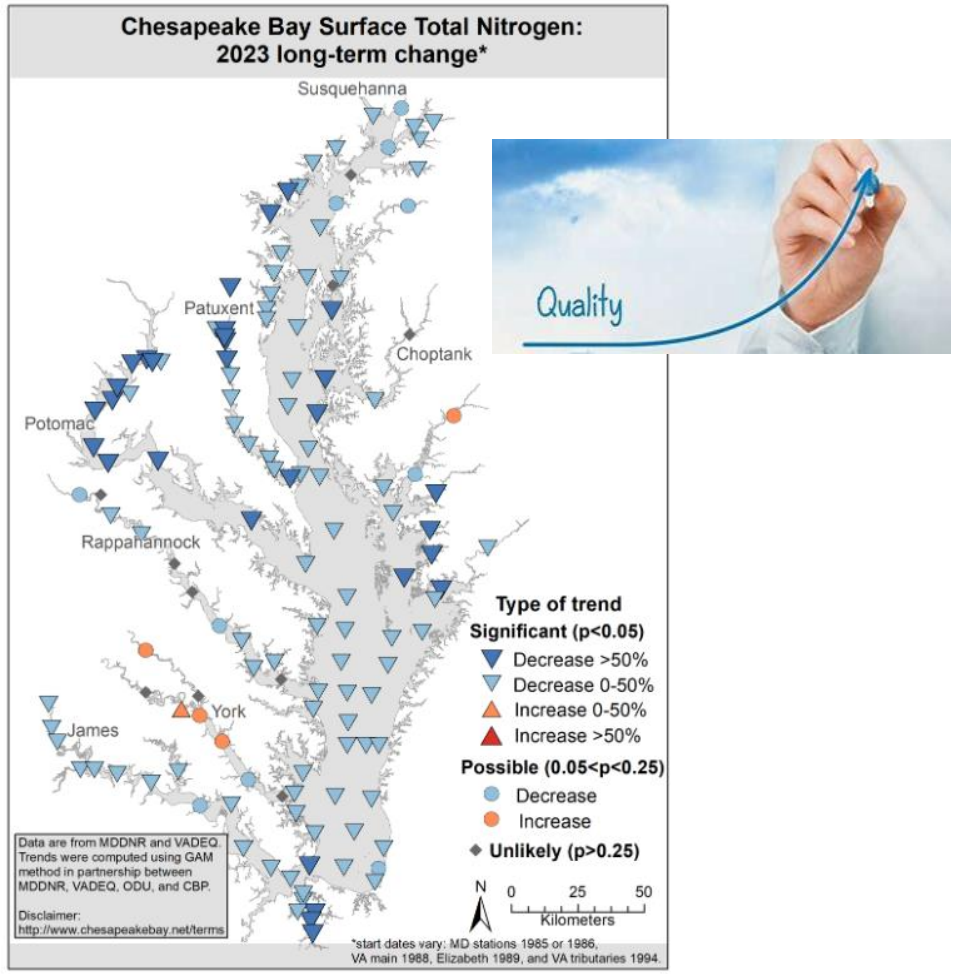
1. describe and track long term trends,
2. characterize the current state of the Bay,
3. assure a Baywide perspective,
4. serve as a useful support framework for ongoing and future studies, and
5. make monitoring information widely available so that it can be used to help managers make decisions on the Bay's future.

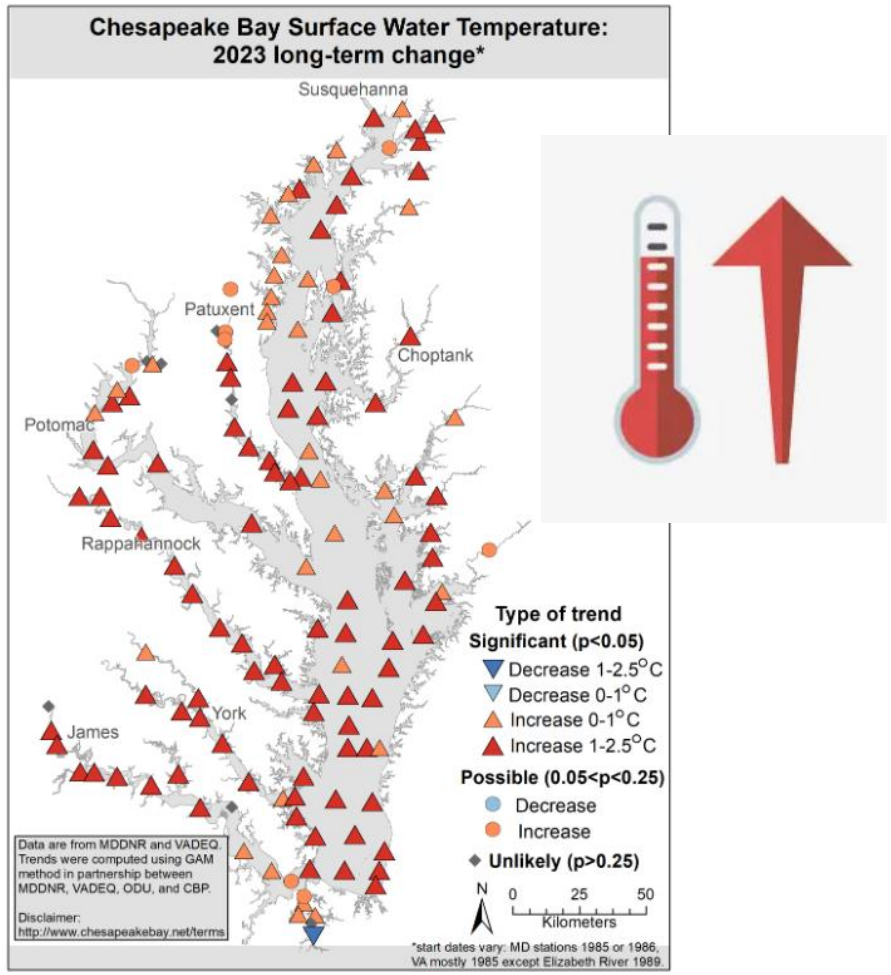


N=165 stations listed in CBP 1987

Objectives 1) focused on status and trends in bay conditions, and 2) make data and results available to support management decisions

Example of results (1985-2023):
Less nitrogen, warmer temperatures in the bay

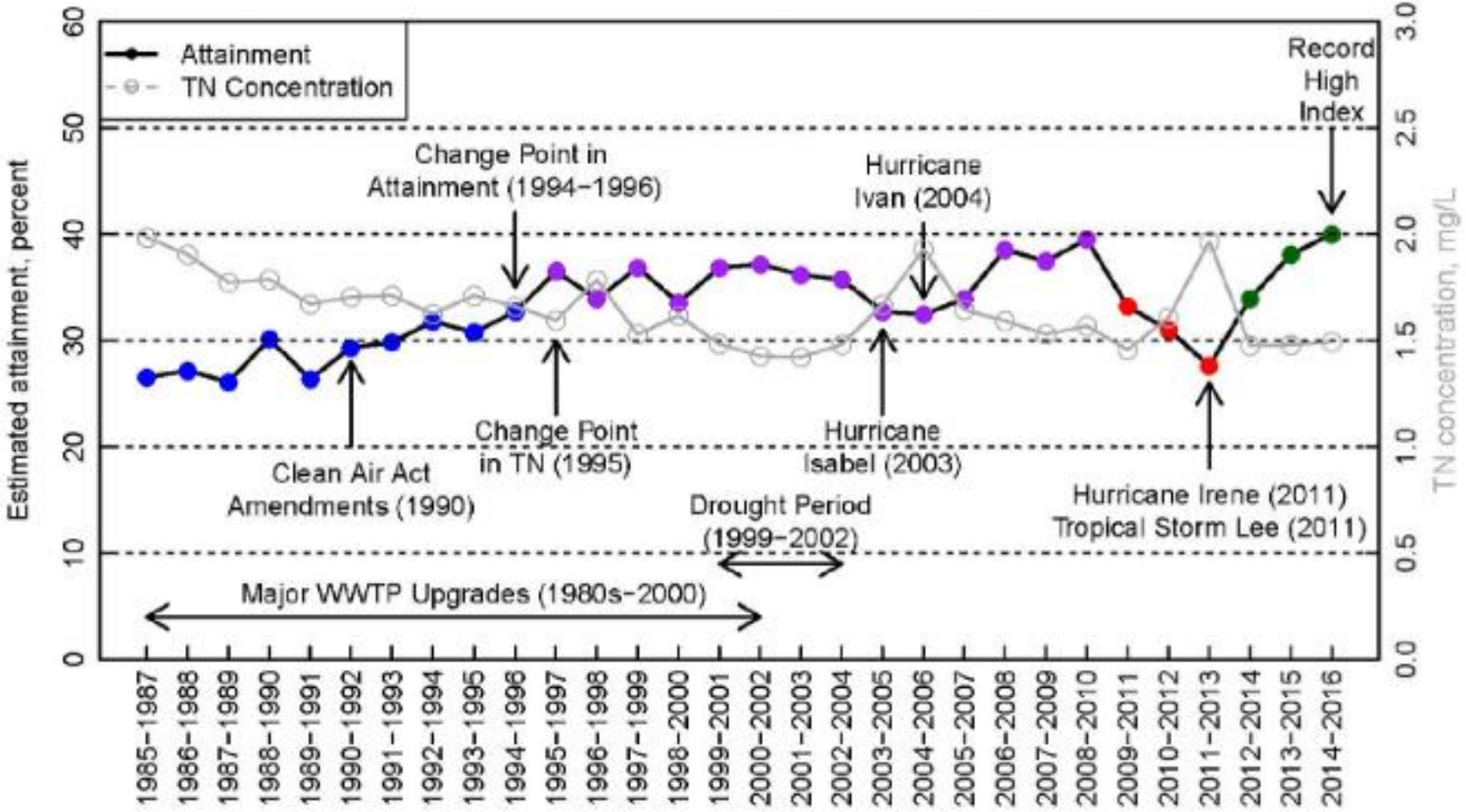




ITAT 2025

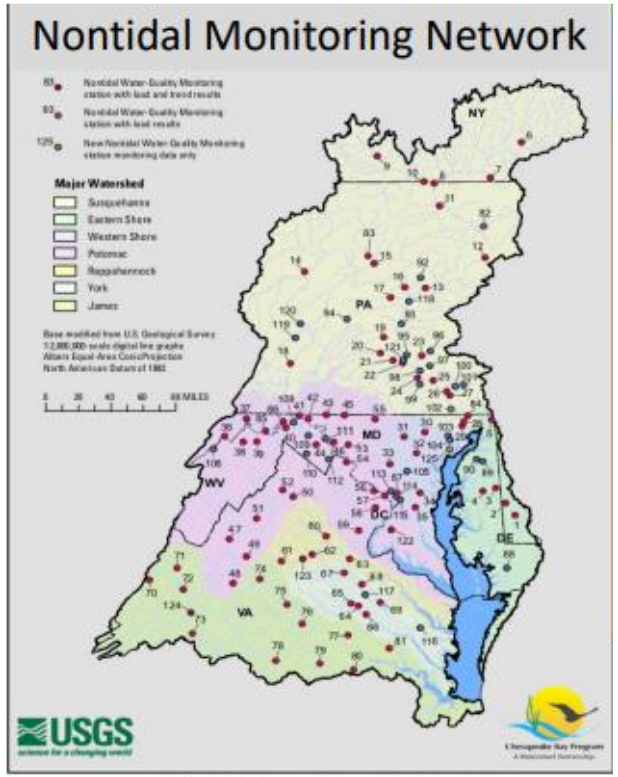
Chesapeake Bay **Water Quality Standards Indicator** uses the data to estimate and report bay health conditions:

