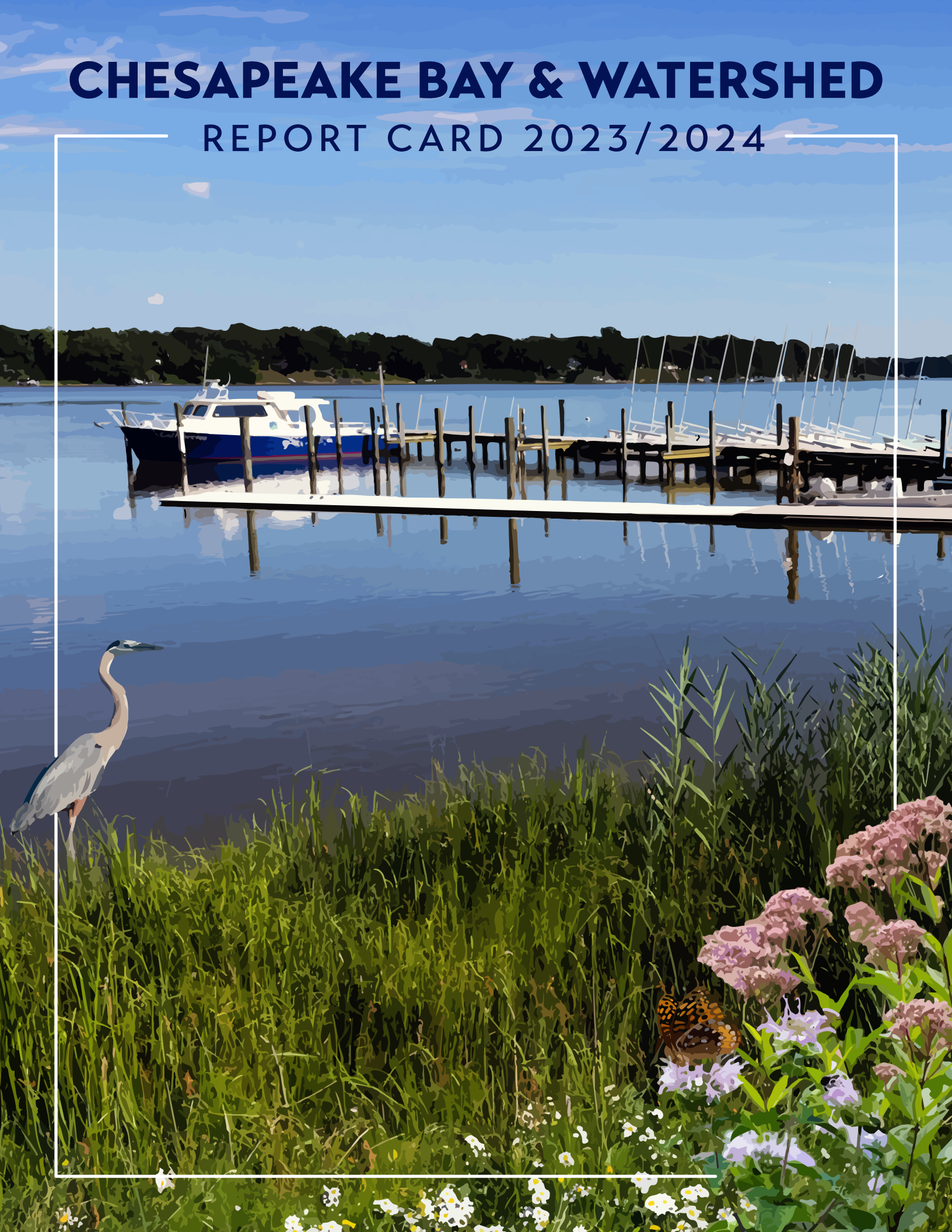
CHESAPEAKE BAY & WATERSHED

REPORT CARD 2023/2024



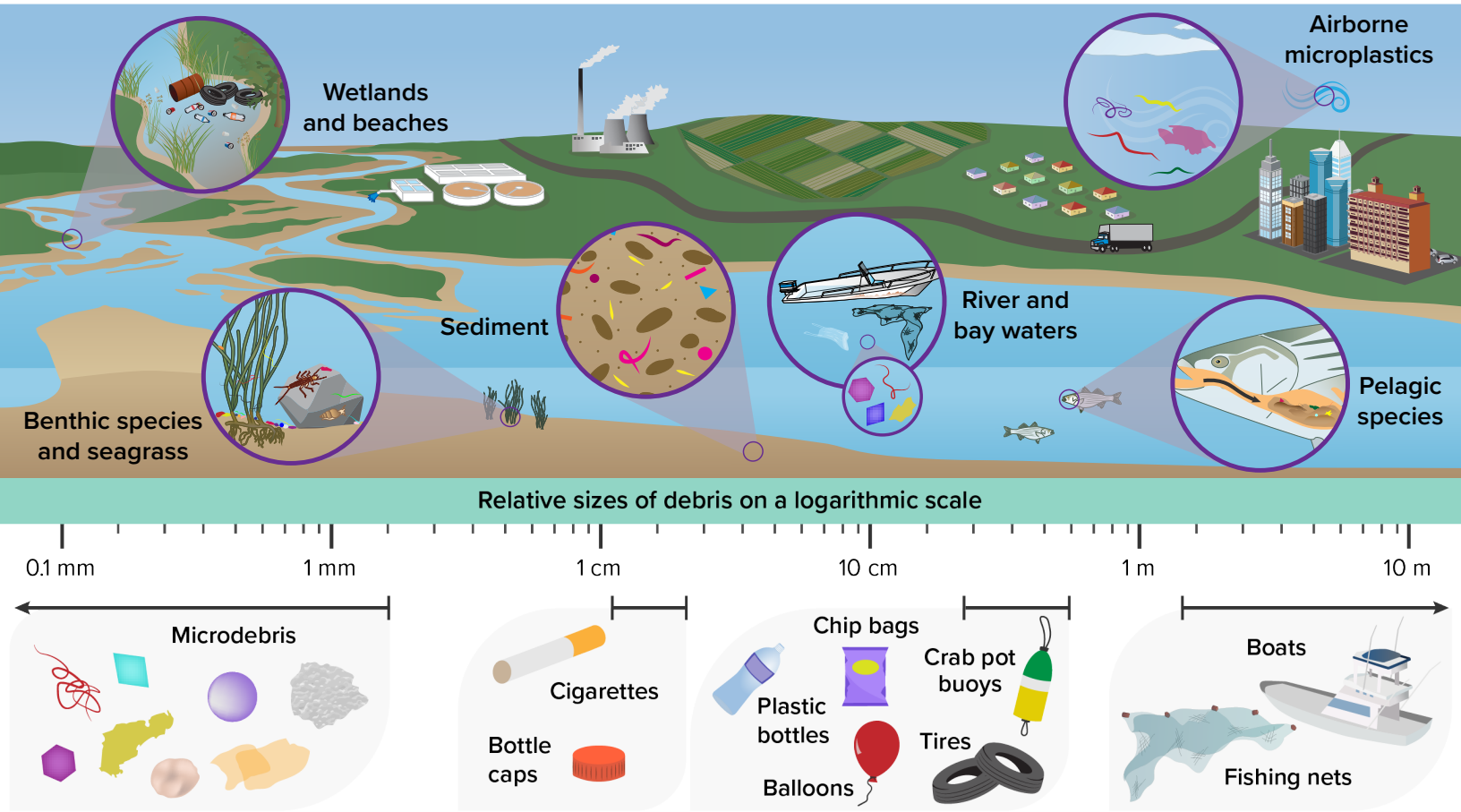
Developing a man-made debris indicator for a healthier Chesapeake Bay

Human activities can result in the introduction of debris into the natural environment. Man-made debris encompasses a variety of materials, from microplastics and cigarette butts to food wrappers and even abandoned boats. This debris can be found in the air, water, soil, and sediment around the Chesapeake Bay and its watershed, affecting the health of plants, animals, and humans living in this area. Currently, not all of this debris is monitored, and the data is not collected uniformly across the Chesapeake Bay and watershed. To help fill these knowledge gaps, UMCES researchers are building a man-made debris indicator to understand the different types of debris contamination across the region and the degree of contamination, and to determine hotspots of pollution. This information can be used by managers and policy makers to create targeted prevention and mitigation strategies.

