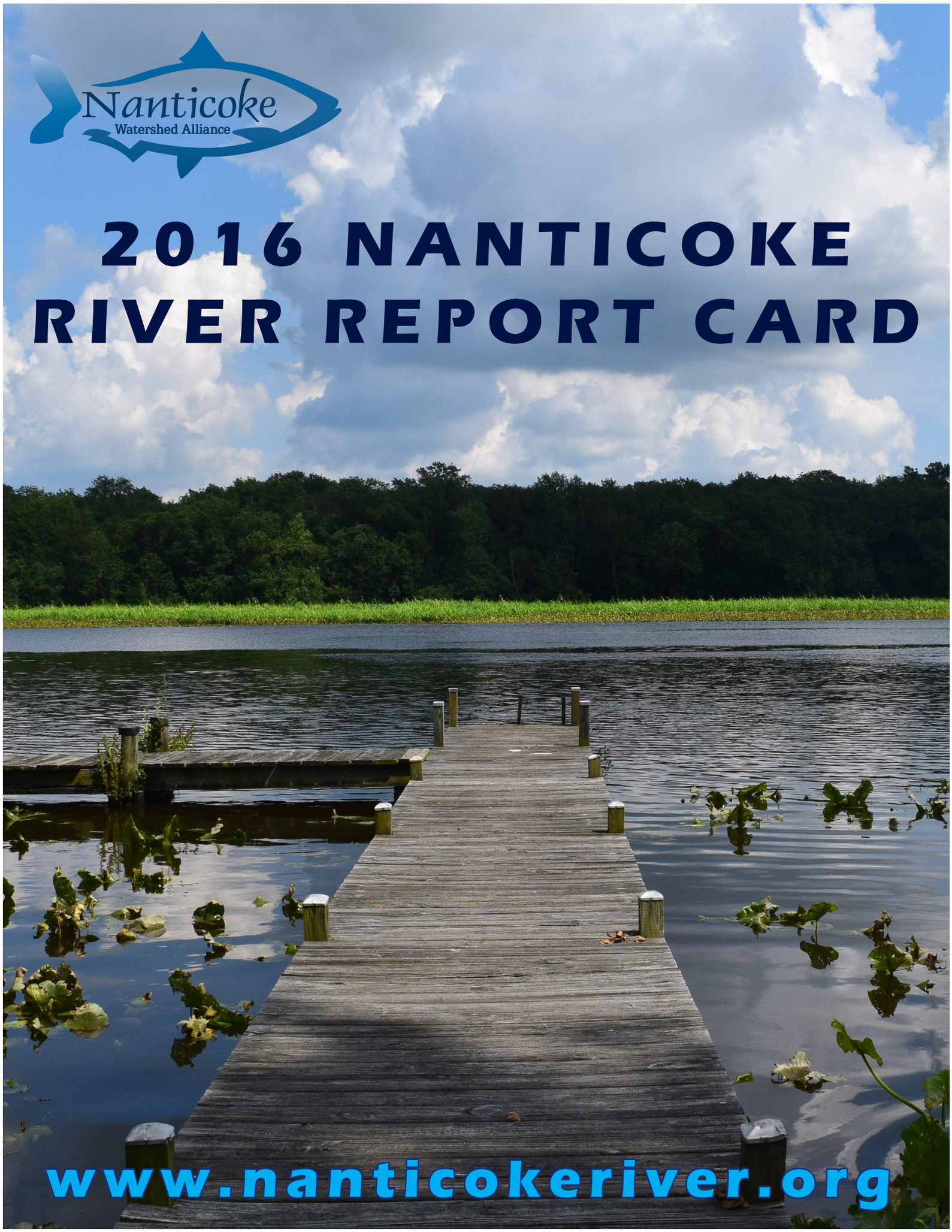
Nanticoke Watershed Alliance

2016 NANTICOKE RIVER REPORT CARD



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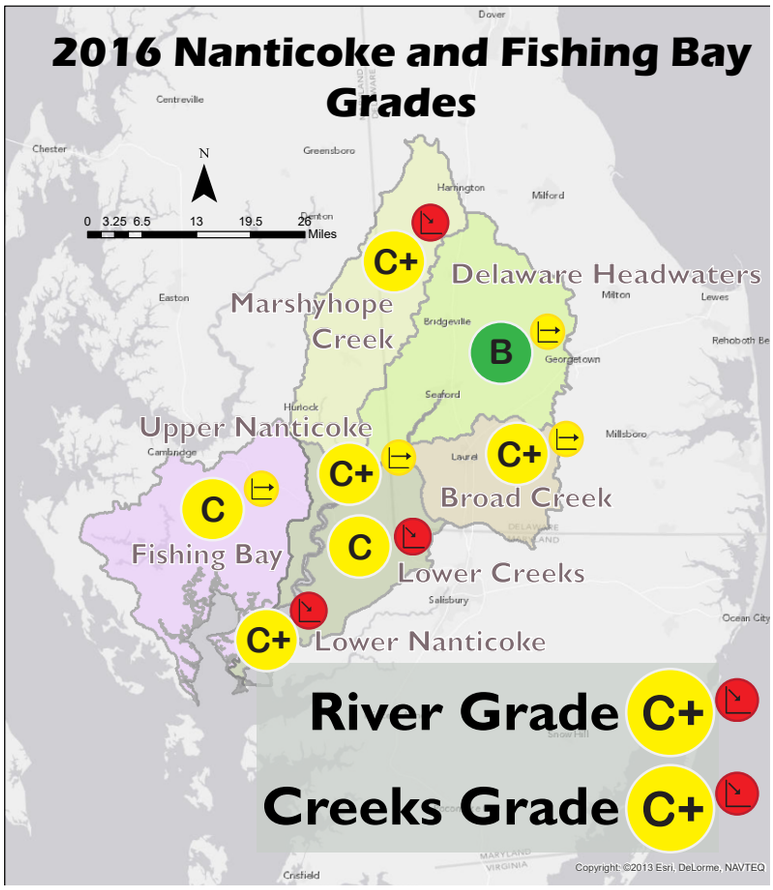


For the first time since 2014, "Overall Health Index" grades declined in both the River and Creeks grades. **The River grade slipped from B- in 2015 to C+ in 2016, while the Creeks decreased two grades, falling from a B to a C+.** Further, three of the six subwatershed areas (Marshyhope Creek, Lower Creeks, and Lower Nanticoke) also showed declines. Delaware Headwaters, Broad Creek, Upper Nanticoke, and Fishing Bay maintained grades achieved in 2015.

Changes were visible across many parameters, from nutrients to water clarity. Several heavy rain events occurred in the Nanticoke River and Fishing Bay watersheds during 2016. A couple of strong summer storms destroyed dams and damaged roads in Mardela Springs and along Nanticoke Road (both in Wicomico County), and a pair of storms preceded Hurricane Matthew in late September and early October.

With climate change, these extreme rain events may become more common, which will continue to negatively impact water quality and to damage infrastructure. We can choose to play a positive or negative role in protecting our local waterways and impacting water quality. See page six for things you can do to help protect the Nanticoke.

