Wicomico River Health

2016 WATER MONITORING REPORT

COMPARISON WITH 2015

River Segment	Total Nitrogen	Total Phosphorus	Water Clarity	Chlorophyll *a*	Bacteria
Ponds	Worsening	Worsening	Worsening	Improving	Worsening
Upper River	Stable	Worsening	Improving	Improving	Worsening
Lower River	Worsening	Worsening	Worsening	Stable	Stable
Wicomico Creek	Stable	Worsening	Improving	Improving	Improving

Improving Worsening Stable

SUMMARY OF RESULTS

In 2016, water quality in the Wicomico River continued to be generally in the moderately impaired range for all parameters measured, except for fecal bacteria, which were highly abundant. The trends in 2016 resembled those of 2015 in that they were mixed compared with the previous year. Above-normal rainfall for June and July, and record amounts in September, produced very high flows and delivery of nutrients, especially phosphorus, and removal of phytoplankton as evidenced by low chlorophyll *a* values. Annual averages for phosphorus were worse, and no improvement was seen in nitrogen. Chlorophyll *a* improved, water clarity was mixed, and bacteria levels were much worse than in 2015. This represents the second year in a row of considerable increases in nutrient levels.

Total Nitrogen (TN) annual averages were worse in the Ponds and Lower Wicomico, and similar to 2015 in Wicomico Creek and in the Upper Wicomico. The number of healthy sites and high-N sites decreased to 2 each.

Total Phosphorus (TP) annual averages were either worse or unchanged for all segments. The number of healthy sites dropped from 7 to 4, with all of these in the Upper River and Ponds. However, for the 3rd year in a row, no individual site averages were above the unhealthy level.

Water Clarity was mixed, improving in the Upper River and somewhat in Wicomico Creek, and worsening elsewhere. This year the number of healthy sites increased to 3.

Chlorophyll *a* levels for all sites remained within the moderate range, but declined in all segments except for the Lower Wicomico. This improvement most likely reflects export of algae by high river flows rather than reduction in nutrient loading, which was not seen.

Fecal enterococci bacteria levels were even worse than in 2015. All sites were ranked very poor (high swimming risk in >40% of samples) this year. Levels in June and in September were extremely high due to very large rainfall events. Although Wicomico Creek improved slightly over 2015, the level was still very poor. The Wicomico River system continues to have substantial delivery of fecal bacteria to its waters.

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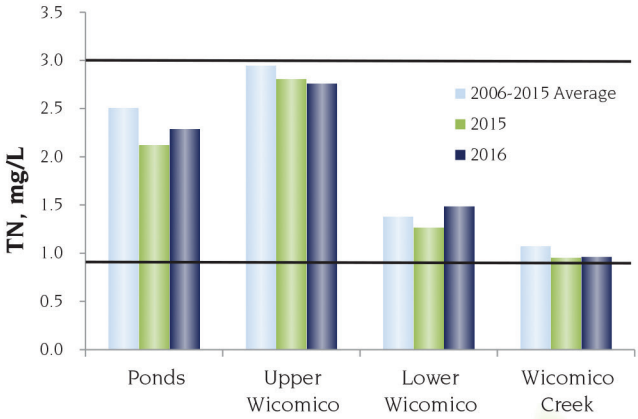
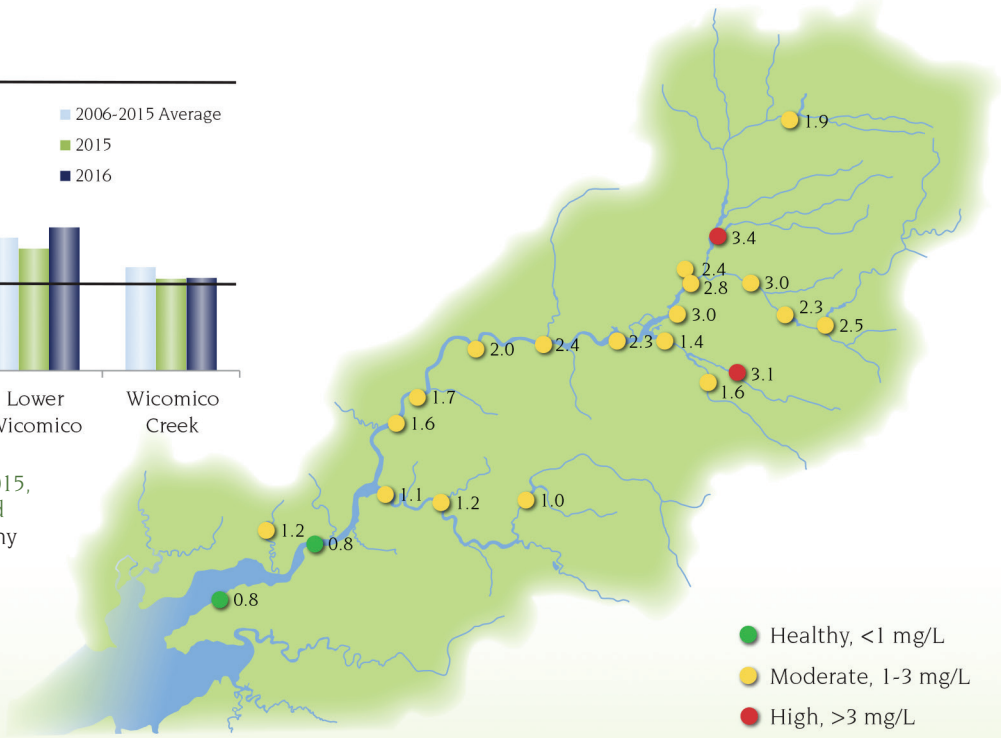
NUTRIENT LEVELS, 2016



