Background Webinar: Monitoring Assessment to Improve the CBP Monitoring Networks

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Chesapeake Bay Program

Science. Restoration. Partnership.

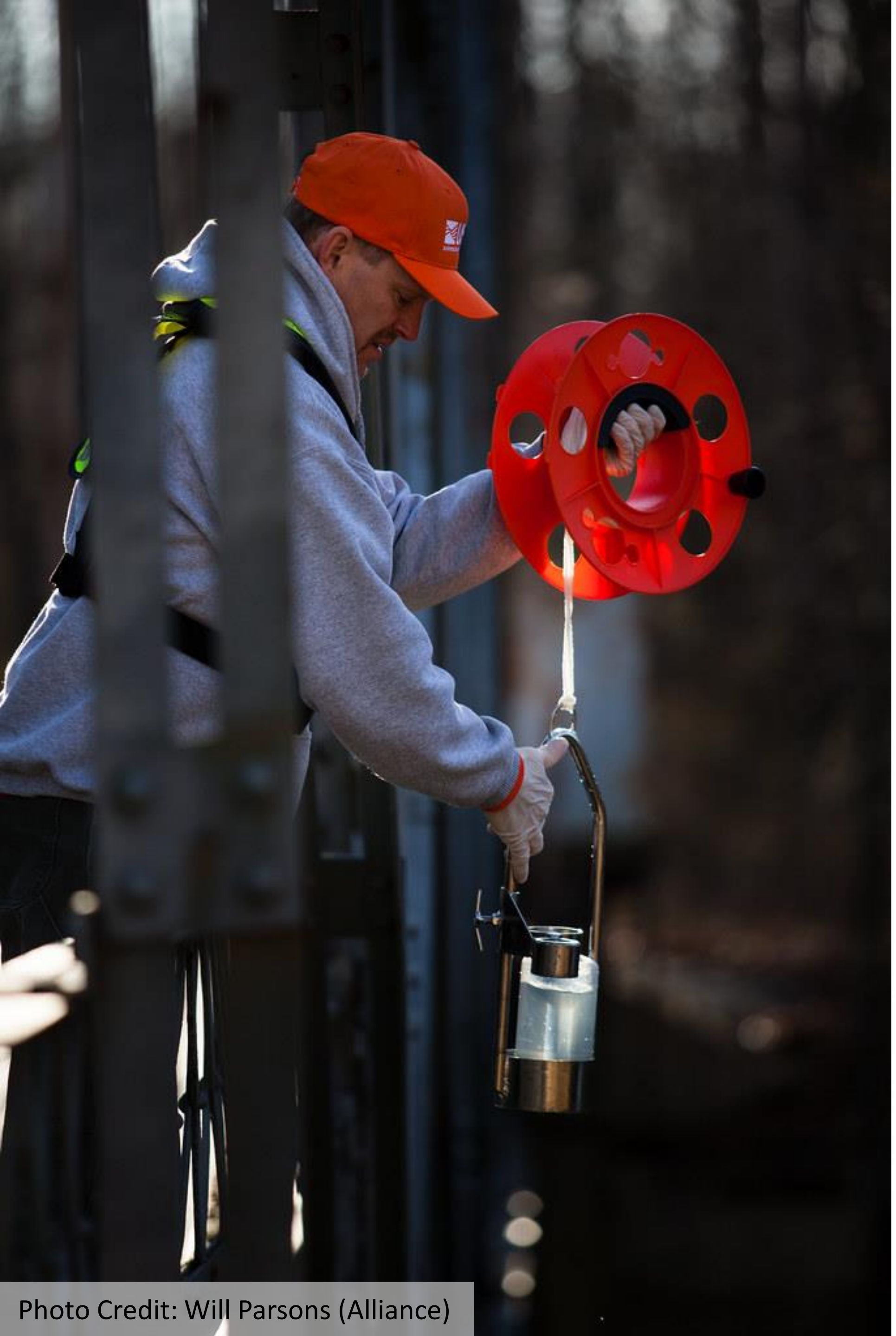


Photo Credit: Will Parsons (Alliance)

Objectives for Overview:

- Background on the Enhancing Monitoring Networks report
- Understanding the six core monitoring networks plus toxic contaminants monitoring
- Understand the value of the networks
- Overview of recommendations from the monitoring report

Photo Credit: Will Parsons (Alliance)

PSC requested information be provided on *what is needed to improve the CBP monitoring networks*, including:

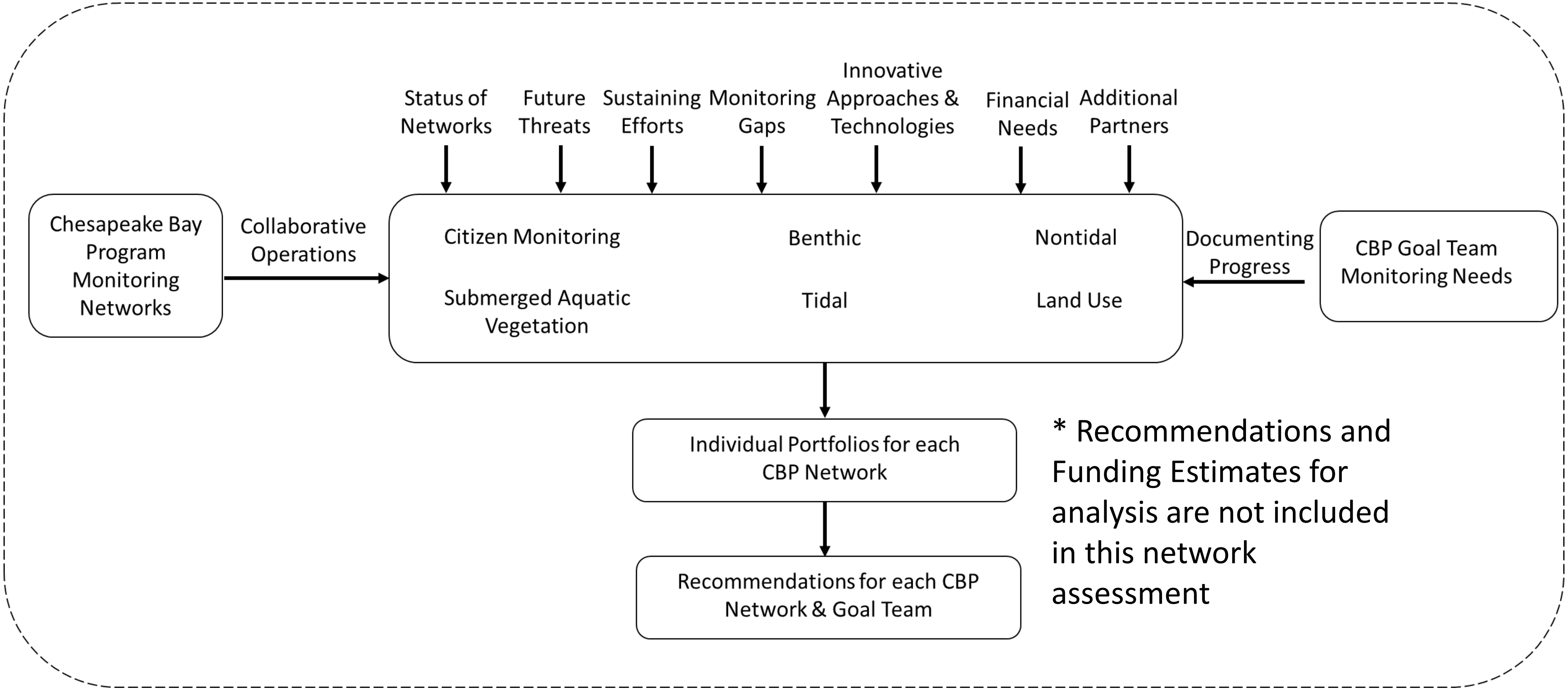
(1) an overview of current status and threats to the networks, and

