

Bay Barometer

An Annual Report on the State of the Program
and the Health of the Chesapeake Bay

December 2021



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A message from Acting Director Michelle Price-Fay



As calendar year 2021 draws to a close, the Chesapeake Bay Program is acutely aware that we are moving closer to the target timeframes established in the most recent *Chesapeake Bay Watershed Agreement*. With our sights set on the 2025 deadline, the partnership remains focused on actions that continue our critical restoration work across the watershed. We are not slowing down or pausing our efforts.

There have been roadblocks along the way. Fiscal, political and scientific challenges have at times slowed down our path to progress, and the greatest trials before us now are the ones related to the impacts of climate change.

Throughout the watershed we are experiencing more frequent and intense rainfall events, flooding and record-breaking heat. This year, the Chesapeake Bay experienced a decline in underwater grasses, a drop in overall water quality standards attainment and the potential for a future decrease in blue crab populations. As we focus on watershed resiliency, it is imperative that the partnership take a strong stance in addressing climate change. As such, at their October meeting, the Chesapeake Executive Council signed [*Directive No. 21-1 Collective Action for Climate Directive*](#), committing the Chesapeake Bay Program to address the increasing threats of climate change in all aspects of its work.

As we move closer to the 2025 deadline, efforts to fund, support and implement on-the-ground conservation efforts continued to be a top priority in 2021. New funding opportunities—such as those presented through the American Recovery Act—as well as an increase in federal funding directed to such programs as the Small Watershed and Innovative Nutrient and Sediment Reduction grants currently managed by the National Fish and Wildlife Foundation and the additional funding focused on most effective basins for implementing pollution reduction practices, provided more support than ever to our partners. This resulted in actions to reduce pollution on farms, upgrade wastewater treatment plants, restore oyster habitats, improve fish passage, plant trees, conserve land and open up new access sites for the public to get out on the water.

Internally, the partnership continues to strengthen its processes to account for changes in economic policy, political priorities and new and emerging science and technology.

In May, we kicked off the third cycle of the Strategy Review System—our adaptive management process that identifies challenges and celebrates successes toward meeting our 31 outcomes—with a two-day virtual meeting. Additionally, a small group of Chesapeake Bay Program volunteers came together to refine the strategy for awarding funding to the Goal Implementation Teams, helping to fund critical projects that support our success. This new process was implemented in August and appears to be working well.

Through it all, we can't forget that we are still in the throes of a worldwide pandemic. The majority of our partnership continues to work from remote locations, conferences and meetings are still virtual in nature and our normal way of doing work continues to evolve. Despite the hardships of 2021, our water quality monitoring crews, environmental educators and community science leaders persevered and were able to safely continue their critical work. Just as impressive, an action team was formed to implement the [Statement in Support of Diversity, Equity, Inclusion and Justice](#), signed by the Chesapeake Executive Council in August 2020, and finalized the [Diversity, Equity, Inclusion and Justice Implementation Plan Strategy](#) just a year later, in November 2021 after a public comment period. We are all eager to dive in and make these critical and necessary changes that will stretch and grow us as more inclusive and equitable partnership.

We end this year by taking a critical and thorough review of every outcome of the *Chesapeake Bay Watershed Agreement*. We want to be transparent in the progress we've made, how far we need to go in order to meet the outcome targets and the challenges that lie before us. This report shares this detailed information, as well as an Appendix that contains information for each outcome. This template discusses how the outcome came to be, as well as its attainability. In addition, this annual report shares many of the successes that the partnership has celebrated over the past year.

Despite the unknown path and the challenges that may lie ahead, the many government agencies, nonprofits, businesses, communities and academic institutions that make up this partnership remain committed to the restoration of the Chesapeake Bay.

A handwritten signature in black ink that reads "Michelle Price Fay". The signature is written in a cursive, flowing style.

**Michelle Price-Fay Acting Director of the
Chesapeake Bay Program**

Outcome Attainability

Assessing the health of the Chesapeake Bay watershed over time can be as complex as the ecosystem itself.

The 10 interrelated goals of the *Chesapeake Bay Watershed Agreement* are linked to a set of outcomes, or time-bound and measurable targets, that directly contribute to its achievement. Each of the 31 outcomes uses quantitative or qualitative data to collectively advance the protection and restoration of the Bay and its watershed. Data and information used to track progress come from a range of trusted sources, including government agencies, academic institutions, nongovernmental organizations and direct demographic and behavior surveys, and are updated at different intervals.

Over the past year, the Chesapeake Bay Program assessed each outcome in its ability to attain its target. This assessment found that 11 outcomes are fully on track to meet their targets by 2025. On the other hand, several challenges were identified in meeting some outcomes (e.g., forest buffers, wetlands, 2025 Watershed Implementation Plans, tree canopy). These issues are now being discussed to determine the appropriate solutions that will accelerate progress. A complete package of all outcomes can be found in the Appendix of this report. The templates include the original outcome language, current status, background information in how the outcome came to be included in the *Watershed Agreement*, the baseline (if available) and data source.

Outcomes with targets and timeframes

SUSTAINABLE FISHERIES GOAL



[Blue Crab Abundance](#)

Maintain crab population at 215 million adult females. Refine targets through 2025 based on best science.



[Oyster Restoration](#)

Restore native oyster habitat and populations in 10 tributaries by 2025.

VITAL HABITATS GOAL



[Brook Trout](#)

Restore and sustain brook trout populations with 8% increase in occupied habitat by 2025.



[Fish Passage](#)

By 2025 open an additional 132 miles every two years to fish passage.



RECENT PROGRESS
DECREASE



OUTLOOK
OFF COURSE

Forest Buffers

Restore 900 miles of riparian forest buffers per year and conserve existing buffers until at least 70% of riparian areas are forested.



RECENT PROGRESS
NO CHANGE



OUTLOOK
UNCERTAIN

Stream Health

Improve health and function of 10% of stream miles above the 2008 baseline.



RECENT PROGRESS
DECREASE



OUTLOOK
OFF COURSE

Submerged Aquatic Vegetation (SAV)

90,000 acres by 2017; 130,000 acres by 2025; ultimate goal of 185,000 acres.



RECENT PROGRESS
NO CHANGE



OUTLOOK
OFF COURSE

Tree Canopy

Expand urban tree canopy by 2,400 acres by 2025.



RECENT PROGRESS
INCREASE



OUTLOOK
OFF COURSE

Wetlands

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.



RECENT PROGRESS
INCREASE



OUTLOOK
OFF COURSE

Black Duck

By 2025, restore, enhance and preserve wetland habitats that support a wintering population of 100,000 black ducks. Refine population targets through 2025 based on best available science.

WATER QUALITY GOAL



RECENT PROGRESS
INCREASE



OUTLOOK
OFF COURSE

2025 Watershed Implementation Plan

By 2025, have all practices and controls in place to achieve applicable water quality standards as articulated in the Chesapeake Bay TMDL.

LAND CONSERVATION GOAL



RECENT PROGRESS
INCREASE



OUTLOOK
ON COURSE

[Protected Lands](#)

By 2025, protect an additional 2 million acres of lands, including 225,000 acres of wetlands and 695,000 acres of forest land.

PUBLIC ACCESS GOAL



RECENT PROGRESS
INCREASE



OUTLOOK
ON COURSE

[Public Access Site Development](#)

By 2025, add 300 new public access sites.

STEWARDSHIP GOAL



RECENT PROGRESS
INCREASE



OUTLOOK
OFF COURSE

[Diversity*](#)

**Target and date set by CBP. Not in original outcome language.*

Outcomes with no quantitative targets or targets with no timeframes

SUSTAINABLE FISHERIES GOAL



RECENT PROGRESS
NO CHANGE



OUTLOOK
ON COURSE

[Fish Habitat](#) & [Forage Fish](#)

WATER QUALITY GOAL



RECENT PROGRESS
DECREASE



OUTLOOK
OFF COURSE

[Water Quality Standards Attainment and Monitoring](#)

TOXIC CONTAMINANTS GOAL



RECENT PROGRESS
NO CHANGE



OUTLOOK
ON COURSE

[Toxic Contaminants Research](#)



RECENT PROGRESS
DECREASE



OUTLOOK
OFF COURSE

[Toxic Contaminants Policy and Prevention](#)

HEALTHY WATERSHEDS GOAL



RECENT PROGRESS
NO CHANGE



OUTLOOK
UNCERTAIN

[Healthy Watersheds](#)

LAND CONSERVATION GOAL



RECENT PROGRESS
INCREASE



OUTLOOK
ON COURSE

[Land Use Options
Evaluation](#)



RECENT PROGRESS
NO CHANGE



OUTLOOK
ON COURSE

[Land Use Methods and
Metrics](#)

STEWARDSHIP GOAL



RECENT PROGRESS
NO CHANGE



OUTLOOK
UNCERTAIN

[Citizen Stewardship](#)



RECENT PROGRESS
NO CHANGE



OUTLOOK
UNCERTAIN

[Local Leadership](#)

ENVIRONMENTAL LITERACY GOAL



RECENT PROGRESS
INCREASE



OUTLOOK
ON COURSE

[Sustainable Schools](#)



RECENT PROGRESS
INCREASE



OUTLOOK
ON COURSE

[Environmental
Literacy Planning](#)