Scan the QR Code on the back of this report card to learn more about UMCES research efforts regarding man-made debris!

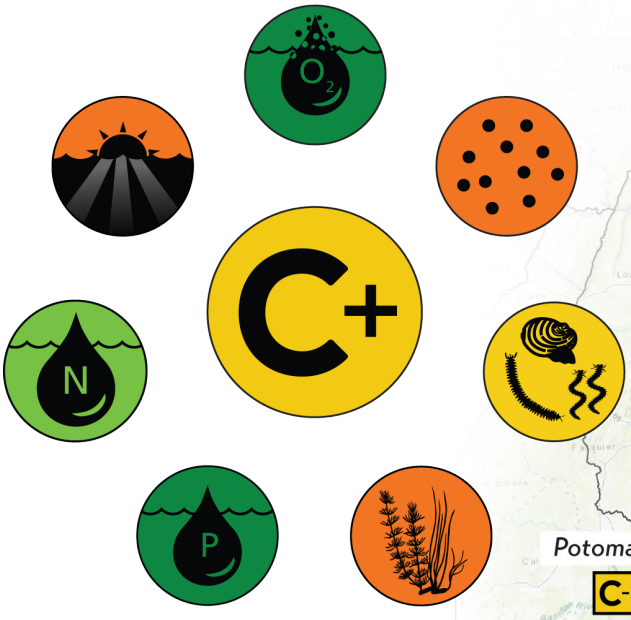
An assortment of debris in a sieve collected from the Atlantic Ocean. Photo courtesy of Nicole Trenholm.

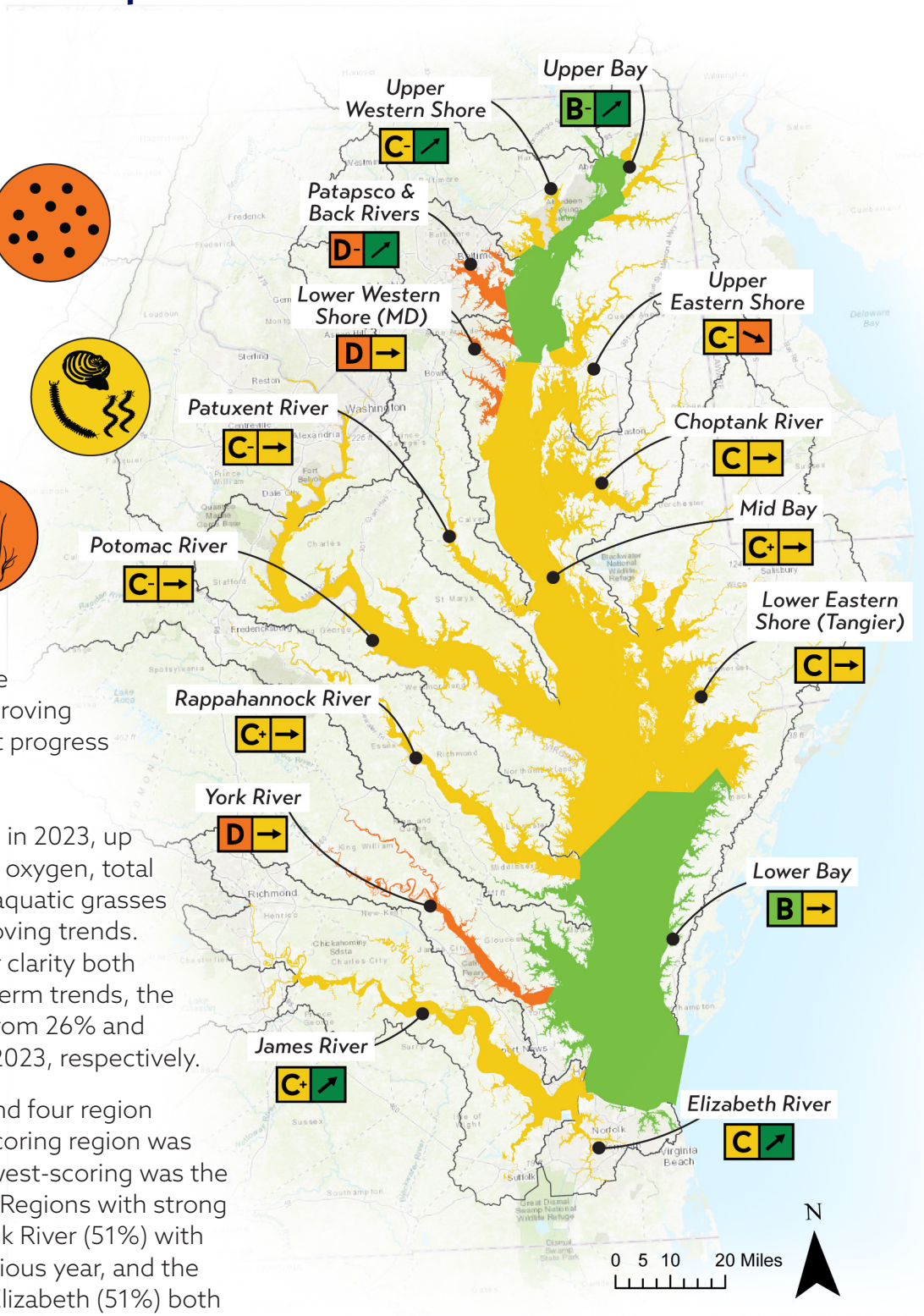
Man-made debris accumulates in different locations and comes in various sizes



