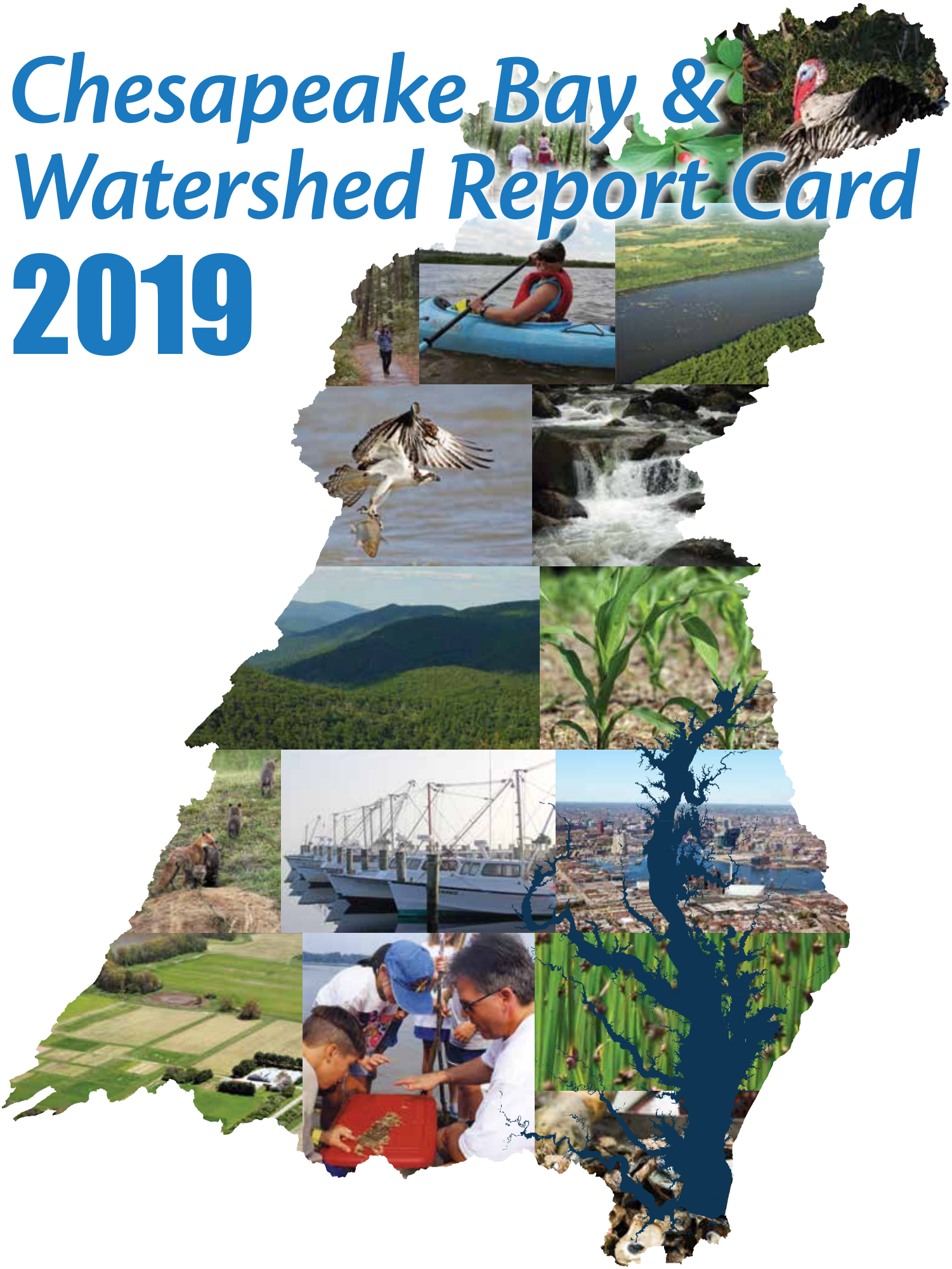
Chesapeake Bay & Watershed Report Card 2019



University of Maryland Center for Environmental Science

Indicators of watershed and bay health

The Chesapeake Bay watershed report card includes five watershed indicators and seven bay indicators. The watershed indicators help describe the condition of aquatic and societal values. The bay indicators evaluate ecosystem condition. All bay indicators use data from 2019, except for striped bass, which is a three-year average. Watershed indicators use differing years of data, based on availability.