(2) what is needed to address the monitoring networks capacity shortfalls

Assessing CBP Networks and monitoring needs

STAR-STAC team engaged multiple CBP partners and GITs to
refine monitoring needs and develop recommendations

Improving Chesapeake Bay Program Monitoring Networks



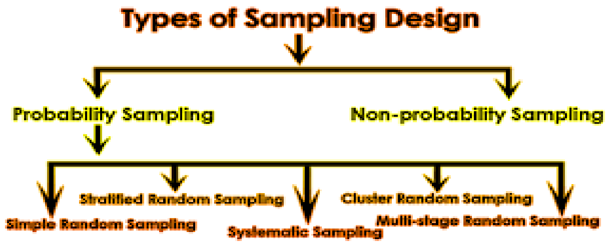
Process of developing recommendations

Needs assessments have been developed and cataloged into the SSRF database

Groups developed sampling designs to address data collection needs

Managers and scientists developed costs for need based on proposed designs

Cost estimates were collated and summed

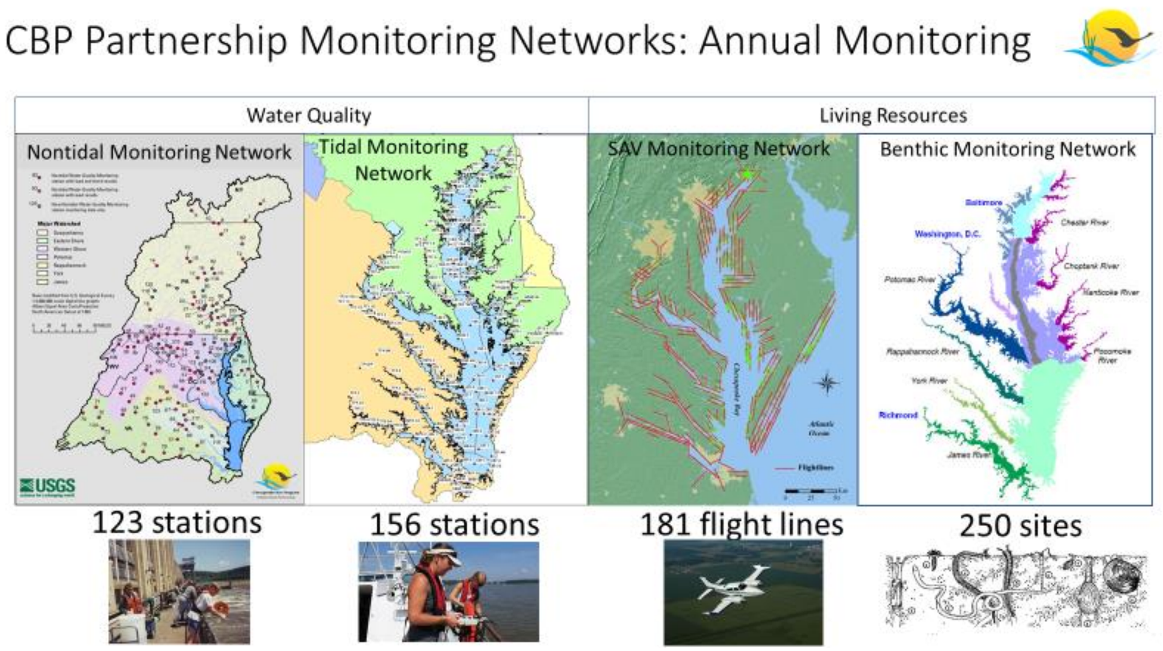


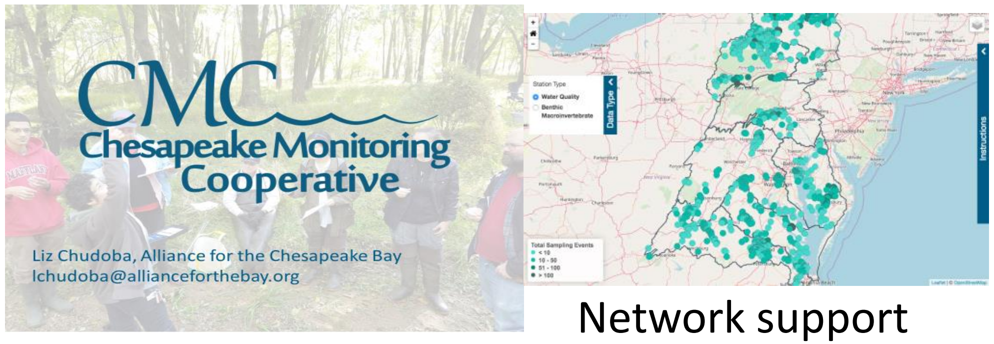
COST MANAGEMENT CATEGORY	Year 1
Salaries and Wages (Data management, regression development)	$21,520
Salaries and Wages (Installation of QW sondes)	$ 21,300
Equipment and Installation Supplies	$105,000

Total cost for first year: $5.1M

Contents of Report

- Sections
- Executive Summary
- 1: Chesapeake Bay Program Network Portfolios
- 2: Chesapeake Bay Watershed Agreement Goals and Outcomes' Monitoring Needs
- 3: Partnership Opportunities to Enhance Chesapeake Bay Program Monitoring
- 4: PSC Charge to the Monitoring Review Team and Foundational Assessment Results





Network support

Key findings

- ## Monitoring is critical
  - Monitoring shows CBP partners progress from water-quality and restoration efforts
  - Need to maintain and enhance core CBP monitoring networks <u>AND</u> partner monitoring programs

- ## Monitoring for many CBP outcomes is insufficient
  - <u>No segment of the bay has assessed all water-quality criteria</u>, and therefore can't be delisted!
  - Some Outcomes need a more coordinated effort to track progress
  - Some Outcomes lack information to assess progress

- ## Opportunities for fundings exist
  - The CBP partners <u>committed to achieving these outcomes</u> have a unique opportunity to build monitoring capacity.

Network Portfolios:

Detail basis for recommendations

Each Portfolio contains:

- Status
- Gaps
- Current Investment
- Innovations
- Vulnerabilities
- Monitoring Gaps
- Recommendations
  - LINE ITEM expressed in overall recommendations

TIDAL LONG TERM WATER QUALITY NETWORK – BAY MONITORING

RECOMMENDATIONS

- $100,000. Operations. Support network sustainability and integrity. Annual cost to tidal network funding addressing existing cost of living impacts in MD, Yr 1. Additional growth of $80,000 each year required in Yrs 2-5.
- $600,000. Infrastructure. Enhance hypoxia network efficiency and capacity with One time purchase of equipment and supplies for 8 advanced vertical profile water quality monitoring stations.
- $300,000. Operations and maintenance. Support the expanded hypoxia monitoring network to address short duration water quality criteria assessment. +5% COLA adjustment annually.
- $233,000. Operations. Nutrient limitation annual survey. Verify predictions on management progress, calibrate bay model. +5% COLA annually.
- $90,000. Infrastructure. Annual cost. Design & implement the 4-D interpolator. Support water quality criteria attainment assessments.
- **Total Infrastructure investment need:** $690,000 initially, 90K per year through 2025 for 4D tool development and implementation.
- **Total Operations and maintenance annual investment need:** Yr $633,000, estimated growth of 100K more needed each year in Yrs 2-5.
  - Funding for data analysis and reporting are not included.

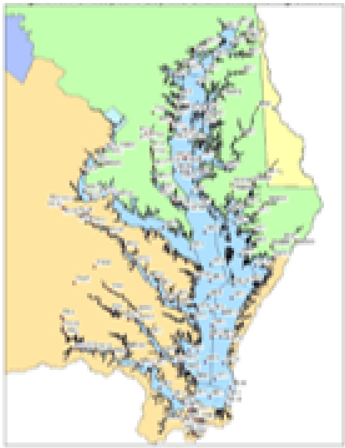


Figure 1. Tidal Bay Monitoring Program locations

STATUS:

- The current tidal monitoring network was established in 1984, its first full year was 1985. There are 154 active stations sampled for physical, chemical, and biological measures throughout the water column with baywide consistent collection and analysis protocols. One or more monitoring sites are located in each of the 92 Bay segments. Stations are sampled 1 or 2 times per month depending on location and season. Targeted sampling occurs in shallow water in a limited number of Bay segments each year either mapping surface water quality or providing continuous (i.e., every 15 minutes) water quality measures at one depth for a fixed location in a season. Advanced statistical analyses are used to report annual and seasonal trends.

