2017 STATE OF THE ANACOSTIA RIVER REPORT CARD

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GRADING THE RIVER

We regularly provide a progress update on the Anacostia River in part to create accountability for decision makers entrusted with the health of the river. This report card is your guide to how well our communities, environmental groups, and governments are meeting the goal of a fishable and swimmable Anacostia River, per the terms of the Clean Water Act. Provided here is a summary of the scientific data we have analyzed so that citizens and public officials can better understand the current state of the Anacostia River.

Progress to a passing grade continues with strong leadership by local government agencies, nonprofit organizations and the private sector to clean up and restore the river. However, for the first time, the Anacostia Watershed Society issuing a "Behavior Threatening Promotion" warning because of the threat of devastating cuts to the EPA budget for restoration of the Anacostia River.

Our 2017 Report Card receives a grade of F, but improving, for water quality conditions that must be overcome for the Anacostia to become healthy.

The Overall Effort and Commitment of government agencies, nonprofit organizations, and the private sector to clean up and restore the river has earned a B- in 2017.

Data Sources and Disclaimers

- Data set: All available, professionally collected data was used. The data sets include those collected by DC government, Maryland Department of Natural Resources, United States Geological Survey, and the Anacostia Watershed Society.
- The data was compared with thresholds developed by Mid-Atlantic Tributary Assessment Coalition (MTAC) who created EcoCheck protocols - Sampling and data analysis protocols for Mid-Atlantic tidal tributary indicators.
- For the 2017 State of the Anacostia River Report, a 2015 data set was used because it was the most recent available data set at time of analysis. However, assessment for Stormwater, Toxics, Trash, and Overall Effort and Commitment is for 2016.
- For trend analysis, data sets from 1984 to 2014 or 2015 were used depending on the parameter and the section of the river.
- Note that no Report Card was issued in 2013 and that the one issued prior to that was dated 2011 (for the year representing most of the available data, rather than the year it was issued, 2012.)

OUR MISSION

The mission of the Anacostia Watershed Society is to protect and restore the Anacostia River and its watershed communities by cleaning the water, recovering the shores, and honoring the heritage. We believe that by working together with businesses, governments, faith-based organizations, and youth we can create sustainable solutions that improve our communities, empower our residents, and create economic prosperity that will result in a clean river. We want to change the way people think about the Anacostia and make the river a destination.

CHALLENGES TO OVERCOME

The most important parameters for a swimmable and fishable Anacostia River are fecal bacteria, toxics, trash, and uncontrolled stormwater. High fecal bacteria levels indicate that the water contains many types of disease-causing viruses, bacteria, and protozoa that can be hazardous to human health. We don't yet know the specific health risks associated with occasional exposure to the toxics (heavy metals, pesticides, and other chemicals) in the sediment in the river, but we do know that those contaminants are having **a negative impact on fish populations** and that removing or treating toxic sediment will be necessary for the river to sustain healthy fish safe for human consumption. Stormwater runoff is a major issue because runoff from impervious surfaces (e.g., roads, parking lots, driveways, roofs) brings numerous pollutants to streams and generates torrential stream flow, which causes streambank erosion and makes the water cloudy and inundates the river with sediment. The runoff also carries fecal matter, trash, and other pollutants to the river.

