SUSTAINABLE FISHERIES GOAL

Blue Crab Abundance Outcome

OUTLOOK
ON COURSE

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

PROGRESS AS OF 2021: The Blue Crab Abundance Outcome is on track. The status of the blue crab population is determined by the number of adult females present in the Bay. Ideally, the number of females would be at or above the target of 196 million, but could be as low as the threshold of 72.5 million and still be considered sustainable. Since 2014, adult female abundance has remained above the threshold, indicating that the population is sustainable and this outcome is being met.

BACKGROUND: The Chesapeake Bay Stock Assessment Committee (CBSAC) has met since 1997 to review the results of the Winter Dredge Survey (conducted since 1990) and to develop management advice. CBSAC is made up of fisheries managers, scientists and state and federal agency partners. The Blue Crab Abundance Outcome was derived from CBSAC's annual Blue Crab Advisory Report.

BASELINE: The 2011 blue crab benchmark stock assessment recommended using a female-specific abundance target and threshold. CBSAC developed a target of 215 million spawning-age (1+ years old) females—the number experts estimate is needed to sustain the crab population—and also set the threshold, or minimum number, at 70 million spawning-aged female crabs. In 2012, an abundance of 95 million blue crabs was measured in the Bay.

DATA SOURCE: Data for the Blue Crab Abundance Outcome is collected through the annual Winter Dredge Survey conducted by the Maryland Department of Natural Resources and Virginia Institute of Marine Science. The survey randomly samples a total of 1,500 sites throughout the Chesapeake Bay that are deeper than five feet. All crabs collected during the survey are measured from spine to spine across the top shell and weighed. The sex of each crab is determined and female maturity is noted. The results are reported as crab density, or the average number of crabs found within a 1,000 meter by 1,000 meter area. These data are paired with annual harvest data provided by Maryland and Virginia.

SUSTAINABLE FISHERIES GOAL

Fish Habitat Outcome

OUTLOOK
ON COURSE

OUTCOME: 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.

PROGRESS AS OF 2021: The Fish Habitat Outcome is on course. This outcome is designed to integrate information and conduct assessments to inform restoration and conservation efforts. Tidal and non-tidal fish habitat assessments have been conducted and additional assessments are underway. Multiple habitat studies have been conducted that can inform shoreline restoration management. Additional studies have linked environmental variability to fish populations resulting in adjustments to fishery management risk assessments.

BACKGROUND: The quantity and quality of fish habitat is declining in the Chesapeake Bay as the result of several factors: poor water quality, human population increases and development pressures, energy development, shoreline hardening, toxic contaminants and rising sea levels.

This outcome builds upon existing information, such as *The Habitat Requirements for Chesapeake Bay Living Resources*, state wildlife action plans and various spatial tools, that include general maps and information showing the habitat, distribution and the water quality requirements for many species. These maps do not characterize the quality of these areas, so efforts to meet this outcome will focus on developing criteria to inform a "high quality" fish habitat. This information will allow partners to identify areas that need conservation, as well as impaired areas that would benefit from restoration efforts, to build an understanding of the relationship between habitat stressors to habitat condition. State and regional fisheries managers that have expressed interest in utilizing characterized habitat information to move towards an ecosystem-based approach to fisheries management, can also use information gained from funded research projects.

BASELINE: Due to the various areas that comprise "fish habitat" (underwater grasses, streams, water column, wetlands, shorelines, etc.), along with gaps in understanding of which provide the highest value in supporting fish reproduction, feeding, juvenile growth and refuge from predation, there is no established baseline at this time.

DATA SOURCE: Progress is measured by tracking the implementation of jurisdictional habitat priorities and the following focal areas: large, nontidal rivers; headwaters; tidal freshwater habitat; and tidal saltwater habitat.

SUSTAINABLE FISHERIES GOAL

Forage Fish Outcome

OUTLOOK
ON COURSE

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 AS OF 2021: The Forage Fish Outcome is on course. Over the last year, the Forage Action Team began development of three forage indicators: tracking the abundance of key invertebrates, the relationship of warming water temperatures to forage abundance and the relationship of the amount of suitable habitat to forage abundance. These initial indicators lay the foundation for the annual assessment of the condition of forage species in the Chesapeake Bay.

BACKGROUND: Forage refers to species that are food for predators. The Sustainable Fisheries Goal Implementation Team, along with other stakeholders, have long discussed the importance of forage in the Chesapeake Bay food web, as a robust and healthy forage base is essential in supporting valuable commercial and recreational fisheries. The Outcome aims to improve understanding of the role and status of forage in the Bay to inform habitat, fisheries and water quality management decisions.

Most forage species are not directly managed, but rather support valuable managed predator species. As analyses have shown that a diversity of forage species is important to predators, including invertebrates, in 2016 the Forage Action Team redefined "forage" under this outcome to refer to all forage species, not just fish.

BASELINE: In 2014, the Chesapeake Bay Program's Scientific and Technical Advisory Committee held a workshop, *Assessing the Chesapeake Forage Base: Existing Data and Research Priorities*, that sought to define the Chesapeake Bay forage base. The workshop put forward five actionable recommendations to better understand and quantify the forage base and its availability to predators. Additionally, the baseline for this outcome is informed by several studies conducted by the University of Maryland Center for Environmental Science, which highlighted the existing gaps in knowledge regarding forage, and the 2015 Atlantic Marine Fisheries Commission Menhaden Stock Assessment report.

DATA SOURCE: It is a desirable goal to maintain a balanced forage base throughout the Chesapeake Bay, but "balanced" is yet to be defined or quantified. The three indicators currently in development will help quantify the relationships between priority predators and prey and provide insight into the status of forage in the Bay.

SUSTAINABLE FISHERIES GOAL

Oysters Outcome

OUTLOOK
ON COURSE

OUTCOME: Continually increase finfish and shellfish habitat and water quality benefits from restored oyster populations. Restore native oyster habitat and populations in 10 tributaries by 2025 and ensure their protection.

PROGRESS AS OF 2021: The Oysters Outcome is on course. Three (Harris Creek, Lafayette River and Little Choptank River) of the 10 tributaries scheduled for restoration have been completed and formally recognized as restored. Three more were completed in 2021 (Lynnhaven, Piankatank and Tred Avon rivers) and will be formally recognized later on this year. Planning, financial resources and construction schedules are in place for the remaining four tributaries (Great Wicomico, Manokin, Lower York and Upper St. Mary's rivers). Additionally, the Eastern Branch of the Elizabeth River in Virginia has been restored to the same standard as the original ten tributaries. This outcome is expected to be met by 2025.

BACKGROUND: The Executive Order 13508 Strategy for Protecting and Restoring the Chesapeake Bay Watershed included a goal to restore oyster populations in 20 tributaries of the Chesapeake Bay by 2025. In response to this goal, the Sustainable Fisheries Goal Implementation Team established the Oyster Metrics Workgroup to develop common Bay-wide restoration goals, success metrics and monitoring and assessment protocols for sanctuary reefs including progress toward achieving a sustainable oyster population and ultimately increasing levels of ecosystem services. Based on experience with current restoration implementation and resource availability, experts determined that an outcome of restoring native oyster habitat and populations in 10 tributaries by 2025 was a more appropriate goal to include in the *Chesapeake Bay Watershed Agreement*.

BASELINE: One tributary (Harris Creek) had been identified, but not yet restored, for large-scale oyster restoration by the time the most recent *Watershed Agreement* was signed in 2014.

DATA SOURCE: The Maryland and Virginia Oyster Restoration Interagency Teams are responsible for developing Oyster Restoration Tributary Plans for each waterway, in consultation with partners and scientists. These plans have been developed for all 10 selected tributaries and include information such as target reef acreage to be constructed and project costs.

Restoration is documented in annual reports developed by the Maryland and Virginia Oyster Restoration Interagency Teams and produced the auspices of the Sustainable Fisheries Goal Implementation Team.

VITAL HABITATS GOAL

Black Duck Outcome

OUTLOOK
OFF COURSE

OUTCOME: 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 AS OF 2021: The Black Duck Outcome is off course. While a target and baseline have been established, the data needed to track restored habitat is lacking. Data support is needed to identify a better tracking method to measure tidal wetland acreage (the primary habitat for black ducks). As this outcome is closely tied to the Wetlands Outcome, any challenges associated with the restoration and implementation of wetlands also apply to the Black Duck Outcome. Therefore, it is assumed the trajectory is off course due to the lack of available data.