Man-made debris can be found in various locations that can be measured, monitored, and reported in future report cards. These pollutants come in many forms and sizes, from the tiniest microplastics to cigarette butts and bottle caps to large fishing nets and boats. To account for these variations, a man-made debris indicator will need to include different categories of debris.

The Chesapeake Bay has improved to C+ for the first time in over 20 years





The overall Chesapeake Bay score is still showing a significantly improving trend. This is an exciting sign that progress is being made in bay restoration.

The overall health score was 55% in 2023, up 4% from the past year. Dissolved oxygen, total phosphorus, total nitrogen, and aquatic grasses scores all have significantly improving trends. Although chlorophyll *a* and water clarity both continue to have declining long-term trends, the indicator scores have improved from 26% and 20% in 2022 to 31% and 24% in 2023, respectively.

Eleven region scores increased and four region scores decreased. The highest-scoring region was the Lower Bay (70%), and the lowest-scoring was the Patapsco and Back Rivers (22%). Regions with strong improvements were the Choptank River (51%) with a 15-point increase from the previous year, and the Upper Eastern Shore (40%) and Elizabeth (51%) both with 13-point increases. The Upper Western Shore was the only bay region with a large, 10-point decrease (42%), due to lower grades for total phosphorus, benthic community, and aquatic grasses.

Regions with significantly improving trends were the James, Elizabeth, Patapsco and Back Rivers, Upper Bay, and Upper Western Shore, while the Upper Eastern Shore exhibited a slightly declining trend.

Grade scale

A	B	C	D	F
100-80	79-60	59-40	39-20	19-0

Health trends

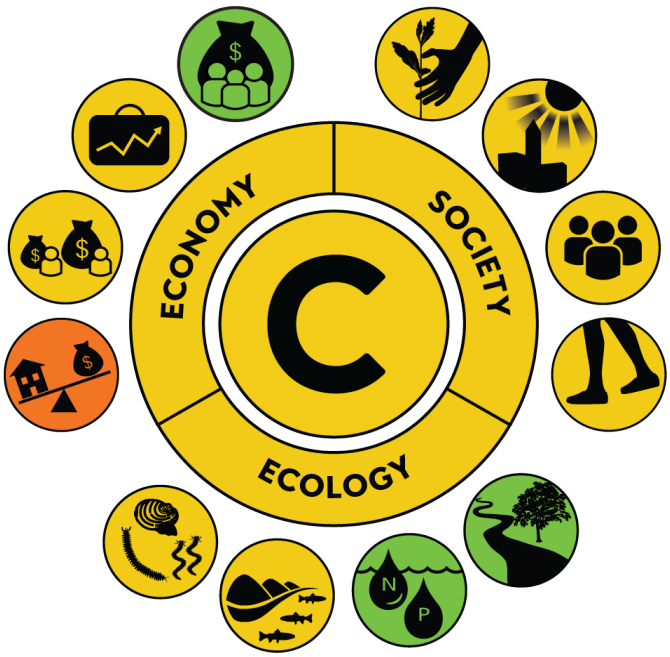
↗	↗	→	↘	↘
Significantly improving	Slightly improving	No change	Slightly declining	Significantly declining

Chesapeake Bay Watershed health is in moderate condition

Overall, the Chesapeake Bay Watershed scored 52% (C), the same score as 2022. The highest-scoring region was the Upper James (63%, B-), and the lowest-scoring region was the Choptank (39%, D+).