VULNERABILITIES:

- Cost of living increases when funding remains unchanged leads to less buying power and decisions for reducing the size of the network.
- Winter weather influencing seasonal assessments

MONITORING GAPS:

- Short duration water quality (dissolved oxygen) criteria attainment assessment.
- Shallow-water monitoring representation.
- Annual full bay water clarity and chlorophyll measures and assessment

CURRENT INVESTMENT:

- Approximately $2.7M. Federal Clean Water Act 117e program funds which includes 1:1 matching support from grant partners.

INNOVATIONS:

- Robust, cost-effective continuous monitoring sensor units (vertical arrays) for open water, shallow and deep water, water column water quality monitoring. (oxygen, salinity and temperature)
- "Big data" management.
- Advanced statistical analyses

Maintain Success of Existing Monitoring Network

12 Outcomes

Examples
Blue Crabs
Oysters

Enhance Efficiency and Capacity of Monitoring Network

12 Outcomes

Examples
Wetlands
Stream Health

Establish a New Coordinated Monitoring Network

7 Outcomes

Examples
Climate
Local Leadership

CBP Monitoring Networks

- Nontidal
- Tidal
- Submerged Aquatic Vegetation (SAV)
- Benthic
- Community Monitoring
- Land Use

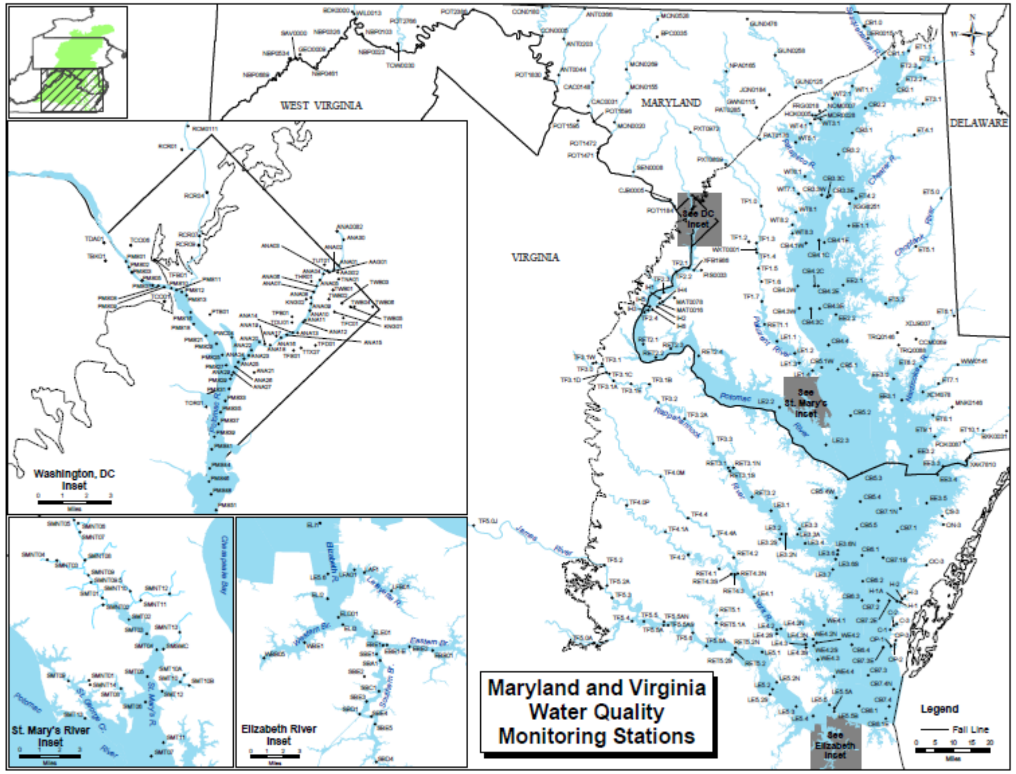
Available Data

- Continuous Monitoring
- Long-term fixed stations
- Dataflow
- SAV Watchers Program
- Aerial SAV
- Macroinvertebrate
- High resolution ($1m^2$) land cover and land use

Data Uses

- Status
- Trends
- Model Development
- Model Calibration
- Model Verification
- BMP Effectiveness assessment
- Climate Impact Assessment
- Research/hypothesis testing
- Leveraging for Proposals
- Policy Making
- Management Decision Support
- Communication
- Outreach
- Education
- Indicator Development
- Indicator Reporting
- Forecasting
- Scientific Discovery