RECENT PROGRESS
NO CHANGE



OUTLOOK
UNCERTAIN

[Student MWEs](#)

CLIMATE RESILIENCY GOAL



RECENT PROGRESS
INCREASE



OUTLOOK
UNCERTAIN

[Climate Monitoring and
Assessment](#)



RECENT PROGRESS
NO CHANGE



OUTLOOK
OFF COURSE

[Climate Adaptation](#)

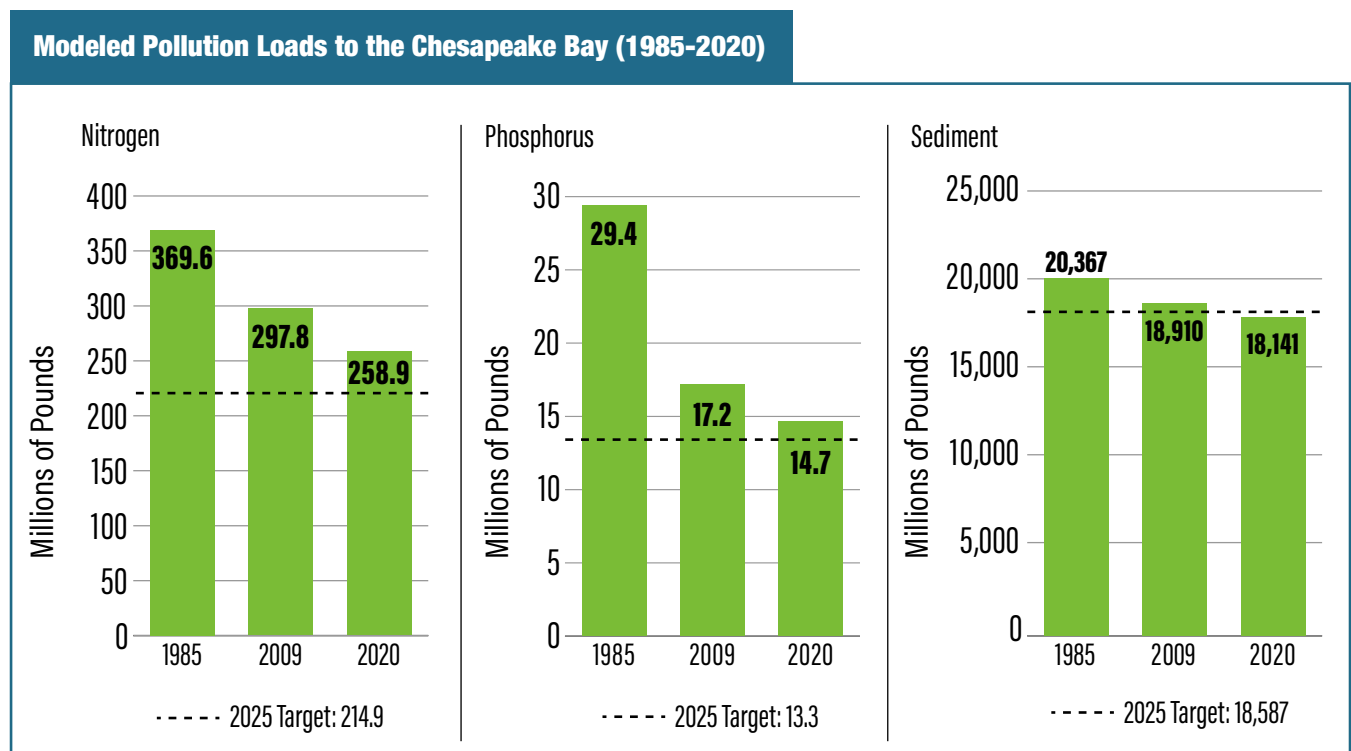
Outcomes Updated in 2021

In 2021, new data informed the progress for the following outcomes:

1. 2025 Watershed Implementation Plans
2. Blue Crab Abundance
3. Blue Crab Management
4. Oysters
5. Public Access Site Development
6. Submerged Aquatic Vegetation
7. Sustainable Schools
8. Water Quality Standards Attainment and Monitoring

2025 Watershed Implementation Plans (WIPs)

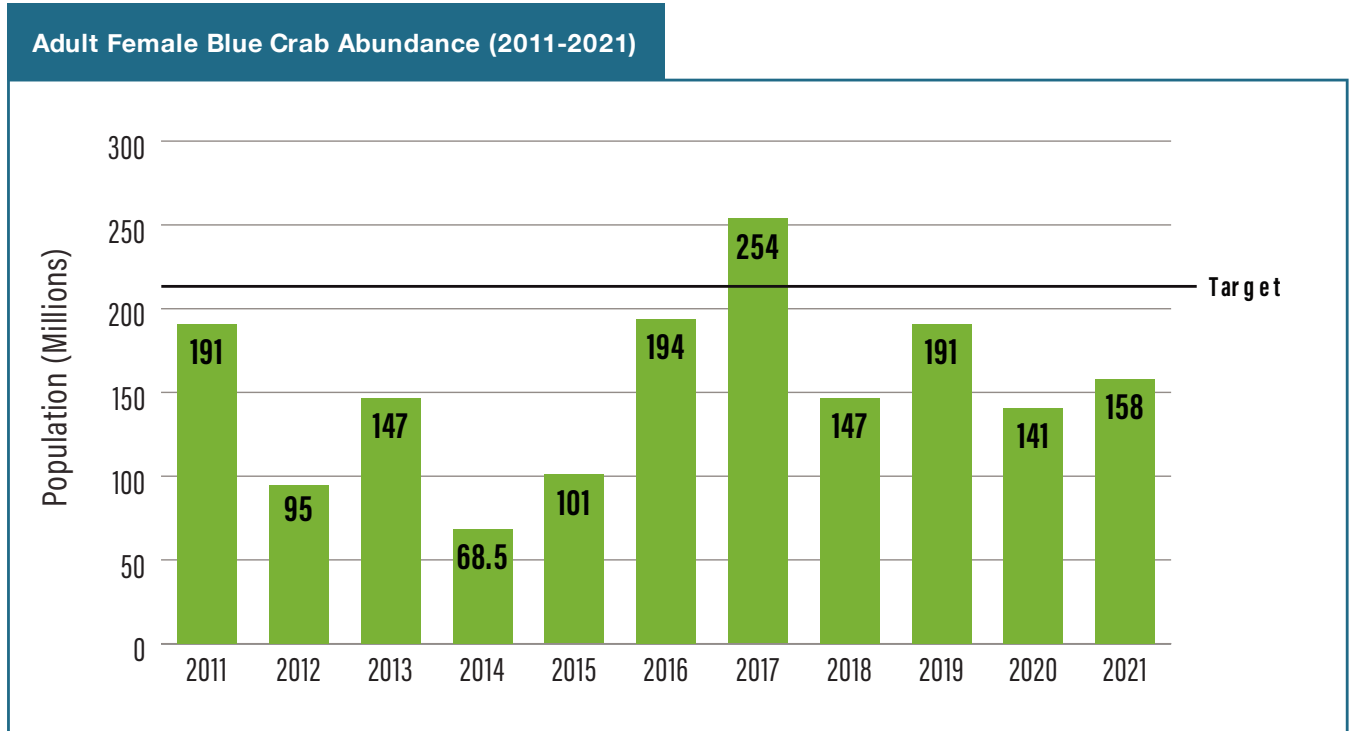
According to computer simulations, pollution controls put into place between 2009 and 2020 are estimated to have lowered overall nitrogen by 13%, overall phosphorus by 14% and overall sediment by 4%. The [2025 WIPs Outcome](#) seeks to have all practices and controls in place to achieve applicable water quality standards as articulated in the Chesapeake Bay Total Maximum Daily Load (Bay TMDL) by 2025. To that end, it is estimated that as of 2020, best management practices in place to reduce pollution have achieved 47% of the nitrogen reductions, 64% of the phosphorus reductions and 100% of the sediment reductions needed to achieve the goals outlined in the Bay TMDL.



OVER THE TIME PERIOD 2009-2020, IT IS BELIEVED THAT THE MAJORITY OF **NITROGEN** AND **PHOSPHORUS** POLLUTANT REDUCTIONS CAME FROM IMPROVEMENTS MADE TO WASTEWATER TREATMENT PLANTS.

Blue Crab Abundance

Between 2020 and 2021, the abundance of adult (age 1+) female blue crabs in the Chesapeake Bay increased 12% from 141 million to 158 million. This number is above the new 72.5 million threshold, which is considered to be the minimum sustainable level for female blue crabs in the Bay, but lower than the new target of 196 million. The [Blue Crab Abundance Outcome](#) seeks to maintain a sustainable blue crab population based on a target of 196 million adult females.