This year, we are looking at the watershed scores in reference to the land use of the regions as shown on the map on the right.

Several indicators also received new methodology or an update by their providers that will better support the assessment of these data. We provide links to these sources on our website (chesapeakebayreportcard.org) for viewers to explore the data available for the Chesapeake Bay Watershed regions.

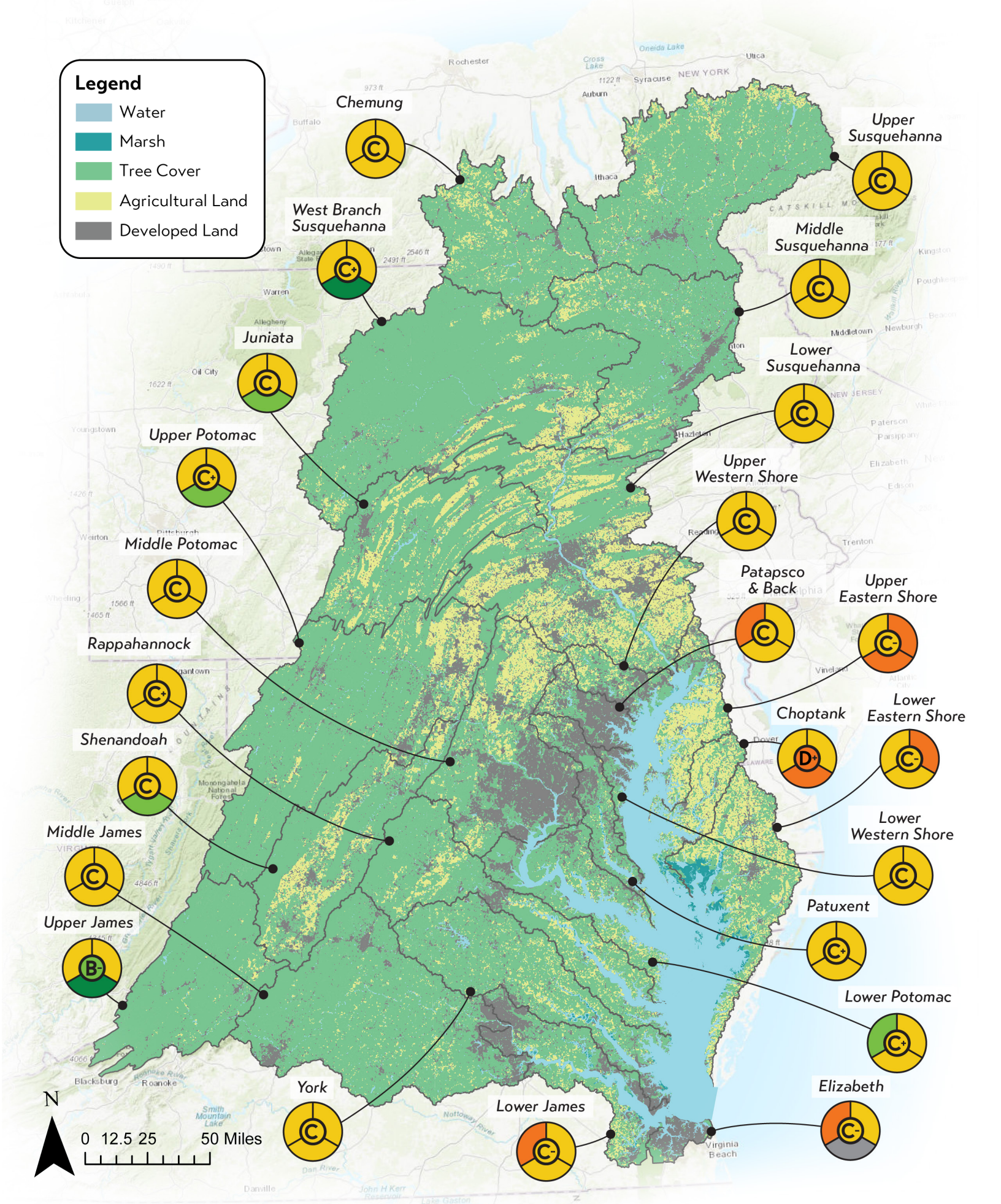


Economic, social, and ecological conditions are influenced by land use

The overall Economic score for the Chesapeake Bay Watershed was 49% (C), decreasing by two points from last year. The Lower Potomac scored the highest (64%, B-), while the Patapsco and Back scored the lowest (35%, D+). The highest-scoring indicator was median household income (64%, B-) and the lowest-scoring indicator was housing affordability (39%, D+). Major cities had some of the worst economic scores, whereas the highest economic scores were mostly in suburban areas. Baltimore and Washington DC are in the lowest ranking for income inequality, housing affordability, and jobs growth but are surrounded by counties that have some of the highest median income scores in the watershed.

The Societal category scored 47%, the same score as the previous year. The Lower Western Shore and the Upper Susquehanna regions both received the highest score of 53% (C), while the Lower Eastern Shore region received the lowest score of 37% (D+). Similar to previous years, nearly all regions had moderate overall scores but had more variability in indicator scores. The stewardship index (41%, C-) increased by 5 points from 2020 and a majority of regions had improved scores from the last update. The social index (57%) score used for 2023 is the same as the previous year. Generally, regions dominated by agricultural lands had the lowest overall scores in the Societal category.