Slow but measurable improvement



Zhang et al. 2018

CBP Partnership Monitoring Networks: Annual Monitoring



123 stations

In 2004, The Chesapeake Bay Partnership signatories signed an agreement to create and support a nontidal water quality monitoring network

2004

Chesapeake Bay Program
A Watershed Partnership

MEMORANDUM OF UNDERSTANDING

AMONG

the State of Delaware, the District of Columbia, the State of Maryland, the State of New York, the Commonwealth of Pennsylvania, the Commonwealth of Virginia, the State of West Virginia, the Interstate Commission on the Potomac River Basin, the Susquehanna River Basin Commission, the Metropolitan Washington Council of Governments, the United States Environmental Protection Agency, the United States Geological Survey and the Chesapeake Bay Commission

REGARDING

Cooperative Efforts for Monitoring and Assessing Water Quality in the Streams and Rivers of the Chesapeake Bay Watershed

Foundation NTN 2004

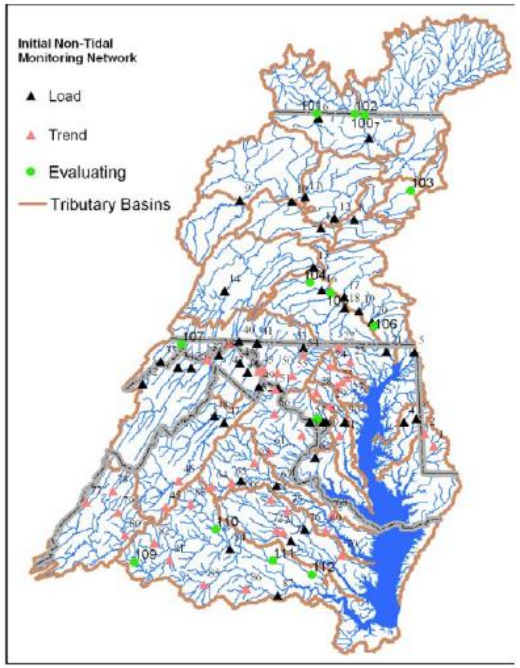


Figure 6. The 87 load and trend stations selected for initial implementation of Chesapeake Bay Nontidal Watershed Water-Quality Network. A subset of 13 stations are still being evaluated to determine if the water-quality monitoring can be co-located with the designated stream gage. The tributary strategy basins are shown to illustrate the network coverage for these basins.

2000-2005: The reckoning: We need more monitoring in the watershed

The Washington Post
https://www.washingtonpost.com › archive › local › ...

2004

GAO Review of Bay Cleanup Sought - The Washington Post

Aug 12, 2004 · The Chesapeake Bay Program, the federal and state partnership directing the restoration of North America's largest estuary, has used numbers from a computer model to ...

Aug 19, 2004

Why the WaPo beat the Sun on Chesapeake water monitoring vs. modeling story

As I wrote yesterday, the Baltimore Sun had a good editorial -- triggered by a good WaPo story -- about a GAO probe on whether we've been measuring progress in the Chesapeake Bay clean-up accurately. There's an interesting -- and possibly telling -- difference between the story and the editorial.

The Washington Post
Democracy Dies in Darkness

GAO Denounces Bay Cleanup Efforts

Federal Office Overstates Progress, Minimizes Threats, Report Says

November 15, 2005 More than **19 years ago**

2005

Summary

By Elizabeth Williamson

The government agency leading the cleanup of the Chesapeake Bay has consistently overstated its progress while minimizing threats to the bay and its own failures to address them, according to a federal oversight report released yesterday.

EPA United States Environmental Protection Agency

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Home / Chesapeake Bay TMDL

Chesapeake Bay TMDL

- Bay TMDL Document
- EPA Activities Pursuant to 2023 Settlement Agreement
- Bay TMDL Fact Sheet
- Bay TMDL Development
- Frequently Asked Questions (FAQs)
- Watershed Implementation Plans (WIPs)
- Milestones
- Air Pollution Reductions
- Wastewater Pollution Reductions
- Trading and Offsets
- Midpoint Assessment
- EPA Oversight of WIPs and Milestones
- Sector-Specific EPA Oversight
- Tracking Tools

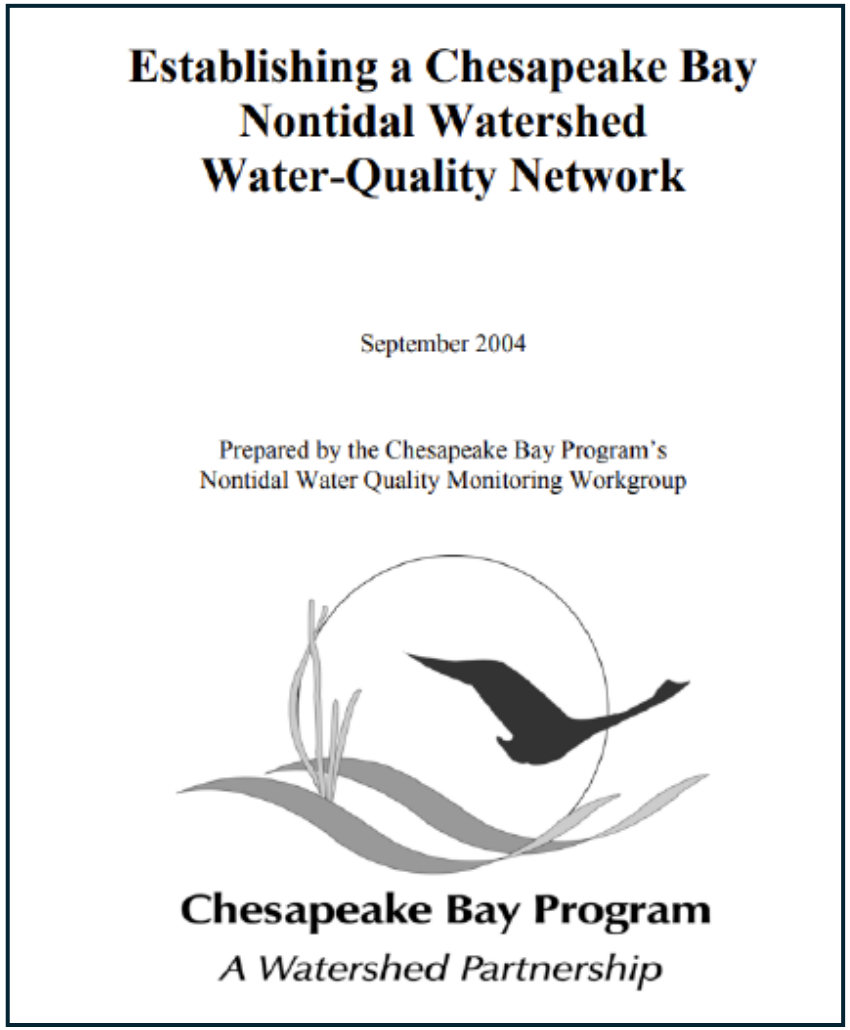
Contact Us about the Chesapeake Bay TMDL

Chesapeake Bay Tributary Strategies

Chesapeake Bay Tributary Strategies were developed by the seven watershed jurisdictions (Delaware, Maryland, Pennsylvania, New York, Virginia, West Virginia and the District of Columbia). The strategies outlined the river basin-specific implementation activities to reduce nutrient and sediment pollutant loads from point and nonpoint sources sufficient to achieve the 2003 nitrogen, phosphorus, and sediment cap loads.

- You will need Adobe Reader to view some of the files on this page. See EPA's About PDF page to learn more.Secretary Tayloe Murphy's April 25, 2003 Memorandum Regarding Nutrient and Sediment Load Allocations and New Submerged Aquatic Vegetation (SAV) Restoration Goals (PDF) (9 pp, 37.5 K)
- *Setting and Allocating the Chesapeake Bay Basin Nutrient and Sediment Loads: The Collaborative Process, Technical Tools and Innovative Approaches* (U.S. EPA 903-R-03-007, December 2003) (PDF) (169 pp, 3.5 M)
- Delaware Tributary Strategy for the Nanticoke River (October 2004) (PDF)(6 pp, 30.4 K)
- Delaware Tributary Strategy for the Upper Chesapeake (January 2008) (PDF)(15 pp, 61.8 K)
- District of Columbia Tributary Strategy (June 2004) (PDF) (90 pp, 1.4 M)
- Maryland Tributary Strategy (January 2008) (PDF) (51 pp, 11.5 M)
- New York Tributary Strategy (September 2007) (PDF)(92 pp, 714 K)
- Pennsylvania Tributary Strategy (December 2004) (PDF) (129 pp, 864 K)
- Virginia Tributary Strategy (January 2005) (PDF)E(92 pp, 418 K)
- Chesapeake Bay and Virginia Waters Clean-Up Plan: Progress Report (December 2009) (PDF)(45 pp, 386 K)
- West Virginia Tributary Strategy (November 2005) (PDF) (53 pp, 595 K)