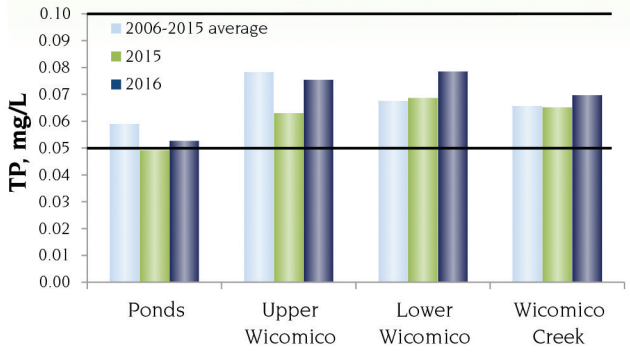
Total Nitrogen (TN) for 2016, 2015, and the previous 10-year period
Solid black lines indicate healthy (below 1 mg/L) and moderate (1 to 3 mg/L) values.



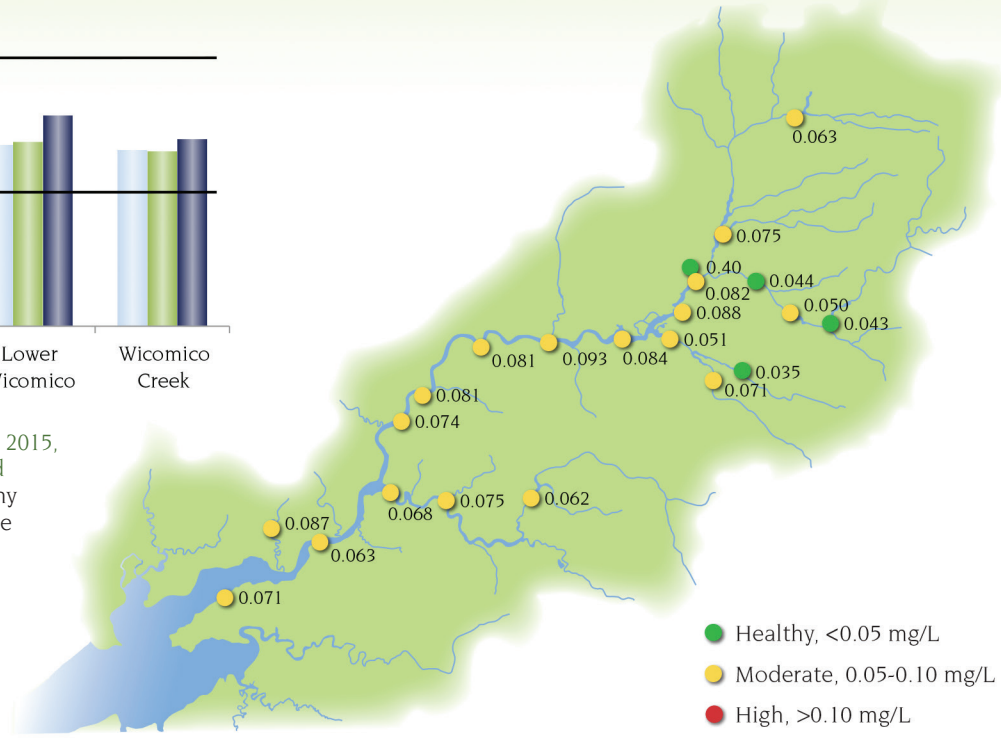
Total nitrogen (TN) yearly averages in the Ponds and Lower Wicomico increased in 2016, and Wicomico Creek and the Upper River segments remained about the same as in 2015. Individual site annual averages were mixed, with healthy sites declining from 6 to 2, and high - N sites dropping from 4 to 2 compared with 2014 averages.