The overall Ecological score of 59% (C+) is a two-point decrease from last year. The Upper James (86%, A) is the highest-scoring region, while the Choptank (33%, D) scored the lowest. The water quality index scored 68% (B) and is a combination of indicators for total nitrogen (73%, B) and total phosphorus (62%, B-). Scores for protected lands (76%, B+) increased by two-points from the last update in 2020. Scores for stream benthic community (52%, C) and fish community index (48%, C) were from 2020 and 2022, respectively, since no new data were available. Very good and good ecological scores were observed in regions with high tree cover and low agricultural or development use.



Map of the Chesapeake Bay Watershed showing land use and the overall grade for each reporting region based on scores for the economic (top left), social (top right) and ecological (bottom) categories.

Agricultural land use has major impacts on the Eastern Shore

For the 2023/2024 Report Card, we focus on the Eastern Shore of the watershed after they received some of the lowest scores for river and watershed health in the previous year. The Eastern Shore of the Chesapeake Bay is made up of three tributaries: the Upper Eastern Shore, Choptank River, and Lower Eastern Shore. Two out of three bay regions improved their scores from the previous year, possibly due to less rainfall and decreased runoff of sediments and nutrients to the rivers. Despite these improvements, the Upper Eastern Shore is still exhibiting a slightly negative trend.

Similar to the previous year, the Upper Eastern Shore, Choptank, and Lower Eastern Shore sub-watersheds received the lowest scores in the ecological and societal categories. Although these three regions make up only 7% of the total watershed area, nearly 40% of that land is devoted to agriculture, second only to tree cover that will be susceptible to future sea level rise. Soybeans and chickens are the main plant and animal products, with chickens outnumbering humans almost 600 to 1. The effects of these industries are important to monitor and manage because they directly impact smaller tributaries that flow into the Chesapeake Bay. Managing the impacts of agricultural runoff is only possible by collaborating with agricultural communities. Balancing economic and social benefits of agriculture with ecological impacts is vital to having a healthy system that supports people and nature.

