

Summary of Monitoring Needs and Investments

In March 2021, the Principal Staff Committee (PSC) requested a report on how to improve Chesapeake Bay Program (CBP) monitoring networks. The monitoring networks include (1) CBP core networks supported primarily by EPA Chesapeake Bay Program funding, and (2) partnership networks supported by multiple federal and state agencies. This summary provides the key findings of the report, which are based on engaging the CBP partnership on the status and needs of existing networks, addressing information gaps for Watershed Agreement outcomes. Recommendations and cost estimates were developed to improve existing networks and are presented as a menu of investment opportunities. CBP partners can choose individual items that collectively will improve monitoring toward multiple outcomes.

Key Findings

1) Monitoring is critical to meeting Bay Program goals

Monitoring is critical to tell the story of progress and challenges toward meeting the goals of the 2014 *Chesapeake Bay Watershed Agreement*, which focus on improving the health of the Bay and its watershed. The improved monitoring will allow the CBP partners to demonstrate progress from water-quality, restoration, and conservation efforts and identify gaps where more progress is needed.

2) Monitoring is insufficient to meeting partners needs

There is significant monitoring, conducted by multiple CBP partners, which provides consistent evaluations over time for tracking progress towards about half of the CBP outcomes. However, monitoring for the remaining CBP outcomes is insufficient, including attainment of tidal water quality standards, and urgently needs to be improved by 2025.

3) Opportunities for funding exist

The CBP partners have a unique opportunity to use funding from the 2021 Bipartisan Infrastructure Law to support the partnership's monitoring needs. Additionally, monitoring capacity can be increased through further support from individual partners via new or redirected investments. Funding is needed to maintain monitoring networks, grow and enhance these networks and invest in new monitoring opportunities that address critical gaps to assess progress toward the CBP outcomes.

Investment Recommendations

The Monitoring Review was guided by the CBP Scientific, Technical Assessment and Reporting (STAR) team and the CBPO monitoring team, with input from STAC leadership. The monitoring team interacted extensively with the Goal Implementation Teams and partners currently responsible for operating and maintaining CBP monitoring networks to evaluate their information needs, determine their priorities, and discuss potential enhancements to monitoring efforts to address the priorities and needs. The monitoring team developed recommendations for investments in CBP networks, and priorities for new monitoring, around 3 themes (Table 1):

- **Assess tidal water quality standards to support living resources**
- **Evaluate implementation priorities for watershed-based outcomes**
- **Document CBP progress toward *Watershed Agreement* goals and outcomes**

Table 1. A Summary of Themes and Investments to Improve Monitoring			
	Assess tidal water quality standards to support living resources.	Evaluate implementation priorities for watershed-based outcomes.	Document CBP Progress toward <i>Watershed Agreement</i> goals and outcomes
Existing traditional CBP Water quality-focused monitoring and assessment networks to maintain	Tidal WQ Monitoring SAV annual survey Benthic annual survey Community Science	Nontidal Network Land Change Community Science	Land change SAV
Partnership monitoring supporting diverse outcomes to maintain	Oysters, Blue Crabs, Climate (temperature)	Stream Health, Fish Passage, Healthy Watersheds	Citizen Stewardship, Local Leadership, Diversity, Student, Sustainable Schools, Environmental Literacy Planning, Public Access
Investments recommended for existing traditional CBP Water quality-focused networks	Estimated investments: \$2.08M Infrastructure: \$780K O&M: \$1.3M -Enhance Tidal, SAV, Benthic, and community science networks to meet requirements to assess WQ standards; Improve SAV assessments.	Estimated investments: \$2.56M Infrastructure: \$956K O&M: \$1.61M Enhance NT network and Community Science to assess nutrient and sediment practices; enhance land change monitoring for riparian forest buffers and wetlands	Estimated investments: \$276K -Enhance tidal and NT to assess PCB reductions (toxic contaminants) (\$0.3M) -More outcome monitoring need cost estimates to be developed over 1-3 years for these efforts.
Establish a more coordinated (or new) monitoring network for CBP Outcomes	Wetlands (coastal), Forage Fish (plankton), Climate (OA, blue carbon)	Brook Trout, Black Duck	Forage Fish, Fish Habitat (shallow water monitoring, fish habitat assessment), Climate

Theme 1: Assessing Tidal Water Quality Standards to Support Living Resources

The CBP has multiple partners monitoring to assess progress toward blue crabs, oyster restoration, SAV, and assessing water-quality standards. Of these outcomes, assessing tidal water-quality standards needs the most improvement. The CBP is under regulatory mandates to reduce nutrients and sediment from the watershed to improve water-quality conditions for fisheries and habitats across the region (EPA 2003).