Watershed indicators

Total phosphorus is an indicator of excess phosphorus in rivers and streams. Nutrients are important for the growth of organisms in the environment, but as nutrient levels increase in rivers and streams, they can negatively impact the environment. Data are from 2012–2017.

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Stream benthic community measures the condition of the benthic community living in streams. Benthic macroinvertebrates are freshwater organisms including snails, mussels, worms, and insects that live in and on the stream and river bottom. Data are from 2006–2011.

Turbidity is a measure of water clarity that expresses how much light passes through the water column. It is dependent upon the amount of suspended particles (e.g., sediment, algae, bacteria) and colored organic matter present. Data are from 2012–2017.

The Social Index uses data about social vulnerability from the Center for Disease Control and Prevention (CDC) collected within the American Community Survey. Social vulnerability is defined by the CDC as a measure of how able a community is to respond and bounce back from hazardous events such as natural disasters. Some of the measures in the index include socioeconomic status, household composition, diversity, minority status, language, housing, and transportation. The data for this indicator are from 2018.

Bay indicators

Benthic community, or the Benthic Index of Biotic Integrity, measures the condition of the benthic community living in or on the bottom areas of the Bay. These organisms are a key food source for fish species.

Dissolved oxygen is critical to the survival of Chesapeake Bay's aquatic life. The amount of dissolved oxygen needed before aquatic organisms are stressed, or even die, varies from species to species.

Total phosphorus is an indicator of excess phosphorus in the bay. Too much phosphorus can lead to algae blooms, which cause poor dissolved oxygen conditions and stress bay organisms.

Water clarity is a measure of how much light penetrates though the water column. Water clarity plays an important role in determining aquatic grasses and phytoplankton distribution and abundance.

Chlorophyll *a* is used as a measure of phytoplankton (microalgae) biomass. High phytoplankton levels lead to reduced water clarity, and decomposing phytoplankton result in reduced dissolved oxygen levels.

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Aquatic grasses, or submerged aquatic vegetation, are one of the most important habitats in Chesapeake Bay. They provide critical habitat to key species such as blue crab and striped bass, and can improve water clarity.

Striped bass, bay anchovy, and blue crab make up the Fisheries Index, which is not included in the Bay Health score. Bay anchovy are one of the most abundant schooling fishes in the bay, providing an important food source for top predators. Striped bass is a key top predator, and uses the bay as an important spawning and nursery area. Blue crabs are both predator and prey in the food web and use aquatic grasses as habitat.

Chesapeake Bay and watershed results

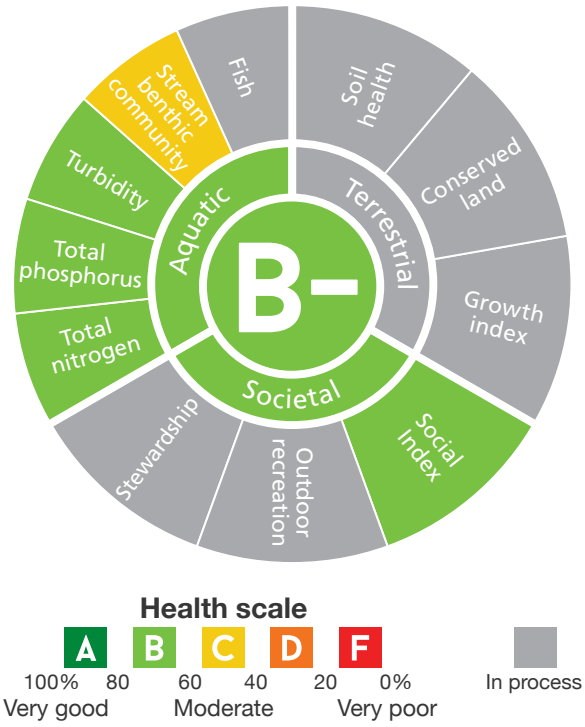
Moderate and poor scores in 2019 were mainly due to above-average temperatures almost every month of the year. The intense heat hurt aquatic grasses and benthic macroinvertebrates, and lowered dissolved oxygen levels. Precipitation was not above normal for the region as a whole, but extreme and severe periods of rain caused pollution from run-off. There were also possibly lingering effects from the record rainfalls in 2018 that stressed the bay and watershed.

