2011 South River Scorecard

south river federation

Protecting, Preserving, Restoring and Celebrating the South River

About the Scorecard

The South River Federation is pleased to present the fifth ***South River Scorecard***, providing an assessment of the state of health of the South River, Maryland. This assessment has six water quality indicators [(1) water clarity, (2) dissolved oxygen, (3) total nitrogen, (4) total phosphorus, (5) chlorophyll *a*, and (6) underwater grasses], a human health indicator (bacteria), an enforcement indicator, and two descriptive indicators which are not scored. Weekly, 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 season. This includes two additional main stem stations added in 2010. The water quality scores are calculated statistically for each numeric indicator, in accordance to the Chesapeake Bay Program Criteria. References used were: *"Ambient Water Quality Criteria for Dissolved Oxygen, Water Clarity and Chlorophyll a for the Chesapeake Bay and Its Tidal Tributaries, 2003-2008"* and the Code of Maryland Regulations (COMAR). The scores are based on the percentage passing the criteria. For example, if 10% passed, the score would be a 1 out of 10, and if 100% passed the criteria the score would be 10. The table below shows the water quality trend since 2007.

Water Quality and Human Health Indicators (0-10)

	2007	2008	2009	2010	2011
Water Clarity	2	2	1	1	2
Dissolved Oxygen	6	5	6	2	6
Nutrients	7	—	2		
Total Nitrogen	—	—	—	9	7
Total Phosphorus	—	—	—	2	1
Chlorophyll *a* – Spring	—	2	0	0	2
Chlorophyll *a* – Summer	—	—	—	—	0
Bacteria	3	2	7	8	7
Underwater Grasses	1	1	0	0	0

Scorecard Results 2011

SUMMARY OF RESULTS

WATER QUALITY INDICATORS	SCORE	CHANGE
Water Clarity	2	▲
Dissolved Oxygen	6	▲
Total Nitrogen	7	▼
Total Phosphorus	1	▼
Chlorophyll *a*, Spring	2	▲
Chlorophyll *a*, Summer	0	NO CHANGE
Underwater Grasses	0	NO CHANGE

HUMAN HEALTH	SCORE	CHANGE
Bacteria	7	▼

ENFORCEMENT INDICATORS	SCORE	CHANGE
Anne Arundel County	8	NO CHANGE
State of Maryland	5	▲

DESCRIPTIVE INDICATORS

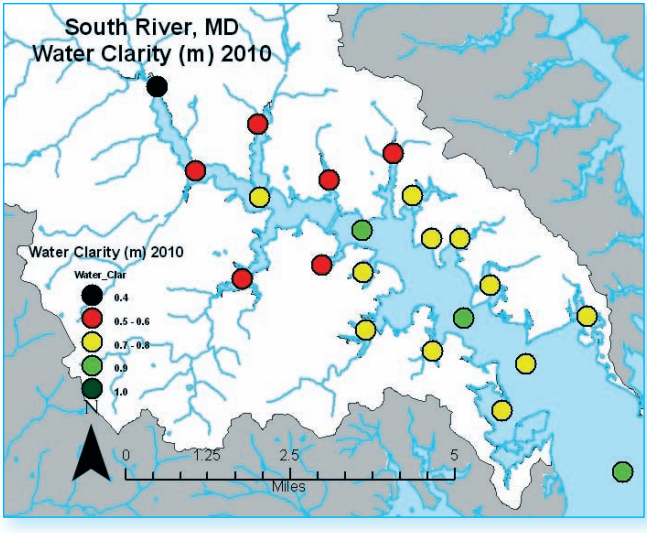
Septics, Community Engagement

Water Clarity

Score:

2

Water Clarity is the measurement of how far sunlight can pass through the water column. Sunlight is one of the key elements needed for underwater grasses to grow. When the water column's clarity is reduced, the underwater grasses do not receive the sunlight necessary for growth. The primary causes of reduced water clarity in the South River are suspended sediments and algae. Both the suspended sediments and algae are a result of stormwater runoff causing plumes of sediment and nutrients to be delivered to the South River. There are now sections of the South River between Flat Creek and Rt 50, where the sediment is permanently suspended in the water column. As shown in the graph, the further upriver the poorer the water clarity. The statistical analysis showed a regression of 0.89 for the 7 main stem stations, this is very significant. This indicates that there is a significant positive correlation between distance up the South River and the worse the water clarity. The area that is least developed has the worse water clarity.