BACKGROUND: The Chesapeake Bay region supports the largest portion of eastern North America's wintering black duck population and preserving its habitat is critical to the species' long-term sustainability. Black ducks are an important indicator species, so restoration of their habitat will also benefit other waterfowl who winter in the watershed. The target of supporting a wintering population of 100,000 black ducks is based on the restoration target established by the North American Waterfowl Management Plan for the entire North American continent, which is 640,000 black ducks (established in 1990, revised in 2004). Experts agree that by achieving the restoration of habitat to support 100,000 black ducks will significantly contribute to the larger continental goal. The Atlantic Coast Joint Venture (ACJV) recently completed a decision support tool to help identify the exact number of acres to protect, restore or maintain at the small watershed scale. The tool allows land managers to identify the best way to achieve black duck goals throughout the watershed. This information is helping to inform a new habitat-based indicator (in addition to tracking population numbers when made possible by individual states) to better reflect the outcome language in the *Chesapeake Bay Watershed Agreement.*

BASELINE: From 2009 to 2011, 47,269 black ducks were noted in the Chesapeake Bay region, achieving 47% of the goal to support 100,000 black ducks. Based on the ACJV's decision support tool, and ongoing work to develop a new indicator, the available black duck habitat in 2014 measured 566,477 acres, while the amount needed to support 100,000 black ducks was estimated to be 717,749 acres.

DATA SOURCE: The abundance and distribution of black ducks in the Chesapeake Bay watershed are measured through the annual Mid-winter Waterfowl Survey, conducted by state agencies. The survey was originally conducted by the U.S. Fish and Wildlife Service, but they discontinued data collection in 2016. Due to this, the long-term monitoring of black ducks within the Bay region is not possible. The Chesapeake Bay Program is working on developing an accurate method of tracking acreage of suitable black duck habitat as a new indicator.

VITAL HABITATS GOAL

Brook Trout Outcome

OUTLOOK
OFF COURSE

OUTCOME: Restore and sustain naturally reproducing brook trout populations in Chesapeake Bay headwater streams, with an eight percent increase in occupied habitat by 2025.

PROGRESS AS OF 2021: The Brook Trout Outcome is off course. While the Brook Trout Action Team has achieved many successes—including 22 of the 28 items listed in their most recent Logic and Action Plan—challenges remain in meeting this outcome. There are two aspects to this issue. First, and most importantly, changes in land use and climate continue to have significant detrimental impacts on brook trout habitat. The resources available to mitigate these impacts are insufficient to adequately sustain and restore brook trout populations at the necessary scale to achieve the outcome. Second, a more accurate and comprehensive system to document gains and losses in brook trout habitat is needed as current data are incomplete. Both aspects have, and continue to play, a significant role in the lack of progress toward meeting this outcome. Data support and intervention is needed to increase the rate of implementation and monitoring of conservation and restoration activities.

BACKGROUND: Brook trout are an essential part of the headwater stream environment and a valuable recreational resource. As the fish needs clean, cold water to survive, and is sensitive to rising water temperatures, its presence is an indicator of a healthy headwater stream. According to an assessment completed in 2015 by the Eastern Brook Trout Joint Venture, wild brook trout occupy 33,200 square kilometers of habitat in the watershed. This includes streams shared with brown and/or rainbow trout. There are 13,500 square kilometers of allopatric—or wild brook trout only—streams, which are comprised of 990 separate patches, or groups of contiguous catchments. This means that 14,622 square kilometers (an eight percent increase) of habitat occupied by wild brook trout serves as the restoration goal for this outcome. The annual restoration target is 137 square kilometers of habitat.

BASELINE: This outcome is focused on conserving "Wild Brook Trout Only" patches and therefore is using the current area of occupancy as determined by the Eastern Brook Trout Joint Venture as the baseline for measuring progress. This area of occupancy is currently 13,500 square kilometers.

DATA SOURCE: The Eastern Brook Trout Joint Venture's five-year range-wide assessment of occupied habitat was initially adopted for measuring progress toward this outcome. To assess interim progress, pertinent jurisdictions would annually report the amount of habitat occupied by wild brook trout only that was added to or removed from the baseline using a standardized occupancy reporting protocol. These annual gains would be combined with the outputs of the monitoring protocol to determine overall progress. However, it is now apparent that this methodology does not capture the full extent of conservation and restoration activities in the watershed at the timescale necessary to meet the outcome target by 2025.

SUSTAINABLE FISHERIES GOAL

Fish Passage Outcome

OUTLOOK
ON COURSE

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 AS OF 2021: The Fish Passage Outcome is on course to meet its target of opening an additional 132 miles of streams every two years. In 2018 and 2019, an additional 1,379 stream miles were opened to fish passage through dam removal projects, far exceeding this goal. Data collection for 2020 and 2021 is not yet complete, and the numbers will not be reported until January 2022. Interest by dam owners is still a major challenge, so the workgroup is focusing on ways to incentivize dam removal projects. Moving forward, the workgroup is planning on using infrastructure funding to expand dam removal and culvert initiatives—funding opportunities made available through sources such as the Infrastructure Bill (H.R.3684) will aid in completing these projects.

BACKGROUND: The outcome was developed by the Chesapeake Bay Program Fish Passage Workgroup between 2009 and 2010 to address the need for improved fish passage for the watershed's aquatic species, although fish passage data began to be continuously reported in 1988. There are more than 140,000 miles of rivers and streams in the watershed and more than 5,000 dams. Dams and other obstructions block the natural migration of diadromous fish (those that migrate between sea and freshwater) to their historic spawning habitats, as well as disrupt the migration of resident fish like American shad, hickory shad, river herring, American eel and brook trout. The original target for the Fish Passage Outcome was to open 1,000 additional miles of waterways to fish passage by 2025. However, this target was met only two years after the *Chesapeake Bay Watershed Agreement* was signed, mainly due to the development of more accurate technologies to measure stream and river habitat. In 2020, the outcome was revised with a target to open an additional 132 miles of fish passage every two years, which is more consistent with the best available science.

BASELINE: The progress of this outcome is measured from zero miles starting in 2011. During the period of 2011 to 2013, the Fish Passage Workgroup reported a total of 215 stream miles re-opened.

DATA SOURCE: Fish passage coordinators in Maryland, Virginia and Pennsylvania report how many stream miles have been opened annually through the Chesapeake Bay Fish Passage Prioritization Tool. The number of miles opened each year is determined through a GIS exercise where a dam removal or fish passage project is located and mapped and an assessment of stream miles accessible to target species is calculated.

VITAL HABITATS GOAL

Forest Buffers Outcome

OUTLOOK
OFF COURSE

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

PROGRESS AS OF 2021: The Forest Buffers Outcome is off course. The Chesapeake Bay Program has not met its goal for riparian forest buffers since 2002, often achieving less than 10% of the *Chesapeake Bay Watershed Agreement* goal. The most recently available data shows that between 2017 and 2018, about 158 miles of forest buffers were planted along rivers and streams in the watershed, followed by about 83 miles in 2019. While these miles progress toward the outcome, it is 742 and 817 miles below the 900-mile-per-year target, respectively. This is unfortunate since riparian forest buffers are often said to be the most important best management practice for the Chesapeake, not only because of their water quality benefits, but because they also offer key habitat, can abate flooding and provide resiliency to climate change. One impendent to achieving this outcome is that the partnership has been relying on the Forestry Workgroup to achieve this goal. While the Forestry Workgroup can provide technical guidance and program design ideas, the agricultural community and state water quality regulators are better equipped to lead. As this practice is so important, yet so far behind, it would benefit from higher-level involvement for each watershed jurisdiction, as the workgroup lacks the leadership to push this largely agricultural practice.

BACKGROUND: Forest buffers have played a role in Chesapeake Bay restoration since 1994 when the Chesapeake Executive Council asked the Chesapeake Bay Program to develop a policy to "enhance riparian stewardship and efforts to conserve and restore riparian forest buffers". In the 2007 Forest Conservation Directive, the watershed jurisdictions agreed to restore 900 miles of forest buffers per year cumulatively. The outcome was formally included into the *Chesapeake Bay Watershed Agreement*, and an additional target of at least 70% forest coverage was developed. Seventy percent is seen as a low threshold for a healthy Bay watershed.

