Maryland

Chesapeake Bay Restoration Spending Report SFY2024

Garrett County - Stephen Badger, **Clopper Lake in Fall** - Chowdhury Shams, **Franklin Point State Park aerial photo** - Resource Restoration Group, **Grainfield foreground** – Gladys Sewell
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Maryland Department of Natural Resources
Maryland Department of Agriculture
Maryland Department of Planning
Maryland Department of Budget and Management
Maryland Department of Transportation

Executive Summary

A. Purpose

The Chesapeake Bay (Bay) lies at the core of Maryland's culture. While the threats to achieving a healthy and vibrant Bay are significant and complex, the environmental, social, and economic benefits of a healthy Bay are far greater. Maryland is firmly committed to our Bay restoration goals, and we have meaningful and measurable program activities, policies, and financing initiatives to achieve our goals. Inherent in all of these goals is the need for cross-collaboration and sharing of financial and technical resources to reinvigorate, rethink, and re-engage in all restoration efforts.

At the same time, new scientific findings, lessons learned over 40 years of restoration, changing environmental conditions, and new policies at the State and federal level require that we modernize restoration programs to sustain future progress. Maryland is shifting our Bay restoration efforts away from numerous, unconnected, or loosely connected nutrient and sediment reduction projects that are focused on and measured in the deepest parts of the Chesapeake Bay and is now advancing a holistic, targeted, comprehensive landscape-level ecosystem restoration strategy that reduces nutrients and sediments, improves critically important shallow-water nearshore habitats, while promoting multiple co-benefits. Our goals are to reinvigorate core restoration actions in Maryland that are working to reduce pollution, rethink new restoration efforts in response to emerging science and lessons learned over the last 40 years to sustain Maryland's progress, and re-engage Marylanders to shape a renewed and shared vision for achieving Bay restoration.

The following is a summary of Maryland's framework for realizing those goals in response to the Joint Chairmen's Report (JCR) of the 2024 General Assembly Session (pages 96-97) requesting that the Maryland Departments of Planning (MDP), Natural Resources (DNR), Agriculture (MDA), Environment (MDE), and Budget and Management (DBM) provide:

1. State Fiscal Year (SFY) 2024 spending on Bay restoration and associated Bay health responses,
2. Projected SFY25 spending on Bay restoration and expected Bay health responses,
3. A framework of needed regulations, revenues, laws, administrative actions and their resulting impacts on individuals, organizations, governments, and businesses SFY24–25 to realize a restored Bay,
4. An analysis of options for financing Bay restoration,
5. An analysis of the cost effectiveness of existing Bay Restoration fund sources, and
6. Updated information on Phase III Watershed Implementation Plan (WIP) implementation and how the impacts of Conowingo Dam infill, growth, and climate change will be addressed.

It is critical to recognize that these JCR responses are based on an extremely complex, unpredictable, and constantly improving suite of scientific understandings, fiscal realities, and policy initiatives. The agencies have responded to the requests based on the current landscape of laws, regulations, and water quality monitoring data and modeling tools. Requests will undoubtedly vary and change as time progresses, and responses must change accordingly if the state is to realize its goals.

B.Regulatory Framework

The Bay Total Maximum Daily Load (TMDL) required under the federal Clean Water Act (CWA) sets the pollution limits necessary to restore the health of the Bay and its tidal tributaries. The TMDL–developed in close collaboration with Maryland and all Bay watershed jurisdictions–sets regulated limits on the amount of nitrogen, phosphorus, and sediment pollution that can enter the Bay and its tidal rivers, and still meet water quality standards. Maryland and the other six Bay watershed jurisdictions (Virginia, Pennsylvania, Delaware, West Virginia, New York, and Washington, D.C.) were required by the U.S. Environmental Protection Agency (EPA) to implement sufficient pollution reduction practices by 2025 to meet the TMDL. However, a decision was made to make any reductions required to address nutrient loads identified with recent model updates after 2025.

To provide reasonable assurance that the TMDL will be met, the EPA has directed each jurisdiction to develop watershed implementation plans (WIPs) that detail the regulatory and non-regulatory actions the jurisdiction will take by 2025 to meet its TMDL. WIPs have been required since 2010. In August 2019, Maryland and the other Bay jurisdictions all submitted our Phase III WIPs, which detail the strategies for meeting the 2025 restoration targets. As part of the accountability framework for achieving the 2025 restoration targets, EPA and the Bay jurisdictions develop short-term goals, called milestones, to increase restoration work and ensure progress. In January of 2022, Maryland submitted a Phase III WIP addendum to address additional load reductions required due to climate change conditions that are needed to meet TMDL endpoints by 2025.

In addition to the suite of actions detailed in the WIP and 2-Year milestones, all seven watershed jurisdictions, the federal government, and the Chesapeake Bay Commission, a tri-state legislative commission, signed the Bay Watershed Agreement in 2014, which commits the signatories to a wide variety of related Bay restoration activities beyond the pollution reduction actions required by the TMDL (like stewardship, environmental literacy, sustainable fisheries, climate resiliency, and diversity).

In recent years enhancements to water quality model data sets used by EPA have led to additional nitrogen loads that the state will need to offset after the 2025 Chesapeake Bay TMDL deadline. The total amount of that unaccounted additional load (UAL), or Interim Targets, is approximately 1.5 million pounds of nitrogen that will need to be reduced to meet our TMDL goals. Our reduction requirements for phosphorus and sediment decreased and no UAL was assigned to Maryland.

C.Maryland's TMDL Progress and Plans

Between SFY00–24, Maryland spent about $15.9 billion on Bay Restoration activities. This amount includes funding for activities that directly reduce nutrient and sediment inputs to the Bay (like cover crops and WWTP upgrades), activities that support the broader commitments of the 2014 Bay Watershed Agreement (like monitoring, education, outreach), and activities that prevent or minimize future degradation of the Bay (like land conservation). From 2010–2020, Maryland had successfully implemented actions to reduce the amount of nitrogen entering the Bay by approximately 11.2 million pounds. The state's monitoring of water quality and habitat conditions in Maryland's streams, rivers, and the Bay has shown increased resilience and improvements to our waters because of these actions. However, during SFY21 & SFY22, due to operational issues at two of the major WWTPs in Baltimore City, the total amount of nitrogen reduction to the Bay was approximately 9.2 million pounds, which was less

than originally planned. Maryland has worked with the city through several consent decrees to bring the two plants back to operating at ENR levels within the tail end of SFY22. Through these efforts, the State has achieved its 2025 goals in this source sector in SFY23 and will continue to monitor discharge reports to ensure continued achievement of this goal.

Under Maryland's Phase III WIP, which included Chesapeake Assessment Scenario Tool (CAST) 2019 model changes, the state needs to reduce its pollution to the Bay by more than 9 million pounds of nitrogen, and 100,000 pounds of phosphorus from 2017 levels. These reductions will come primarily from the wastewater and agricultural sectors. By 2025, these sectors are expected to reduce their nitrogen loads from 2017 levels by 41%, and 20%, respectively. Loads from the stormwater and septic sectors are anticipated to remain constant or slightly increasing, with reductions from implementation being offset by loads from new growth. It will be important, however, for the stormwater and septic sectors to increase implementation beyond 2025 to offset the impacts of expected future growth to remain under our TMDL. In the most recent iteration (Generation 5) of the Phase I large and medium Municipal Separate Storm Sewer System (MS4) permit, MDE included an average 11% impervious acre statewide retrofit goal for the developed stormwater sector. Currently, the last Generation 5 permit is being developed for Maryland's State Highway Administration.

The Bay model version used by the Chesapeake Bay Program (CBP) to evaluate Maryland's Phase III WIP indicated that the state's plans achieved 1 million pounds more nitrogen reduction and 440,000 pounds more phosphorus reduction than needed to meet EPA's pollution reduction targets. These additional reductions provided Maryland with a margin of safety by creating a surplus that could be applied toward achieving climate change allocations. In 2019, updates to the Bay model reduced this surplus to about 394,000 pounds of nitrogen and 330,000 pounds of phosphorus. In 2022, Maryland submitted an addendum to its Phase III WIP and developed 2022/2023 milestones to address the impacts of climate change quantified by CBP. This climate addendum used all of Maryland's surplus pollution reductions while also requiring wastewater treatment plants (WWTPs) to perform much better through financial incentives.

Maryland and the other Bay jurisdictions also finalized a collaborative Conowingo WIP (CWIP) to reduce the estimated 6 million pounds of nitrogen entering the Bay because of the Conowingo Dam infill in a phased approach that will extend beyond 2025.

D.Reaching Our 2025 Goals and Sustaining Restoration into the Future

Moving toward the 2025 restoration deadline, Maryland has a narrower path to achieving and sustaining our Bay Restoration goals than was anticipated in the Phase III WIP. Increased climate loads calculated after the Phase III WIP was developed cut into Maryland's planned pollution reduction surplus that had provided a margin of safety in achieving our 2025 goals. Data updates to the CAST, a water quality planning and modeling tool used to measure our estimated progress, now indicate less progress reducing nitrogen than anticipated during the Phase III WIP development. At the same time, operations and maintenance failures at our largest WWTPs have highlighted needs for preventive maintenance and more certified plant operators. In addition to a need for trained WWTP operators, there are other workforce needs to scale up nonpoint source pollution reductions, such as agricultural technical assistance, private sector capacity to design and install pollution reduction and climate resilient best management practices (BMPs), and maintain installed projects. The Bipartisan Infrastructure Law (BIL) will provide additional support to our Bay restoration effort. Since most of the BIL

funding is going into existing competitive grant programs, there is an ongoing need to build capacity to compete for this funding and to manage and implement projects.

Meeting Maryland's existing Phase III WIP, and 2014 Bay Watershed Agreement commitments, addressing the impacts of climate change, implementing a CWIP, and offsetting future growth will be challenging, but not impossible. Maryland's Phase III WIP identified seven "guiding principles" to ensure success in this effort, including:

1. Balancing regulations and incentives.
2. Using WWTP capacity wisely while driving long term and sustained progress in the slower paced sectors.
3. Creating a restoration economy and driving innovation.
4. Locally driven restoration and co-benefits.
5. Accounting for and leveraging conservation and protection programs.
6. Holistic ecosystem management.
7. Accountability and adaptive management framework.

We are maximizing outcomes for the Bay by utilizing innovative and emerging technology and industries, environmental and STEAM (science, technology, engineering, arts and mathematics) education, promoting economic value in restoration, and connecting with underserved, overburdened and under- and unemployed communities. Inherent in all of the Bay restoration goals is the need for cross-collaboration and sharing of financial and technical resources to ensure success. This is achieved by maximizing and continually improving the cost effectiveness of Maryland's three primary Bay restoration funding programs: the Bay Restoration Fund (BRF), the Chesapeake and Atlantic Coastal Bays Trust Fund (Trust Fund), and the Maryland Agricultural Water Quality Cost Share (MACS) Program. Funds from these programs can, in turn, be leveraged with funds from more focused state programs [like Program Open Space (POS), Water Quality Revolving Loan Fund (WQRLF)], federal infrastructure programs like Conservation Reserve Enhancement Program (CREP), local funds, and the private sector. Maryland has a strong tradition of remaining grounded in sound science while pushing the envelope on innovative policies (like the recently established Whole Watershed Act and initiatives (like water quality trading, Transportation-Infrastructure Restoration Partnership, Grants Gateway, Innovative Technology Fund, recognizing and reacting to the co- benefits of stormwater mitigation projects), which place it in a strong position for success.

However, it is imperative that operational funding be sufficient to staff our capital and regulatory programs, through appropriate administrative and regulatory fee structures, at fully self-sustaining levels to ensure robust programmatic oversight and enforcement.

As we look beyond 2025, Maryland will likely have the ongoing challenge of reducing loads due to climate change and population growth impacts as determined by new science, modeling tools, and data. The Moore Administration is rebooting our restoration effort through a new Executive Order designed to accelerate restoration in the face of these challenges, while ensuring equitable distribution of the benefits. In addition, the Whole Watershed Act (SB 969/HB 1165) provides funding for different grants crafted to aid in the restoration of Chesapeake and Atlantic Coastal bays. This Act provides $20,000 per project (up to up to $100,000 total per fiscal year) from FY26-FY30. Applications are due early December every year.

Regarding Conowingo Dam's pollution impacts, the phased approach that goes beyond 2025

will allow more time for jurisdictions to reduce Conowingo pollution loads while Maryland ramps up pay- for-success financing with its historic $25 million investment. With the potential for future data and model updates to impact our progress, we will need to ensure that robust scientific vetting processes are in place through the CBP partnership. Lastly, technical and financial assistance is being expanded to support our farmers and a growing number of diverse, small farm operations. Additional work will still be required to achieve ambitious agricultural sector pollution reductions but will be guided by recent science and strategies focused at farm-level management and conservation.

Introduction

A. Historical Perspective

In 2010, after decades of voluntary efforts to fully restore the Bay, the EPA established regulatory limits under the federal CWA to restrict three major pollutants in the Bay's waters: nitrogen, phosphorus, and sediment. These limits, known as TMDLs, are science-based estimates of the amount of each substance that the Bay and its tributaries can receive and still meet standards for clean, healthy water. The pollution limits require the seven Bay watershed jurisdictions (Maryland, Virginia, Pennsylvania, Delaware, West Virginia, New York, and D.C.) to have pollution reduction practices in place to achieve these limits by 2025. It is important to note, however, that fully restored water quality standards will not be realized until sometime after 2025 due to time lags between when the practices are implemented and when the ecosystem responds.

To provide reasonable assurance that the TMDL would be achieved the EPA directed jurisdictions to develop WIPs that detail the specific actions each jurisdiction will take to meet their 2025 limits. The EPA recognized that the level of detail it expects the jurisdictions to include in their WIPs would take time to develop, and that the scientific understanding and tools available to meet the goals were constantly improving and, therefore, divided the process into three distinct phases:

- Phase I (submitted 2010): WIPs identified initial strategies and practices that each jurisdiction would begin implementing in 2010 to achieve 60% of the necessary pollutant load reductions by 2017.
- Phase II (submitted 2012): WIPs were a more detailed and geographically directed suite of actions informed by 2 years of implementation lessons learned and discussions with local officials. Like Phase I, the Phase II WIPs were focused on achieving 60% of the necessary pollutant load reductions by 2017.
- Phase III (submitted 2019): In 2017, CBP conducted a "mid-point assessment" during which EPA evaluated each jurisdiction's progress at achieving its Phase I and Phase II WIP commitments, applied new understandings of the science, and updated models to identify necessary mid- course adjustments. Examples of some of the identified adjustments included an increased understanding about phosphorus saturated soils, the changing conditions (infill) behind the Conowingo Dam, increased loads due to growth, and water quality impacts due to climate change. Based on new scientific understandings and lessons learned during the Phase I and Phase II WIP implementation, jurisdictions then were to submit Phase III WIPs in August 2019 that detailed actions necessary to meet 100% of the necessary pollutant load reductions by 2025.
- Phase III WIP Climate Addendum (submitted 2022): The impacts to jurisdictions' Bay Restoration efforts due to climate change were not fully understood during the preparation of the Phase III WIPs. In January 2022, climate change impacts and related strategies were incorporated into the jurisdictions' Phase III WIPs through an addendum and/or the jurisdictions' 2022-23 milestones. Maryland is leveraging existing Phase III WIP wastewater strategies that include enhanced nutrient removal (ENR), and continued operation and maintenance grants to optimize performance. The expectation is that these existing strategies will result in overall average WWTP concentrations of 2.85 mg/L nitrogen that will achieve increased climate loads. The addendum and milestones were submitted to EPA on January 15, 2022.

By successfully implementing the actions called for in its Phase I, Phase II and Phase III WIPs, Maryland has made significant progress toward its ultimate 2025 TMDL pollution reduction goals. The pollution reduction practices implemented to date are accounted for in the Bay models, which, when combined with the planned future pollution reduction strategies, help determine whether Maryland is on a trajectory to achieve its 2025 restoration goals. Figure 1 shows Maryland's modeled progress from 2010 to 2023, with projected reductions toward meeting its 2025 Phase III WIP nitrogen target, including its climate change allocation. Figure 2 shows the 2010 and 2023 nitrogen contributions by source sector.

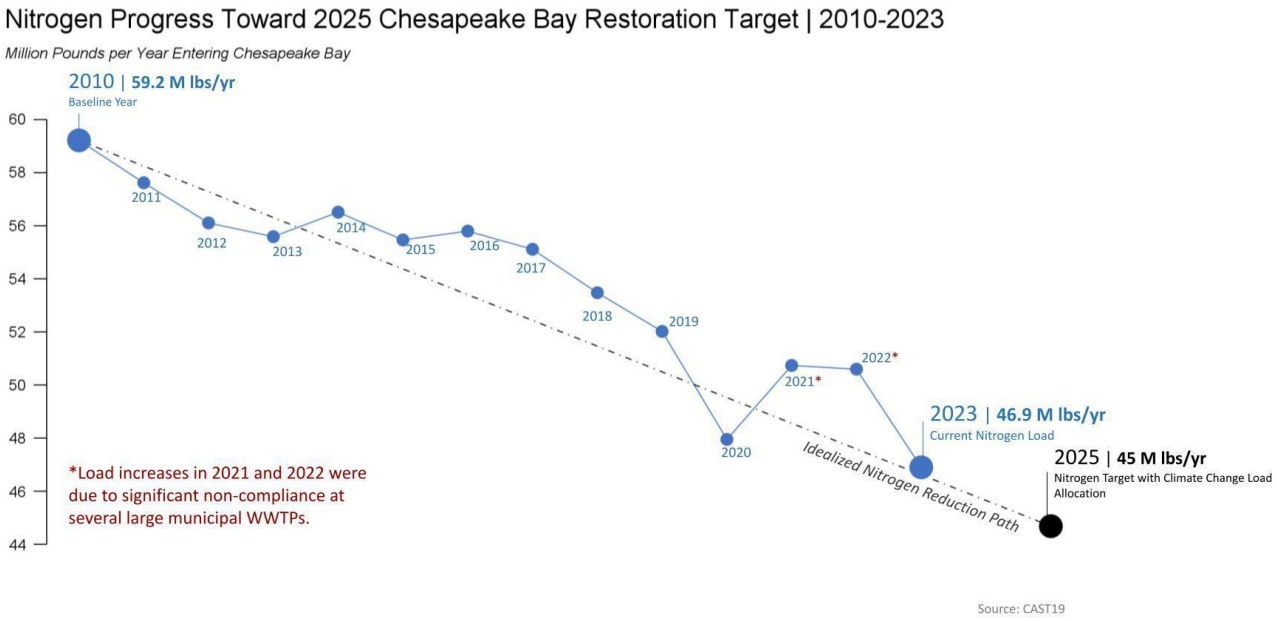


Figure 1. Modeled trends in Maryland's nitrogen loads to the Bay[1]

[1] SFY23 model trends results presented in this document were obtained from the "CAST19" version of the Bay Model. Maryland will use CAST23 results when the CBP begins to use it to measure WIP progress

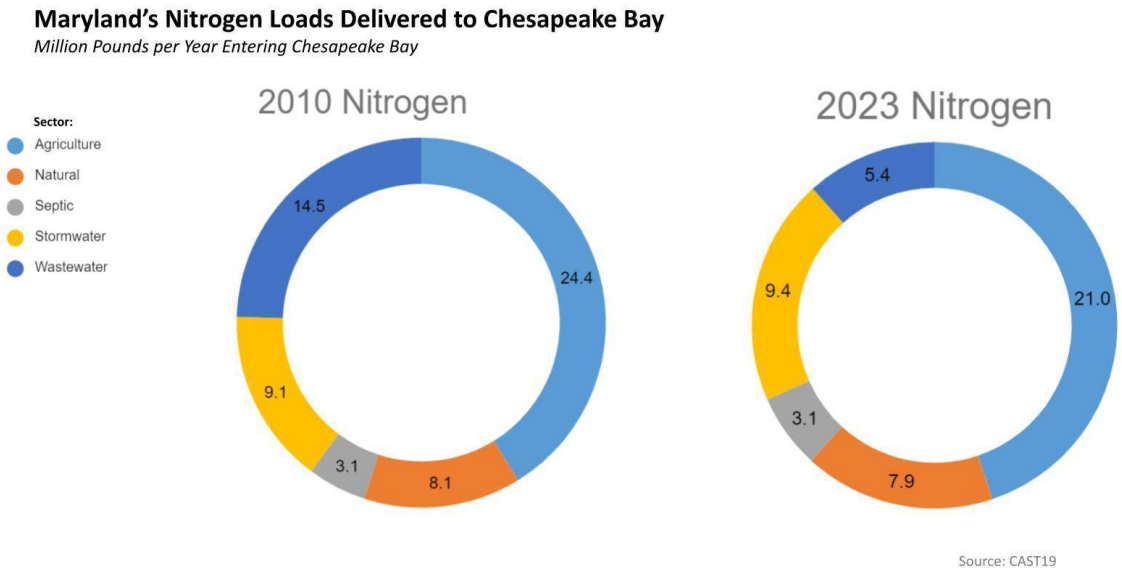


Figure 2. Maryland's modeled total nitrogen load delivered to the Bay by sector.

