CHESAPEAKE BAY PROGRAM 2019-2020
BAY BAROMETER

ANNUAL PROGRESS REPORT OF THE CHESAPEAKE BAY PROGRAM

NOTE FROM THE CHESAPEAKE BAY PROGRAM DIRECTOR

IT GOES WITHOUT SAYING THAT 2020 WAS A YEAR LIKE NO OTHER.

In the face of a worldwide pandemic and rising social and racial justice issues, the Chesapeake Bay Program continued on—and prospered.

Like many others, our offices closed in mid-March due to coronavirus concerns, and our work went virtual—as it continues to this day. Despite initial fears about the disruption this might cause to our daily routines, our staff and partners rose to the challenge and embraced this new style of working. We even held the first-ever, completely virtual Executive Council meeting, attracting the most attendees ever!

We continued working with our many partners, ensuring that our grant programs continued uninterrupted, and communities and organizations across the watershed received money to fund on-the-ground restoration projects and help with the implementation of each jurisdiction's Phase III Watershed Implementation Plan (WIP). In fact, the Chesapeake Bay Stewardship Fund, a partnership between the Environmental Protection Agency and the National Fish and Wildlife Foundation, awarded a record $18 million in grants to support the restoration and protection of the Bay.

In October 2020, after months of collaborative work, the draft Conowingo WIP was made available for public review. This document explores innovations that will reduce implementation costs and accelerate achievement of our restoration goals.

Internally, the Chesapeake Bay Program successfully concluded its second cycle of the Strategy Review System (SRS) process in early 2021. Spanning two years, the SRS process provides an opportunity for the partnership's Management Board to review the progress being made in meeting the 31 outcomes of the Chesapeake Bay Watershed Agreement. In turn, the workgroups have the opportunity to explain their challenges, ask for assistance and celebrate their successes. The workgroups then use this new knowledge to adjust the strategies and approaches that each is taking to meet their associated outcomes.

But our most important work of the past year took place in the summer. Recognizing that there is much more that we can do to strengthen and improve diversity, equity, inclusion and justice (DEIJ) within every facet of the partnership, both the Executive Council and the Principals' Staff Committee signed historic directives re-affirming our commitment to DEIJ in all forms. As a result, a DEIJ Action Team was formed to put an implementation plan in place to address criteria outlined in a DEIJ Strategy that was completed in April 2020, among several other actions.

Despite these accomplishments, you'll see throughout this report that we remain behind in meeting the targets for several critical outcomes, including wetlands, forest buffers, toxic contaminants and others. While we continue to make progress in meeting our water quality goals, it is crucial that we continue to look at the entire watershed holistically, remembering that this is an interconnected ecosystem and each one of our outcomes plays a critical role in the health of the Chesapeake Bay.

Dana Aunkst
Director, Chesapeake Bay Program

THE CHESAPEAKE BAY PROGRAM

The Chesapeake Bay Program is a partnership of federal, state and local governments, academic institutions, communities, businesses, individuals and non-governmental organizations, leading the effort to restore and conserve the Chesapeake Bay. Primarily funded by the Environmental Protection Agency, two-thirds of our budget goes directly into funding on-the-ground restoration work across the watershed. Our partnership is guided by the *Chesapeake Bay Watershed Agreement*, which sets goals, tracks progress and holds us accountable for our work. For more information, please visit www.chesapeakebay.net.

THE CHESAPEAKE BAY WATERSHED AGREEMENT

Signed on June 16, 2014 and amended in 2020, the *Chesapeake Bay Watershed Agreement* commits our partners to protecting and restoring the Bay, its tributaries and the lands that surround them. It envisions an environmentally and economically sustainable Chesapeake Bay watershed with clean water, abundant life, conserved lands and access to the water, a vibrant cultural heritage and a diversity of engaged stakeholders. The agreement contains five themes consisting of 10 goals that will advance the restoration and protection of the watershed.

BAY BAROMETER

Each of the 10 goals of the *Chesapeake Bay Watershed Agreement* is linked to a set of outcomes, or time-bound and measurable targets that directly contributes to its achievement. Each outcome is updated real-time on ChesapeakeProgress (chesapeakeprogress.com) and included in the Chesapeake Bay Program's annual science-based report, the Bay Barometer.

ABUNDANT LIFE

Sustainable Fisheries | Vital Habitats
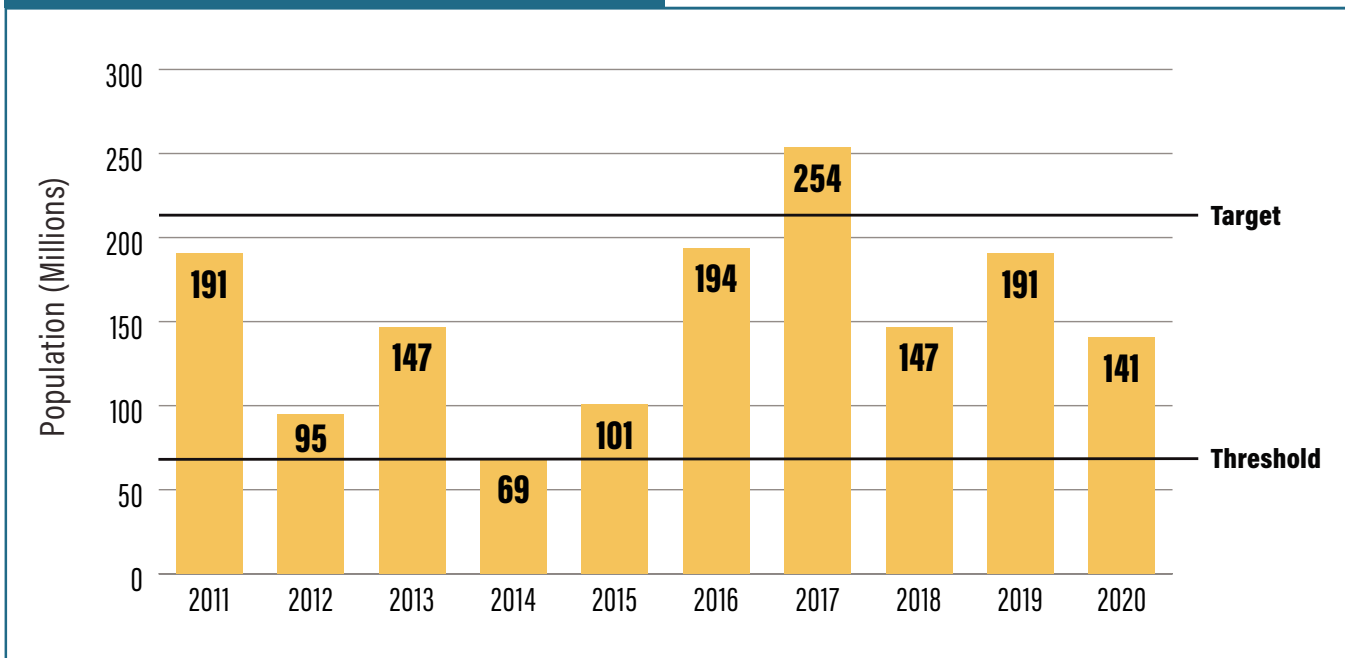
BLUE CRAB ABUNDANCE

OUTCOME

Maintain a sustainable blue crab population based on the 2012 target of 215 million adult females. Refine population targets through 2025 based on best available science.

PROGRESS

Abundance is above the 70 million threshold, but lower than the target of 215 million

Adult Female Blue Crab Abundance (2011-2020)

Between 2019 and 2020, the abundance of adult (age 1+) female blue crabs in the Chesapeake Bay decreased 26% from 191 million to 141 million. This number is above the 70 million threshold that is considered to be the minimum sustainable level for female blue crabs in the Bay, but lower than the target of 215 million.

More Crabs Live to See Spring

As part of the annual Blue Crab Winter Dredge Survey, researchers track the number of crabs that die in between fall and spring (often due to cold and/or freezing water temperatures). This is referred to as the overwintering mortality. In 2020, overwintering mortality was 0.36%, likely due to the warmer-than-average 2019-20 winter, relative to the previous decade. This is the lowest overwintering mortality rate observed since 1996; the average is 4.53%.
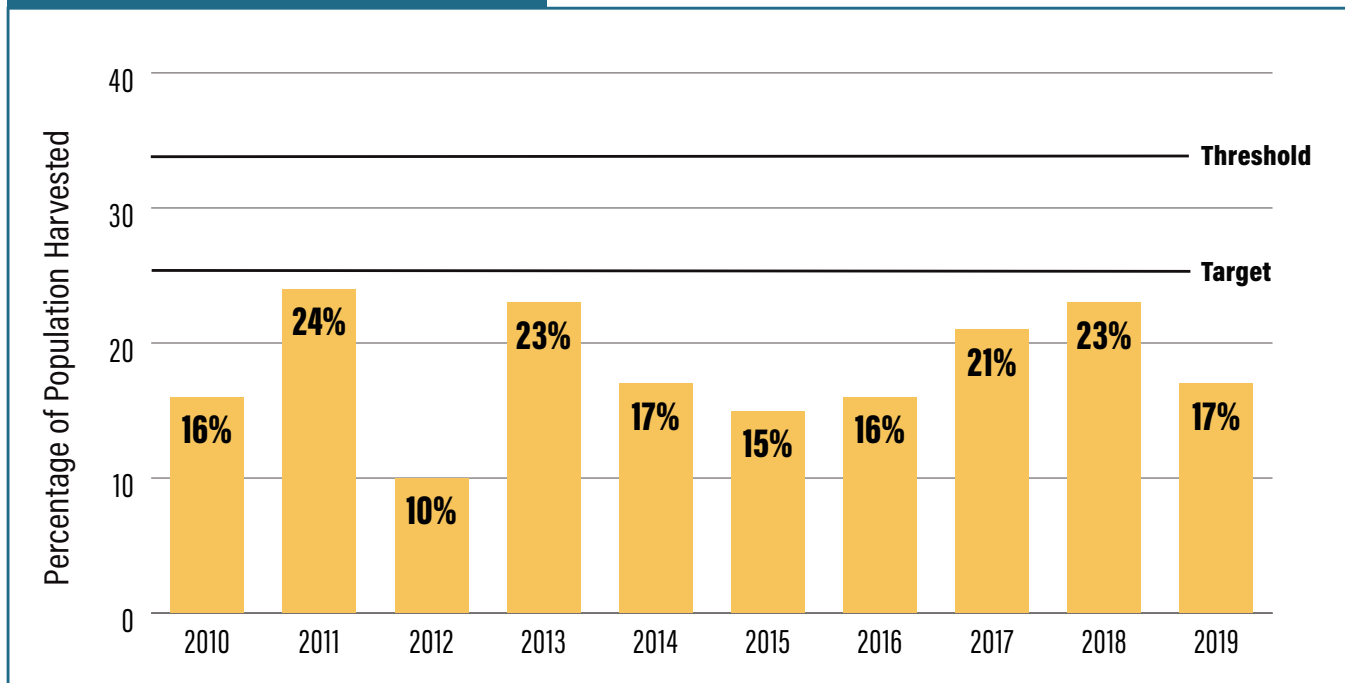
BLUE CRAB MANAGEMENT

OUTCOME

Manage for a stable and productive crab fishery including working with the industry, recreational crabbers and other stakeholders to improve commercial and recreational harvest accountability.

PROGRESS

The blue crab stock is not depleted and is not being overfished.

Female Blue Crab Harvest (2010-2019)

Percentage of Population Harvested

Year	Value
2010	16%
2011	24%
2012	10%
2013	23%
2014	17%
2015	15%
2016	16%
2017	21%
2018	23%
2019	17%

Threshold

Target

In 2019, an estimated 17% of female blue crabs were harvested from the Chesapeake Bay. For the twelfth consecutive year, this number is below the 25.5% target and the 34% overfishing threshold. Experts have determined the blue crab stock is not depleted and is not being overfished.