Chesapeake Bay Watershed scored for the first time

This is the first year the watershed has been scored. Three categories were chosen to represent watershed health—aquatic, terrestrial, and societal. Within each category, indicators were assessed against thresholds or goals for each of the 23 regions.

Overall, the Chesapeake Watershed scored 60%, a B-. There were four aquatic indicators and one societal indicator. Watershed-wide, total nitrogen scored 79%. Total phosphorus scored 61% and turbidity scored 68%. Stream benthic community scored 46%. One social indicator was included, the Social Index, which scored 60%. See the indicator descriptions section for more details about what these new indicators measure.

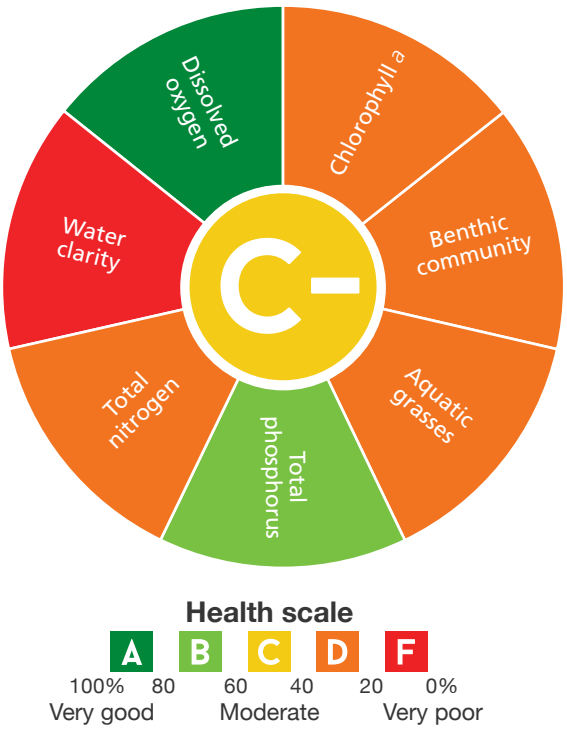
The highest scoring region was the Upper James (72%), with the Lower Potomac and Lower Western Shore just slightly behind (both 71%) (see map next page). The lowest scoring region was the Lower Eastern Shore (42%), followed by the Choptank (47%) and the Elizabeth (52%). Overall, 10 regions had poor scores and 13 had moderate scores. More forested regions tended to have better scores.



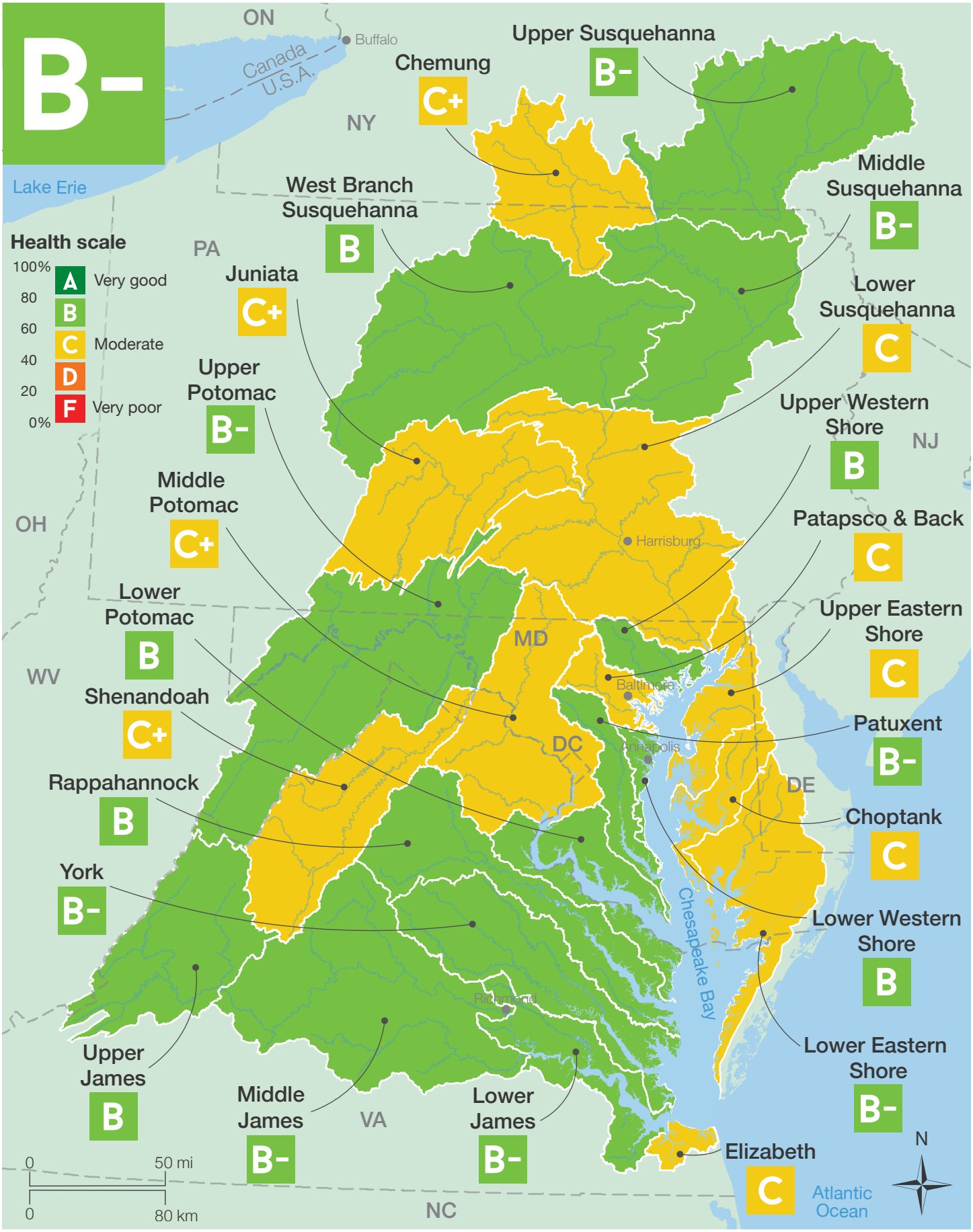
Chesapeake Bay health remained moderate in 2019