WHY? This is due to what is known as the "*Turbidity Maximum.*" In the headwaters of the South River, fresher water entering the river flows over the denser saltwater that has intruded from the mouth. As this buoyant plume of fresh water spreads out over the saltier water, the fluid velocity decreases and as a result, the fine particulates that have entered through erosion and stormwater runoff sink into the landward flowing salt layer. The particles are now carried upstream where they are re-injected into the upper flow creating a closed loop. Over time, the concentration builds up in this closed loop area until the concentration that is lost downstream by the ebbing tide equals that which is carried into the area over a tidal cycle. This zone is called the *Turbidity Maximum* and has the highest concentration of suspended sediments therefore the lowest water clarity. One important note is that many of our creeks are reaching turbidity concentrations that are in the typical range for turbidity maximum zones for these sub-estuaries (60-100 mg/l).

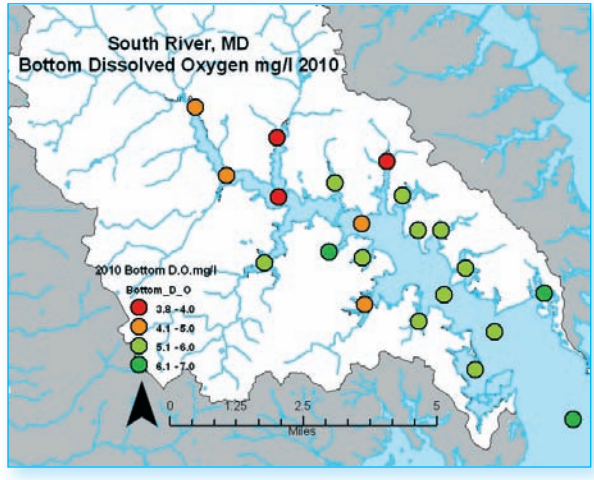
The water clarity depth criteria in the State of Maryland (COMAR 26.08.02.03) for the South River is 1 meter (3.3 feet), and the sampling season is from April 1 to October 1. The water clarity scores were calculated from 323 data points from 21 stations, and were calculated on the frequency of meeting the 1-meter (3.3 feet) criteria (pass/fail). Only **18%** of the water clarity passed the 1-meter criteria, giving it a score of **2 out of 10**. This year's slight improvement is attributed to the addition of two new main stem stations.

Dissolved Oxygen

Score:

6

Oxygen is the number one necessity for life. In aquatic systems oxygen is found in the form of dissolved oxygen and without it, the fish, crabs, and oysters can not exist. Low dissolved oxygen concentrations can lead to reduced growth and reproduction rates, change the distribution and behavior patterns of the aquatic organisms, and can lead to death. Dissolved oxygen is measured in milligrams per liter (mg/l) and can enter the water through photosynthesis from aquatic grasses, phytoplankton, or algae and by the physical process of wind mixing.



Dissolved oxygen concentrations are usually better on those days, or seasons, when there is greater wind mixing, however, the ecosystem quickly regresses back to being dominated by low dissolved oxygen in the absence of wind if nutrient levels are otherwise excessive.

This year, the median bottom dissolved oxygen was slightly better than in 2009, however during the months of July and August hypoxia, low D.O., was found at many locations *(see map)*. There were 323 measurements for bottom dissolved oxygen from 21 stations. **55%** passed the 5 mg/l healthy dissolved oxygen criteria, giving the final score of **6 out of 10,** other dissolved oxygen criteria is defined in the chart below.

Dissolved Oxygen	Conditions	% Passing the Criteria
Healthy Water	Dissolved Oxygen concentrations 5.0 mg/l or greater	55%
Hypoxia	Low levels of dissolved oxygen between 2.0 to 5.0 mg/l	82%
Severe Hypoxia	Extremely low levels of dissolved oxygen between 0.2 to 2.0 mg/l	82%
Anoxia	No oxygen (0-0.2) and the possibility of hydrogen sulfide production or the “rotten egg” smell	92%

Nutrients

Scores:

Total Nitrogen 7 ▼ / Total Phosphorus 1 ▼

The nutrients of concern are primarily nitrogen and phosphorus which enter tidal portions of the South River mostly from stormwater runoff, leaky septic and sewer systems, over fertilizing, eroding stream banks, and farmlands. Samples for nutrients were collected by the South **RIVERKEEPER®** at all 21 stations for 1 meter below the surface. The total nitrogen and total phosphorus in water is comprised of dissolved inorganic, particulate organic, particulate inorganic and organic nitrogen and phosphorus (minus atmospheric nitrogen). Both the nitrogen and phosphorus cycling are very complex, but the fact is, the nutrients that go into the South River are a food source for the algae and phytoplankton, creating a fast food buffet, causing them to grow. The criterion for total nitrogen is 0.65mg/l with 70 % passing that threshold, giving a score of **7** out of **10**. The criterion for total phosphorus is 0.037mg/l with only 10% passing the threshold, giving it a score of **1** out of **10**.