BASELINE: In 2010, 358.9 miles of forest buffers were planted in the watershed, but the 900-miles-per-year goal was first established in 2007. In the 2000s, each watershed jurisdiction established Tributary Strategies to reduce pollution from nutrients and sediment. These strategies had a forest buffer target higher than the 900 miles-per-year, which is why it was not scaled back when the *Watershed Agreement* was put into place.

DATA SOURCE: Acres of forest buffers are provided to the Chesapeake Bay Program by the watershed jurisdictions on an annual basis to be added to the Watershed Model. Some of the partners reporting progress include the Maryland Forest Service, Pennsylvania Department of Environmental Protection, Virginia Department of Forestry and Department of Conservation Resources, West Virginia Division of Forestry, Delaware Department of Natural Resources and Environmental Control and the Upper Susquehanna Coalition for New York.

VITAL HABITATS GOAL

Stream Health Outcome

? OUTLOOK **UNCERTAIN**

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

PROGRESS AS OF 2021: The Stream Health Outcome is uncertain. While the Stream Health Workgroup is currently on track to meet the majority of activities in their most recent Logic and Action Plan, the status of the outcome remains uncertain due to the timing of data collection and analysis. This makes it difficult to assess progress on an annual basis. The first data update since the baseline covers the period between 2012 and 2019; this data is currently being finalized and will hopefully be released in December 2021. The workgroup is implementing a plan to develop additional metric(s) to measure stream health. These metrics are intended to be established over the next five years and will fill gaps in our assessment of stream health.

BACKGROUND: Restoring health to local rivers and streams not only benefits the fish, wildlife and people using them, but is a necessary step toward meeting water quality standards in the Chesapeake Bay. Over 100,000 stream miles drain from the watershed into the Chesapeake Bay. The Stream Health Outcome was initially derived using an existing Chesapeake Bay Program indicator that used an index to measure stream quality—the Chesapeake Basin-wide Index of Biotic Integrity (Chessie BIBI). This index was mentioned specifically as a measure of stream restoration in the *Strategy for Protecting and Restoring the Chesapeake Bay* and featured in the 2007-2009 Chesapeake Bay Program Bay Barometer reports. In 2018, the Interstate Commission on the Potomac River Basin and an ad-hoc team of other experts from the Chesapeake Bay Program established the six years between 2006 and 2011 as the baseline for this outcome. Between 2000 and 2010, more than 14,000 stream sites across the Chesapeake Bay watershed were sampled and rated for biological integrity. The data from this research that fell under the years of 2006 to 2011 were used to inform the baseline.

BASELINE: The Chessie BIBI describes the quality of assessed streams in relation to all the streams throughout the Bay region. During the baseline time period of 2006-2011, the Chessie BIBI ranked 25% of the watershed as having fair, good or excellent stream conditions, while 21% showed poor or very poor conditions. Fifty-four percent of the watershed was not included in the baseline assessment due to insufficient or absent data.

DATA SOURCE: Data to inform the Stream Health Outcome is collected every five years through the Chessie BIBI. The benthic macroinvertebrate and water quality data that informs the Chessie BIBI comes from multiple federal, state, county and volunteer monitoring groups and is based on a common methodology agreed to by the Chesapeake Bay Program's Nontidal Water Quality Monitoring Program.

VITAL HABITATS GOAL

SAV Outcome

OUTLOOK
OFF COURSE

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 AS 0F 2021: The SAV Outcome is off course. Following six years of expansion, over one-third of the SAV in the Chesapeake Bay was lost in 2019—2020, decreasing acreage from 108,000 to 62,000. This loss is due to degraded water clarity following two years of above-normal precipitation. Because of this decline, reaching the Bay-wide 2025 goal on time is highly unlikely. However, it is possible to attain segment-specific goals by that time.

BACKGROUND: The outcome was established by the Chesapeake Bay Program SAV Workgroup, who reviewed historic records and photographic evidence from the 1930s to present-day to establish the target of 185,000 acres. While this outcome is associated with the most current *Chesapeake Bay Watershed Agreement*, the SAV Workgroup has provided technical expertise and applied research findings to resource managers in the larger Bay community since 1976. Current monitoring efforts began in 1984 and formal goals to restore and protect SAV throughout the Chesapeake Bay were included in the *1987 Chesapeake Bay Watershed Agreement*.

The Chesapeake Bay is divided into 93 different segments, each with its own SAV restoration target, and four salinity zones (Tidal Fresh, Oligohaline, Mesohaline and Polyhaline). The Chesapeake Bay Program has divided the estuary into segments to get a more accurate picture of Bay health since its founding in 1983.

BASELINE: Historically, the Chesapeake Bay most likely supported over 200,000 acres of SAV In 1984, 38,000 acres of SAV were mapped throughout the Chesapeake Bay.

DATA SOURCE: SAV abundance is tracked through an annual aerial survey conducted by the Virginia Institute of Marine Science and supported by satellite data when necessary. Additionally, data is collected through ground surveys conducted by a number of agencies and individuals.

VITAL HABITATS GOAL

Tree Canopy Outcome

OUTLOOK
OFF COURSE

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 AS OF 2021: The Tree Canopy Outcome is off course. While the first official update for the tree canopy indicator is pending due to best management practice progress data and land use change data to be finalized, draft data indicates that tree canopy losses across the watershed are significantly outpacing gains. From 2014-2020, the six watershed states and the District of Columbia reported around 5,500 acres of trees planted on developed lands (approximately 1.6 million trees). Despite this progress, the initial version of the Chesapeake Bay High Resolution Land Cover Project (released in 2016 and reflecting the time period of 2013-2014) and draft data from the updated dataset (to be released in 2022, reflecting the time period 2017-2018) show a net loss of over 31,000 acres of tree canopy on developed/developing lands. As this is the first time that the Forestry Workgroup has had access to comprehensive data on tree canopy gains and losses, a Tree Canopy Funding and Policy Roundtable with state and local leaders is planned for 2022 to develop solutions focused on climate resilience and equity to stem future losses and accelerate gains.

BACKGROUND: Expanding tree cover benefits people and the environment. It can enhance air quality, water quality, lead to energy savings, improve public health and allow for community investment. The Chesapeake Bay Program first recognized and set goals related to urban tree canopy in the 2003 Chesapeake Executive Directive on Expanded Riparian Forest Buffer Goals. In the 2007 Forest Conservation Directive, the watershed jurisdictions agreed to have 120 communities increase their tree canopy by 2020. The Tree Canopy Outcome in the current *Chesapeake Bay Watershed Agreement* will track acres of expansion that better reflect changes on the ground that are most beneficial to the Chesapeake Bay watershed. In the outcome, urban tree canopy is broadly defined as tree plantings in communities of any size—including urban, suburban and rural—that are not on agricultural lands. Each jurisdiction will set their own annual and long-term planning targets that contribute to the 2,400 acre goal. The goal is intended to reflect a net gain in tree canopy acreage, after accounting for losses due to development, storms, pests/diseases and natural mortality. Achieving the target requires protecting our existing tree canopy as much as possible and planting enough new trees to mitigate losses and expand by 2,400 acres.

BASELINE: The jurisdictions agreed that 2,400 additional acres by 2025 represented a reasonable goal.

DATA SOURCE: Tree canopy data comes from the Chesapeake Bay High Resolution Land Cover Project, whose datasets are updated every four years. Additionally, the outcome is informed by urban tree planting data reported by each jurisdiction.

VITAL HABITATS GOAL

Wetlands Outcome

OUTLOOK
OFF COURSE

OUTCOME: Continually increase the capacity of wetlands to provide water quality and habitat benefits throughout the watershed. Create or re-establish 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 AS OF 2021: The Wetlands Outcome is off course. Between 2010 and 2017, 9,103 acres of wetlands were established, rehabilitated or re-established on agricultural lands. While the outcome includes a target to restore 85,000 acres of tidal and non-tidal wetlands in the watershed, 83,000 of these restored acres should take place on agricultural lands. This marks an 11% achievement of the 83,000-acre goal. No progress has been reported toward the wetlands enhancement goal. Numerous challenges in reaching this outcome have been identified, including a lack of funding and resources to complete projects, the unwillingness of landowners to take on voluntary restoration, conflicting state priorities and incomplete tracking information.