Eastern Shore agriculture is dominated by chickens and soybeans

LIVESTOCK FARMING

459 million chickens

34 thousand other livestock

CROP FARMING

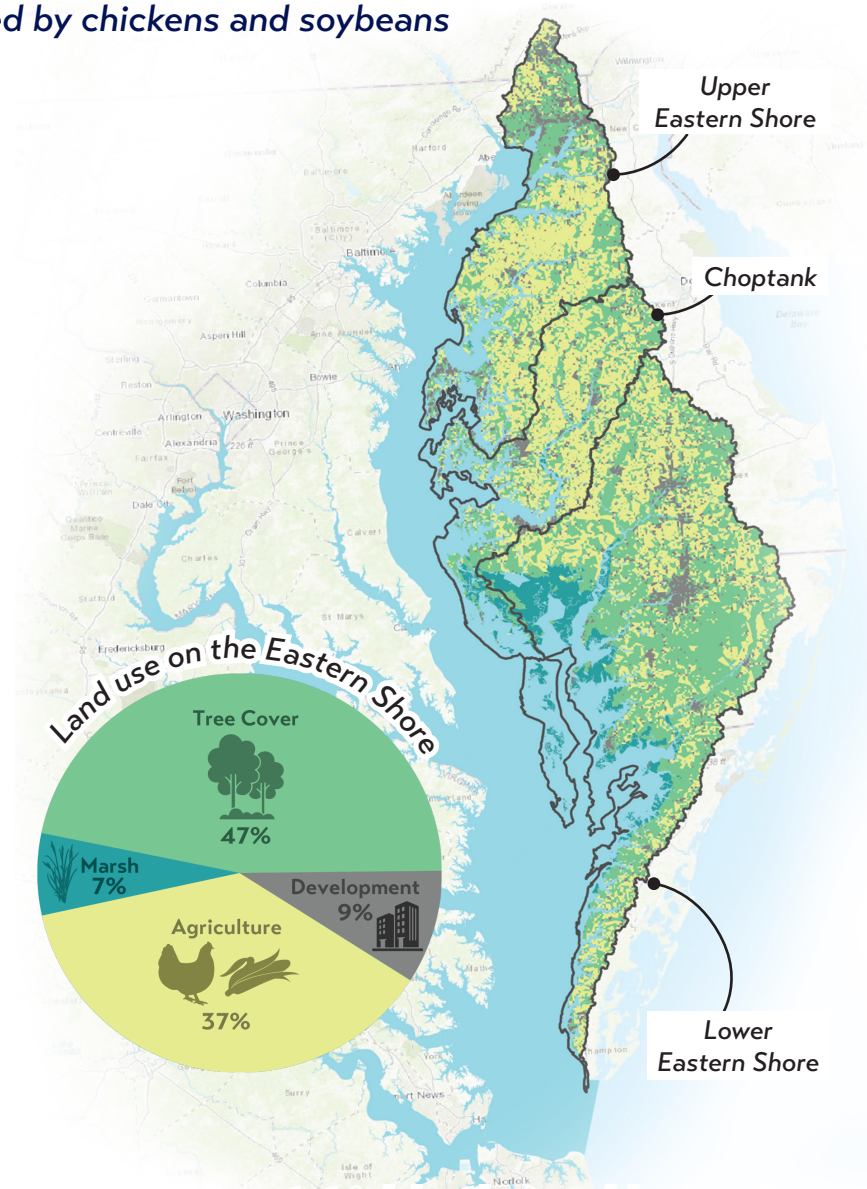
1 Million Acres

Soybeans 43%

Corn 36%

Wheat 13%

Other crops 8%



Additional agriculture outputs include cattle, pigs, and sheep, as well as corn, wheat, and other crops (USDA NASS, 2022 Census of Agriculture).

About the report card

The Chesapeake Bay and Watershed Report Card includes seven bay indicators and twelve watershed indicators. The bay indicators assess aquatic ecosystem conditions, while the watershed indicators cover ecological, societal, and economic aspects. This categorization aims to offer a more comprehensive view of the watershed. Previously, the report cards were named based on the year of the bay data used for analysis. Moving forward, they will be named after the year they are released.

This year's report card is called the 2023/2024 Chesapeake Bay and Watershed Report Card to maintain continuity. The bay indicators are based on 2023 data, while watershed indicators use data from different years, depending on what is available. For more information on the data used, please visit **chesapeakebayreportcard.org**.

Bay indicators

Total phosphorus measures the amount of phosphorus in bay waters.

Total nitrogen measures the amount of nitrogen in bay waters.

Dissolved oxygen is measured to assess how much oxygen is present at different depths.

Benthic community measures the condition of organisms living in or on the bottom areas of the bay.

Water clarity is a measure of how much light penetrates through the water column.

Chlorophyll *a* is used as a measure of phytoplankton (microalgae) biomass.

