Executive Summary

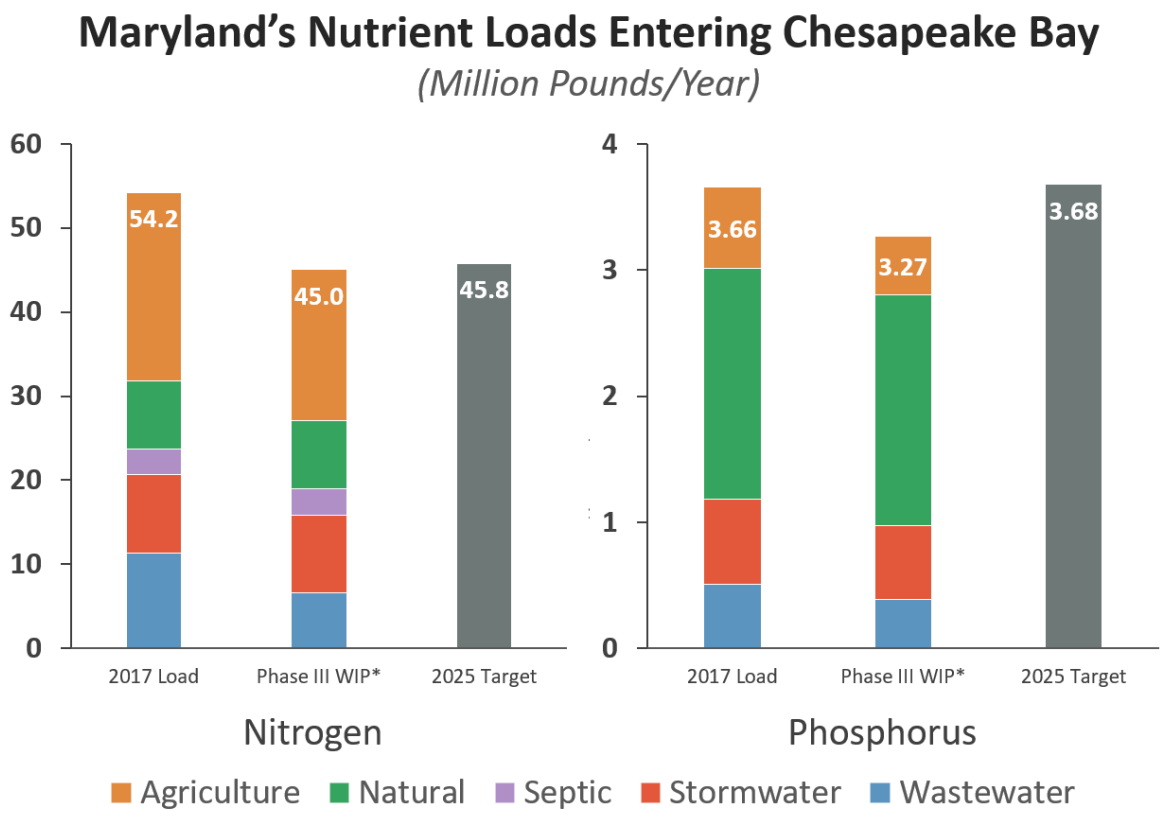
The Chesapeake Bay plays a significant role in Maryland's identity, economy, history and legacy. The State's success in restoring and preserving this national treasure for future generations will require balanced solutions that are cost effective, spur innovation, stimulate market-based approaches and create a restoration economy. Restoration will also test the collective will across seven watershed jurisdictions, spanning from the southern tier of New York State all the way to the capes of Virginia, to live in harmony with the region's natural systems. Having reached the mid-point between development of the 2010 Total Maximum Daily Load (TMDL), which establishes current Chesapeake Bay pollution reduction goals and the ultimate 2025 restoration deadline, the good news is that healthy signs of recovery are being seen in both water quality and living resources like bay grasses and blue crabs. This third phase of Maryland's Chesapeake Bay Watershed Implementation Plan (WIP) identifies the strategies, opportunities, and challenges in not only meeting the 2025 Chesapeake Bay Restoration targets, but also sustaining restoration into the future.