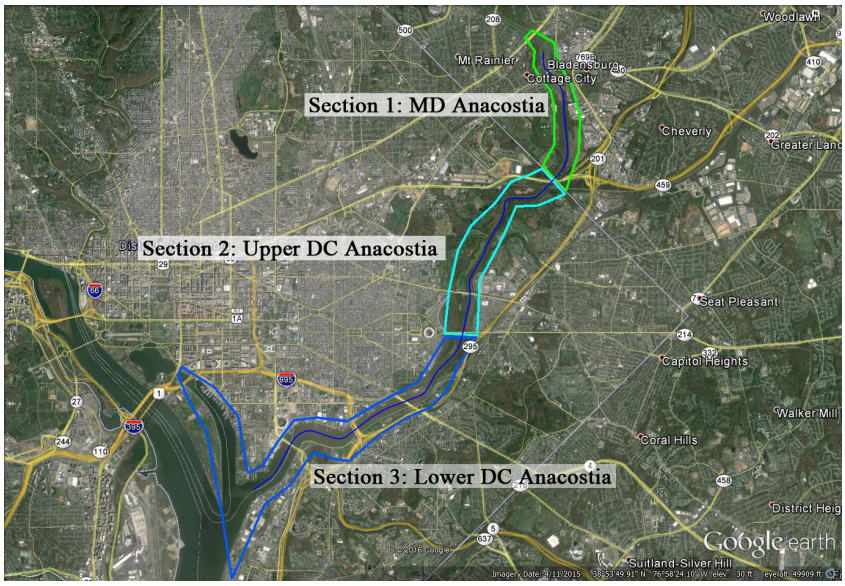
WATER QUALITY AND ASSESSMENT

	Parameter[*1]	Dissolved Oxygen	Fecal Bacteria	Secchi Disk Depth (Water Clarity)	Chlorophyll (a)	SAV	Stormwater Runoff Volume	Toxics	Trash	Average of % Score	Grade for section[*2]	%Score and Grade for the entire Anacostia
Section 1 (MD Anacostia)	% Score	66	45	40	78	% Score 37	% Score 47	% Score 32	% Score 49	49	F	% Score 49
	Grade for each parameter[*2]	D	F	F	C+							
	Long Term Trend	Needs attention	Improving	Improving	Improving							
Section 2 (Upper DC Anacostia)	% Score	40	63	39	69	Grade F	Grade F	Grade F	Grade F	47	F	Grade F
	Grade for each parameter[*2]	F	D	F	D+							
	Long Term Trend	Needs attention	Improving	Improving	Improving							
Section 3 (Lower DC Anacostia)	% Score	56	59	44	76	Trend Improving	Trend Degrading	Trend Improving	Trend Improving	50	F	
	Grade for each parameter[*2]	F	F	F	C							
	Long Term Trend	Needs attention	Improving	Improving	Improving							

*1 AWS scoring method used for Stormwater, Toxics and Trash. EcoCheck scoring method for all other parameters. (100% is best.)
*2 Standard school grading system (Below 60 = F)
Note: Toxics and Trash data is from 2016. Other data sets are from 2015, the most recent available data sets at time of analysis.
For trend analysis, data sets from 1984 to 2015 or 2016 were used.

Overall Water Quality Grade: Fail

To arrive at the overall grade for water quality in the Anacostia River, the Anacostia Watershed Society (AWS) first evaluates and grades each of three sections of the 9 mile tidal river for the key indicators of Dissolved Oxygen, Fecal Bacteria, Water Clarity and Chlorophyll *a*. The three sections, shown on the map below, are the Maryland portion of the Anacostia (Section 1: MD Anacostia), the upper half of the Anacostia in the District of Columbia above the East Capitol Street Bridge (Section 2: Upper DC Anacostia), and the lower portion in the District (Section 3: Lower DC Anacostia). Assessment for Submerged Aquatic Vegetation (SAV), Stormwater Volume Runoff, Toxics, and Trash is conducted for the entire tidal Anacostia River. These parameters will also be taken into consideration to give %Score and Grade for each section and the entire river.



Steady progress overall is seen once again for this year's report with a small increase in the %Score. Fecal Bacteria, Water Clarity and Chlorophyll *a* have been slowly improving, likely a result of DC Water's work to reduce its sewage overflows (reduced by 40% in 2009 and by 60% in 2011). Submerged Aquatic Vegetation (SAV) continues to make a strong comeback after a decade of absence. The %Score for SAV increased by seven times from 2013! However, these gains are not enough to result in the substantial

improvement of water quality in any section or overall. With each section for various parameters continuing to earn a failing grade, our overall assessment of water quality in the Anacostia River evaluated in 2017 is an F.

Building on previous years' discovery of the rebounding mussel population in the river, we conducted a river-wide mussel survey. We partnered with the Maryland Department of Natural Resources (MDDNR) and released the report in February 2016. AWS and MDDNR observed seven species of freshwater mussels in the river (Eastern floater, Eastern elliptio, Paper pondshell, Eastern pondmussel, Tidewater mucket, Atlantic spike, and Alewife floater) at Dueling Creek, the Bladensburg wetlands, Kingman Marsh, Kenilworth Marsh, the main stem of the river and Buzzard Point. These are seven of the nine species known to occur in the tidal Potomac River. One adult mussel can filter more than 10 gallons of water a day, therefore, a recovery of the mussel communities could be beneficial for the water quality of the river.

In May of 2013 an Eastern floater (a native freshwater mussel, left) was caught by an angler on its fishing line while fishing at Bladensburg Waterfront Park in Maryland. The finding encouraged us to do a mussel inventory in the river.