Aquatic grasses, or submerged aquatic vegetation, are one of the most important habitats in the bay.

Watershed indicators

Protected lands measures the amount of all lands protected in the watershed.

Water quality indicators include total phosphorus and total nitrogen.

Fish community index, developed by the EPA, examines river health by assessing native species and pollution tolerance.

Stream benthic community measures the condition of the organisms living on the bottom of streams.

Stewardship examines citizen stewardship in categories of behavior, volunteerism, and civic engagement.

Heat vulnerability uses metrics such as tree canopy, impervious surfaces, temperature, and households in poverty to assess vulnerability to heat.

Social index uses data about social vulnerability from the U.S. Census and measures how a community can respond to hazardous events.

Walkability measures how many people can walk to a park in 10 minutes from where they live.

Median household income is a traditional measure of economic vitality and uses data from the U.S. Census.

Jobs growth measures the percentage of jobs gained or lost (net) per capita from the past four years.

Income inequality measures the inequality in income distribution.

Housing affordability measures how much housing is available at a cost that is affordable based on income.

Enhancing the report card for greater impact

The Chesapeake Bay and Watershed Report Card is continuously being improved to develop new pathways for change, ensuring a comprehensive assessment and engaging with communities.

Creating new partnerships and expanding engagement

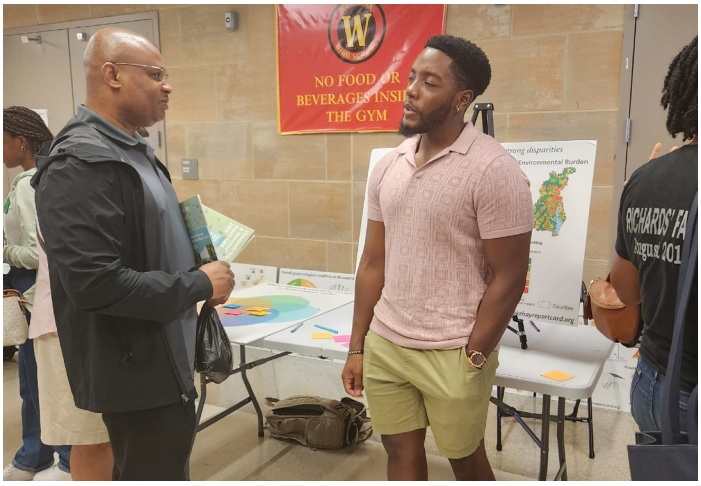
Community listening sessions and workshops in more regions of the watershed will be conducted to ensure the inclusion of all voices. These sessions, designed to gather input from different people, including those who are often left out, are a crucial part of the report card process. These targeted engagement events will facilitate new partnerships and collaboration that are essential for capacity building and sustaining watershed restoration efforts.

Developing new indicators

New indicators will be developed to provide a more holistic view of the watershed. Focus areas include agriculture, governance, community and cultural health, coastal resilience, invasive species, and debris and plastic pollution. The goal is to develop these indicators in a way that promotes shared ownership and collective action among all stakeholders.

Updating data and methodologies

In the 2023/2024 report card, new scores for Protected Lands and Stewardship Indicators were introduced following updates from the Chesapeake Bay Program Partnership in these goal areas. The annual update to Park Walkability included townships, many of which are rural with limited access to parks. These updates highlight the need to continuously assess and respond to changes in data availability and analysis.



Listening sessions are continuously held across the watershed. For example, sessions took place after the Capital Rivers Church services in Silver Spring, MD (left), and as part of an agricultural education event at the Patawomeck Museum in Fredericksburg, VA, in collaboration with the Environmental Justice Journalism Initiative (EJJI) (right). Photo credit: Kameryn Overton and Veronica Malabanan Lucchese.

Acknowledgments:

Report card released in July 2024 by the Integration & Application Network, University of Maryland Center for Environmental Science. The data and methods underpinning this report card represent the collective effort of many individuals and organizations working in the Chesapeake Bay scientific and management community. For a complete list of contributors, visit **chesapeakebayreportcard.org.** Funding was provided by the National Fish and Wildlife Foundation. Photos collage created with photos courtesy of Chesapeake Bay Program, photo credit to Matt Rath, Carlin Stiehl, and Will Parson.

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