Gaps to address

- No tidal segment in the Chesapeake Bay has been assessed for its full suite of dissolved oxygen, water clarity/SAV and chlorophyll *a* criteria across all seasons and designated uses.
- Without this information, and CBP can't fully assess progress (1) towards attaining water-quality standards, (2) impacts of nutrient- and sediment-reduction efforts, and (3) water-quality improvements to support crabs, oysters, and other fisheries.

Recommended investment (COST: \$2.08M) (see Section 1 for more details)

One-time capital investments:

- Address short-duration dissolved oxygen criteria by establishing a high-frequency, water-column sensor system
- Develop new SAV protocols for use of satellite image collection, data management, and AI interpretation and alignment with historical data.
- Implement Chesapeake Bay SAV Sentinel Site Monitoring Program to inform AI development of satellite imagery and monitor changes in SAV habitat.
- Incorporate volunteer SAV Watchers data into Chesapeake Monitoring Cooperative database

Long-term operations and maintenance costs include:

- Cost of living and inflation increases to sustain tidal water quality, tidal benthic macroinvertebrate, SAV, and hypoxia monitoring programs.
- Develop and implement 4D interpolator to ingest available data to output assessments for all frequencies provided for dissolved oxygen criteria.
- Enhancing network efficiency and capacity to maintain high frequency open water hypoxia monitoring program
- Management of Sentinel Site Monitoring program
- Coordination for Community Science SAV Watchers Monitoring program to allow for broad-scale condition assessments and identifying and quantifying driver/response relationships.
- Conduct nutrient limitation survey to verify predictions on management progress

Theme 2: Evaluate Implementation Priorities for Watershed-based Outcomes

Under the Bay TMDL, a shared priority of all jurisdictions is to document water-quality improvements from nutrient and sediment reduction practices that must be implemented by 2025; which will reduce loads to tidal waters resulting in progress toward standards attainment to support living resources (Theme 1).

Gaps to address

- Further explaining the factors (such as changing land use and climate) affecting the response of water-quality to better assess the effectiveness of nutrient and sediment-reduction efforts.
- Better targeting the placement of nutrients and sediment practices in agricultural watersheds and assessing water-quality response in local waters.
- More frequent data on nutrient and sediment loads to improve understanding of tidal- water changes.
- More data specific to how water-quality practices provide benefits and improved understanding for other outcomes.

Recommended investment (COST: \$2.56M) (see Section 1 for more details)

One-time capital investments include:

- Adding continuous monitoring equipment at River-Input monitoring (RIM) stations and strategic Lower Susquehanna Reservoir stations to better detect changes in nutrient and sediment concentrations and understand watershed and tidal water quality response to management actions. 3 of the 9 RIM stations now have continuous monitoring.
- Increase continuous monitoring infrastructure in selected small watersheds to assess water-quality response, better understand management effectiveness, and further inform targeting applications of nutrient and sediment practices.
- Improve associated data (such as land-use change and BMP tracking) to continuously improve explanation of patterns, trends and response to management practice, and potential benefits to other outcomes.

Longer-term operational costs include:

- Retooling of grants to sustain existing NTN sites and improve monitoring in the Susquehanna basin.
- Enhancing network efficiency and capacity to maintain new continuous monitoring stations of major river RIM stations and strategic Lower Susquehanna monitoring sites.
- Support coordinator of community science Nitrate Monitoring program to address gaps in understanding water quality improvements from restoration practices.

Theme 3: Documenting CBP Progress toward Watershed Agreement Goals and Outcomes

CBP is committed to tracking the progress toward the goals and outcomes of the *Chesapeake Bay Program Watershed Agreement* which requires accurate, current and accessible data and information on environmental health for all outcomes. A recent evaluation by the Management Board on the progress toward attaining the outcomes revealed:

- Some of the outcomes are off course (such as forest buffers, brook trout, SAV,)
- Some lacked information to assess progress (including stream health, tree canopy)
- Others lacked targets or timeframes to evaluate progress or their achievement (15 of the outcomes).