The Phase III WIP builds upon lessons learned in Phase I and II[1], and charts a course to 2025 that is locally-driven, achievable, and balanced. In developing the Phase III WIP, Maryland agencies met with county public works and planning departments, municipalities, soil conservation districts, NGOs, and the public to better understand which restoration strategies are working, which are not, what additional plans and restoration actions are anticipated between now and 2025, and where resources and collaborations are needed to achieve them. This information was compiled, along with information regarding local pollution sources, progress to date and any pollution reductions required by permit or contract, into local summaries that establish local planning goals. These local goals combined with state-level pollution reduction strategies are projected to achieve Maryland's 2025 Chesapeake Bay restoration targets.

Implementing Maryland's Phase III WIP Will Achieve the 2025 Chesapeake Bay Restoration Targets

Maryland's 2025 pollution reduction targets for bay restoration are 45.8 million pounds total nitrogen (TN) and 3.68 million pounds of total phosphorus (TP). In meeting the targets, the state will also meet its sediment goals. These 2025 nitrogen and phosphorus targets were calculated to include increased pollution impacts expected from growth in human and livestock populations through 2025. Figure 1 below shows Maryland's 2017 progress to date and the projected future reductions in total nitrogen and total phosphorus, respectively, with Maryland's Phase III WIP in place. The projected total nitrogen reductions are expected to be under the 45.8 million pound nitrogen target by 780,000 pounds. Maryland is already on track to meet its phosphorus target. Since phosphorus attaches itself to sediment, the projected phosphorus reductions through 2025 indicate that Maryland is also on track to meet its sediment target. These calculations have been confirmed by the Chesapeake Bay Program's (CBP) science and modeling framework, effectively demonstrating that Maryland will meet its federally assigned Chesapeake Bay pollution reduction targets by 2025.

[1] mde.maryland.gov/programs/Water/TMDL/TMDLImplementation/Pages/wip.aspx



Source: Maryland Phase III WIP Scenario; CAST 2019

*****Phase III WIP reductions subject to change upon EPA review.

Figure 1: *Current and projected total nitrogen and phosphorus loads by sector relative to Chesapeake Bay Restoration targets.*

Maryland's success in meeting its restoration targets is driven by implementing key pollution reduction strategies among major source sectors (Figure 1), which include wastewater, stormwater, septic, natural lands and agriculture. Table 1 below identifies these key nitrogen and phosphorus reduction strategies within each major source sector. For detailed information on every Phase III WIP practice by major sector please see Appendix B of this report

Table 1: *Maryland's Phase III WIP strategy*

Sector	BMP Description	Lbs. TN Reduced	Lbs. TP Reduced	Annual Costs
Agriculture	Conservation Technical Assistance (1 million acres of Conservation Plans + Design & Oversight of all BMPs implementation)	1.1 million/yr	53,000/yr	$ 13,817,000
	Nutrient Management Compliance	1.6 million/yr	76,000/yr	$ 3,100,000

Sector	BMP Description	Lbs. TN Reduced	Lbs. TP Reduced	Annual Costs
Agriculture	Cover Crops (470,000 acres planted annually)	2.3 million/yr	2,000/yr	$ 25,500,000
	Manure Transport (100,000 tons transported annually)	228,000/yr	26,000/yr	$ 2,000,000
	Verification of existing BMPs	87,500/yr	1,500/yr	$ 500,000
	Implementation of Additional BMPs (The Maryland Agricultural Water Quality Cost-Share (MACS) Program)	652,000	10,600	$ 9,275,000
Natural Lands	Upland Tree Planting and Streamside Forest Buffers (1,150 acres)	8,000	700	$1,683,920
	Wetland Restoration (175 acres)	600	50	$125,000
	Stream Restoration (6 miles)	2,500	2,250	$3,172,520
	Shoreline Management (Living Shoreline Technique) (3,000 ln ft)	150	100	$257,140
	Oyster Aquaculture (350,000 bushels)	10,000	1,000	$2,500,000
Septic	Best Available Technology (BAT) Upgrades (Based on roughly 920 BAT unit upgrades)	40,000	-	$10,100,327
	Connection to Wastewater Treatment Plants **(**WWTP) (Based on roughly 1,600 sewer connections)	16,800	-	$1,296,899
	Pumping (Not available until Septic Stewardship Plans developed by 2021)	-	-	TBD - Septic Stewardship
Stormwater	Complete current Phase 1 Municipal Separate Storm Sewer (MS4) permits restoration requirement (completion dates: 2018 and 2019) *Approximately 20,000 impervious acres*	85,000	40,000	$40,000,000
	Complete new Phase 1 MS4 restoration requirement (completion dates: 2023 and 2024) *Approximately 17,500 impervious acres*	90,000	12,500	$40,000,000

