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WATERKEEPER ALLIANCE MEMBER

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south river federation

2014 South River Report Card

Protecting, Preserving, Restoring and Celebrating the South River

Message from the Executive Director

I sit down to write this three weeks after Erik Michelsen—our outstanding Executive Director since 2008—left to take the helm of Anne Arundel County's new stormwater program, officially as the first Administrator of its Watershed Protection and Restoration Program. The Board is pleased and proud to see such a talented individual placed in a position where he can make an enormous difference in the battle to improve water quality in the South River and all the waterways in Anne Arundel County. We wish him much success. Please be assured of the board and staff's commitment to continue all the fine work accomplished by the South River Federation thus far.

As we publish our eighth annual Report Card, we are happy to report improvements in water clarity and dissolved oxygen. Of course, "better" doesn't necessarily mean "good" in these or any of the other categories, and Diana is adept at pointing out all the possible reasons for year-to-year fluctuations. But the reason we amass this data is to begin to identify trends, and to link the changes we see to land management practices, good or bad. Once again we can "round up the usual suspects": septic system seepage, stormwater runoff, excessive use of lawn fertilizers, and eroding stream banks as the major sources of degradation.

Hoping to accelerate a tributary's recovery from current conditions, we have just embarked on a major stream restoration project in the Church Creek watershed that we hope will serve as a model throughout Anne Arundel County. Church Creek drains the Route 2 corridor south of West Street in Annapolis—an area characterized by large shopping centers and parking lots. In addition to the excellent monitoring program Diana conducts in order to compile this Report Card, we plan to conduct before-and-after monitoring at the mouth of the Creek, so we can begin to validate actions that produce the results we want: reduced sedimentation and cleaner water at the outfall. Further, we are proposing a technology that addresses the accumulated sediments already present in the creek bottom—in some areas 3-5 feet deep. We expect the benefits from this project will be visually evident, but more importantly, confirmed by respected scientific monitoring data. Hopefully, all parties interested in improving the Chesapeake Bay will benefit from this example and proof that these projects WORK!

We believe that the South River Federation and the County itself are positioned to accelerate the number and scope of restoration projects in the next 3-5 years. Passage of the stormwater fee was a huge step forward in ensuring that the County will have the resources to fund the types of projects necessary to make the South River healthy again—in our lifetimes. Thank you for your interest and support for these efforts. We will all benefit.

Sincerely,

Lynn Buhl

Lynn Buhl
Acting Executive Director and Chairman of the Board

Acknowledgments

We would like to thank the following for their support and/or funding to the mission of the South River Federation's annual Report Card, their continued contribution and support is greatly appreciated.

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Jennifer Carr

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Diana Muller

Conclusions

Each year the scientific assessment in the South River and its tidal creeks tells us a different story, and yet the same story. This year the region experienced a "normal" climate. We did not have an El Niño or a La Niña climatic event, therefore, we did not have extended periods of hot weather/ drought or larger periods of rain. This year's data set underscores the large impact that stormwater has on the South River's water quality. I have learned over the years of monitoring the South River that each and every tidal creek has its own unique node (identifier-characteristic) of pollution going into the tidal creek. For instance, Church Creek sub-watershed is 1,300 acres, and impacted by five shopping centers, two highways and 315 septic systems. That translates to more than half of the land being covered by impervious surface (concrete, asphalt, buildings, etc). It is only through stream-tidal restoration—including stormwater controls and septic upgrades—that this sub watershed can be healed. The other sub watersheds throughout the South River have their own nodes of pollution and are in need of their own specific restoration plans.

The statistical analysis of the South River Federation's long-term water quality data set, as presented in the 1st South River Technical Report, shows that the South River is currently not getting any worse. In fact, we are starting to see improvements due to high citizen awareness, and adequate revenues for restoration measures. This means that with real in-the-ground restoration, we can repair the water quality of the South River. We have to realize that the South River is an interconnected ecosystem from the headwaters of each freshwater stream to the end point into each tidal tributary and the South River.

I am positively convinced that through hard work, dedication and passion we can heal the South River through our great variety of scientific restoration projects.

About the Report Card

The South River Federation is pleased to present the 8th Annual South River Report Card providing an assessment of the state of health of the South River, Maryland. This assessment has ten water quality indicators (water clarity, dissolved oxygen, chlorophyll *a* [spring/summer], total nitrogen, total phosphorus, pH [surface/bottom], underwater grasses, temperature [surface/bottom], a human health indicator [bacteria] and an enforcement indicator. Weekly, Captain Diana Muller, the South RIVERKEEPER® and her crew of volunteers performed water quality monitoring at 21 stations in the tidal portion of the South River during the water quality monitoring assessment season from April through October.