Refining Population Targets

The Chesapeake Bay Stock Assessment Committee applied the best available science for blue crab management by adopting new biological reference points for the population. The new reference points came from the 2017 blue crab stock assessment update and will be reflected in the 2021 Blue Crab Advisory Report. They include new targets (197 million) and thresholds for female abundance and exploitation, which indicates that the population is healthy and has improved since the previous assessment in 2011.

OYSTERS

Oyster Reef Restoration Progress Dashboard

TRIBUTARY	TRIBUTARY RESTORATION PLAN	REEF CONSTRUCTION & SEEDING	MONITORING & EVALUATION	COMPLETED/ TARGET ACREAGE
Harris Creek (Md.)	COMPLETE	COMPLETE	IN PROGRESS	351/351
Little Choptank (Md.)	COMPLETE	IN PROGRESS		351/440
Manokin (Md.)	IN PROGRESS			TBD/441 (draft)
Tred Avon (Md.)	COMPLETE	IN PROGRESS		84/147
Upper St. Mary's (Md.)	COMPLETE	IN PROGRESS		TBD/60
Great Wicomico (Va.)	IN PROGRESS	IN PROGRESS		TBD/TBD
Lafayette (Va.)	COMPLETE	COMPLETE	IN PROGRESS	82/80
Lower York (Va.)	COMPLETE	IN PROGRESS		35/200
Lynnhaven (Va.)	COMPLETE	IN PROGRESS		105/152
Piankatank (Va.)	COMPLETE	IN PROGRESS		317/438

Each of the ten tributaries that have been selected for oyster restoration is at a different level of progress in a process that involves developing a tributary restoration plan, constructing and seeding reefs, and monitoring and evaluating restored reefs. In Maryland tributaries, 788 acres of oyster reefs are considered complete. In Virginia tributaries, 539 acres of oyster reefs are considered complete. Some of these reefs have undergone restoration as part of our progress toward this outcome, while others have undergone previous restoration work or already meet our restoration criteria.
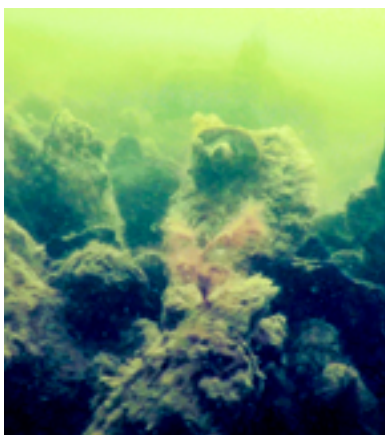
Eleventh, "Bonus" Tributary Added

In January 2020, the Virginia Marine Resources Commission announced plans to complete large-scale oyster restoration in the Eastern Branch of the Elizabeth River. Because this tributary will follow the same rigorous process as the 10 tributaries selected for restoration by 2025 under the Oyster outcome, the area will be seen as a "bonus" 11th tributary. Approximately 21 acres of reef were constructed in three locations using 100,000 bushels of fine oyster shell as a base, topped with 10,000 tons of crushed stone. Previously, 2.7 acres of reef were restored, and another 2.7 acres will be constructed in the future, bringing the restoration total to 26.4 acres of reef.

FISH HABITAT

Continually improve effectiveness of fish habitat conservation and restoration efforts by identifying and characterizing critical spawning, nursery and forage areas within the Bay and tributaries for important fish and shellfish and use existing and new tools to integrate information and conduct assessments to inform restoration and conservation efforts.

This outcome targets the habitats that fish and shellfish use at critical points in their life histories. Due to the range of areas that comprise fish habitat and the existing gaps in our understanding of which habitats offer the highest value for fish reproduction, feeding, growth or refuge, there is no established baseline for this outcome at this time.

Finding High-Quality Habitat

Over the past year, the Fish Habitat Workgroup continued to use the best available science to develop criteria and spatial tools that will identify high-quality fish habitat and areas of concern. The Workgroup recently completed a metadata inventory of stressor and biological data for tidal and non-tidal waters that may be used in regional fish habitat assessments. And in coordination with the GIS Team, they are working to develop map products that connect the percentage of hardened shorelines along the Chesapeake Bay to fish habitat conditions.

FORAGE FISH

OUTCOME

Continually improve the Partnership's capacity to understand the role of forage fish populations in the Chesapeake Bay. By 2016, develop a strategy for assessing the forage fish base available as food for predatory species in the Chesapeake Bay.

PROGRESS

A suite of indicators is under development that will help explain why changes in forage fish matter for fisheries and habitat management. Current studies show that fluctuations in prey populations are linked to changes in habitat and other environmental conditions. While enough food for predators currently exists in the Bay, more research is needed about how variability within and across species affects predators.

Seven New Indicators for Forage Fish Outcome

The Forage Action Team developed a Forage Indicator Development Plan in September 2020 to provide an overview of previous efforts and present a framework toward developing forage indicators moving forward. An important part of the Chesapeake Bay ecosystem food web, forage species (e.g., Atlantic menhaden, bay anchovies, mantis shrimp) serve as prey for other fish species and are commercially and recreationally valuable. The Plan identified seven initial indicators to develop, as well as their potential data sources and approximate timelines for development and/operationalization. Indicator development will be based on a tiered approach with increasing complexity. Tier One is the most basic, focusing on forage abundance. Tier Two will use relationships between environmental and/or habitat factors and forage abundance to track forage status over time. Finally, Tier Three, the most complex, will observe changes in predator consumption of forage over time.

SUBMERGED AQUATIC VEGETATION (SAV)

OUTCOME

Sustain and increase the habitat benefits of submerged aquatic vegetation (SAV) in the Chesapeake Bay. Achieve and sustain the ultimate outcome of 185,000 acres of SAV Bay-wide necessary for a restored Bay. Progress toward this ultimate outcome will be measured against a target of 90,000 acres by 2017 and 130,000 acres by 2025.

PROGRESS

36% of outcome achieved.

Submerged Aquatic Vegetation (SAV) Abundance (2010-2019)
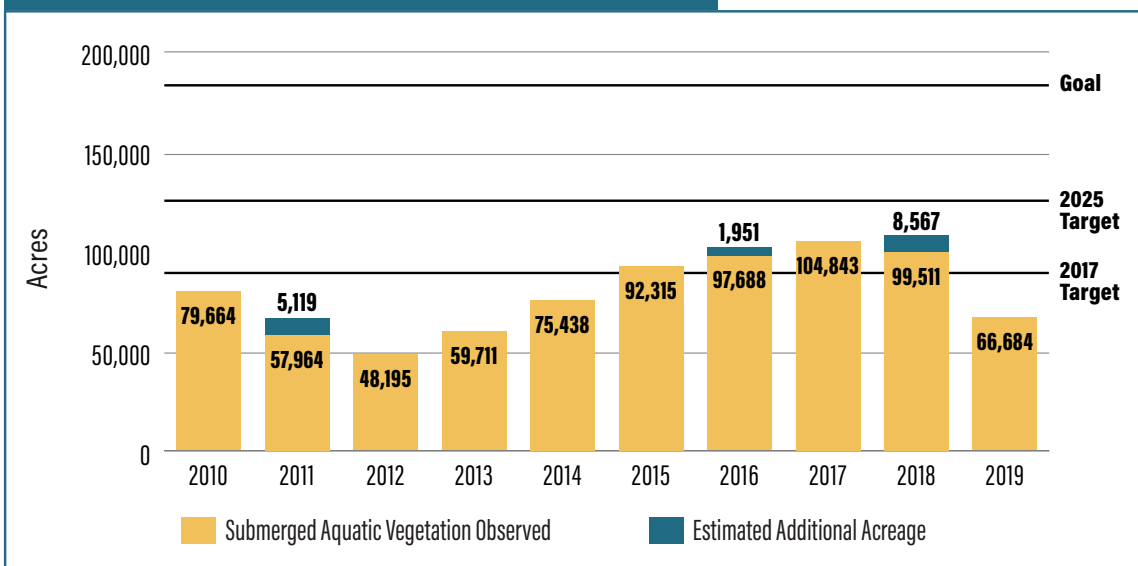
According to data from the Virginia Institute of Marine Science, 66,684 acres of underwater grasses were mapped in the Chesapeake Bay in 2019. This is just over halfway (52%) to the Chesapeake Bay Program's 2025 restoration target of 130,000 acres and a third (36%) of the way to the partnership's 185,000-acre goal. Although the 66,684 acres is a significant increase from the 38,958 acres observed during the first survey in 1984, it is a slight (17%) decrease from the preceding 10-year average of 79,738 acres and a 38% decrease from 2018 when it was estimated that the Bay may have supported up to 108,078 acres of underwater grasses.

Long-Term Data Collection

The SAV Workgroup is currently designing, and will implement, a Sentinel Site Monitoring Program for underwater grasses in the Chesapeake Bay. Data taken from the sentinel sites, which are research locations where long-term environmental data is collected, will be used to complement acreage and density information that is currently collected through the Chesapeake Bay-wide aerial survey, and community science input gathered through the Chesapeake Bay SAV Watchers Program. The goal is to establish five sentinel sites in each of the four salinity zones of the Chesapeake Bay to monitor changes in habitat characteristics and resilience indicators, as well as to determine if the various communities of grass species respond differently to environmental stressors.

BLACK DUCK

By 2025, restore, enhance and preserve wetland habitats that support a wintering population of 100,000 black ducks, a species representative of the health of tidal marshes across the watershed. Refine population targets through 2025 based on best available science.

PROGRESS

51% of the outcome is achieved.

Tool Identifies High-Quality Habitat

The Black Duck Decision Support Tool helps land managers identify the exact number of acres across the Chesapeake Bay watershed that is needed to protect, restore or maintain high-quality, non-breeding habitat for black ducks. Throughout 2020, the Black Duck Action Team has used the tool to determine that the 2014 baseline of available habitat was 566,477 acres. The tool also established a 2025 restoration target of 717,749 acres, which is estimated to be the amount of available habitat needed to support 100,000 black ducks. The baseline and target may slightly adjust when future updates are made to the Black Duck Decision Support Tool, to integrate the most up-to-date science and data.

FISH PASSAGE

OUTCOME

Continually increase access to habitat to support sustainable migratory fish populations in the Chesapeake Bay watershed's freshwater rivers and streams. By 2025, restore historical fish migration routes by opening an additional 132 miles every two years to fish passage. Restoration success will be indicated by the consistent presence of alewife, blueback herring, American shad, hickory shad, American eel and brook trout, to be monitored in accordance with available agency resources and collaboratively developed methods.

PROGRESS

23% of the outcome is achieved.

Historical Routes Return

The Chesapeake Bay Program met its original goal for the Fish Passage Outcome in 2016, mainly due to the development of more accurate technologies for measuring stream and river habitat. In March 2020, a revised outcome goal was added to the *Chesapeake Bay Watershed Agreement* that calls for restoring 132 miles of historical fish passage routes every two years. The Fish Passage Workgroup established the new goal by determining that since the outcome was established in 2014, habitat for migratory fish populations has opened at this rate, as measured by these more accurate techniques.

BROOK TROUT

OUTCOME

Restore and sustain naturally reproducing brook trout populations in Chesapeake Bay headwater streams, with an 8% increase in occupied habitat by 2025.

PROGRESS

A 2015 assessment by the Eastern Brook Trout Joint Venture found that wild brook trout occupy 33,200 square kilometers of habitat in the Chesapeake Bay watershed. This includes the streams they share with brown and/or rainbow trout. Out of the 33,200 square kilometers, 13,500 or 40% are "wild brook trout only" streams, which are comprised of 990 separate patches, or groups of contiguous catchments. Progress toward this outcome will be measured from this baseline, which means 14,600 square kilometers of habitat occupied only by wild brook trout is our restoration goal. Our annual restoration target is 137 square kilometers of habitat.