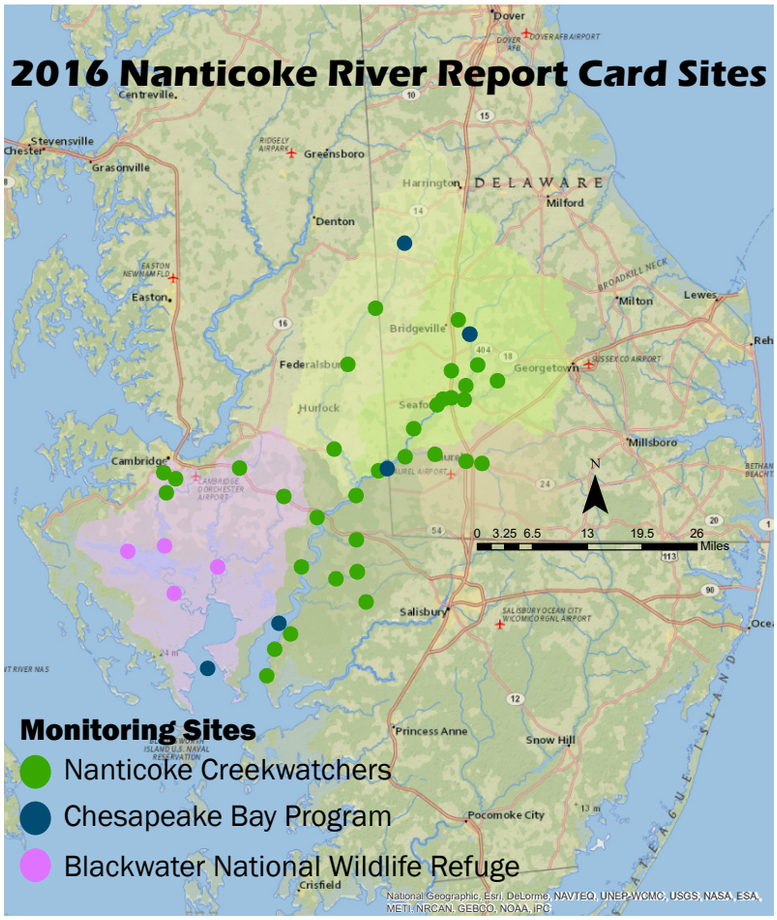
Figure 1 (above): The map shows the "Overall Health Grades" for the Nanticoke River's six subwatersheds, as well as Fishing Bay watershed. In addition, the map lists the Overall River and Creeks Grades for 2016. The Overall Health Index (total score) is calculated by averaging the numeric scores of all indicators. The arrow graphic shows if the score improved, declined, or remained steady from the previous year. Water clarity and chlorophyll a are applicable only to tidal sites.

River Region	Dissolved Oxygen	Water Clarity	Total Nitrogen	Total Phosphorus	Chlorophyll a
DE Headwaters	A+	A-	F	A-	B-
Broad Creek	A+	B-	F	B+	D+
Marshyhope Creek	A+	C	F	B	C
Lower Nanticoke	A+	D+	D-	A-	C
Upper Nanticoke	A+	C	F	A-	C-
Lower Creeks	C	C	D	B	C+
Fishing Bay**	B	D-	D	D+	B-

Figure 2 (left, above): The "Road Closed" sign at the crossing of Barren Creek at Railroad Road in Mardela Springs illustrates both the power of water and the challenges our waterways faced in 2016 as runoff inundated local streams, creeks, and the Nanticoke River.

Figure 3 (right, above): The table shows a breakdown of grades for each reporting region, by water quality indicator.

***Scores for Fishing Bay Watershed are included in this report due to its relevance and proximity to the Nanticoke River but are not included in calculations for the Rivers and Creeks "Final Grade."*



The Nanticoke Watershed Alliance included 45 sites in data analysis for the 2016 Nanticoke River Report Card. Data derived from the 36 Nanticoke Creekwatchers sites, four sites from the Blackwater National Wildlife Refuge's volunteer monitoring program, and five Chesapeake Bay Program (CBP) sites (two in Delaware, three in Maryland). Some of the CBP sites overlap or closely match existing Nanticoke Creekwatchers sites. All sites are noted on the 2016 Nanticoke River Report Card Sites map (left). The NWA used data from the five key indicators used in this report card, along with salinity data, for data analysis purposes.

The NWA uses a multithreshold system provided by the Mid-Atlantic Tributary Assessment Coalition. The Tidal Protocol, Bacteria Addendum, and Nontidal Protocol documents can be viewed at the University of Maryland's Center for Environmental Science's Integration and Application Network's website at *ian.umces.edu*.

Figure 4 (left): A map of the sites used for the 2016 Nanticoke River Report Card.

Transquaking Bacterial Source Tracking Project

During summer 2016, two volunteers collected eight bacteria samples on the nontidal Transquaking River. This site (TRAN1) has shown very high bacteria counts during several sampling seasons and was and is a site of concern. The volunteers then transported their samples directly to the Salisbury University Bacterial Source Tracking Lab, which is led by Dr. Mark Frana. Dr. Frana and his staff analyzed the samples with the purpose of excluding or verifying humans as the source of bacteria at these three sites. Dr. Frana also provided fecal enterococcus data. Over the summer, the TRAN1 site averaged 876 MPN (Most Probable Number). The EPA determines that sites with values above 104 MPN, a measure of bacteria amounts, are unsafe for human contact.