Report Card Grades 2014

Water Quality Indicators	Percent	Grade	Change from 2013
Water Clarity	19%	E	▲ increase
Dissolved Oxygen	60%	D	▲ increase
Total Nitrogen	91%	A	▼ decrease
Total Phosphorus	8%	E	▼ decrease
Chlorophyll *a*, Spring	16%	E	▼ decrease
Chlorophyll *a*, Summer	0%	E	▼ decrease
pH (surface)	50%	E	▼ decrease
pH (bottom)	72%	C	▼ decrease
Underwater Grasses	2%	E	no change
Temperature (surface)	59%	E	▲ increase
Temperature (bottom)	65%	D	▲ increase
Human Health Indicator			
Bacteria	71%	C	▼ decrease
Enforcement Indicator			
State of Maryland	70%	C	no change
Anne Arundel County	80%	B	no change

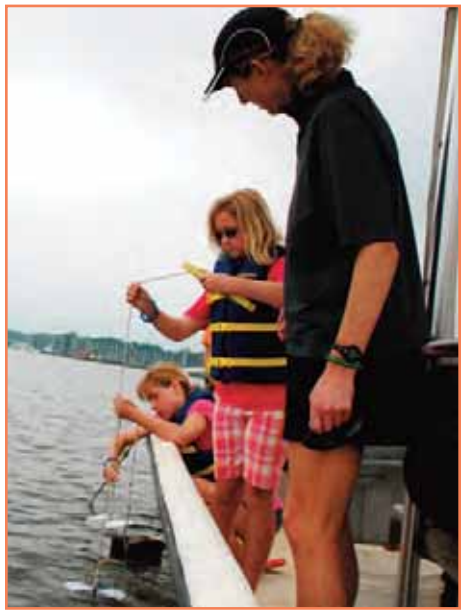
Report Card Grades 2007 – 2013

Water Quality Indicators	2007	2008	2009	2010	2011	2012	2013
Water Clarity	E	E	E	E	E	E	E
Dissolved Oxygen	D	E	D	E	D	E	E
Nutrients:							
Total Nitrogen				A	C	A	A
Total Phosphorus				E	E	E	E
Chlorophyll *a* -Spring		E	E	E	E	E	E
Chlorophyll *a*-Summer		E	E	E	E	E	E
Surface pH						C	C
Bottom pH						A	A
Bacteria	E	E	C	B	C	A	A
Underwater Grasses	E	E	E	E	E	E	E

The grading scale is as follow: 90-100=A, 80-89=B, 79-70=C, 69-60=D, 59 and less=E (Anne Arundel County Public Schools).

Water Clarity

Percent Passing: 19%



The criterion for water clarity as stated in COMAR (Code of Maryland Regulations) is to meet or exceed 1 meter, and a score of 90% or greater. Out of 362 observations at 21 stations, 19% passed the criteria of 1 meter and had a median of 0.7 meters. Although it is still not a passing grade, it is a movement in the positive direction from last year's 13% passing. As a comparison, the eight-year water clarity percent passing was 20% with a median of 0.7 meters and 543 observations (2004–2012). This means that the South River is statistically not degrading, and there is hope for improvement!

Water clarity is a measurement of how far down the water column light penetrates. If sunlight cannot get through the water column, then plants will not have the light necessary to grow. The reason that the South River is having so much trouble obtaining the proper water clarity is due to high concentrations of sediment, chlorophyll/algae blooms, and organic matter. The sources are: stormwater, eroding stream banks, poor erosion and sediment control on construction sites, septic and sewer.

The Secchi disk— created in 1865 by Angelo Secchi—is a circular disk used to measure water transparency. The disk is mounted on a pole or line, and lowered slowly down in the water. The depth at which the pattern on the disk is no longer visible is taken as a measure of the transparency of the water. This measure is known as the Secchi depth and is related to water turbidity.

Restoration ✳ Education Volunteerism

In 2013, the South River Federation had over 3,500 volunteer hours assisting with various restoration, clean-up, and water monitoring projects! This year SRF had more than ten clean-ups, two restoration plantings per month, planted oysters, removed invasive plants, and began an education outreach program to the Hispanic community.