Nitrogen and phosphorus are essential for plants and animals, but an overabundance causes algal blooms and resulting low dissolved-oxygen levels. Phosphorus is often attached to particles of sediment, and nitrogen in surface water is generally delivered dissolved in runoff and groundwater.

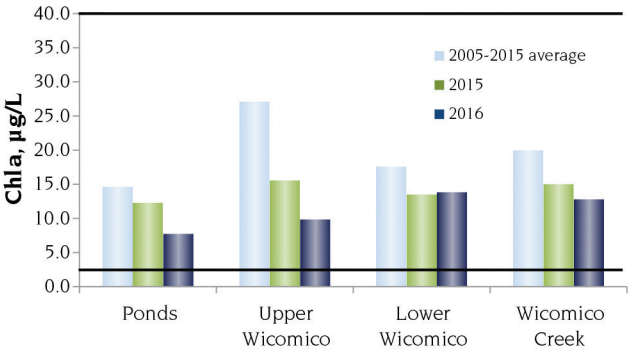
Total phosphorus (TP) worsened in every segment compared with 2015, exceeding the long-term average both in the Lower Wicomico and in Wicomico Creek. As with 2015, no individual sites exceeded the high threshold, but the number of sites in the healthy range decreased from 7 to 4.



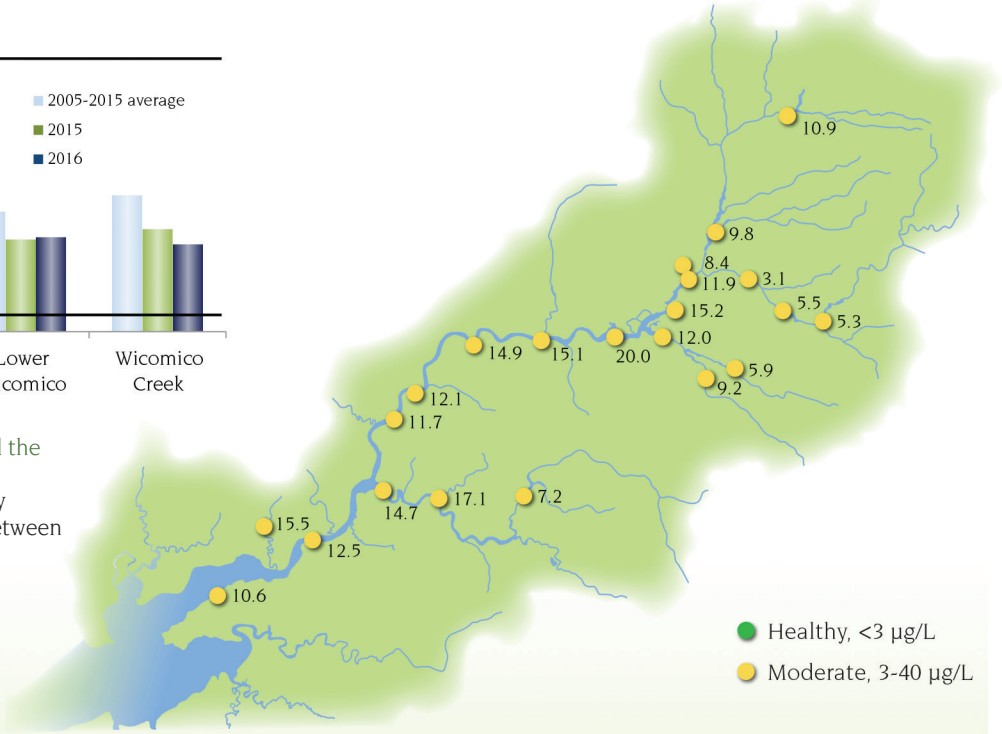
Total Phosphorus (TP) for 2016, 2015, and the previous 10-year period
Solid black lines indicate healthy (below 0.05 mg/L) and moderate (0.05 to 0.10 mg/L) values.