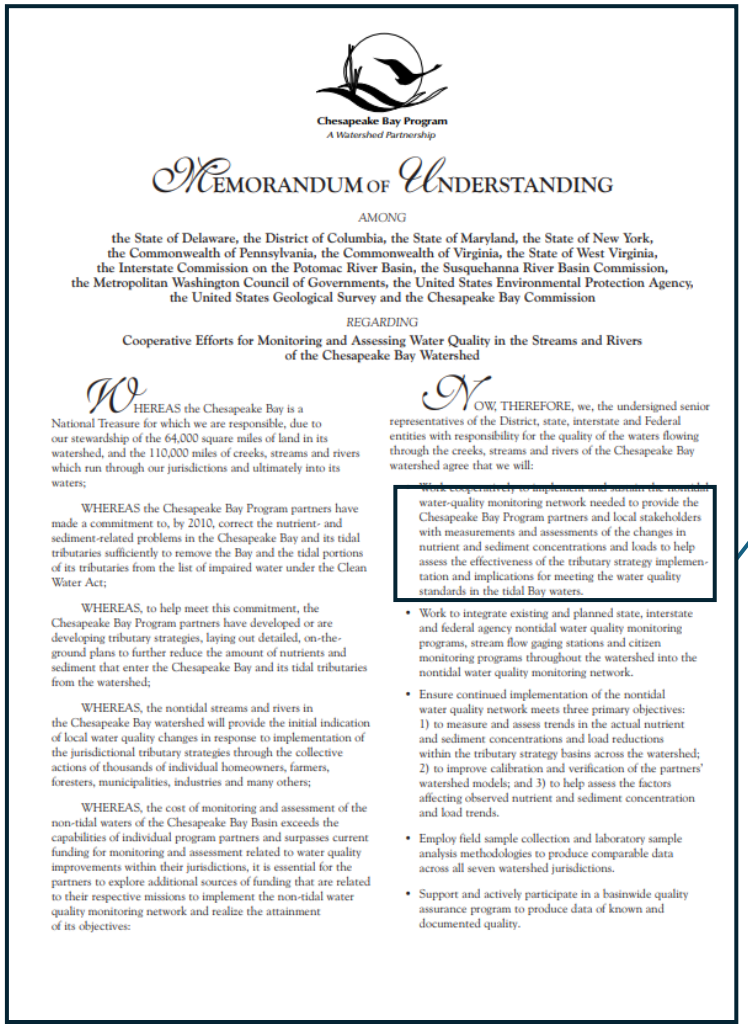
Nontidal WQ Monitoring Workgroup Network development: Established 2004



- 1700 candidate WQ stations in database
- 641 stations active in 2001
- 161 co-located with stream gages
- 94 had minimum sample size requirements
- WV & DE added +21 to the list = 115
- Modelers requested +73 new sites = 191
- Jurisdictions elected to fund a network of 87 stations

Network records indicated 85 stations established

Founding principles of our Nontidal Monitoring Network



Chesapeake Bay Program
A Watershed Partnership

Memorandum of Understanding

AMONG

the State of Delaware, the District of Columbia, the State of Maryland, the State of New York, the Commonwealth of Pennsylvania, the Commonwealth of Virginia, the State of West Virginia, the Interstate Commission on the Potomac River Basin, the Susquehanna River Basin Commission, the Metropolitan Washington Council of Governments, the United States Environmental Protection Agency, the United States Geological Survey and the Chesapeake Bay Commission

REGARDING

Cooperative Efforts for Monitoring and Assessing Water Quality in the Streams and Rivers of the Chesapeake Bay Watershed

WHEREAS the Chesapeake Bay is a National Treasure for which we are responsible, due to our stewardship of the 64,000 square miles of land in its watershed, and the 110,000 miles of creeks, streams and rivers which run through our jurisdictions and ultimately into its waters;

WHEREAS the Chesapeake Bay Program partners have made a commitment to, by 2010, correct the nutrient- and sediment-related problems in the Chesapeake Bay and its tidal tributaries sufficiently to remove the Bay and the tidal portions of its tributaries from the list of impaired water under the Clean Water Act;

WHEREAS, to help meet this commitment, the Chesapeake Bay Program partners have developed or are developing tributary strategies, laying out detailed, on-the-ground plans to further reduce the amount of nutrients and sediment that enter the Chesapeake Bay and its tidal tributaries from the watershed;

WHEREAS, the nontidal streams and rivers in the Chesapeake Bay watershed will provide the initial indication of local water quality changes in response to implementation of the jurisdictional tributary strategies through the collective actions of thousands of individual homeowners, farmers, foresters, municipalities, industries and many others;

WHEREAS, the cost of monitoring and assessment of the non-tidal waters of the Chesapeake Bay Basin exceeds the capabilities of individual program partners and surpasses current funding for monitoring and assessment related to water quality improvements within their jurisdictions, it is essential for the partners to explore additional sources of funding that are related to their respective missions to implement the non-tidal water quality monitoring network and realize the attainment of its objectives:

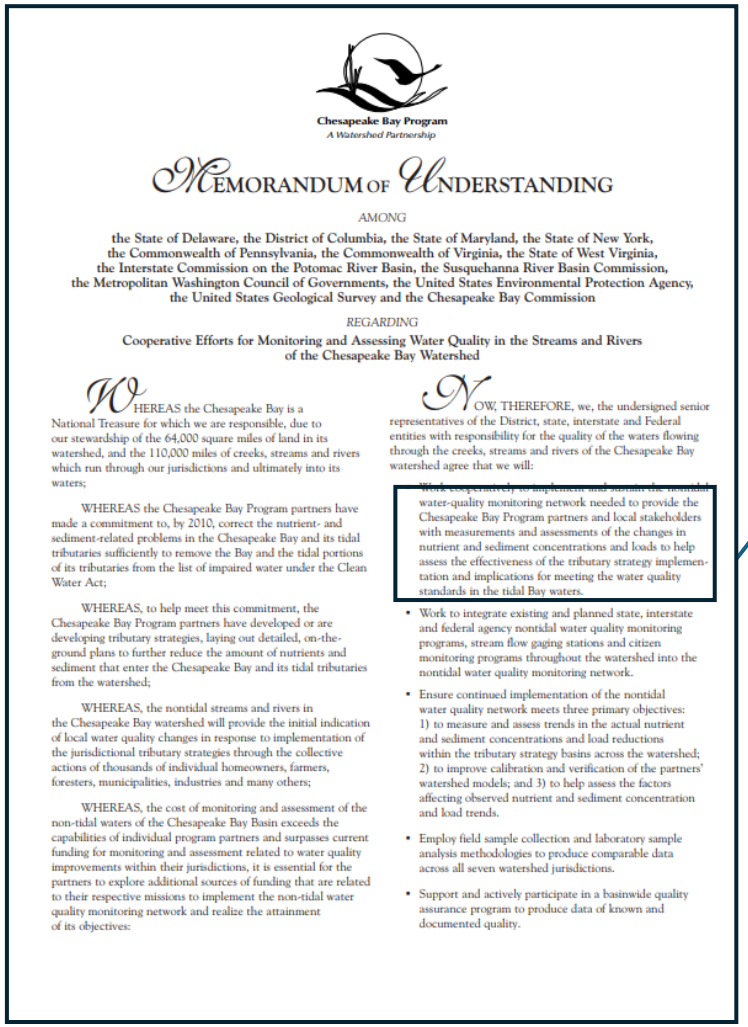
NOW, THEREFORE, we, the undersigned senior representatives of the District, state, interstate and Federal entities with responsibility for the quality of the waters flowing through the creeks, streams and rivers of the Chesapeake Bay watershed agree that we will:

- Work cooperatively for implementation and maintain the nontidal water-quality monitoring network needed to provide the Chesapeake Bay Program partners and local stakeholders with measurements and assessments of the changes in nutrient and sediment concentrations and loads to help assess the effectiveness of the tributary strategy implementation and implications for meeting the water quality standards in the tidal Bay waters.
- Work to integrate existing and planned state, interstate and federal agency nontidal water quality monitoring programs, stream flow gaging stations and citizen monitoring programs throughout the watershed into the nontidal water quality monitoring network.
- Ensure continued implementation of the nontidal water quality network meets three primary objectives: 1) to measure and assess trends in the actual nutrient and sediment concentrations and load reductions within the tributary strategy basins across the watershed; 2) to improve calibration and verification of the partners' watershed models; and 3) to help assess the factors affecting observed nutrient and sediment concentration and load trends.
- Employ field sample collection and laboratory sample analysis methodologies to produce comparable data across all seven watershed jurisdictions.
- Support and actively participate in a basinwide quality assurance program to produce data of known and documented quality.

- Work together sustaining the monitoring of nutrients and sediments to understand changes with management

Chesapeake Bay Program
Science. Restoration. Partnership.

Founding principles of our Nontidal Monitoring Network



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CHESAPEAKE WATERSHED AGREEMENT

On June 16, 2014, the *Chesapeake Bay Watershed Agreement* was signed

- Work together sustaining the monitoring of nutrients and sediments to understand changes with management

Water Quality Goal

CHESAPEAKE BAY WATERSHED AGREEMENT

"Reduce pollutants to achieve the water quality necessary to support the aquatic living resources of the Bay and its tributaries and protect human health."

Photo by Will Parson/Chesapeake Bay Program

Water Quality Standards Attainment and Monitoring Outcome

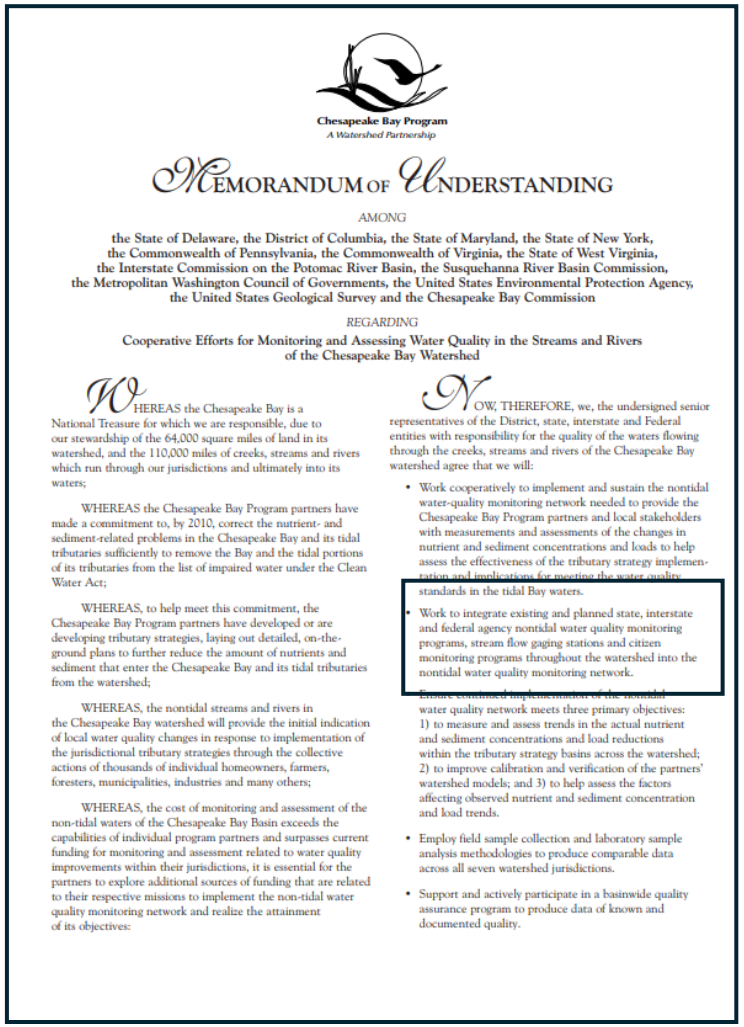
OUTLOOK ON COURSE

Outcome

Continually improve our capacity to monitor and assess the effects of the management actions being taken to implement the Bay TMDL and improve water quality. Use monitoring results to report annual progress being made in attaining water quality standards and trends in reducing nutrients and sediment in the watershed.