Riverkeeper Tool

The Hydrolab DS5 is a state of the art water quality instrument that measures: dissolved oxygen, temperature, salinity, conductivity, pH, chlorophyll a, and blue-green algae. Water quality profiles are made at 21 different stations in the South River weekly from April through October.

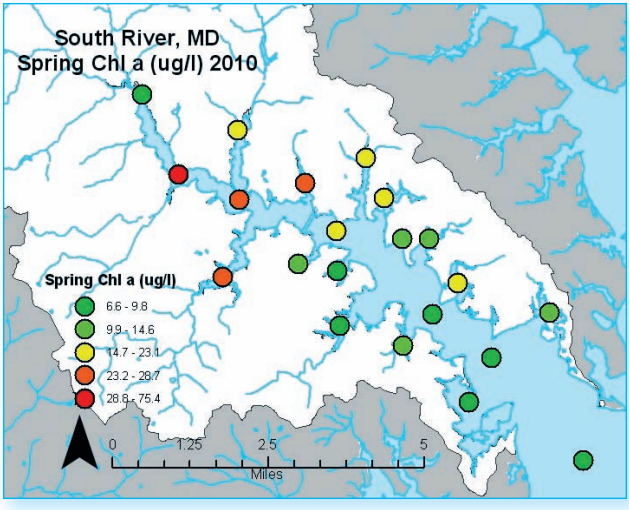
Dr. Andrew Muller, Department of Oceanography, USNA is helping to monitor the South River using the Hydrolab DS5. He uses the results to model hypoxia events in the river.

Chlorophyll a

Score:

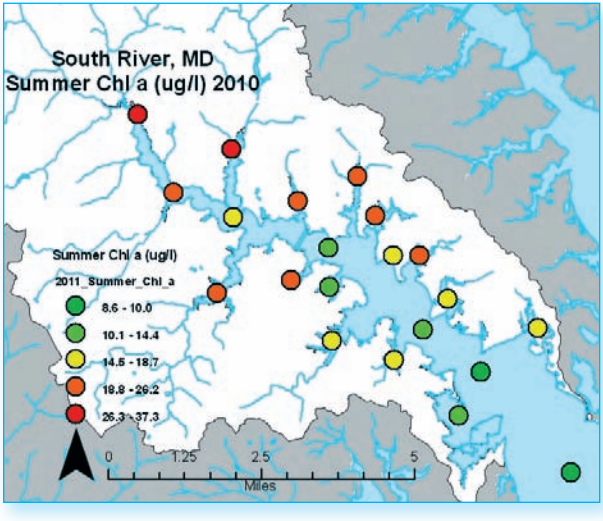
Spring: 2 Summer: 0

Algae and phytoplankton are microscopic plants that grow and drift in the water column. They are an important food source for the zooplankton (microscopic animals), oysters, clams, mussels, and menhaden. Most of the animals living in the Chesapeake Bay and tidal tributaries feed directly on phytoplankton or their secondary products.



However, due to excessive phosphorus and nitrogen loading, the phytoplanktons' food supply is unlimited causing them to grow and expand, resulting in large phytoplankton and algae blooms. This coupled with a massive reduction in the number of filter feeders that eat the phytoplankton—such as oysters and menhaden—indicate that the food web has been broken.

So what does phytoplankton have to do with chlorophyll? Chlorophyll is a green pigment that is found in plants, such as phytoplankton and algae. Chlorophyll converts energy that it absorbs from the sun to carbon dioxide to carbohydrates, which is the plants' food source. Analytically, chlorophyll is measured to determine the concentration of phytoplankton/algae in the aquatic environment. The spring chlorophyll criterion is 6.3μg/l and **15%** of the data passed the criterion giving it a score of **2**. The summer chlorophyll criterion is 7.7μg/l and **1%** of the data passed the criterion, giving the score a **zero**.