These past actions have addressed all pollutant sectors. Critical to realizing this progress has been Maryland's BRF and the Trust Fund and, in particular, the doubling of the BRF in 2012, and the full funding of the Trust Fund since 2017.

B.Looking Forward

When Maryland developed its Phase III WIP in 2019, we were on a path to achieving our share of the 2025 Bay pollution reduction targets. Maryland's Phase III WIP accounted for projected growth in human and livestock populations, while still achieving a nitrogen load of 44.8 million pounds per year, and a phosphorus load of 3.28 million pounds per year by 2025. At the time this exceeded our required targets by 1 million pounds of nitrogen and 440,000 pounds of phosphorus. Subsequent 2019 updates to the Bay model decreased our Phase III WIP surplus to 394,000 pounds of nitrogen and 330,000 pounds of phosphorus.

The model updates indicated that our Phase III WIP pollution reduction surpluses were not sufficient to offset additional climate change nutrient load reductions assigned to Maryland in 2020. In January 2022, MDE submitted a Phase III WIP addendum and 2022-23 milestones to EPA that describe strategies to meet the additional climate change pollution reductions, while continuing to provide a margin of safety. EPA's draft review of the Phase III WIP addendum concluded that the proposed strategies met expectations.

By 2020, Maryland was still on track to meet our 2025 WIP targets and climate allocation. The WWTP sector was very close to achieving its WIP sector targets, indicating that success was possible. However, in 2021, inspections conducted at Baltimore City's Patapsco River and Back River WWTPs found them to be in significant noncompliance. Numerous actions were taken by

MDE, the Maryland Environmental Service (MES), and the Office of the Attorney General to bring the facilities back on track as they were in 2020. Recent analyses and inspection reports indicate that they have been meeting the nutrient limits required in their permits. MDE also conducted a comprehensive review of our wastewater permitting and compliance framework and implemented improvements to both bring these facilities into compliance and prevent this from happening at other WWTPs.

Maryland has divided its total pollution reduction targets among five major pollutant source sectors, with 3 occurring in what's been identified as the developed sector (stormwater, septic, and wastewater), a combination of point and nonpoint source pollution identified in Figure 2. It is important to recognize that the pace of progress varies among sectors. This is because the pollution reduction opportunities, planning constraints, and costs vary widely between sectors. As a result, nonpoint source offsets in the developed (stormwater and septic system) sector are expected to continue through steady implementation of BMPs past 2025. The wastewater point source performance is planned to offset the slower pace of nonpoint source reductions in the developed sector allowing the state to meet its 2025 goals.

Maryland now has a more difficult path to achieving our Bay restoration goals than was anticipated in the Phase III WIP. The increased loads resulting from climate change, new data, population growth, and related model updates have cut into Maryland's pollution reduction surplus. At nearly the same time, operations and maintenance failures at our largest WWTPs highlighted challenges that can threaten the sector's progress.

We also know that future data and model updates can impact our progress and that we need to put mechanisms in place to ensure these updates have full scientific vetting through the CBP partnership. Additional model updates in 2023 would have depleted our surplus and potentially led to a load deficit for Maryland's 2025 TMDL goals. Fortunately, the Chesapeake Bay partnership decided to postpone the need to offset the loads from 2023 model updates until after the 2025 deadline.

Lastly, technical and financial assistance is being expanded to support our farmers and a growing number of diverse, small farming operations, but additional work will still be required to achieve ambitious agricultural sector pollution reductions. It is also imperative that operational funding across sectors be sufficient to staff our restoration, capital and regulatory programs, through appropriate administrative and regulatory fee structures, at fully self-sustaining levels to ensure robust programmatic fiscal management and enforcement.

The remainder of this document is organized into four parts (per the 2023 JCR section K00A14.02):

- Part I documents our progress to date - state spending on Bay restoration from SFY00– 23, and the resulting changes in Bay health.
- Part II discusses where we still need to go - a general framework for implementing Maryland's Phase III WIP and meeting our required TMDL by 2025.
- Part III describes how we are making the most of the Bay restoration resources available to us - how we are maximizing the cost-effectiveness of existing state-funded programs.
- Part IV looks to the future and discusses several financing options under consideration that will help enable the state to better fund its water quality restoration obligations.

Part I - Where We Have Been: Bay Restoration Funding and Progress to Date (SFY00-SFY24)

A. Bay Restoration Funding

Since SFY07, the Governor's annual budget highlights have included a table of Bay Restoration Activities Funded in the Budget. A gross summary table of SFY00–24 Bay Restoration spending is provided below (Table 1), and a more detailed table is attached as Appendix 1. In SFY00- SFY24, the state spent about $15.9 billion on Bay Restoration activities, $8.2 billion of which has been appropriated in the last 9 years.

Table 1. SFY00-SFY24 Maryland Bay Restoration Funding Summary

Category	Total SFY00-SFY24 Funding Amount
Bays Council Agencies Bay Restoration Funds	$ 7,925M
Land Conservation	$ 1,138 M
Agricultural Land Preservation	$ 912 M
General Obligation (GO) Bonds	$ 1,725 M
Transportation	$ 3,874 M
Education	$ 291 M
Total	**$ 15,865 M**

Several important caveats and approximations must be recognized in interpreting Table 1 and Appendix 1:

1. Data is not consistent over time: Records are less accessible and, therefore, reported funding amounts are less reliable for the beginning of this time period than more recent years.
2. Not all funding goes directly to reducing pollutant loads to the Bay: Bay Restoration involves a diversity of important functions beyond simply reducing the amount of nitrogen, phosphorus, and sediment entering the Bay. For example, water quality monitoring is essential to track progress and direct future actions to the most cost-effective practices; education and outreach are important to providing Maryland students and citizens with access to and appreciation for a restored Bay; planned development and growth, and land conservation and preservation programs minimize growth impacts and protect the Bay from future degradation. All of these examples (and others) are essential aspects of Bay Restoration, but do not directly result in reductions in loadings to the Bay. (*As a result, it is inappropriate to simply divide the total cost presented in this report by the number of pounds pollutant reduction to get a dollar amount per pound reduced.)*

3. Judgment calls are necessary in identifying a program as Bay Restoration. Many state agency programs and budget categories contribute to restoration, as well as other non-Bay related efforts. In an effort to remain as consistent as possible, only those programs that are estimated to have more than 50% of their activities related to Bay Restoration are included in this analysis.

B. Modeled Bay Restoration Progress 2000–2023 as per Reported Implementation

Maryland and the other Bay jurisdictions annually report to the EPA the number, type, and locations of pollution reducing BMPs that they have implemented, maintained, and verified are working. The EPA then uses that information to estimate and track annual progress toward our nitrogen, phosphorus and sediment goals. This assessment looks at the modeled loads of nutrients and sediment originating from each jurisdiction that end up in the Bay. These estimates are produced with a watershed model that normalizes for weather fluctuations and accounts for approved pollution management practices on the ground. *This model was updated in 2019 to a version called CAST 2019 and will be held steady until the partnership decides on whether or not to adopt a newer version of the model for future years.*

Figure 3 shows the modeled contributions of phosphorus and sediment loads to the Bay from Maryland's five source sectors in 2023. The total modeled nitrogen, phosphorus, and sediment loads to the Bay from the Maryland portion of the watershed from 2010 to 2023 are displayed in Figure 4**.** Based on the CAST19 version of the Bay model, Maryland's actions from 2010 through 2023 have reduced nitrogen loadings by 20.8%, phosphorus loadings by 15.6%, and sediment loadings by 1.5%.

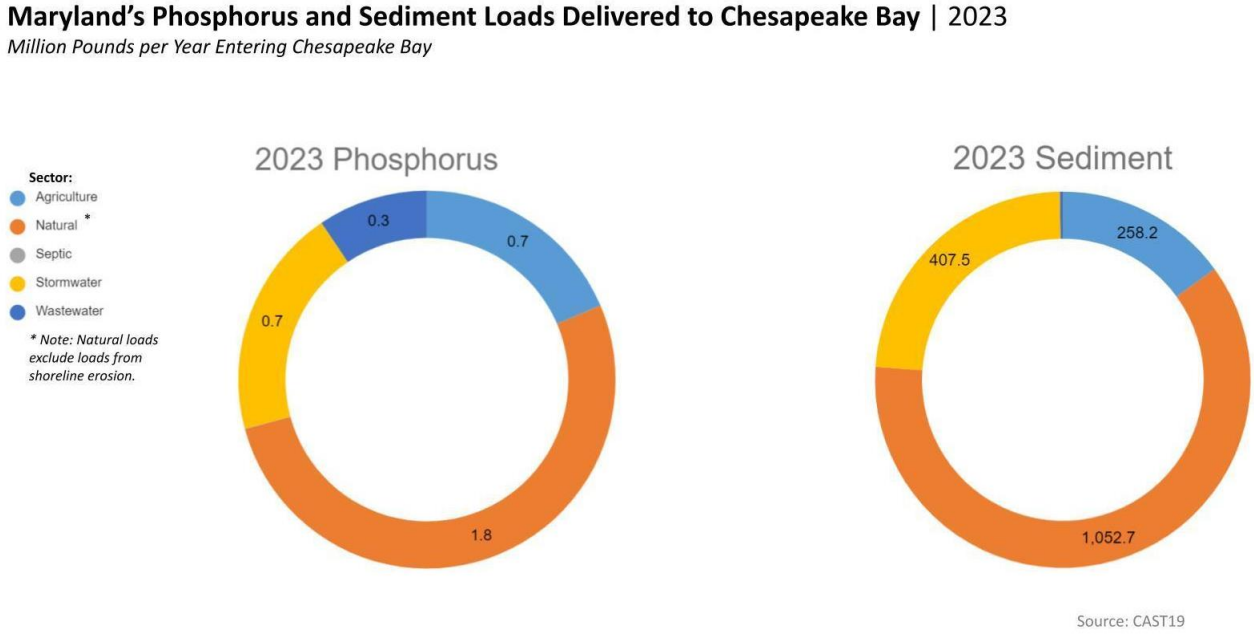


Figure 3. SFY23 source sector phosphorus and sediment contributions of Maryland's loads delivered to Bay.

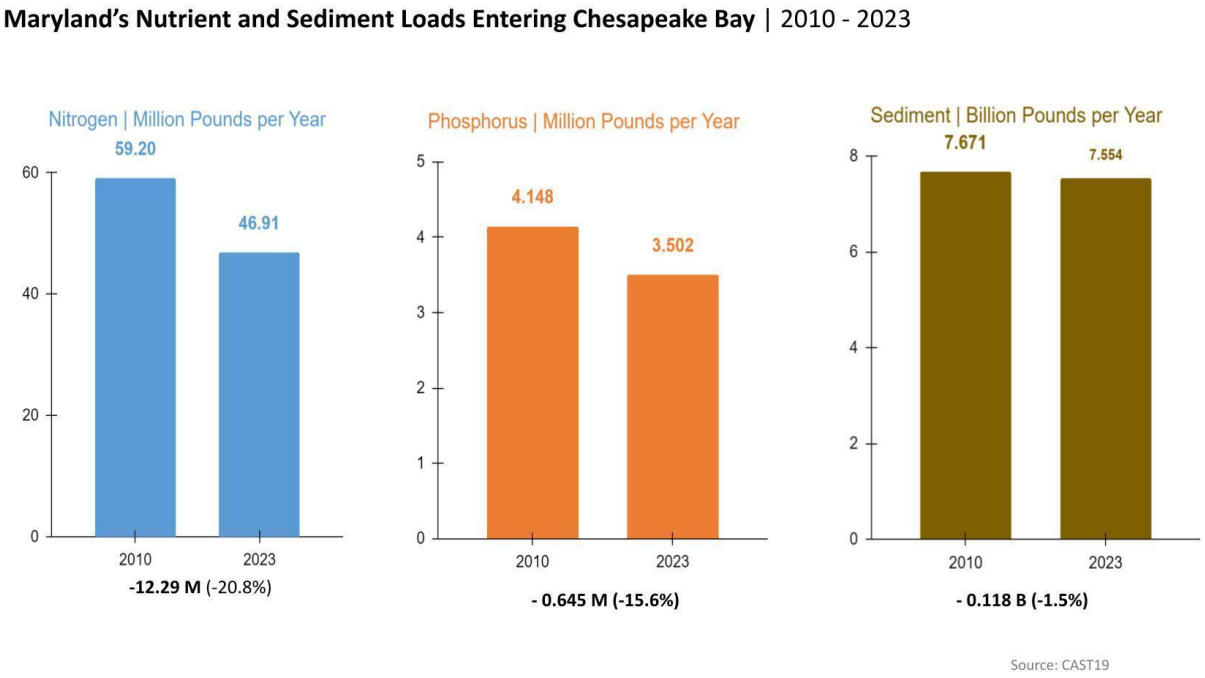


Figure 4. Maryland modeled loads of nitrogen, phosphorus, and sediment from SFY10–SFY23.

Changes in loads can result from changes in data inputs and model outputs, conservation practices, land use, wastewater treatment, air deposition, animal population estimates, septic systems, and precipitation. A description of the key programs in each sector are as follows:

- Agriculture: The sector is constantly working to optimize nutrient inputs to balance conservation and producing Maryland's food and fiber, and is expanding its programs to a broader suite of producers. Maryland Phase 3 WIP for agriculture, developed with Maryland's Soil Conservation Districts and ag stakeholders, remains our Plan of Conservation through 2025. Strong progress on the Plan has been accomplished, and MDA will continue to engage producers on their farm-level conservation needs that achieve natural resource protection and farm profitability.

- Wastewater: This sector makes up Maryland's second largest contribution of nitrogen to the Bay, and it has achieved the largest sector reductions despite some challenges with compliance at several major municipal-managed treatment plants. Changes in the loads from WWTPs are a combination of the upgrades of municipal plants, treatment plant performance, performance incentives, population growth, and the impact of year-to- year rainfall variability.

- Urban Stormwater: This sector is Maryland's third-largest contributor of nitrogen to the Bay and is a substantial contributor of phosphorus. Atmospheric deposition is a major nitrogen source in the urban environment and implementation of air pollution reduction strategies in the region is a key driver of nitrogen reduction. Phosphorus reductions are due in part to urban fertilizer management. Since 2010, new development must meet Environmental Site Design to the Maximum Extent Practicable, which helps to minimize nutrient and sediment pollution reaching the Bay from developed land. Currently, Phase I permittees have completed about 47% of their permit impervious surface

restoration requirement, or 9,069 acres. This does not include MDOT SHA as their generation 5 permit is currently under development. In total, Phase II permittees completed 10,815 acres of restoration over their five year permit, and the next generation of that permit is being developed now.

- Septic Systems: The septic sector has the least contribution of nitrogen to the Bay and contributes no phosphorus or sediment. In general, restoration practices, such as upgrades to Best Available Technology (BAT) and connecting failing septic systems to public wastewater treatment facilities have kept pace with the addition of loads from new systems. Future reductions are anticipated from the elimination of septic systems due to the increase of connections to WWTPs. Additionally, at low elevations, there may be more failures of septic systems due to sea level rise and storm events; therefore, this may result in additional connections to WWTPs.

C.Chesapeake Bay Water Quality Monitoring Data

To understand the health of the Bay and track the progress of restoration efforts, the state, through DNR, regularly monitors tidal and non-tidal waters at 124 sites. Monitoring data provides highly accurate information on the past and present concentration of pollutants in our waterways as well as our progress toward providing more oxygenated habitat for fish and crabs and clearer water for submerged aquatic vegetation (SAV). Monitoring data cannot, however, identify the sources of the pollutants nor predict future pollutant loads resulting from planned pollutant reduction efforts, the impacts of climate change, growth, etc.; for that information, we must depend on models.

Trends are determined using a flow-adjustment method. The flow-adjusted method uses daily flow data from U.S. Geological Survey (USGS) gaging stations to include the impact of changes in river flow on the nutrients and sediment levels; higher nutrients and sediments are associated with high river flows. Changes in the levels of nutrients and sediments are flow adjusted by using flow as one of the factors that determine the differences between years. The flow-adjusted method is much more robust for determining the impact of changes in water quality over a long-time period, and for determining what changes over time have resulted from management actions, not due to changes in rainfall from 1 year to the next.

Statistical analysis of monitoring data collected at both tidal and non-tidal stations from 1999 through 2023 demonstrates that the current impact of historical Bay Restoration spending has resulted in significant reductions in nitrogen concentrations at 70% of stations (Figure 5), phosphorus concentrations at 52% of stations (Figure 6), and sediment concentrations at 31% of stations (Figure 7).

Monitoring results confirm that most nutrient and sediment reductions occur in streams and rivers closest to where the management actions have been implemented. Moving downstream into the tidal tributaries, water quality improvements, especially in nitrogen levels, are more likely to be observed on Maryland's western shore where those reductions are associated with WWTP upgrades. Conversely, water quality improvements on Maryland's Eastern Shore, which are dominated by diffuse nonpoint source impacts, have a more delayed response.

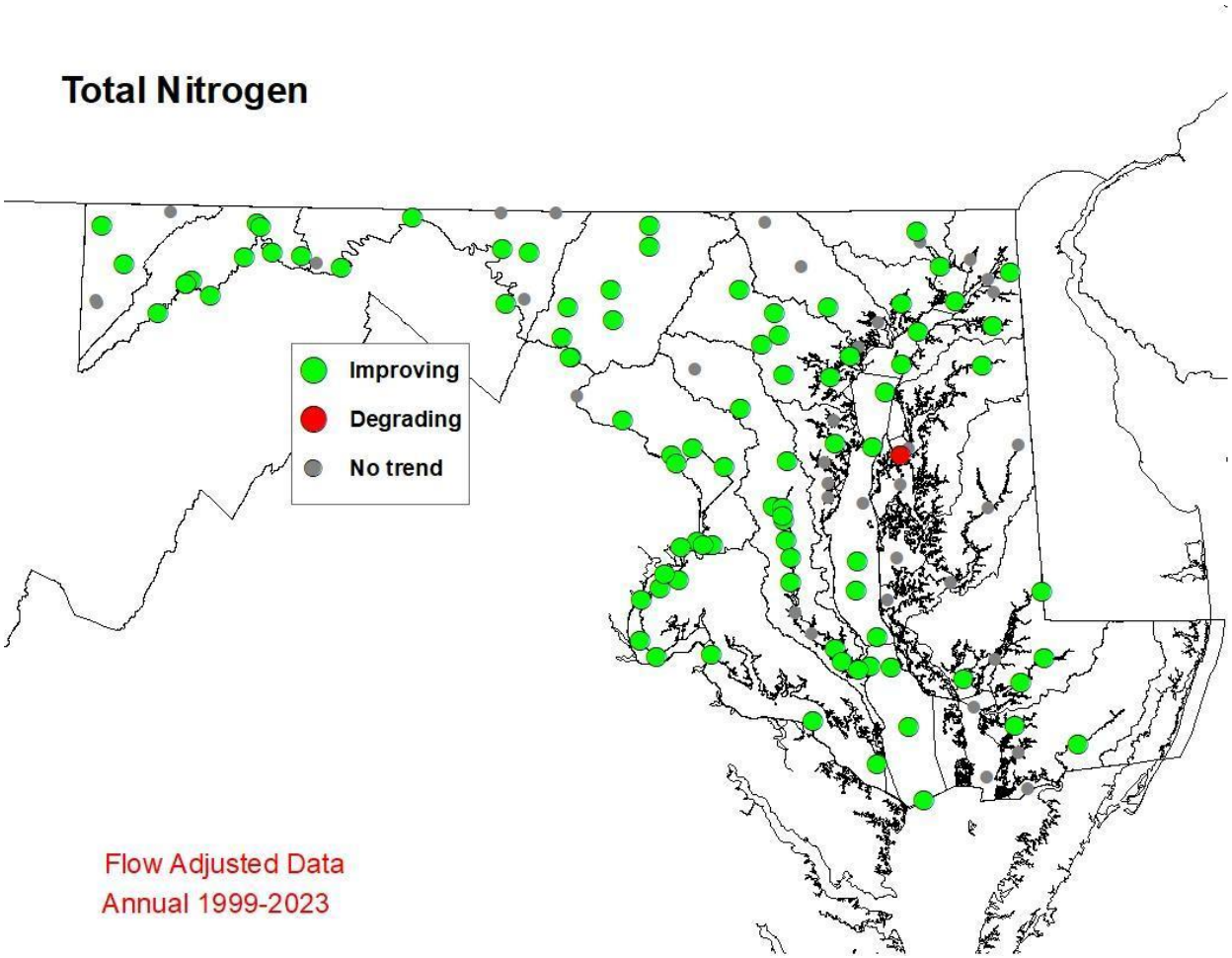


Figure 5. Trends in flow adjusted total nitrogen concentrations 1999–2023.