BACKGROUND: Wetlands act as natural filters, absorbing nitrogen, phosphorus and sediment pollution before it can enter waterways. It also provides habitat for commercially important fish species, juvenile blue crabs and migrating waterfowl. They stabilize shorelines, control erosion and buffer inland and coastal properties from damages associated with flooding and storm surges. The current Wetlands Outcome was established by federal, state and non-profit partners. The outcome is also linked to the National Wetlands Inventory estimate that one million acres of tidal and non-tidal wetlands are available for restoration or enhancement in the Bay watershed. Wetland restoration (resulting in gains in wetland acreage) is tracked separately from wetland enhancement (results in gains in existing wetland functions). The outcome specifically calls out wetlands established, rehabilitated or re-established on agricultural lands due to the additional benefits these habitats provide, when compared to other types of wetlands (e.g., urban stormwater ponds).

BASELINE: The progress of the Wetlands Outcome is measured from zero acres starting in 2010 when the first Watershed Implementation Plans were drafted and adopted by each jurisdiction. Between 2010 and 2013, 6,098 acres of wetlands were established, rehabilitated or re-established on agricultural lands throughout the watershed.

DATA SOURCE: Jurisdictional representatives compile state, federal and non-governmental wetland restoration and enhancement accomplishments and data and submit the to the Chesapeake Bay Program. Wetland restoration on agricultural lands is tracked through the National Environmental Information Exchange Network.

WATER QUALITY GOAL

2025 Watershed Implementation Plans (WIPs)

OUTLOOK
OFF COURSE

OUTCOME: By 2025, have all practices and controls installed to achieve the Bay's dissolved oxygen, water clarity/submerged aquatic vegetation, and chlorophyll-a standards as articulated in the Chesapeake Bay Total Maximum Daily Load (Bay TMDL) document.

PROGRESS AS OF 2021: The 2025 WIP Outcome is off course. According to the Chesapeake Assessment Scenario Tool (CAST), pollution controls put in place in the Chesapeake Bay watershed between 2009 and 2020 lowered nitrogen loads 13%, phosphorus loads 14% and sediment loads 4%. This is an improvement in nitrogen and phosphorus reductions from the 2009-2019 period when it was estimated that nitrogen had decreased by 11% and phosphorus by 10%. Sediment has remained static at a 4% reduction between the two time periods. As of 2020, conservation practices are currently in place to achieve 47% of the nitrogen reductions, 64% of the phosphorus reductions and 100% of the sediment reductions. The vast majority of the nitrogen and phosphorus reductions to date came from improvements to wastewater treatment facilities and efforts from the agricultural sector helped to lower sediment. Remaining nitrogen reductions are expected to mainly come from the agricultural sector, representing at least a seven fold increase in historical implementation rates.

BACKGROUND: In 2010, the Environmental Protection Agency established the landmark Chesapeake Bay Total Maximum Daily Load (TMDL)—a federal "pollution diet" that sets limits on the amount of nitrogen, phosphorus and sediment that can enter the Bay and its tidal rivers and still meet water quality goals. In an effort to achieve the Bay TMDL, each of the seven watershed jurisdictions created WIPs that spell out detailed, specific steps that each will take to meet their pollution reductions by 2025. Federal, state and local governments coordinate through the Chesapeake Bay Program to develop the WIPs. Now in Phase III, the 2025 WIP Outcome indicates the partnership's progress towards reducing pollution in the waterways that feed the Bay.

BASELINE: The year 2009 was established as the baseline year because it the last year for which pollution reduction progress was assessed prior to EPA establishing the Bay TMDL in 2010. In this year, 297.79 million pounds of total nitrogen, 17,171 pounds of phosphorous and 18,910 pounds of sediment had entered the Bay.

DATA SOURCE: Each year, the seven watershed jurisdictions report the steps they have taken to reduce nitrogen, phosphorus and sediment pollution from entering the rivers and streams that flow into the Chesapeake Bay to the Environmental Protection Agency. Chesapeake Bay Program experts then run this information through the Watershed Model to estimate how far its partners have come toward meeting the pollutant reductions goals outlined in the *Chesapeake Bay Watershed Agreement* and the Bay TMDL.

WATER QUALITY GOAL

Water Quality Standards Attainment & Monitoring Outcome

OUTLOOK
OFF COURSE

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 (Bay 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 AS OF 2021: The Water Quality Standards Attainment and Monitoring Outcome is currently off course. Tidal monitoring has been recognized as insufficient to fully assess water quality standards since the criteria was established in 2003. Data collection in the Bay has declined each year. Nontidal monitoring has maintained a network of about 125 sites across the watershed for the last decade. However, annual funding shortfalls and a major monitoring gap in the Coastal Plan region, limits assessments of nitrogen and phosphorus pollution entering tidal waters. During the most recent assessment period (2017-2019), the Chesapeake Bay Program estimated that 33% of the Bay and its tidal tributaries met water quality standards attainment for dissolved oxygen, water clarity (measured through underwater grass abundance) and chlorophyll a. Currently, 67% of the Chesapeake Bay and its tidal waters are likely to be impaired, although long-term trends (1985-2019) have improved.

BACKGROUND: In 2012, the Chesapeake Bay Program endorsed a more integrated approach in assessing progress toward the Bay TMDL and attaining water quality standards. The integrated approach includes the reporting of water quality management practices, the analyses of nitrogen, phosphorus and sediment trends in the watershed and the assessment of the attainment of dissolved oxygen, chlorophyll a and water clarity in measuring progress. To quantify and explain water quality trends in the watershed, the integrated approach uses monitoring information, enhanced best management practice implementation data and the use of several analytical tools.

BASELINE: The baseline for the Water Quality Standards Assessment and Monitoring Outcome was set in 2012. At that time, 90 of the 291 designated use segments in the Chesapeake Bay met water quality standards, or an estimated 31%.

DATA SOURCE: Tidal water quality is evaluated using three parameters: dissolved oxygen, water clarity and chlorophyll a. Data to inform these three parameters come from the Chesapeake Bay Program tidal monitoring network. Data regarding the amount of nitrogen, phosphorus and sediment pollution entering tidal waters are collected at nine River Input Monitoring stations. The indicator is also informed by water samples taken from wastewater treatment plants, computer-simulated estimates of nitrogen and phosphorus pollution from nonpoint sources and computer-simulated estimates of air deposition of nitrogen to tidal waters. Monitoring data is also collected at more than 100 nontidal monitoring stations throughout the watershed.

TOXIC CONTAMINANTS GOAL

Toxic Contaminants Research Outcome

OUTLOOK
ON COURSE

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 (BMPs) might provide multiple benefits of reducing nutrient and sediment pollution as well as toxic contaminants in waterways.

PROGRESS AS OF 2021: The Toxic Contaminants Research Outcome is on course. Progress has been made to further characterize the occurrence, concentrations, sources and effects of mercury and PCBs, along with a new emphasis on per—and polyfluoroalkyl substances (PFAS). However, our ability to characterize more regional occurrences and concentrations of other contaminants, such as pesticides, has been limited. A recent Chesapeake Bay Program Scientific and Technical Advisory Committee workshop, Integrating Science and Developing Approaches to Inform Management for Contaminants of Concern in Agricultural and Urban Settings, provided insights for a limited number of BMPs that have co-benefits between nutrient, sediment and contaminant reductions. As this scientific area is somewhat limited, the Phase III Watershed Implementation Plans do not have an emphasis on addressing the co-benefits for contaminant reductions at this time.

BACKGROUND: In 2013, a Chesapeake Bay Program report, Toxic Contaminants in the Chesapeake Bay and its Watershed: Extent and Severity of Occurrence and Potential Biological Side Effects, revealed that more information was needed to formulate effective reduction strategies for contaminants. The Toxic Contaminants Workgroup worked with stakeholders in 2015 to identify five priority issues to be addressed in the Toxic Contaminant Research outcome. They include: Synthesize information to make fish and shellfish safer for human consumption; Understand the influence of contaminants degrading the health and contributing to the mortality of fish and wildlife; Document the sources, occurrence and transport of contaminants in different landscape settings; Provide science to help mitigate contaminants and emphasize the co-benefits with nutrients and sediment reductions; Gather information on issues of emerging concerns.