CHLOROPHYLL *a* AND WATER CLARITY, 2016



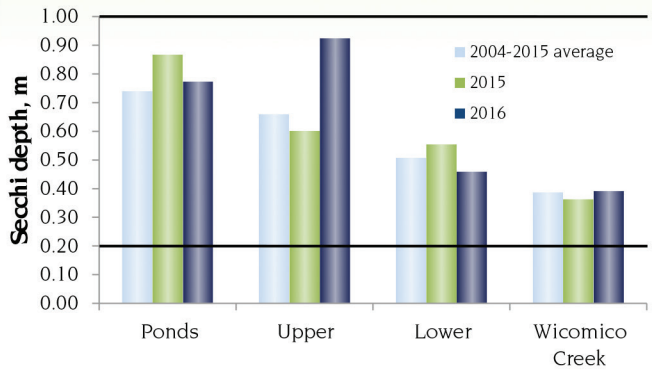
Chlorophyll *a* for 2016, 2015, and the previous 11-year period
Solid black lines indicate healthy (below 3 mg/L), and elevated (between 3 and 40 mg/L) reference levels.



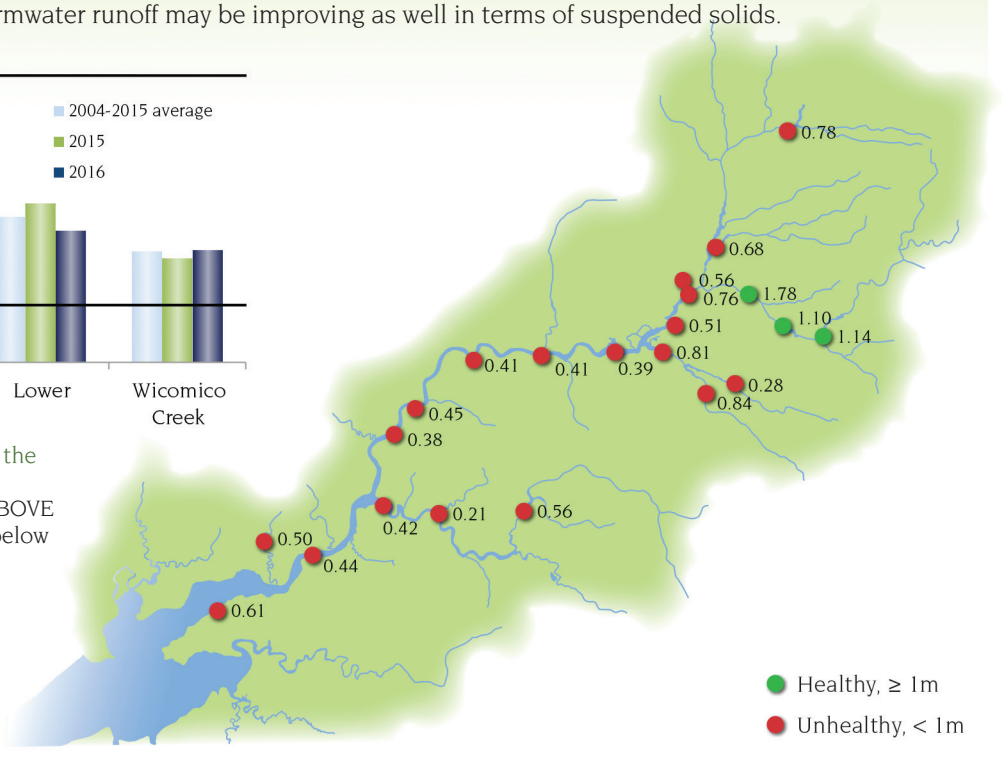
Chlorophyll *a* levels improved in the majority of the site averages in 2016, including most of the Pond sites. Although, as in 2015, no sites were in the healthy range, all sites were well below the upper 40 mg/L threshold, indicating substantial but not unhealthy phytoplankton abundance.
Chlorophyll *a* levels by segment improved except in the Lower Wicomico, probably because phytoplankton were flushed from the system by the unusually heavy rains in June and September.