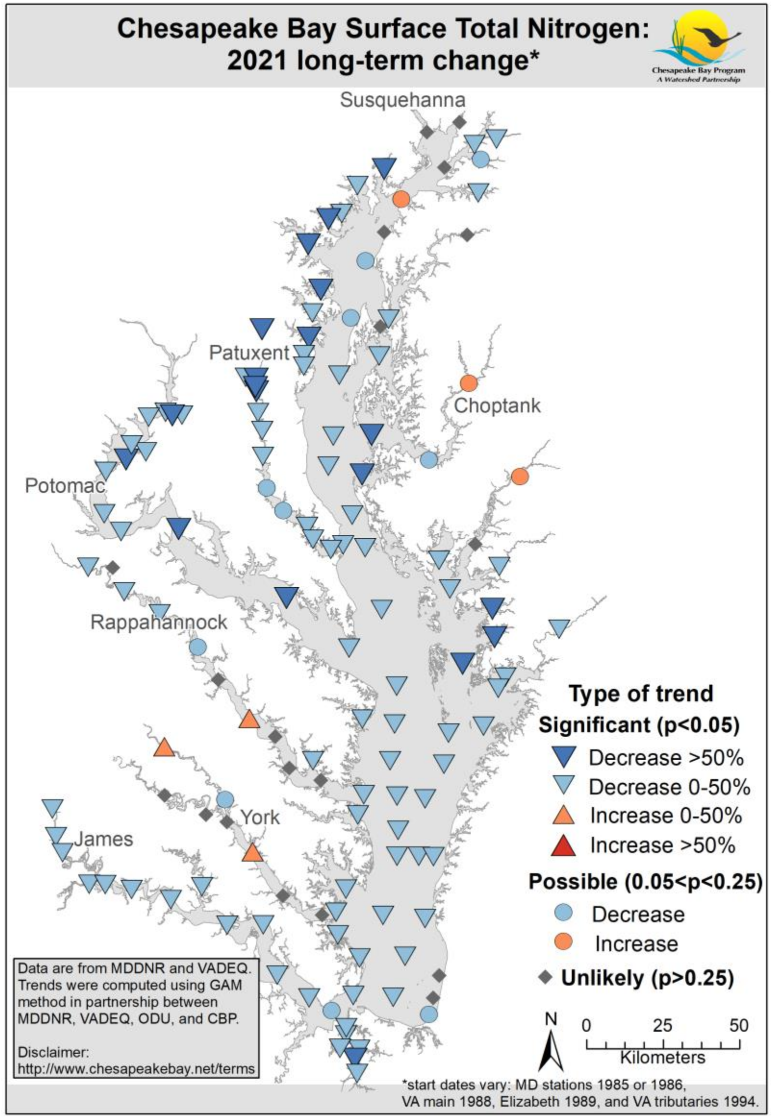
Tidal Water Quality Network



Established in 1984, first year of operation in 1985

154 active stations sampled

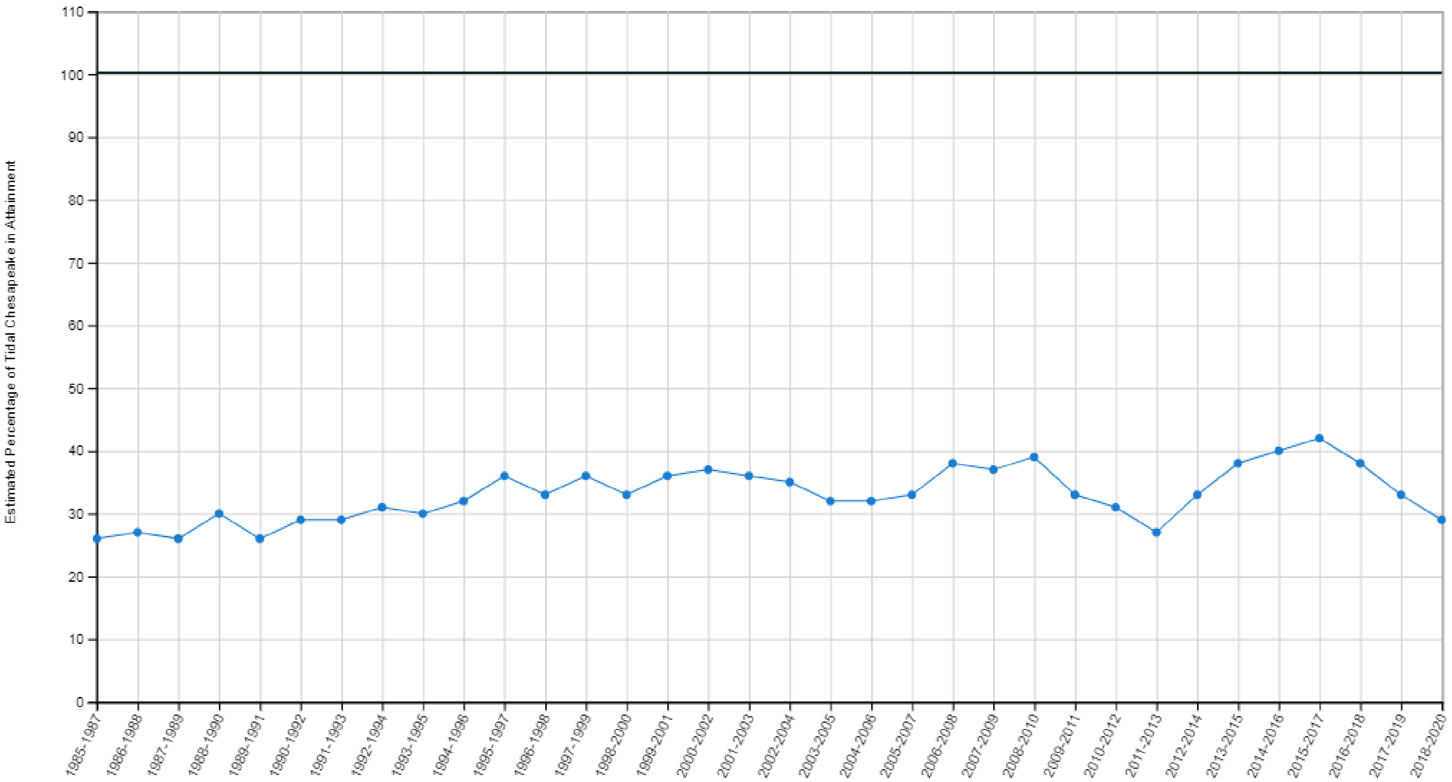
Long-term stations sampled 1 – 2 times per month



Water Quality Standards Attainment (1985-2020)

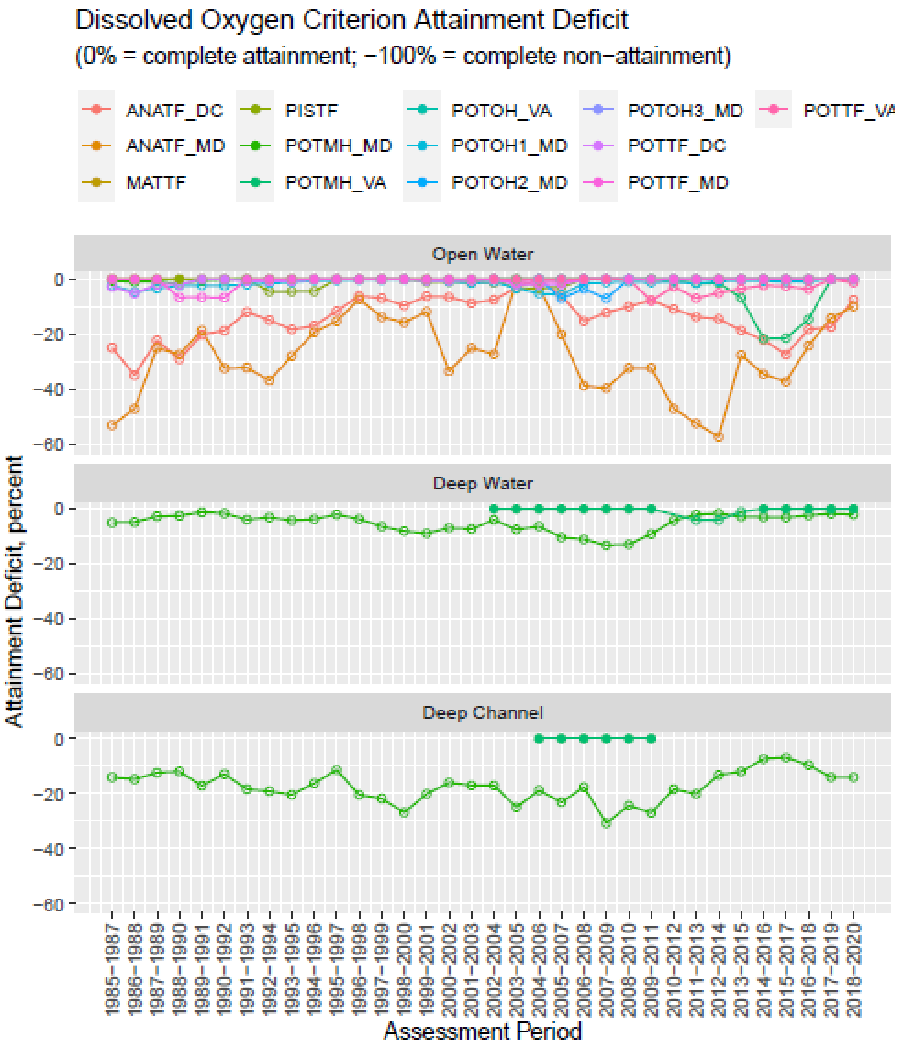
Water quality is evaluated using three parameters: dissolved oxygen, water clarity or underwater grass abundance, and chlorophyll a (a measure of algae growth).