2014 - The partnership recommits to monitoring progress toward improving our waterways

Founding principles of our Nontidal Monitoring Network



Chesapeake Bay Program
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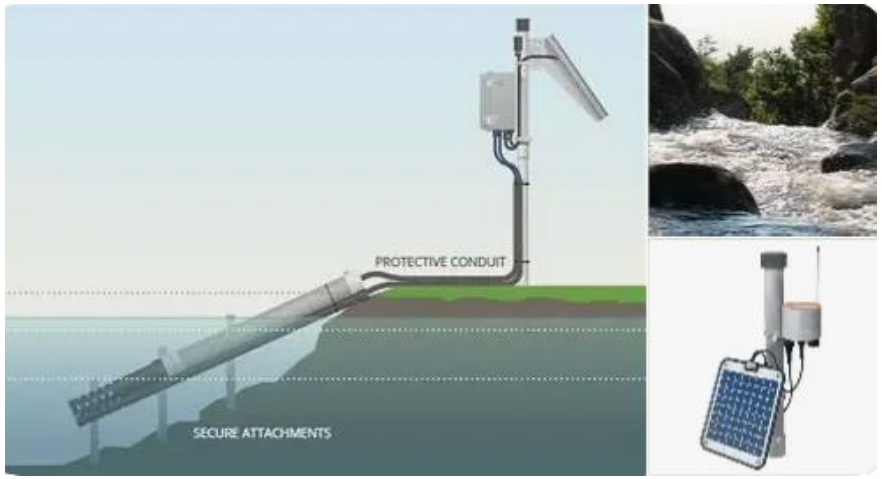
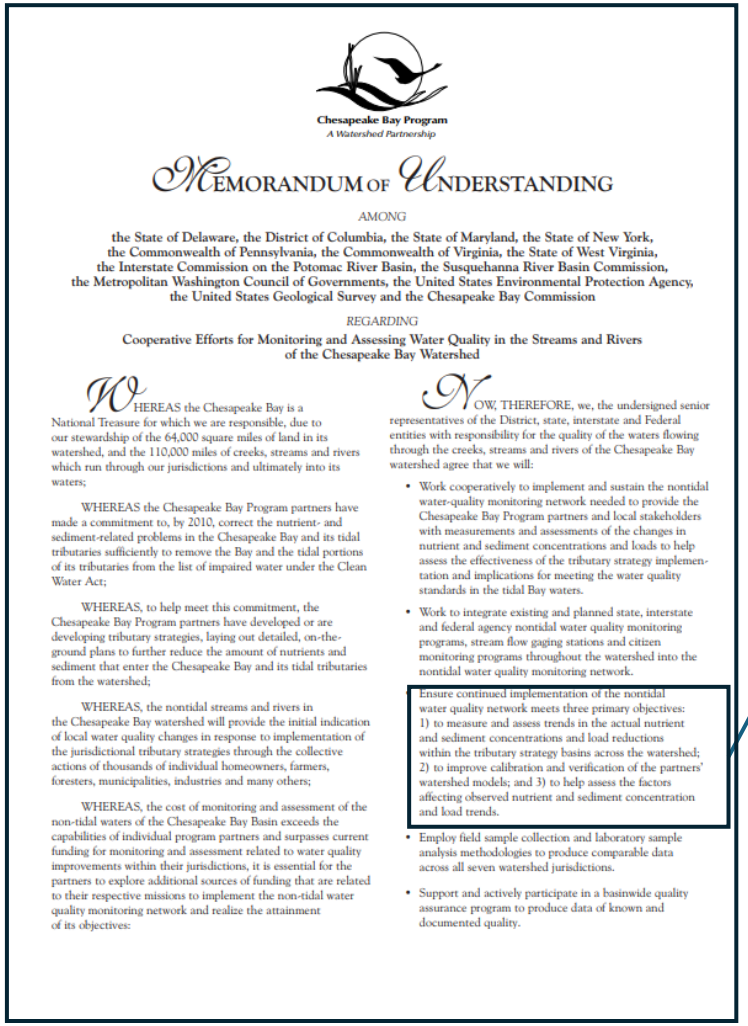
- Coordinate monitoring programs across the region – flow, nutrient and sediment



Flow monitoring

Water sampling collection

Founding principles of our Nontidal Monitoring Network



Chesapeake Bay Program
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Network objectives include:

- Measure and assess trends
- Help evaluate what is affecting changes in nutrients and sediments
- Inform models with data

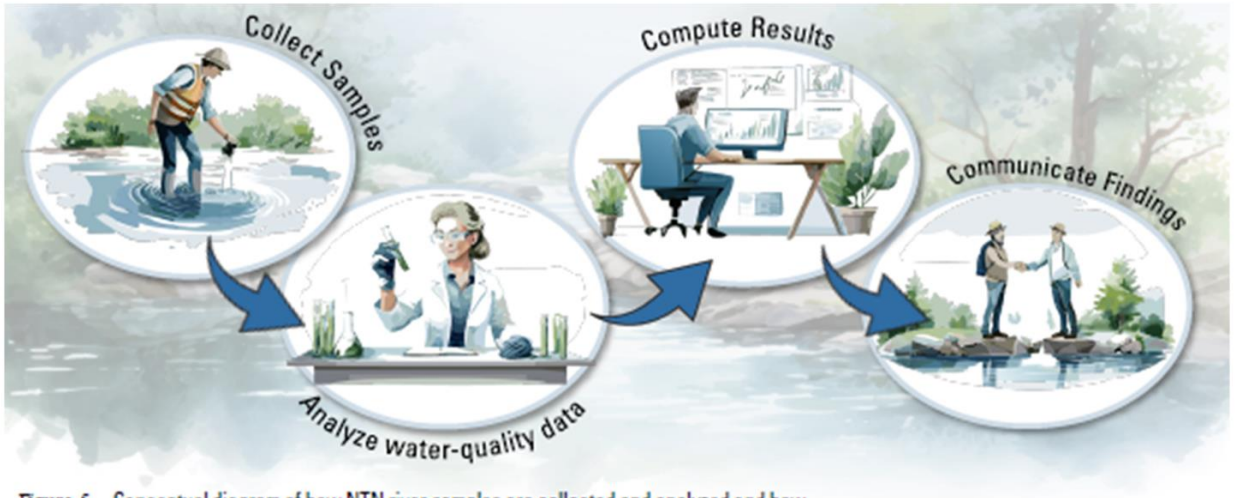

Figure 5. Conceptual diagram of how NTN river samples are collected and analyzed and how results are interpretated and communicated with local partners to inform conservation decisions.

Webber et al. 2025 in review

Founding principles of our Nontidal Monitoring Network

Chesapeake Bay Program
A Watershed Partnership

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REGARDING

Cooperative Efforts for Monitoring and Assessing Water Quality in the Streams and Rivers of the Chesapeake Bay Watershed

WHEREAS the Chesapeake Bay is a National Treasure for which we are responsible, due to our stewardship of the 64,000 square miles of land in its watershed, and the 110,000 miles of creeks, streams and rivers which run through our jurisdictions and ultimately into its waters;

WHEREAS the Chesapeake Bay Program partners have made a commitment to, by 2010, correct the nutrient- and sediment-related problems in the Chesapeake Bay and its tidal tributaries sufficiently to remove the Bay and the tidal portions of its tributaries from the list of impaired water under the Clean Water Act;

WHEREAS, to help meet this commitment, the Chesapeake Bay Program partners have developed or are developing tributary strategies, laying out detailed, on-the-ground plans to further reduce the amount of nutrients and sediment that enter the Chesapeake Bay and its tidal tributaries from the watershed;

WHEREAS, the nontidal streams and rivers in the Chesapeake Bay watershed will provide the initial indication of local water quality changes in response to implementation of the jurisdictional tributary strategies through the collective actions of thousands of individual homeowners, farmers, foresters, municipalities, industries and many others;

WHEREAS, the cost of monitoring and assessment of the non-tidal waters of the Chesapeake Bay Basin exceeds the capabilities of individual program partners and surpasses current funding for monitoring and assessment related to water quality improvements within their jurisdictions, it is essential for the partners to explore additional sources of funding that are related to their respective missions to implement the non-tidal water quality monitoring network and realize the attainment of its objectives:

NOW, THEREFORE, we, the undersigned senior representatives of the District, state, interstate and Federal entities with responsibility for the quality of the waters flowing through the creeks, streams and rivers of the Chesapeake Bay watershed agree that we will:

- Work cooperatively to implement and sustain the nontidal water-quality monitoring network needed to provide the Chesapeake Bay Program partners and local stakeholders with measurements and assessments of the changes in nutrient and sediment concentrations and loads to help assess the effectiveness of the tributary strategy implementation and implications for meeting the water quality standards in the tidal Bay waters.
- Work to integrate existing and planned state, interstate and federal agency nontidal water quality monitoring programs, stream flow gaging stations and citizen monitoring programs throughout the watershed into the nontidal water quality monitoring network.
- Ensure continued implementation of the nontidal water quality network meets three primary objectives: 1) to measure and assess trends in the actual nutrient and sediment concentrations and load reductions within the tributary strategy basins across the watershed; 2) to improve calibration and verification of the partners' watershed models; and 3) to help assess the factors affecting observed nutrient and sediment concentration and load trends.
- Employ field sample collection and laboratory sample analysis methodologies to produce comparable data across all seven watershed jurisdictions.
- Support and actively participate in a basinwide quality assurance program to produce data of known and documented quality.