Chlorophyll allows plants—including algae—to capture sunlight and perform photosynthesis. The abundance of chlorophyll a is a good indicator of the amount of algae present in water. Light is critical for growth of underwater grasses. Poor water clarity indicates water that is clouded with suspended sediment and algae.

Water clarity in 2016 remained impaired, below the healthy threshold of one meter, in most sites. The number of healthy sites, with Secchi depth > 1m, increased from 2 to 3, including 2 Ponds and the site on the Upper River's East Branch.
The annual average by segment for water clarity improved dramatically in the Upper River, and very slightly in Wicomico Creek. Levels worsened in the other 2 segments. Improvements were most likely related to the flushing of algae from the system, but they indicate that stormwater runoff may be improving as well in terms of suspended solids.



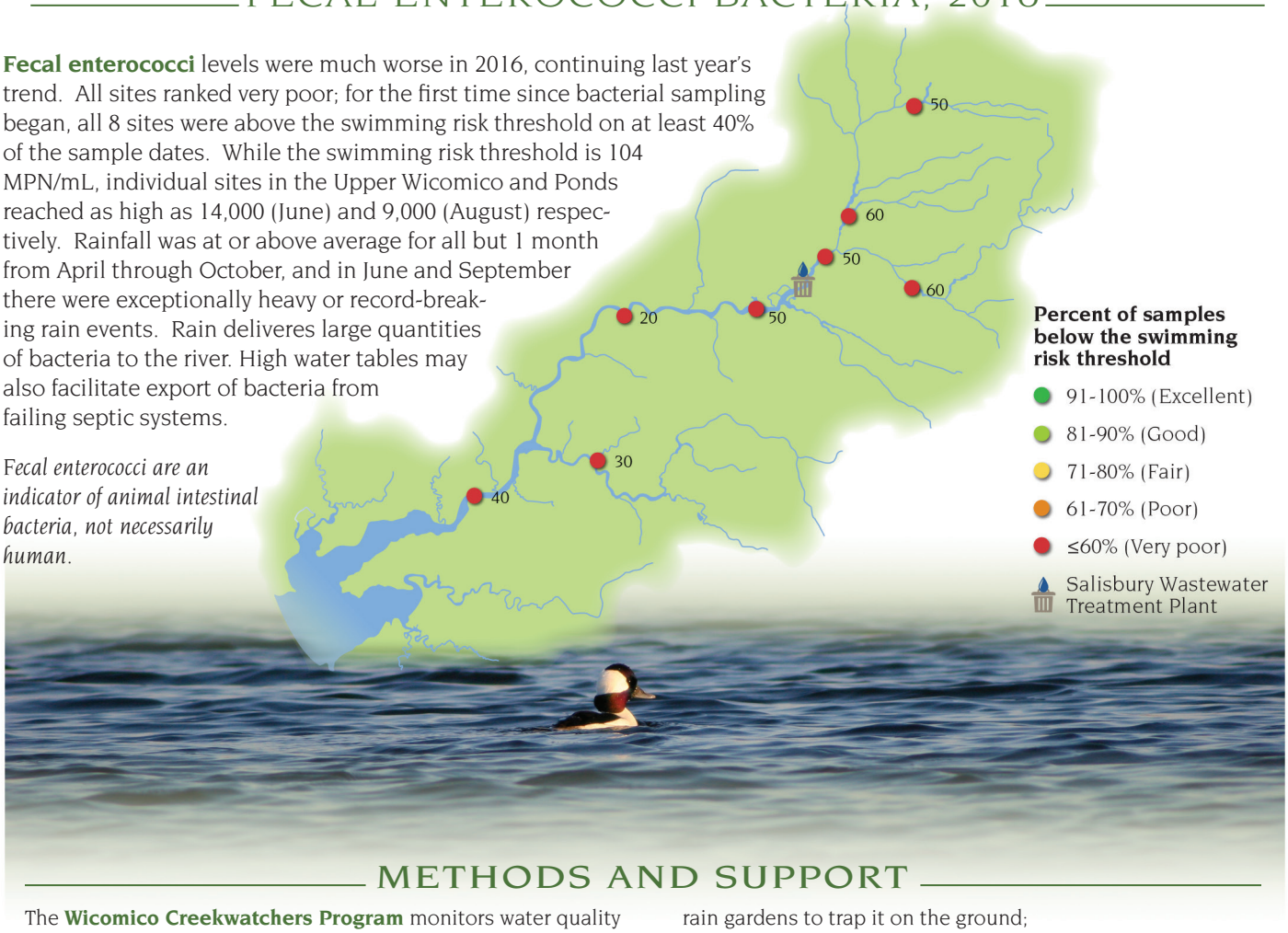
Water Clarity for 2016, 2015, and the previous 12-year period
Healthy values are equal to or ABOVE one meter and very poor levels below 0.2 m (solid black lines).