- 70% of stations (87 of 124) have improved nitrogen levels compared to 1999
- <1% of stations (1 of 124) have degraded nitrogen levels compared to 1999
- 29% of stations (29 of 124) do not have nitrogen levels that are significantly different from 1999

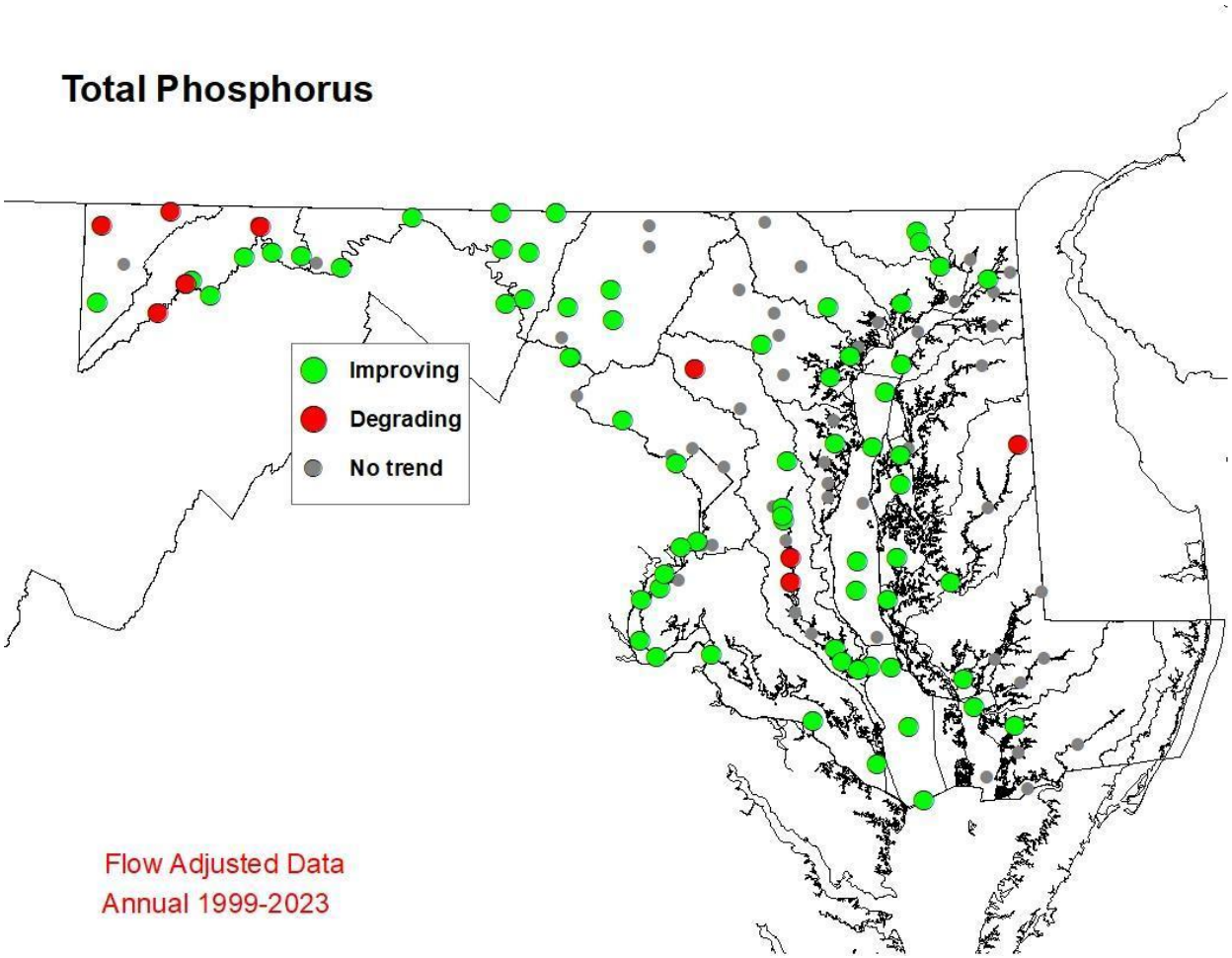


Figure 6. Trends in flow-adjusted total phosphorus concentrations 1999–2023.

- 52% of stations (65 of 124) have improved phosphorus levels compared to 1999
- 8% of station (10 of 124) has degraded phosphorus levels compared to 1999
- 40% of stations (49 of 124) do not have phosphorus levels that are significantly different from 1999

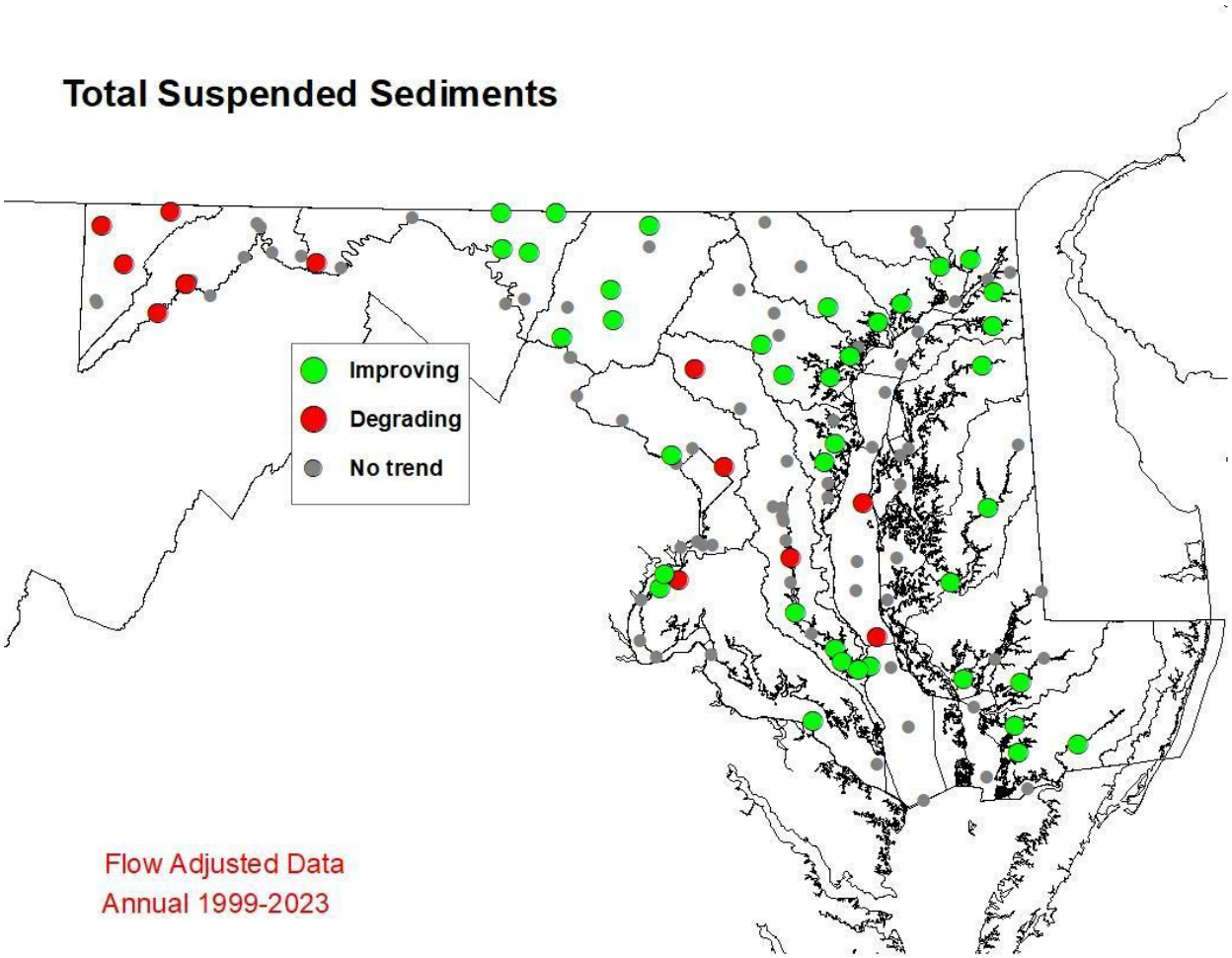


Figure 7. Trends in flow-adjusted total suspended sediment concentrations 1999–2023.

- 31% of stations (38 of 124) have improved sediment levels compared to 1999
- 10% of stations (13 of 124) have degraded sediment levels compared to 1999
- 59% of stations (73 of 124) do not have sediment levels that are significantly different from 1999

Bottom dissolved oxygen (Figure 8) is a key indicator of overall Bay health and improved bottom dissolved oxygen is a primary goal of nutrient and sediment reduction activities. However, only 21% of stations have improved dissolved oxygen levels, so further actions to reduce nutrients and sediments will still be required to see continued widespread improvement in bottom dissolved oxygen.

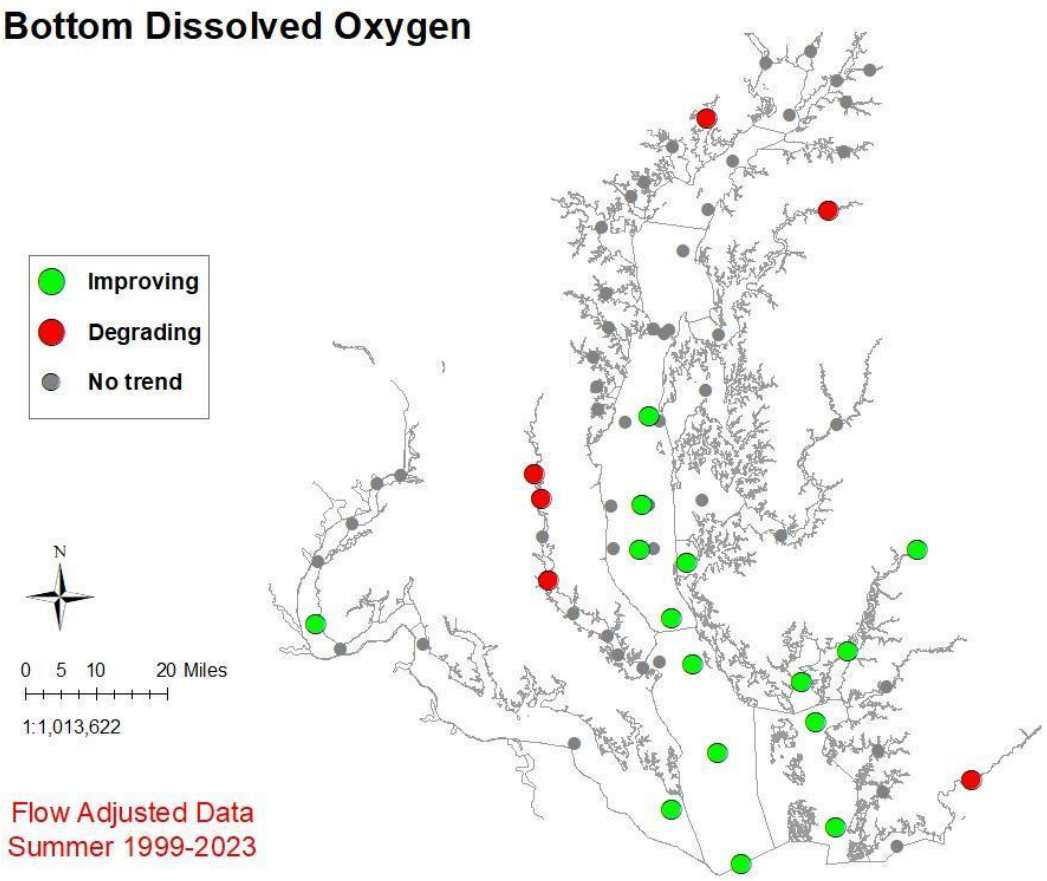


Figure 8. Trends in flow-adjusted bottom dissolved oxygen concentrations 1999–2023.

- 21% of stations (15 of 71) have improved dissolved oxygen levels compared to 1999
- 9% of stations (6 of 71) have degraded dissolved oxygen levels compared to 1999
- 70% of stations (50 of 71) do not have dissolved oxygen levels that are significantly different from 1999

Submerged aquatic vegetation (SAV) is a key indicator of Bay health since it quickly responds to improvements in water quality. As such, sustaining and increasing the habitat benefits of SAV is a vital Bay Agreement outcome. In 2023, 37,770 acres of SAV were mapped in Maryland's tidal waters. This represents 47% of the state's 2025 restoration target of 79,800 acres. The Chesapeake Bay experienced moderate to dry conditions in 2023, which may have contributed to the increase (0.1%) from 2022 (Figure 9). Underwater grass acreage in the Bay decreased significantly in 2019 and 2020 after heavy rains inundated the region in 2018. The resulting runoff brought more nutrient and sediment pollution to the Chesapeake Bay, which clouds the water and blocks sunlight from reaching underwater grass beds (Figure 9).

Despite these record-high rainfall and stream flows in 2018 and 2019, long-term monitoring has identified major reductions in polluted runoff entering the Bay as a result of Maryland's Bay restoration activities. Substantial SAV increases have occurred in areas with long-term reductions in nutrient loads entering the Bay. Continued nutrient and sediment reduction actions are expected to result in greater SAV resilience despite increased symptoms of climate change.

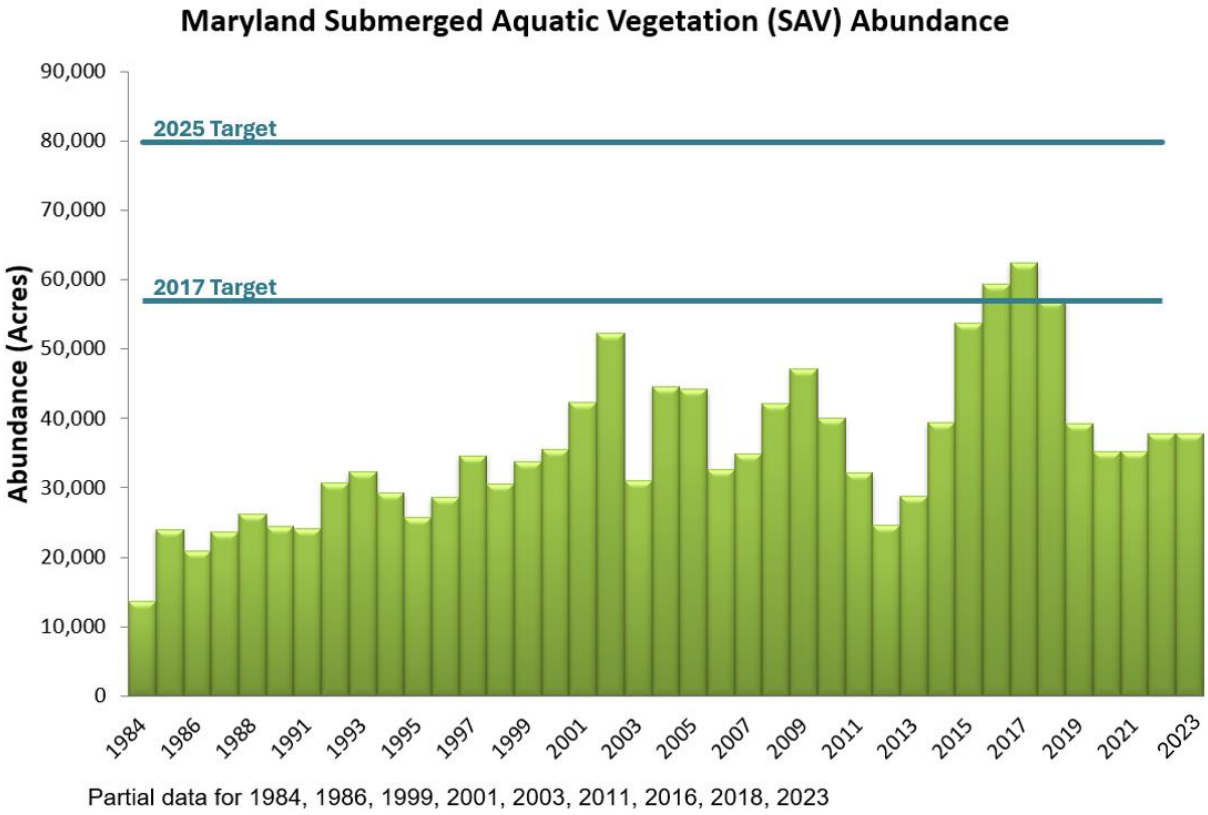


Figure 9. Total abundance of SAV in Maryland's portion of the Bay and tidal tributaries, 1984– 2023. (2023 data is preliminary and subject to change.)

Water clarity, chlorophyll *a,* and suspended solids are major factors for understanding the amount of light available for SAV. Tidal water clarity (Figure 10) has worsened at many stations, but also improved at other stations. Chlorophyll *a*, an indicator of algal concentration (Figure 11), has worsened in the upper and middle Maryland Mainstem and in many of the rivers.

While total nitrogen has improved at most stations (Figure 5), total phosphorus has improved at more than half of the stations (FIgure 6) and sediment levels have improved at approximately a third of the stations (Figure 7), water clarity (Figure 10) and algal levels (as measured by chlorophyll *a* levels, Figure 11) have not improved or have continued to degrade at many of the same locations. The relationship between nutrients and sediment inputs and algal levels and water clarity are complex and difficult to assess with the methods used for trends analysis. The Chesapeake Bay scientific community continues to examine this disconnect but no complete understanding is available yet.

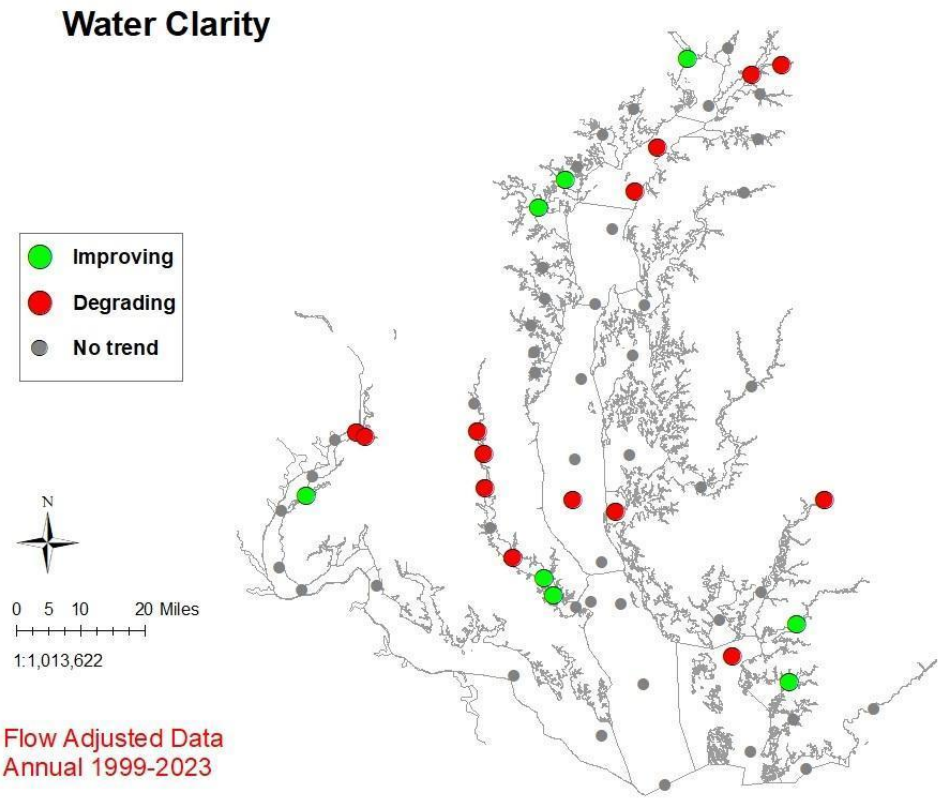


Figure 10. Trends in flow-adjusted water clarity concentrations 1999–2023.