VIEW CHART **VIEW TABLE**

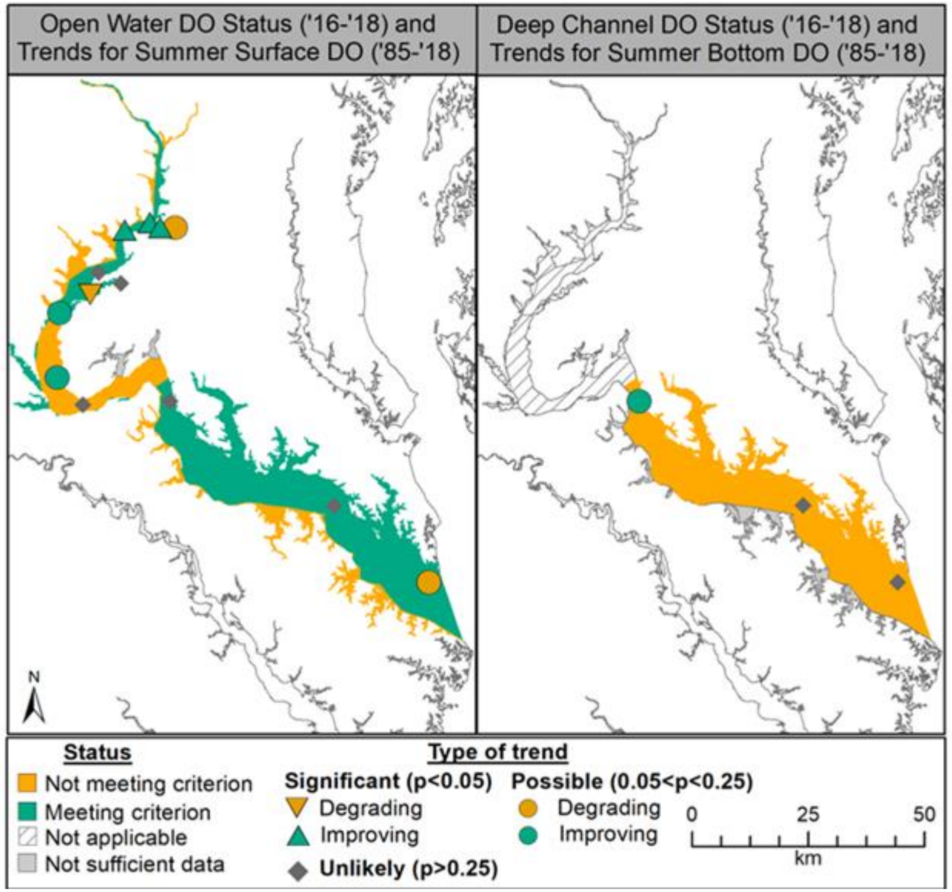


Annual tidal trends results help gauge the health of the bay and identify changes due to management actions and climate.

Multi-metric water quality standards indicator to estimate water quality standards attainment of full bay-wide assessment to inform managers of conditions based on limited information.

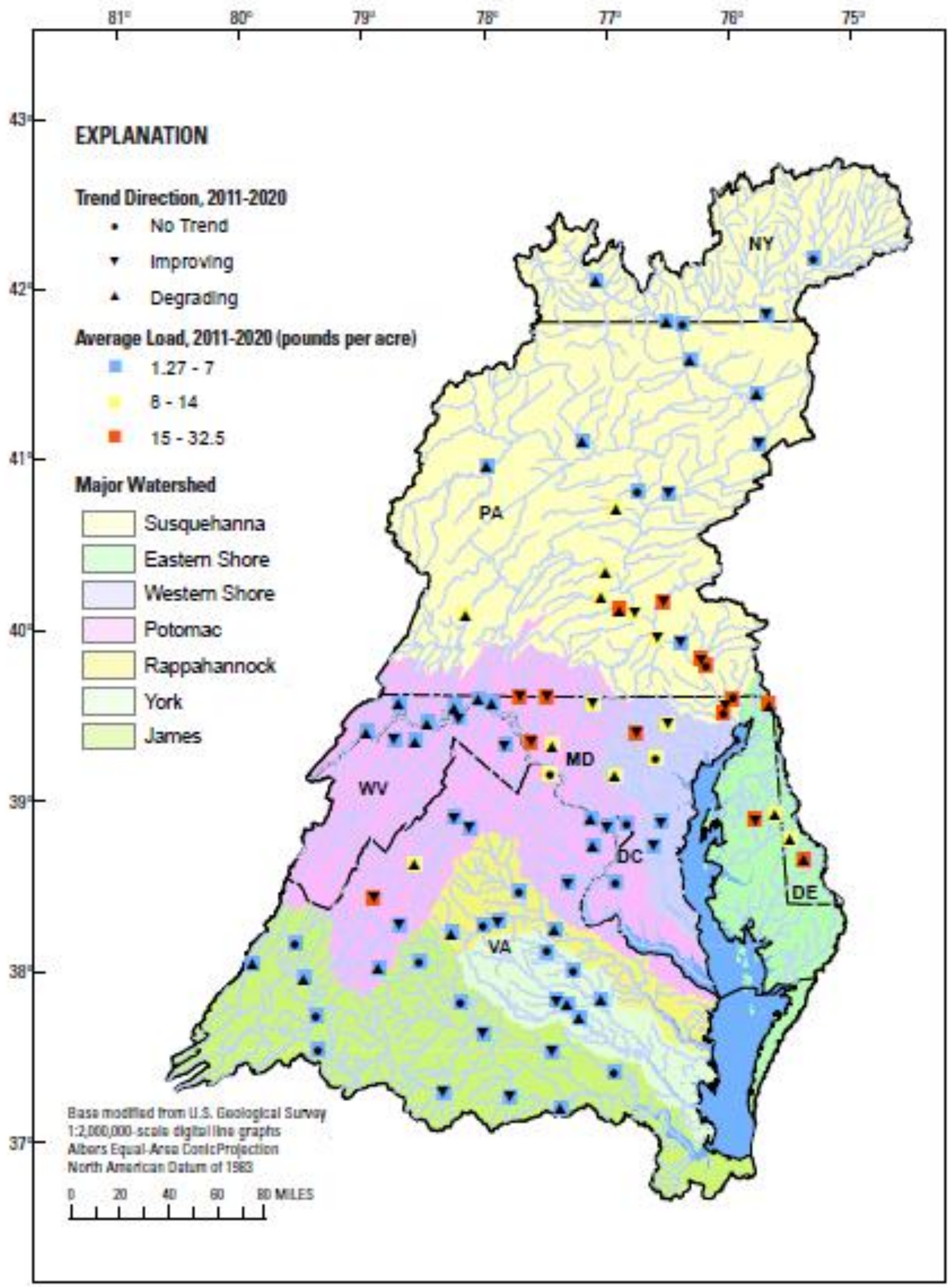


Attainment deficit to show incremental progress and provide guidance on how close management segments in the Bay were to achieving attainment of water quality standards.



Tributary Summaries use water quality sample data to summarize 1) how tidal water quality has changed over time, 2) how and which factors may influence change and 3) connecting observed changes in aquatic conditions to its drivers.