Competition for Native Brook Trout

In fall 2020, the U.S. Geological Survey published *Effects of Introduced Species on Native Brook Trout: A Guide to the Scientific Literature*. The report summarized the existing scientific literature on how two introduced species affect native brook trout, particularly focusing on competition for resources, disease and climate change interactions. The impacts on brook trout from rainbow trout were mixed, as different conditions produced varying results. In contrast, brown trout tended to gain an advantage over brook trout as stream temperature increased or land cover type shifted from forest to agriculture or urban. These findings show that the potential for an introduced species to cause significant harm to native brook trout can vary by location, the type of species and the environmental conditions of the habitat.

TREE CANOPY

OUTCOME

Continually increase urban tree canopy capacity to provide air quality, water quality and habitat benefits throughout the watershed. Expand urban tree canopy by 2,400 acres by 2025.

PROGRESS

The Chesapeake Bay Program defines tree canopy as tree plantings in communities of any size that are not on agricultural lands. A two-pronged indicator that will track the extent of tree canopy in the watershed is currently under development. This indicator will include remotely sensed changes in tree canopy, to be updated every five years, and annual tree plantings reported as best management practices by jurisdictions under the Chesapeake Bay Total Maximum Daily Load (Bay TMDL).

A Summit for the Trees

To help build a broader base of knowledge about the newer opportunities available to advance tree canopy efforts, the second Chesapeake Tree Canopy Summit was held in January 2020. Attendees identified opportunities to disseminate information at the local, sub-regional and state levels, while collaborating with new cross-sector partners (e.g., public health and planning agencies) and recognizing areas for improvement. Presenters framed the need for more trees, sharing the latest research, tools and best practices related to public health, equity, stormwater, local policies and financing strategies. Additional resources and success stories to help communities understand, maintain and expand their tree canopy can be found on the Chesapeake Tree Canopy Network.
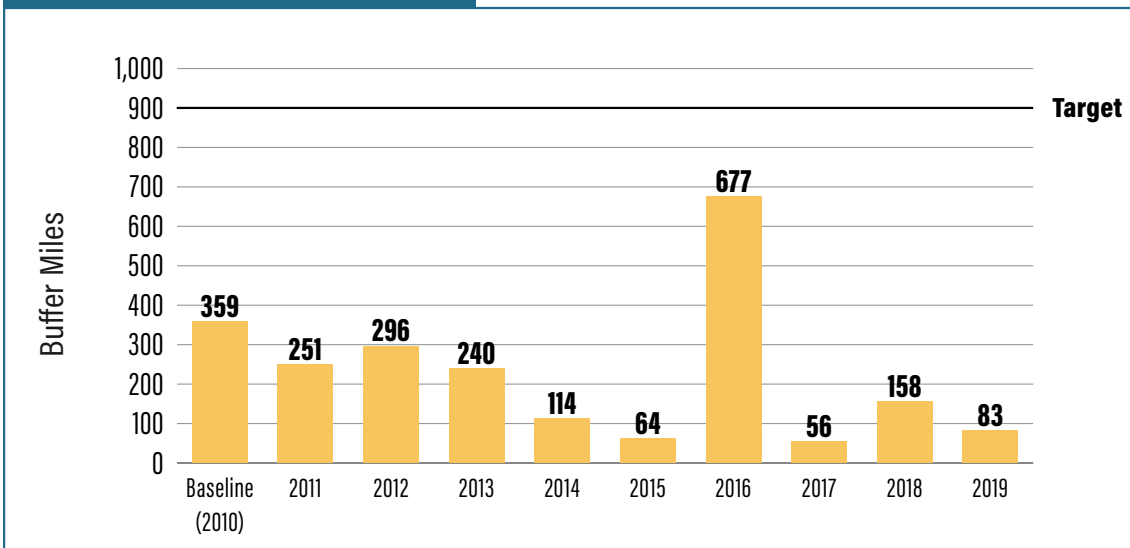
FOREST BUFFERS

OUTCOME

Continually increase the capacity of forest buffers to provide water quality and habitat benefits throughout the Chesapeake Bay watershed. Restore 900 miles of riparian forest buffers per year and conserve existing buffers until at least 70% of riparian areas in the watershed are forested.

PROGRESS

Between 2017 and 2018, about 158 miles of forest buffers were planted along rivers and streams in the Chesapeake Bay watershed, followed by about 83 miles in 2019. While this marks progress toward the outcome, it is 742 and 817 miles below the 900-mile-per-year target, respectively.

Annual Forest Buffers Planted (2010-2019)

Bar chart — Buffer Miles (y-axis, 0–1,000) by year. Target line at 900.

Year	Buffer Miles
Baseline (2010)	359
2011	251
2012	296
2013	240
2014	114
2015	64
2016	677
2017	56
2018	158
2019	83

Since 2010, the miles of forest buffers planted each year has averaged just 25% of the yearly restoration target that will help us reach our clean water goals. Experts attribute the slowed progress to lack of technical assistance, inconsistent buffer programs that are difficult to use, competing water quality practices and low incentives. Many of the Bay jurisdictions estab-lished even more ambitious goals for forest buffers in their Phase III Watershed Implementation Plans (WIPs). In total, the states put 190,500 acres of cumulative forest buffer implementa-tion in their Phase III WIPs to achieve by 2025. To put this in context, as of 2019, states had reported a cumulative total of 38,255 acres of forest buffers. This reflects a gap of 152,245 acres or 12,448 miles, assuming an average 100.9 ft. buffer width. Between 2020 and 2025, states would need to add 2,075 miles per year to meet the targets in their Phase III WIPs.

Foresters Unite for Stewardship

To accelerate progress toward meeting forest buffer goals to improve habitat, climate resilience and water quality, the Forestry Workgroup developed the concept for the Natural Filters Restoration Program, to leverage private capital through conservation finance for more buffers to be planted and maintained across the watershed. Additionally, in October 2020, the U.S. Forest Service signed a Shared Stewardship Agreement with the state foresters from the seven Chesapeake Bay watershed jurisdictions. The agreement affirms the long-standing partnership between the state foresters of the Chesapeake Bay watershed and directly ties to the Chesapeake Forest Restoration Strategy, which was updated earlier in 2020.
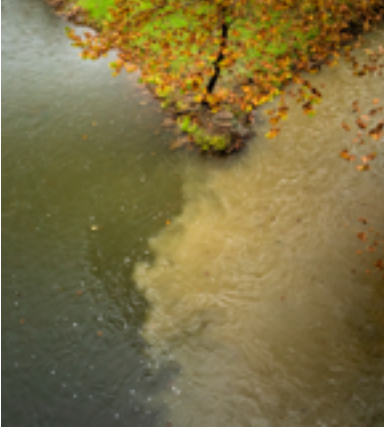
STREAM HEALTH

OUTCOME

Continually improve stream health and function throughout the watershed. Improve health and function of 10% of stream miles above the 2008 baseline for the watershed.

PROGRESS

In 2018, a baseline period for the health of streams across the watershed was established. It covers a six-year period between 2006 and 2011, when 25% of streams across the watershed were found to be in fair, good or excellent condition.

What Impacts the Health of a Stream

In collaboration with the U.S. Geological Survey, the Stream Health Workgroup is investigating what stressors impact the health of a stream. Many different factors go into defining what makes a stream healthy, including the chemical makeup of the water, whether it can support plant and animal life and how the surrounding land is developed. A literature review and survey of watershed jurisdictions have been in progress throughout 2020. This will determine what stressors are most affecting stream health, what is driving these stressors to occur and which are responsible for causing the impairment of streams.

WETLANDS

OUTCOME

Continually increase the capacity of wetlands to provide water quality and habitat benefits throughout the watershed. Create or reestablish 85,000 acres of tidal and non-tidal wetlands and enhance function of an additional 150,000 acres of degraded wetlands by 2025. These activities may occur in any land use (including urban), but primarily occur in agricultural or natural landscapes.

PROGRESS

There was a slight decrease in the number of cumulative acres of wetlands restored from 2016 to 2017 (10,876 to 9,103 acres), achieving 11% of the target.

Highlighting Wetland Co-benefits

In collaboration with the Chesapeake Bay Program Communications Office, the Wetlands Workgroup is creating a series of fact sheets that highlight how wetland restoration benefits other jurisdiction-specific programs, plans and initiatives related to economic development, public health and safety, infrastructure and maintenance and natural benefits. The goal of these fact sheets is to encourage state and local governments, nonprofit organizations and community groups to invest in wetland restoration and living shorelines.

CLEAN WATER

Water Quality | Toxic Contaminants | Healthy Watershed
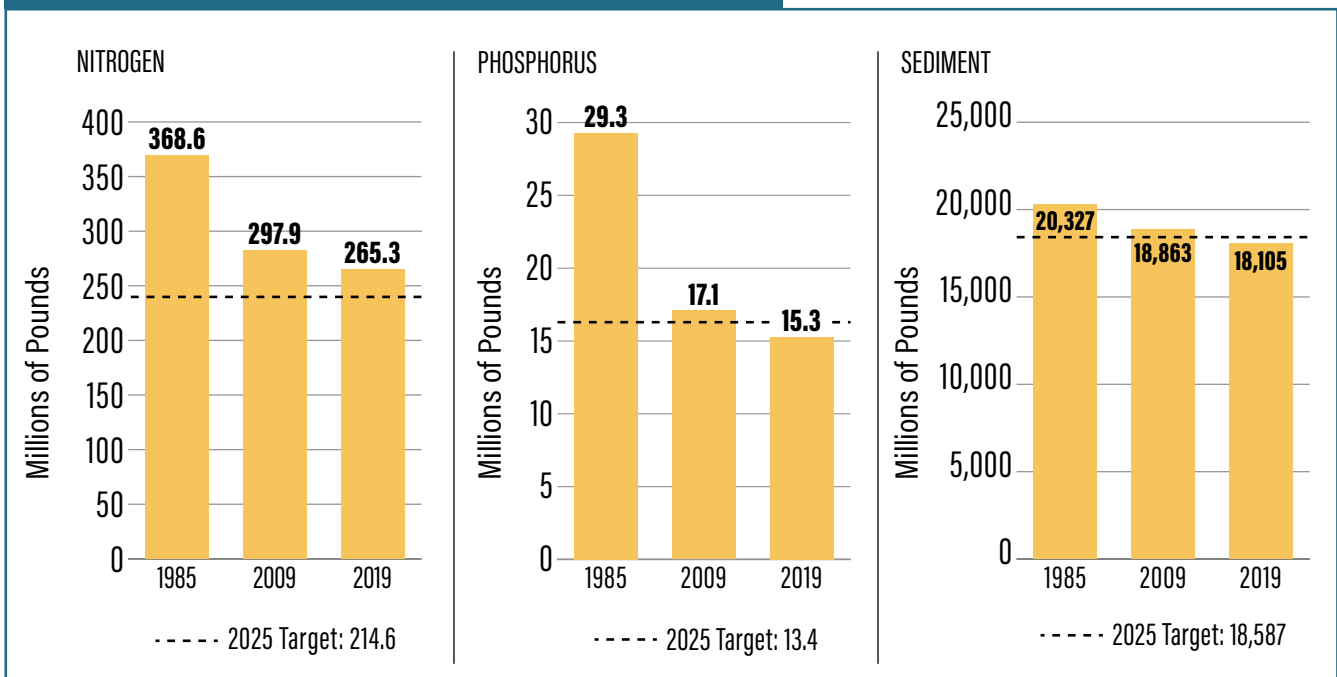
2025 WATERSHED IMPLEMENTATION PLANS (WIPS)

OUTCOME

By 2025, have all practices and controls in place to achieve applicable water quality (i.e., dissolved oxygen, water clarity/submerged aquatic vegetation and chlorophyll *a*) standards as articulated in the Chesapeake Bay Total Maximum Daily Load.