FECAL ENTEROCOCCI BACTERIA, 2016

Fecal enterococci levels were much worse in 2016, continuing last year's trend. All sites ranked very poor; for the first time since bacterial sampling began, all 8 sites were above the swimming risk threshold on at least 40% of the sample dates. While the swimming risk threshold is 104 MPN/mL, individual sites in the Upper Wicomico and Ponds reached as high as 14,000 (June) and 9,000 (August) respectively. Rainfall was at or above average for all but 1 month from April through October, and in June and September there were exceptionally heavy or record-breaking rain events. Rain deliveres large quantities of bacteria to the river. High water tables may also facilitate export of bacteria from failing septic systems.

Fecal enterococci are an indicator of animal intestinal bacteria, not necessarily human.



METHODS AND SUPPORT

The **Wicomico Creekwatchers Program** monitors water quality in 22 sites throughout the Wicomico River system from March to November. Citizen scientists collect water samples and data on water clarity and field conditions at regular two-week intervals. Bacterial samples are collected on the same schedule from 8 sites between May and September for analysis at the Salisbury University (SU) Bacteria Source Tracking Lab. Chlorophyll *a*, nitrate, phosphate, pH, and salinity are measured by SU students, and total nitrogen (TN) and total phosphorus (TP) are determined at the Horn Point Laboratory of the University of Maryland Center for Environmental Science (UMCES). For detailed methods and past annual reports, see www.salisbury.edu/creekwatchers

Results are evaluated using threshold values developed by the Mid-Atlantic Tributary Assessment Coalition, UMCES, for freshwater tidal / oligohaline (low salinity) waters.

You can help improve the health of your River and the Bay:
- Get involved locally—your local organizations and government can't do it alone;
- Use lawn chemicals and fertilizers sparingly and only as directed;
- Create "buffers"—areas that will soak up excess rainwater—by planting native trees, shrubs, and grasses;
- Use rain barrels to catch rainwater from your roof and plant rain gardens to trap it on the ground;
- Support your local and regional conservation groups; and
- Become a Creekwatcher!

Our 2016 Creekwatcher Volunteers were Madeleine & Steve Adams, Sandy & Frank Bontempo, Peter Bozick, Clinton & Ramona Bradway, Peggy Buchness, Judy Burns, Kathy Cordry, Anita Danko, Kevin Davis, Bill Day, Henriette DenOuden, Susan Dupont, Dave Eccleston, John Groutt, John Haffner, Bob & Winona Hocutt, Larry Hunt, Barry Johansson, Mike, Cassy, & Kara Lewis, Tom & Nancy Mace, Bill McCain, Katherine McCallister, Ryan Mello, Paul Mysak, Nancy & Terry Nyquist, Lynne & Mac Peverley, Linda Prestileo, Tami Ransom, Richard & Elizabeth Rose, Becky Ratliff, Nancy & Dr. Richard Reddish, Dan Savoy, Keota Silaphone, George Tavaglione, Mat Tilghman, Dave Van de Pol, Ray and Pat Vorus, Stuart & Kathy Wikander, Chuck Wojchechowski, John Wright, and Bill & Judy Wyatt.

Student volunteers: Valerie Case, Stephanie Cirata, Nathan Hirtle, Andrew Jones, Jennifer Kneas, David Light, Stephen Miller, Sarah Ober, Michael Omps, Gabriel Pierce, Catherine Raley, Tyler Wilson, and Emily Zumstein. THANKS FOR A GREAT SEASON!!

Wicomico Creekwatchers are supported by the City of Salisbury, Chesapeake Bay Trust, Wicomico Environmental Trust, George Miles & Buhr Engineering, Salisbury University Henson School of Science and Technology, and Salisbury University Department of Biological Sciences.

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