Nontidal Water Quality Network

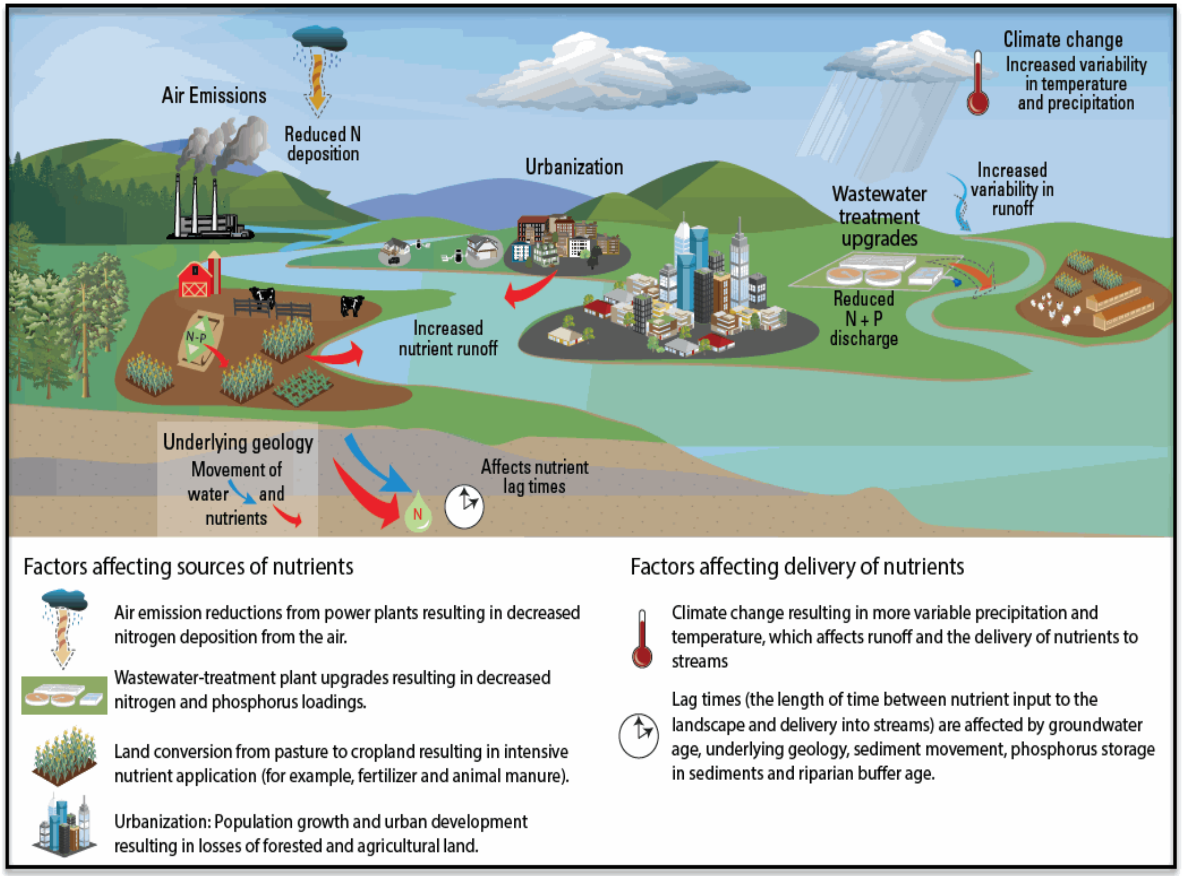


Established in 2004

123 Nontidal active stations sampled

9 River Input Monitoring sites

Conceptual diagram illustrating some of the complex factors affecting nutrient trends.



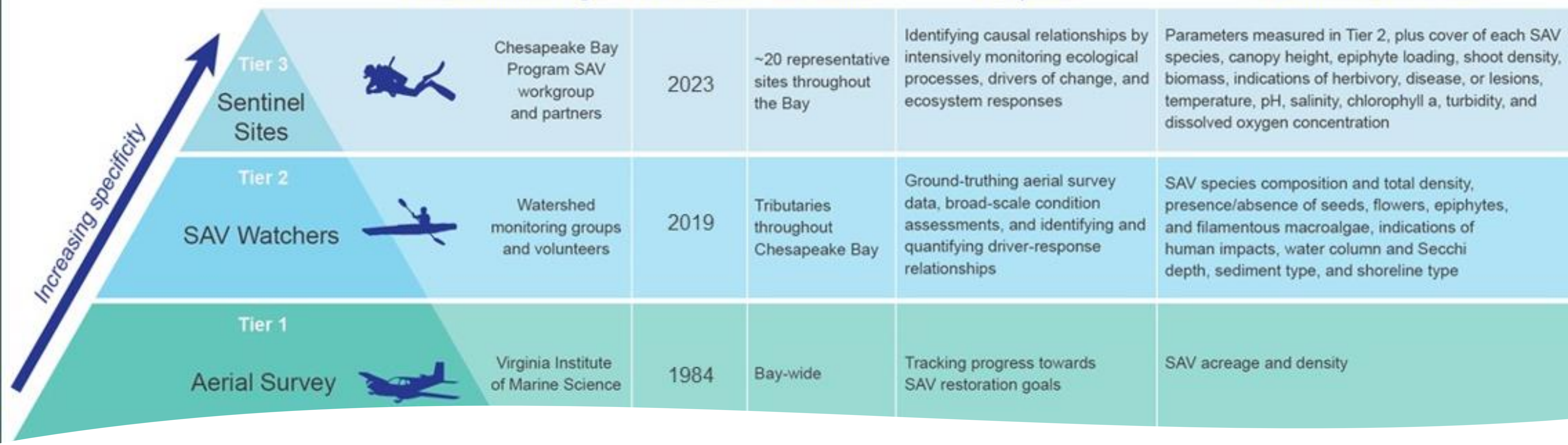
Accomplishments and Highlights for 2022

Nutrients, Sediment, and Flow

- Chesapeake Bay sees smaller than average dead zone in 2022
- Water quality throughout the Chesapeake Bay watershed shows mixed results
- USGS calculates loads and trends through 2021 for the nine major rivers entering Chesapeake Bay

Factors Affecting Water Quality

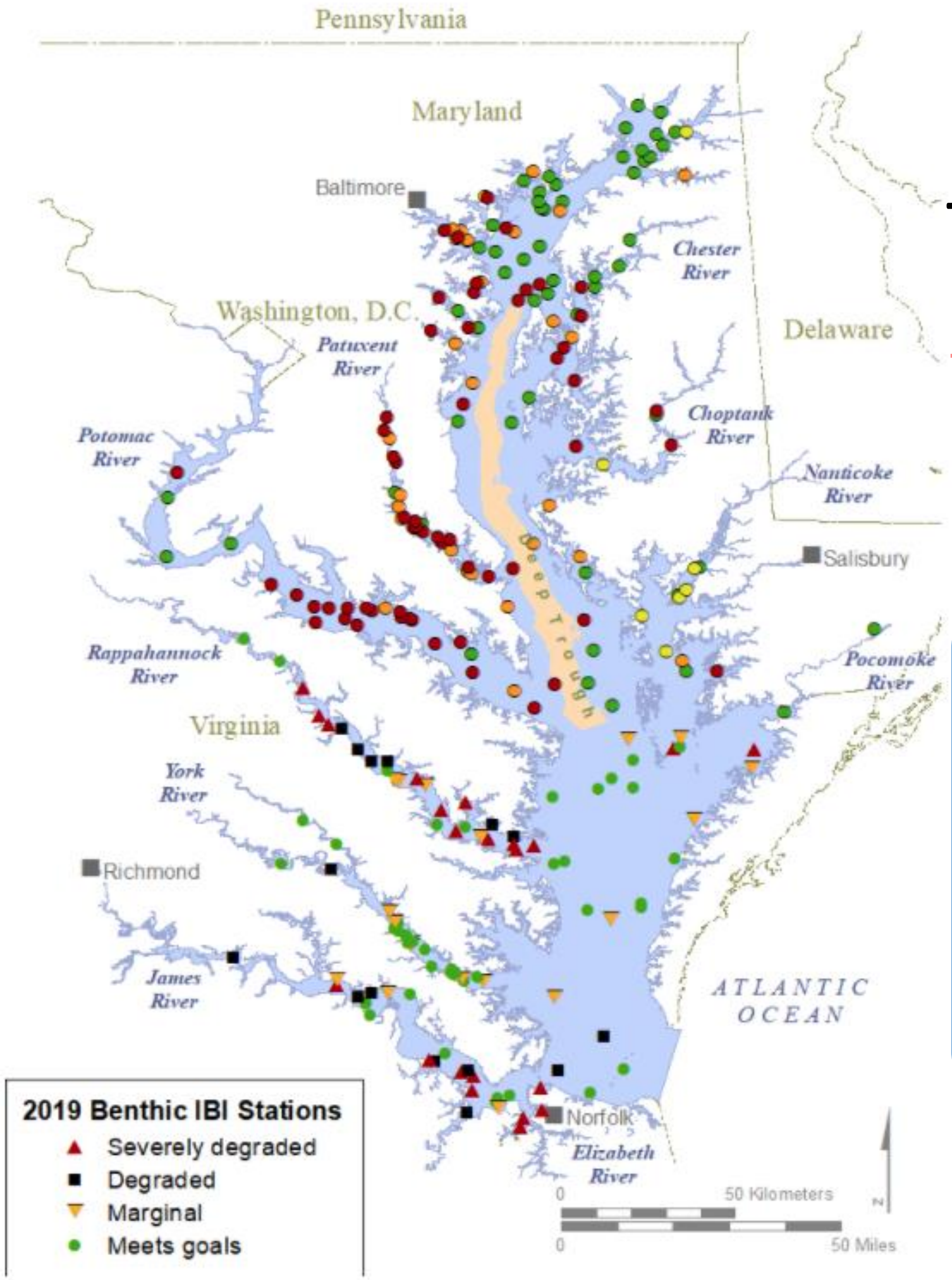
- Greatest Opportunities for Future Nitrogen Reductions to the Chesapeake Bay Watershed are in Developed and Agricultural Areas
- USGS Chesapeake Publication Receives National Award for Superior Communication Product
- Unique 20-year study assesses ecosystem response to different types of stormwater management
- New study shows importance of streambank erosion and floodplain deposition on sediment, phosphorus, and nitrogen sources and transport in the Chesapeake watershed