On the restoration side, we completed the Arundel-on-the-Bay bioswale project and the Davidsonville Wildlife Sanctuary. Our largest stream restoration project to date is underway to restore the headwaters of Church Creek. Volunteers will be needed to plant trees and shrubs.

If you or your organization are looking for volunteer or educational opportunities, please contact our office at **410–224–3802**.

Enforcement

Maryland
Grade: C

State of Maryland: 70%

Anne Arundel County: 80%

AA County
Grade: B

State of MD: This year the South River Federation intervened as a plaintiff in a lawsuit brought by the State of Maryland to compel cleanup of the largest tire dump in Maryland. We believe our participation raised the visibility of the issue and accelerated its resolution, as an agreement was reached with the landowners in February 2014. The State quickly allocated $2.5 million for removal of the 350,000 or more tires on the Joy-Boehm property in Crownsville. The Maryland Department of the Environmental plans to clean up this site in spring 2015.

Anne Arundel County: The Anne Arundel County Department of Inspections and Permits is still very responsive to calls concerning poor erosion and sediment control practices throughout the watershed. The county also aggressively pursued violations against a number of parties who conducted egregious clearing within the critical area buffer.

Tires at the Joy-Boehm dump site.

The South River Federation participates on all levels on enforcement: local, state, and federal. Some of these include: construction sediment and erosion issues, illegal dumping and/or discharge, NPDES (National Pollutant Discharge and Elimination System) violations, Superfund, stormwater, critical area violations, and legislative issues. The best way for citizens to avoid environmental violations is to know what the local critical area and grading laws are in Anne Arundel County. The following website is the link to the critical area laws:
www.dnr.state.md.us/criticalarea/compliance.asp

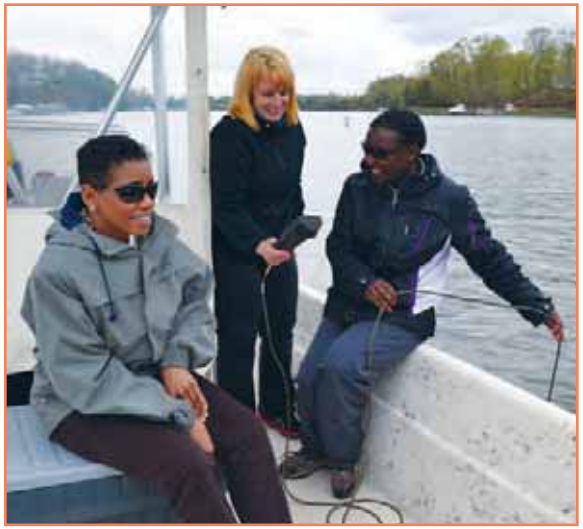
Dissolved Oxygen

Grade: D

Percent Passing: 60%

The criterion for bottom dissolved oxygen is 5mg/l or greater. The South River's bottom dissolved oxygen this year increased from 36% last year to 60%! This was one of the better years for the South River with regards to dissolved oxygen. Out of 385 observations, 60% passed the criteria of 5mg/l for bottom dissolved oxygen. The eight-year median for bottom dissolved oxygen in the main stem was 4.9 mg/l with 552 observations.

This year the weather pattern was "normal." The region did not experience an El Niño or a La Niña, therefore, there was no excessive heating in the water column. It is the combination of hot temperatures and nutrient enriched waters that help drive the explosive algae blooms, which in the end, drive the low dissolved oxygen. It is the lower temperatures in 2013 that helped reduce the algae blooms the South River experienced in 2012.



Congresswoman Donna Edwards, Capt. Diana Muller and Katie Geiger.

Nutrients

Nitrogen
Grade: A

Total Nitrogen: 91%

Total Phosphorus: 8%

Phosphorus
Grade: E

Total Nitrogen (TN): In 2013, 91% passed for nitrogen with 160 observations at 21 stations, and a median concentration of 0.09mg/l. The criterion for TN is less than 0.037mg/l. It appears as if nitrogen is within the acceptable range. However, this is deceiving because the nitrogen is metabolized by algae and phytoplankton.

Total Phosphorus (TP): In 2013, TP had a passing score of 8%, with 160 observations at 21 stations, and a median of 0.24mg/l. The criterion for TP is less than 0.65mg/l.