Sector	BMP Description	Lbs. TN Reduced	Lbs. TP Reduced	Annual Costs
Stormwater	Complete Current Phase 2 MS4 restoration requirement (completion date: 2025) *Approximately 3,000 impervious acres*	15,000	5,000	$5,000,000
	Miscellaneous implementation on non-MS4 counties (i.e. trading, trust fund) *Approximately 400 impervious acres*	5,000	500	$5,000,000
Wastewater	Complete Bay Restoration Fund (BRF)-Funded Enhanced Nutrient Removal (ENR) upgrades to 67 significant municipal wastewater plants	4,000,000	100,000	Fully Funded Pre-WIP III
	Continue funding ENR upgrades for non-significant municipal plants through the BRF (11 additional plants by 2025, for a total of 16)	25,000	5,000	$50,000,000
	Provide Operations and Management (O&M) Grant through the BRF for facilities achieving nitrogen discharge concentrations of 3.0 mg/L	425,000	No planned additional reductions	$10,000,000
	Incentivize higher treatment levels (beyond 3.0 mg/L of nitrogen) through water quality trading and the Clean Water Commerce Act (through 2021)	No estimate	No estimate	$10,000,000
	Complete upgrades to federal significant municipal plant	3,000	300	No state costs
	Continue minor industrial reductions	No estimate	No estimate	No state costs
	Maintain achievement of significant industrial Waste Load Allocations	No planned additional reductions	No planned additional reductions	No state costs
	Implement sewer projects to address combined sewer overflows (CSOs), sanitary sewer overflows (SSOs) and inflow and infiltration (I/I)	20,000	2,000	$40,000,000

Financial Assurance and Creating a Restoration Economy

An independent 2015 assessment by the University of Maryland Environmental Finance Center[2] (EFC) confirmed that sufficient 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 as long as Maryland: (1) leverages wastewater treatment plant reductions wisely in the interim while stormwater and septic sectors build capacity for steady progress; (2) continues effective and consistent enforcement of existing environmental regulations; and (3) continues to fully fund state Chesapeake Bay grant programs and directs these resources in the most cost effective manner possible. A cursory analysis of 2019 restoration funding relative to costs suggests Maryland has sufficient fiscal capacity to assure Chesapeake Bay's Water Quality Standards (WQS) will be met. However, it is important to realize that this analysis is based on current year funding and estimated implementation costs. The analysis also did not factor in the substantial federal and local funding sources that fund implementation efforts to achieve Maryland's TMDL targets. A thorough financial analysis is recommended in the near term to confirm Maryland's fiscal capacity to achieve 2025 TMDL targets.

Governor Larry Hogan's fiscal year 2019 budget invests a record $1.2 billion in state funds for comprehensive Chesapeake Bay restoration efforts. This record level of funding for key conservation and regulatory programs includes $52.9 million for the Chesapeake and Atlantic Coastal Bays Trust Fund (Trust Fund), marking the third year in a row that the Hogan administration has fully funded Bay restoration efforts. The fiscal year 2019 budget also marks the first time since 2008 that no funding for transfer tax programs, including Program Open Space, is diverted to the General Fund; in total, these programs received $253 million in 2019, an increase of $67 million from the prior fiscal year. As chair of the Chesapeake Executive Council, Governor Hogan fought to preserve full federal Chesapeake Bay Restoration funding and worked to ensure Maryland's farmers get needed federal resources for conservation practices through both the Farm Bill and a CBP partnership Agricultural Technical Assistance directive. Maryland is also working with the CBP partnership to increase federal funds targeted for Bay restoration.