	Who is monitoring?	Year started	Location	Purpose	Parameters monitored
Tier 3 Sentinel Sites	Chesapeake Bay Program SAV workgroup and partners	2023	~20 representative sites throughout the Bay	Identifying causal relationships by intensively monitoring ecological processes, drivers of change, and ecosystem responses	Parameters measured in Tier 2, plus cover of each SAV species, canopy height, epiphyte loading, shoot density, biomass, indications of herbivory, disease, or lesions, temperature, pH, salinity, chlorophyll a, turbidity, and dissolved oxygen concentration
Tier 2 SAV Watchers	Watershed monitoring groups and volunteers	2019	Tributaries throughout Chesapeake Bay	Ground-truthing aerial survey data, broad-scale condition assessments, and identifying and quantifying driver-response relationships	SAV species composition and total density, presence/absence of seeds, flowers, epiphytes, and filamentous macroalgae, indications of human impacts, water column and Secchi depth, sediment type, and shoreline type
Tier 1 Aerial Survey	Virginia Institute of Marine Science	1984	Bay-wide	Tracking progress towards SAV restoration goals	SAV acreage and density

SAV

- Quantifying SAV habitat distribution and density through the Bay, critical to life of living resources
- Tracks progress towards SAV Chesapeake Bay Watershed Agreement Goals
- Determine SAV carbon flux and storage potential

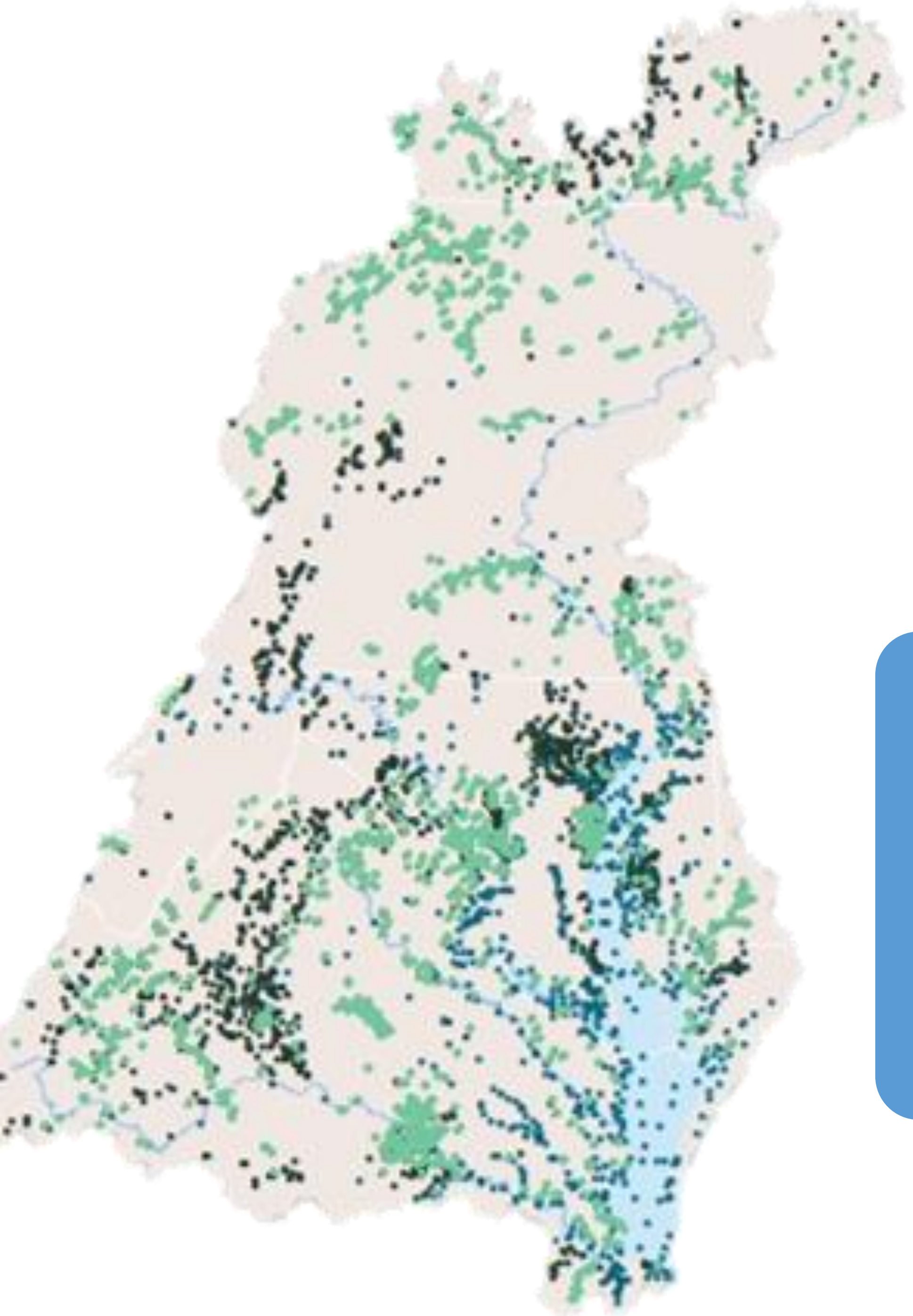


Tidal Benthic

Established in Maryland in 1984 and Virginia in 1985

53 fixed-site monitoring sampling for trends

200 random sites to create index of communities meeting or failing restoration goals



