

ANTIETAM CREEK WATERSHED REPORT CARD 2025



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ANTIETAM CREEK AND BEAVER CREEK

The Antietam-Conococheague Watershed Alliance (ACWA) and the Beaver Creek Watershed Association (BCWA) are two grassroots organizations passionate about protecting and restoring Antietam Creek and its tributaries. Both organizations are focused on improving water quality to create a thriving ecological habitat and healthy environment for recreation. BCWA was incorporated as a nonprofit 501(c)(3) in 2002 and ACWA followed in September 2007 to raise awareness among citizens and other organizations within the Antietam Watershed.

The Antietam Creek is roughly 54 miles in length, beginning in Franklin County, Pennsylvania, running through Maryland, and discharging into the Potomac River near Sharpsburg, MD. In Maryland, the Antietam mainstem is approximately 37 miles long, entirely within Washington County. The land that drains into Antietam Creek, called the watershed, covers 187.0 square miles (~118,400 acres) in Maryland. The total population in the Antietam Creek Watershed is estimated to be 113,162 (Maryland Department of the Environment, 2009).

Three subwatersheds within the Antietam Creek drainage area—Beaver Creek, Marsh Run, and Little Antietam Creek—historically contain cold-water species such as trout, which require the highest level of water quality to support sensitive populations of fish and other organisms.

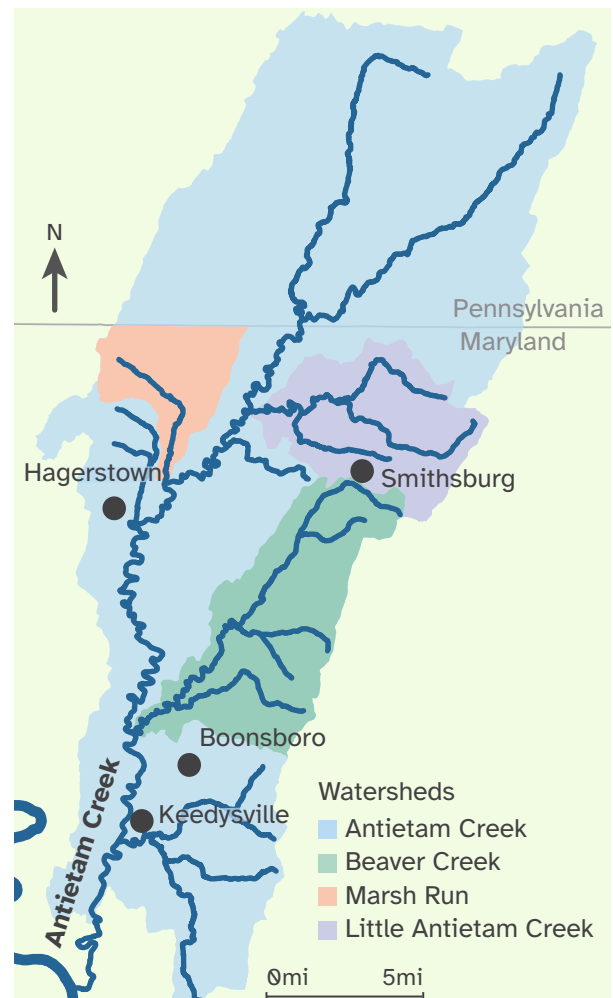
In 1996, Antietam Creek was placed on Maryland's 303(d) list of impaired waters for sediments. In 2002, it was also listed for fecal bacteria impairments, and in 2008 for high Total Phosphorus levels. To address these impairments, Total Maximum Daily Loads (TMDL) for sediment, bacteria, and Total Phosphorus were developed and approved for the Antietam Creek Watershed.

The waters of the Antietam are vital to both the natural environment and the human communities within its watershed. Monitoring the waters of the Antietam provides

valuable information for long-term planning, including identifying pollutants, protecting human health, and ensuring that the plants and animals that call the Antietam home can thrive.

In April 2019, ACWA and the Beaver Creek Watershed Association (BCWA) began collecting water quality data and aquatic insects to track health trends. Over the years, parameters have included air and water temperature, dissolved oxygen, pH, conductivity, nitrogen, phosphorus, turbidity, and *E. coli* bacteria counts. The data are publicly available at the Chesapeake Monitoring Cooperative's Data Explorer website.

This report card addresses Antietam Creek and a main tributary, Beaver Creek. A future report card will detail the Conococheague.



Left: West Branch Antietam Creek. Photo by Nicholas_T on Flickr (CC BY 2.0).

ECOSYSTEM HEALTH IS ASSESSED USING INDICATORS

This report card assesses ecosystem health using nine indicators in three categories; water quality, biota, and landscape. The thresholds for each indicator are based on scientifically derived targets or goals. Each measure is compared to the threshold and scored and then averaged to the overall indicator score. Each overall indicator score is averaged to the category score. The three categories are averaged to the overall Antietam score.