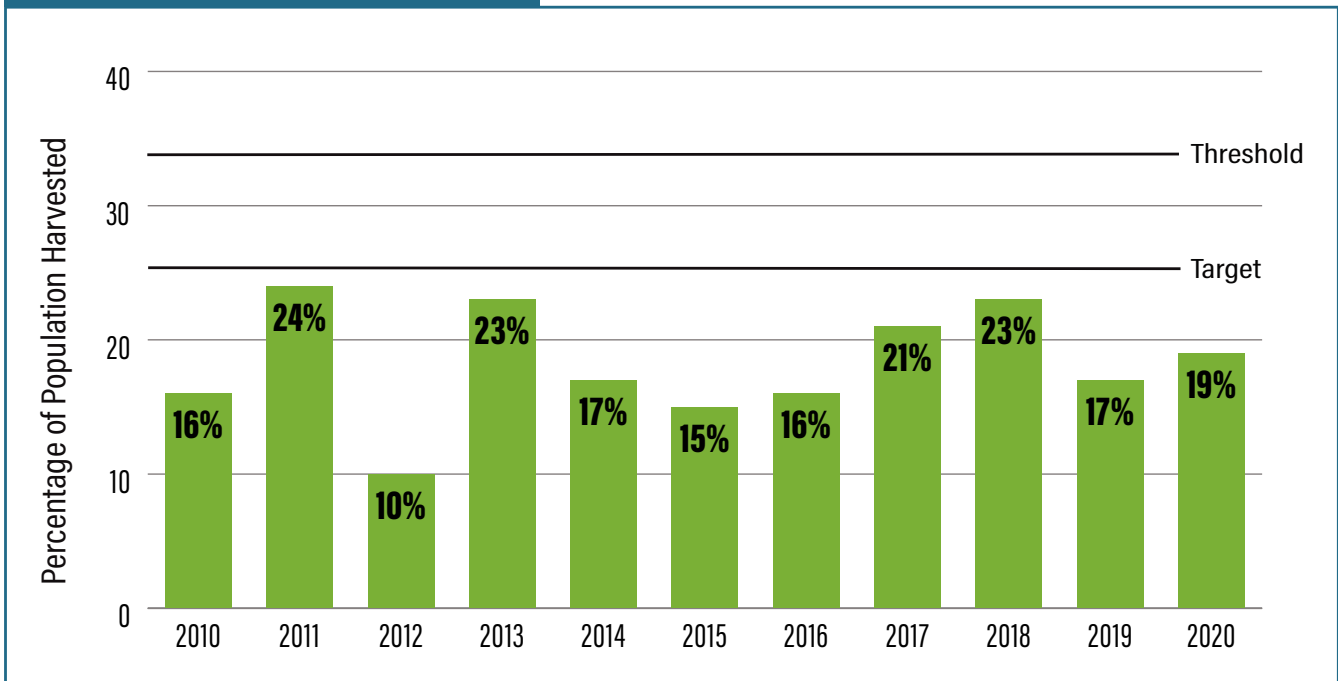
ABUNDANCE OF ADULT FEMALE BLUE CRABS IN THE CHESAPEAKE BAY INCREASED FROM **141 MILLION** IN 2020 TO **158 MILLION** IN 2021.

THE POPULATION OF MALE BLUE CRABS (AGES 1+) WAS ESTIMATED TO BE **39 MILLION** 2021, DOWN FROM **79 MILLION** IN 2020.

Blue Crab Management

For the past several years, the Chesapeake Bay Stock Assessment Committee had used reference points from 2011 to determine the target and threshold levels for the Chesapeake Bay female blue crab population. In November 2020, Maryland, Virginia and the Potomac River Fisheries Commission formally adopted new female-specific reference points generated by the 2017 blue crab stock assessment update, which included more recent survey and harvest data. This indicated that the female blue crab population has improved since 2011 and continues to be healthy. As a result of this update, the target female exploitation rate, or percentage of female crabs removed by harvest, increased from 25.5% to 28%, and the threshold increased from 34% to 37%. Approximately 19% of all female blue crabs in the Bay were harvested in 2020. The [Blue Crab Management Outcome](#) is considered to be achieved.

Female Blue Crab Harvest (2010-2020)



APPROXIMATELY **19%** OF ALL FEMALE BLUE CRABS IN THE BAY WERE HARVESTED IN 2020.

IT IS ESTIMATED THAT RECREATIONAL CRABBERS CAUGHT **2.4 MILLION** POUNDS IN 2020, A DECREASE FROM 2019 WHEN THEY HARVESTED APPROXIMATELY **3.8 MILLION** POUNDS.

COMMERCIAL ANGLERS HARVESTED APPROXIMATELY **41.6 MILLION** POUNDS OF BLUE CRABS FROM THE CHESAPEAKE BAY AND ITS TRIBUTARIES IN 2020, A DECREASE FROM THE **61 MILLION** POUNDS HARVESTED IN 2019.

Oysters

Ten sites have been chosen for large-scale oyster restoration and are in varying stages of progress. As of 2020, three of the ten originally selected tributaries have been restored—Harris Creek, Little Choptank River and Lafayette River—as well as an 11th bonus tributary (the eastern branch of the Elizabeth River). The [Oyster Outcome](#) seeks to continually increase finfish and shellfish habitat and water quality benefits from restored oyster populations, while restoring native oyster habitat and populations in 10 tributaries by 2025 and ensuring their protection.

Oyster Reef Restoration Progress Dashboard

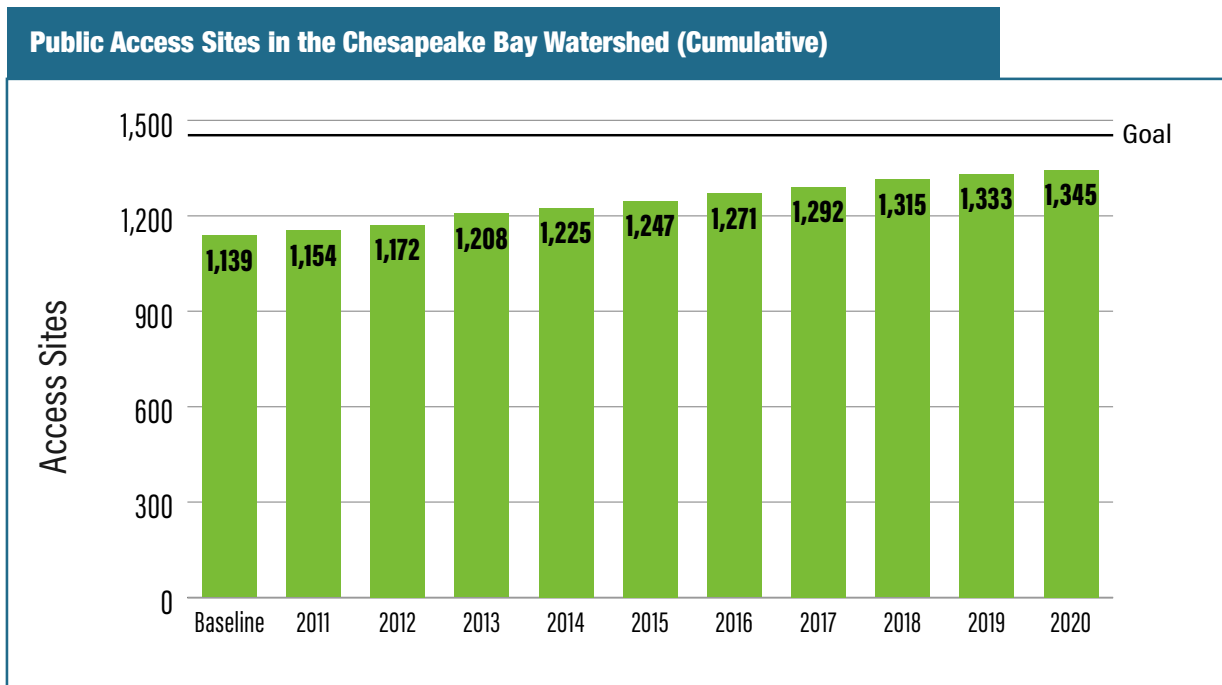
Tributary	Tributary Restoration Plan	Reef Construction & Seeding	Monitoring & Evaluation	Completed/Target Acreage
Harris Creek (Md.)	Complete	Complete	In Progress	351/351
Little Choptank (Md.)	Complete	Complete	In Progress	358/358
Tred Avon (Md.)	Complete	In Progress	complete	92/147
Upper St. Mary's (Md.)	Complete	In Progress	complete	TBD/60
Manokin (Md.)	Complete	In Progress	complete	TBD/441
Lafayette (Va.)	Complete	Complete	In Progress	82/80
Piankatank (Va.)	Complete	In Progress	complete	378/438
Lynnhaven (Va.)	Complete	In Progress	complete	105/152
Lower York (Va.)	Complete	In Progress	complete	48/200
Great Wicomico (Va.)	Complete	In Progress	complete	TBD/122
Eastern Branch of the Elizabeth River (Va.)	Complete	complete	In Progress	24/20

AS OF 2020, **THREE OF THE TEN** ORIGINALLY SELECTED TRIBUTARIES HAVE BEEN RESTORED.

AN 11TH **"BONUS" TRIBUTARY** WAS RESTORED IN VIRGINIA IN 2020.