- 12% of stations (8 of 66) have improved water clarity compared to 1999
- 21% of stations (14 of 66) have degraded water clarity compared to 1999
- 67% of stations (44 of 66) do not have water clarity that is significantly different from 1999

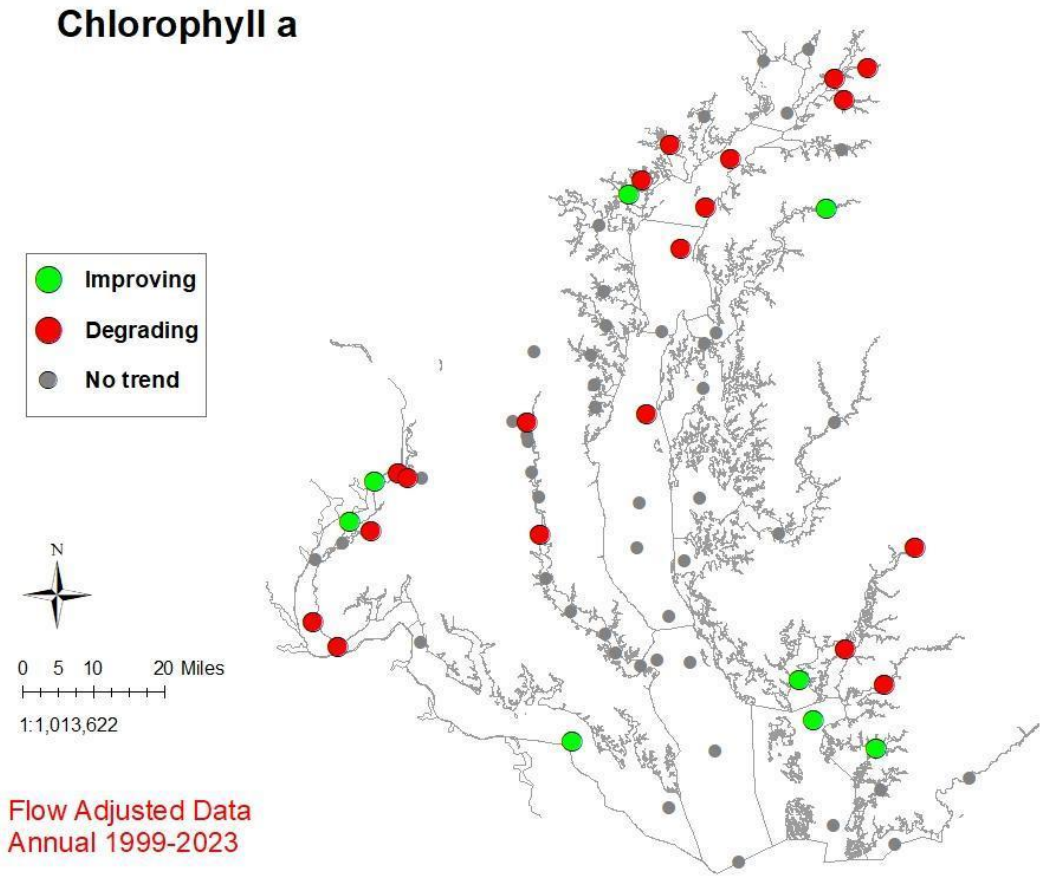


Figure 11. Trends in flow-adjusted chlorophyll *a* concentrations 1999–2023.

- 11% of stations (8 of 73) have improved chlorophyll *a* levels compared to 1999
- 26% of stations (19 of 73) have degraded chlorophyll *a* levels compared to 1999
- 63% of stations (46 of 73) do not have chlorophyll *a* levels that are significantly different from 1999

Climate change has increased surface water temperatures throughout the non-tidal and tidal waters; 91% of stations have had an increase in surface water temperature since 1999 (Figure 12). Water temperature is 1 degree F, or more, warmer at 83% of the non-tidal and tidal stations (Figure 13). Increased temperatures can cause negative changes in water and habitat quality. Water temperature determines what areas plants and animals can live in and which species will thrive or disappear from an area. In addition, warmer water holds less dissolved oxygen, further impacting habitat conditions and making the goal of providing more areas with suitable oxygen for fish, crabs, and other Bay organisms more difficult. Implementing practices such as forest buffers and stormwater infiltration will help address rising temperatures while also reducing nutrients.

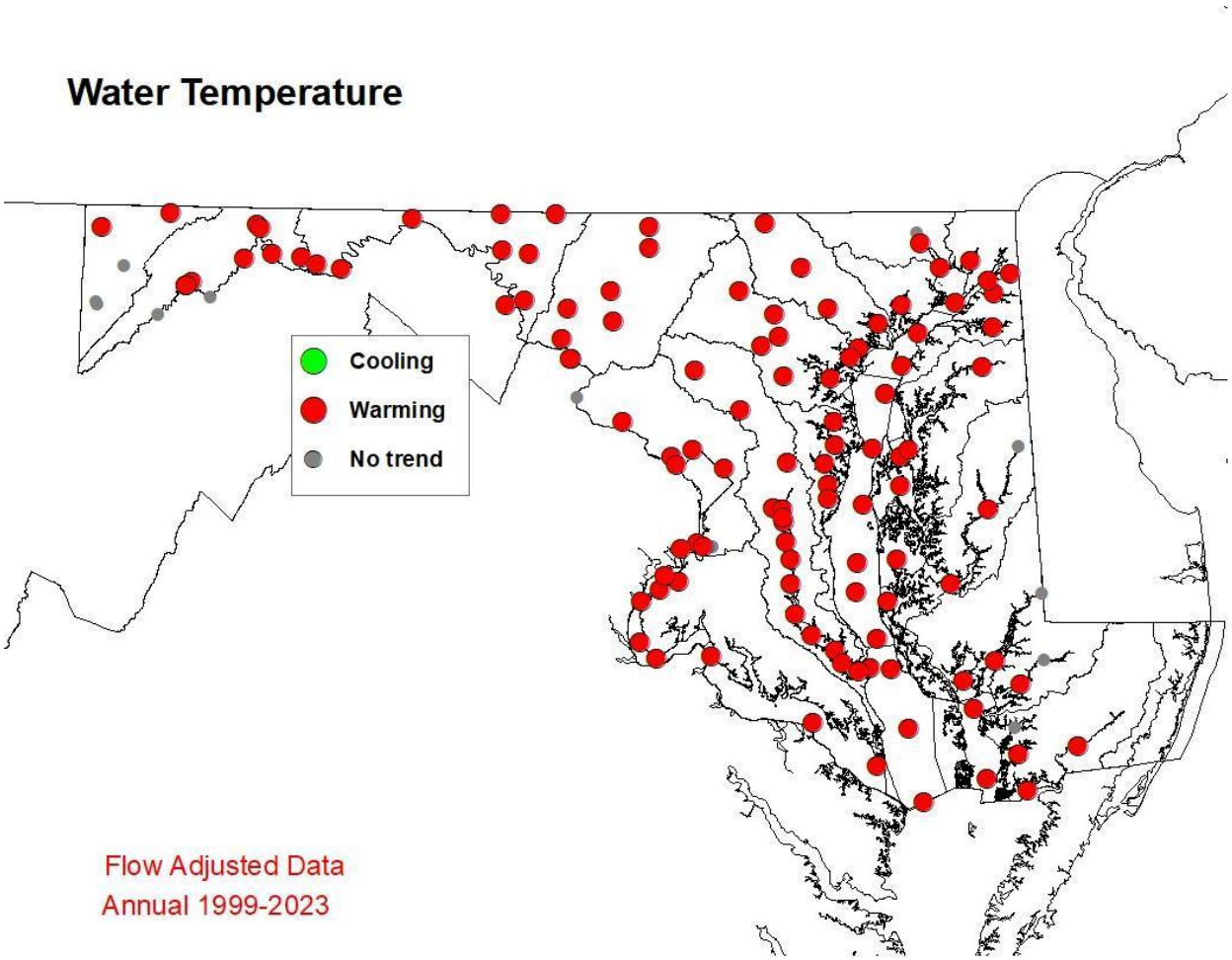


Figure 12. Trends in flow-adjusted surface water temperature 1999–2023.

- 0% of stations (0 of 124) have cooling surface water temperatures compared to 1999
- 91% of stations (113 of 124) have warming surface water temperatures compared to 1999
- 9% of stations (11 of 124) do not have surface water temperatures that are significantly different from 1999

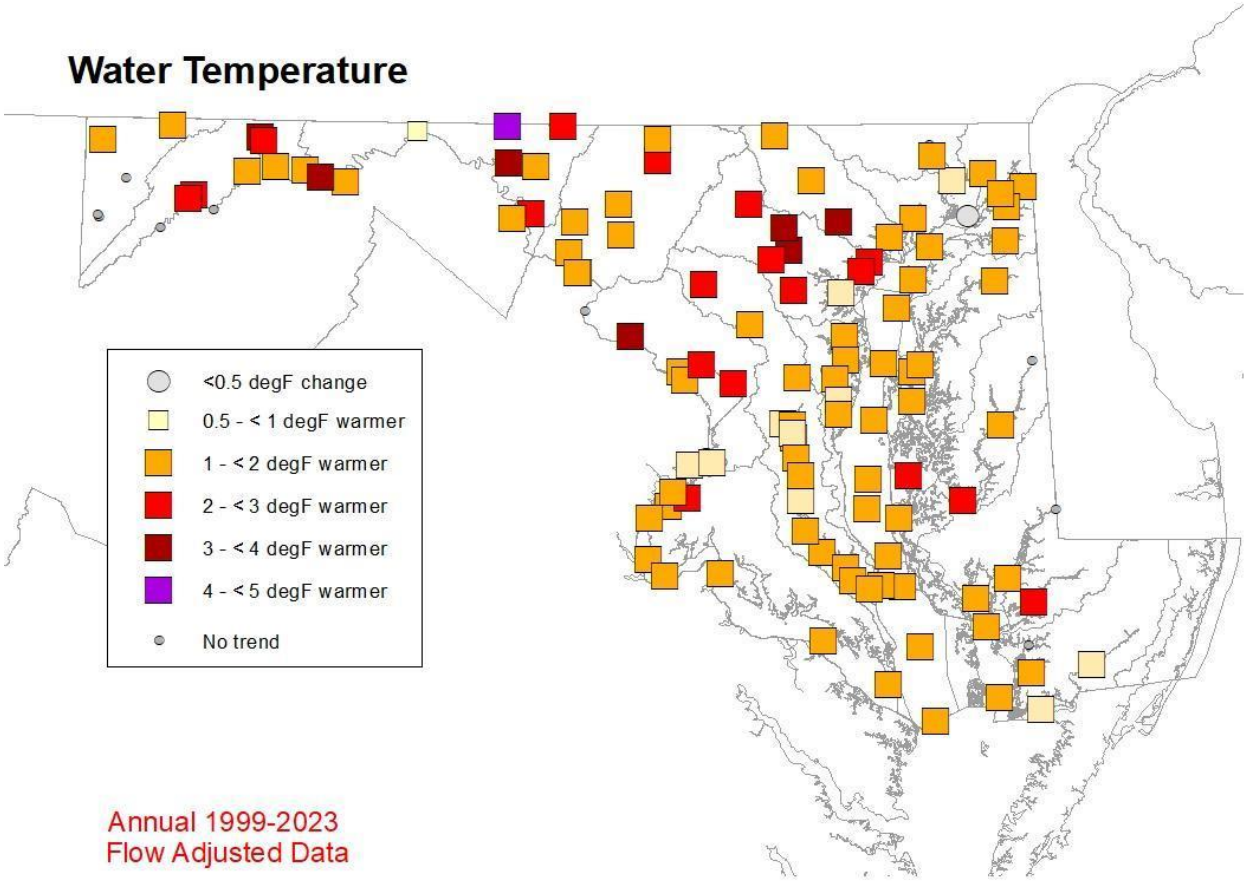


Figure 13. Magnitudes of change in surface water temperature 1999–2023.

- 2% of stations (2 of 124) are less than 0.5 degrees F change
- 9% of stations (11 of 124) are between 0.5 and less than 1 degree F warmer
- 60% of stations (74 of 124) are between 1 and less than 2 degrees F warmer
- 14% of stations (18 of 124) are between 2 and less than 3 degrees F warmer
- 6% of stations (7 of 124) are between 3 and less than 4 degrees F warmer
- 1% of stations (1 of 124) is between 4 and less than 5 degrees F warmer

Part II - Where We Still Need To Go: Maryland's Framework for Bay Restoration 2021 - 2025

The Phase I and Phase II WIPs effectively established the pollution targets, responsibilities, and initial strategies for achieving the required pollution reductions. The Phase III WIP (completed in 2019) uses lessons learned from Phase I and Phase II to refine those strategies and identify the next steps to ensuring that the necessary policies, regulations, incentives, and financing structures are in place to achieve restoration success in the long term (2025 and beyond). This section of the report summarizes those strategies.

The following framework focuses on the necessary role of the state and the associated meaningful and measurable program activities, policies and financing resources needed for a successful restoration effort. Achieving pollution reduction targets will require the resources and engagement of multiple stakeholders and entities, public and private, working in concert over the coming years. Due to the Bay's importance to our culture, residents and economy, Maryland has a unique leadership role in its restoration. EPA leadership is also critical for holding all jurisdictions accountable and responsible for achieving and maintaining their final pollution targets. The following framework is intended to address Maryland's capacity to lead the restoration effort subject to several key technical parameters.

A. Background–Pollutant Source Sector Status

Under the Phase III WIP, which includes CAST 19 model changes, the state plans to reduce its pollution to the Bay by more than 9 million pounds of nitrogen and about 0.1 million pounds of phosphorus from 2017 levels. These reductions will come primarily from the wastewater and agricultural sectors. Loads from the urban stormwater and septic sectors are anticipated to remain the same, with reductions from implementation being offset by loads from new growth.

1) Wastewater

In SFY23, wastewater represented about 11.5% of the nitrogen load in Maryland, and reductions in this sector—from 14.5 million pounds per year in SFY10 to 5.4 million pounds per year in SFY23—represent a true water quality financing success. The combination of firm, enforceable regulations coupled with a dedicated and consistent revenue stream from the BRF, has resulted in pollution reductions in the wastewater sector, and has provided room for future growth.

As of 2018, BRF upgrades to Maryland's 68 major WWTPs to ENR have been fully obligated. As of July 2023, 67 upgrades of significant municipal plants were completed, with one in the planning phase. Minor WWTPs (less than 0.5 million gallons per day) are also being upgraded using the BRF on a voluntary basis, and when the upgrade is cost-effective. As of July 2023, 16 upgraded minors were in operation, three were in construction, and 16 were in design or planning stages. There are approximately 200 minor WWTPs in Maryland.

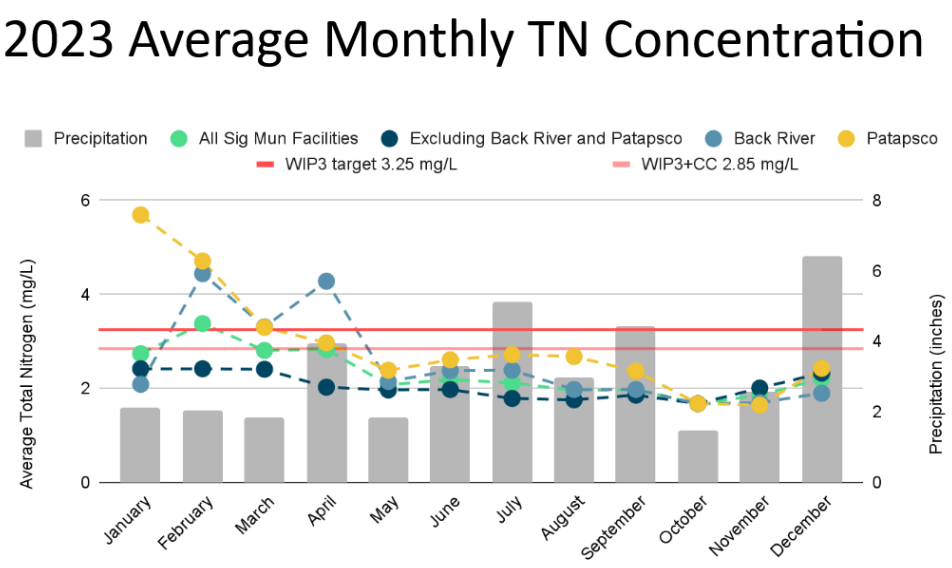
With the substantial investments in advanced treatment systems at its municipal wastewater plants, the state is now considering ways to ensure that plants will fully utilize these

technologies. The state has developed several performance incentive programs, such as the Wastewater Operations and Maintenance (O&M) Grant through the BRF, to ensure that the wastewater sector surpasses the statewide annual average operational goal, established in the Phase III WIP, of 3.25 milligrams of nitrogen per liter in plant effluent. A statewide annual average concentration of 2.85 milligrams of nitrogen per liter is required to meet the additional nutrient load reductions needed to address 2025 climate change conditions, as explained in the climate change addendum to Maryland's Phase III WIP.

By early/mid 2020, Maryland was on track to meet its Phase 3 WIP and Climate Change Target of 2.85 mg/l (See Figures below). However, in 2021, MDE's compliance inspections at Maryland's two largest WWTPs (Back River and Patapsco) uncovered significant permit violations. Numerous actions were taken by MDE, the Maryland Environmental Service (MES), and the Office of the Attorney General to bring the plants back into compliance. Those efforts recently culminated in a settlement with Baltimore City that includes penalties, enforceable timelines for corrective actions at the Back River and Patapsco WWTPs, and competitive grants for water quality and aquatic habitat improvement projects in the Patapsco and Back River watersheds.

In addition, and to prevent future performance problems at our major WWTPs, MDE performed a comprehensive review of its wastewater permitting and compliance framework. These "Reinvigorated Strategies to Reduce Nutrients in Wastewater" can be found HERE, and include monthly WWTP performance tracking. The graphs below show the performance tracking results at Maryland's significant WWTPs starting in January 2020. During 2023, compliance inspections also confirm that Baltimore City has been meeting nutrient limits in their permits. As shown in the graphics, Maryland met its Phase 3 WIP and Climate Change target in the wastewater sector by the end of 2023.

Websites maintained by MDE contain information on previous noncompliance issues with the Back River and Patapsco WWTPs and provide up-to-date information on bringing them back into compliance. The Reinvigorated Strategies webpage (link provided above) also provides up to date information on all major WWTP performance.