WATER QUALITY INDICATORS



Conductivity is a measurement of ion concentration in water. When conductivity levels are high, the ecosystem cannot physiologically maintain a salt balance. This affects organisms living in a river or stream, which can become stressed and not survive.



Turbidity is a measure of water clarity that shows how much light passes through the water column. It is dependent upon the amount of suspended particles (like sediment, algae, bacteria) and colored organic matter present. Clear water is critical for the survival of fish and other organisms.



Nutrients such as **Nitrogen** occur naturally in streams. Plants and animals need nutrients to grow and survive. Excess nitrogen can fuel the growth of algae, creating algal blooms that block sunlight and reduce oxygen for fish and other organisms. Nitrate-nitrogen was evaluated to score nitrogen for this report card.



Phosphorus is an essential nutrient for all plants and animals. Excess phosphorus causes algae to grow in large algal blooms, which depletes oxygen for fish and other animals. Orthophosphate was evaluated to score phosphorus for this report card.

BIOTA INDICATORS



Trout species are very sensitive to changes in stream temperature, so they serve as a valuable indicator for any increase in water temperature. Two species of trout—rainbow trout and brown trout—were assessed for this indicator. Trout species are popular for sport fishing, so keeping them healthy is important for fisherman and the ecosystem.



Benthic community species are freshwater organisms including snails, mussels, worms, and insects that live in and on the stream and river bottom. These organisms are a key food source for many fish species.

LANDSCAPE INDICATORS



Impervious surface includes manmade structures like roads and roofs. This indicator assesses the amount of impervious surface in the watershed. These surfaces do not absorb water during storms, so the water flows across the ground into streams and rivers. Runoff can increase the probability of flooding and water pollution.



Tree canopy reflects the amount of forest cover in the watershed. Forests are valuable habitat for many species. Tree roots reduce erosion by holding soil in place, and trees require a lot of nutrients and water to live. By absorbing water and nutrients from the soil, trees reduce the likelihood of flooding and nutrient pollution in streams and rivers.



Forested riparian areas are critical for protecting streams and rivers from runoff and pollutants. Riparian area, which is the area within 100 feet of a body of water, is susceptible to erosion during storms. Because the riparian area is close to the water, maintaining forest or plant cover is important to prevent excess runoff.

ANTIETAM CREEK WATERSHED IS IN MODERATE CONDITION

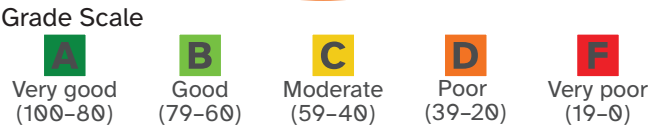
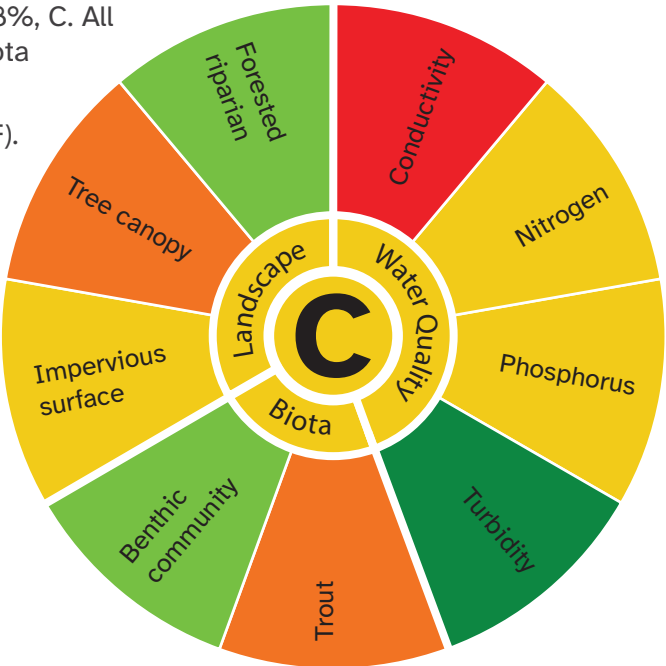
The Antietam Creek Watershed is in moderate condition, scoring 48%, C. All categories had C grades; Water Quality scored 52%, followed by Biota (47%) and Landscape (45%).

The lowest-scoring Water Quality indicator was Conductivity (18%, F). Moderate Nitrogen (42%, C-) and Phosphorus scores (56%, C+) suggest there was nutrient loading in the creek. However, Turbidity received a very good score (91%, A), which shows that the water was clear.