Gaps to address

- Monitoring is insufficient for a majority of CBP outcomes representing a critical need for informed understanding for outcomes that are behind in attainment including forest buffers and wetlands.
- For some outcomes, individual monitoring efforts by different partners could be better enhanced. Examples include stream health and brook trout.
- For other outcomes, a new coordinated monitoring effort needs to be designed and established.

Recommended investment (COST: Toxics \$0.3M, with other outcomes to be determined, see Section 2 for more details)

One-time capital investments include:

- Monitoring PCB response to management efforts would benefit states and local jurisdictions. For one geographic-focus area the estimated annual cost is about \$0.3M.
- Take advantage of on-going efforts and recommendations from upcoming workshops addressing CBP issues including wetlands, forests, PFAS, rising water temperature, and microplastics.

Longer-term operational costs include:

- Additional monitoring is necessary to understand how climate change impacts will directly affect outcomes and determine if it will limit ability to reach restoration targets. Examples include public access site development and SAV.

Investment from partners (see Section 3 for more details)

A partnership approach, relying on multiple federal and state agencies, local governments, academic institutions, and nongovernmental organizations is needed to address the vast scope of monitoring needs (Figure 1). The CBP partners have a unique opportunity to use the Infrastructure Law funding to provide short-term capital improvements to improve monitoring by 2025. Modifications to current jurisdictional work and enhancement to current monitoring support provides opportunities for more long-term operational costs.

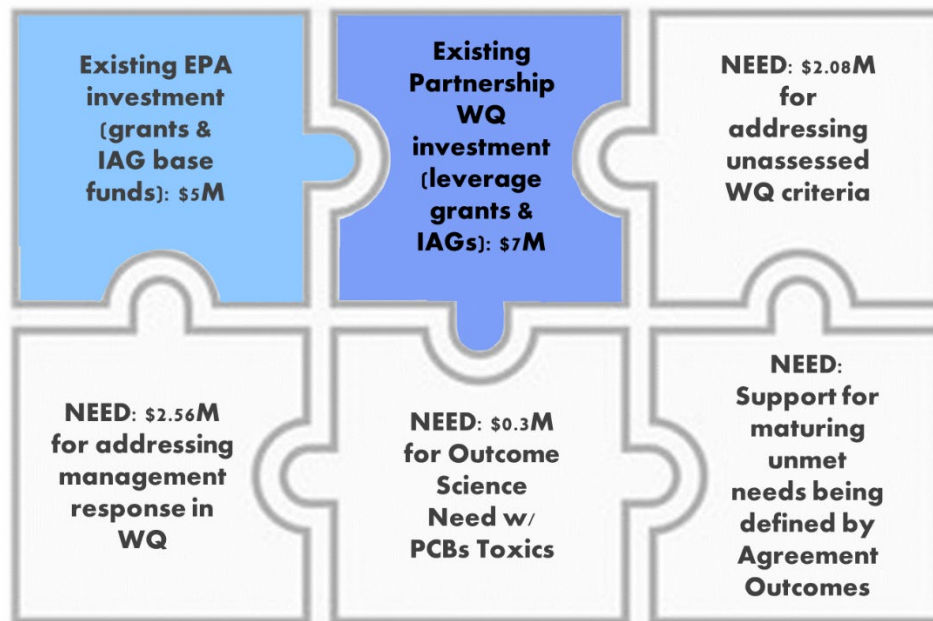


Figure 1. Envisioning an expanded set of investments across the CBP partnership to address critical monitoring needs identified during the review.

For both short-term capital investments and long-term operational costs, CBP partners can identify opportunities that align with their priorities and are willing to support, which will result in a collective increase in CBP monitoring capacity. Agencies can choose from the menu of recommendations needed

to enhance water quality monitoring and improve tracking progress toward CBP outcomes. CBP monitoring networks have a solid foundation of investments with partner support to help function, but there is a gap in investments to maintain, grow, and enhance monitoring networks for all outcomes. Current investments plus additional measures are needed to fulfill the recommendations so the CBP can have monitoring in place to assess progress toward the outcomes in the Watershed Agreement.