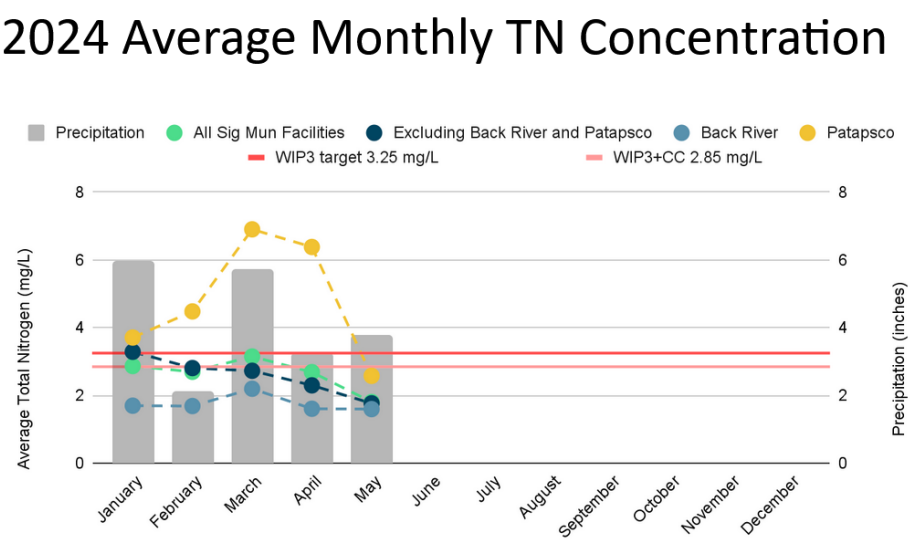


Figure 14. Monthly performance at Maryland's significant WWTPs vs. precipitation

Maryland's Phase III WIP and its climate change addendum assume that WWTP performance will exceed permit requirements and expect that plants will not be operating at full design capacity by 2025. This should result in plant loads that are well below the allocations established in the Bay TMDL and compensate for the slower pace of reductions in the septic and stormwater sectors through 2025. As WWTPs approach design capacity because of population growth, it will be critical for continued reductions to occur in the other sectors, and to increase the transfer of loads from other sectors to the Natural sector using nature-based practices. Continued optimization and use of the Wastewater BRF O&M Grant are priority strategies for achieving the aggregate average wastewater operational goal.

2) Agricultural Lands

Nutrient loads from agricultural lands decreased by nearly 380,000 pounds of nitrogen for 2023 progress when compared to the prior year, based on CBP modeling tools. Implementation of several key conservation practices contributed to this progress including:

- Exclusion Fencing (+133 acres of excluded buffer)
- Forest Buffers (+ >2,000 acres)
- Grass Buffers (+ >5,000 acres)
- Wetland Practices (>+2,000 acres)
- Conversion to Pasture and Open Space (+4,221 acres)
- Prescribed Grazing (+2,394 acres)
- Conservation Plans – Record Year for Planned Acres (Over 100,000 WIP acres planned) and
- Livestock Waste Management Systems (over 80% goal addressed statewide)

Programmatically, MDA continues to incentivize and align programs to maximize co-benefits for water quality, soil health, climate resilience and equity. Successful examples include the Healthy Soils Program and the Small and Urban Farm Program. Both opportunities enhance technical and financial assistance opportunities for equine, small farm, agroforestry, and urban agriculture operations to ensure program access for all Maryland farmers. Additionally, MDA is

expanding incentives to advance the adoption of riparian buffers and tree plantings through the popular Conservation Buffer Initiative. With expanded incentives since SFY23, the program demand has increased to $448,353 in conservation grants awarded to 43 farm operations as of June 30, 2023.

Maryland's flagship Agricultural Water Quality Cost-Share Program (MACS) continues to experience strong demand that resulted in $7.2 million in grants to install 344 conservation projects on farms during SFY 23 that coupled with other conservation grants programs (cover crops, manure management, and ecosystem incentives) totaled $35.1 million in cost-share grants to farm operations during the fiscal year. Critical to delivering financial assistance to farms, are trained, capable technical assistance providers from Maryland's 23 Soil Conservation Districts. State staff recruitment, onboarding and certification has been a primary goal of MDA's Office of Resource Conservation alongside our federal partners in SFY23. Additionally, the influx of federal funds for on-farm conservation are leveraging state programs to advance water quality and climate smart agricultural practices.

With the combination of agriculture initiatives, the sector anticipates meeting its sediment and phosphorus goals by 2025, including continuing to address and develop strategies to minimize the impact of legacy phosphorus concentrations. While the Plan of Conservation will nearly be accomplished by 2025, MDA recognizes that additional conservation will be needed to achieve nitrogen reductions based on updated modeling estimates. Staff are engaging with Chesapeake Bay Program workgroups to ensure the best data and methods included in future modeling tools are an accurate representation of the sector, and will continually evaluate additional opportunities to advance conservation adoption.

3) Urban Stormwater

In SFY23, urban stormwater represented around 20% of Maryland's nitrogen loads to the Bay. Compared with the nutrient reductions from the state's farms and WWTPs, the pace of progress in reducing urban stormwater loads is more gradual since stormwater does not generally contain as many nutrients as other sectors. Controls to address stormwater pollution also cannot be rapidly deployed because they include longer planning and implementation horizons to scale up. Over the longer-term stormwater pollution is a critical piece of Maryland's plan for restoring the Bay and its non-tidal waters.

A recent analysis by the EPA Chesapeake Bay Program did not show progress in nitrogen or phosphorus load reductions in the Developed (stormwater) sector. This is due to several factors: 1) Growth that occurs in the model is not automatically offset by installed BMPs due to a data reporting time lag 2) Operations and Maintenance (BMP Verification) is not keeping pace with growth due to the sheer volume of BMPs in this sector. MDE is working with local jurisdictions to create standardized reporting to show which BMPs were accepted into the model as well as those not accepted by the model and the reasons for exclusion.

As opportunities for reductions on agricultural land become exhausted, and as wastewater plants reach capacity, urban stormwater will make up an increasing portion of the loads, and the potential nutrient reductions in the state. With population growth beyond 2025, and with additional reductions required to meet climate change reduction goals and Conowingo Dam infill, it may be impossible for the state to meet and maintain its targets. The result of these factors is that stormwater implementation will not account for a large portion of the 2025 nutrient reductions, but it will need to make continued, steady progress to and beyond 2025.

Implementing stormwater practices poses numerous challenges, including the decentralized nature of StormWater Management (SWM), where practices must be constructed throughout the watershed instead of at a single, centralized location, and the significant amount of time that must be spent in planning, design, and permitting. One major hurdle faced throughout the Bay watershed is the cost of installing these practices. In the 2019 University of Maryland Center for Environmental Science (UMCES) study, "Cost Analysis of Stormwater and Agricultural Practices for Reducing Nitrogen and Phosphorus Runoff in Maryland," indicated the cost of reducing a pound of nitrogen through stormwater practices ranges from $384 per pound to over $10,000 per pound, with a mid-range practice costing around $1,500 per pound. In contrast, the median cost of reducing a pound of nitrogen through WWTPs upgrades is about $40 per pound, with further reductions using BRF O&M grant incentives estimated as low as $10 per pound.

Recognizing the necessity of SWM in maintaining Maryland's nutrient caps, while also understanding the price tag of implementation, the state is looking to optimize the cost-benefit relationship. This can be done not just by minimizing the cost of implementation, but also by maximizing the potential environmental impact — particularly by looking at effects beyond just nutrient reductions. Maryland's non-tidal streams, for example, are commonly impacted by sediment, flow-related stressors, temperature, and channelization. In many cases these sorts of impairments cannot be addressed by any means other than managing urban runoff. Practices that address stormwater runoff may also be designed to address water quantity, such as by mitigating the impacts of flooding and other factors driven, in part, by climate change or legacy environmental justice issues. These additional, non-nutrient impacts are referred to as co-benefits, and are a major focus of the Phase III WIP. By stacking multiple benefits and co-benefits, state and local governments can ensure that each dollar spent has a far-reaching impact. As this co-benefit framework guides the implementation process, watershed managers should be planning in a way that focuses on multiple objectives, rewarding long term planning rather than just meeting a near term goal.

Over 80% of impervious surfaces in Maryland are covered under stormwater National Pollutant Discharge Elimination System (NPDES) permits. The state has reissued NPDES Municipal Separate Storm Sewer System (MS4) Permits for the regulated Phase I large and medium jurisdictions and will be reissuing the Maryland Department of Transportation (MDOT) State Highway Administration's (SHA) permit. These permits required nutrient reductions associated with 20% impervious area restoration over the prior 5-year permit cycle with an additional 10% restoration required for the current permit cycle. Phase I permittees that did not meet their restoration requirements have been required to pay penalties and operate under a legally enforceable consent order. The Phase II MS4 general permits for small municipalities, and for state and federal facilities took effect in October 2018, and requires permittees to plan to restore 20% of permittees' impervious areas by 2025.

MDE has been working with both the regulated community and stakeholders on the next generation of Phase I MS4 permits to ensure a robust restoration pace in the stormwater sector while addressing local priorities and implementation challenges. MDE issued final permits for Anne Arundel, Baltimore, and Montgomery Counties, as well as Baltimore City, on November 5, 2021. At that time, MDE also issued its plan for advancing stormwater resiliency to adapt to climate change impacts. MDE issued final permits for Carroll, Charles, Frederick, and Harford Counties on December 30, 2022. SHA's final permit is currently under development and has just completed the public comment phase. Prince George's County entered into a consent decree with MDE to finish the requirements of its previous permit and to continue work to meet the goals established in their new permit that was issued on December 2, 2022.

On average, the reissued Phase I permits will achieve 2% restoration each year for a total of 10% restoration over a 5-year permit cycle. Nutrient trading regulations have also been promulgated, which allow the purchase of lower-cost nutrient reduction credits by the stormwater sector to accelerate nutrient reductions to the Bay. In addition, recognizing the need for a consistent and efficient restoration project permit review process, the department worked with the U.S. Army Corps of Engineers to develop flexible permitting for restoration projects designed to provide ecosystem improvement.

Finally, MDE is also continuing to work with a stakeholder consultation group to help modernize Maryland's stormwater program by incorporating precipitation projections into design standards. Warming temperatures increase evaporation, evapotranspiration, and also the amount of rainfall that can be held in the atmosphere. This warming effect increases both precipitation amounts and the frequency of extreme precipitation events. Maryland will likely be proposing new standards to increase stormwater capture and reduce pollution runoff to the Bay while providing other important public safety and ecosystem co-benefits. MDE staff are also looking at watershed-wide flooding data that can identify other factors, like undersized stormwater conveyance, that contribute to local flooding. More information on Advancing Stormwater Resiliency in Maryland (A-StoRM) can be found here.

4) On-Site Septic Systems

The septic sector contributes about 7% of Maryland's nitrogen load to the Bay. Similar to the urban stormwater sector, reductions from the septic sector are slower than those from wastewater and agriculture. Implementation in this sector faces many of the same challenges as the urban stormwater sector, with dispersed sources and significant costs for implementation. The 2019 UMCES cost study referenced above found that nitrogen reductions from septic practices cost between $130 and $330 per pound—lower than stormwater, but higher than agriculture or WWTPs. This sector is also challenged by additional development growth which offsets reductions achieved through BMPs.

As with the urban stormwater sector, the state is looking for ways to increase the impact of this implementation by seeking practices that offer multiple co-benefits. In the case of septic systems, two of the most significant direct benefits, apart from nitrogen reductions, are public health and groundwater protection. Toward this end, the state agencies are pursuing "high-benefit" reductions in places with impacts to public health and drinking water quality.

Additional strategies include accelerating the pace of septic connections to sewers in high-benefit areas to take advantage of the significant investments Maryland has made in ENR treatment at Maryland's WWTPs. By maximizing the potential impact on public health and groundwater protection, these projects are also more likely to address the needs of Maryland's disadvantaged communities where those concerns are more prevalent.

The state will continue to fund the upgrade of septic systems to BAT, targeted to failing and other systems in the Critical Area, and address about 1,000 systems per year. In 2018, the legislature passed a bill establishing a new incentive for the proper operation and maintenance of septic systems. The bill authorizes financial assistance through the BRF to eligible homeowners in jurisdictions with a septic stewardship plan, to pump out septic tanks at least once every 5 years. As with the urban stormwater sector, it is anticipated that implementation of septic practices will need to continue well beyond 2025 to meet TMDL goals.

5) Clean Air Act Role

Atmospheric deposition is a major nitrogen source in the urban environment, and air pollution reduction strategies brought about by the federal Clean Air Act (CAA) are a key driver of nitrogen reduction. Actions implemented from 2010 to 2020 through the CAA are expected to have resulted in 6.5 million pounds of nitrogen reduction in the Bay. Credit for federal programs is applied across the watershed, rather than being given to any specific state, however through its Phase III WIP, Maryland has been investigating the potential for nitrogen reductions from state programs that it is implementing toward non-federal goals, such as climate change.

In addition, the state is pushing for tighter controls on nitrogen oxide emissions from upwind states, such as in its 2016 CAA Section 126 petition to EPA, and its 2019 petition to the Ozone Transportation Commission. While these would not result in WIP credit for Maryland, they could drive a significant air and water quality improvement for the Bay. Maryland is also pursuing model reductions that can be attributed to the electrification of transportation sources of nitrogen. This is a longer-term effort and Maryland is working closely with the CBP to ensure modeling tools account for these important reductions.

6) Conowingo Dam

When the TMDL was first published in 2010, it was estimated that Conowingo Dam would be trapping sediment and associated nutrients through 2025. New science has determined that this is not the case, and that the reservoir behind Conowingo Dam has reached capacity. As a result, more nitrogen, phosphorus and sediment are now entering the Bay than were estimated when the TMDL was written. This additional pollutant load (estimated at 6 million pounds total nitrogen and 260,000 pounds total phosphorus) must be addressed if we are to meet the Bay's water quality standards. In July 2022, the CBP partnership approved a phased approach to CWIP implementation that goes beyond 2025. This allows Conowingo jurisdictions (Maryland, Pennsylvania and New York) the flexibility to participate in the collaborative CWIP to achieve their share of the Conowingo nutrient reductions, or otherwise reduce their assigned loads in their jurisdictional WIPs.

Maryland has a three-pronged strategy to address pollution loads and ecosystem impacts from Conowingo Dam, including:

- Collaborating with Pennsylvania and New York on CWIP Implementation to reduce the increased nutrient loads to the Bay from Conowingo infill;
- The Clean Water Act, Section 401 Water Quality Certification (WQC) required to ensure water quality standards are met during federal hydropower relicensing for Conowingo Dam; and,
- Exploring Conowingo Reservoir Environmental Dredging and Reuse through an Innovative and Beneficial Reuse Pilot.

For CWIP implementation, Maryland put $25 million in the SFY23 State Budget for CWIP Implementation. MDE now has a contract in place with the Susquehanna River Basin Commission (SRBC) to administer these monies for pay-for-success projects that help reduce nutrient loads to Bay from Conowingo Pond filling with sediment. Maryland oversees and provides policy direction to SRBC and has participated in selecting Conowingo projects that produce the most cost- effective nutrient reductions. An RFP was issued in October 2023 to

solicit these pay-for-success proposals and awards were announced on August 15th. A second RFP is expected to be issued for the next round of funding.

On April 27, 2018, MDE issued to Constellation Energy Generation, LLC (Constellation (formerly Exelon)) a Clean Water Act, Section 401 WQC required to ensure water quality standards will be met with Federal Energy Regulatory Commission (FERC) relicensing. The WQC was then administratively appealed by multiple parties. In 2019, MDE and Constellation entered into a water quality settlement agreement and in 2021, FERC issued a license incorporating certain terms and conditions of the settlement. The FERC license was subsequently challenged and on December 20, 2022, the D.C. Circuit ordered that the FERC license be vacated, in part to allow completion of the WQC administrative process that was interrupted by the settlement. In light of the D.C. Circuit's decision, administrative review has resumed and MDE is reconsidering the original WQC in light of new information and science since the 2018 certification.

To further explore environmental dredging as a Conowingo Dam solution, Maryland funded a $3.3 million Conowingo Sediment Characterization and Innovative Reuse and Beneficial Use pilot to provide Maryland with better information on the quality of sediments behind the dam, dredging costs, dredged material reuse options, scalability, and feasibility for addressing Conowingo's pollution impacts. Maryland is also working with the CBP partnership and through a cost-share project with the Army Corps of Engineers to fill science gaps for determining the nutrient reduction effectiveness of an environmental dredging program.

The innovative financing and BMPs envisioned in these Conowingo solutions present some of the greatest opportunities to modernize and accelerate Bay restoration. By ensuring water quality standards are met in relicensing the dam, leveraging pay-for-success financing, targeting BMPs in the most effective areas of the watershed, pushing development of new BMPs and science, and collaborating across jurisdictions to address pollution, Conowingo is helping to create new and strengthened restoration approaches across the watershed. To ensure success, Maryland must continue to lead Conowingo efforts within the CBP partnership and provide continuity across administrations in funding and prioritization.

7) Climate Change

The Bay region is projected to experience changes in temperature, sea level, and precipitation because of climate change (Najjar, et al. 2010; Johnson et al., 2016). These changes are expected to affect nutrient and sediment loads to the Bay, and in turn, affect the Bay's health (Sinha et al., 2017, Wang et al., 2017; Irby, et al. 2018; Herman, et al. 2018).

The Bay TMDL and the Phase I, Phase II, and Phase III WIP planning targets were established based on 1995 climate conditions. In March 2018, the CBP Principal Staff Committee (PSC), who represent the Bay-state governors and the mayor of D.C., agreed that the Bay jurisdictions' Phase III WIPs would include a narrative strategy to address changes in climate between 1995 and 2025. As part of the same decision, the PSC agreed to refine the climate modeling and assessment framework based on an improved understanding of the science of the impacts of climate change.

CBP further committed to adopting revised numerical climate change targets by 2021 using updated versions of the CBP's modeling tools. Changes were made to model inputs of rainfall, air temperature, wetland area, sea level rise, ocean temperature, and salinity. Watershed delivery of nitrogen, phosphorus, and sediment were modeled using improved processes to capture the effects of climate changes on watershed loads. At its December 2020 meeting, the PSC approved the recommendation that jurisdictions will be expected to address additional nutrient loads due to 2025 climate change conditions in a Phase III WIP addendum and/or 2-year milestones beginning in 2022. EPA expected each jurisdiction to also submit a Bay model scenario that numerically demonstrates that the additional nutrient load reductions will address 2025 climate change conditions.

Preliminary estimates for the climate impact through 2035 indicate a doubling of the 2025 climate change load effect. The effect of climate change on our ability to meet the Bay's water quality standards is a significant and increasing concern. The CBP partnership has committed to continue improving understanding of climate effects and reassess its impact to Bay water quality in 2025. Maryland also is investing in tangible climate mitigation efforts through new legislation and funding, including the implementation of the 5 Million Trees goal from the Tree Solutions Now Act of 2021, and addressing emissions through the Climate Solutions Now Act of 2022. The Tree Solutions Now Act of 2021 brought an equity focus to the tree planting effort by requiring at least 10% in urban underserved areas and focusing $10 million of the $15 million in funding there. These bills are accelerating progress toward riparian forest buffers, urban tree canopy, and other upland tree planting, reaching new audiences and landowners, and contributing to further declines in airborne nutrient contributions. As of July 2024, a total of 478,628 trees have been planted as part of this program, with 41,079 planted in underserved areas. Agencies are reporting progress beyond the 200-acre baseline using a publicly accessible and spatially referenced tracking tool. The award of the EPA Climate Pollution Reduction Grant for nature-based solutions will expand federal funding available for wetland restoration and tree planting. Additionally, the Harry Hughes Center for AgroEcology is finalizing a *Climate Vulnerability Assessment for Maryland Agriculture* that will outlay new science and recommendations for the state. MDA anticipates using the information to inform additional programs and investments on-farm.

Maryland had already committed to additional nutrient load reductions beyond its Phase III WIP targets, equal to an additional 1.142 million pounds of nitrogen per year and 0.111 million pounds of phosphorus per year. The 2017 model used by CBP to evaluate Maryland's Phase III WIP indicated that the nitrogen load reduction achieved by implementing the WIP would provide a surplus of 1 million pounds of nitrogen and 0.44 million pounds of phosphorus beyond the EPA target. These additional reductions not only provided Maryland with a margin of safety, but more importantly, provided a surplus that could be applied toward achieving climate change allocations.

Moreover, 2019 science updates to the Bay model indicated that Maryland's required Phase III WIP targets are only exceeded by about 0.394 million pounds of nitrogen and to 0.33 million pounds of phosphorus. Additional updates for 2023 have erased nitrogen reduction surpluses from the State's Phase III WIP. Although many of these loads will not need to be met by the 2025 TMDL deadline, they represent an additional 1.5 million lb nitrogen reduction challenge for the State as it prepares for the 2026 evaluation of Chesapeake Bay efforts by the U.S. Environmental Protection Agency.

Maryland submitted an addendum to its Phase III WIP detailing its climate allocation strategy, which focuses on a viable solution to address the nitrogen reduction gap caused by the combination of Bay model updates and Maryland's additional nitrogen reductions required to offset impacts from 2025 climate conditions. Maryland's primary nutrient control strategy relies on further improvements in the performance of the state's WWTP operations.