Nitrogen and phosphorus cycling in estuaries is an extremely complex process. So, when grades for nitrogen that indicate an "A" this appears to be a "good" thing. However, this can be particularly misleading. The reason nitrogen appears low is that the phytoplankton (microscopic plants and algae) quickly metabolize nitrogen first in the presence of phosphate. When there are excess concentrations of phosphorus, then the phytoplankton use up all of the available nitrogen and grow explosively. This causes an increase in the chlorophyll *a* concentration *(see chlorophyll section)*. The South River has what is known as "rolling" algae/phytoplankton blooms from May through October, which results in low dissolved oxygen levels, and in turn fuels the release of nutrients from bottom sediments.

Algae bloom in Almshouse Creek June 2013.

Nutrients in the South River come from stormwater runoff, leaky septic systems, broken sewer lines, eroding stream banks and fertilizers. Some nutrients are recycled from bottom sediments during low oxygen (hypoxic) events.

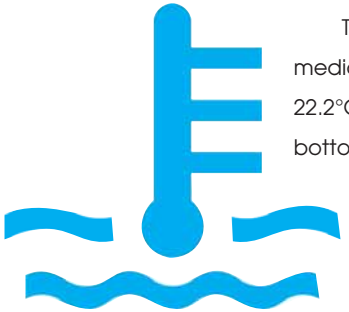
Temperature

Surface
Grade: E

Total Surface: 59%

Total Bottom: 65%

Bottom
Grade: D



The South River's surface median temperature (1 meter) was 22.2°C (71.6°F) and the median bottom temperature was 22.3°C (71.6°F). The median thermal tolerance is 25°C for aquatic species in the South River. Out of 386, observations the score for the surface thermal tolerance was 59% passing, while the bottom was 65% passing.

With climate variability and vulnerability, land subsidence (sinking), and sea level rise—tracking temperature is of vital importance. When water temperatures become too hot and exceed the median thermal tolerance, animal and plant species become stressed and either relocate or die. Temperature is another factor contributing to the dissolved oxygen decrease. The combination of nutrient enriched water and hot temperatures fuels the algae blooms, causing the bottom dissolved oxygen to decrease.

Summer intern Keaghan Muller.

Bacteria

Grade: C

Percent Passing: 71%

As part of South River Federation's *Operation Clearwater*, bacteria samples are collected every week from Memorial Day through Labor Day. The results are available to the public within 24-36 hours of collection. In 2013, bacteria concentrations increased dramatically after rain events in June and July.

People swimming or recreating in areas high in bacteria can get diarrhea, fever, gastritis, skin/tissue infections, chills, muscle aches, eye and/or respiratory infections. Chronic effects can include ulcerated infections, seizures, and death.

Residents can help reduce bacteria by picking up pet waste, keeping Canada Geese off shorelines/beaches and maintaining septic systems. This really helps to keep the bacteria out of the South River, especially after a heavy rainstorm.

Summer intern Maura Duffy.

How to Receive the Bacteria Information

Swim Guide: on your smart phone. For installation and directions check out our website: **www.southriverfederation.net/index.php/river-health/bacteria-data**

Website: www.southriverfederation.net

Facebook: www.facebook.com/SouthRiverFederation

Or: if you would like to have your community's recreational area tested, please contact our office at **410–224–3802** and request to sign-up for *Operation Clearwater.*