Network objectives include:

- Measure and assess trends
- Help evaluate what is affecting changes in nutrients and sediments
- Inform models with data (See Olivia D.: CAST)

Figure 5. Conceptual diagram of how NTN river samples are collected and analyzed and how results are interpretated and communicated with local partners to inform conservation decisions.

Webber et al. 2025 in review

Network expansion: 2009-2013

Development and Implementation of a Process for Establishing Chesapeake Bay Program's Monitoring Program Priorities and Objectives

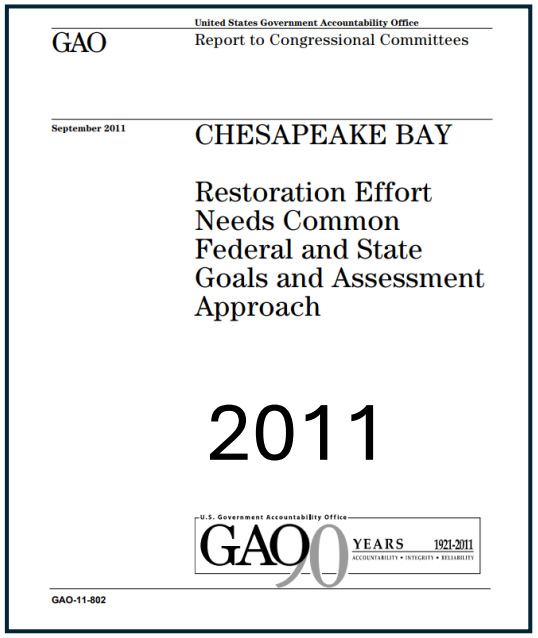
Results of the Monitoring Review Workshops, held May through December 2008

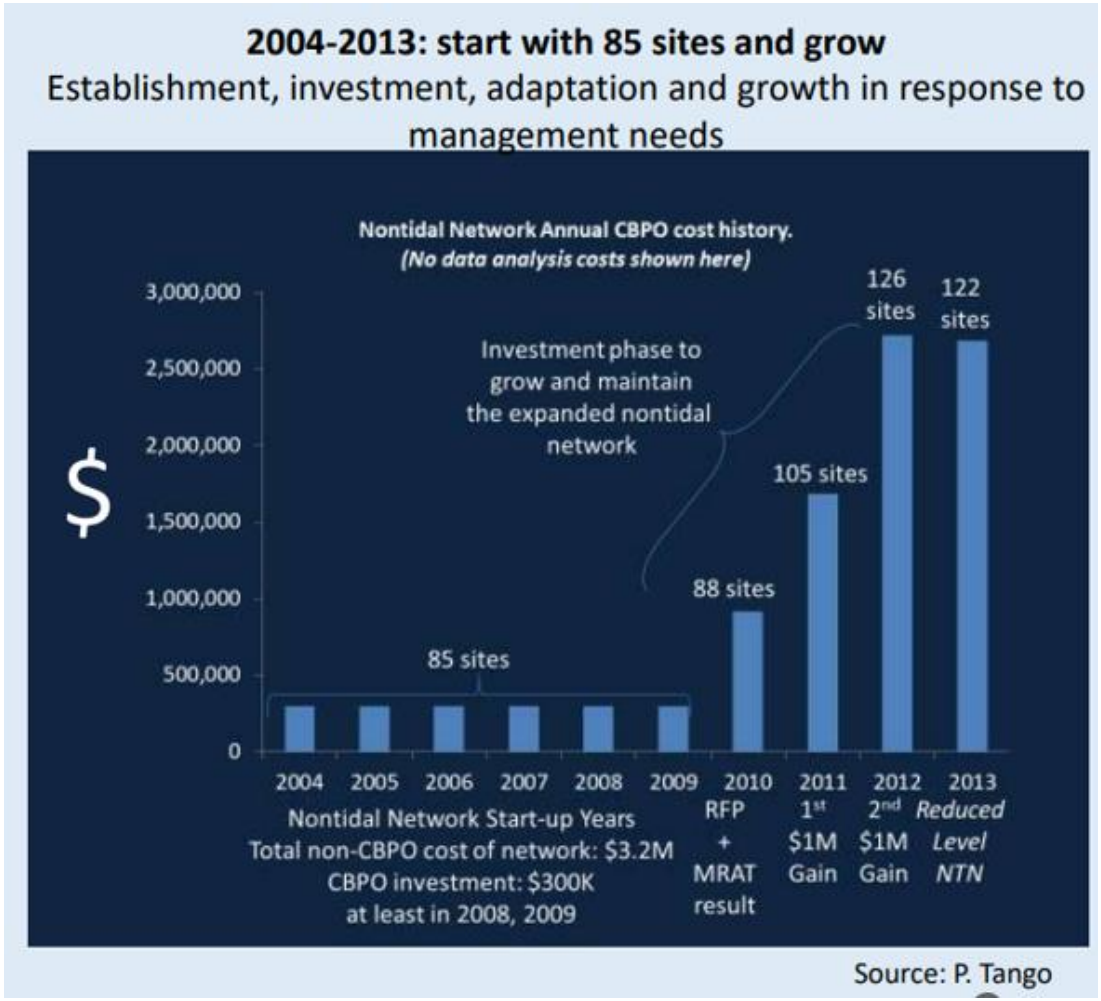
Prepared jointly by representatives of the Chesapeake Bay Program Science and Technical Advisory Committee and the Chesapeake Bay Program Watershed Partners Senior Managers

Executive Summary

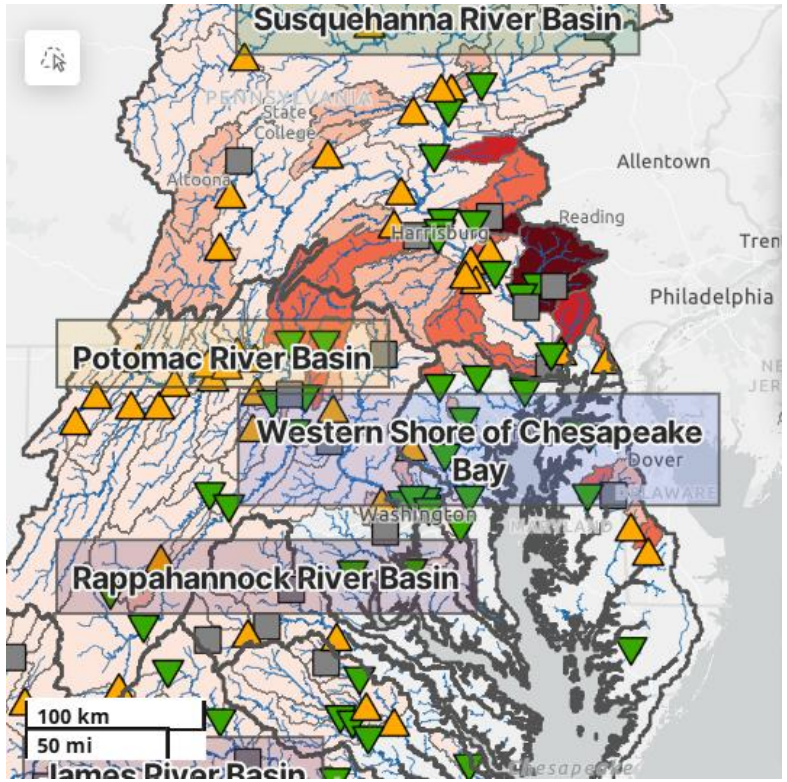
The process developed by the Scientific Technical Advisory Committee (STAC), Chesapeake Bay Program (CBP) representatives, and the CBP Watershed Partners Senior Managers provides a framework and method for establishing the priorities and objectives of the monitoring program, as requested by the CBP. It meets the larger mission specified by external reviews by the General Accountability Office (GAO) and the Office of Management and Budget (OMB) by providing a repeatable, defensible, and collaborative process. The outcome of this process can be used to re-align, if necessary, the monitoring program with the objectives of the CBP partnership. This process does not make, or endorse, specific recommendations for monitoring program re-design.

CBP STAC Monitoring Review 2009





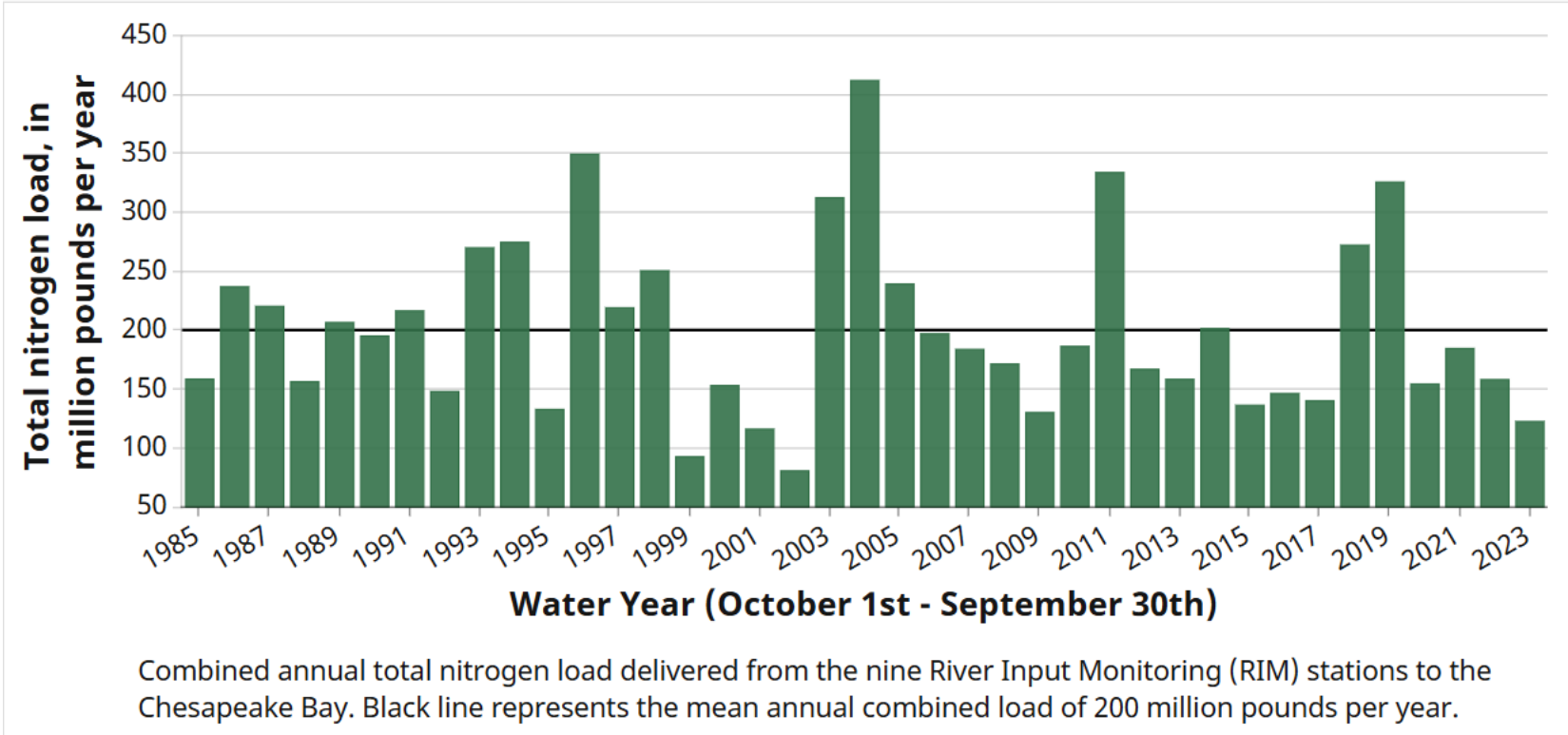
Measure and Assess Trends
Nutrient and sediment trend information