To this purpose, the lab tested all samples against a human DNA marker suitable for this region. Unfortunately, all eight lab samples tested positive for the human DNA marker, albeit at low levels. **These results implicate human impact on bacteria levels, and the likely culprit is a faulty septic system or direct septic outflow into the Transquaking River above the sampling site.**

The Nanticoke Watershed Alliance has shared these results with the Maryland Department of the Environment for follow-up.

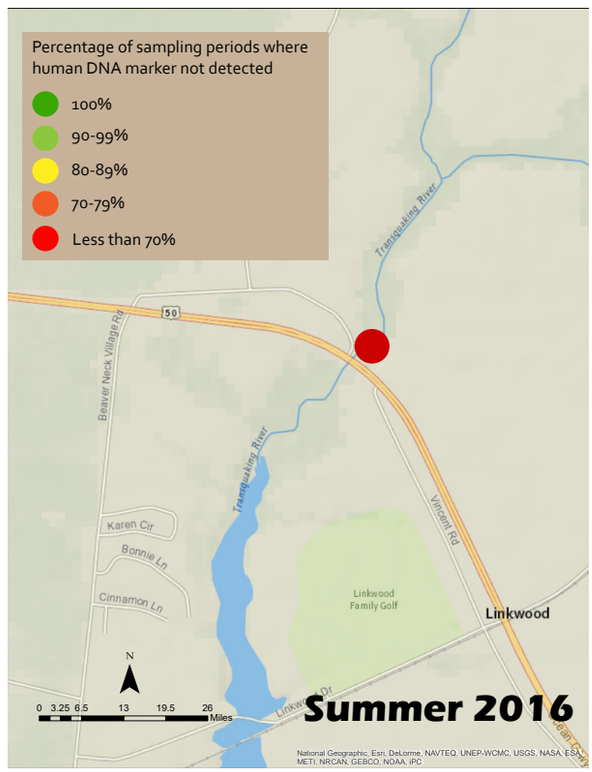
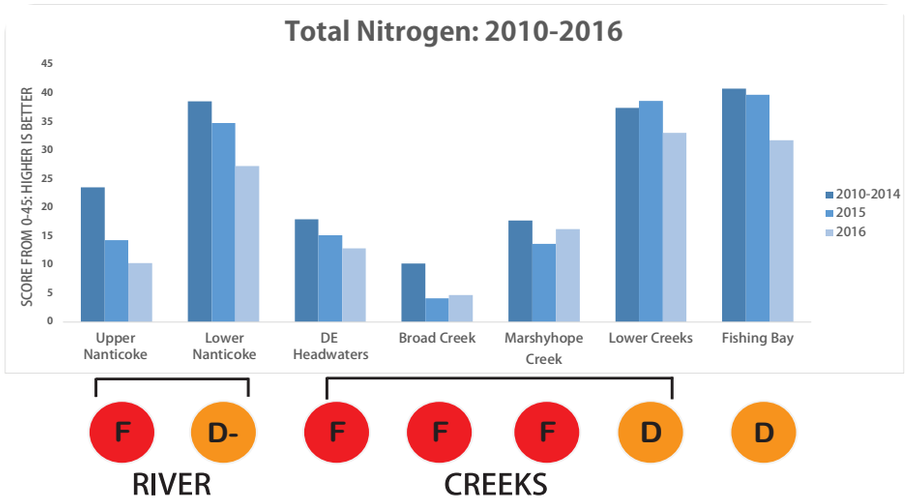