The State is also hard at work implementing policies to meet Maryland's nation-leading greenhouse gas goals while building a green economy and achieving environmental justice for all Marylanders. Maryland's June 2023 Climate Pathway Report solicited public feedback on greenhouse gas control opportunities. Maryland's Climate Pollution Reduction Plan was published in December 2023 with policies to reduce statewide greenhouse gas emissions 60% by 2031 and create a path to a goal of a net-zero economy by 2045.

8) Accounting for Growth in Loads

Maryland is expected to grow by approximately 14,100 households per year through 2045, resulting in increased nutrient pollution (MDP, Projections and State Data Center, October 2021). Given changes to the CBP model and forecasted climate change impacts, an updated analysis to inform Maryland's accounting for growth approach moving forward is needed.

In developing the Phase III WIP to meet 2025 pollution reduction targets, the PSC agreed in December 2017 to use 2025 projected conditions to account for growth impacts on land use and populations. Consequently, Maryland's Phase III WIP strategies have already accounted for projected 2025 growth in calculating each sector's load reduction. However, Maryland will continue to need to meet the Bay TMDL after 2025, which will require a greater focus on ensuring that growth impacts are accounted for in perpetuity.

Growth in nutrient loads attributed to agriculture are anticipated once the CAST-23 modeling suite is adopted by the CBP to evaluate annual progress. CAST-23 includes updated fertilizer sales data to estimate nutrient applications made to crop fields. MDA is advocating future modeling updates to allow a more extensive review of available fertilizer data and distribution methodologies that did not occur for CAST-23 due to restricted time and procedures under the CBP governance.

B.Maryland's Guiding Principles for Bay Restoration

The phased watershed planning and implementation approach for Bay Restoration is designed to be adaptive and allow jurisdictional flexibility based upon lessons learned throughout the implementation process. During development of the Phase III WIP, Maryland evaluated each pollution sector's progress in coordination with local governments and stakeholders responsible for on-the-ground implementation. We also reassessed Maryland's guiding principles for restoration to determine their continued applicability, effectiveness, as well as alignment with larger administration priorities and approaches for achieving and maintaining our 2025 restoration goals.

Prior to development of the Phase III WIP, Maryland's Bay Restoration framework was informed by the University of Maryland Environmental Finance Center (EFC) assessment of, a) Bay Restoration progress to date, b) necessary future progress to meet the 2025 goals, and c) available resources. The EFC's findings indicated "that the resources are in place to achieve interim and final restoration targets. In other words, no new state-based fees or taxes are required moving forward." The EFC's conclusion that Maryland had sufficient financial resources to achieve its interim and final pollution reduction targets were predicated on three caveats:

1. The state applies its expected excess WWTP allocation (i.e., urban growth capacity) today to offset expected shortfalls in the stormwater and septic sectors, and then builds the capacity for growth back into the system;
2. Assume that the current level of regulation will be maintained within each of the four pollution sectors, and that enforcement will be consistent and effective; and,
3. Current state Bay grant programs are fully funded and applied in the most cost-effective manner possible.

While the conclusions, caveats, and recommended next steps of the EFC assessment were valuable and remain largely applicable today, they were based on an earlier version of the watershed model, different (Phase II) pollutant reduction targets, and an older suite of BMPs and associated efficiencies. Furthermore, the assessment did not consider the impacts of climate change and the Conowingo Dam, as they were not identified at that time. As a result, and building upon the solid foundation of the EFC report, Maryland developed an expanded set of Bay Restoration guiding principles to get us to 2025, and maintain those pollution reductions into the future.

There will be no single action that will bring us success. Instead, we will need to rely on a diversity of practices, constant vigilance to and grounding in sound science, and the willingness and ability to constantly evaluate, innovate, and adapt approaches as our understanding of the environmental, financial, and social landscapes constantly change. In recognition of these realities, Maryland's Phase III WIP identifies seven guiding principles to meet our 2025 goals, and sustain a restored Bay into the future that is balanced, achievable, and locally driven:

1. Balancing regulations and incentives: Maryland has many regulatory tools under the federal CWA and state law that set numeric pollutant discharge limits, restoration conditions, or other requirements on the regulated community. Maryland also has significant pollution sources within the non-regulated community that play an essential role in achieving and maintaining our Bay Restoration targets. Consistent with the EFC findings, Maryland will continue to use a balanced approach of both effective regulations and financial incentives to drive restoration progress across sectors by prioritizing areas that achieve the most pollution reductions for each dollar invested. This will continue to be backed by robust and effective compliance and enforcement.
2. Using WWTP capacity wisely while driving long term and sustained progress in slower paced sectors: Accelerated pollution reductions from WWTPs and farms are the primary drivers of success in meeting our Bay Restoration targets. Consistent with the EFC report, Maryland continues to use its wastewater capacity to help attain our 2025 restoration goals. However, as Maryland's population grows, wastewater plant loads will increase from the growing use of public wastewater and must be offset by steady progress in reducing nutrient discharges from the stormwater and septic sectors.
3. Creating a restoration economy and driving innovation: In addition to traditional funding approaches, Maryland is pursuing market-based strategies that are designed to stimulate a restoration economy and reduce costs. Examples of new approaches in place or currently under development include nutrient credit trading, the CWCA, the Conservation Finance Act (CFA), the CWIP and Innovative and Beneficial Reuse Pilot, public-private partnerships, improved alignment of greenhouse gas reduction goals with Bay Restoration goals, and new water reuse technologies.
4. Locally driven restoration and co-benefits: Bay Restoration will not be successful without sufficient capacity and close collaboration with local partners. Additionally, the state is working with those partners to develop a strategic implementation plan for addressing local restoration challenges.
5. Accounting for and leveraging conservation and protection programs: Protecting Maryland's ecologically significant lands, aquatic resources, and wildlife is among the most effective ways to sustain Bay Restoration. Maryland is ensuring its Bay Restoration effort fully accounts for land conservation programs, while funding land conservation programs for future acquisitions.
6. Holistic ecosystem management: While Maryland's Phase III WIP is designed to be consistent with EPA's expectations and achieve the TMDL nitrogen, phosphorus, and sediment targets, Maryland is also committed to the broader goals outlined in the 2014 Bay Watershed Agreement, which include sustainable fisheries, vital habitats, reducing toxic contaminants, healthy watersheds, land conservation, stewardship, public access, environmental literacy, and climate resiliency. Maryland's commitment to this broader ecosystem management framework helps the state achieve its TMDL restoration targets while maintaining the productivity of the Bay's living resources and supporting local economies.
7. Accountability and adaptive management framework: Consistent with CBP's Accountability and Adaptive Management Framework, Maryland develops short term milestones that identify practices, programs, policies, and resources to be implemented over 2-year periods. EPA and Maryland evaluate our progress toward achieving these milestone commitments, and then take appropriate actions to improve progress during the next 2-year period.

Maryland is committed to these guiding principles for our Phase III WIP while at the same time realizing we need to adapt and modernize our programs to sustain restoration into the future. To date, Maryland has not met its pollutant reduction targets for nitrogen, but has met its phosphorus and sediment reduction goals. Reported Best Management Practices (BMPs) have achieved 83% of nitrogen, 100% of phosphorus and 100% of sediment reductions for our WIP targets. However we still have 1.5 million lbs of additional loads that need to be offset post 2025 and we will need to do a better job focusing on reducing pollution from diffuse agricultural, urban, and suburban sources (aka “nonpoint” sources vs distinct or “point” sources like wastewater treatment plants). We will also need to focus restoration in our shallow water habitats that provide recreationally and commercially important fisheries, use restoration approaches that protect communities from sea level rise and flooding, while increasing equitable access to the recreational and economic productivity that a healthy bay provides. Another important component of Maryland's overall Bay Restoration strategy is to ensure other jurisdictions are doing their fair share and that EPA is holding all jurisdictions accountable to reducing their pollution loads. Maryland and its partners took legal actions to hold EPA and all jurisdictions accountable which ended with a 2023 agreement. Outcomes from the settlement include a renewed focus by EPA in Pennsylvania on critical jurisdictions contributing large amounts of nutrients (Lancaster, York, Bedford, Cumberland, Centre, Franklin, and Lebanon counties) and to increase efforts to review urban stormwater permits.

The pandemic’s impacts on the guiding principles for Bay Restoration are still playing out. COVID-19 was a confounding factor in the operation and maintenance failures at Patapsco and Back River WWTPs, and ongoing supply chain shortages continue to impact recovery. At the same time pandemic relief funding and the new BIL have injected unprecedented funding into water infrastructure and environmental restoration programs. The BIL increased Bay Program funding by almost $44 million/year over the next 5 years. The challenge with this increased funding is that much of it is directed to competitive grant programs. To effectively compete for this funding, local governments and implementers need to have the capacity to develop robust grant proposals and have the necessary resources (staffing, contractors, equipment, and supplies) to do the work. Providing local implementers the technical support to compete for grant funding and creating workforce development programs that build the next generation of clean water professionals will be key to our continued success.

Part III - Maximizing Existing Resources: Cost- Effectiveness of State Funded Programs

The following section briefly describes how the respective lead state agencies are implementing each of the four primary Bay Restoration funding sources (BRF, WQRLF, Trust Fund, and MACS) as well as a variety of other efforts underway to maximize the cost-effectiveness of our Bay Restoration efforts.

A couple of important principles relative to this section:

- Multiple Water Quality Objectives: Multiple objectives, or co-benefits, are being considered in Maryland's WIP. Beyond low-cost nutrient and sediment reductions to the Bay, other water quality impairments are also a key consideration in funding projects. For example, streams are commonly impaired by flow-related stressors, such as temperature and sediment. These flow-related stressors are effectively managed through stormwater control measures and practices that bridge rural and urban sectors, such as riparian forest buffers and soil health. Bacteria impairments found in Maryland's streams and tidal tributaries may be addressed through implementation in the septic sector. In looking at the cost-effectiveness of a practice, Maryland is working on improving measures to quantify the significant non-nutrient impacts of practices. Furthermore, to promote more holistic projects and more strategically identify all the co-benefits of practices and their locations, the Trust Fund incorporates the following co- benefits into project selection: restoration of aquatic resources, climate resilience, carbon sequestration, creation of wildlife habitat, local employment opportunities, recreational opportunities, and/or environmental justice benefits.

- Other Bay Agreement Outcomes: Beyond nutrient and sediment reductions, states are being asked to address other objectives of the 2014 Bay Watershed Agreement in their WIPs. A notable example is the need to install more resilient infrastructure and restoration practices in expectation of extreme weather to facilitate climate change adaptation. This can be more costly than the standard nutrient reduction alternatives that do not consider additional resilience. Similar issues of additional costs may be associated with striving to meet other Bay Agreement goals, rather than solely nutrient and sediment targets.

One particular Bay Agreement Outcome that has received significant, renewed attention and focus is the Diversity Outcome, which seeks to increase engagement and participation by communities currently underrepresented in the Bay Restoration effort. Several state agencies (MDE, DNR, MDA, MDOT, and MDP) have created Environmental Justice positions within their departments and have staff that are cross-collaborating to advance DEIJ principles within agency programs and customer delivery. The University of Maryland Center for Environmental Sciences (UMCES) has committed to enhancing DEIJ initiatives and maintains Committees at both the Unit-level and institution-wide In 2021, DNR established a partnership with the Chesapeake Bay Trust (CBT) with funding provided by EPA to launch the Capacity Building Organization- Capacity Building Initiative. This program will identify historically under-engaged community-based organizations that have not previously participated in two grant programs - the Watershed Assistance Grant Program and the Resiliency Through Restoration Initiative. Interested organizations will receive the technical assistance needed to develop robust proposals for these grant programs. This initiative will enhance the state's capacity to achieve Bay Restoration goals and regulatory requirements by making the collective body of organizations pursuing restoration projects more inclusive. In April 2020 CBP formally accepted a "Diversity, Equity, Inclusion, and Justice" strategy to further progress toward that Outcome and the Executive Council signed a statement at their August 18, 2020 meeting, reaffirming their commitment to increasing participation by underrepresented communities and charging the leadership with moving forward on implementation of the strategy. A draft implementation plan was released in fall 2021, providing a roadmap for achieving the recommendations outlined in the strategy. Maryland's Bays Council agencies are currently exploring new opportunities to better engage these important stakeholders.

In support of this work, DNR recently adopted a new DEIJA statement, which reads "Maryland DNR commits to fostering a culture and workforce that is inclusive, equitable, and representative of the State's diversity. We are committed to increasing accessibility to our public lands, waterways, and natural resources for all communities to enjoy. By engaging and understanding communities that have historically been left behind, we strive to address and remove systematic barriers that perpetuate environmental injustices. Through this work, we celebrate these values within nature, our partnerships, and the communities we serve."

We will take the following actions to ensure that environmental justice is embedded throughout this plan. These actions include, but are not limited to:

- Prioritizing grant funding and programs in underserved and overburdened communities;
- Establish a community liaison program to ensure underserved and overburdened communities have a voice in our work and decision making;
- Provide technical assistance to underserved and overburdened communities; through our programming; and
- Provide equitable and accessible public access opportunities through these climate projects.

This work is currently being implemented via several initiatives and programs at DNR that include the Greenspace Equity Program, Community Forestry Catalyst Fund, Whole Watershed Act and Fund, Grants Gateways Program, and partnerships like Envision the Choptank.

One example is MDE's recent partnership with Moonshot Missions to build a Maryland Utility Peer-to- Peer network, which will provide supplemental technical assistance to water utilities in underserved communities with the goal to increase water sustainability, equity, and

affordability.

When considering the cost-effectiveness of Bay Restoration, it is also important to consider the return on investment (ROI) that a clean Bay provides, be it for boating, fishing, recreation, tourism, and increased opportunities for currently underserved communities within our watershed.

A 1989 report by the Maryland Department of Economic and Employment Development (now Labor) estimated the value of the Bay in excess of $33 billion annually and at a total value of $678 billion. The 2004 Bay Blue Ribbon Finance Panel estimated that in today's dollars, that value would now be in excess of $1 trillion. This 2004 report also cited estimates of $2 billion annually just for recreational boating activity in Maryland. As far as the costs of Bay Restoration, a Congressional Research Service Report estimated total costs of restoration from $7 billion for each state to $28 billion for the entire watershed. These estimates did not include ongoing maintenance costs for sustaining restoration.

A. Chesapeake Bay Restoration Fund

The BRF provides grants for projects that reduce nutrient and sediment loads to the Bay. The BRF is composed of two separate funds, the Septic Fund, and the Wastewater Fund. The Septic Fund pays for septic upgrades to BAT, and prioritizes these based on proximity to the Bay, which results in the most cost-effective reductions per pound of nitrogen. A 2019 Cost Effectiveness study by UMCES estimated the cost efficiency of BAT upgrades to be around $300 per pound. The septic ranking scheme also prioritizes failing systems, which provides the important co-benefit of protecting public health. The Septic Fund also pays for cover crops, another cost-effective practice, through MDA's Cover Crop Program.

Up to 10% of the Wastewater Fund may be used to pay WWTPs that optimize their ENR operation after the upgrade and demonstrate high performance levels (those discharging nitrogen concentrations below 3 mg/L, and phosphorus concentrations below 0.3 mg/L). This program is highly cost-effective, generating reductions at an estimated $10 per pound of nitrogen. In 2021, the BRF regulations were amended and the BRF O&M grant can now be distributed in a way that pays for nutrient load reductions below the current grant threshold of 3 mg/l of nitrogen and 0.3 mg/l of phosphorus, in other words, providing additional grants to facilities achieving better than ENR.

Up to $20 million annually is allocated from the BRF Wastewater Fund to the Clean Water Commerce Act (CWCA), which allows MDE to purchase cost effective nitrogen reduction from both public and private entities. Projects funded by MDE under this program can be any kind of BMP, but have to compete for cost efficiency. Carveouts for the funding include $7M/year to agricultural practices, $2M/year for non-agricultural practices and $4M/year for projects in underserved areas. For point sources, reductions must be achieved above and beyond the permit requirements. The program encourages innovation and is intended to reach entities and projects that are not eligible to participate in the MDE traditional capital projects program.

The Wastewater Fund also pays for upgrades to minor WWTPs, sewer improvements to reduce overflows and improve climate resiliency of the sewer system, septic connections, and stormwater projects. Projects are prioritized using the EPA-approved Integrated Project Priority System (IPPS), which evaluates which projects provide the most cost-effective nutrient reductions in dollars per pound. MDE has also worked with other state agencies to expand the IPPS to also factor in non-nutrient co- benefits such as public health benefit, sustainability and climate resiliency.

Maryland's Phase III WIP recognizes that as opportunities for low-cost nutrient reductions are used up, per pound costs will increase. As costs rise it will become increasingly important to ensure that the cost- benefit ratio is optimized—not just through lower costs, but by maximizing the benefits. This can be thought of as stacking co-benefits. Maryland's Bays Council agencies will continue their work with our CBP partners to define and quantify non-nutrient co-benefits, and this work will be used to inform state project prioritization metrics, including subsequent iterations of the IPPS.

B.Water Quality Revolving Loan Fund

The WQRLF provides below market interest rate loans, and loan principal forgiveness (where applicable) to local governments and other eligible entities to finance water quality improvement projects. Since its inception in 1987 through June 2024, the WQRLF has provided approximately $3.412 billion in financing for water quality projects. In addition to protecting public health, one of the primary goals of the program is to achieve these improvements by reducing the amount of nutrients being discharged into the Bay. Projects eligible for funding include WWTP improvements and upgrades, eliminating failing septic systems, reducing combined sewer overflows and sanitary sewer overflows, nonpoint source projects such as urban stormwater control, and sewer system rehabilitation.

Projects submitted for consideration are rated and ranked using the IPPS, which prioritizes cost effective projects, along with co-benefits such as public health benefit, sustainability, and climate resiliency.

The WQRLF is receiving significant additional federal funding through the BIL. Between Federal Fiscal Years 2022 and 2026 the WQRLF will receive approximately $270 million in additional funding from EPA for all eligible uses of the WQRLF. These funds will be prioritized using MDE's EPA approved scoring system, providing more funding to local governments and other eligible funding recipients for projects that reduce nutrients being discharged into the Bay.

C.Chesapeake and Atlantic Coastal Bays Trust Fund

The Trust Fund allows Maryland to accelerate Bay Restoration by focusing financial resources on the most efficient, cost-effective nonpoint source pollution control projects in targeted areas of the state. The ability to award the maximum amount of Trust Fund resources to local partners through competitive measures is mandated in the Trust Fund's enabling statute and is critical to the fund's success at delivering quantifiable benefits to water quality. State agencies work with our local partners to administer the money in ways that leverage the funds to the greatest extent possible, target the funds geographically, engage the community at large, and hold everyone accountable.

Step 1: Incorporating science into decision-making. The Trust Fund's explicit goal is to ensure the greatest environmental return on investment. To that end, the Trust Fund is advised by a Scientific Advisory Panel, which reviews and advises on priorities and geographic targeting based on the latest scientific advancements. The Trust Fund utilizes a targeting map to geographically guide investments. In SFY24, the Trust Fund incorporated a new targeting map, piloted in the previous year. To promote more holistic projects and more strategically identify all the co-benefits of practices and their locations, the Trust Fund prioritizes projects that, in

addition to providing cost-effective and measurable nonpoint source pollution reductions, provide co-benefits including: restoration of aquatic resources (i.e., submerged aquatic vegetation, oyster reefs); climate resilience; carbon sequestration; creation of wildlife habitat; local employment opportunities; improvement or provision of recreational opportunities; and environmental justice benefits. The Conservation Finance Act of 2021 (CFA) added these co-benefits to the investment criteria for the Trust Fund decision-making, extending the desired environmental outcomes beyond simply nitrogen, phosphorus, and sediment reduction.

Additionally, the state has created an online tool, FieldDoc.org, in collaboration with the National Fish and Wildlife Foundation and Chesapeake Commons, to ensure accurate and efficient returns on investment. During project proposals, applicants use FieldDoc to estimate nitrogen, phosphorus, and sediment reductions. The land use loading rates and BMP effectiveness estimates within FieldDoc are consistent with CBP protocols and are required to calculate reductions for all proposal submissions.