Bacteria

Score:

7

Bacteria is a great human health indicator and the South River Federation participates in a summer bacteria sampling program called "Operation Clearwater." In this program, water samples are collected weekly from May to September in participating communities. During the summer months, people like to recreate in the South River by swimming, kayaking, wake boarding, water skiing, and jet skiing. However, after rainstorms high levels of bacteria can pose a health risk for individuals swimming in the water, causing gastroenteritis, nausea, diarrhea, and/or dehydration. The possibility of getting sick from the water is of concern, and it is especially important for the young, elderly, and people with compromised immune systems to be mindful of conditions. The State of Maryland's Department of the Environment post a swim advisory for 48 hours after a rain event. But if our waterway were maintained in accordance to the Clean Water Act, we would not need these swim advisories. The fecal pollution in the South River after a rain event can come from leaky septic systems, broken sewer lines, pet waste, agricultural manure, wildlife waste, and boaters pumping out their holding tanks.

The regulations in the Code of Maryland Regulations (COMAR 26.08.02.03-3) for bacteria are that water samples should not exceed 104 colony forming units per 100ml (cfu/100ml). The score is based on the frequency of passing the 104cfu/100ml concentration. As shown in the table below, most of the stations passed the daily bacteria concentration. Out of 124 data points on these 9 stations, the percentage passing was 71%, giving the final score of 7 out of 10.

Operation Clearwater Locations	% Passing 104 cfu/100ml
Hillsmere	*86*
Glen Isle	*86*
Harbor Hills	*86*
South River Manor	*79*
Pine Whiff	*7*
SRPCA	*36*
Selby-on-the-Bay	*79*
Fishing Creek Farms	*86*
Cape St. John	*100*
Shoreham Beach	*90*

Underwater Grasses

Score:

0 No Change


Redhead Grass

There are sixteen species of underwater grasses that can grow in the Chesapeake Bay and tributaries, like the South River. These underwater grasses are crucial to the ecosystem health of the South River. They supply oxygen to the water column, provide habitat for blue crabs, small fish and mollusks, and help to prevent shoreline erosion. Bay scientists have found that thirty times more juvenile blue crabs live in grass beds than grassless areas (EPA CBP).

According to the Maryland Code of Regulations (COMAR 26.08.02.03-3) the underwater grass acreage restoration goal for the South River is 455 acres. In 1952, there were 552 acres of grasses documented. Yearly, the Virginia Institute of Marine Science (VIMS) performs "fly-overs" in the whole Chesapeake Bay region to identify areas that have underwater grasses. In 2010, they found no evidence of underwater grasses in the South River. This was field verified by the South **RIVERKEEPER®** and volunteers while on patrol and monitoring. In late April to early May, the species of grass that everyone seems to see in the South River is called Horned Pondweed (*Zannichellia palustris*) pictured right. This species of grass is not considered highly important by Bay scientists due to its very short life cycle which is approximately one month long.


Horned Pondweed

Enforcement

Score:

AA County 8 no change / State of MD 5▲

We have separated enforcement into two categories: Anne Arundel County and the State of Maryland.

Anne Arundel County: 8 out of **10** — The South River Federation has found that the Anne Arundel County Department of Inspections and Permitting has been extremely responsive to enforcement and violation issues. Every contact made Inspections and Permits was answered and investigated in a timely manner.

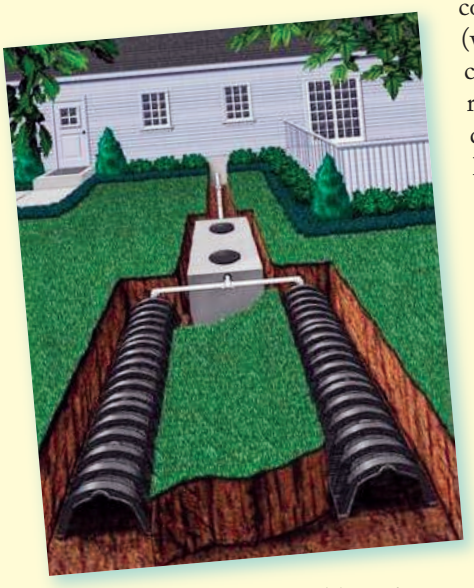
One example of cooperation with Anne Arundel County government was trying to identify the bacteria "hot" spots in the Warehouse and Almshouse Creek watersheds. One example of cooperation with Anne Arundel County government was trying to identify the bacteria "hot" spots in the Warehouse and Almshouse Creek watershed. As part of the effort, we took part in a tour with the Anne Arundel Department of Public Works, and residents of South River Farm Park of the Woodland Beach pumping station. This tour provided considerable insight into how pumping stations, and the sewer system work and all of the measures the County has in place to reduce the likelihood of catastrophic leaks.