Individual Stations

Increasing Decreasing

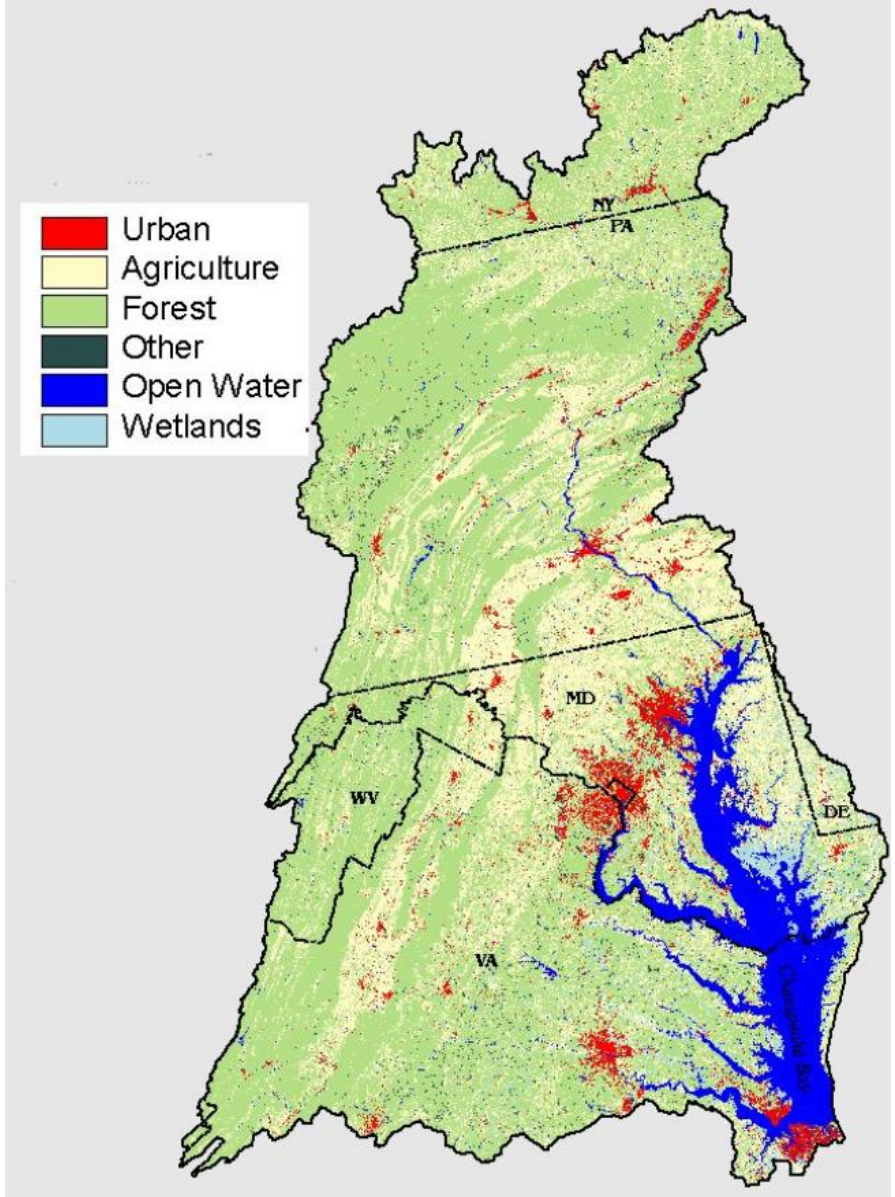
No trend



Combined annual total nitrogen load delivered from the nine River Input Monitoring (RIM) stations to the Chesapeake Bay. Black line represents the mean annual combined load of 200 million pounds per year.

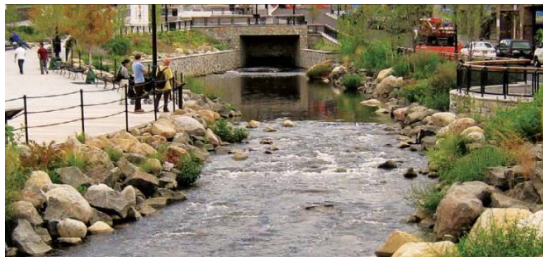
Watershed Nitrogen Load Summary 1985-2024

https://va.water.usgs.gov/geonarratives/ntn/



Chesapeake Bay Land Cover

Our 123 monitoring sites mostly represent areas of mixed land use



Urban
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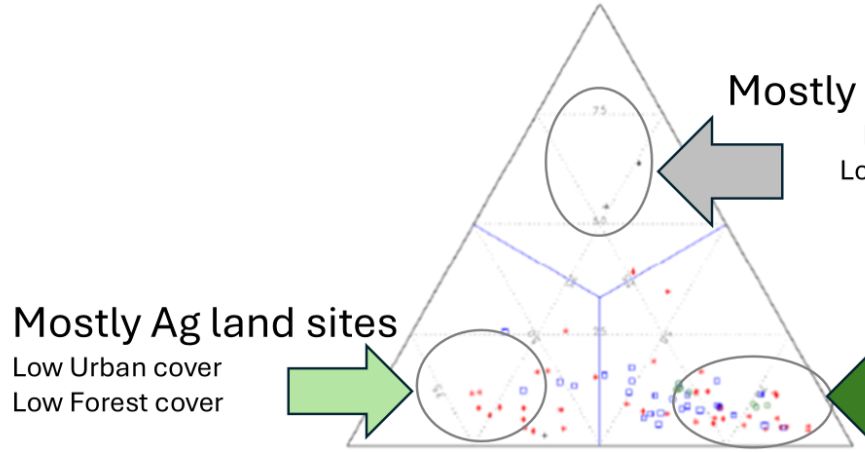
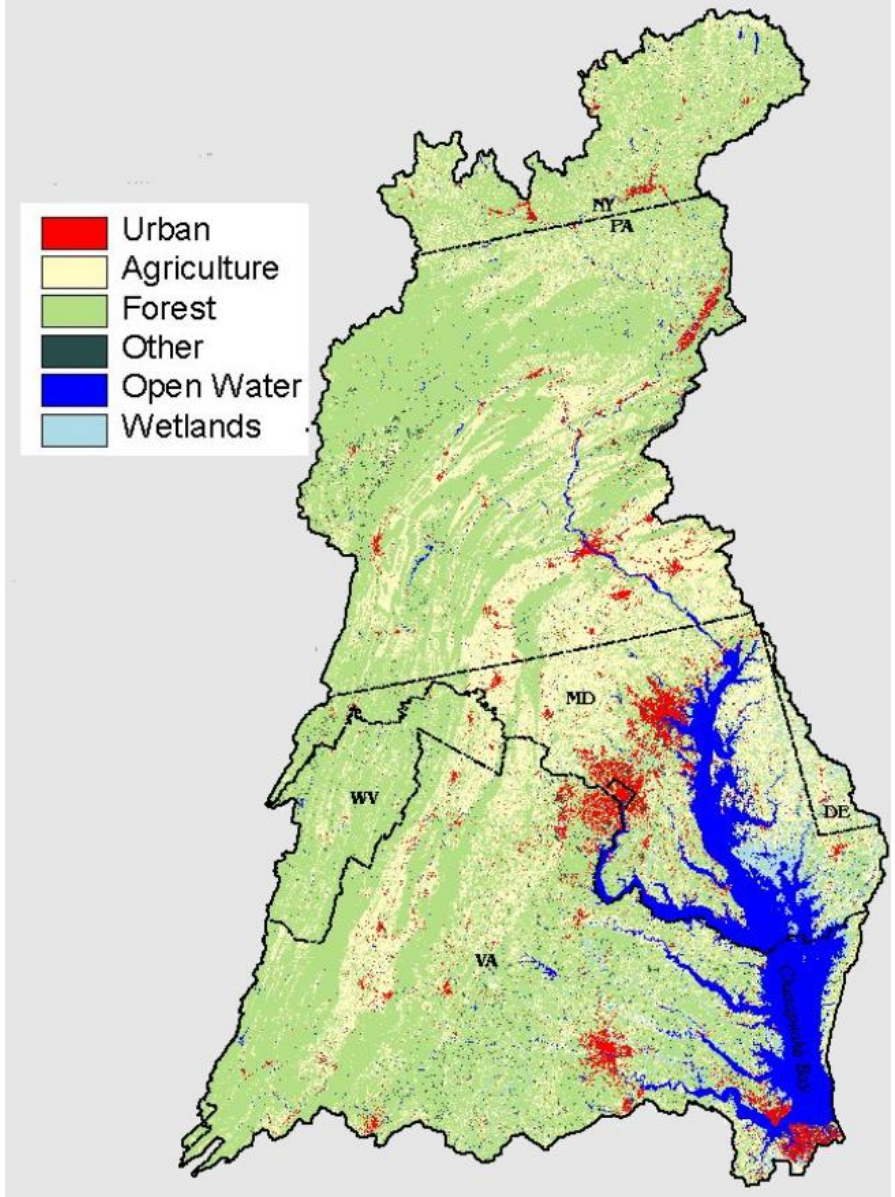