Community Science

Chesapeake Monitoring Cooperative (CMC) formed in 2015, MOU in 2018

Improve data density by using non-traditional partner data sources

Over 600,000 data publicly available in Chesapeake Data Explorer

Land Use Land Change

Critical for achieving multiple outcomes in Watershed Agreement

Benefit local communities while minimizing environmental damages

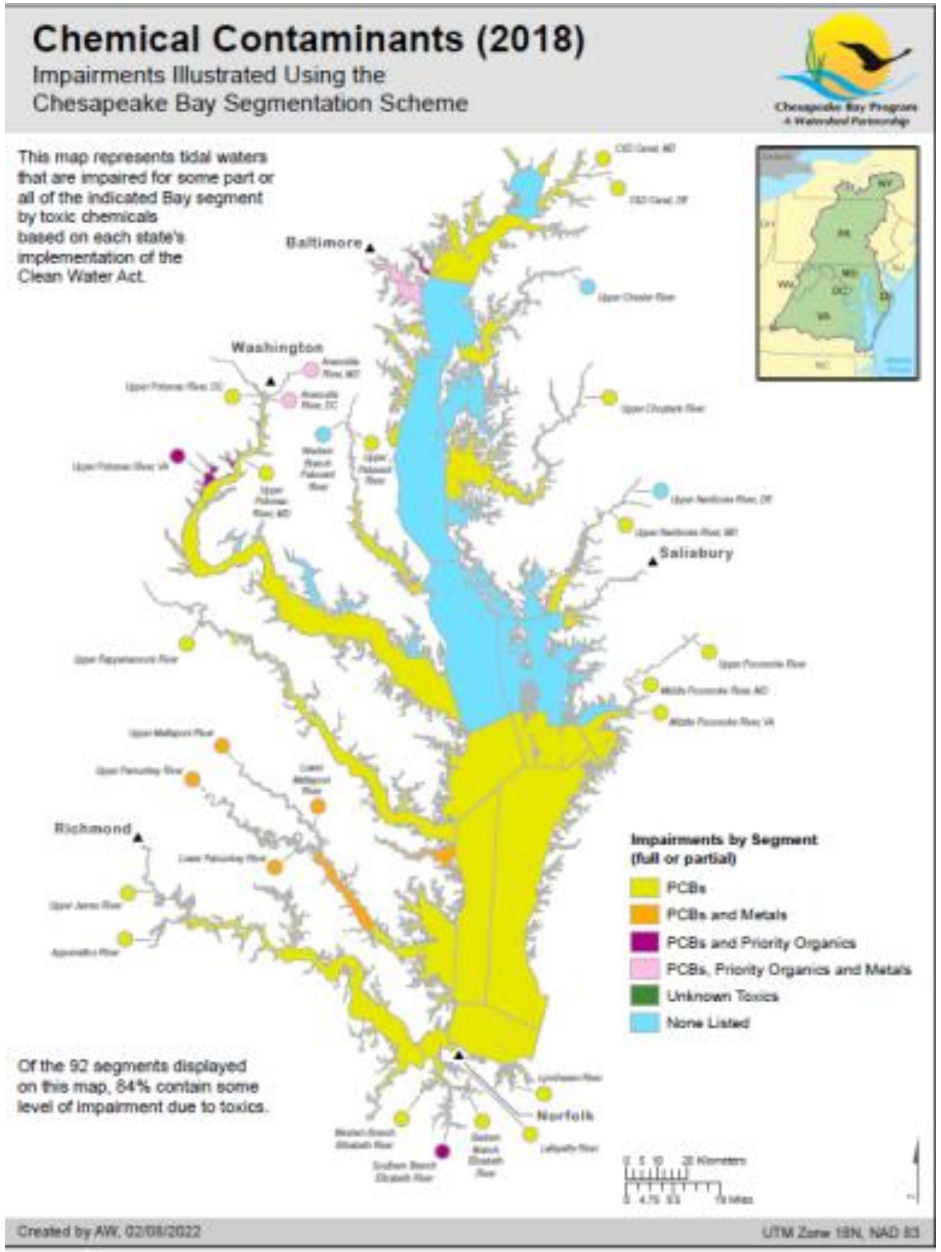
Highest spatial resolution for this size are in the country

Toxic Contaminants

Lack CBP network for contaminants

Establish network to detect changes in PCBs from local TMDLs

Supplement existing sampling in selected places



Recommendations

Tidal	Nontidal	SAV	Benthic	Community Science	Land Use Land Change	Toxic Contaminants
6	9	7	1	5	1	1

Photo Credit: Will Parsons (Alliance)

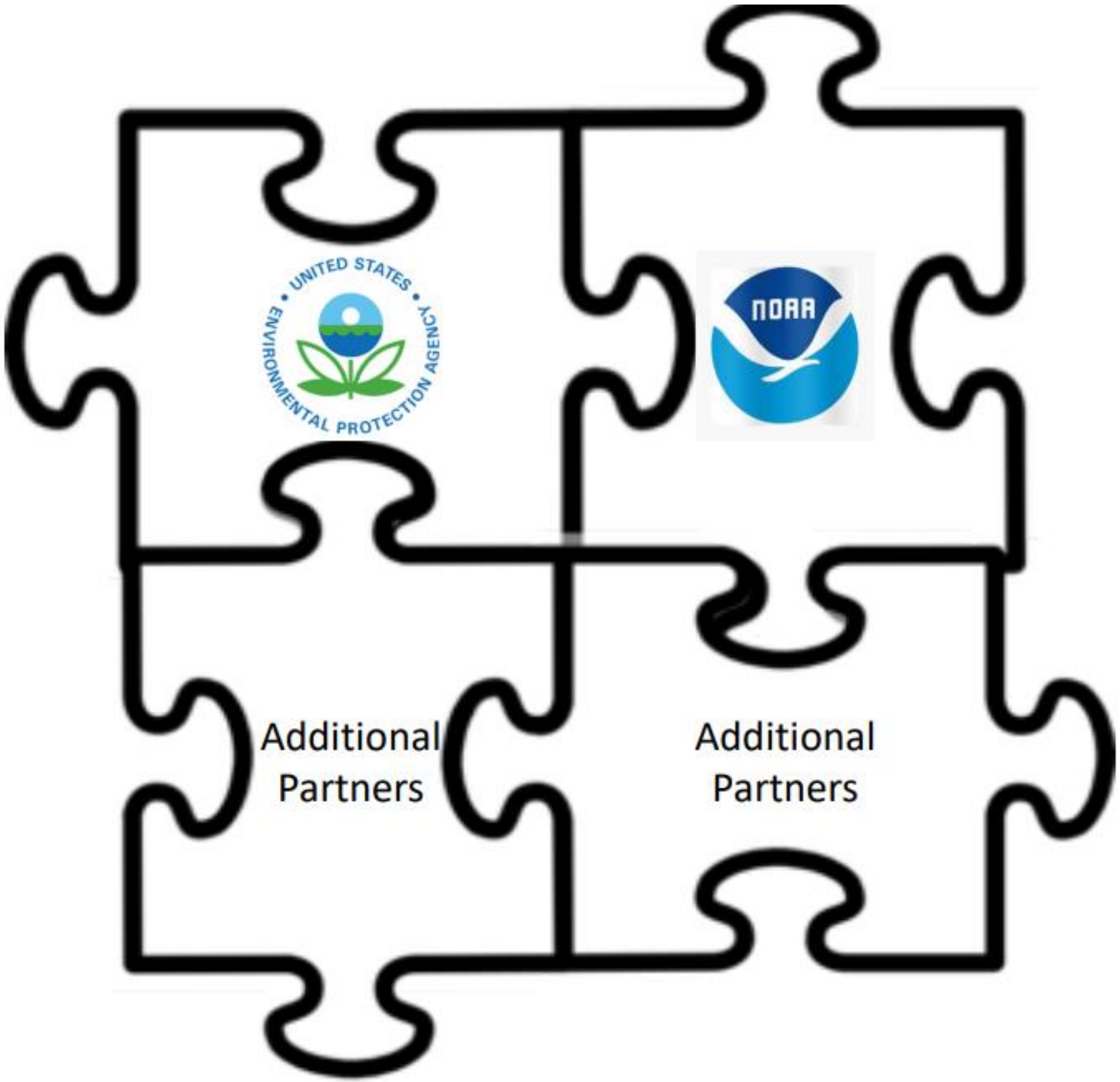
Tidal Long Term Water Quality Network

RECOMMENDATIONS

- $304,000 Yr1, increasing by $90,000 per year for Yr2 & Yr3 and $100,000 per year for Yr4 & Yr5. Operations. Support network sustainability and integrity. Annual cost to tidal network funding addressing existing cost of living impacts in MD.
- $500,000. Capital Cost. Enhance hypoxia network efficiency and capacity with one time purchase of equipment and supplies for 8 advanced vertical profile water quality monitoring stations.
- $300,000 Yr1, Plan annual increase of 5% COLA. Operations. Deploy and maintain the expanded hypoxia monitoring network arrays to address short duration water quality criteria and fish habitat health assessment.
- $275,000 Yr1 – Yr2. Operations. Nutrient limitation annual survey. Verify predictions on management progress, calibrate bay models.
- $30,000 Yr1, Plan 3% annual COLA. Operations. Accounting for VADEP COLA.
- $60,000 Yr1 – Yr5. Operations. Design & implement the 4-D interpolator. Support water quality criteria attainment assessments.
- **Total Capital cost investment need**: $500,000
- **Total Operations and maintenance annual investment need**: $969,000 Yr1, requiring increases to accommodate COLA needed each year in Yrs 2-5 depending on recommendation.
- ***Funding for data analysis and reporting are not included the estimates.**

Building Monitoring Capacity

- To sustain funding for recommendations in the long-term, *Need a multi-partner approach* to invest in monitoring.
- Example: Hypoxia collaborative



How can you help?

- Initial investment secure for majority of recommendations.
- Remaining recommendations need secured funders
- Begin discussion on sustaining long-term monitoring of enhancements

Photo Credit: Will Parsons (Alliance)