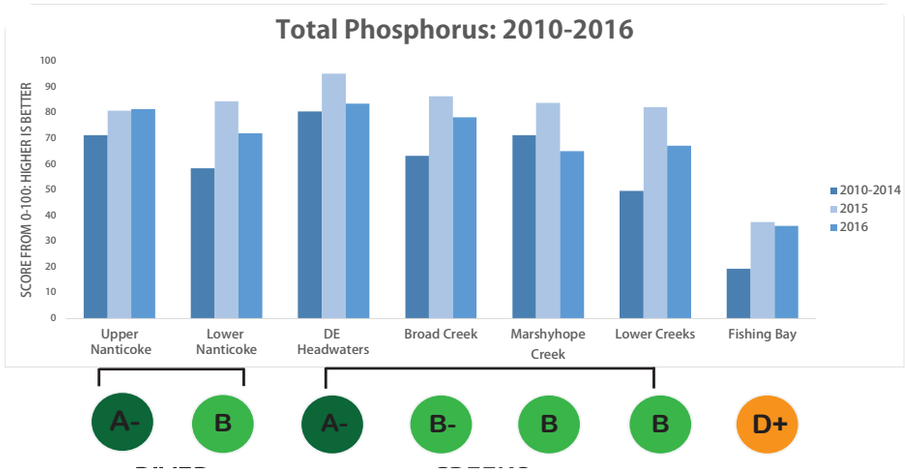
Figure 5 (above): The map shows the TRAN1 (Transquaking River) site and the percentage of sampling periods where human DNA markers were not detected.

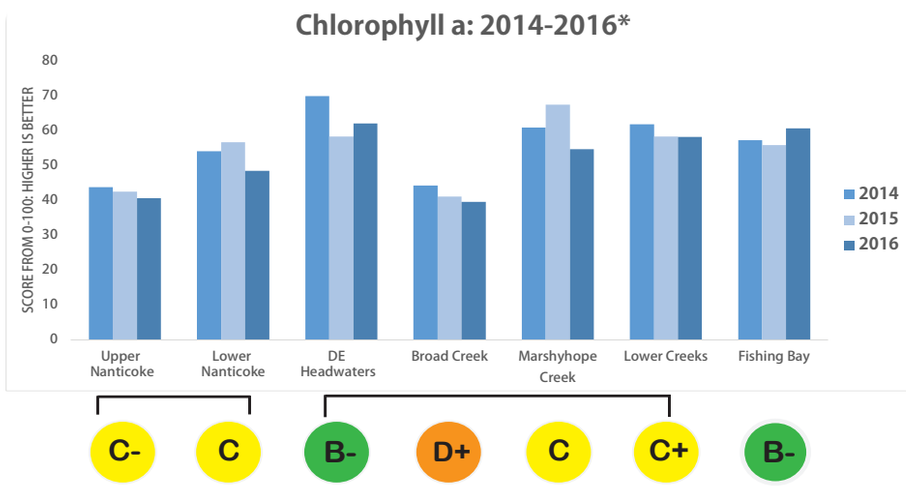
Although natural and necessary for plant growth, excessive amounts of nitrogen and phosphorus cause a number of water quality issues, including algal blooms and fish kills. Nitrogen and phosphorus are key indicators, as these nutrients are major pollution sources in the Nanticoke River watershed (and throughout the Chesapeake Bay watershed).

Total nitrogen continues to report excessive levels in subwatersheds throughout the Nanticoke River watershed. Most subwatersheds, especially those in the upper half of the region, have consistently scored F's. Most subwatersheds showed a decline over the 2015 scores and five-year average scores. Broad Creek and Marshyhope Creek, which tend to score worst in this parameter, showed very minor improvements in grades during 2016. All subwatersheds scored F's except for the Lower Creeks (D) and Lower Nanticoke (D-). Fishing Bay also scored a D.

Phosphorus scores declined in all subwatersheds and Fishing Bay, except for a slight improvement in the Upper Nanticoke. Since phosphorus binds with soils, it is heavily impacted by rain events and stormwater runoff. The heavy rain events during summer of autumn 2016 led this broad decline in phosphorus scores, which shows a continued need for green infrastructures improvement in the Nanticoke River to adapt to higher volume rain events. As in the past, the Fishing Bay subwatershed performed worst in this category.