Overall, Chesapeake Bay scored 44% in 2019. This is the lowest score and first C- since 2011. Although several indicators of bay health improved in 2019, they did not offset those that declined. Bay-wide, dissolved oxygen scored 83% in 2019, a decrease from 2018. Water clarity scored 10%, a slight decrease from last year's 7%. The benthic community score sharply decreased from a 59% to a 38%. Total nitrogen scored 39%, a decline from last year's 44%. Total phosphorus scored 76%, a slight increase from 2018. Chlorophyll *a* scored 26%, an increase from 22% in 2018. Aquatic grasses scored 35%, a decline from last year's 39%.

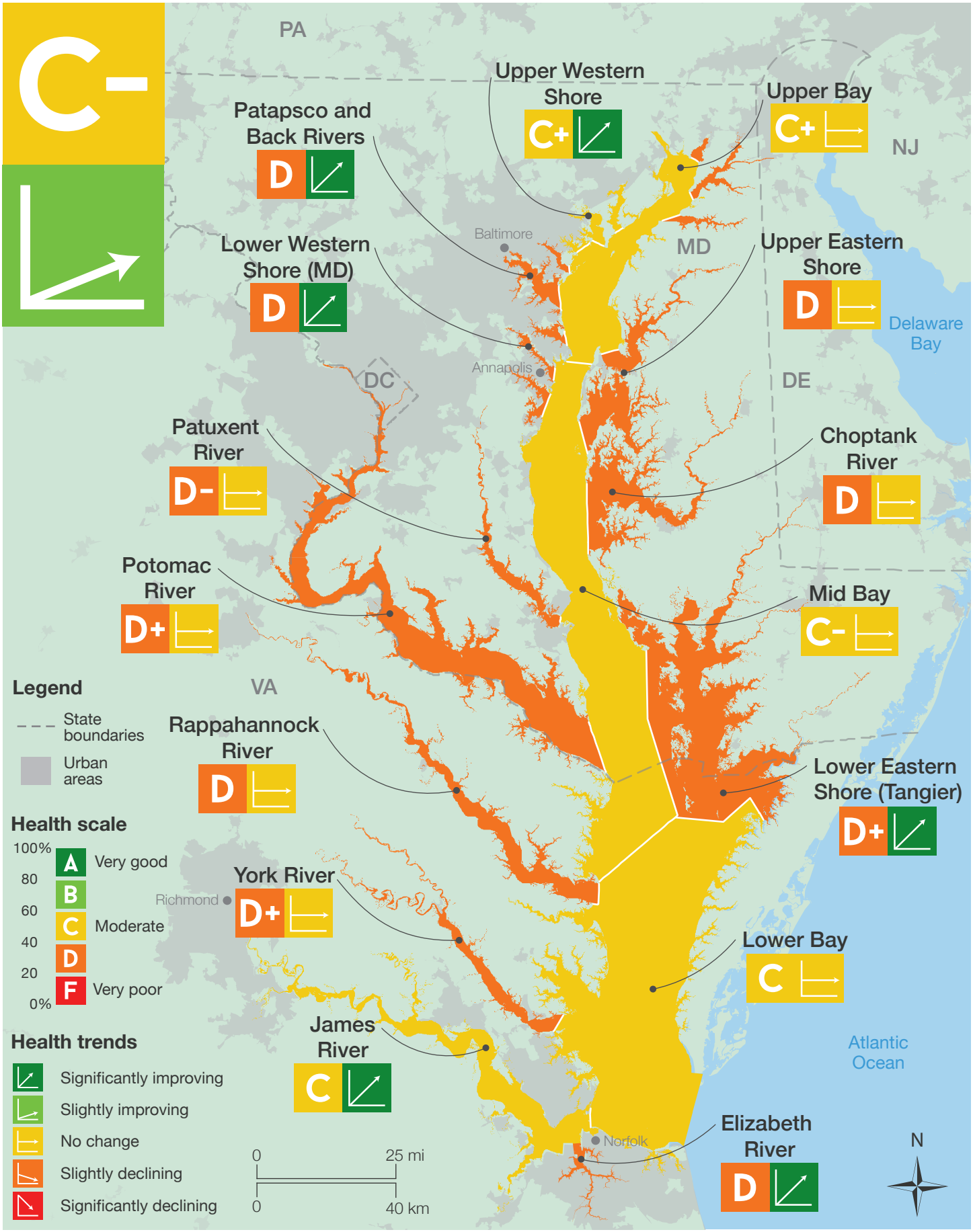
The highest scoring region was the Upper Western Shore (58%). The lowest scoring region was the Patuxent River (22%). This is the first year there was no "B" grade for a region since 2011. However, no region had an "F" grade either. Despite low scores in 2019, long-term trends are still showing improvement. Six regions are showing significant positive trends over time, and the overall bay is showing a slightly improving trend. No regions are showing significantly declining trends over time (see map on far page).



Watershed health is good in first evaluation



Bay health stressed due to elevated temperatures



Our journey to expand the report card

Since 2016, UMCES has engaged stakeholders throughout the watershed to transform the report card into an evaluation of the Chesapeake Watershed health. Watershed health includes traditional ecosystem indicators, but also social, economic, and cultural indicators. This is the first year we have scored the watershed, using five indicators of ecological and socioeconomic health. Additional indicators are being researched and we intend to include them in the next report card.