BASELINE: Baseline information for the contaminants impacting the five priority issues originally came from the above-referenced 2013 Chesapeake Bay Program report. A qualitative assessment of the baseline understanding for the sources, occurrence and effects for these contaminant groups was prepared by the Toxic Contaminants Workgroup. The contaminant groups with the greatest uncertainty are the primary emphasis of the research efforts.

DATA SOURCE: One supporting item in the outcome provides a qualitative assessment of progress—further characterize the occurrence, concentrations, sources and effects of mercury, PCBs and other contaminants of emerging and widespread concern. Data are based on impairments reported by each jurisdiction and research by federal agencies and academic partners, who rely on the monitoring of select toxic contaminants in water, sediment and fish tissue to increase the understanding of their impacts.

TOXIC CONTAMINANTS GOAL

Toxic Contaminants Policy and Prevention Outcome

OUTLOOK
OFF COURSE

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 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 AS OF 2021: The Toxic Contaminants Policy and Prevention Outcome is off-course. Since 2010, each biennial update has seen the number of tidal segments in the Chesapeake Bay that are listed as fully or partially impaired due to toxic contaminant increase, with the number reaching 82% in 2016. Chesapeake Bay Program partners are building off current state programs to implement local Total Maximum Daily Loads (TMDLs) to advance the remediation efforts of polychlorinated biphenyls (PCBs) in localized areas (e.g., Patapsco River, Anacostia River), as well as making improvements to wastewater treatment plants and increasing implementation of land-based best management practices. Despite these efforts, overall water quality standards and attainment in the Chesapeake Bay and its tidal tributaries, which contributes to waterways being listed as impaired for PCBs and other contaminant-related impairments, continues to decline. In addition to PCBs and mercury which are the leading causes of fish consumption advisories, the Toxic Contaminant Workgroup is interacting with jurisdictions to formulate a coordinated approach in assessing per—and polyfluoroalkyl substances (PFAS), which have begun to appear in concentrations that are resulting in new fish consumption advisories throughout the watershed.

BACKGROUND: Chesapeake Bay Program partners came together to focus this outcome on high-priority pollutants. Although there are many contaminants of potential concern, it was decided that they would focus first on PCBs, in part because they often trigger fish consumption advisories, and committed to reduce other contaminants in the future as further priorities were identified. The partnership applies its collective abilities to reduce inputs of PCBs, though the same inputs often contain other contaminants of concern, such as mercury, pesticides, polycyclic aromatic hydrocarbons, known and suspected endocrine disruptors and microplastics.

BASELINE: The baseline for toxic impairments in the tidal Chesapeake Bay was recorded in 2010 and found that 74% of the Bay and its total tributaries were fully or partially impaired by a toxic contaminant listed on a state's 303(d) list. Fifty-eight percent of the impairments came from PCBs. Watershed jurisdictions provided the following data to inform the baseline: Widespread contamination of fish and extensive fish consumption advisories; extensive impairments of both tidal and non-tidal waters due to PCBs; and numerous existing PCB TMDLs across the watershed as well as those under development.

DATA SOURCE: Data in this outcome is obtained from 303(d) lists for Delaware, the District of Columbia, the Environmental Protection Agency, Maryland and Virginia. It is notable to mention that these jurisdictions use raw data regarding chemical contaminants found in fish tissue samples to develop their lists of impaired waterways.

HEALTHY WATERSHEDS GOAL

Healthy Watersheds Outcome

? OUTLOOK **UNCERTAIN**

OUTCOME: One hundred percent of state-identified currently healthy waters and watersheds remain healthy.

PROGRESS AS OF 2021: The Healthy Watersheds Outcome is uncertain. Currently, the Healthy Watersheds Goal Implementation Team (GIT) is working toward a comprehensive understanding of the most current high-quality scientific data and information that will inform a spectrum of watershed health across the Chesapeake region at the catchment scale. An interim assessment of progress toward the Healthy Watersheds Outcome will investigate the proportion of state identified healthy waters and watersheds that are not protected and under threat of development. This information will then be communicated to stakeholders through ChesapeakeProgress. Due to changing land use, population growth, climate change and other stressors, it will be difficult to sustain 100% of state-identified healthy watersheds.

The Healthy Watersheds GIT will be able to communicate progress toward the outcome with the continued investment, refinement and cooperation within the Chesapeake Healthy Watersheds Assessment framework. The Healthy Watersheds Outcome is intricately linked to many of the other outcomes in the *Chesapeake Bay Watershed Agreement* and relies on the development and results of other indicators including, but not limited to, data related to stream health, black duck and oysters. Land use change and protection have been identified as primary factors affecting progress toward this outcome; therefore, the related Land Use Methods and Metrics Outcome and Land Use Options Evaluation Outcome are critical to the success of the Healthy Watersheds Outcome.

BACKGROUND: Healthy watersheds begin with healthy streams and bring resilience into the region in the form of clean water, critical habitat and social and economic benefits. The Healthy Watersheds GIT collaborated with a range of Chesapeake Bay Program partners to develop the outcome that is currently a part of the *Chesapeake Bay Watershed Agreement*. The long-term conservation of healthy watersheds focuses on four factors: Tracking the health of watersheds and our effectiveness in protecting them; strengthening local commitment and capacity to protect healthy watersheds; improving protection of state-identified healthy watersheds under federal programs and federal agency decision-making; and supporting state-based efforts to improve assessment and protection of healthy watersheds. The Maintain Healthy Watersheds GIT made the strategic decision to not seek a common definition for the healthy waters and watersheds and instead uses the definitions applied by each jurisdiction. The GIT chose to instead track and support state-identified currently healthy waters and watersheds.

BASELINE: Waters and watersheds across the Chesapeake Bay region identified by each jurisdiction as "healthy" serves as the baseline from which watershed health will be assessed and progress will be measured toward the outcome.

DATA SOURCE: Identified healthy waters and watersheds reported by each of the seven watershed jurisdictions.

LAND CONSERVATION GOAL

Land Use Methods and Metrics Development Outcome

OUTLOOK
ON COURSE

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 AS OF 2021: The Land Use Methods and Metrics Development Outcome is on course. The release of the Chesapeake Bay High-Resolution Land Use Project in 2016, the identification of hot spots of change using Landsat satellite data and the accurate, detection of land cover change from 2013 to 2017 have helped to improve the collective knowledge of land conversion and its associated impacts throughout the watershed. The Land Use Workgroup is currently drafting indicators of impervious cover per capita and the change in impervious cover per capita based on the Chesapeake Bay High-Resolution Land Use Project. Over the coming months, more indicators will be developed, including looking at development gain (impervious surfaces + turf + trees over turf), development gain per capita, forest clearing and regrowth, urban tree canopy gain (from new plantings) and loss, and agricultural gain and loss.

BACKGROUND: The outcome was derived from public comments received during the drafting of the most recent *Chesapeake Bay Watershed Agreement* and refined by the Land Use Workgroup and representatives from the Maryland Department of Planning and the Chesapeake Bay Commission. The public felt that the initial *Watershed Agreement* did not sufficiently address the extent and impacts of land use change throughout the watershed at a scale and accuracy level sufficient to inform local decisions. The watershed-wide methodology and local-level metrics for characterizing the rate of farmland, forest and wetland conversion by 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 was originally scheduled for completion in 2016. However, the development of high-resolution land use data for the entire watershed, in addition to the reallocation of resources to support the Chesapeake Bay Total Maximum Daily Load Mid-Point Assessment, led the Land Use Workgroup to re-evaluate the methodology and guidelines for producing metrics associated with this outcome. In January 2020, the Management Board agreed to move the deadline for this outcome to December 2021 and acknowledged that initial metrics would evolve over time with the release of new data and improvements in methods.

BASELINE: The temporal baseline for this outcome is the years 2013 (Delaware, the District of Columbia, Maryland, New York, Pennsylvania) and 2014 (Virginia and West Virginia) for which one-by-one meter resolution land cover data and land use data exist for all counties located within the Bay watershed.