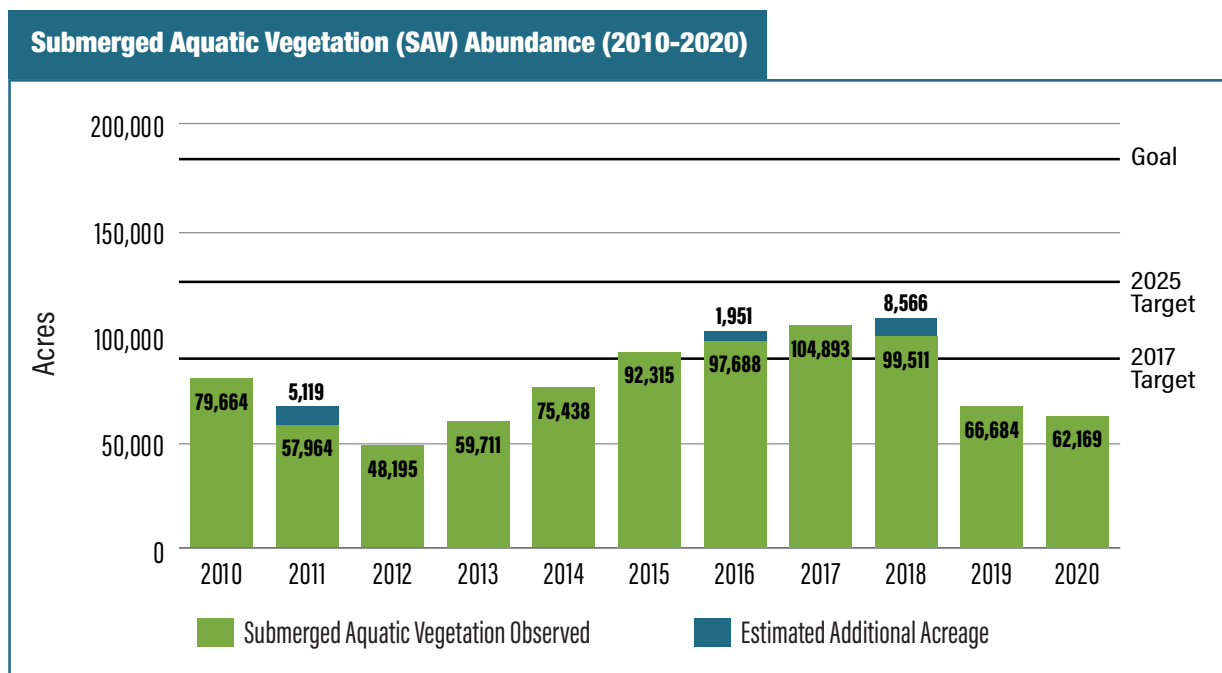
Public Access Site Development

In 2020, 12 new public access sites were added, bringing the total number to 206 that have opened on and around the Chesapeake Bay between 2010 and 2020. This marks a 69% achievement of the [Public Access Outcome](#) to add 300 new access sites to the watershed by 2025.



Submerged Aquatic Vegetation (SAV)

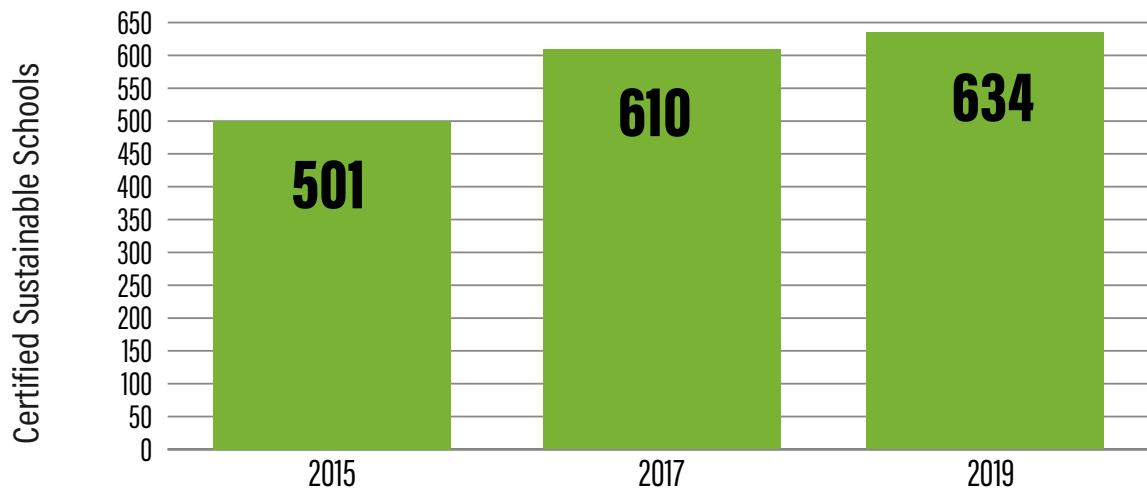
According to preliminary data from the Virginia Institute of Marine Science, 62,169 acres of underwater grasses were mapped in the Chesapeake Bay in 2020. This is 48% of the 2025 restoration target of 130,000 acres and 34% of the 185,000-acre goal.



Sustainable Schools

In 2019, 15% of public and charter schools in the Chesapeake Bay watershed—634 schools in all—were certified sustainable. This marks a 4% increase from the number of sustainable schools in the watershed in 2017. The outcome seeks to continually 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.

Certified Sustainable Schools in the Chesapeake Bay Watershed (2015-2019)



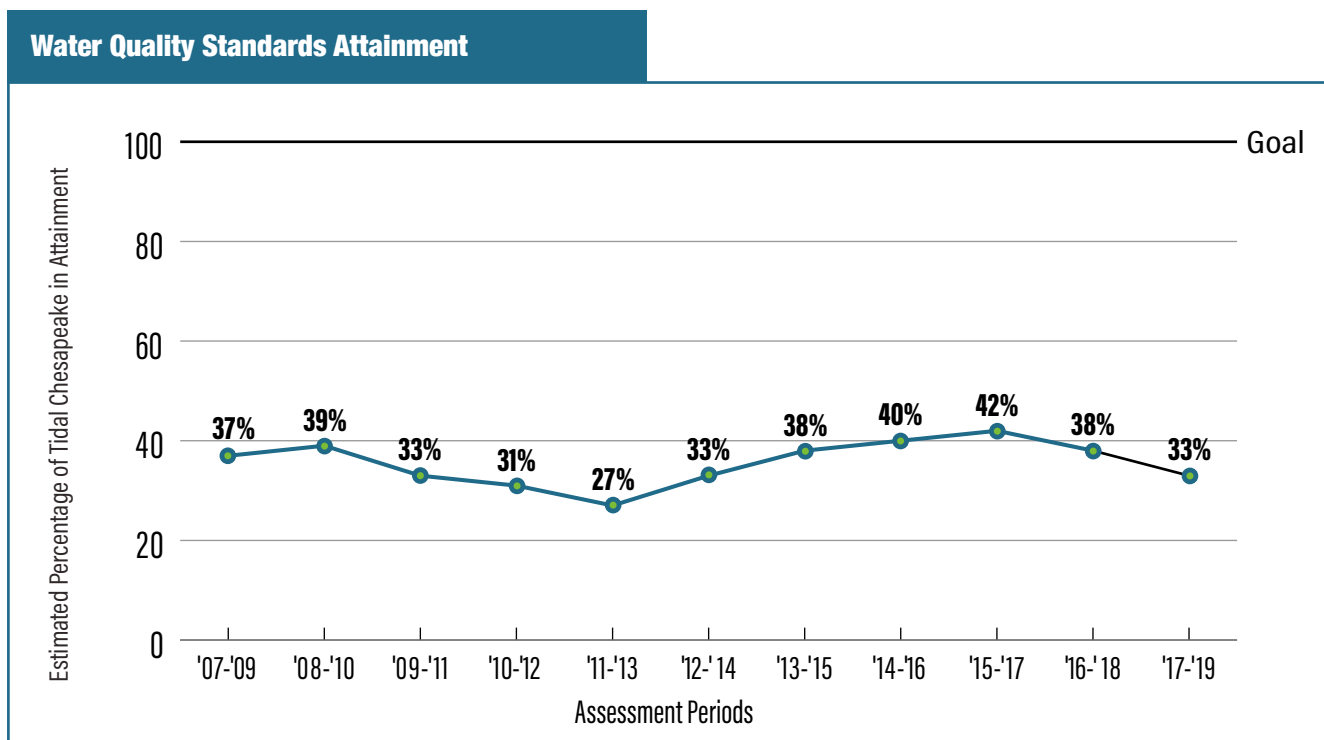
THE NUMBER OF SUSTAINABLE SCHOOLS **INCREASED 4%** BETWEEN 2017 AND 2019.

MARYLAND IS HOME TO **81%** OF THE TOTAL CERTIFIED SUSTAINABLE SCHOOLS IN THE WATERSHED.

SEVENTEEN PERCENT OF THE SUSTAINABLE SCHOOLS IN THE WATERSHED ARE LOCATED IN VIRGINIA.