Over Fiscal Years 2000 – 2018, the state spent about $8.4 billion on Chesapeake Bay restoration activities. This amount includes funding for activities that directly reduce nutrient and sediment inputs to the Bay (e.g., cover crops and wastewater treatment plant upgrades), activities that indirectly support Bay restoration (e.g., monitoring, education, outreach), and activities that prevent or minimize future degradation of the Bay (e.g., land conservation). In addition, local jurisdictions are spending approximately $300 million a year to retrofit older communities with stormwater controls that reduce nutrient delivery to the Bay and provide important local co-benefits like flood attenuation and improved stream health.

As Maryland moves forward with implementing the Phase III WIP we will build on our successes and continue to develop and explore financing innovations that stretch funding and grow business opportunities that have both environmental and economic benefits. This can be accomplished by further expanding successful "pay for performance" models that pay for nutrient reductions delivered versus the traditional approach of paying for reductions promised through a proposed project. Maryland will explore

[2] efc.umd.edu/assets/financing_strategy_final_6_5.pdf

more public-private partnerships, such as the oyster program in Anne Arundel County, as well as leverage the financing innovations being explored in the Conowingo WIP (CWIP) to help accelerate overall restoration efforts by bringing in resources from the private sector. There are real and exciting opportunities to restore the Chesapeake Bay by bringing the environmental and finance sectors together to stimulate a restoration economy. Finally, retaining full federal funding for Chesapeake Bay restoration is paramount to meeting and sustaining our 2025 restoration targets, while also leveraging or expanding funding sources like the Farm Bill, as well as EPA's Clean Water State Revolving Fund, with specific strategies on utilizing its Land Conservation Projects program.

Current and Future Challenges to Chesapeake Bay Restoration

While Maryland is on track to meet its 2025 restoration goals with the Phase III WIP strategies, current level of resources and investments, and based upon the latest science, there are several factors that need consideration in order to achieve and sustain restoration into the future. These factors include:

A Changing Climate

Climate change impacts, including increased precipitation and storm events, are causing increased nutrient and sediment loads to the Chesapeake Bay. The current Phase III WIP highlights climate change implementation strategies and plans that reduce nutrient and sediment loads to Chesapeake Bay while simultaneously mitigating or reducing carbon emissions, building resilient communities and ecosystems, and helping with local needs like flood control and sustainable infrastructure. As a national leader on climate change, Maryland has a comprehensive portfolio of climate mitigation and adaptation practices. The Phase III WIP focuses on those climate practices that provide nutrient reductions is not intended to provide a complete inventory of Maryland's climate-related actions.

The CBP partnership understands that additional science is needed to both quantify potential increases in watershed-wide nitrogen load reductions and understand how current pollution reduction practices will perform under a changing climate. Between now and March 2021, the CBP partnership is committed to improving scientific understanding of these impacts, identifying outstanding research needs, and refining nutrient and sediment load estimates for each Bay jurisdiction.

Population Growth Beyond 2025

Projected growth in both human and animal populations, and their impact to Bay water quality, were accounted for in developing the 2025 targets. Moving beyond 2025, however, as these populations continue to increase, growth in pollutant loads is also expected from more wastewater, septic systems, manure and greater stormwater loads when lands are converted and developed. When this anticipated growth is coupled with expected climate change impacts, sustaining the state's restoration targets will be challenging, requiring innovative and collaborative approaches to achieve restoration targets.

Conowingo Dam

The CBP partnership estimates that after full Phase III WIP implementation, an additional Baywide reduction of 6 million pounds of nitrogen and 0.26 million pounds of phosphorus is needed in order to mitigate the increased pollution resulting from Conowingo Dam infill and meet downstream WQS. Through Clean Water Act Section 401 water quality certification (WQC) authority, Maryland has assigned this pollution reduction responsibility to Exelon, Conowingo Dam's owner. The CBP partnership also agreed to complement Maryland's WQC efforts by working collaboratively and helping to reduce the increased pollutant loads now flowing over Conowingo Dam. These additional Conowingo loads are being accounted for in a separate CWIP that pools CBP partnership funding into a single fund, explores innovative financing strategies, and public/private partnerships, as well as targets cost effective practices in locations that have the greatest water quality benefits to the Bay. The draft CWIP will be open to public comment according to a schedule that is still under development by the CBP partnership.