In 2016 AWS has taken a photo of what seems to be a river otter with our trail camera. And DOEE has taken photos of the Northern River Otter in National Arboretum!! The Northern River Otter is a species listed as a "Species of Greatest Conservation Need" in the DC 2015 Wildlife Action Plan.

River Otters on the trail camera. Photo credit: Lindsay Rohrbaugh of District Department of Energy and Environment.

We are excited to see a diversity of bivale species returning because it is a good indication that conditions are improving, in sync with what we are observing in terms of water quality. It is also encouraging that river's conditions are good enough to support otters!

Comparison to Last Year

There are limitations when comparing water quality scores over a short period of time because of numerous variables that impact water quality parameters. For example, more intense and frequent precipitation patterns generally make the water quality worse. More rain results in more sewer overflows and an increase in polluted runoff from streets and parking lots. So the comparison of indicators for wet and dry years can mask the underlying conditions. Long term trends are generally more helpful for understanding the river and changes in water quality than year-to-year, short term comparisons.

2017 Anacostia River Report Card

			2014 Report	2015 Report	2016 Report	2017 Report
Water Quality Indicators	Dissolved Oxygen (DO)	%Score	48	41	58	54
		Grade	F	F	F	F
		Trend	Improving	Needs attention	Needs attention	Needs attention
	Fecal Bacteria	%Score	69	64	60	56
		Grade	D+	D	D-	F
		Trend	Improving	Improving	Improving	Improving
	Water Clarity	%Score	43	46	40	41
		Grade	F	F	F	F
		Trend	Static	Improving	Improving	Improving
	Chlorophyll *a*	%Score	71	78	72	74
		Grade	C-	C+	C-	C
		Trend	Improving	Improving	Improving	Improving
	SAV	%Score	0	5	30	37
		Grade	F	F	F	F
		Trend	Static	Improving	Improving	Improving
Stormwater Runoff Volume		%Score	49	51	45	47
		Grade	F	F	F	F
		Trend	Degrading	Degrading	Degrading	Degrading
Toxics		%Score	14	22	28	32
		Grade	F	F	F	F
		Trend	Improving	Improving	Improving	Improving
Trash		%Score	41	43	46	49
		Grade	F	F	F	F
		Trend	Improving	Improving	Improving	Improving
Entire Anacostia		%Score	42	44	47	49
		Grade	F	F	F	F
		Trend	Improving	Improving	Improving	Improving
Overall Effort and Commitment		Grade	C-	C+	C+	B-
		Trend	Improving	Improving	Improving	Improving

- AWS scoring method used for Stormwater, Toxics, Trash, and Overall Effort and Commitment. EcoCheck scoring method for all other parameters. (100% is best.)
- For Grade, the standard school grading system was used (below 60 = F)
- Toxics and Trash data is from 2016. Other data sets are from 2015, the most recent available data sets at time of analysis.
- Trends represent a long term trend, which data sets are from 1984 to 2015 or 2016, depending on the parameter.

These effects appear to be at play here for dissolved oxygen (DO). Intense rain events during the grading period results in regular sewage and runoff discharges to the lower river from the District's Combined Sewer Overflow (CSO) system (see Precipitation Pattern for detail). CSOs discharge a lot of organic matter that will later decompose, consuming oxygen in the water. As a result, dissolved oxygen values could be very low in the District portion of the river. The faster flowing, more turbulent, Maryland streams carry more DO, and give the Maryland portion of the Anacostia a better grade compared to the DC portions of the Anacostia (See the first table on this page). In contrast, the tidal river in Maryland has higher readings of fecal bacteria (thus a lower score) than the lower portions in the District due in part to the presence of more wildlife feces upriver. Potomac River water that enters the lower Anacostia as part of the daily tide cycle also has a stronger dilution effect in the lower river which could be a factor here.

Despite the various weather patterns, dry weather or wet, the trend of water clarity have been improving gradually and steadily in terms of %Score though the year to year comparison in the above table does not show the trend clearly (**See Data Analysis to better see trend**). The long term improving trend toward clearer water was also seen in the return of submerged aquatic vegetation (SAV) as reported in the 2015 Report Card for the first time since it disappeared from the Anacostia in 2003. SAV is back and continues to grow!