The State of Maryland: 5 out of **10** — The South **RIVERKEEPER®** continued to have positive, quick responses from the Department of Natural Resource. However, the Department of the Environment (MDE) has failed to fully perform its enforcement and permitting duties to the established standards.

Enforcement is used as part of the water quality criteria, because enforcement of existing laws is crucial to protecting the health of the river.

Septic Systems

The South River watershed has around 66,000 people living in it, and almost 6,000 septic systems located within its boundaries. Conventional septic systems are designed to neutralize the harmful bacteria associated with human waste, but do little to address the associated nutrient loading. For instance, according to the Maryland Department of the Environment, homes on conventional septics in the critical area (within 1,000 feet of tidewater) contribute 80% of their nitrogen to the river, causing algae blooms and dissolved oxygen problems. Even homes further from the river, but within 1,000 feet of the non-tidal streams and creeks that feed the river, contribute 50% of their nitrogen to tidewater.



New research suggests that even phosphorus, which was once thought to be treated by septics, may actually leach into the groundwater for decades after it is initially deposited in the septic field.

What this means from a practical perspective is that a community like Edgewater Beach–Sunny Section, which is made up of 153 homes, largely on older septic systems, contributes about 3,000 lbs of nitrogen to the South River on an annual basis. That's about 1–2% of all the nitrogen entering the river each year, and could be cut by 90% if those homes were hooked up to sewer, where wastewater can achieve a much higher level of treatment at the Annapolis sewer plant. There are similar communities throughout the watershed, each contributing high levels of nutrients, and in some cases, bacteria to tidewater, and any strategy for cleaning up the South River has to involve taking steps to change the way we deal with wastewater.

In 2010, the community of Sylvan Shores took the important step of voting to replace an antiquated community sewer system with a properly function system administered by the County Department of Public Works. In any wastewater upgrade, there are considerable expenses associated with the effort, often times borne by the homeowner, and the Federation remains committed to working with the State and County government to try to make the process less costly and more efficient.

If your community is interested in taking the steps necessary to upgrade its septic infrastructure, please contact us at the office at **410-224-3802**, so we can assist you with the process.

Community Engagement

Community engagement is an important part of the South River Federation's work to protect, preserve, restore, and celebrate the South River. Throughout the year we host everything from educational trainings to stream clean-ups. If you would like to participate in one of these programs please contact our office at **410-224-3802** or **info@southriverfederation.net**. A few of our programs are:

RIVERWATCHERS

- The Riverwatchers are a dedicated group of volunteers that monitor the water quality of select sites in the non-tidal sections in the South River Watershed from April through October. This group of volunteers takes a mandatory water quality monitoring class, and then monitors stations on a bi-weekly basis.

MASTER WATERSHED STEWARDS

- The Watershed Stewards Academy is an initiative of the Anne Arundel County Department of Public Works, Anne Arundel County Public Schools and Arlington Echo Outdoor Education Center to train community leaders called "Master Watershed Stewards" to reduce the negative impact of stormwater runoff in Anne Arundel County.

  Their mission is to educate and engage citizens, businesses, and organizations within small geographic areas with the goal to reduce the pollutant load carried from the land into Anne Arundel County waterways. They coordinate installations of rain barrels, green roofs, raingardens, larger bioretention features for communities and businesses, and living shorelines. The South River Federation has partnered with South River Watershed Stewards. Our hope is to extend each other's effectiveness by working together to preserve the South River Watershed. Starting in 2011, the South River Federation will be offering mini grants to the South River Watershed Stewards in order to enhance their role in protecting our watershed.

OYSTERS

- The South River Federation has been involved in oyster restoration since founder John Flood first proposed the idea of an oyster restoration program in Harness Creek. In 2010, the South River Federation applied to Maryland's Department of Natural Resources to participate in the Maryland Grow Oyster Program (MGO). Presently, there are 526 MGO cages and approximately 500 Flood buckets to help the South River oyster sanctuaries.

SOUTH RIVER DAYS

- This is a family, fun-filled event held during the late spring to early summer that includes the Bernie Fowler Wade-In, a Kayak Sojourn and a picnic. This year we also plan on including an Oyster Flotilla. This is where the Oyster Gardeners will bring their oysters out to sanctuary reefs in the South River.

Want a Clean South River?

The bottom line is stormwater runoff needs to be controlled. Stormwater runoff carries with it phosphorus, nitrogen and sediment, the primary causes of poor water quality in the South River.

STORMWATER UTILITY FEE

- All citizens can call their local representative to support a Stormwater Utility Fee that can be utilized for stream restoration projects and/or best management practices.