Local Implementation Challenges

Maintenance and Verification

Much of the on-the-ground implementation to achieve Maryland's Bay restoration targets occurs at the local government level. Our local government partners are installing physical infrastructure, whether larger capital projects like upgrading wastewater plants or smaller scale stormwater retrofits, designed to reduce pollution at its source. Like all infrastructure projects, pollution reduction practices must be properly installed and maintained to achieve their intended function. Maryland has approved verification protocols to ensure pollution reduction practices are working properly and can continue to be counted towards Bay restoration credit. [3] Local jurisdictions, soil conservation districts, and other partners who are implementing these projects on the ground have identified maintenance, verification, funding, programs and accounting as resource challenges that could impact restoration progress.

Restoration Capacity

Local partners also need continued resources to build restoration capacity, whether in the form of permitting assistance, technical assistance, knowledge transfer, more dedicated staff and/or financial incentives. These needs vary regionally, by sector, as well as within individual jurisdictions. Since there is no one-size-fits-all solution to local implementation challenges, ongoing local engagement and capacity building will be necessary throughout the implementation process to ensure restoration progress.

Maryland's Approach to Addressing Current and Future Chesapeake Bay Restoration Challenges

[3] Maryland BMP verification protocols are available at .mde.state.md.us/programs/Water/TMDL/TMDLImplementation/Documents/BMP%20Verification/MD_Verification%20Protocols_Master_Doc.pdf

Tackling the significant challenges to Bay restoration requires agreement on a principled approach to restoration that is backed by diverse strategies and contingencies implemented through a robust accountability and adaptive management framework. Some of the key principles Maryland is using to address these challenges and sustain restoration into the future include:

Balancing Regulations and Incentives

Maryland has many regulatory tools under both the federal Clean Water Act and state law that set numeric pollutant discharge limits and conditions for restoration or other requirements on the regulated community. Some examples across sectors include: federal National Pollutant Discharge Elimination System (NPDES) permit limits on wastewater treatment plant pollution discharges; federal and state restoration requirements for areas under MS4 permits, which require stormwater management retrofit practices; state requirements for agricultural nutrient management plans; and state BAT requirements for onsite (septic) systems in the Critical Area (within 1,000 feet of tidal shorelines). At the same time Maryland has pollution sources within the stormwater, agricultural and septic sectors, such as small communities with no Bay restoration requirements for pre-law stormwater discharges (non-MS4s) that nevertheless play an important role in ultimately achieving Bay restoration targets. Maryland utilizes both federal and state funding programs to finance Wastewater Treatment Plant (WWTP) upgrades, stormwater management retrofits, agricultural BMPs, natural land restoration and conservation, and septic upgrades. Additionally, local financing structures and private investments are employed to implement restoration across all the sectors. Maryland uses a balanced approach of effective regulations and financial incentives to drive restoration progress across sectors, and in priority areas that achieve the largest pollution reductions.

Using Wastewater Treatment Plant Capacity Wisely While Driving Long-term and Sustained Progress in Slower Paced Sectors

Accelerated pollution reductions at wastewater treatment plants and on farms are largely driving Maryland's success in meeting the 2025 Bay restoration targets. As Maryland's population grows and the number of households being served by public wastewater rises, discharges from wastewater plants will increase. Continued steady progress in both the stormwater and septic sectors is required to ensure that ongoing pollution reductions keep pace with any increased loads due to climate change and population growth. MS4 permits now cover greater than 90 percent of Maryland's developed landscape and are legally enforceable mechanisms to ensure steady restoration progress in that sector over the long term. Continued steady progress in the septic sector will be assured through upgrades, innovative technologies, sewer hookups and the recent Septic Stewardship law that helps local jurisdictions with septic maintenance through pumpouts.