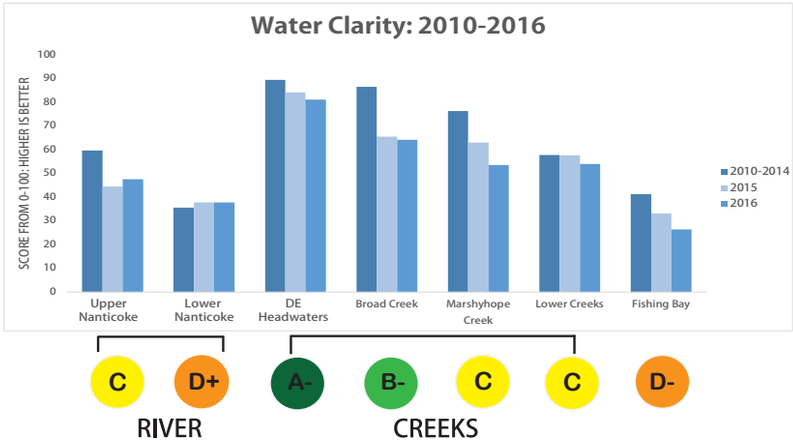


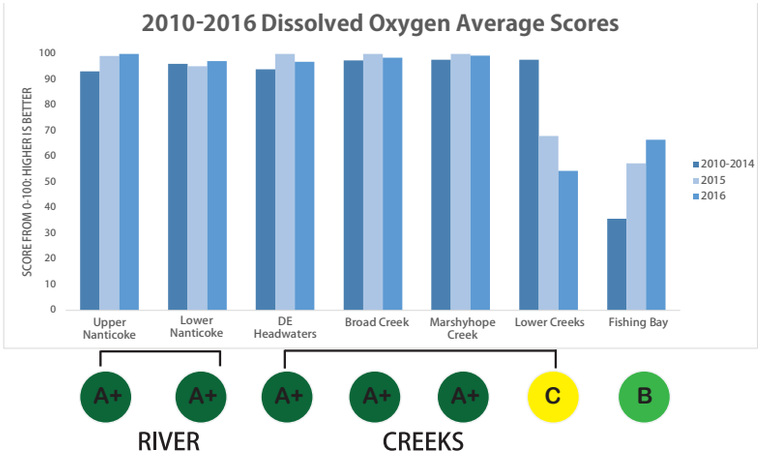


Figures 6-8 show total nitrogen, total phosphorus, and chlorophyll a scores for each subwatershed. Five-year average scores (2010-2014), 2015 scores, and 2016 scores are provided when available. Note that the nitrogen graph only shows 0-45, instead of 0-100, as do the other charts.

**Figure 8: The program did not measure chlorophyll a from 2009-2013.*

The chlorophyll *a* score reflects the amount of algae present in the water, which helps us view a more complete picture of nutrient-related water quality. In 2016, chlorophyll a scores declined broadly. However, the Delaware Headwaters and Fishing Bay regions improved slightly. Broad Creek scored poorest of all subwatersheds in 2016, scoring a D+.





Figures 9-10 (above left) show charts that compare 2010-2014 five-year average scores, 2015, and 2016 scores for water clarity and dissolved oxygen. Blackwater National Wildlife Refuge Fishing Bay sites were included in data from 2014-2016.

Dissolved oxygen is crucial for all aquatic life. Low dissolved oxygen can be caused by conditions such as algal blooms and by decaying organic matter (such as leaves) in the water. Once dissolved oxygen reaches critical levels, fish kills and dead zones occur.

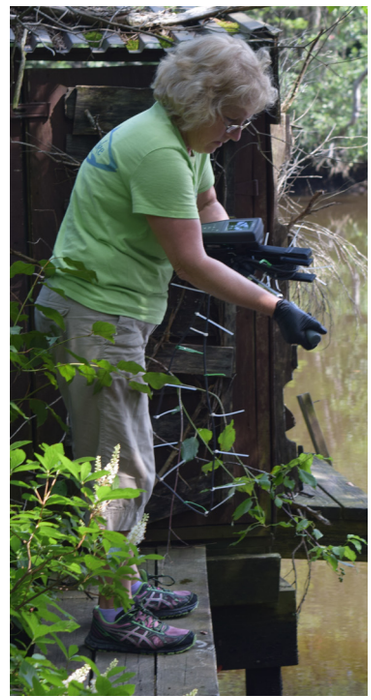
In general, Nanticoke Creekwatchers take at least two dissolved oxygen measurements per site (surface and bottom readings). Deep water sites take additional measurements. Measurements vary at different points in the water column, especially during periods of intense biological activity, such as algal blooms. Water temperature and salinity (at brackish sites) also varies.