SEPTIC AND SEWER

- Maintain your septic and sewer line systems on a regular basis. Individual septic systems can be upgraded to a de-nitrifying septic system.

CONSTRUCTION

- Improperly managed construction sites can lead to erosion and sediment (E&S) pouring into the South River. Please report violations about construction sites to Anne Arundel County (**410-222-7777**) or Diana Muller, South **RIVERKEEPER®** at (**410-224-3802**).

LAWN AND GARDEN

- Residents can stop fertilizing and applying pesticides/herbicides to their lawns. When landscaping use plants native to the Maryland coastal plain area. Install rain barrels, cisterns and/or rain gardens where ever necessary.

SHORELINES

- Be sure to manage your shoreline buffer properly, and if you have erosion issues, install a living shoreline to prevent shoreline erosion and provide habitat for animals.

WATER QUALITY

- If you notice discolored water, or mats of algae floating on the South River's surface report it to Maryland Department of Natural Recourses (DNR) Harmful Algal Bloom /Center at: **http://mddnr.chesapeakebay.net/hab** or call **1-800-285-8195**, or report to Diana Muller, South **RIVERKEEPER®** at **410-224-3802**. Please avoid the swimming (primary contact) in the water during times of high algae blooms.

PETS

- Pick up your pet waste; this will help reduce the *Enterococci* levels in the South River.

BOATING

- Boaters must to properly discharge their waste at pump stations. Almost all of the marinas in the South River have pump out stations.

CHESAPEAKE BAY TRUST

- Provides loans and grants for homeowner's associations to install living shorelines, and or/ community rain gardens, etc. Check their website for opportunities: **www.cbtrust.org**.

Conclusions


Diana Muller

The health of the South River is in ***deplorable*** condition.

The South River has too much sediment, too many nutrients, no underwater grasses, high bacteria counts after rainfalls, explosive algae blooms, periodic fish kills, extremely low dissolved oxygen, poor water clarity, fish with cancer, fish with PCBs (poly-chlorinated biphenyls), trash, and streams with highly eroded banks. Last I checked we did not live in a third world county, so why I ask, are we putting up with third-world conditions?

The answers I get are: no money, no time, and no resources. These are not answers, these are excuses. The science shows that the health of the South River is in grave condition. According to the Chesapeake Bay Nutrient and Sediment Enrichment Criteria (*EPA, Technical Support Document for the Identification of Chesapeake Bay designated Uses and Attainability*), the South River can be considered "Highly Eutrophic" (Table V-2). This definition is an "aquatic system so overloaded with nutrients those nutrients cannot be assimilated by the system and therefore nutrients are exported to adjacent waters." This is a serious state to be in and we can no longer ignore or be apathetic about this condition. However, this is not an impossible feat. The South River can be cleaned and must be cleaned. Since stormwater runoff is the largest contributor to pollutants in the South River, we must find a way to control the runoff and pay for the cost or we will not see any improvement in the health of the river.

As citizens of the South River Watershed, we must stand up and say enough is enough. It is our legal right under the Clean Water Act to have swimmable, fishable and drinkable waters. Each and every one of us needs to be held accountable for our actions to help enforce the Clean Water Act. How can we do this? First, by modifying our own behavior and then by holding our elected county, state and federal officials accountable for their actions. It is ignorant to say that "Saving the South River and Chesapeake Bay" will hurt our economy, when in fact, saving our resources will help our economy rebound. Currently, green collar jobs are on the increase, so let us help this part of the workforce by implementing stormwater controls and better engineering. Citizens and businesses can adapt and change to policy, but our South River can no longer take any more pollution.

ACKNOWLEDGMENTS

We would like to thank the following for their support and/or funding of the mission of the South River Federation's Annual Scorecard. Their continued contributions and support are greatly appreciated.

Anne Arundel County

The Keith Campbell Foundation for the Environment

The Chesapeake Bay Trust

Frohring Foundation

Pierre Henkart, Ph.D. National Institute of Health

Sally Hornor, Ph.D.
Anne Arundel Community College Operation Clearwater

Maryland Department of Natural Resources

Maryland Department of the Environment

Murray Foundation

Munson Foundation

National Oceanic and Atmospheric Administration
Chesapeake Bay Program Office

Robert Orth, Ph.D., Virginia Institute of Marine Science

Rouse Foundation

Marlene Simoncini — Simoncini Graphics

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Published March 2011 ✳ Graphic Design by Simoncini Graphics