PROGRESS

As of 2019, best management practices (BMPs) to reduce pollution are in place to achieve 39% of the nitrogen reductions, 49% of the phosphorus reductions and 100% of the sediment reductions needed to attain applicable water quality standards when compared to the 2009 baseline established in the Chesapeake Bay Total Maximum Daily Load (Bay TMDL).

Simulated Pollution Loads to the Chesapeake Bay (1985-2019)

NITROGEN (Millions of Pounds)

Year	Value
1985	368.6
2009	297.9
2019	265.3

- - - - 2025 Target: 214.6

PHOSPHORUS (Millions of Pounds)

Year	Value
1985	29.3
2009	17.1
2019	15.3

- - - - 2025 Target: 13.4

SEDIMENT (Millions of Pounds)

Year	Value
1985	20,327
2009	18,863
2019	18,105

- - - - 2025 Target: 18,587

According to the Chesapeake Assessment Scenario Tool (CAST), BMPs (pollution controls) put in place in the Chesapeake Bay watershed between 2009 and 2019 lowered nitrogen loads 11%, phosphorus loads 10% and sediment loads 4%.

Accounting for Climate Change

The Water Quality Goal Implementation Team is conducting analyses to better understand how to address additional pollution resulting from climate change. Models show that by 2025, additional pollution resulting from climate change is approximately five million pounds of nitrogen and 600,000 pounds of phosphorus. However, by 2035, the estimated amount is anticipated to be double that which is predicted for 2025. In December 2020, the Principals' Staff Committee reconfirmed expectations set in 2018 that the six watershed states and the District of Columbia would account for the estimated 2025 additional pollution resulting from climate change through an addendum to their Phase III Watershed Implementation Plans and/or their two-year milestones beginning in 2022. Both the District of Columbia and the Commonwealth of Virginia included climate change considerations in their Phase III WIPs.

WATER QUALITY: STANDARDS ATTAINMENT

OUTCOME

Continually improve the capacity to monitor and assess the effects of management actions being undertaken to implement the Chesapeake Bay Total Maximum Daily Load (TMDL) and improve water quality. Use the monitoring results to report annually to the public on progress made in attaining established Bay water-quality standards and trends in reducing nutrients and sediment in the watershed.
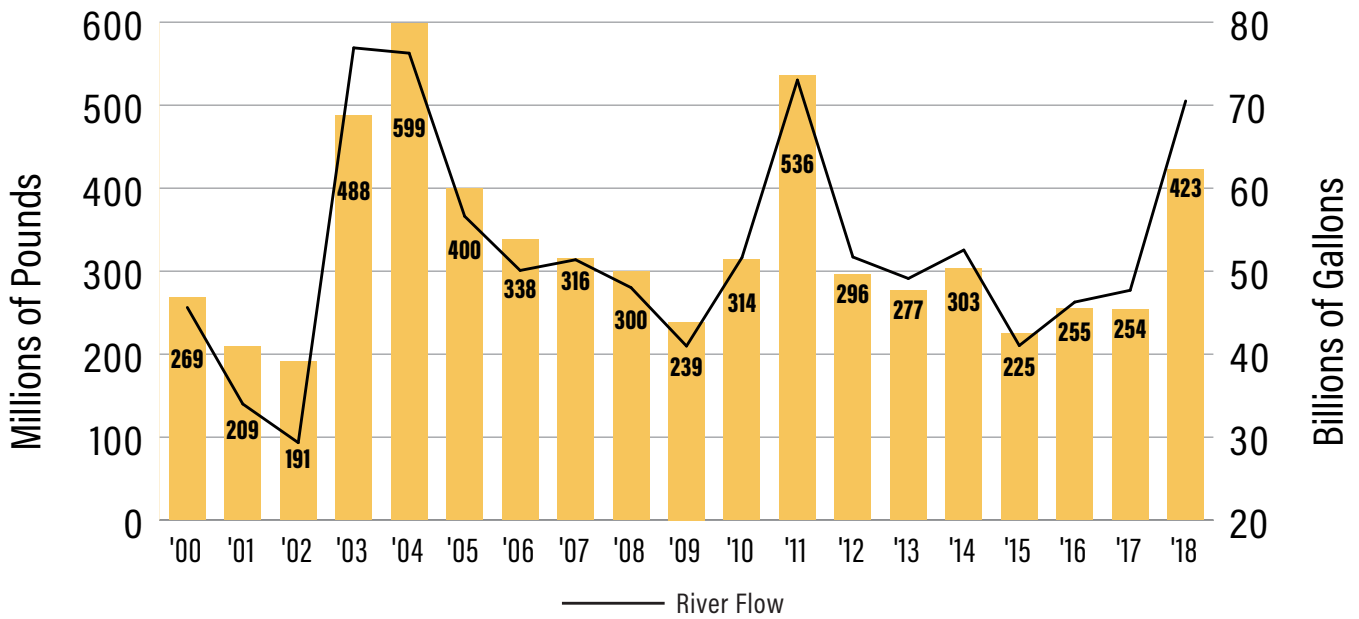
PROGRESS

An estimated 38% of the Chesapeake Bay and its tidal tributaries met water quality standards between 2016 and 2018. Approximately 423 million pounds of nitrogen, 42.1 million pounds of phosphorus and 15,689 million pounds of sediment reached the Bay in 2018.

Water Quality Standards Attainment (2007-2018)
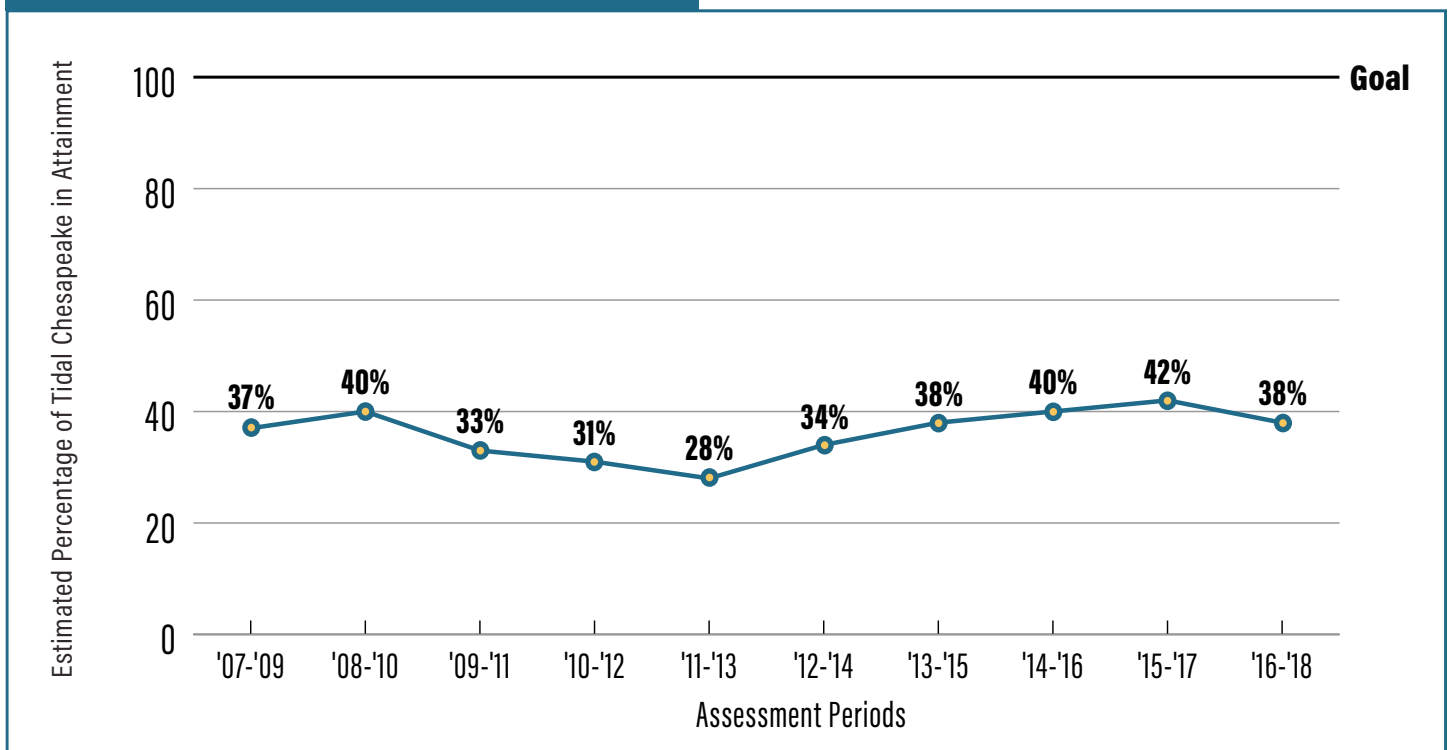
Between October 2017 and September 2018, river flow to the Bay measured an above-average 70.5 billion gallons per day. Generally, when the watershed receives more rain and river flows increase, the water carries more sediment and nutrient pollution than usual. Greater flows increase pollution loads received by the Bay. This remained true from October 2017 to September 2018 as approximately 423 million pounds of nitrogen, 42.1 million pounds of phosphorus and 15,689 million pounds of sediment reached the Bay: a 66%, 181% and 262% increase from the previous year, respectively. These higher nutrient levels feed algae blooms and result in larger dead zones than in drier years.

Nitrogen Loads and River Flow to the Chesapeake Bay (2000-2018)

Millions of Pounds | Billions of Gallons

Values by year:
- '00: 269
- '01: 209
- '02: 191
- '03: 488
- '04: 599
- '05: 400
- '06: 338
- '07: 316
- '08: 300
- '09: 239
- '10: 314
- '11: 536
- '12: 296
- '13: 277
- '14: 303
- '15: 225
- '16: 255
- '17: 254
- '18: 423

—— River Flow

Phosphorus Loads and River Flow to the Chesapeake Bay (2000-2018)

Millions of Pounds | Billions of Gallons

Values by year:
- '00: 12
- '01: 9
- '02: 7
- '03: 43
- '04: 45
- '05: 25
- '06: 20
- '07: 19
- '08: 16
- '09: 10
- '10: 24
- '11: 74
- '12: 17
- '13: 19
- '14: 22
- '15: 12
- '16: 16
- '17: 15
- '18: 42
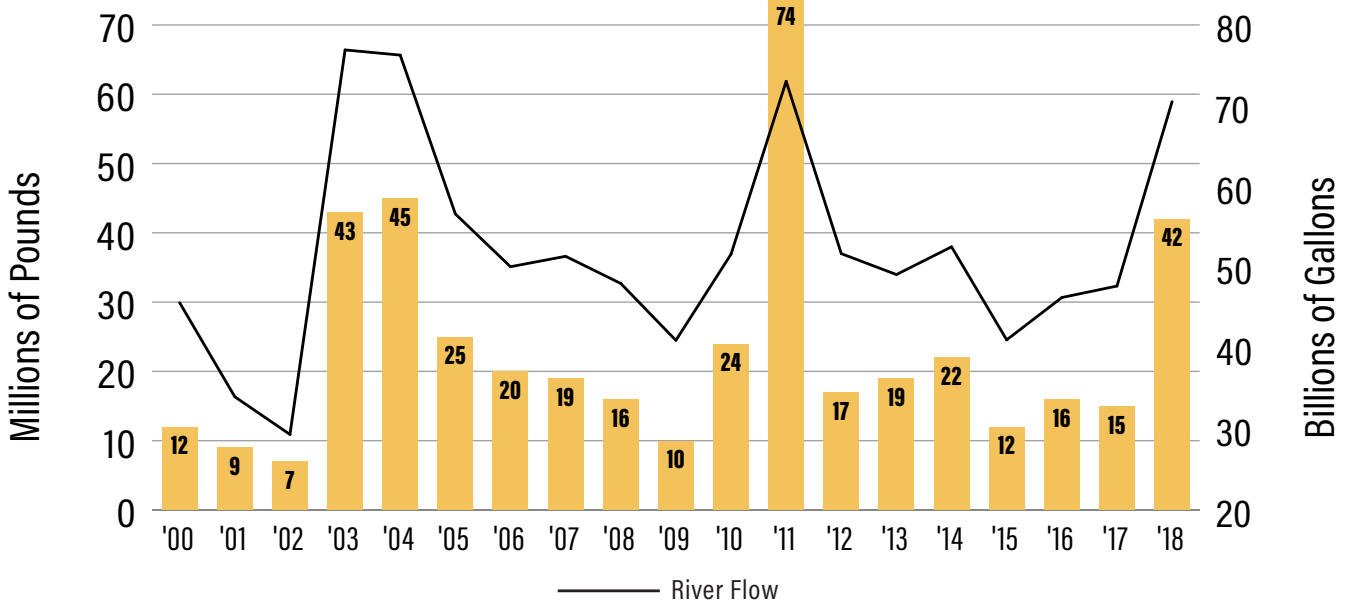
—— River Flow