For the Biotic grade, indicators included the abundance and diversity of the Benthic community, and the presence and year classes of two Trout species, Rainbow and Brown. The Benthic community was in good condition, scoring a B- (64%). However, the Trout community was in poor condition with a D score (30%).

Landscape indicators assessed the land cover in the watershed and along creeks. A poor Tree canopy score (31%, D) and moderate Impervious surface score (42%, C-) show development pressure negatively impacting the watershed. Forested riparian was in good condition (63%, B-), meaning that there are buffers between development and creeks.

Overall, lack of tree canopy, poor trout populations, and high conductivity levels are concerning issues in the watershed.



WATER QUALITY HAS VITAL SIGNS

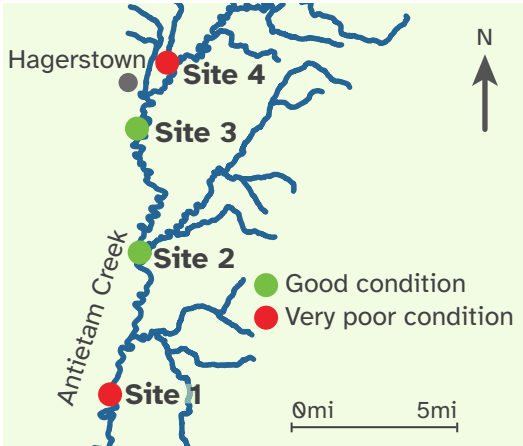
Three vital signs—dissolved oxygen (DO), pH, and temperature—are used as diagnostic indicators for stream health. In streams, these vital signs should always be in good condition. If there is a problem, it is usually site-specific and would show the need for more investigation.

DO is necessary for aquatic animals. Low DO is often a result of excessive algae growth in the water, which is caused by nutrient overloading. pH measures the acidity or alkalinity of water. Any pH measure outside of a normal range can be harmful to plants and animals living in the stream. Water temperature can vary based on the time of day and season. Extreme temperatures are harmful to plants and animals. Together, these three vital signs show that the stream is healthy and safe for species to inhabit. All vital signs in the Antietam were very good.

Vital Sign	Score	
Dissolved Oxygen	100%	●
Temperature	86%	●
pH	100%	●

BACTERIA IN WATER CAN BE HARMFUL

Bacteria are everywhere in our environment, but some bacteria can make water unsafe for contact. *E. coli* is used as an indicator of possible harmful bacteria in the water. High numbers of *E. coli* represent an increased risk to humans of becoming sick after coming in contact with the water. In Antietam Creek, bacteria was high at Sites 1 and 4. Site 1 in particular consistently measured bacteria levels over the safe threshold (235 MPN), meaning the conditions were very poor.



Bacteria sample sites on Antietam Creek.

FISH KILL REDUCED WILD TROUT POPULATION IN RECREATIONAL FISHING AREAS

On Monday, August 7, 2023, a heavy thunderstorm with lightning, high winds, and hail moved through the Beaver Creek area, east of Hagerstown. The next day, fishermen and Maryland Department of Natural Resources (DNR) staff started reporting dead adult brown trout. This devastating fish kill wiped out the trout population for a mile downstream of I-70, the heart of the fly fishing only section of Beaver Creek. There were many dead fish found, from 4 to 22 inches long, but most were washed downstream in the high water following the heavy rain.

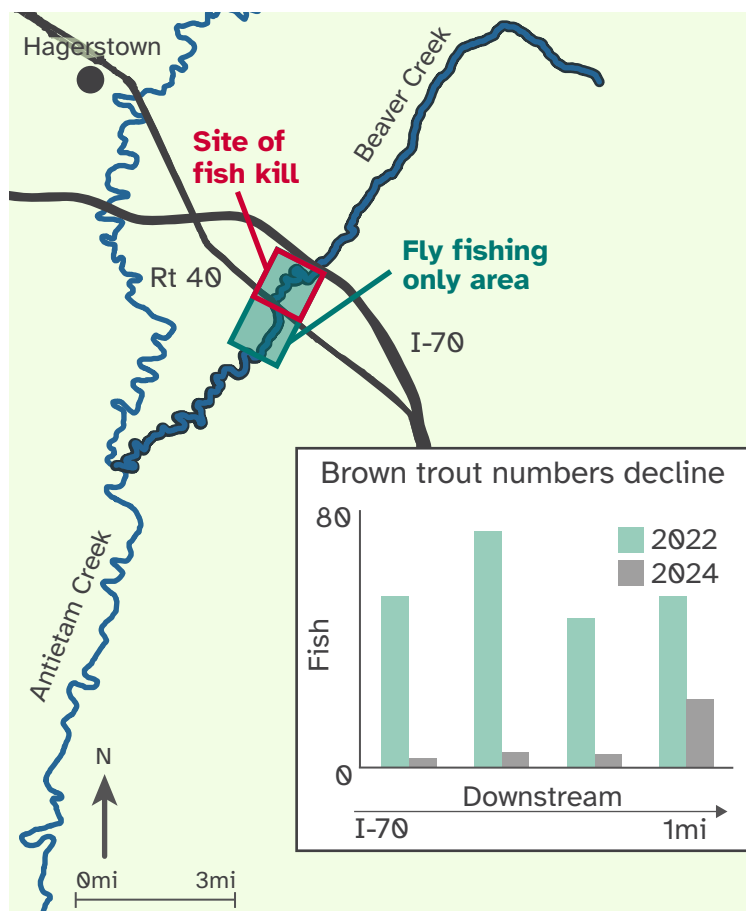
The source of the kill has not been determined. Data and analysis eliminated common causes such as a temperature spike, runoff from agricultural fields, or runoff from paved surfaces. The unverified suspicion is that some type of pollution from I-70 entered the main channel of Beaver Creek with enough concentration to kill all the fish and then diluted to a non-lethal level a mile downstream. No one knows how the pollutant entered the creek, but the 2.5 inches of rain produced runoff from I-70 into the creek.