Water Quality Standards Attainment and Monitoring

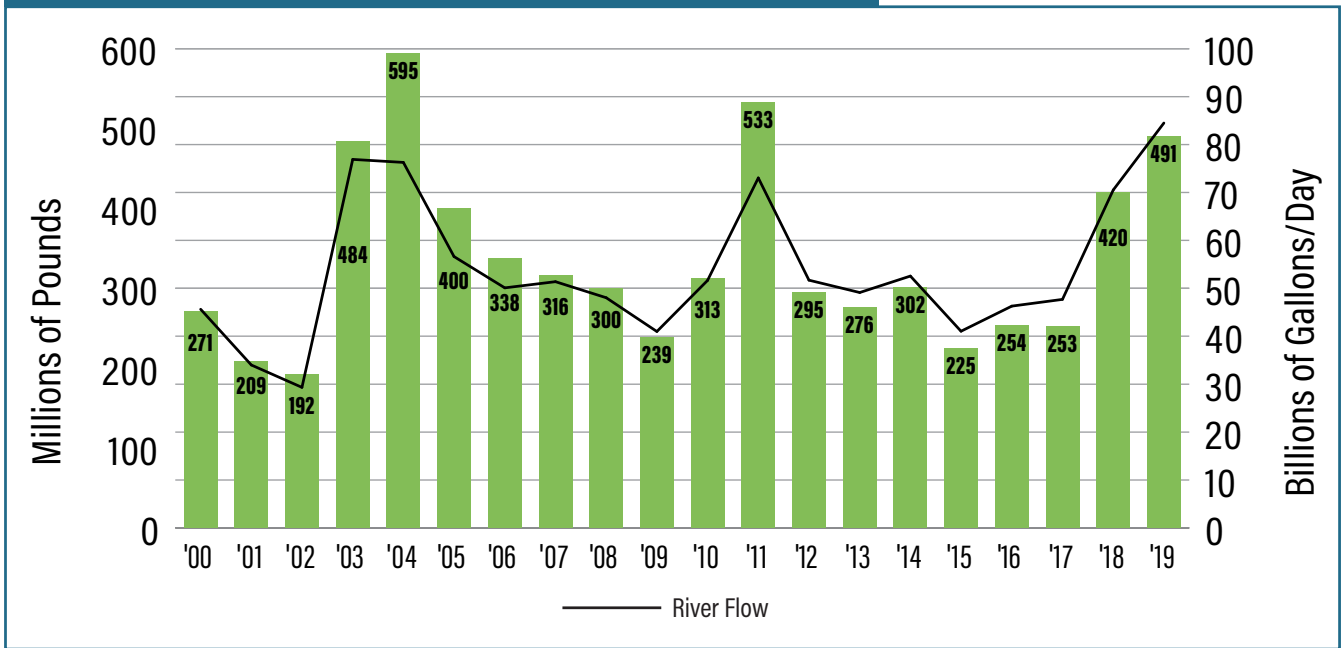
An estimated 33.1% of the Chesapeake Bay and its tidal tributaries met water quality standards during the 2017-2019 assessment period. This score is lower than the previous score of 38% received during the 2016-2018 assessment period and marks a consecutive decline in the assessment status since the record high 42.2% achieved during the 2015-2017 assessment period. Water quality estimates for the Bay remain far below the 100% attainment necessary to fully support survival, growth and reproduction of its living resources, and 67% of tidal waters were estimated to be impaired during the 2017-2019 assessment period.



33.1 PERCENT OF THE CHESAPEAKE BAY AND ITS TIDAL TRIBUTARIES MET WATER QUALITY STANDARDS DURING THE 2017-2019 ASSESSMENT PERIOD.

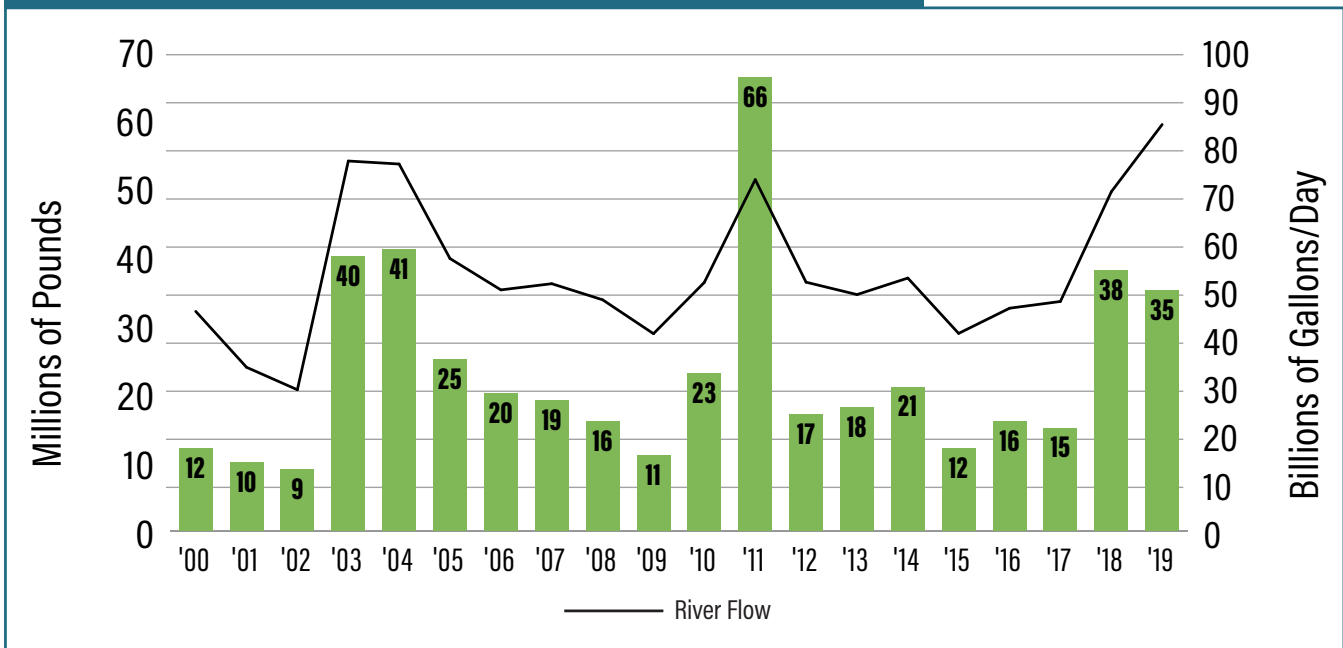
67 PERCENT OF THE BAY'S TIDAL WATERS WERE ESTIMATED TO BE IMPAIRED DURING THE 2017-2019 ASSESSMENT PERIOD.

Nitrogen Loads and River Flow to the Chesapeake Bay (2000-2019)



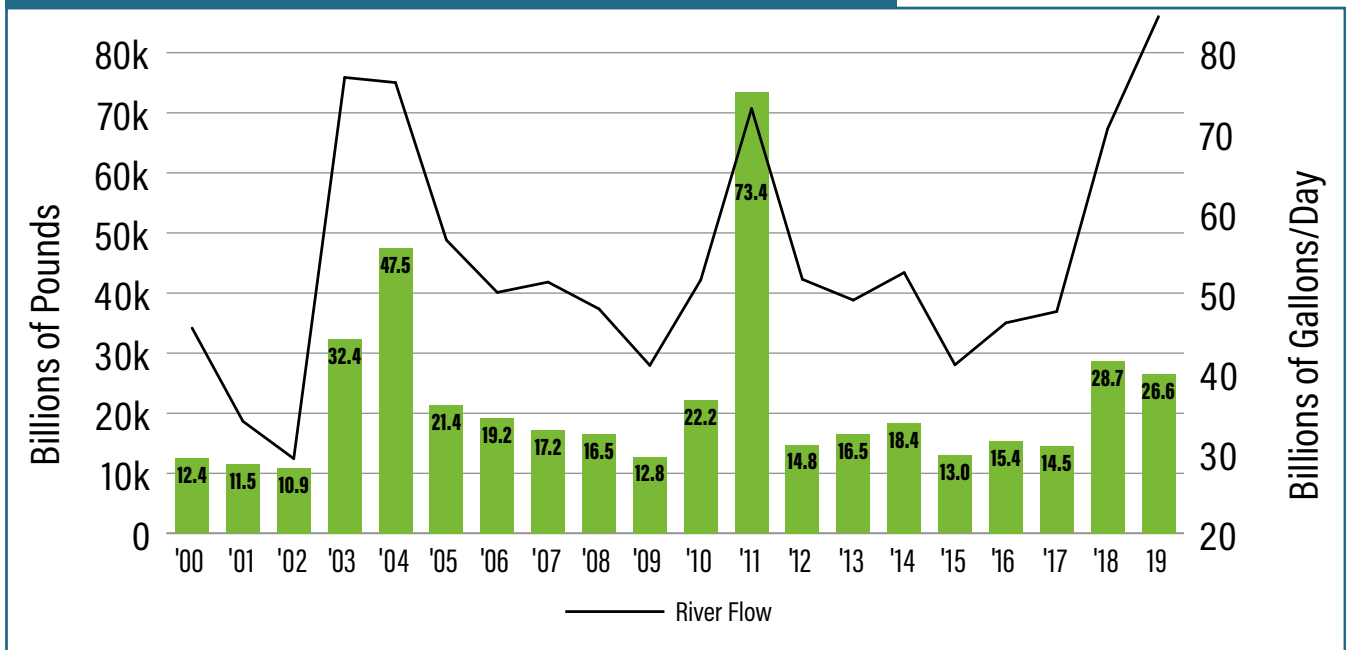
NITROGEN LOADS INCREASED FROM **420 MILLION** POUNDS IN 2018 TO **491 MILLION** POUNDS IN 2019.