In 2016, the Lower Creeks reported a steep decline, primarily caused by low oxygen conditions during summer months at several sites. However, the Fishing Bay watershed improved its score. The other subwatersheds showed very minor changes in scores.

Water clarity (or Secchi depth) is crucial for aquatic grasses and bottom-dwelling aquatic animals. Poor water clarity can smother aquatic creatures with no or limited mobility, such as oysters and freshwater mussels, and prevent predators from finding prey. Poor water clarity is also unable to sustain underwater grasses, which hold sediment and phosphorus in place in waterways and provide cover and food for juvenile fish and crabs.

Water clarity may be diminished due to a number of factors, including algal blooms that are driven by excessive nutrients, runoff from land sources due to lack of appropriate buffer vegetation, and erosion generated by excessive wave energy created by boat wakes and storms.

Scores declined in most regions, especially in Marshyhope Creek and Fishing Bay. The Upper Nanticoke showed a minor score increase, and the Lower Nanticoke, which scored poorest among Nanticoke regions, remained steady.



Figures 11-12 (above): (l) Creekwatcher Nan Zamorski measures dissolved oxygen at an upper Nanticoke site, while (r) Creekwatcher Helen Wilson uses a Secchi disk to obtain water clarity and total water depth measurements.

REDUCE RUNOFF 6

Runoff from impervious surfaces, lawns, or agricultural fields can overwhelm our local waterways (Figure 13, right) by introducing excessive amounts of nutrients (nitrogen and phosphorus), as well as sediment.

Plant native trees (Figure 14, left), like this American sycamore (*Platanus occidentalis*), or native plants. Trees provide shade, cooling surrounding waterways and land, and their deep roots absorb nutrients and hold sediment in place. Native trees and plants also serve as hosts for a number of pollinators and insect species. They also provide color and structure to landscapes.

Aquatic grasses, such as these growing in Gravelly Branch (Figure 15: background), are sensitive to sediment. Submerged aquatic vegetation provides hiding places for juvenile fish and holds bottom in place, while also absorbing nutrients. Decrease impervious or paved surfaces to reduce runoff by using permeable pavers (Figure 16: right, credit: Jane Hawkey, UMCES IAN) and directing runoff to rain gardens.

ABOUT NANTICOKE CREEKWATCHERS 7

Nanticoke Creekwatchers follow an EPA-approved methodology. During the 2016 season, members of the Chesapeake Monitoring Cooperative performed field assessments with three different Creekwatchers teams to verify that volunteers performed the same in the field as on paper and in anticipation of integrating future tidal data into the Chesapeake Bay Program. In addition, Nanticoke Creekwatchers received a third Delaware Governor's Volunteer Award for their service.

During the 2016 season, 42 citizen scientists participated in the Nanticoke Creekwatchers Citizen Water Monitoring Program. These volunteers monitored 36 sites in the watershed, including five in neighboring Fishing Bay watershed. Creekwatchers sampled at their sites every other week from late March through early November, gathering data and water samples and making observations about their sites.

Envirocorp Labs Inc. continues to serve as a keystone of the program, providing over $70,000 of lab work annually. In 2016, the Delaware Department of Natural Resources and Environmental Control funded the Delaware portion of the program and provided technical assistance. Town Creek Foundation supported chlorophyll a testing at all Maryland sites and facilitated the Bacterial Source Tracking project. RSVP of the Lower Shore and Delaware 50+ provided additional support for volunteers. The Integration and Application Network at the University of Maryland Center for Environmental Science provided technical assistance, as did Dr. Judith Stribling of Salisbury University. Lastly, Delaware Technical and Community College provided equipment and offered students opportunities to shadow Creekwatcher teams.