Outdoor recreation is a key value throughout the watershed and people recreate in many different ways. Hiking, bird watching, hunting, fishing, kayaking, and boating, among others, are important activities that communities take part in. We examined sales of hunting and fishing licenses, but did not feel that the data accurately encompassed the values of outdoor recreation. Further research is ongoing.

Conserving land is critical for the health of the watershed and is part of the Chesapeake Bay Program's Watershed Agreement. The goal is to conserve landscapes to maintain water quality and habitat; sustain forests, farms and maritime communities; and conserve lands of cultural, indigenous, and community value. We are working with partners on this indicator.

Citizen stewardship is vitally important to enhance the health of local watersheds and the Bay as a whole. The Chesapeake Bay Program developed the Stewardship Index, which examines citizen stewardship within the categories of Behavior, Volunteerism, and Civic Engagement. We are planning to include their index in the report card scoring.

In addition to these three indicators, we are also investigating indicators of fish, soil health, forest cover, and diversity to include in future report cards.

Top: Stakeholders gathered in Harrisburg, PA to develop new watershed indicators. Center: Citizen scientists assessing health of aquatic grasses in the Severn River, MD. Citizen stewardship of the bay and its watershed will be included in subsequent report cards. Bottom: Catch and release along the Little Juniata River, PA. Recreational fishing is an important value to include data on in future report cards. Photos: Sky Swanson, Will Parson, Chesapeake Bay Program.

Acknowledgements

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