Sediment Loads and River Flow to the Chesapeake Bay (1990-2018)
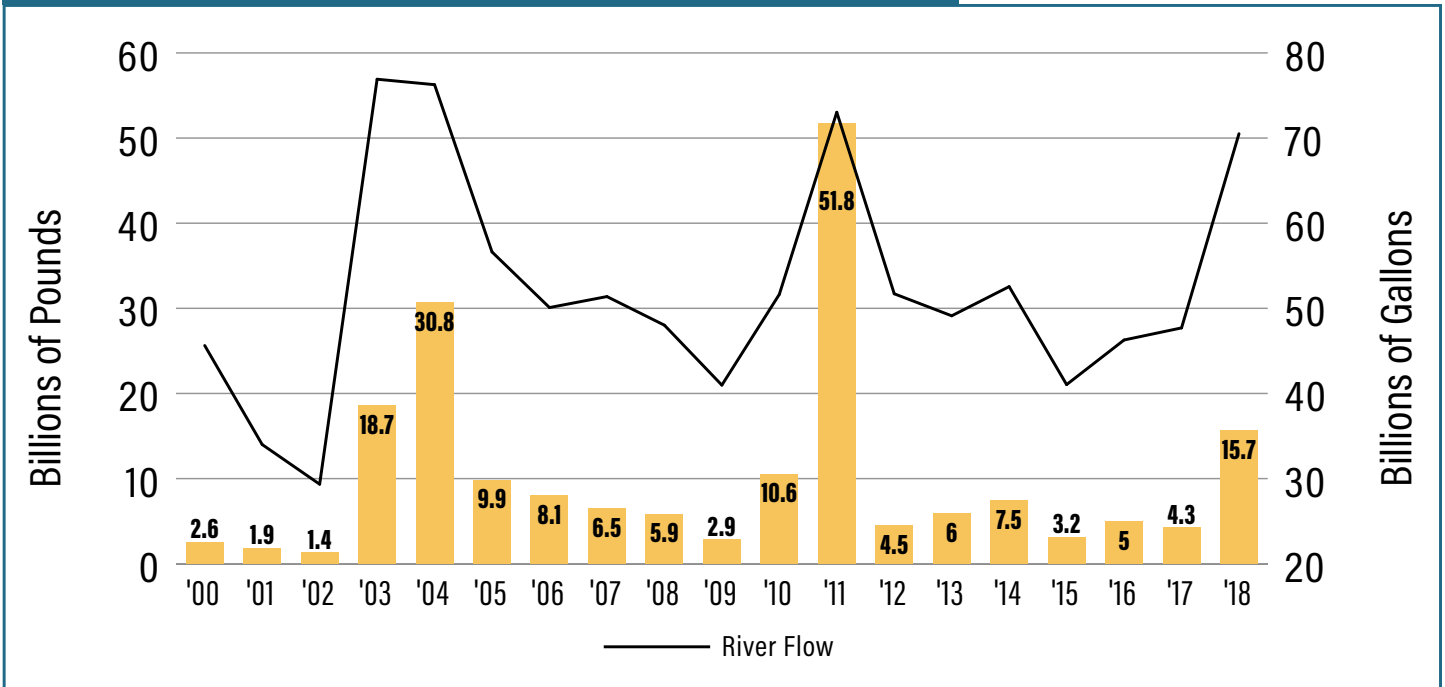
Chart showing Billions of Pounds (left axis) and Billions of Gallons (right axis) from '00 to '18.

Bar values (Billions of Pounds):
'00: 2.6, '01: 1.9, '02: 1.4, '03: 18.7, '04: 30.8, '05: 9.9, '06: 8.1, '07: 6.5, '08: 5.9, '09: 2.9, '10: 10.6, '11: 51.8, '12: 4.5, '13: 6, '14: 7.5, '15: 3.2, '16: 5, '17: 4.3, '18: 15.7

— River Flow

An estimated 38% of the Chesapeake Bay and its tidal tributaries met water quality standards during the 2016-2018 assessment period. This score is lower than the record high of 42% during the 2015-2017 assessment period but is still the fifth highest estimate of water quality standards attainment since 1985. A decline in open water dissolved oxygen in a large area of the Bay impacted the attainment results. Open water habitat in a large area of the Bay failed to meet its standards in this period which had a big effect on lowering the indicator score. However, dissolved oxygen conditions in deep water habitat and surface chlorophyll *a* measures improved from the 2015-2017 assessment period, which may indicate increasing resilience in the Bay ecosystem. Nonetheless, water quality measures remain far below the 100% attainment necessary to fully support survival, growth and reproduction of the Bay's living resources, and 62% of tidal waters are estimated to be impaired during the 2016-2018 assessment period.

A Network of Monitoring Stations

The Chesapeake Bay Non-Tidal Monitoring Network consists of more than 100 stations across the watershed where nitrogen, phosphorus and sediment pollution are measured, as well as river flow, to provide pollution loads and trends across the watershed. In spring 2020, the U.S. Geological Survey updated trends from Non-Tidal Monitoring Network data for water years 2009-2018 (October 1 – September 30) to update their trends analysis. Results showed nitrogen pollution to be decreasing at 41% of stations across the watershed, increasing at 40% and the remaining 19% see no trend. For phosphorus, 44% of stations show a decrease, one-third are increasing and the remainder show no trend. Sediment pollution is decreasing at 20% of stations, whereas it is increasing at 42% and the remainder show no trend.

TOXIC CONTAMINANTS POLICY & PREVENTION

OUTCOME

Continually improve practices and controls that reduce and prevent the effects of toxic contaminants below levels that harm aquatic systems and humans. Build on existing programs to reduce the amount and effects of polychlorinated biphenyls (PCBs) in the Bay and watershed. Use research findings to evaluate the implementation of additional policies, programs and practices for other contaminants that need to be further reduced or eliminated.

PROGRESS

In 2016, 82% of the Chesapeake Bay and its tidal tributaries were found to be partially or fully impaired by toxic contaminants, an increase of 2% from 2014.

Taking a Bite Out of Toxic Exposure

IIn November 2020, the Toxic Contaminants Workgroup, in conjunction with the Diversity Workgroup, finalized the Fish Consumption Advisory Project, which aimed to develop effective communications tools for populations at high risk for PCB exposure through consuming fish caught in impaired waters. Tools developed include a bilingual fish consumption advisory infographic and accompanying user guide, video, and recipe cards.

TOXIC CONTAMINANTS RESEARCH

OUTCOME

Continually increase our understanding of the impacts and mitigation options for toxic contaminants. Develop a research agenda and further characterize the occurrence, concentrations, sources and effects of mercury, polychlorinated biphenyls (PCBs) and other contaminants of emerging and widespread concern. In addition, identify which best management practices might provide multiple benefits of reducing nutrient and sediment pollution as well as toxic contaminants in waterways.

PROGRESS

Research has improved our understanding of several issues related to toxic contaminants. Studies in the Susquehanna River basin have identified disease as an important factor leading to poor fish health and mortality. Studies by the U.S. Geological Survey suggest that toxic contaminants are compromising the immune systems of fish, making them more susceptible to disease and other factors degrading their health. While research from the U.S. Fish and Wildlife Service indicates the presence of tumors in brown bullhead catfish in the Anacostia and Potomac rivers has decreased, fish collected from these areas still show a significantly higher rate of tumors than those sampled from more rural waters.

Promising Approaches for Protecting the Watershed

The Scientific and Technical Advisory Committee released a report in January 2020 detailing what researchers currently know about the contaminants of concern affecting urban and agricultural settings and fisheries, and what opportunities exist for their reduction. Findings show that fish consumption advisories are widespread throughout the fresh and tidal waters of the watershed due to elevated levels of mercury and polychlorinated biphenyls (PCBs). The report identified several promising approaches to reduce toxic contaminants observed in urban and agricultural areas, including taking advantage of nutrient and sediment reduction practices.

HEALTHY WATERSHED

100% of state-identified currently healthy waters and watersheds remain healthy.

PROGRESS

Each jurisdiction in the Chesapeake Bay region has its own definition of healthy waters and watersheds, and its own programs to support watershed protection. Honoring state preferences, the Chesapeake Bay Program will not seek a single watershed-wide definition for healthy waters and watersheds but will strategically track and support the preservation of state-identified healthy waters and watersheds (state definitions range from exceptional water quality to what makes these waterways ecologically sound). These waters and watersheds, as identified in 2017, will serve as the baseline from which we assess watershed health and measure progress toward this outcome. The Chesapeake Bay Program is working to determine the feasibility of using a framework like the Environmental Protection Agency's Preliminary Healthy Watersheds Assessments to track change from this baseline.

Maintaining Healthy Watersheds

Building upon the Environmental Protection Agency's Preliminary Healthy Watershed Assessment, _Assessing the Health and Vulnerability of Healthy Watersheds within the Chesapeake Bay_ develops a framework to track the health of state-identified healthy watersheds over time and allows for new data to be integrated as it becomes available. The Chesapeake Healthy Watersheds Assessment is now available through a web-based tool that summarizes a series of metrics (landscape condition, hydrology, geomorphology, habitat, biological condition and water quality) into an overall watershed health index. These data also consider some vulnerabilities (climate change, wildfire risk, land use change and water use), and when factored together, can help detect signals of change, providing information useful to support strategies to protect and maintain watershed health.