Ag land
100%

Forest
100%



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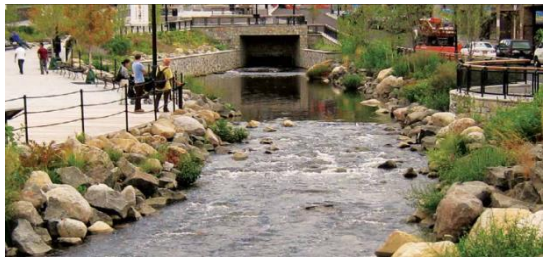

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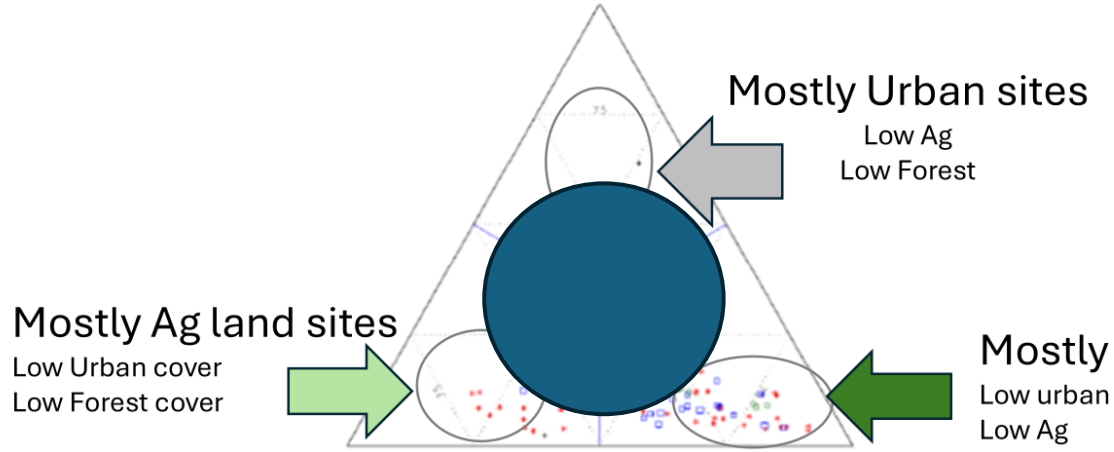

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Forest
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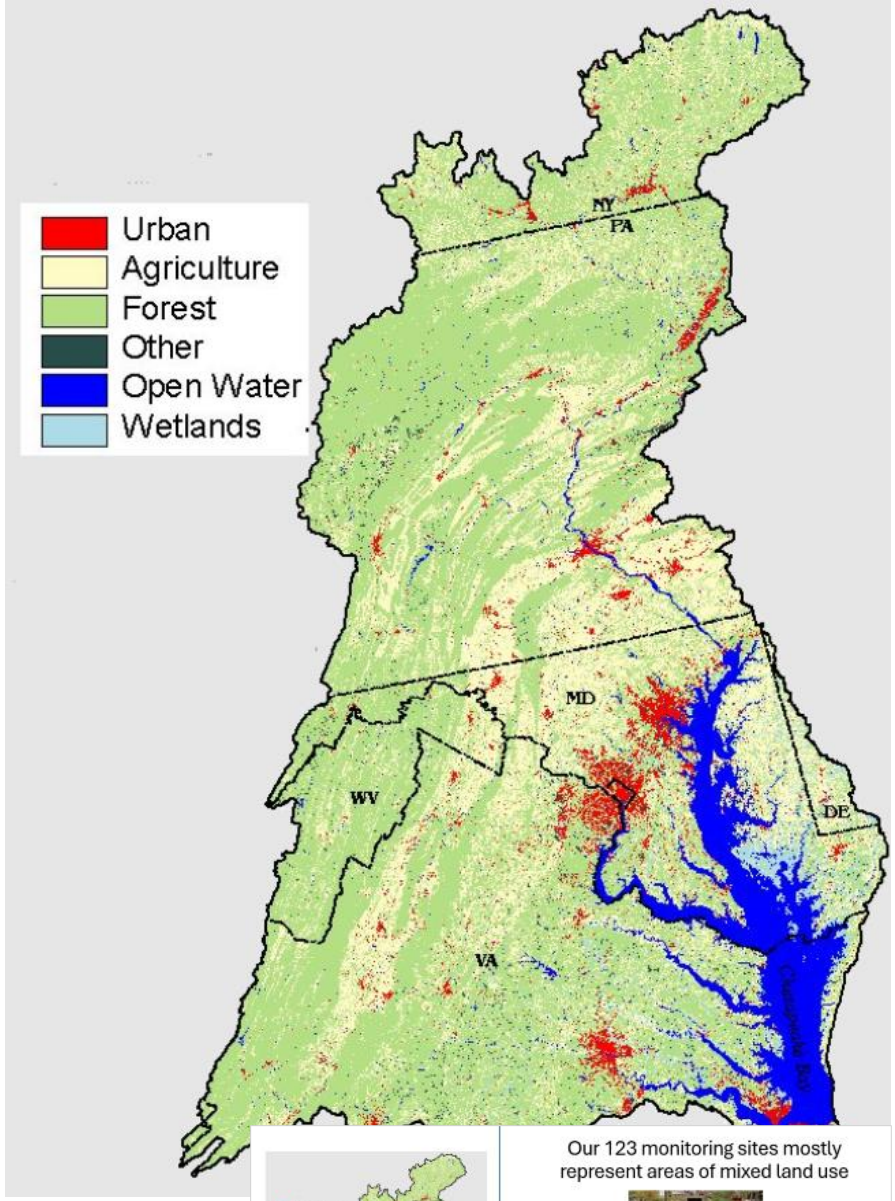

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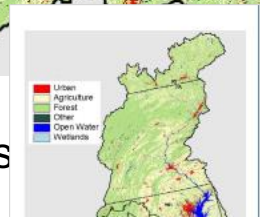

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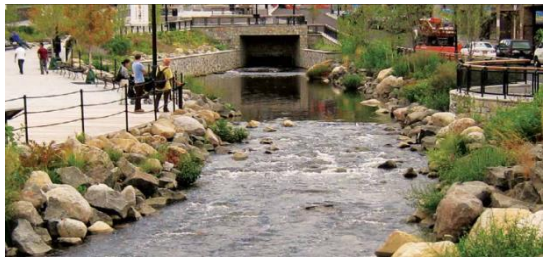

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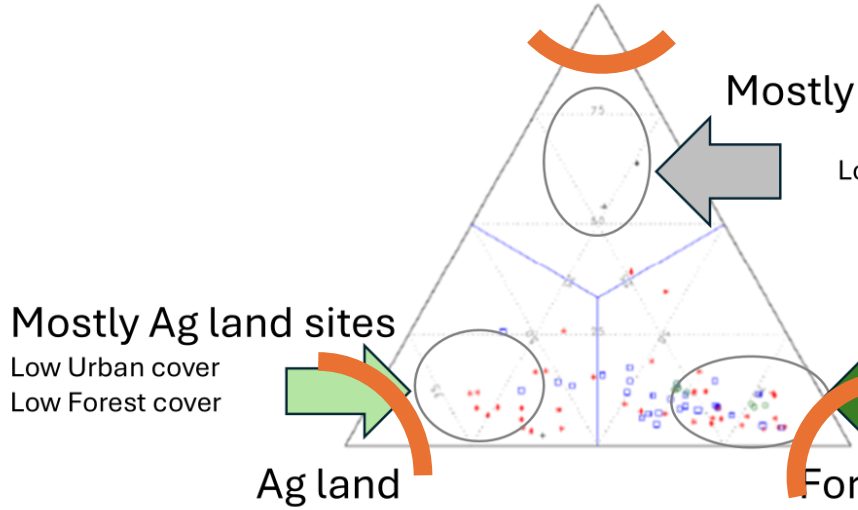


Ag land
100%

Forest
100%

2021-22 PSC Requested Monitoring Review, CBP response:
Small Ag Watershed Monitoring Additions

Enhancing the Chesapeake Bay Program Monitoring Networks
A Report to the Principals' Staff Committee

Table 1.2. Recommendations to improve Chesapeake Bay Program monitoring with line-item cost projections for a 5-year planning horizon.

CBP Network	Recommendation	Category	Funding				
			Year 1	Year 2	Year 3	Year 4	Year 5
Funder							
Nontidal	Adding 5 Small Watershed Continuous Monitoring stations	Capital Cost	$375,000				
Funder							
Nontidal	Sustain 5 new Small Watershed Continuous Monitoring stations	Operation & Maintenance	$150,000	$157,500	$165,375	$173,644	$182,326
Funder							

Chesapeake Bay Program
Science. Restoration. Partnership.

Citation:
Chesapeake Bay Program. 2022. Enhancing the Chesapeake Bay Program Monitoring Networks - A Report to the Principals' Staff Committee. 103 pages.