Phosphorus Loads and River Flow to the Chesapeake Bay (2000-2019)



PHOSPHORUS LOADS DECREASED FROM **39 MILLION** POUNDS IN 2018 TO **35 MILLION** POUNDS IN 2019.

Sediment Loads and River Flow to the Chesapeake Bay (2000-2019)



SEDIMENT LOADS DECREASED FROM **28.7 BILLION** POUNDS IN 2018 TO **26.6 BILLION** POUNDS IN 2019.

Each of the 31 outcomes is updated in real-time on ChesapeakeProgress.com

Partnership Updates



Shimkin joined the partnership as Deputy Director in 2021. (Photo by Will Parson/Chesapeake Bay Program)

New Chesapeake Bay Program Deputy Director

The Chesapeake Bay Program was excited to welcome aboard Martha Shimkin as our permanent Deputy Director in May 2021. Stepping into the role vacated by Jim Edward in December 2020, Shimkin brings a diverse and varied background to the partnership. She has served in a leadership capacity with the EPA for over 25 years, including as the acting Deputy Director for both the Office of Wetlands, Oceans and Watersheds, and the Office of Wastewater Management, as well as in the Office of Water Immediate Office, where she was the acting Deputy Assistant Administrator during the most recent presidential transition. Shimkin also has a familiarity with EPA Region 3, having served as the acting Director of the Land and Chemicals Division in 2017-2018.



In October 2021, Executive Council members signed a Climate Directive. (Photo by Will Parson/Chesapeake Bay Program)

Climate Change Directive

The Chesapeake Executive Council signed Directive No. 21-1: Collective Action for Climate Change (https://www.chesapeakebay.net/documents/43419/climatedirective_final_3.pdf) at their October 2021 meeting in Virginia Beach, Virginia. This historic agreement acknowledges that climate change throughout the Chesapeake Bay watershed is not only impacting the region through sea level rise, increased precipitation, flooding, species migration and heat waves, but also is disproportionately affecting vulnerable and disadvantaged populations. Building upon the individual policies and programs that each jurisdiction currently has in place, the directive will address the threats of climate change across all aspects of the partnership's work, including the outcomes of the *Chesapeake Bay Watershed Agreement*.

Advancing Diversity, Equity, Inclusion and Justice

Diversity, Equity, Inclusion and Justice Implementation Plan (DEIJ) Strategy

After the Chesapeake Executive Council signed the Chesapeake Bay Program [Diversity, Equity, Inclusion and Justice Statement](#) at their 2020 meeting, a DEIJ Action Team was formed to carry out its implementation. Their main objective was to create a roadmap to address the recommendations put forth in [Restoration from the Inside Out: A Diversity, Equity, Inclusion and Justice Strategy](#), completed in spring 2020. The DEIJ action team successfully carried out their task, creating the *Chesapeake Bay Program Diversity, Equity, Inclusion and Justice Strategy Implementation Plan* (<https://www.chesapeakebay.net/documents/ecbrief/43969/december2021-deij-strategyimplementationplan.pdf>), which overall contains specific goals to increase the racial and ethnic diversity among partnership staff and leadership, help all partners develop as DEIJ leaders who understand, respect and embrace cultural diversity, and provide the tools necessary to continually assess progress toward DEIJ goals. The Chesapeake Bay Program sought feedback on the implementation plan from the organizations and individuals working directly in the communities where the partnership hopes to fund grants, better engage with and prioritize on-the-ground restoration work. The implementation plan will now be turned over to the Diversity Workgroup to monitor progress.

EPA Chesapeake Bay Program Office Grants Become More Inclusive

As the partnership works to honor its commitment to increasing DEIJ in all aspects of its work, the EPA Chesapeake Bay Program Office Grants Team began including more inclusive language in several Requests for Applications (RFA) for competitive grants that were issued in 2021. These actions also take a step toward meeting the [Justice40 Initiative](#) from Executive Order 14008, "[Tackling the Climate Crisis at Home and Abroad](#)." In particular, the RFA to provide Agriculture and Non-Point Sources Support to the Chesapeake Bay Program, was highlighted by the EPA's Office of Grants and Debarment as a model for other federal agencies. Additionally, the Diversity Workgroup will receive funding in 2022 to improve the ability of under-resourced communities in accessing and managing funding for activities related to conservation, restoration and stewardship throughout the watershed.

Cultivating and Strengthening Partnerships

During the 2020 GIT Funding process, the Diversity Workgroup was awarded funding for a project entitled, "Cultivating and Strengthening Partnerships", which uses an abundance-oriented approach to better understand the partnership's capacity for engaging communities, as well as an understanding of the assets and resources available with which to do so. Internal and external focus groups were held throughout 2021 to provide insight into the needs, barriers and priorities of organizations led by and serving historically underrepresented and underserved communities, as well as the reasons why the Chesapeake Bay Program wants to engage with underrepresented groups, and how they can do so intentionally. A recommendations report will be finalized in early 2022, followed by a workshop intended to allow all parties to have meaningful dialogue with one another.

Education and Stewardship

Chesapeake Behavior Change

The Stewardship Workgroup completed a soft launch of Chesapeake Behavior Change (www.chesapeakebehaviorchange.org) in November 2021. The tool is meant to assist agencies and organizations that are working to foster stewardship and create behavior change campaigns. It contains data from the 2017 Stewardship Index Survey, the first comprehensive survey of people's actions and attitudes in the Chesapeake Bay watershed. Data is anticipated to be updated every five years.

Biennial Mid-Atlantic Environmental Literacy Leadership Summit

The Chesapeake Bay Program's Education Workgroup held their Biennial Mid-Atlantic Environmental Literacy Leadership Summit in collaboration with the Commonwealth of Pennsylvania in June 2021. The summit connected leaders from across the watershed to engage on issues of equity and climate readiness. During the day, there was the opportunity for jurisdictions to hold individual discussions with their stakeholders to discuss policy and programming priorities. The Education Workgroup and state educational working group leads continue to assess the priorities shared by jurisdictional leaders at the summit to determine how best to move forward.

Chesapeake Bay Program Youth Initiative

In 2021, the Chesapeake Bay Program supported the inaugural Chesapeake Bay Program Youth Initiative. Launched in June, this five month program connected high school students with 12 mentors from around the partnership, to help them develop an understanding of the complex issues facing the Chesapeake Bay watershed. The students selected an issue of interest to work on with their mentors and presented their final reports at the October Management Board meeting. The initiative was considered to be a success and will continue in 2022.

Chesapeake Bay Program Webinar Series

In light of the COVID-19 pandemic, the Chesapeake Bay Program Communications Office began to offer a series of webinars to the interested public in February 2021. Topics included a Chesapeake Bay Program primer for media, native plants and pollinators, green infrastructure, blue crabs, wetlands and recreation. The recorded webinars can be found on the Bay Program's YouTube site: <https://www.youtube.com/chesbayprogram>. Keep an eye on our Attend an Event Calendar (<https://www.chesapeakebay.net/action/attend>) for upcoming 2022 webinars.

Local Government Guide to the Chesapeake Bay

In April, the Local Leadership Workgroup launched a seven-module series to support decision-making by local government officials. The series includes visual PowerPoint presentations, fact sheets and a video. Its intention is to inform and empower local decision makers in the choices they make for their communities. Local officials can achieve mutually beneficial outcomes by prioritizing local economic development, infrastructure resiliency, public health and education, while also protecting the environment. To access the modules: www.chesapeakebay.net/who/group/local_leadership_workgroup.

Finance and Policy Updates

Impacting the Chesapeake Bay

Record Amount of Funding Distributed Through National Fish and Wildlife Foundation

Funding for the Chesapeake Bay Program comes primarily through the EPA's budget, which is allocated by Congress each year. Part of the budget is earmarked for on-the-ground restoration activities through different grant programs. Since 1999, the National Fish and Wildlife Foundation (NFWF), in partnership with the Bay Program, helps administer this money each year through the [Chesapeake Stewardship Fund](#). In 2021, a record \$23.3 million was distributed to local organizations across the watershed in support of their conservation and restoration projects.

- [Eight projects](#) in Pennsylvania received \$1.2 million to improve rivers and streams that connect to the Chesapeake Bay. Funds were provided as part of the Consolidated Appropriations Act of 2014, which allocated money to the six watershed states and the District of Columbia for the implementation of restoration projects by local governments.
- The [Innovative Nutrient and Sediment Reduction Grants Program](#) awarded \$9.6 million to 11 projects across the watershed to support innovative, sustainable and cost-effective approaches that reduce nutrient and sediment pollution to the Chesapeake Bay and its local waterways.
- The [Small Watershed Grants Program](#) awarded \$10 million for 49 projects across the watershed. These grants go to organizations and local governments that work on community-based projects that improve the condition of their local watershed while building stewardship among residents.
- The inaugural [Most Effective Basins Grants](#) support and enhance prior investments in Pennsylvania conservation efforts made throughout the calendar year. Ten projects in the Commonwealth were awarded \$2.5 million to accelerate implementation of cost-effective agricultural best management practices in selected regions of Pennsylvania's portion of the Chesapeake Bay watershed.