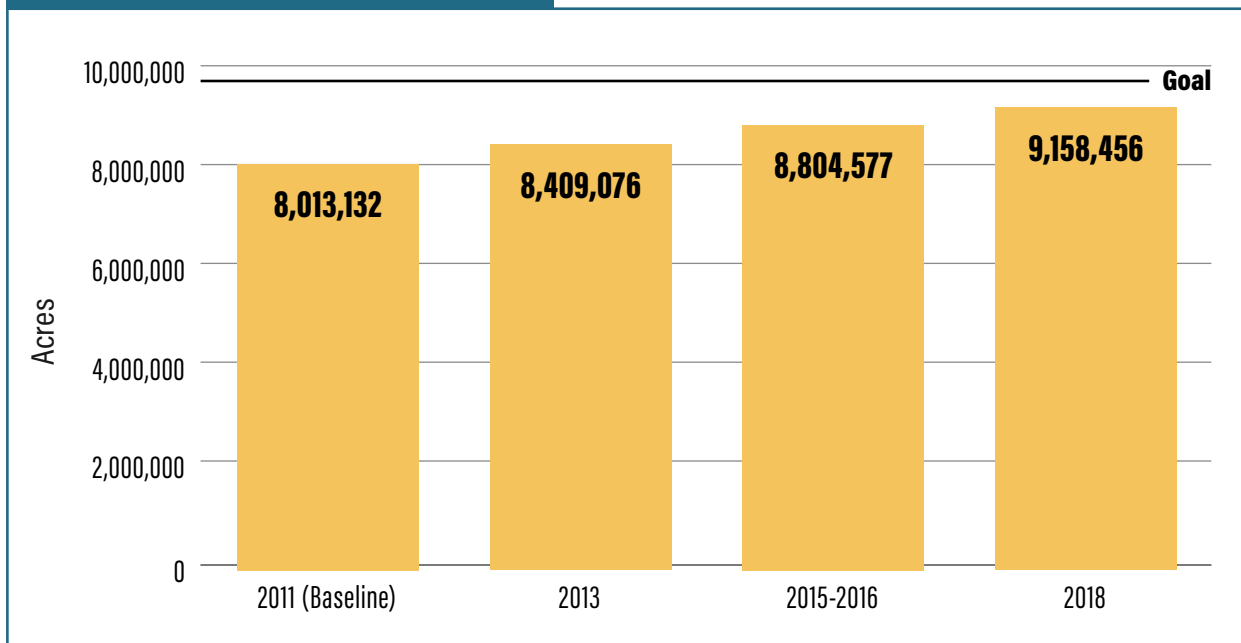# CONSERVED LAND

Land Conservation Goal

PROTECTED LANDS

OUTCOME

By 2025, protect an additional two million acres of lands throughout the watershed—currently identified as high-conservation priorities at the federal, state or local level—including 225,000 acres of wetlands and 695,000 acres of forest land of highest value for maintaining water quality.

PROGRESS

68% of outcome achieved.

Protected Lands (Cumulative) (2011-2018)

Bar chart showing cumulative protected lands in acres. Y-axis labeled "Acres" ranging from 0 to 10,000,000. A dashed line labeled "Goal" sits at 10,000,000.
- 2011 (Baseline): 8,013,132
- 2013: 8,409,076
- 2015-2016: 8,804,577
- 2018: 9,158,456

According to data collected through early 2019, nearly 1.36 million acres of land in the Chesapeake Bay watershed have been permanently protected since 2010. This marks an achievement of 68% of the land conservation goal and brings the total amount of protected land in the watershed to 9.16 million acres. State agencies are the largest entity contributing to land protection: they own approximately 44% of the protected acres in the watershed.

Factoring in Public Health

Inspired by the events of 2020—from a worldwide pandemic to a renewed call for social justice reform—the Chesapeake Conservation Partnership (CCP) proposed adding a new public health goal to ensure future land conservation activities include a focus on equity and public health. A series of virtual work sessions were held to develop strategies, actions and ideas for operationalizing this new goal in the context of land conservation watershed wide. This new goal will expand upon the CCP's existing human health goal by calling for the protection, conservation and enhancement of lands that support equitable public health for all, with an urgent focus on underserved communities, both urban and rural.

LAND USE METHODS & METRICS DEVELOPMENT

OUTCOME

Continually improve our knowledge of land conversion and the associated impacts throughout the watershed. By December 2021, develop a watershed-wide methodology and local-level metrics for characterizing the rate of farmland, forest and wetland conversion, measuring the extent and rate of change in impervious surface coverage and quantifying the potential impacts of land conversion to water quality, healthy watersheds and communities. Launch a public awareness campaign to share this information with local governments, elected officials and stakeholders.

PROGRESS

Work is underway to develop a methodology and metrics for characterizing the rate of farmland, forest and wetland conversion; measuring the extent and rate of change in impervious surface coverage; and quantifying the potential impacts of land conversion on water quality, healthy watersheds and communities. This work will be based on changes to the landscape observed between 1985 and 2015 and is expected to be updated every two to five years.

Meter-by-Meter View of Watershed Land Use

In January 2020, the Chesapeake Bay Program approved a change in date from 2016 to 2021 to meet the Land Use Methods and Metrics Development Outcome due to the emergence of new technologies and resources. An update is currently underway for the Chesapeake Bay High-Resolution Land Cover Project, which provides one-by-one-meter resolution land cover data for the entire watershed. Waiting for the release of this updated high-resolution land cover data to complete the assessment of land cover and land use changes throughout the watershed will yield a far superior product.

LAND USE OPTIONS EVALUATION

OUTCOME

By the end of 2017, with the direct involvement of local governments or their representatives, evaluate policy options, incentives and planning tools that could assist them in continually improving their capacity to reduce the rate of conversion of agricultural lands, forests and wetlands as well as the rate of changing landscapes from more natural lands that soak up pollutants to those that are paved over, hardscaped or otherwise impervious. Strategies should be developed for supporting local governments' and others' efforts in reducing these rates by 2025 and beyond.

PROGRESS

In June of 2017, two projects were completed to support the evaluation of existing land use policy options, incentives and planning tools that can reduce the rate of farm, forest and wetland conversion to developed lands. The Conservation Land-Use Policy Toolkit describes and evaluates seven policy tools that local governments can use to slow the conversion of farms, forests and wetlands. The Healthy Watersheds Forest Retention Project explains how local governments can save resources by using forest conservation as a method of managing stormwater and includes "toolkits" of policies and practices that can support forest conservation in Pennsylvania and Virginia. The next phase of this project will train local leaders in policy and practice implementation and produce a financial model to incentivize private investment in land conservation.

Working for Land Conservation with Local Leaders

Throughout 2020, several communications products were developed to reach local decision-makers across the Chesapeake Bay watershed to enhance their knowledge around land conversion and its associated impacts. The recently-launched Chesapeake Data Dashboard contains a module on Land Policy and Conservation that provides information on how to assess the potential for growth and development, explore management options related to smart growth and land conservation practices, identify geographic areas that have the potential to implement smart growth or conservation measures and how to target or prioritize areas for management actions based on the likelihood of growth and potential for conservation. Additionally, the Land Use Resource Guide was published in September 2020 to provide a compilation of existing initiatives, databases, tools and other resources to grow the knowledge of local governments and land use managers in designing sustainable landscapes.

ENGAGED COMMUNITIES

Public Access | Environmental Literacy |
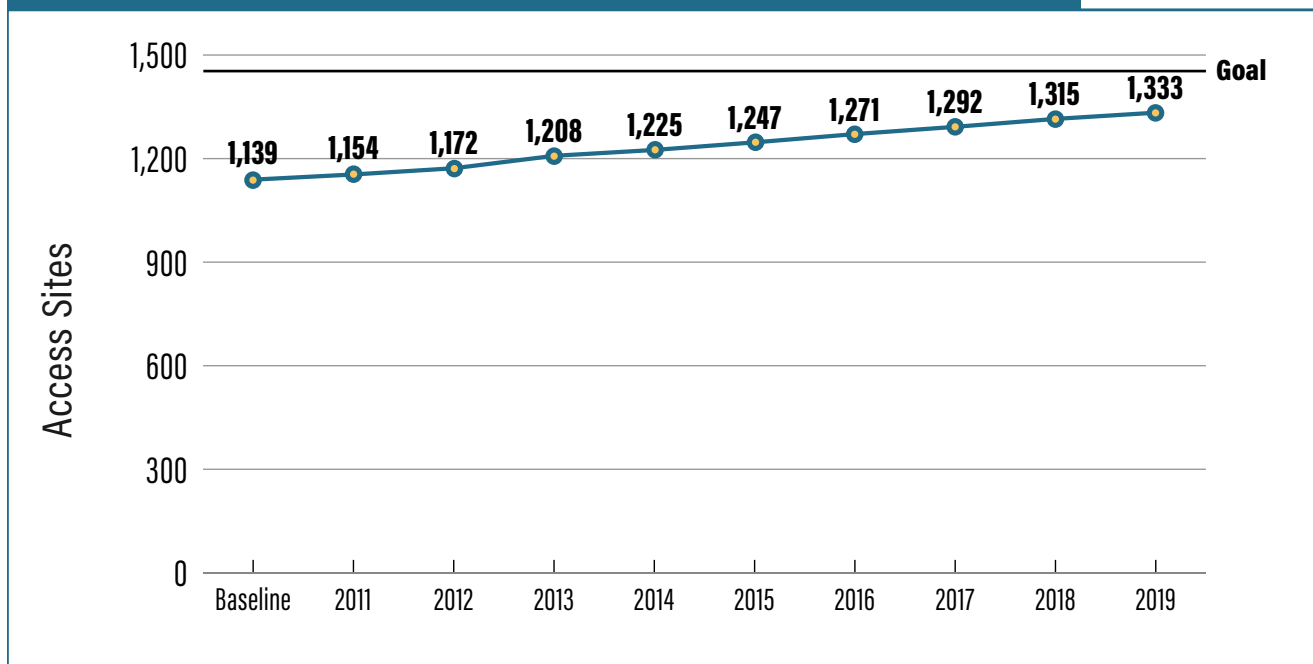Stewardship | Diversity

PUBLIC ACCESS

OUTCOME

By 2025, add 300 new public access sites, with a strong emphasis on providing opportunities for boating, swimming and fishing, where feasible.

PROGRESS

65% of the outcome is achieved.

Public Access Sites in the Chesapeake Bay Watershed (Cumulative) (2010-2019)

Between 2010 and 2019, 194 boat ramps, fishing piers and other public access sites were opened on and around the Chesapeake Bay. This marks a 65% achievement of the goal to add 300 new access sites to the watershed by 2025 and brings the total number of access sites in the region to 1,333.

Breaking Down Barriers

The Public Access Workgroup received funding in 2020 for *Public Access Research—Benefits and Barriers Across the Watershed*, a project that will determine how residents in the Chesapeake Bay watershed utilize public access sites and what barriers exist that prevent traditionally underserved populations from visiting those areas. This project will be helpful in determining what actions should be taken to engage with underserved communities so that they may enjoy the watershed's resources. The findings will also inform the future development and enhancement of public access sites and provide support for greater resources toward site development and maintenance, as well as education and programming efforts.
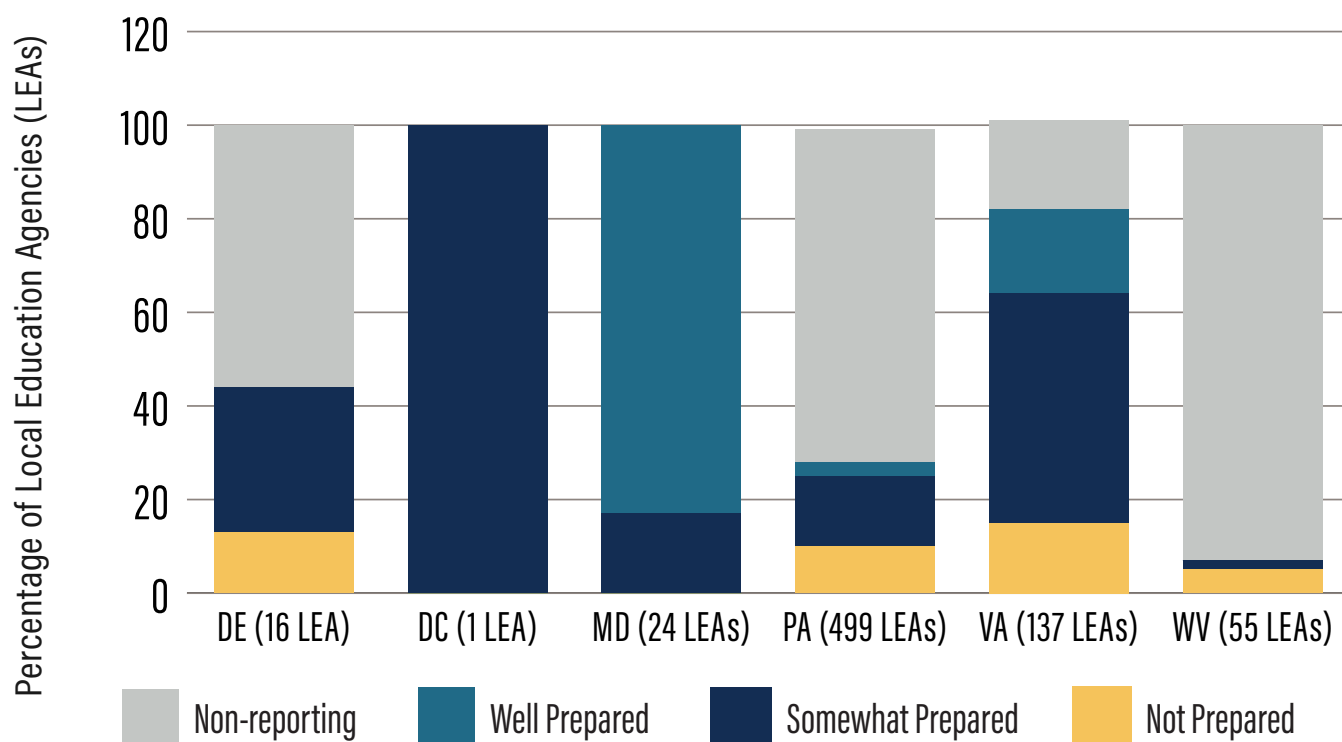
ENVIRONMENTAL LITERACY PLANNING

OUTCOME

Each participating Bay jurisdiction should develop a comprehensive and systemic approach to environmental literacy for all students in the region that includes policies, practices and voluntary metrics that support the environmental literacy Goals and Outcomes of this Agreement.