DATA SOURCE: Data for this outcome will be derived from the Chesapeake Bay High-Resolution Land Use Data Project representing four-year intervals: 2013/14 – 2017/18 – 2021/22. Continuing the monitoring of high-resolution landscape change beyond 2021/22 will be further discussed by the Management Board in 2023.

LAND CONSERVATION GOAL

Land Use Options Evaluation Outcome

OUTLOOK ON COURSE

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 the efforts of local governments and others in reducing these rates by 2025 and beyond.

PROGRESS AS OF 2021: The Land Use Options Evaluation Outcome is on course. As the nature of this outcome is qualitative, it aims to determine the depth and breadth of resources aimed at reducing the rates of land conversion. The Healthy Watersheds Goal Implementation Team has packaged and made available samples of policies, actions, tools and technical resources for local governments and other stakeholders (e.g., Conservation Land-Use Policy Toolkit, Healthy Watersheds Forest Retention Project and Preserving Local Character and Landscapes module of the Local Government Guide to the Chesapeake Bay). They have coordinated projects as well as collaborative efforts toward increasing the education, understanding and capacity of local government staff to improve their knowledge of innovative conservation financing incentives. Outreach and engagement to local governments and other stakeholders across the watershed are ongoing needs. The outcomes that make up the Local Action Cohort (Land Use Options Evaluation, Land Use Methods and Metrics, Local Leadership and Tree Canopy) are currently working to further coordinate on how to engage local audiences by packaging common materials and resources together that meet their needs, in a combined outreach effort. These four outcomes are intrinsically tied together in meeting their targets. For example, the Land Use Methods and Metrics Outcome provides quanitative data that allows the Chesapeake Bay Program to track and report the rate of land conversion over time and calls for a public awareness campaign to share this information with residents, local governments, elected officials and other stakeholders. The Land Use Options Evaluation Outcome aims to determine the depth and breadth of resources aimed at reducing those rates of conversion. And the Local Leadership Outcome strives to increase the knowledge and capacity of local officials on related to water resources.

BACKGROUND: Preventing the loss of forests and wetlands by minimizing the amount of natural lands constrained by new development is the best methods for retaining the natural hydrology and pollution control that these lands provide to the Chesapeake Bay watershed. Land use change is a local issue with regional consequences. It can impact restoration and protection efforts if not understood, mitigated or otherwise planned for. This outcome was included in the Chesapeake Bay Watershed Agreement to ensure local governments have the capacity to plan for and mitigate land use change impacts. The specific outcome was derived from public comments received during the drafting of the most recent Watershed Agreement and refined by the Land Use Workgroup and representatives from the Maryland Department of Planning and the Chesapeake Bay Commission.

BASELINE: The baseline for local level metrics for characterizing land conversion rates will be developed through the Land Use Methods and Metrics Outcome.

DATA SOURCE: Since the baseline for this outcome will be developed through the Land Use Methods and Metric Outcome, the data source for the Land Use Evaluations and Options Outcome is yet to be determined.

LAND CONSERVATION GOAL

Protected Lands Outcome

OUTLOOK ON COURSE

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 AS OF 2021: The Protected Lands Outcome is on course to meet its target. Based on the most recent 2018 data, 68% of the target to protect an additional two million acres has been met, including 79% of the forest acres target and 30% of the wetlands target. Given that additional acres have been protected since 2018 and not yet counted, projections indicate the potential to meet the target early, pending updated data expected by the end of 2021. Additional emphasis is now being placed on conserving large forest tracts and wetland acres, as well as on working to exceed the original two million acre target, instead reaching to protect 30% of the watershed by 2030, in concert with the America the Beautiful Initiative and the Chesapeake Executive Council's Directive No. 21-1: Collective Action for Climate Change.

BACKGROUND: Between 2009—2010, state, federal and nongovernmental partners working on land conservation and public access met at a series of collaborative sessions to develop recommendations for supporting further progress across the watershed in these areas. These sessions led to the inclusion of the Land Conservation Goal and the Protected Lands Outcome within the *Chesapeake Bay Watershed Agreement*. The Chesapeake Conservation Partnership, a regional coalition of over 80 diverse organizations throughout the watershed, primarily guides and advances the development of this outcome.

BASELINE: At the time the Chesapeake Bay Watershed Agreement was signed, land protection was tracked only in the three states that signed *Chesapeake 2000*: Maryland, Pennsylvania and Virginia. GIS data was used to track protected lands in Delaware, New York and West Virginia. Based on this data, a baseline of 7.8 million acres of protected lands was established in 2010. By the end of 2013, approximately 8.37 million acres of land (21% of all land in the watershed) had been permanently protected from development, marking a 29% achievement toward protecting an additional two million acres of land by 2025.

DATA SOURCE: Watershed jurisdictions self-report progress toward the Protected Lands Outcome using GIS data and the Protected Areas Database.

PUBLIC ACCESS GOAL

Public Access Site Development Outcome

OUTLOOK
ON COURSE

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

PROGRESS AS OF 2021: The Public Access Outcome is on course to meet its target. A total of 206 public access sites have opened in the Chesapeake Bay watershed between 2010 and 2020, marking a 69% achievement of the partnership's goal to add 300 new access sites to the watershed by 2025. Progress is measured annually via a survey of the Bay states of actual sites opened in the calendar year.

BACKGROUND: Between 2009—2010, state, federal and nongovernmental partners working on land conservation and public access, met at a series of collaborative sessions to advance progress throughout the watershed in these areas. These sessions, along with an analysis of past trends, helped inform a new goal statement and outcomes for land conservation and public access in the *Chesapeake Bay Watershed Agreement*. At this time, 125 planned and potential public access sites already documented for near term development were identified, indicating that a target of 300 new sites by 2025 was feasible. Four types of public access sites are tracked: Boat-related, swimming, fishing and access at the water's edge for viewing water, wildlife and shoreline areas. To count as a new site, one of the following parameters must be met—development of a new public access facility on a new site, or development of a new type of access at an existing site.

BASELINE: The baseline was established in 2011 with 1,139 sites. The first year of the annual data call was in 2013 and it was reported that from 2011 to 2013, 69 new public access sites that provided additional opportunities for people to enjoy the water resources of the watershed were opened. This equates to approximately 23% of the goal to add 300 new public access sites by 2025. Overall, this brought the number of public access sites throughout the watershed to 1,208.

DATA SOURCE: Each watershed jurisdiction self-reports the number of public access sites opened each year.

ENVIRONMENTAL LITERACY GOAL

Environmental Literacy Planning Outcome

OUTLOOK ON COURSE

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 AS OF 2021: The Environmental Literacy Planning Outcome is on course. The indicator for this outcome looks to increase the number of school districts that are well-prepared to implement environmental education programming. The Environmental Literacy Indicator Tool (ELIT) is distributed to all school districts in the watershed every two years. The indicator shows that the percentage of well-prepared districts has increased slightly each year since 2015: 19% in 2015; 22% in 2017; 27% in 2019. Digging deeper into the data, 47% of the districts showed some increase in their total score, even if they did not move to a new category of preparedness, which indicates strong progress. The 2021 ELIT was delayed due to COVID-19 considerations and it is very likely that the results will show a decline due to school districts shifting their priorities due to the pandemic response and recovery.

BACKGROUND: It has been over 20 years since the Chesapeake Executive Council adopted Directive 98- 1: Chesapeake Bay Program Education Initiative, formally recognizing the importance of education to the Chesapeake Bay Program. In June 2012, the Education Workgroup released a strategy that outlined how the federal government should support state efforts to advance environmental literacy. The priorities identified in the strategy served as the basis for including the Environmental Literacy Planning Outcome in the *Chesapeake Bay Watershed Agreement*. The Education Workgroup coordinates with school districts and state agencies to provide the needed resources and training, as well as measure each school's level of preparedness to meet environmental literacy goals.

BASELINE: In 2015, among the local education agencies who responded to the ELIT, 26% reported being "Not prepared," 55% reported being "Somewhat prepared" and 19% reported being "Well-prepared."

DATA SOURCE: Data for this outcome is self-reported through the ELIT, which is administered biennially to all school districts in six of the seven watershed jurisdictions: the District of Columbia, Delaware, Maryland, Pennsylvania, Virginia and West Virginia.