EPA and USDA Provide Joint Funding Opportunities

The EPA and the U.S. Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS) signed a "decision memorandum" in July 2021 that allows agricultural projects that are critical to the restoration of the Chesapeake Bay and local waters in the region to receive joint funding. This permits EPA Chesapeake Bay Program Office grants to be used as matching funds for most applications under the NRCS Regional Conservation Partnership Program (RCPP). RCPP grants provide up to \$10 million for projects and require an equal partner contribution. By signing this memorandum, nonprofit organizations, conservation districts, state agricultural departments and other interested entities will be able to better compete for these funds to support farmers and ranchers across the watershed in implementing conservation practices that will reduce pollutants entering the Bay.



Streams flow through farmland on their way to Penns Creek, a tributary of the Susquehanna River, in Union County, Pennsylvania. (Photo by Will Parson/Chesapeake Bay Program)

Chesapeake Bay Resilient Farms Initiative

In August 2021, agricultural secretaries for Delaware, Maryland, New York, Pennsylvania, Virginia and West Virginia sent a letter to USDA Secretary Tom Vilsack to propose the establishment of a [Chesapeake Bay Resilient Farms Initiative](#). The initiative would provide funding across the watershed for the implementation of states' Phase III WIPs, particularly for those projects located in sub-watersheds that have the greatest influence on the Chesapeake Bay—particularly the Susquehanna River. The Chesapeake Bay Commission is championing the initiative, which has received support from state farm bureaus.

New York's Phase III WIP Approved

New York submitted a revised Phase III WIP to the EPA in May 2021, after identifying additional ways to meet its 2025 goals to lower nitrogen pollution. The EPA had found New York's original WIP, submitted in August 2019, to fall short in meeting its nitrogen reduction goals. The revised WIP was evaluated by the EPA in August 2021.

Susquehanna River Basin Commission Letter of Understanding

Secretaries and deputy secretaries of watershed jurisdictional environmental agencies signed a letter of understanding with the Susquehanna River Basin Commission (SRBC) in October 2021 to recognize the organization in serving as the financing authority to fund projects and actions under the Conowingo WIP. Working with the watershed jurisdictions, the SRBC would receive and distribute the necessary funding to implement the Conowingo WIP, working closely with the Chesapeake Bay Program grantee to select and implement conservation practices. The letter of understanding includes a sunset provision currently targeted for December 31, 2025, with an option for renewal.

Internal Updates

Updating the Goal Implementation Team Funding Process

Each year, the Chesapeake Bay Program puts aside a small pot of money to fund innovative projects put forward by each of the GITs. These grants are specifically earmarked to advance the outcomes of the *Chesapeake Bay Watershed Agreement*. Throughout the spring of 2021, a small group of internal Chesapeake Bay Program staff refined the current GIT funding process. Changes to the 2021 round of funding include allowing one project per outcome to request funding and an expanded set of project evaluation criteria, including annual priorities set by the GIT Chairs.

Third Cycle of the Strategy Review System Kicks Off

In May 2021, the Chesapeake Bay Program held the third biennial Strategy Review System (SRS) two-day meeting. The SRS process was adopted by the Bay Program in 2017 to provide a broad review of where and why we have made progress, and identify issues and developments in the scientific, fiscal and policy fields that could impact goal and outcome achievement. It is a two-year cycle where each of the outcomes under the *Chesapeake Bay Watershed Agreement* reviews their progress, identifies lessons learned, applies new opportunities and understandings and implements needed changes to management approaches and/or actions with the Management Board. Each cycle is kicked off by a two-day partnership meeting.

The 2021 meeting allowed for the identification of what partners have learned from and about the SRS process, what resulted from that and how it helped their progress. Discussions also focused on what partners felt their role was in achieving the outcomes of the *Watershed Agreement* in contrast to the roles of Chesapeake Bay Program staff. The second day covered lagging outcomes and allowed for brainstorming on how to best accelerate progress. The complete notes from the meeting can be found at: https://www.chesapeakebay.net/channel_files/41940/ii.b_summary_document.pdf.



The GIT-funding process leads to a number of on-the-ground restoration projects, such as living shoreline development and stream restoration. (Photo by Will Parson/Chesapeake Bay Program)

Advisory Committee Updates

The Chesapeake Bay Program is advised by three committees that are made up of appointed and/or elected volunteers who provide independent perspectives from critical stakeholder groups and strengthen the natural and social science basis for Bay protection and restoration activities.

Citizens Advisory Committee (CAC)

- In 2020, the CAC initiated a new onboarding process to engage new members on the issues related to Chesapeake Bay watershed restoration and the partnership.
- In addition to the CAC's quarterly meetings, virtual learning sessions were held that focused on water quality monitoring, modeling, the Environmental Justice and Equity Dashboard and plastics pollution.
- Leadership of the CAC was actively engaged in the Bay Program's Diversity, Equity, Inclusion and Justice (DEIJ) Action Team and draft implementation plan.

Local Government Advisory Committee (LGAC)

In June 2021, the LGAC held its annual Local Government Forum, which focused on Developing Collaborative Watershed Partnerships. The Forum is held annually with LGAC members and subject matter experts to problem solve on a challenge impeding local watershed restoration.

The LGAC hosted a webinar in September 2021 to inform local decision makers on the opportunity to use federal funds under the American Rescue Plan for stormwater and wastewater infrastructure projects. Jasmine Gore, LGAC Chair, moderated the webinar, which was kicked off by Acting Regional Administrator Diana Esher and included speakers from the National League of Cities, National Association of Counties and local governments from Charles County, Maryland, Laurel, Delaware and Washington, D.C. Over 300 participants heard about funding possibilities and proposed infrastructure-related projects, while having their questions answered.

Scientific Technical Advisory Committee (STAC)

The STAC provides scientific and technical guidance to the Chesapeake Bay Program on measures to restore and protect the Chesapeake Bay. To provide this guidance, STAC hosts workshops and reviews to produce reports that includes specific recommendations for the partnership. The STAC Recommendations Database provides a user-friendly interface to search for recommendations by keyword, topic, author, date and report. Each recommendation links back to the original report and lists the relevant Bay Program GITs, workgroups and action teams. The STAC Recommendations Database can be found at <https://stac.chesapeakebay.net/client>.

The following reports were published by the STAC in 2021:

Chesapeake Bay Program Climate Change Modeling 2.0: The report provides guidance and expert advice on the models and framework used to assess the effects of climate change on the Bay TMDL. Experts developed recommendations that can be implemented to support assignment of any additional pollution reductions in 2021, as well as recommendations on longer-term modeling goals for the partnership.

Exploring Satellite Image Integration for the Chesapeake Bay SAV Monitoring Program: The report thoroughly explored the science and technology associated with using satellite imagery for assessing annual SAV acreage in the tidal waters of the Chesapeake Bay. It also looked at identifying scientific, logical and/or financial benefits and constraints related to the integration of satellite data into the SAV monitoring program.

Incorporating Freshwater Mussels into Chesapeake Bay Restoration Efforts: The report considered ecosystem services, documented biodiversity, outlined intersections with Chesapeake Bay issues and explored the ability of freshwater mussels in engaging partners.

Linking Soil and Watershed Health to In-Field and Edge-of-Field Water Management: The report identifies critical information gaps that limit the capacity to provide advanced water management guidance and implementation across diverse landscapes and under changing climate conditions.



Staff and volunteers with the Anacostia Watershed Society release 1,300 freshwater mussels into the Anacostia River near Kingman Island in Washington, D.C., (Photo by Will Parson/Chesapeake Bay Program)

Science Updates

Revised indicators of climate change

At the March 2021 Management Board meeting, the Climate Resiliency Workgroup presented a list of prioritized indicators with which to assess climate change across the Chesapeake Bay watershed. The Management Board asked for this information to help identify the utility of the current climate change indicators that were first announced in 2019. In developing this prioritized list, the Climate Resiliency Workgroup found that some of the current indicators were part of a national program and the management applications for the Bay Program were not well defined. As such, some of the existing indicators will not be updated or their methodology for data collection will be refined. The Workgroup is also working on an updated *Climate Change Indicator Implementation Strategy*, which also will include a new climate indicator that assesses the extremes in high temperatures.

Forage indicator development

The Forage Action Team completed an [indicator development plan](#) that prioritized seven indicators that could be developed with existing data and have clear management applications. Of those, four were chosen for development, or are currently pursuing funding to determine the availability of prey for key predators in the Bay over time. The process for prioritizing indicators looked at the identification of key forage species in the Bay, understanding the environmental and ecological relationships, and assessing which predators eat prey, how much they eat and how that changes over time. The four indicators include benthic invertebrate status and trends, habitat suitability index for bay anchovy and juvenile spot, springtime warming impacts on forage abundance and shoreline condition threshold for juvenile blue crab and other forage species.



A great egret catches a small fish on the Lynnhaven River in Virginia Beach, Va., on Oct. 1, 2021. (Photo by Will Parson/ Chesapeake Bay Program)

Development of Shoreline Hardening Maps

In 2018, the Virginia Institute of Marine Science was awarded funding to determine the impacts that shoreline development and other stressors had on important forage species and blue crabs in the Bay. The study found that shoreline hardening of 10-30% led to the decline of seven analyzed forage species, while an increase in shoreline development led to a general decline in blue crabs. In 2021, the Chesapeake Bay Program GIS Team developed these findings into GIS layers showing the percentage of hardened shorelines in four coastal counties of [Maryland](#), and in all of the tidal tributaries and counties adjacent to the Bay in [Virginia](#).