Figures 17-18: (l) Former Governor Jack Markell awards Nanticoke Creekwatchers with a Delaware Governor's Volunteer Award in October 2016. Mascot Don Dew, along with Creekwatchers Sandi Dew, Rick Zamorski, Nan Zamorski, Bob Kijewski, and Bonnie Kijewski, and Volunteer and Outreach Coordinator Beth Wasden accepted the award. (r) Creekwatchers and friends close out the 2016 with a celebration at Trap Pond State Park.

THANK YOU, 2016 NANTICOKE CREEKWATCHERS!

Richard Ball
Joyce Black
Galen Brosius
Sandi Dew
Colden Fees
David Fees
Debbie Fees
Rusty Good
Susan Good
Jeff Hampton
Barbara Hanley
Dan Houghtaling
John Huberty
Mary Lynn Huberty
Amy Jones
Hope Jones
Richard Julian
Troy Julian
Bob Kijewski
Bonnie Kijewski
John King
John Lindinger
Pat Maher
Ron Maher
Cyrus Marter
Alice Mohrman
Blake Moore
Biddi Nixon
Jennie Powell
Mike Pretl
Bob Sellers
Rachael Shedaker
Stan Shedaker
Howard Vanderslice
Frayser Williamson
John Williamson
Beverly Wilson
George Wilson
Helen Wilson
Kirsten Zamorski
Nan Zamorski
Rick Zamorski

Thanks to Delaware Tech and Community College students Jermaine Robinson, Heather Lefner, and Zak Donohoe for participating in early season water monitoring and to their instructor, Bethany Krumrine.

The Nanticoke Watershed Alliance is a consortium of non-profit organizations, local businesses, industry, state and federal agencies that work together to ensure a bright future for the iconic Nanticoke River. The NWA is a venue for sharing information and creating open and honest dialogue around river issues and potential solutions. Some of our key efforts include:

- Monitoring the health of the Nanticoke River system and providing data to agencies and partners.
- Providing outreach and workshops to watershed residents.
- Educating middle schoolers in schools and on field trips and leading stewardship activities in school communities.
- Offering workshops to teachers in Delaware and in Maryland.
- Organizing river clean-ups, tree plantings, and other events.
- Encouraging recreational usage of and improving public access to the river and its tributaries.

Support the NWA!

- Join our team of dedicated volunteers and help with water monitoring, restoration and clean-ups, outreach efforts, and more.
- Make a tax-deductible donation to support our work for the river and its communities.
- Become an NWA partner. Businesses and organizations can join the NWA's "Partners In Conservation" program and become a part of ongoing dialogue associated with the conservation of the Nanticoke River.
- Say hello at our office or at outreach events. Our office is located in Vienna, Maryland, and is open from 9:00 am-4:00 pm, Mondays through Fridays.

For more information, visit www.nanticokeriver.org

The NWA strives to support the local community through service projects and other outreach events. If you are interested in joining the NWA in making the Nanticoke Watershed a cleaner, healthier, and more beautiful place to live, contact us online at *www.nanticokeriver.org* or *www.facebook.com/NanticokeRiver.*

Figures 19-21: (l) Creekwatchers Galen Brosius and Sandi Dew wrap up another Creekwatchers outing. Volunteers serve as Creekwatchers and assist with outreach and education activities. (m) Former board member Dave Nemazie and current board member Alan Girard raise a "Toast to the Nanticoke," the NWA's largest annual fundraising event. (r) A painted and planted rain barrel, which the NWA provided at a Homeowner Workshop. The NWA appreciates and thanks our community. We invite you to volunteer as a Creekwatcher, to support the Nanticoke Watershed Alliance by donating or becoming a partner, and to participate in the improvement of our communities and waterways by making positive changes to your home landscape.

The Nanticoke Watershed Alliance would like to thank the following organizations for their contributions and support of the Creekwatchers program during the 2016 season:

Project Supervisor/Author
Beth Wasden

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Cover image of the Nanticoke River's abundant wetlands at Woodland, Delaware.