The challenge now is to prevent a repeat fish kill the next time there is a heavy rain following a dry spell. ACWA and the Beaver Creek Watershed Association are encouraging the Maryland Department of Transportation to investigate ways to capture and filter the stormwater runoff before it enters Beaver Creek. Implementing such stormwater management measures should help in preventing a similar incident in the future.

In the fall of 2023, DNR Fisheries transported some adult brown trout from downstream to see if spawning would occur in the area where fish were killed. These areas were checked later in the season and there was no evidence that spawning occurred.

In the last week of August 2024, an annual brown trout survey was conducted in the same sections as in past years. In the four sections from I-70 to about a mile downstream, the amount of fish declined dramatically. But perhaps more important than current depressed numbers of adult brown trout, only a few young-of-year were observed in 2024 when there were 152 found in 2022. The decline in young-of-year following the fish kill indicates that the wild brown trout population will take years to return to its previous status as a premier wild trout stream.

Beaver Creek Watershed Association will continue to protect and enhance the water quality throughout the watershed. Volunteers will continue to sample different stream locations to ensure that water quality will support a wild trout reproduction.



LANDSCAPES INFLUENCE STREAM QUALITY

Activities on land directly impact water quality. Construction of roads, buildings, and warehouses create hard, impervious surfaces that water runs off, taking pollutants, grit, and heat into streams. Land use in the Antietam Creek Watershed varies dramatically by location. Impervious surfaces cover 7% of the Watershed, earning a moderate Impervious surface score of 42%. Most impervious surfaces are in the western half of the watershed, in the City of Hagerstown. Less than 40% of the Antietam Creek Watershed is forested, earning a poor Tree canopy score of 31%.

Beaver Creek is the largest subwatershed within the Antietam Creek Watershed and contains unique habitat and sensitive aquatic species. This subwatershed has just over 4% Impervious surface coverage, earning a good score of 60%. Approximately 50% of the Beaver Creek Watershed is forested, earning a moderate Tree canopy score of 51%.

The presence of riparian forest cover (100 feet on each streamside) is critical to maintaining healthy streams. The Chesapeake Bay Agreement has set a target of 70% riparian tree canopy coverage by 2025. In the Antietam Creek Watershed, Riparian Forest covers only 47% of the overall watershed. Riparian areas within Hagerstown are only 39% covered, while Beaver Creek measures 51% of forested riparian area.

Overall, actions to support landscapes are needed, including protecting and restoring forests and riparian areas, reducing impervious surfaces, and using green stormwater practices. This improves communities by reducing flooding, providing green space, and supporting recreation activities.

Acknowledgments

This report card provides a timely, transparent assessment of Antietam Creek Watershed ecosystem health. The report card was released in June 2025 by the Antietam-Conococheague Watershed Alliance and the University of Maryland Center for Environmental Science Integration and Application Network. Funding was provided by the Chesapeake Monitoring Cooperative. Data were provided by the Antietam-Conococheague Watershed Alliance and the Potomac Riverkeeper Network. The most recently available data was used; for water quality and vital signs 2020–2024, for biotic 2022–2023, and for landscape 2018 Chesapeake Conservancy aerial data. All photos courtesy of the Antietam-Conococheague Watershed Alliance unless otherwise noted. Data analysis and layout design by Annie Carew, Ann Foo, and Alexandra Fries. For more information on the Antietam-Conococheague Watershed Alliance, visit acwamaryland.org.



YOU CAN GET INVOLVED

- Check out activities to help protect the land and waters of the Antietam at acwamaryland.org/events
- Report problems and concerns. Contact information for reporting dumping, erosion, or trash can be found at acwamaryland.org/problemreporting