Chesapeake Bay Program Science Needs Database

As a direct result of the Strategy Review System, the Chesapeake Bay Program developed a Strategic Science and Research Framework to identify and assess the short and long-term science needs of the partnership. In 2021, a database was launched to track these needs and provide additional information to address the need. The Science Needs Database (<https://star.chesapeakebay.net/>) engages stakeholders, identifies opportunities to better align or evolve resources, update activities and workgroups to address needs and inform the Scientific and Technical Advisory Committee of research priorities.

Twelve tributary summaries

In 2021, the Chesapeake Bay Program compiled summaries for 12 major tributaries of the Chesapeake Bay. The summaries look at how tidal water quality has changed over time, the factors that drove those changes over time and the current state of science in connecting these changes in aquatic conditions to its causes. The tributaries include the Choptank, Potomac, Patapsco, Back Patuxent, James, Rappahannock and York rivers, as well as Maryland's upper and lower western shores, upper and lower eastern shores and the mainstems of Maryland's and Virginia's portions of the Bay. The summaries can be found at <https://cast.chesapeakebay.net/Home/TMDLTracking#tributaryRptsSection>.

Tidal Trends Results

The Integrated Trends Analysis Team developed a series of maps documenting tidal water quality change in the tributaries of the Chesapeake Bay. Four series of maps were developed, measuring nitrogen, phosphorus, chlorophyll-*a* (spring and summer), Secchi depth, total suspended solids, surface water temperature and dissolved oxygen. The four series of maps are:

- Observed long-term change in water quality by station from 1985-2020.
- Change in water quality by station from 1985-2020 if river flows were average each year.
- Observed short-term change in water quality by station from 2010-2020.
- Change in water quality by station from 2010-2020 if river flows were average each year.

All maps can be found at https://www.chesapeakebay.net/who/group/integrated_trends_analysis_team.

Hypoxia Collaborative Team

The Hypoxia Collaborative Team formed in response to the need for continuous, real-time information about the status of dissolved oxygen throughout the Bay. In October 2021, a small buoy with solar-powered sensors was launched into the Bay to continually track dissolved oxygen at key locations to aid in hypoxia modeling. The buoy measures dissolved oxygen, temperature and salinity at different depths and sends information back to a server on land every 10 minutes. Monitoring and analyzing these changes in dissolved oxygen levels, along with information on how different species use the Bay, allows the Team to evaluate the effects hypoxia has on important Bay resources.

Monitoring Updates

Assessing the Chesapeake Bay's monitoring networks

In March 2021, experts presented an overview of Chesapeake Bay Program monitoring networks to the Principals' Staff Committee (PSC). It included information about the status of, and potential reductions to, the nontidal nutrient and sediment network, tidal water quality monitoring network, underwater grasses, tidal benthic monitoring network and community science monitoring. The reductions of stations and data is mainly due to inflation in the cost of monitoring over the past five years, while funding has been held constant. The PSC requested an overview of current status and threats to the network, as well as what is needed to address the monitoring networks capacity shortfalls. The Monitoring Team is currently in the midst of a nine-month review to determine this information and will return to the PSC in early 2022 with their recommendations.

Chesapeake Monitoring Cooperative Six-Year Accomplishments Report

The Chesapeake Monitoring Cooperative (CMC) released its six-year accomplishments report in early 2021. Over this period, the CMC provided technical, programmatic and outreach support to over 100 community and volunteer-based monitoring groups. This support provided training to begin or maintain monitoring programs, which covered topics including study design, chemical and benthic collection, quality assurance and quality control, data upload to the Chesapeake Data Explorer, and data interpretation and science communication. Over the past six years, the CMC has helped to upload over 450,000 volunteer-based water quality and macroinvertebrate monitoring data points into the Chesapeake Data Explorer for the public to access. The full report can be found at <https://www.chesapeakemonitoringcoop.org/wp-content/uploads/2021/02/CMC-Report-FINAL-7pp.pdf>.



Sophie Stern, standing at center, of the Alliance for the Chesapeake Bay, leads a Chesapeake Monitoring Cooperative training event along the Patuxent River in Bowie, Md. (Photo by Will Parson/Chesapeake Bay Program)

Enhancing monitoring in agricultural areas

In December 2021, the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) and EPA released their recommendations on how to enhance the communication and coordination of funding in the Chesapeake Bay watershed for agricultural conservation practice implementation and water quality monitoring. It was determined that a major challenge was the need for enhanced monitoring at finer scales to better connect implementation of management practices with water quality and sediment changes. To address this challenge, recommendations were organized around three objectives:

1. Identify the watersheds with the greatest needs and opportunities for monitoring the impacts of conservation work on the water quality of local streams and rivers
2. Identify opportunities to further coordinate federal and state water quality monitoring programs, and interpretation of results, to assess the impacts of agricultural conservation practices on the water quality throughout the watershed
3. Identify approaches to improve communication of findings, and engage policy makers and stakeholders to inform implementation decisions

The full report can be found at: https://www.chesapeakebay.net/channel_files/41834/report_nrcs_epa_usgs_federal_wq_monitoring_team_122220.pdf

Monitoring sustained at Conococheague Creek

A historic nontidal network monitoring station at Conococheague Creek, located on the border of Maryland and Pennsylvania, was in danger of losing funding in 2019. This site has provided over 100 years of monitoring information about the Chesapeake Bay watershed. In March 2021, the Chesapeake Bay Program addressed funding support to sustain the monitoring station through 2022.

Reports

[Quantifying the Response of Nitrogen Speciation to Hydrology in the Chesapeake Bay Watershed Using a Multilevel Modeling Approach](#)

Bertani, I., Bhatt, G., Shenk, G. W., & Linker, L. C. (2021). Quantifying the Response of Nitrogen Speciation to Hydrology in the Chesapeake Bay Watershed Using a Multilevel Modeling Approach. *JAWRA Journal of the American Water Resources Association*.

[The Chesapeake Bay program modeling system: Overview and recommendations for future development](#)

Hood, R. R., Shenk, G. W., Dixon, R. L., Smith, S. M., Ball, W. P., Bash, J. O., ... & Zhang, Y. J. (2021). The Chesapeake Bay program modeling system: Overview and recommendations for future development. *Ecological Modelling*, 456, 109635.

[Nutrient trends and drivers in the Chesapeake Bay Watershed: U.S.](#)

Hyer, K.E., Phillips, S.W., Ator, S.W., Moyer, D.L., Webber, J.S., Felver, R., Keisman, J.L., McDonnell, L.A., Murphy, R., Trentacoste, E.M., Zhang, Q., Dennison, W.C., Swanson, S., Walsh, B., Hawkey, J., and Taillie, D., 2021, Nutrient trends and drivers in the Chesapeake Bay Watershed: U.S. Geological Survey Fact Sheet 2020-3069, 4 p., <https://doi.org/10.3133/fs20203069>.

[Nutrient limitation of phytoplankton in Chesapeake Bay: Development of an empirical approach for water-quality management](#)

Zhang, Q., Fisher, T.R., Trentacoste, E.M., Buchanan, C., Gustafson, A.B., Karrh, R., Murphy, R.R., Keisman, J., Wu, C., Tian, R., Testa, J.M., and Tango, P.J. January 2021. Nutrient limitation of phytoplankton in Chesapeake Bay: Development of an empirical approach for water-quality management. *Water Research*, Volume 188.

Appendix

View the Background and Attainability Assessments for each Outcome:

SUSTAINABLE FISHERIES GOAL

[Blue Crab Abundance](#)

***Blue Crab Management**

[Fish Habitat](#)

[Forage Fish](#)

[Oysters](#)

VITAL HABITATS

[Black Duck](#)

[Brook Trout](#)

[Fish Passage](#)

[Forest Buffers](#)

[Stream Health](#)

[Submerged Aquatic Vegetation \(SAV\)](#)

[Tree Canopy](#)

[Wetlands](#)

CLEAN WATER GOAL

***2017 Watershed Implementation Plans**

[2025 Watershed Implementation Plans](#)

[Water Quality Standards Attainment and Monitoring](#)

TOXIC CONTAMINANTS GOAL

[Toxic Contaminants Research](#)

[Toxic Contaminants Policy and Prevention](#)

HEALTHY WATERSHEDS GOAL

[Healthy Watersheds](#)

LAND CONSERVATION GOAL

[Land Use Options Evaluation](#)

[Land Use Methods and Metrics Development](#)

[Protected Lands](#)

PUBLIC ACCESS GOAL

[Public Access Site Development](#)

ENVIRONMENTAL LITERACY GOAL

[Environmental Literacy Planning](#)

[Student](#)

[Sustainable Schools](#)

STEWARDSHIP GOAL

[Citizen Stewardship](#)

[Diversity](#)

[Local Leadership](#)

CLIMATE RESILIENCY GOAL

[Climate Monitoring and Assessment](#)

[Climate Adaptation](#)

The outcome attainability documents can be found on:

***These outcomes have met their targets and are considered to be complete**