ENVIRONMENTAL LITERACY GOAL

Student Outcome

OUTLOOK UNCERTAIN

OUTCOME: Continually increase students' age-appropriate understanding of the watershed through participation in teacher-supported, Meaningful Watershed Educational Experiences (MWEE) and rigorous, inquiry-based instruction, with a target of at least one meaningful watershed educational experience in each grade band—elementary, middle and high school—depending on available resources.

PROGRESS AS OF 2021: The Student Outcome is uncertain. The indicator for this outcome seeks to increase the number of systemic student MWEEs in each elementary, middle and high school as indicated through the Environmental Literacy Indicator Tool (ELIT). The rate of system-wide MWEE availability for elementary and middle school grades has shown little change since 2015. This is due, in part, to an increased understanding by school districts of the rigor of MWEEs. For high school, the indicator has increased very slightly since 2015. The 2021 ELIT was delayed due to COVID-19 considerations and it is very likely that the results will show a decline because of school districts shifting their priorities due to the pandemic response and recovery.

BACKGROUND: It has been over 20 years since the Chesapeake Executive Council adopted Directive 98- 1: Chesapeake Bay Program Education Initiative, formally recognizing the importance of education to the Chesapeake Bay Program. In June 2012, the Education Workgroup released a strategy that outlined how the federal government should support state efforts to advance environmental literacy. The priorities identified in the strategy served as the basis for including the Student Outcome in the *Chesapeake Bay Watershed Agreement*. The Education Workgroup coordinates with school districts and state agencies to provide the needed resources and training, as well as measure each school's level of preparedness to meet Student MWEE goals.

BASELINE: In 2015, system-wide availability of MWEEs was at 15% in elementary schools, 18% in middle schools and 13% in high schools.

DATA SOURCE: Data for this outcome is self-reported through the ELIT, which is administered biennially to all school districts in six of the seven watershed jurisdictions: the District of Columbia, Delaware, Maryland, Pennsylvania, Virginia and West Virginia.

ENVIRONMENTAL LITERACY GOAL

Sustainable Schools Outcome

OUTLOOK ON COURSE

OUTCOME: 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.

PROGRESS AS OF 2021: The Sustainable Schools Outcome is on course. The indicator for this outcome looks to increase the number of sustainable schools in the watershed. The indicator shows the number of sustainable schools has increased from 501 in 2015, to 610 in 2017, to 634 in 2019.

BACKGROUND: It has been over 20 years since the Chesapeake Executive Council adopted Directive 98- 1: Chesapeake Bay Program Education Initiative, formally recognizing the importance of education to the Chesapeake Bay Program. In June 2012, the Education Workgroup released a strategy that outlined how the federal government should support state efforts to advance environmental literacy. The priorities identified in the strategy served as the basis for including the Sustainable Schools Outcome in the *Chesapeake Bay Watershed Agreement*. To achieve this outcome, the Education Workgroup coordinates with state agencies, local governments and schools to provide the resources and funding needed to install sustainable features in schools.

BASELINE: In 2015, 501 schools were considered sustainable.

DATA SOURCE: Data for this outcome is collected from public and charter K-12 schools in the Chesapeake Bay watershed that are certified sustainable through a state or national program (e.g., U.S. Department of Education Green Ribbon Schools). Data is updated every two years.

STEWARDSHIP GOAL

Citizen* Stewardship Outcome

? OUTLOOK **UNCERTAIN**

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

PROGRESS AS OF 2021: The Citizen Stewardship Outcome is uncertain. A quantitative target has not been established for the Citizen Stewardship Outcome. In 2021, a baseline indicator was developed using data from the 2017 Citizen Stewardship Index. Resources are now needed to prioritize programmatic efforts and build desired behaviors.

BACKGROUND: A commitment to fostering individual responsibility and stewardship of the Bay's resources was first included in the *1987 Chesapeake Bay Watershed Agreement*. *Chesapeake 2000* reaffirmed that commitment with a stewardship and community engagement goal, and then in the 2010 *Strategy for Protecting and Restoring the Chesapeake Bay Watershed*, a goal to "Foster a dramatic increase in the number of citizen stewards of every age who support and carryout local conservation and restoration" was committed to by the Chesapeake Bay Federal Leadership Committee. This led to the inclusion of the Citizen Stewardship Outcome in the most recent *Chesapeake Bay Watershed Agreement*. The Stewardship Workgroup aims to measure the impact of stewardship programs, support the implementation of highly effective programs, and expand the number and diversity of volunteers and community leaders.

*In 2021, where possible, the Stewardship Workgroup replaced the use of *citizen stewardship* with the more inclusive *stewardship*, reinforcing that all residents in the Chesapeake Bay watershed can be good stewards.

BASELINE: In 2017, residents of the Chesapeake Bay region scored a 24 out of 100 on the Stewardship Index. To earn a score of 100, everyone in the region would need to do everything they could in their daily lives to improve water quality and environmental health. There are three components to this score:

- Advocating: Measures the portion of the public engaged in local and regional activities on behalf of water quality and environmental health. The current score is 19.
- Personal Action: Measures the adoption of 19 actions that individuals can take to improve water quality and environmental health. The current score is 38.
- Volunteering: Measures the portion of the public participating in community efforts to improve water quality and environmental health. The current score is 23.

DATA SOURCE: The Citizen Stewardship Index is informed by data collected through a survey of randomly selected individuals across the watershed. In 2021, Chesapeake Behavior Change was developed to house the data from the Citizen Stewardship Index and assist organizations in applying the results to their work. The next survey to update the data is expected to be conducted in 2022.

STEWARDSHIP GOAL

Diversity Outcome

OUTLOOK
OFF COURSE

OUTCOME: Identify stakeholder groups that are not currently represented in the leadership, decision making and implementation of conservation and restoration activities, and create meaningful opportunities and programs to recruit and engage them in the partnership's efforts.

PROGRESS AS OF 2021: The Diversity Outcome is currently off course. Diversity surveys conducted in 2016 and 2019 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, and an increase in the percentage of people of color in leadership positions from 9.1% to 10.3%. While diversity surveys issued in 2016 and 2019 tracked progress toward the target of increasing racial and ethnic diversity within the Chesapeake Bay Program partnership and leadership, meeting the overall outcome has not been tracked using a numeric indicator. Additional metric(s) should be explored to track these other components. An effective methodology for measuring success will need to be determined by the Diversity Workgroup in partnership with the Executive Council, Principals' Staff Committee and the Management Board.

BACKGROUND: Stakeholder feedback collected during the development of the most recent *Chesapeake Bay Watershed Agreement* pointed out a clear need for including diversity as an outcome. In 2018, the partnership set a target for this outcome to increase the racial and ethnic diversity representation in the partnership to 25% and increase the percentage of people of color in leadership positions to 15% by 2025. The Diversity Workgroup oversees progress toward meeting this outcome, as well as leads the effort to intentionally incorporate equity, inclusion and justice into the overall implementation of the *Chesapeake Bay Watershed Agreement*.

BASELINE: In 2016, a Diversity Survey found that 13.7% of respondents identified as people of color. Among those who identified as Chesapeake Bay Program leadership, 9.1% identified as people of color.

DATA SOURCE: The Diversity Survey is delivered to all partners of the Chesapeake Bay Program on a biennial basis. However, the response rate for the 2016 and 2019 surveys were low, and there is concern that the analysis does not truly capture data that assess the outcome, and that it does not effectively portray the full scope of diversity, equity, inclusion and justice work throughout the partnership. Prior to conducting future data collection, the process for distributing and explaining the survey will be evaluated in an effort to improve response rates and comparability of the data. The 2021 Diversity Survey has been delayed due to the federal approval process for conducting surveys.

STEWARDSHIP GOAL

Local Leadership Outcome

OUTLOOK
UNCERTAIN

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 AS OF 2021: The Local Leadership Outcome is uncertain. Significant progress has been made in the last few years, including an evaluation of existing educational opportunities, stakeholder interviews and recommendations for engaging with local leaders, creation of the methodology for a baseline survey, development of tailored educational materials and ongoing engagement with local government trusted sources. Over the last two years, efforts have engaged an estimated 1,500 local government elected officials and staff covering all six watershed states and the District of Columbia. However, the development of an indicator, which would depend upon data collected via survey to inform a baseline, is on hold until the Office of Management and Budget approves the content.