Creating a Restoration Economy and Driving Innovation

In addition to traditional funding approaches, the Hogan administration is pursuing market-based strategies designed to stimulate a restoration economy and reduce costs. Nutrient credit trading is one such tool that allows non-mandated pollution reductions from one entity to be purchased by another entity. This creates a marketplace that will drive innovation across sectors to develop the most cost

effective pollution reduction practices. At the same time, other innovative financing strategies like the Clean Water Commerce Act and the CWIP drive innovation by creating funding streams for the most cost effective practices and developing collaborative funding models like public-private partnerships to reduce public costs of restoration. Aligning Maryland's greenhouse gas (GHG) reduction actions with Bay restoration actions that have significant carbon sequestration benefits can leverage and diversify financing to accelerate pollution reduction practices. Maryland is also actively pursuing water reuse technologies that help with long term water supply sustainability for our citizens, as well as reduce pollution loads to Chesapeake Bay[4].

Locally-Driven Restoration and Co-benefits

Chesapeake Bay restoration will not be successful without sufficient capacity and close collaboration with local partners. County governments, municipalities, soil conservation districts, farmers, citizens and NGOs are the boots on the ground implementing restoration practices through permits or grant/incentive programs. To ensure the continued progress of local partnerships, restoration practices must not only be cost effective and achievable, but also provide benefits to local communities and address local challenges like flooding. Understanding and resolving restoration barriers through continuing local engagement and targeted strategies, as well as controlling ongoing maintenance costs, will be particularly important to sustain restoration in the long-term. Maryland will also work closely with local partners to identify strategies that address barriers through the adaptive implementation process of two-year milestones, progress evaluations, accelerating strategies that are cost effective and meet local needs, while embracing a continuous improvement philosophy to build on successes and learn from shortcomings. Maryland is already forming a workgroup to improve technical assistance delivery to local partners, as well as working with those partners to develop a strategic implementation plan for addressing local restoration challenges.

Accounting for and Leveraging Conservation and Protection Programs

One of the best ways to sustain Bay restoration is to ensure that Maryland's ecologically significant lands, aquatic and wildlife resources are protected. These protections preserve the lowest pollution loading land uses from converting to higher pollution land uses that will set Maryland further behind in its restoration goals. Maryland is making sure its land conservation programs are fully accounted for in the Bay restoration effort while fully funding land conservation programs for future acquisitions. Maryland is also reviewing current conservation and protection program effectiveness, through monitoring results and other measures, in achieving conservation and protection goals; and evaluating these programs to further leverage restoration opportunities on conserved and protected lands.

Holistic Ecosystem Management

Although Maryland's Phase III WIP is designed to achieve the TMDL nitrogen, phosphorus, and sediment targets and be consistent with EPA's expectations, Maryland is also strongly committed to the

[4] mde.maryland.gov/programs/Water/waterconservation/Pages/water_reuse.aspx

broader goals outlined in the current (2014) Chesapeake Bay Agreement[5]: These include sustainable fisheries, vital habitats, reducing toxic contaminants, healthy watersheds, land conservation, stewardship, public access, environmental literacy and climate resiliency. These other watershed goals provide critical feedback loops that improve water quality, whether through restored fisheries providing nutrient uptake and water filtration services, nitrogen and carbon uptake in the plant tissue of submerged vegetation, or land-based practices like wetlands and forest buffers that capture and process nutrients before they enter surface waters. Maryland's commitment to this broader ecosystem management framework will help the state achieve its TMDL restoration targets while also maintaining the productivity of the Bay's living resources that strengthen local economies.

Accountability and Adaptive Management Framework

The accountability and adaptive management framework that underpins Chesapeake Bay restoration is shown in Figure 2.