Chlorophyll a

Spring Grade: E

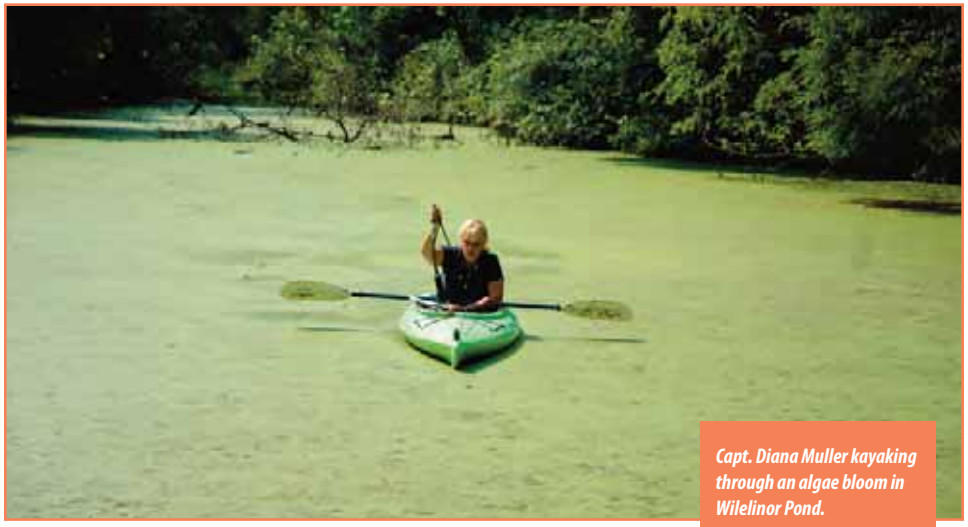
Total Spring: 16%

Total Summer: 0%

Summer Grade: E

Chlorophyll *a* is the green pigment found in phytoplankton and algae (small to microscopic plants), and is used as the indicator to estimate the concentration of phytoplankton and algae. These plants are found naturally in the South River and Chesapeake Bay. The excessive amount of nitrogen and phosphorus coupled with phosphorus laden sediments, leads to an explosive growth causing what is known as algae blooms or algae mats. The algae blooms not only photosynthesize during the day and then respire during the night. It is during the respiration phase that oxygen is utilized in the water, which leads to hypoxic and/or anoxic conditions.

This year out of 382 observations at 21 stations, 16% passed the criterion of 6.7µg/l for spring, with a median of 17.9µg/l. The summer criteria had 0% passing the criterion of 7.7 µg/l for summer, with a median of 22.7µg/l.



Capt. Diana Muller kayaking through an algae bloom in Wilelinor Pond.

pH

Surface Grade: E

Bottom Grade: C

Total Surface: 50%

Total Bottom: 72%

Measuring pH and alkalinity in the South River and throughout the South River watershed are extremely important to understanding its overall health.

Surface pH had a score of 50% passing, with 385 observations and a median of 8.01. The bottom pH had a score of 72% passing out of 385 observations, and a median of 7.63. The surface pH was alkaline, which usually correlates to the reaction of the river's chemistry after an algae bloom. Since the pH of water is critical to the survival of most aquatic plants and animals, and alkalinity is a measurement of the water's capacity to neutralize acids, monitoring pH is vitally important. Substances with a pH less than seven are acidic, and those with a pH greater than seven are basic (alkaline).

Summer intern Natasha Rathlev.

Biological activity can significantly alter pH in aquatic ecosystems. Through photosynthesis, plants remove carbon dioxide (CO_2) from the water and expel oxygen (O_2). Since CO_2 becomes carbonic acid when dissolved in water, the removal of CO_2 results in a higher pH, and the water becomes more alkaline. When algae naturally begin to increase in estuaries during the spring, pH levels tend to rise. An overabundance of algae (called an algal bloom) may cause pH levels in the river to rise significantly, and this can be lethal to aquatic animals. The increase in pH peaks shortly after the chlorophyll and/or blue-green algae blooms. These increases in pH have generally been occurring in the late spring through the summer. However, due to the high nutrient concentrations and climatic events, blooms have also been occurring in the fall and early winter. The impact is that aquatic animals, which can only live in a narrow pH range, are stressed or killed by the fluctuations.

Underwater Grasses

Grade: E

Percent Passing: 2%

The underwater grass or Submerged Aquatic Vegetation (SAV) survey in 2013 was performed by the South River Federation's trained SAV team. The SAV team uses kayaks in order to survey the shoreline, then GPS units are used to mark the locations of SAV. The grasses are identified by family and/or species. The use of ArcGIS (geographic information system) is used to calculate the acreage. In addition, the aerial surveys performed by the Virginia Institute of Marine Science are used in the calculations.

In accordance to Maryland Code of Regulations, the restoration goal for the South River is 455 acres from the mouth of the South River to above Rt. 450. This year the grasses grew later in the year and approximately ten acres were located in 2013, thereby giving an attainment of only 2%.

The grasses identified were Horned Pondweed (*Zannichellia palustris*), Sago Pondweed (*Potamogenton pectinatus*), and Widgeon Grass (*Ruppia maritima*). Horned-pond weed is a spring plant visible from mid-April to May, perishing as the water temperatures warm. Sago pondweed and widgeon grass grow in the South River from June through the end of October.

Underwater grasses provide an array of benefits to the South River. They provide the dissolved oxygen necessary for aquatic animals and serve as a habitat for fish, blue crabs, mollusks, and birds. High concentrations of sediment and nutrients coming off the land prevent sunlight from reaching the bottom of the shallows. Without sunlight, the grasses cannot grow, and if the grasses do not grow, then there is not enough oxygen or habitat. The dramatic loss of underwater grasses is due to the poor water quality conditions in the South River.