Step 2: Prioritizing cost-effective projects through the project solicitation process. The Trust Fund has quickly become one of the most innovative and important water quality financing programs in the region. The first step toward incentivizing cost efficiency was to prioritize efficiency through the competitive solicitation process. Competitive award processes allow state agencies to target funds for performance-based outcomes that have true, quantifiable benefit to the Chesapeake and Coastal Bays. Given that the primary restoration goal is to reduce pollutant loadings, the cost-efficiency is best measured in Trust Fund dollars per pound of pollutant reduced. This cost per pound metric guides decision making and has been made more reliable using FieldDoc. Other cost-related analysis for co- benefits related to DEIJ, climate, habitat and others is emergent, using targeting and ecosystem services as the basis.

To aid in the annual competitive process, the state created the Chesapeake and Coastal Grants Gateway, which provides a one-stop location for partners seeking technical and financial support for projects that foster healthy ecosystems, communities, and economies that are resilient in the face of change. The Trust Fund dollars are awarded through the gateway along with other state and federal funding to allow for comprehensive project support and leveraging across financial programs leading to more cost-efficiency and project efficacy. The CFA further extends the Trust Fund's ability to work with aggregators to fund large-scale pay for success projects. The CFA is a broad legislation allowing the Trust Fund to contract directly with for-profit restoration firms to target cost-efficient nutrient and sediment reduction while also considering other benefits, including climate resilience, DEIJ considerations, habitat, and carbon sequestration.

Step 3: Incorporating monitoring data into future decision making. The most logical outcome of adaptive decision-making is a system where data is used to inform future funding decisions by Trust Fund managers. The entire system requires data reporting requirements that are clearly established as part of the project monitoring protocols; in addition, a clear system for incorporating those data into future decision making must be established. To do this, the Trust Fund managers leverage the expertise of DNR's Resources Assessment Service to establish clear project monitoring protocols to ensure consistency among projects.

Beginning in SFY15, the Trust Fund partnered with CBT to create a pooled monitoring initiative and issue the Restoration Research Grant. The goal of this research program is to answer several key restoration questions that are a barrier to watershed restoration project implementation. Answering these questions will ultimately lead to increased confidence in proposed restoration project outcomes, clarification of the optimal site conditions in which to apply particular restoration techniques, information useful to regulatory agencies in project permitting, and

information that will help guide monitoring programs. Since the advent of the pooled monitoring initiative, other state and local partners have begun to invest in the research grant to increase the impact and breadth of study, including Anne Arundel County, Baltimore City, Charles County, Frederick County, Harford County, Montgomery County, and the Maryland Department of Transportation State Highway Administration.

Step 4: Incentivizing cost-effectiveness at the project level. The Trust Fund has been working to predicate financing on performance rather than implementation rates. Perhaps the greatest benefit associated with the adaptive decision-making system of the Trust Fund is that it enables the state to shift its financing away from practice-based metrics of success to actual performance-based metrics. With a more accurate understanding of how well projects and practices mitigate nutrient emissions, it becomes more efficient to focus financing on that performance. This contrasts with how typical restoration investments are made where increasing units of practices installed is the primary financing goal. It is the hope that by increasing performance at any given price point, a project implementer has an opportunity to increase their return on investment. This incentive is much less impactful in the practice-based system because the reductions in cost could be at the expense of pounds removed from the system. The CFA has created the enabling conditions to extend the state's ability to focus on performance-based metrics by amending procurement law to include environmental outcomes as a desirable commodity.

D. Increasing the Co-Benefits of Agricultural Implementation

In addition to reducing nutrient and sediment flows into the Bay and its tributaries, many of the agronomic and conservation practices used by Maryland's farmers, growers and producers have the potential to make a significant contribution to the state's climate change goals by sequestering carbon and reducing other greenhouse gas emissions.

The 2017 Healthy Soils Act charged MDA with the development of a Healthy Soils Program to improve the health, yield, and profitability of Maryland's soils and promote the further adoption of conservation practices that foster soil health while increasing sequestration capacity. After finalization of program recommendations in January 2022, from MDA's Soil Health Advisory Committee, MDA has launched two new initiatives - *Cover Crop Plus* and the Healthy Soils Competitive Fund. The latter is experiencing strong demand with $993,000 awarded during the SFY24 funding cycle, a 54% increase from the previous year.

Advancing the Healthy Soils Program is key to the state's climate change goals and MDA continues to partner with MDE to improve methods that better quantify the soil carbon sequestration and greenhouse gas reduction potential of key conservation practices while seeking to capitalize on co-benefits for both water quality and climate resilience.

E. Increasing the Co-Benefits of Stormwater Implementation

Maryland's Phase III WIP Stormwater Sector Report states that "care should be taken to select specific restoration practices that provide both a nutrient reduction benefit for the Bay as well as address other important local stressors." These "important local stressors" can impact both aquatic life as well as human health and safety and include, but are not limited to, fecal bacteria, temperature, metals and other toxic pollutants, trash, increases in total stream flow and peak flow, and both riparian and interior watershed flooding. Further, Maryland's WIP

states “A different way to maximize the impact of money spent on SWM is to expand the benefit across multiple water quality objectives.” While current stormwater permit credits are based on nutrient and sediment load reductions for variable practices, Maryland is working with researchers from UMCES to develop crediting systems and protocols for these other water quality objectives that are systemic to urban watersheds. These systems and protocols that are in development could be applied in future stormwater permits. The first phase of this work utilizes the Capacity, Opportunity, Payoff, and Equity (COPE) strategy to assess the benefits of any particular water quality objective. COPE assesses the combined effectiveness of any given project at reducing the pollutant of concern, the number of people the project will benefit, the opportunity for providing a benefit based on project location, and the social vulnerability of the population the project will benefit. Phase I of this work was completed in August 2022, and Phase II of this work was initiated in the summer of 2023 and is exploring the results of prior COPE system crediting and is subsequently making adjustments.

F. Leveraging Private and Public Partnerships

Innovative Technology Fund. Providing efficiency and cost effectiveness within the restoration effort requires innovative partnerships and financing structures. Through the Innovative Technology Fund (funded through the Trust Fund), the state is taking a lead role in financing the advancement of knowledge in the areas that most impact restoration programs, practices, and policies. The goal of the Innovative Technology Fund is to support Maryland businesses that are developing new, cost-effective approaches to reducing nonpoint source pollution to the Bay. To achieve this goal, the Innovative Technology Fund works with both the Maryland Industrial Partnership to provide grants that develop and validate emerging restoration technologies, and with the Maryland Technology Enterprise to administer the Chesapeake Bay Seed Capital fund that invests seed funding for direct commercialization efforts.

Established as an Evergreen Fund, the Chesapeake Bay Seed Capital Fund saw a 60% return with one of its investments in 2023 and will use these proceeds to continue to invest in Maryland-based startup companies with solutions that improve air and water quality. To date the Innovative Technology Fund has invested $10.9 million with $13.5 million in private matches, supporting 63 new technologies and 53 Maryland businesses.

Conowingo Pay for Success. The Maryland General Assembly appropriated $25 million to purchase “environmental outcomes” as part of the Conowingo WIP implementation. This financing was authorized under Maryland’s Conservation Finance Act (2022) and piloted in the Clean Water Commerce Act. Nitrogen reductions are quantified using the Chesapeake Assessment Scenario Tool (CAST) and verified using the Chesapeake Bay Program BMP verification guidance. The pay for success financing strategy is a cost effective approach and minimizes risk. Applicants, including environmental consulting firms and non-governmental organizations, submit proposals that detail a cost per pound of nitrogen reduction realized by Chesapeake Bay Program-approved BMPs, such as core nitrogen management, riparian forest buffers, and stream restorations. Proposals that are considered high in cost or too uncertain will not be chosen. Payments for awarded projects will only be made when the BMP is fully implemented and nutrient reductions are verified. A payment schedule for annual nutrient reductions is agreed upon, not to exceed 20 years. A memorandum of understanding was established with the Susquehanna River Basin Commission (SRBC) to administer the financing and related procurement processes for the pay for success program.

On August 15th, SRBC and the Maryland Department of the Environment (MDE) announced funding of more than $11 million to seven projects that will help mitigate water quality impacts of the Conowingo Reservoir on the Chesapeake Bay. This first round of funding has nitrogen reductions priced from approximately $150 per pound of nitrogen reduced, to as low as approximately $6 per pound, for a variety of practices. Total annual nitrogen loads are projected to be reduced by approximately 46,000 pounds per year, for a total of approximately 368,200 pounds of nitrogen reduced over the lifespans of the projects funded. For more information, please see SRBC's website HERE. A second round of funding will be initiated in the near future.

Pay for Success - Trust Fund

The Conservation Finance Act allowed the Chesapeake and Atlantic Coastal Bays Trust Fund the opportunity to contract with for-profit aggregators/organizations to achieve Bay goals at a larger scale and lower cost for the desired outcome. Ultimately, this is an effort to attract private investment in environmental outcomes. In 2024, legislation was passed to provide a procurement exemption to facilitate the ease of contracting awarded projects to for-profit organizations. These projects are completed through the Grants Gateway solicitation each year.

Whole Watershed Program and Fund

The Whole Watershed Act (SB 969/HB 1165), passed in the 2024 legislative session, establishes a highly collaborative, science-based approach to watershed restoration across the state promoting innovative, science-based solutions to waterway restoration efforts. The legislation will utilize existing state funds to create a new Whole Watershed Fund supporting a five-year pilot program targeting five Maryland watersheds that best represent the state's diverse land uses, geographies, and impairments.

A direct response to the Chesapeake Bay Program's Scientific and Technical Advisory Committee's Comprehensive Evaluation of System Response (CESR) report, the pilot projects will address multiple restoration and conservation benefits, including water quality, increased public access, wildlife habitat, fisheries improvement, environmental justice and climate resiliency. Selected projects will be overseen by a State Management Team, made up of agency experts, to help find efficiencies in project permitting and funding, and to measure project results.

The state published the watershed criteria for selection in July 2024 to allow local partners to assess their watersheds for opportunities. A full Request for Proposals will be issued by October 1, 2024. The State Management Team will select up to five (5) watersheds for a concentrated five (5) year focus of technical and financial assistance. The State Management Team anticipates local watershed teams to be inclusive of many partners, including community associations, local government(s), landowners, watershed organizations and other non-profit organizations, and private firms engaged in eligible watershed activities, among others.

G. Generating Water Quality Credits from Oysters

An adult oyster feeds by filtering the Bay's water. In doing so, it helps to improve water quality by assimilating nutrients into its tissue and shell, removing sediment particles from the water column, increasing the availability of bioavailable nitrogen to bacteria and depositing particles that may become buried on the bottom.

Now recognized as a water quality improvement practice, MDE and DNR are implementing an oyster harvest verification process to allow participation in the Water Quality Trading (WQT) Program and the CWCA. This approach incentivizes the oyster aquaculture industry while providing a water quality improvement co-benefit. Many oyster aquaculture growers have participated in Maryland's WQT program, with several selling credits to buyers in the state. Recent awards for the purchase of nutrient credits from aquaculture via the CWCA should encourage the participation of additional farmers in future years.

Additionally, CBP has incorporated aspects of the public oyster fishery (i.e., the commercial harvest of wild oysters) and oyster reef restoration as verified water quality improvement practices. While no such practices have been approved to date, we are optimistic that the commercial harvest of wild oyster populations that have been enhanced with hatchery-produced spat and certain aspects of oyster reef restoration will move forward with additional nutrient reductions in 2025.

H. Water Quality and Climate Change

A report from the CBP's Scientific Technical Advisory Committee (STAC) entitled Chesapeake Bay: A Comprehensive Evaluation of System Response (CESR) highlights challenges posed by a changing climate and guarantees change for Chesapeake Bay and its tributaries. It also states that the Bay of the past is not achievable, which makes it difficult to conduct Bay "restoration" in coming decades. TMDL water quality standards were based on mid-20th century conditions, but the Chesapeake and its tributaries will be warmer, facing flashier periods of drought, and more intense storms. Although the CESR report forecasts some stark changes in how we should manage the Chesapeake, they did provide some recommendations for future efforts in the Chesapeake that focus on new ways to determine success in addition to our existing modeling efforts. MDE, MDA, DNR, MDP, and DBM created a special workgroup to review the CESR findings and to make suggestions for new policies and methods for Bay restoration and protection. These suggestions are now incorporated into the Bays Council goals and strategies to reinvigorate, rethink and re-engage in meaningful and measurable program activities, policies and investments to achieve our commitment to protecting the Chesapeake Bay and Coastal Bays Watershed.

Many of the implementation strategies that result in water quality improvements also provide climate change adaptation and mitigation co-benefits. This also applies to Maryland's Ocean Acidification Action Plan, adopted in 2021. These co-benefits include mitigating greenhouse gasses using renewable energy or energy efficiency, and adapting to climate change by improving soil health, and utilizing natural filter BMPs such as wetland creation and tree planting. To capitalize on these water quality and climate co- benefits, state agencies have prioritized these implementation strategies leveraging the benefits with one project budget.

This has been done with Maryland's Resiliency through Restoration Initiative; Water Quality and Climate Change Portfolio; and by synchronizing the beneficial use of dredged material in restoration projects that reduce flooding, stabilize shorelines, and mitigate storm impacts.

Maryland's CFA updated funding priorities for the Trust Fund to include climate resilience in the project investment criteria. The CFA opens the Trust Fund investment metrics to focus not only on water quality but also climate, carbon sequestration, habitat, and other project benefits as well.

A-StoRM seeks to improve the resiliency of our state's stormwater infrastructure network by reviewing new rainfall patterns, identifying areas of flooding concern due to inadequate stormwater treatment, and to update the stormwater design manual to incorporate additional volume control. This effort is being conducted to enhance community safety by building BMPs that are able to withstand larger and more intense amounts of precipitation.

The Adaptation and Resiliency Working Group under the Maryland Commission on Climate Change released the Next Generation Adaptation Plan in August 2024 which provides a prioritized list of milestones for the next 10-years. The Next Gen Plan is composed of 5 sector groups (Water Resources, Human Health, Working Lands and Natural Resources Based Industries, Natural Resources and Ecosystems, and Critical Infrastructure) and 3 overarching focus groups (Justice, Equity, Diversity, and Inclusion, Local Government and State Service Delivery, and Climate Jobs and Training). The priorities included in this report are separated into resource ready, meaning the resources already exist to begin achieving milestones, and investment needed, which are those that will require more investment and attention to begin the work. The sector and focus groups in Next Gen have many implications for water quality specifically, but span climate change impacts across the board.

I. MDOT-DNR MOU

Since 2021, DNR and MDOT have moved forward with four project task agreements under their executed Memorandum of Understanding (MOU). Three of the tasks involved the MDOT Urban Tree Program, which was established in 2021 to promote local tree planting and other sustainable practices that would improve local air quality, alleviate urban heat island effects, and prioritize the initial replacement of trees, on public or private property, in communities affected by transportation impacts and environmental justice issues or heat island effect. These tasks provide co-benefits beyond air quality, including nutrient uptake, carbon sequestration, enhancing bicycle and pedestrian connections to transit, and temperature mediation that reduces urban heat impacts.

Since its inception, the MDOT Urban Trees Grant Program has awarded $97,000 across 29 projects that support the site preparation, outreach, maintenance, and planting for over 1,000 trees. At the time of this report, just under 800 of the over 1,000 funded trees have been planted, with fall 2023 awardees currently scheduling their planting events. MDOT introduced an online application process for the fall 2023 funding cycle, which saw an increase of 470% in applications received compared to the same period last year. This is due in part to the online application availability, but also the power of partnership and community building. Over the last year, MDOT has worked closely with DNR Forestry to improve awareness of the program, improve outreach, and enhance program operations which resulted in the largest single season grant award totaling $52,948. The funding will support the planting of 308 trees in 13 communities across Maryland this fall. As the Program continues to grow, MDOT is working to better understand and measure the co-benefits of tree planting, including for communities, human health, ecosystem function and ecology, as the Program continues to grow.

J. EPA Chesapeake Bay Implementation Grant

The Maryland Department of Natural Resources applied for a new 3-year Chesapeake Bay Implementation Grant (CBIG) from the EPA in July 2024. This funding will support DNR's efforts towards achieving the goals of the 2014 Chesapeake Bay Watershed Agreement. For SFY25, DNR expects to receive $3,600,104. Projects included will support tree planting efforts, water quality best management practices, environmental education, Maryland Agricultural Cost Share, and other projects that advance Maryland's commitments to a healthier Chesapeake Bay.

K. EPA Infrastructure Investment and Jobs Act Most Effective Basins Grant

IIJA: The EPA has awarded the State of Maryland $2,848,404 in SFY25 to support projects throughout the EPA's Most Effective Basins (MEB) and to support goals in the 2014 Chesapeake Bay Watershed Agreement. The funding will support a variety of implementation and MEB technical assistance projects. DNR and MDE worked to identify projects in the targeting MEB areas that had been competitively submitted through existing channels including state requests for proposals as well as projects submitted through the competitive solicitations of the Chesapeake Bay Trust. The additional federal funding allowed the state programs to extend their capacity to fund effective projects.

SFY25 IIJA MEB Projects:

- MDE - City of Brunswick Stream Restoration
- Broadway East Community CDC - Urban Bioretention Strips
- Chesapeake Bay Trust - Community Based Organization Capacity Building Initiative
- Town of Middletown: Greenfields Community Garden
- Chesapeake Village Condominium Association, Inc. - A Greener Chesapeake Village
- The 6th Branch - Midway Community Garden
- City of New Carrollton - Greenfields Community Gardens
- Howard County, MD - Reducing Heat Islands in Vulnerable Populations
- Oakland Mills Interfaith Inc. - Oakland Mills Interfaith (OMI) Upper Parking Lot Bioretention facility
- City of Cambridge - Cambridge City Hall and Washington Street-Stormwater Improvements
- Third Haven Monthly Meeting - Third Haven Friends Meeting - Tree Succession Planning and Partnership Development
- Delmarva Muslim Community - Delmarva Muslim Community, Inc.: Environmental Planning for Future Generations
- The Delmarva Free School, Inc - Creating Community Green Space for Mental Health
- National Wildlife Federation - Living Shoreline in Morgan Creek

Part IV - Planning for the Future: Implementing a Sustainable Chesapeake Bay Restoration Financing Strategy

Over the past 30 years, significant resources have been committed to studying threats to the Bay and its watersheds, identifying restoration opportunities, assigning, and implementing restoration responsibilities. From SFY00-SFY24, about $15.9 billion (Table 1) has been invested in Bay Restoration.

In 2024, the General Assembly passed the Whole Watershed Act which establishes a highly collaborative, science-based approach to watershed restoration across the state promoting innovative, science-based solutions to waterway restoration efforts. The legislation utilizes existing state funds to create a new Whole Watershed Fund supporting a five-year pilot program targeting five Maryland watersheds that best represent the state's diverse land uses, geographies, and impairments.

A direct response to the Chesapeake Bay Program's Scientific and Technical Advisory Committee's Comprehensive Evaluation of System Response (CESR) report, the pilot projects will address multiple restoration and conservation benefits, including water quality, increased public access, wildlife habitat, fisheries improvement, environmental justice and climate resiliency. Selected projects will be overseen by a State Management Team, made up of agency experts, to help find efficiencies in project permitting and funding, and to measure project results. The first proposal solicitation is planned for Fall 2024, with five pilot watersheds to be selected in Spring 2025.

The Bays Council recognizes that the state must continually keep the door open to and explore new, innovative approaches to Bay Restoration if we are to be successful. Innovation and flexibility within existing programs can also be mechanisms to promote cost-effective water quality restoration solutions. While bringing more private dollars and project risk-sharing into our restoration efforts will be critical to accelerating and scaling up restoration, we must also ensure that state agencies have sufficient operational funding and staffing to administer and oversee restoration programs.

Additionally, the state along with other bay watershed jurisdictions have continued to stress the importance of multiple benefits of restoration and conservation efforts, including but not limited to the reduction of environmental disparities experienced by overburdened or underserved communities; creation or restoration of wildlife habitat, riparian buffers, and wetland restoration; the restoration of aquatic resources, such as fresh water mussels, fish passage, or oyster reefs; carbon sequestration; heat island reduction, climate change mitigation, adaptation, or resilience; local employment opportunities; improving and protecting public health; and recreational opportunities and public access to waterways and natural habitats. Broadening the scope and desired outcomes of our state investments to look beyond pounds of pollution reduced as the cost-efficiency metric may impact overall costs of state investments, but with greater outcomes and more beneficial local impact on the people, wildlife, aquatic species and economies. While continuing to achieve effective, cost-efficient implementation, the cost-efficiency review now must consider multiple benefits beyond water chemistry and the

cost of investment in areas that have long been neglected. Importantly, these considerations are of greater importance as the state continues to weigh the pressures of continued growth and development with the need for land conservation and environmental restoration to balance impacts and ensure progress.