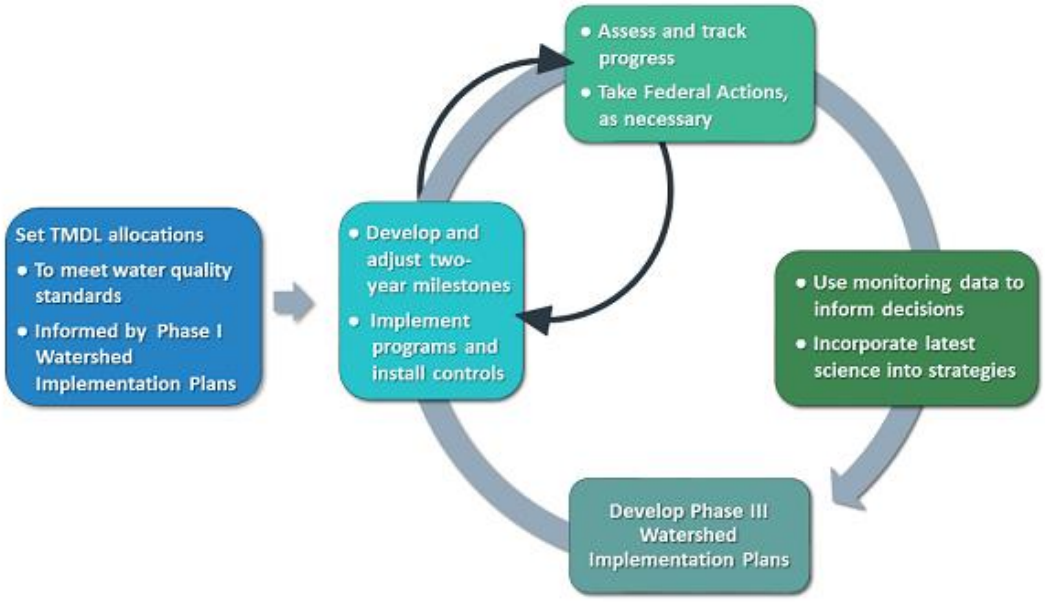


Figure 2: *Chesapeake Bay TMDL Accountability Framework. Graphic courtesy of the EPA Chesapeake Bay Program web site at epa.gov/chesapeake-bay-tmdl/ensuring-results-chesapeake-bay*

As part of this accountability framework, the Chesapeake Bay Program partners develop short term goals, called milestones, to ensure restoration progress. Milestones identify the restoration practices, programs, policies and resources that jurisdictions commit to implement over two-year periods. EPA then evaluates progress that the jurisdictions have made toward achieving their milestone commitments and takes appropriate federal actions, as necessary, to help jurisdictions remain on track.

[5] chesapeakebay.net/what/what_guides_us/watershed_agreement

Maryland submitted its 2018-2019 milestones to EPA in January 2018, and expects to submit 2020-2021 milestones in January 2020. These milestones serve as key checkpoints on the way to restoring the Bay by 2025, and include annual evaluations to gauge progress. The milestones provide Maryland the opportunity to adaptively manage the restoration process, incorporate new science on restoration practices performance, and apply key lessons learned from Phase III WIP successes or failures along the way. Chesapeake Bay water quality and living resources data are also used to ensure results are being seen in the Bay, as well as to adjust, as necessary, to new science or changing conditions.

Conclusion

There are both great challenges and great opportunities in restoring and protecting the Chesapeake Bay watershed and the rich natural heritage that defines this region. To do so, Marylanders must sustain the collective will to revive this national treasure, work to control costs and stimulate a restoration economy, leverage local and regional partnerships, and private or public partnerships, implement restoration practices that achieve multiple benefits, promote and adopt innovation, adaptively manage and build on successes. Marylanders must also acknowledge that restoration success will require full commitment from upstream states, like Pennsylvania and New York, Maryland's continued strong leadership in the CBP partnership and the EPA's maintenance of a strong restoration oversight and accountability role.

The Chesapeake Bay is a dynamic system influenced by natural ecosystem processes, as well as the multiple pressures of climate change, population growth, land use changes and invasive species. Maryland and the CBP's long term commitment to the science that informs policy and management actions, demonstrates effectiveness and communicates restoration progress must be sustained into the future. As one participant keenly observed during the state's recent local engagement process: 2025 is not the end of restoration, but rather another benchmark on the restoration journey.