PROGRESS

Between 2017 and 2019, there have been continued positive shifts in school districts' level of preparedness, primarily with an increase in the proportion of those within the watershed that scored as "well-prepared" (22% in 2017 to 27% in 2019). Moreover, aggregated data shows that from 2015 to 2019, the proportion of surveyed school districts who are well-prepared indicate a steady increase, of about 3-4% each period. Furthermore, when only looking at data from school districts who responded in both 2017 and 2019, 23% moved to a higher category of preparedness.

Environmental Literacy Preparedness in Watershed Jurisdictions (2019)

In 2019, 27% of the school districts that responded to a Chesapeake Bay Program survey self-identified as "well-prepared" to deliver high-quality environmental literacy programming to their students. Of the remaining respondents, 52% identified as somewhat prepared and 22% identified as not prepared. This marks an increase in environmental literacy preparedness since the pilot Environmental Literacy Indicator Tool survey was distributed in 2015. However, the 2019 survey includes districts who had previously not responded so it is important to look at data from school districts who responded in both 2017 and 2019. Of those districts, 47% improved their environmental literacy indicating positive progress.

Giving Schools the Tools They Need

In collaboration with the Stroud Water Research Center, the Education Workgroup is creating a tool that will prioritize school districts and buildings that have the greatest need and potential to install best management practices (BMPs). Additionally, the tool compares data from a variety of sources, including, the Environmental Literacy Tool Indicator, equity data from school districts, rate of stormwater runoff on school grounds, impacts of BMP installations from Chesapeake Bay Program modeling tools and use of the National Stormwater Calculator for cost comparisons. This work follows a report summarizing interviews with stakeholders across the watershed regarding the current implementation of BMPs on school grounds and how they contribute to student and community learning.
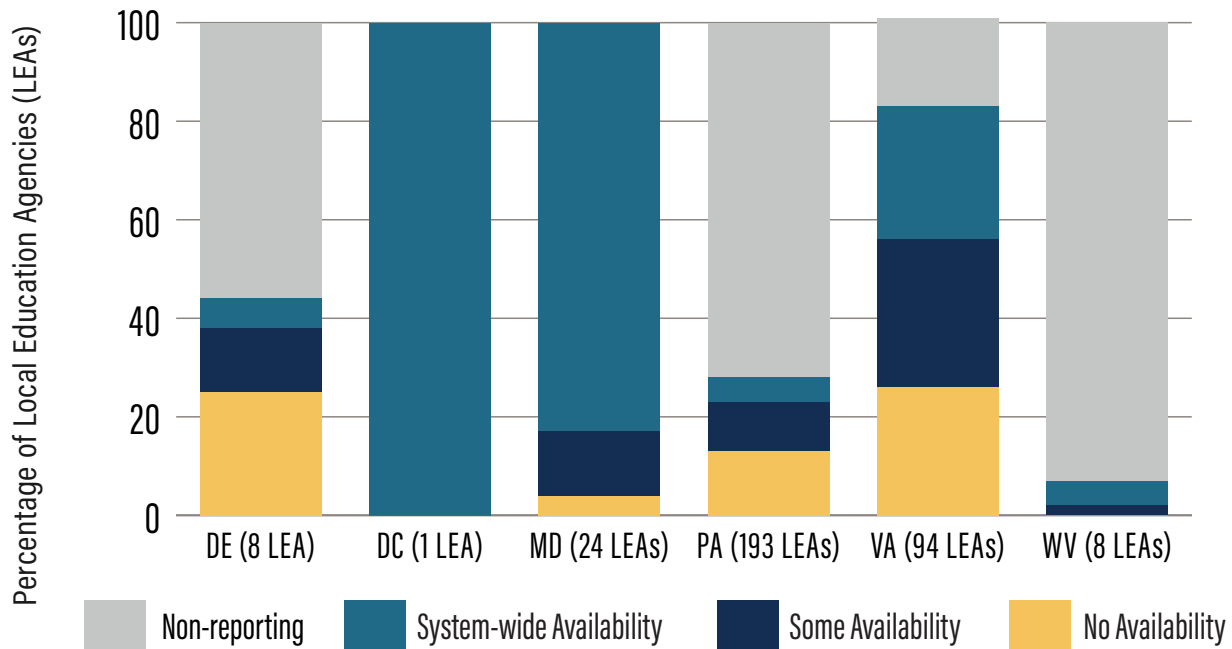
STUDENT

OUTCOME

Continually increase students' age-appropriate understanding of the watershed through participation in teacher-supported meaningful watershed educational experiences and rigorous, inquiry-based instruction, with a target of at least one meaningful watershed educational experience in elementary, middle and high school depending on available resources.
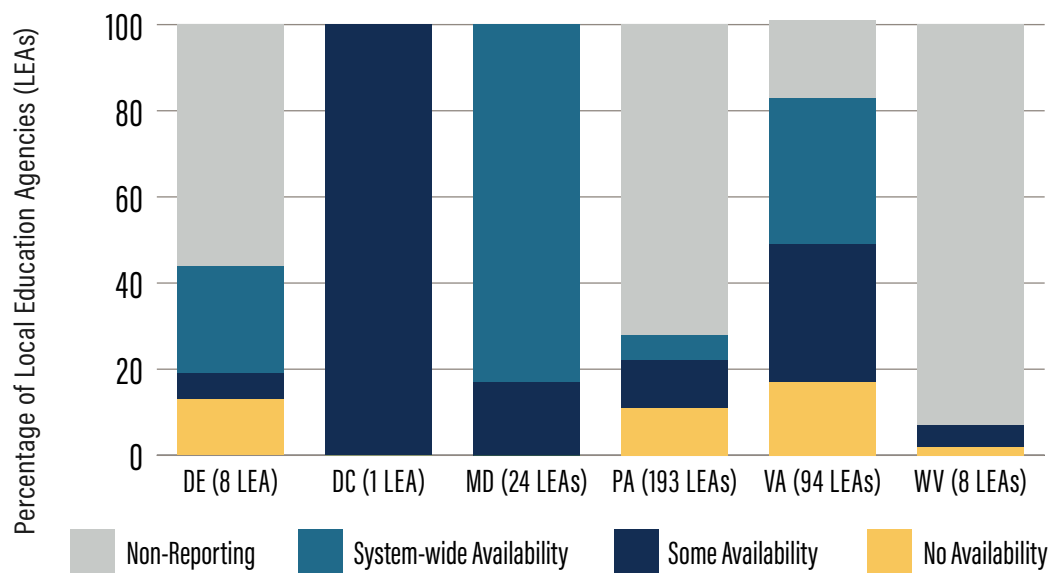
PROGRESS

Data collected through the Environmental Literacy Tool in 2019 for elementary grades show the proportion of school districts with system wide meaningful watershed educational experiences (MWEEs) reverted to levels on par with 2015, after a slight increase in 2017. Middle school grades improved in 2019 after a slight decrease in 2017. The largest growth in system wide MWEEs was at the high school level, after remaining table in 2017.

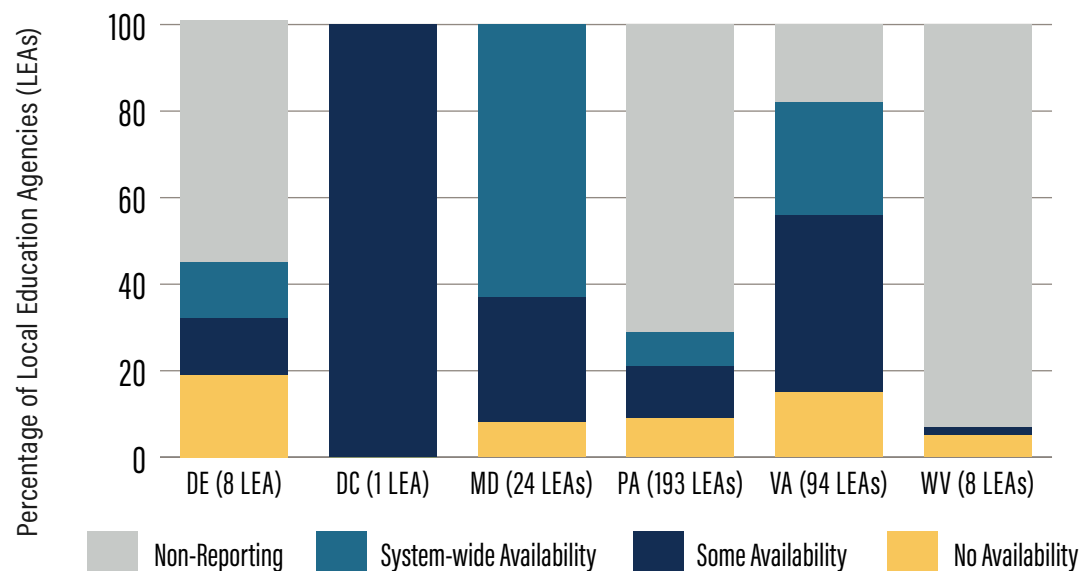### MWEE Availability in Watershed Jurisdictions (Elementary School) (2019)

During a MWEE, students must investigate an environmental issue, participate in an outdoor field experience, take action to address an environmental issue and analyze, evaluate and communicate their conclusions. In 2019, 32% of the 132 local education agencies that responded to a Chesapeake Bay Program survey reported providing MWEEs to at least some of their elementary school students. At the middle school level, this number rose to 38%, and at the high school level, it rose to 43%. Data collected through the ELIT in 2019 for elementary and middle grades show the proportion of districts with system wide MWEEs have not increased, and that there has been only a slight increase in high school. However, the 2019 survey includes districts who had previously not responded, and the data suggests that these new districts are not as far along in their programming. When comparing the districts that responded in both 2017 and 2019, the number of districts with systemwide MWEEs actually increased from 45% to 52% in elementary school, 51% to 55% in middle school, and 33 to 48% in high school—indicating substantial improvement.