BACKGROUND: In 2014, approximately 60 local appointed and elected officials, senior government staff, experts in leadership training and other stakeholders, participated in a workshop to share descriptions of successful watershed protection and restoration efforts, identify gaps in information and resources and recommend actions to increase the knowledge and capacity of local officials to help them manage natural resources more effectively. Recommendations from the workshop informed the development of the outcome.

BASELINE: The success of Chesapeake Bay restoration efforts not only rely on the ability to increase the knowledge and capacity of local leaders, but also on voluntary, informed actions by local officials, watershed associations, nongovernmental organizations, grassroot leaders and individual stewards. To that end, the indicator for this outcome will relate to the building of knowledge and capacity of local officials. A baseline has not yet been established.

DATA SOURCE: When approved, the Local Leadership indicator will contain multiple factors, including assessing the knowledge and capacity among local leaders through a survey instrument conducted every two years. However, developing this type of measurement is problematic due to the high turnover raters in local governments. Other potential data sources may include public opinion polls, the number of municipalities that have built in certifications or training or tracking the number of educational resources available to local officials.

CLIMATE RESILIENCY GOAL

Climate Adaptation Outcome

OUTLOOK
OFF COURSE

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 AS OF 2021: The Climate Adaptation Outcome is off course. Very little has been done to pursue, design and construct restoration and protection projects to enhance the resiliency of the Bay and aquatic ecosystems. This is in part due to limited progress on the monitoring and assessment outcome, which will provide information to guide adaptation actions. Current coordination efforts with local governments and subject matter experts are leading to recommendations addressing climate-related flooding. More work is required to connect scientific assessments with adaptation planning to target, design and ultimately fund the implementation of restoration and protection projects.

BACKGROUND: While no formal ecological condition or programmatic baseline for climate adaptation had been established prior to the *Chesapeake Bay Watershed Agreement*, Chesapeake Bay Program partners had been engaged in climate change-related activities for several years. In the 2010 *Strategy for Protecting and Restoring the Chesapeake Bay Watershed*, it was noted that changing climatic conditions are a significant challenge to the successful restoration and protection of the Chesapeake Bay and its watershed. The Climate Adaptation Outcome is built off of the strategy's recommended objectives to minimize the vulnerability of the watershed, including its habitats, public infrastructure and communities, to adverse impacts from climate change, as well as demonstrate and implement effective restoration planning. Reports prepared by the Chesapeake Bay Program's Scientific and Technical Advisory Committee (particularly, *Climate Change and the Chesapeake Bay: State-of-the-Science-Review and Recommendations*) have provided a sound basis pursing, designing and constructing restoration and projection projects to enhance the resiliency to the impacts of changing climatic conditions within the Chesapeake Bay watershed.

BASELINE: A current baseline for the Climate Adaptation Outcome does not yet exist. However, on-the-ground restoration efforts will be addressed largely through the 29 individual outcomes that make up the *Chesapeake Bay Watershed Agreement*. It is highly recommended that these efforts be made "climate smart" by considering and integrating changing climatic conditions, such as sea level rise and storm surge factors in the pursuit, design, implementation and long-term maintenance of restoration components for each outcome. Climate change considerations must also be designed into current agricultural, forestry, urban and wastewater best management practices.

DATA SOURCE: Data sources do not currently inform the Climate Adaptation Outcome.

CLIMATE RESILIENCY GOAL

Climate Monitoring and Assessment Outcome

? OUTLOOK **UNCERTAIN**

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 AS OF 2021: The Climate Monitoring and Assessment Outcome is uncertain. Monitoring and assessing the impacts of climate change on the resiliency of our living resources, habitats and communities is a significant challenge. The Climate Resiliency Workgroup is supporting science to assess and forecast the effects of climate change on selected aspects of the watershed and estuary; evaluating best management practice performance under a changing climate; and identifying the management utility of climate change indicators. In 2021, the Climate Resiliency Workgroup undertook a thorough review of the indicators. They identified whether an indicator would stay the same, is in the process of being updated or should be refined to better connect with the *Chesapeake Bay Watershed Agreement* goals. They also decided on brand new indicators that will be incorporated into the outcome. This review was approved by the Management Board in March 2021. More work is required to develop metrics that assess impacts and guide projects that improve resiliency and enhance the support of monitoring.

BACKGROUND: While no formal ecological condition or programmatic baseline for climate resiliency had been established prior to the Chesapeake Bay Watershed Agreement, Chesapeake Bay Program partners had been engaged in climate change-related activities for several years. In the 2010 *Strategy for Protecting and Restoring the Chesapeake Bay Watershed*, it was noted that changing climatic conditions are a significant challenge to the successful restoration and protection of the Chesapeake Bay and its watershed. The Climate Monitoring and Assessment Outcome is built off of the strategy's recommended actions to improve the monitoring of climate change impacts in the Bay and throughout the watershed, as well as ensure monitoring results are integrated and available to assess the effectiveness and adjust management actions as necessary. Reports prepared by the Chesapeake Bay Program's Scientific and Technical Advisory Committee (particularly, *Climate Change and the Chesapeake Bay: State-of-the-Science-Review and Recommendations*) have provided a sound basis for what it is envisioned will be a continuous effort to monitor and assess changing climatic conditions and resulting impacts throughout the watershed.

BASELINE: In 2018, the Climate Resiliency Workgroup developed five indicators to track the impact that changing climatic conditions are having on the physical environment of the watershed. They include:

• Average Air Temperature and Changes in High Temperature Extremes: Air temperature has increased over the last 100 years (1901-1917). However, throughout the Chesapeake Bay watershed, only one weather station showed a statically significant increase in high temperature extremes since 1984.

• Changes in Total Annual Precipitation: Annual precipitation totals in some parts of the watershed have increased over the last 100 years (1901-1917).

• Relative Sea Level Rise: Between 1960 and 2017, the level of the Bay has risen between one-eighth of an inch and approximately one-sixth of each inch each year.

• River Flood Frequency and Magnitude: Between 1965 and 2015, 72% of 47 stream sites in Delaware, Maryland, Pennsylvania, Virginia and West Virginia experienced an increase in the size of river floods. Seventy-one percent of stream sites experienced an increase in the frequency of river floods.

• Stream Water Temperature: Data shows that average annual stream temperature in the watershed has increased by 1.1 degrees Fahrenheit over the past six decades. Seventy-nine percent of 72 streams sites monitored between 1960 and 2014 experienced an increase in water temperature, averaging approximately 2.1 degrees Fahrenheit.

DATA SOURCE: The Chesapeake Bay Program has reviewed the current climate monitoring and assessment indicators and is developing more that will track the ecological and social impacts of climate change, in addition to others related to the physical environment. Further development of these indicators will depend on the quality of supporting data, the added value of the indicators in question and the priorities and resources of the Climate Resiliency Workgroup. Data sources for the five existing indicators are as follows:

• Average Air Temperature and Changes in High Temperature Extremes: Data related to changes in average air temperature and high temperature extremes come from temperature measurements collected at land-based weather stations by the National Oceanic and Atmospheric Administration (NOAA). This indictor will need to be refined to better connect with the Tree Canopy Outcome in the future.

• Changes in Total Annual Precipitation: Data is collected from precipitation measurements at land-based weather stations by the NOAA and maintained by the National Centers for Environmental Information.

• Relative Sea Level Rise: Data to measure relative sea level rise is collected by the NOAA through their network of tidal gauge stations. The devices measure the change in sea level relative to the land surface. This indicator will need to be refined to better connect with the Wetlands Outcome in the future.

• River Flood Frequency and Magnitude: Data for these indicators are collected from USGS monitoring stations. Stream gauges measure stream elevation continuously, while the USGS measures actual discharge. Data are no longer available for this indicator. *

• Stream Water Temperature: Changes related to stream water temperature come from measurements conducted by the U.S. Geological Survey at monitoring stations around the Chesapeake Bay watershed. This indicator will need to be refined to better connect with the Stream Health and Brook Trout outcomes in the future.

*Data are not currently available to support the River Flood Frequency and Magnitude indicator. Instead, it was decided to develop a Tidal Bay Water Temperature Change indicator in connection with water quality thresholds for fish and underwater grasses.

Additional parts of each indicator were adapted from a national indicator maintained by the U.S. Environmental Protection Agency.