Recognizing that multiple benefits such as water quality, climate resilience and habitat creation, among others, work in tandem to achieve living resource goals, state restoration and resilience programs select projects that meet these multiple objectives/benefits. This shift from exclusively evaluating projects based on their water chemistry benefits (nutrients and sediment) to accounting for multiple benefits has redefined what a cost-effective project is. Pounds per dollar of nutrients or sediment reduced is not the only metric that should drive project implementation.

A. Bay Restoration Fund

This fund continues to be a pollution reduction driver. Between SFY05 and SFY23, the fund awarded $2.056 billion in grants for enhanced nutrient reduction at the state's major and minor WWTPs, sewer overflow abatement projects, SWM control measures, cover crops, and septic connections to Biological Nutrient Removal or ENR WWTPs. With the major wastewater treatment plants fully funded, the fund will continue its emphasis on cost efficient nitrogen reductions to achieve Bay Restoration goals. Some recent highlights of this fund include:

Increased Emphasis on Cost Efficiency through the Revised Project Ranking and Selection System The system consists of four rating categories, which include Water Quality or Public Health Benefits,
Compliance, Cost Efficiency, and Sustainability. Total scoring points were increased in cost efficiency to ensure that grant funded projects are providing the highest environmental benefits for the least dollars spent. The most points are still awarded to either the project's nitrogen reduction benefit or public health benefit. The revised scoring system is resulting in higher scores for projects that have a high nitrogen reduction or significant public health benefits and are also cost-effective at reducing nitrogen. The revised project rating system was used to select projects for the SFY24 budget cycle. The revised IPPS has led to more holistic scoring for each project application, as well as a stronger list and more diverse mix of projects selected.

Paying Directly for Nutrient Reductions through the CWCA
During the 2017 session, the CWCA was signed into law, which allows up to $30 million ($4, $6, $10, and $10 million in SFY18-SFY21, respectively) of Bay Restoration Funds to purchase cost-effective nitrogen, phosphorus, and sediment load reductions. This is expected to leverage market forces and provide the state with another mechanism to more cost effectively meet Bay Restoration goals. The CWCA was reauthorized during the 2021 legislative session. The new iteration of the program has more robust funding ($20 million a year through SFY30) and an enhanced scope, including additional project eligibilities such as agricultural BMPs, and focus on additional benefits, including equity for overburdened communities, climate mitigation and resilience, and improving local water quality in addition to Bay water quality. The first project solicitation under the reauthorized program was opened during summer 2022 and closed on September 9, 2022. The Department is in the process of evaluating the project proposals received for award funding.

There has been significant interest in the new iteration of the program (FY23), with 36 applications received and over $90 million in funding requested. MDE, MDA, and the

Environmental Policy Innovation Center (EPIC) evaluated the submitted applications and selected 16 projects to be funded (nine projects by MDE, five by EPIC, and two by MDA). The 16 projects include $14 million for agricultural practices and $2 million for landscape restoration projects.

Paying-for-Performance at WWTPs

Up to 10% of the Wastewater Fund may be used toward O&M grants, which pay WWTPs that optimize their ENR operation after an upgrade and demonstrate high performance levels (discharging nitrogen concentrations below 3 mg/L and phosphorus concentrations below 0.3 mg/L). In 2021, the BRF regulations were amended and the BRF O&M grant can now be distributed in a way that pays for nutrient load reductions below the current grant threshold of 3 mg/l of nitrogen and 0.3 mg/l of phosphorus, in other words, providing additional grants to facilities achieving better than ENR. This provides an additional incentive for ENR WWTPs to further optimize their performance. MDE anticipates utilizing the full 10% of BRF wastewater funding (up to $11 million) for this program going forward. MDE is requesting additional authorization of this funding for FY25 to incentivize enhanced performance at the State's wastewater treatment facilities.

Septic Fund

MDE is using BRF to upgrade septic systems with the Best Available Technology (BAT) for nitrogen removal. As of June 30, 2023, the BRF has funded 15,638 BAT upgrades throughout Maryland, of which 9,522 upgrades were completed within Maryland's Critical Areas. In addition, 1,504 homes have been connected to public sewers using BRF. The BRF has provided $244 million in grants to local health departments in order to perform this work.

B.Chesapeake and Atlantic Coastal Bays Trust Fund

The Trust Fund was fully funded again in SFY25, with an allocation of $74.5 million. Between 2009 and 2023, the fund has invested more than $707 million in efforts to improve the health of the Bay by advancing the implementation of local and state WIPs. In SFY24, the fund targeted $60.6 million, and leveraged an additional $20 million awarded through a competitive process to accelerate state and local efforts to improve the health of the Bay.

As a transformative step forward, the Trust Fund's annual solicitation for projects began directly linking investments to water quality performance rather than implementation rates. By establishing pounds reduced per dollar spent as the primary criterion for selecting projects, the Trust Fund built an inherent incentive into the financing system to improve efficiency. The Trust Fund is the most impactful when it uses this cost-effective, performance-based framework through competitive processes to the greatest extent practicable to engage in implementation of nutrient and sediment reduction projects as dictated in the guiding legislation.

To continue to build on the Trust Fund's innovative structure to expand its reach and influence, it is essential that the Trust Fund be catalytic in nature, facilitating the flow of public and private capital and improving the effectiveness of other restoration policies and programs across the state, while ensuring the most water quality benefit for every dollar invested. In this effort, DNR introduced the Grants Gateway, a single point of entry for organizations seeking technical and financial assistance to restore local waterways, increase their resilience to climate impacts, strengthen local economies and develop the next generation of environmental stewards.

Created to streamline the grant application process for government and non-governmental organizations as well as academic institutions, grants are made possible with funding through the Trust Fund, the Coastal Resiliency Program, the Waterway Improvement Fund, the National Oceanic and Atmospheric Administration and CBP. This streamlined application process allows Trust Fund managers to work closely with other state and federal sources to leverage funds and support comprehensive projects that achieve a myriad of co-benefits.

The Trust Fund managers are working to establish technical and financial support to assist with the ongoing maintenance and adaptive management needs of funded watershed projects. Many projects require periodic maintenance that some community partners are not well-equipped to perform or finance. Additionally, nature-based BMPs can require a period of adaptive management to best ensure how these dynamic systems respond to restoration and increased storm events. In order to address these needs, the Trust Fund has begun to explore opportunities to provide technical and financial assistance aligned with post-construction sustainability. There are several market-based financing pilots initiated through the Trust Fund in recent years that continue to advance and are assessed for future consideration and fund growth. These include building cost-efficiency through project aggregation and pursuing pay-for-success models with private investment. Additionally, through financing for startups with Bay improving technologies, the Trust Fund has helped support the development of 56 new technologies that improve water quality in the Bay and is now also investing in climate technologies that mitigate nutrients loads attributed to climate change. Recent co-investments with other professional investors have leveraged additional resources for the startup and increased the cost-effectiveness of the state's investment.

C.Water Quality Trading

Following the adoption of trading regulations in 2018, Maryland implemented its WQT program, which creates a public market for nitrogen, phosphorus, and sediment reduction credits to enhance the restoration and protection of the Bay and local waters by reducing the cost and accelerating the pace of nutrient and sediment reduction efforts. Credits can be purchased to meet pollution control requirements for permits at facilities where pollution control measures are infeasible or too expensive. Credit trading provides a means to ensure pollution controls are implemented in the most cost- effective manner possible.

The first credits were certified under the program in February 2019, and the first trade was approved in March 2019. The first trade for credits from oyster aquaculture occurred in May 2020. In 2020, MDOT Maryland Port Administration became the first state agency to generate and trade credits under this program. Trades have been used to meet industrial stormwater and municipal stormwater restoration requirements as a "bridge to compliance" while additional restoration activities are completed.

As of July 2024, 1,362,854 pounds of nitrogen reduction credit; 499,158 pounds of phosphorus reduction credit; and 41,425,185 pounds of sediment reduction credit had been certified through the program for CY23. Maryland is continuing to work to promote additional supply and demand in the market through voluntary credit acquisition efforts.

D. Phase I MS4 Financial Assurance Plan requirements/review and implementation plans

In May 2015, revisions to Maryland's SWM law, repealed the statewide mandate for stormwater fees, but preserved the authority of counties and towns to mandate such fees if they chose to do so. These revisions resulted in new fiscal reporting requirements for Maryland's Phase I MS4 jurisdictions, which include Baltimore City and Anne Arundel, Baltimore, Carroll, Charles, Frederick, Harford, Howard, Montgomery, and Prince George's counties. One of the new reporting requirements, financial assurance plans, are required to demonstrate how impervious surface restoration plans (ISRP) are going to be paid for during the permit term. Each jurisdiction submitted comprehensive information on local SWM projects, costs, and budgets for meeting ISRP requirements, including:

- Annual Programs: street sweeping, inlet cleaning, storm drain vacuuming
- Structural Practices: wet ponds, swales, infiltration, dry wells, rain gardens, green roofs, permeable pavement, rainwater harvesting, submerged gravel wetlands
- Alternative Practices: tree planting, outfall stabilization, stream restoration

The 10 Phase I MS4 jurisdictions certified that they have sufficient revenue to fund 100% of the projected SFY23 and SFY24 costs to comply with ISRP requirements, meeting the stormwater law's criteria. The 10 Phase I MS4 jurisdictions have projected spending $797.7 million over the next 2 fiscal years. The next FAP submittals, due with SFY24 MS4 annual reports, must show how each jurisdiction can fund 100% of its ISRP requirement for SFY25 and SFY26.

E. The Maryland Agricultural Water Quality Cost Share Program (MACS)

Since 1985, the MACS program has been the state's flagship program to assist tenant farmers and farm owners with the implementation costs of BMPs to control water quality problems on their property.
Helping farmers comply with regulatory requirements and meet Maryland's Bay Restoration goals remains at the heart of the program. Costs for installing BMPs vary depending on the area being protected, the scope of the problem, and local construction costs. MDA has taken steps to increase cost- share rates and per project maximums to address needs from the agricultural sector.

MACS continues to experience strong demand that resulted in $7.04 million in grants to install 296 conservation projects on farms during SFY 24 that coupled with other conservation grants programs (cover crops, manure management, and ecosystem incentives) **totaled $40 million in cost-share grants to farm operations during the fiscal year.** Critical to delivering financial assistance to farms, are trained, capable technical assistance providers from Maryland's 23 Soil Conservation Districts. State staff recruitment, onboarding and certification has been a primary goal of MDA's Office of Resource Conservation alongside our federal partners in SFY23. Additionally, the influx of federal funds for on-farm conservation are leveraging state programs to advance water quality and climate smart agricultural practices.

F. Federal Highway Administration Promoting Resilient Operations for Transformative, Efficient, and Cost Saving Transportation (PROTECT) Program

The Bipartisan Infrastructure Law added the Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Formula Program into Federal-Aid Highway Program Apportionments for Maryland. The State Highway Administration (SHA) received approximately $20.6 million in both Federal Fiscal Years 2022 and 2023. The funding supports resilience improvements that meet the criteria of one of four project areas:

1. Planning activities
2. Resilience improvements
3. Community Resilience and Evacuation Route activities
4. At-Risk Coastal Infrastructure activities

PROTECT Formula Program funds may be combined with other federal funding for projects that support the goals of the PROTECT Formula Program if the eligibility requirements and applicable federal cost-share are met. Eligible resilience improvement activities must improve the ability of an existing surface transportation asset to withstand one or more elements of a weather event or natural disaster, or to increase the resilience of surface transportation infrastructure from the impacts of changing conditions, such as sea level rise, flooding, wildfires, extreme weather events, and other natural disasters. These activities include (but are not limited to):

- The upgrade of an existing surface transportation facility to meet or exceed a design standard adopted by the Federal Highway Administration.
- Installation of mitigation measures that prevent the intrusion of floodwaters into surface transportation systems.
- Strengthening systems that remove rainwater from surface transportation facilities.
- Upgrades to and installation of structural stormwater controls
- Other protective features, including natural infrastructure, as determined by the US Secretary of Transportation.

The PROTECT program also offers states an optional opportunity to develop a Transportation Resilience Improvement Plan (TRIP) that addresses surface transportation system resilience to current and future weather events and natural disasters. When combined with certain other federal programs, it is possible that the required non-federal match could be lowered from the typical 20%. This would help extend state dollars for other priority needs. MDOT is currently developing a TRIP that will meet all requirements outlined in the PROTECT Program Guidance. The TRIP will outline MDOT's approach to resilience, including the identification and prioritization of projects for resilience improvements across the state. In addition to a risk-based vulnerability assessment, Maryland's TRIP will include an approach to evaluating, prioritizing, and selecting projects for PROTECT funding. Once the TRIP is complete, Maryland will become eligible for reduced federal match requirements for projects identified and prioritized in the TRIP.

MDOT also established an internal Resiliency Task Force (RTF) that began meeting in 2023. The RTF serves as a multi-modal collaborative community of practice, where resiliency approaches and strategies are aligned, modal administrations learn from each other, and discuss best practices across the MDOT system. MDOT oversees multiple modes of transportation, a broad range of assets, and is integral to the safety, security and functioning of the state. The Resiliency Task Force prioritizes collaborative approaches to establish a baseline understanding of resilience activities taking place across and throughout the modal administrations. The RTF also discusses reporting requirements and opportunities to streamline resilience processes, definitions and policy, and inform the development

of the TRIP. The Task Force will continue to meet and further the resilience goals of MDOT and state by working and learning together and aligning strategies wherever possible.

G. Conowingo WIP Financing

The CWIP is sometimes referred to as an eighth WIP, separate from jurisdictional WIPs and where all the CBP partners are working collaboratively to fund and implement restoration practices in the most cost-effective way. As previously discussed, Maryland put $25 million in the SFY23 State Budget for CWIP implementation. These monies are administered through the SRBC for pay-for-performance projects that help reduce nutrient loads to Bay from Conowingo Pond filling with sediment. The recent CFA, passed during Maryland's 2022 legislative session, allows the CWIP to capitalize on the opportunity to energize the conservation finance directive and use conservation finance tools to combine robust public funding for public projects with private sector partnership. Maryland is overseeing and providing policy direction to the SRBC in selecting Conowingo projects with the main goal of achieving the most cost-effective nutrient reduction while building a market-based strategy to ensure investments in green and blue infrastructure across the watershed. This work is continuing as a second request for proposals will be released by SRBC.

H. Paying for Performance and enlarging pool of bidders

The CFA was a bold step to incentivize more private dollars in the Bay cleanup effort. The broad act addresses Environment, Agriculture, Natural Resource and Procurement law to encourage for-profit aggregators to bring pay for success (pay for performance) model restoration to Maryland in a meaningful way. The act encourages leveraging of the State Revolving Loan Fund and the Trust Fund to advance large-scale projects that address not only water quality but also DEIJ, climate resilience, local jobs, habitat creation and carbon sequestration. The current SFY26 solicitation for the Trust Fund includes a pay for performance track, however, other state agencies are working together and with procurement to develop the appropriate programmatic conditions for successful implementation.

Long-term costs are minimized by funding practices that are known to be the most efficient and by enabling innovation that reduces costs over the long term. Increasing the flexibility to propose alternative practices through competitive bidding is a tested approach to enhancing cost-effectiveness. In addition, paying for performance (rather than practices) can attract problem solvers who can reduce nutrient runoff control costs over the long term. Due to the fact that complexity of program design can limit participation, more complex competitive bidding and pay-for-performance programs are best used as complements to simpler pay-for-practice programs that enable widespread implementation of practices with demonstrated performance.

To enable a program that used competitive bidding to fund a wide variety of actions, multiple legal, regulatory and policy impediments would need to be addressed. Examples of such impediments include: 1) Sewer hookup policies (category change process is cumbersome); 2) variability in local health department rules can hinder use of successful low impact development and water reuse techniques; 3) concerns about nutrient credit accounting create confusion as to who owns credits; 4) procurement processes and impacts on project timelines. Solutions include: a) Streamlining approval processes for innovative techniques, including working with the CBP to rapidly establish reduction efficiencies of new practices; b) evaluating approaches to manage risk of underperformance (e.g., state self-insuring, portfolio rules to limit

proportion of high risk practices, or establishing assurance bonds); c) Developing standardized agreements to use to reduce risk to innovators, such as safe harbor agreements for landholders; d) amend procurement code to rapidly approve pay-for-success contracts.

To address public concerns that the most cost-effective nutrient reduction practices may not provide equivalent social benefits, cost-effectiveness can be measured using outcome measures that integrate multiple concerns and co-benefits. Alternatively, separate programs can be used to achieve goals that are not complementary. For example, the most cost-effective stormwater reduction practices may not be the most cost-effective nutrient reduction practices. Therefore, creating separate funds to achieve distinct goals can enhance overall cost- effectiveness of spending.

I. Enabling innovation in stormwater practice design by reducing financial risk

To enable innovation for addressing restoration requirements found in local MS4 permits, the state considers approving new practices when proper documentation and monitoring information are provided to verify performance claims. The policies and procedures for approving innovative stormwater practices are found in MDE's "Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated, Guidance for National Pollutant Discharge Elimination System Stormwater Permits, November 2021." MDE works closely with the CBP workgroups and MS4 jurisdictions to enable the use of innovative technologies in a manner that is equitable and consistent with other activities in the Bay region. Recently, MDE has begun to offer credit for new stormwater retention and infiltration technologies where study plans and corresponding results are provided in coordination with reviewers.

J. Comprehensive Water Quality and Climate Resiliency Portfolio

DNR has assembled a portfolio of projects focused on enhancing resilience to climate change stressors that also leverage habitat, water quality and greenhouse gas reduction benefits. The portfolio comprises a suite of restoration and conservation projects identified in close coordination with affected communities and public/private/nonprofit sectors. These projects will work together to optimize resiliency benefits and leverage important habitat, water quality, and greenhouse gas mitigation gains. This approach lends itself to longer budgeting timeframes, beyond a 1-year cycle, for fiscal certainty, generates new financing opportunities with other partners and provides opportunities to better integrate green and grey infrastructure approaches.

DNR is piloting this approach by working within two targeted resiliency areas with restoration and conservation potential that provide high value resiliency benefits for communities, economies, public lands, and important ecosystems to demonstrate this concept. One is located within the Hamilton Run watershed, in partnership with Hagerstown and Washington County. The second is located in Worcester County, focused on Pocomoke City and its drainage area, and in partnership with the city and the county. Input from the public, with attention to climate justice communities, has helped guide project identification. The pilot project concluded in March 2024 at which time and provides a limited amount of fundable projects that enhance resiliency and address local government and community needs.

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Appendix 1

Total Funds

	SFY24 Actual
DNR	113,422,599
POS	72,997,976
Rural Legacy	33,424,164
MDP	6,026,296
MDA	65,775,336
Maryland Agricultural Land Preservation Foundation	97,505,036
MDE	380,707,841
Maryland State Department of Education	743,515
Maryland Higher Education	30,824,498
MDOT	43,081,712
Total	**844,508,973**

Fund Type Summary

	SFY24 Actual
General Funds	68,862,019
Special Funds	586,786,285
Federal Funds	69,615,702
Reimbursable Funds	31,436,757
Current Unrestricted	8,230,689
Current Restricted	22,593,809
GO Bonds	13,902,000
MDOT	43,081,712
Total	**844,508,973**

Spending Category

	SFY24 Actual
Land Preservation	205,383,633
Septic Systems	20,832,040
Wastewater Treatment	301,705,130
Urban Stormwater	45,656,527
Agricultural BMPs	92,088,051
Oyster Restoration	7,863,037
Transit & Sustainable Transportation Alternatives	10,518,681
Living Resources	58,862,766
Education and Research	31,773,597
Other	69,825,511
Total	**844,508,973**

Note: This presentation only includes state agency programs that have more than 50% of their activities directly related to Bay Restoration. Funding related to salaries and fringes does not reflect health insurance or increment adjustment