MWEE Availability in Watershed Jurisdictions (Middle School) (2019)

Percentage of Local Education Agencies (LEAs)

DE (8 LEA) | DC (1 LEA) | MD (24 LEAs) | PA (193 LEAs) | VA (94 LEAs) | WV (8 LEAs)

- Non-Reporting
- System-wide Availability
- Some Availability
- No Availability

MWEE Availability in Watershed Jurisdictions (High School) (2019)

Percentage of Local Education Agencies (LEAs)

DE (8 LEA) | DC (1 LEA) | MD (24 LEAs) | PA (193 LEAs) | VA (94 LEAs) | WV (8 LEAs)

- Non-Reporting
- System-wide Availability
- Some Availability
- No Availability

A Teacher's Favorite Website

Bay Backpack is the premier resource for teachers in the Chesapeake Bay watershed, offering education modules, funding opportunities, curriculum guides, lesson plans and field studies. Throughout 2020, the website has gotten a major overhaul, which includes new resources, activities and assistance for environmental educators.

SUSTAINABLE SCHOOLS

OUTCOME

Increase the number of schools in the region that reduce the impact of their buildings and grounds on their local watershed, environment and human health through best practices, including student-led protection and restoration projects.

PROGRESS

In 2017, 14% of public and charter schools in the Chesapeake Bay watershed were certified sustainable, marking a 22% increase from the number of sustainable schools reported in the watershed in 2015.

Norfolk School an Ally to Nature

On Earth Day 2020, Ocean View Elementary School in Norfolk, Virginia received the honor being named a U.S. Department of Education Green Ribbon School for their sustainability initiatives. Their school building has a white roof to help reduce the heat island effect, native plant landscaping to help reduce stormwater runoff and an energy-saving design that makes use of the natural path of the sun. The school also makes sidewalks and bike racks readily available for the 22% of the staff and students who walk or bike to school. The entire school participates in community science through an oyster gardening program that has introduce over one million oysters to the Lynnhaven River. And recently, students identified and placed a 400-year-old live oak on the Virginia Big Tree Registry.

CITIZEN STEWARDSHIP

OUTCOME

Increase the number and diversity of trained and mobilized citizen volunteers who have the knowledge and skills needed to enhance the health of their local watersheds.

PROGRESS

In 2017, residents of the region scored a 24 out of 100 on the Citizen Stewardship Index.

The Behavior Change Support Tool

Work continues to develop Chesapeake Behavior Change, a web database that supports an online, question-driven/scenario-based, interactive tool. It takes data collected from the Citizen Stewardship Index and allows key audiences (e.g., watershed organizations, local governments, students) to scale, segment, compile and analyze data, create correlations and customize reports for the development of campaigns and programs related to behavior change, volunteerism and community leadership development. Chesapeake Behavior Change is slated to launch in 2021.

LOCAL LEADERSHIP

OUTCOME

Continually increase the knowledge and capacity of local officials on issues related to water resources and in the implementation of economic and policy incentives that will support local conservation actions.

PROGRESS

Before the Chesapeake Bay Program can increase the knowledge and capacity of local elected officials to protect the Chesapeake Bay, the partnership must determine how many local governments are participating in restoration activities and what their local elected officials know about the watershed. The workgroup is developing and implementing an approach that would determine the baseline and monitor change in the knowledge and capacity of local elected officials to implement watershed protection and restoration activities.

Preparing for Floods

In collaboration with the University of Maryland's Municipal Online Stormwater Training (MOST) Center, the Alliance for the Chesapeake Bay launched a series of virtual stormwater training sessions for local decision makers in November 2020. The goal for these sessions is to increase the knowledge and capacity of local elected officials regarding water-related issues. Participants from 15 local governments from Maryland, Pennsylvania and Virginia will have the opportunity to connect with MOST Center online courses, technical assistance providers and other local leaders as they find solutions to navigate sustainable stormwater practices according to their unique needs.
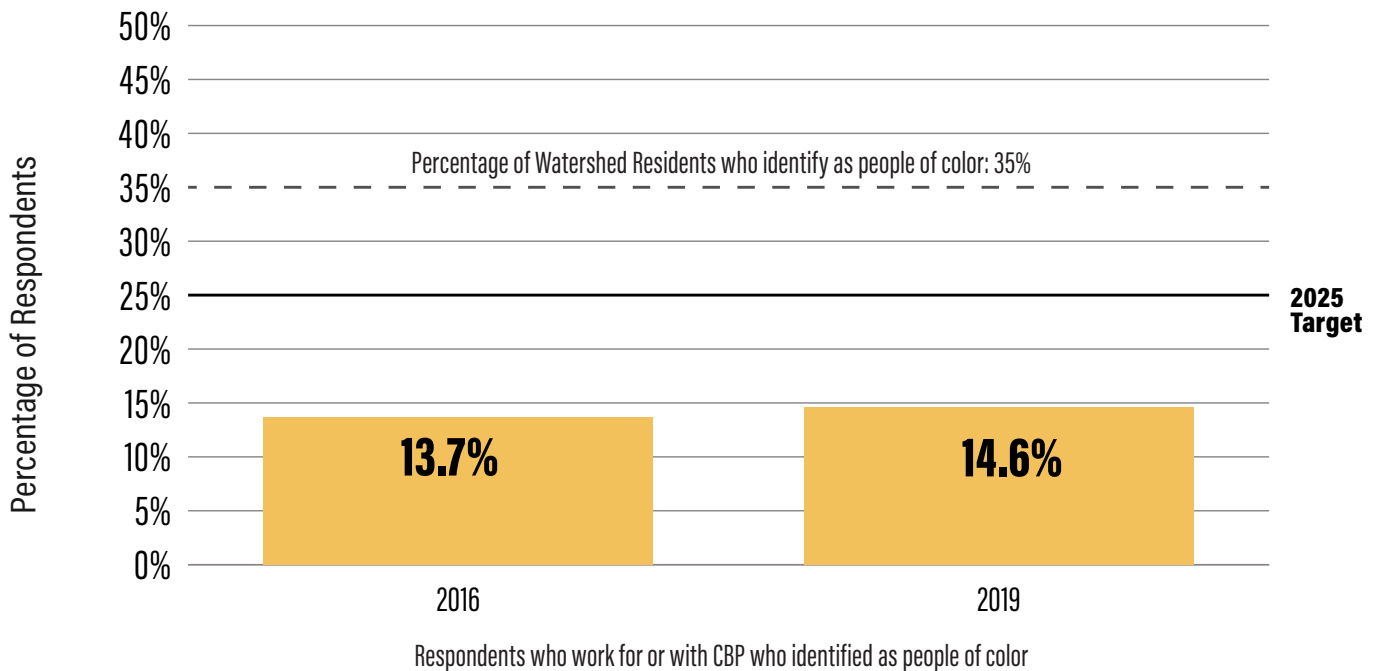
DIVERSITY

OUTCOME

Identify stakeholder groups not currently represented in the leadership, decision-making or implementation of current conservation and restoration activities and create meaningful opportunities and programs to recruit and engage these groups in the Partnership's efforts.

PROGRESS

In 2019, the Chesapeake Bay Program's diversity survey indicated a slight increase in the percentage of respondents who self-identified as people of color from 13.7% to 14.6%. The 2019 survey results also showed the percentage of people of color in Chesapeake Bay Program leadership positions rose from 9.1% to 10.3%.

Chesapeake Bay Program (CBP) Diversity Survey 2016-2019

Percentage of Watershed Residents who identify as people of color: 35%

2025 Target

13.7% (2016)

14.6% (2019)

Percentage of Respondents

Respondents who work for or with CBP who identified as people of color

In 2019, the Chesapeake Bay Program's diversity survey indicated a slight increase in the percentage of respondents who self-identified as people of color from 13.7% in 2016 to 14.6% in 2019. The partnership has set a target to increase the percentage of people of color in the Chesapeake Bay Program to 25% by 2025. The Chesapeake Bay Program has also set a target to increase the percentage of people of color in leadership positions to 15% by 2025. The 2019 survey results showed an increase in the percentage of people of color in leadership positions from 9.1% to 10.3%. While both the 2016 and 2019 surveys were distributed to approximately 750 people who work for or with the partnership, the latest survey had a low response rate of 38% compared to 50% in 2016. The lower response rate may have affected the results.

Implementing Diversity, Equity, Inclusion and Justice

In spring 2020, with assistance from Skeo Solutions, the Diversity Workgroup developed a Diversity, Equity, Inclusion and Justice (DEIJ) Strategy for incorporating DEIJ across the partnership. In summer 2020, the Chesapeake Executive Council and the Principals' Staff Committee adopted statements committing the Chesapeake Bay Program to embracing DEIJ in all areas of the partnership's work. To oversee this new framework, a DEIJ Action Team consisting of representatives from federal and state agencies, federally recognized tribes and external stakeholders, was convened to develop an implementation plan.

CLIMATE CHANGE

Climate Resiliency

CLIMATE ADAPTION

OUTCOME

Continually pursue, design and construct restoration and protection projects to enhance the resiliency of Bay and aquatic ecosystems from the impacts of coastal erosion, coastal flooding, more intense and more frequent storms and sea level rise.

PROGRESS

Data that would inform potential adaptation indicators are being assessed to help track climate change effects on Chesapeake Bay species and habitats. One potential indicator focuses on the effects of warming waters on fish habitat, while another integrates data involving shoreline conditions, marsh migration and sea-level rise to better understand potential wetland loss. These efforts could help resource managers identify vulnerable areas and decide where to implement adaption strategies.

Local Leaders Convene on Flood Prevention

In September 2020, the Local Government Advisory Committee, in coordination with the Climate Resiliency Workgroup, held a virtual local government forum that brought together local elected officials and subject matter experts to collaboratively identify recommendations on what they can do to act more deliberately in addressing climate-related flooding from more intense storms, increasing precipitation, high tides and sea level rise. Attendees recommended encouraging and incentivizing more dedicated funding, financing and revenue streams for flooding projects; supporting efforts that improve the incorporation of engineering, education and documentation into local ordinances; promoting more innovative partnership opportunities that result in stronger collaboration and cooperation; and that local elected officials make social justice a platform in order to prioritize equity on critical issues such as flooding.

CLIMATE MONITORING & ASSESSMENT

OUTCOME

Continually monitor and assess the trends and likely impacts of changing climatic and sea level conditions on the Chesapeake Bay ecosystem, including the effectiveness of restoration and protection policies, programs and projects.

PROGRESS

In 2018, the Chesapeake Bay Program developed five indicators to track the impact of changing climatic conditions on the physical environment. Patterns and trends observed in these indicators remain static.

Protecting Vulnerable Communities

The Habitat Goal Implementation Team and the Climate Resiliency Workgroup are supporting the _Targeted Outreach for Green Infrastructure in Vulnerable Areas_, a project that aims to identify and assist underserved communities vulnerable to climate change impacts in developing plans for shovel-ready restoration projects that provide protection from flooding, while also working to improve habitat value. To help identify and select communities to work with in Maryland, Pennsylvania and Virginia, the project team used available GIS data from several sources, including information from the NOAA Sea-Level Rise Viewer, the FEMA Risk MAP and the U.S. EPA Environmental Justice Screening and Mapping Tool. Combining these data allowed the team to visualize and assess the potential impacts of flooding in relation to communities that are most vulnerable.

Did you know that our progress toward restoring and protecting the Chesapeake Bay is updated in real-time?

Visit chesapeakeprogress.com for the most up-to-date information on meeting the goals and outcomes of the *Chesapeake Bay Watershed Agreement.*

Thank you, Jim Edward!

In December 2020, the Chesapeake Bay Program's deputy director of 12 years, Jim Edward, retired. Edward helped draft the executive order calling for broader federal agency support in restoring the Chesapeake Bay, played a leading role in the development of the most recent *Chesapeake Bay Watershed Agreement*, the Chesapeake Bay Total Daily Maximum Load and the 2020 Diversity, Equity, Inclusion and Justice Statement signed by the Chesapeake Executive Council. Edward began his public service career with the Department of Interior where he worked for four years in the Bureau of Labor Management Wilderness Program before joining the Environmental Protection Agency in 1984.

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