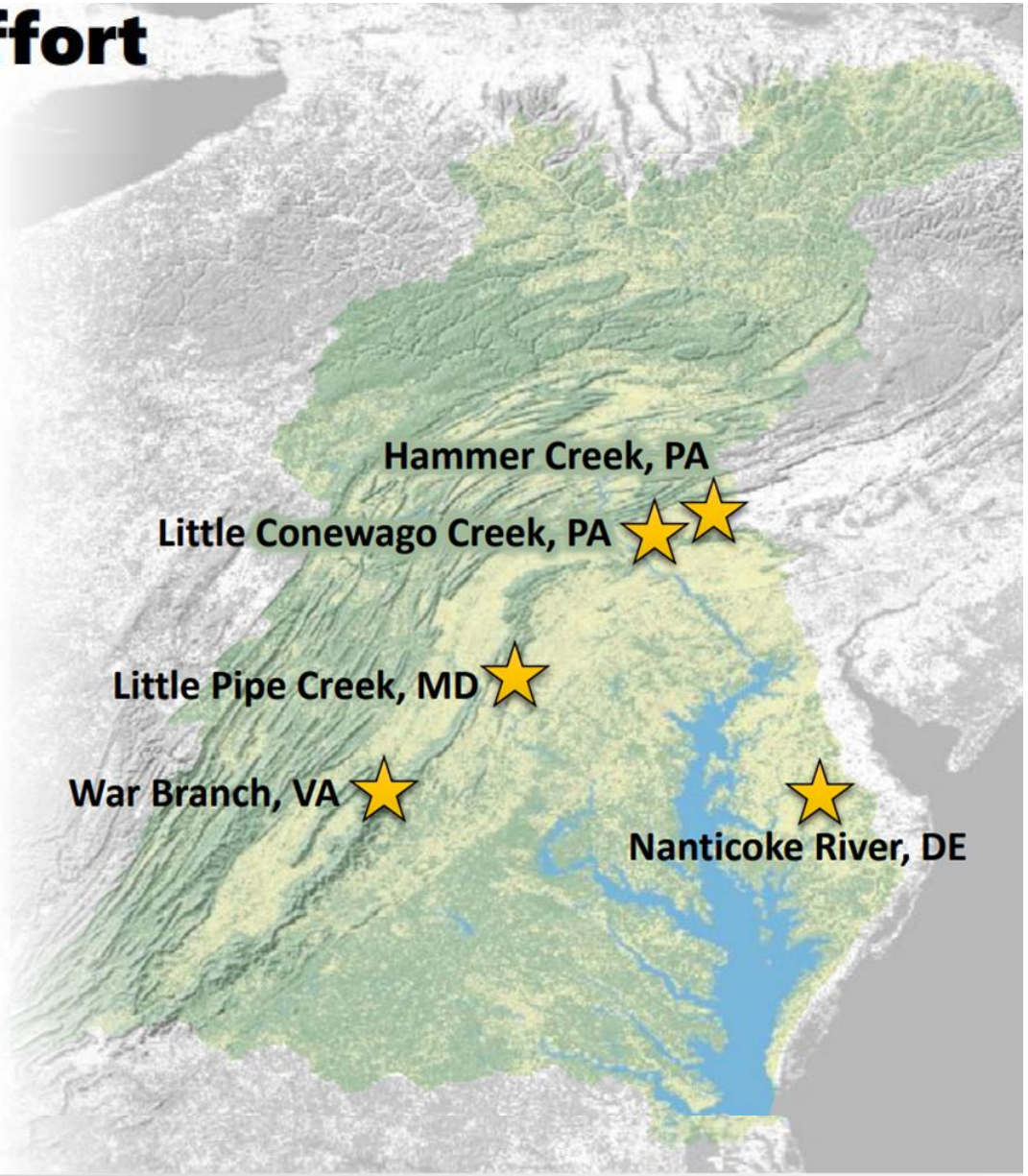
New Water-Quality Monitoring Effort in Small Agricultural Watersheds

The USGS is planning a new water-quality monitoring effort in Chesapeake Bay agricultural watersheds, in collaboration with the EPA, NRCS, and other partners.

The objectives of this effort are to:

1. Evaluate the water-quality effects of agricultural conservation efforts
2. Develop new outreach and educational opportunities with agricultural, stakeholder, and academic communities.

The development of this monitoring effort builds on lessons learned from the showcase watershed study.



Webber et al. 2024

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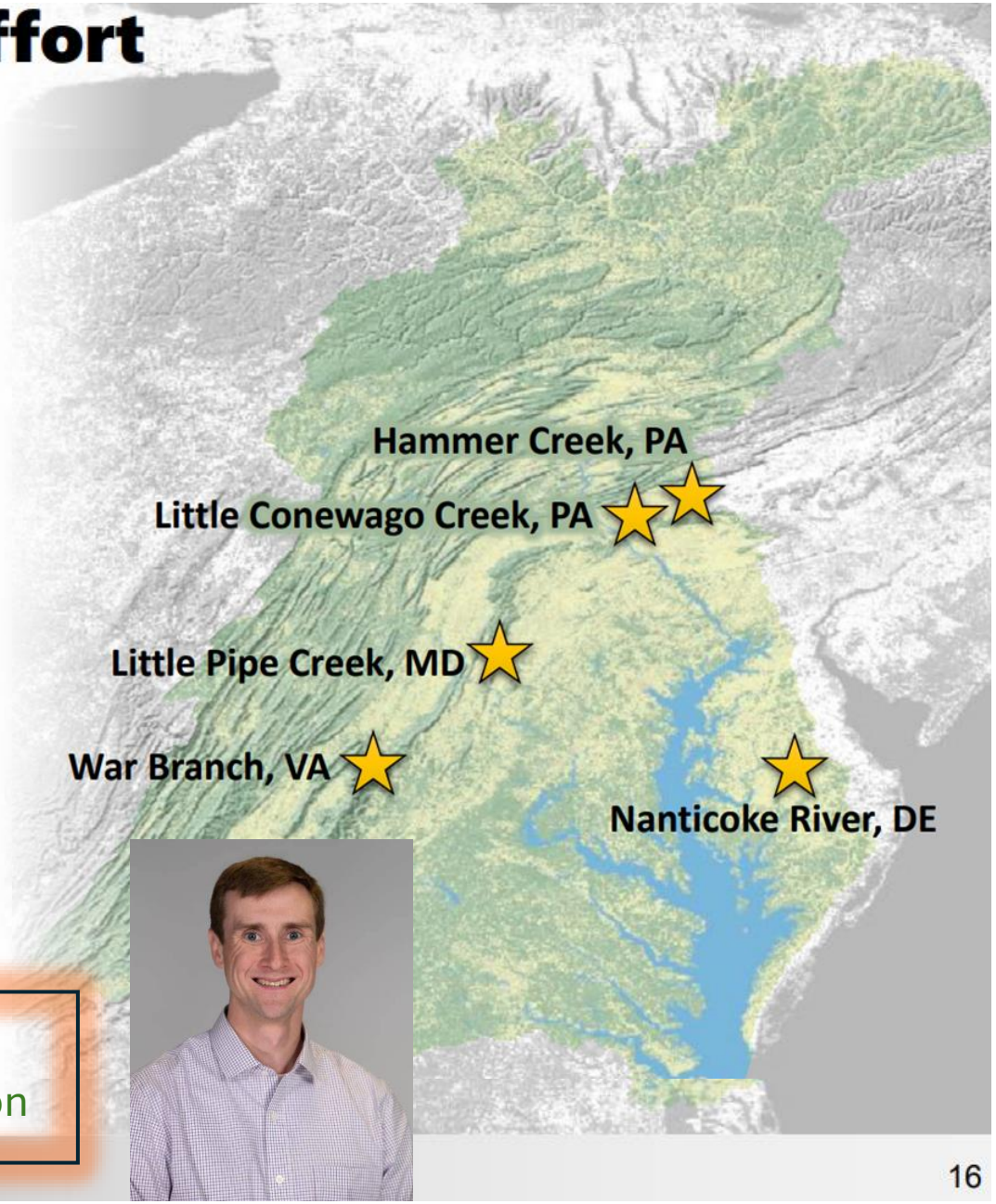
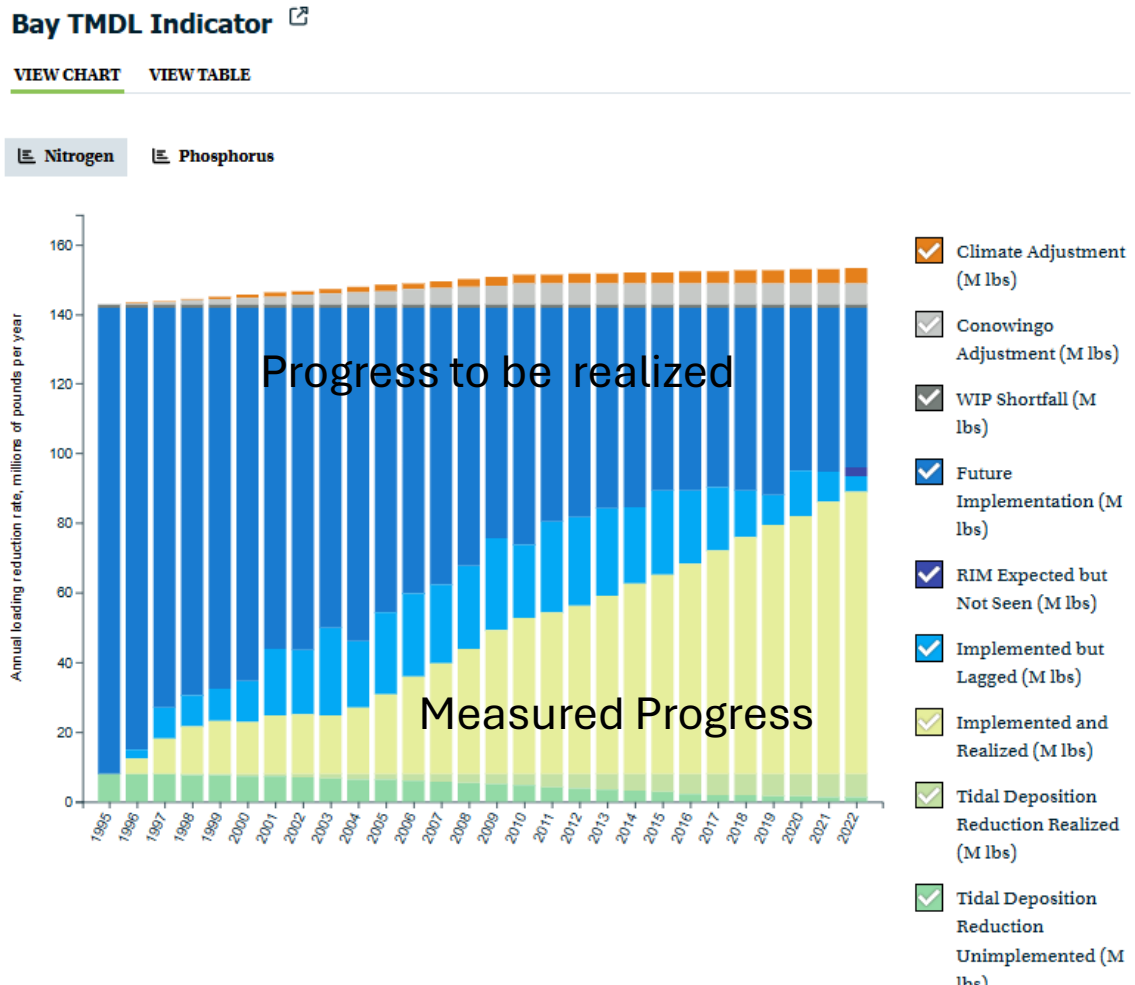


See more with Jimmy Webber
Small Ag Watersheds Presentation

USGS

Webber et al. 2024

Watershed Management Indicators – METRIC
Telling the story of management and recovery



See Kaylyn Gootman's METRIC presentation

Thank you ☺

Peter Tango USGS

Chesapeake Bay Monitoring Coordinator