The improvement in Chlorophyll *a* is another indicator that the water is becoming clearer because the better %Score of Chlorophyll *a* means the less amount of algae in the water and less greenish. Some of this may be a result of earlier improvements to the CSO system that have reduced the number of smaller and more frequent releases to the river, which is dirtier "first flush" runoff from the District, being diverted to the Blue Plains Plant for treatment. The reduction of nutrient inputs to the river from these system upgrades (60% improvement to date) may be an important factor in the improvement of Chlorophyll *a* and water clarity. Again, the improving trend is not visible in the table. When we examine trend, it is very important to see a long term analysis. **See our Data Analysis for detail.**

The %Score calculation table for Toxics and Trash is shown below.

Toxics		Yes		Some		No	Year				
							1989	2013	2014	2015	2016
Technical research is adequate?		1	0.75	0.5	0.25	0	0	0.5	0.54	0.6	0.69
plan to remove toxics		1	0.75	0.5	0.25	0	0	0	0.19	0.29	0.31
political will		1	0.75	0.5	0.25	0	0	0.25	0.5	0.6	0.7
funding	Funding for planning: 0.5, for implementation: 0.5	1	0.75	0.5	0.25	0	0	0.25	0.25	0.25	0.35
implementation/remediation		1	0.75	0.5	0.25	0	0	0	0.04	0.22	0.22
fish tissue testing result show safe to eat?		1	0.75	0.5	0.25	0	0	0	0	0	0
declaration of fishable Anacostia by governments		1	0.75	0.5	0.25	0	0	0	0	0	0
	Max Score	7		%Score			0	14.3	21.7	28.0	32.4

*There are detailed sub-matrices to fill in this matrix.

Trash		Yes		Some		No	Year				
							1989	2013	2014	2015	2016
Technical research is adequate?		1	0.75	0.5	0.25	0	0	1	1	1	1
solid plan to remove trash in MS4		1	0.75	0.5	0.25	0	0	0.5	0.5	0.5	0.5
political will		1	0.75	0.5	0.25	0	0	0.5	0.6	0.7	0.75
funding		1	0.75	0.5	0.25	0	0	0.5	0.5	0.5	0.55
implementation		1	0.75	0.5	0.25	0	0	0.5	0.5	0.5	0.5
regulation for behavior change (bag bill, bottle/can deposit, Styro ban, etc)		1	0.75	0.5	0.25	0	0	0.25	0.34	0.52	0.52
Trash reduction can be seen at Nash Run trap/Earth Day cleanup event		1	0.75	0.5	0.25	0	0	0	0	0	0.13
delcalation of Trash Free Anacostia?		1	0.75	0.5	0.25	0	0	0	0	0	0
	Max Score	8		%Score			0	40.6	43.0	46.5	49.3

*There are detailed sub-matrices to fill in this matrix.

While there has been substantial progress in the study and assessment of legacy toxics in and along the river, notably the ongoing investigation of toxic river sediments throughout the entire tidal portion of the river, and continued collaboration and discussions among stakeholders and potentially responsible parties, little actual cleanup has yet to occur. The only sites along the river that have completed cleanups are Washington Gas and the Washington Navy Yard, but these were on land only while river portions continue to be studied. Until there is a reduction in the presence of toxic substances in and along the river that results in an improvement in water quality and the health of aquatic organisms, this grade will remain low.

Progress on trash reduction has been slow, but growing. Past efforts to install trash traps in the District and charge fees on plastic bags in DC and Montgomery County are notable. Stepped up efforts by local jurisdictions to reach goals set in trash reduction plans required by federal law (due to the extreme nature of the problem here) should soon produce more substantial results. This includes new laws to prohibit the use of plastic foam (a.k.a. Styrofoam) as food and beverage containers (effective January 1, 2016 in the District and Montgomery County, and July 1, 2016 in Prince George's County). The proliferation of beverage containers in river trash is a major problem yet to be addressed. Environmental advocates have started to take action to reduce beverage containers through legislation;

however, these efforts have been unsuccessful thus far. Non-floatable trash is also a significant problem; AWS trash monitoring at Nash Run shows 70% of trash by count is non-floatable. More work needs to be done to address this larger problem likely through enforcement of illegal dumping and littering or lifestyle change. Our food packing lifestyle could be changed so that food wrappers (chip bags, etc.) will not be discarded.

Overall Effort and Commitment Grade: B-

While water quality in the river is still failing, there has been real improvement in the overall effort and commitment of area jurisdictions for the work necessary to clean the river. Strong, committed leadership across the watershed continues to grow. Important policies to reduce pollution at its source are being passed and/or raising more awareness. Funds continue to be directed to support efforts to reduce polluted runoff by local jurisdictions. A unique public private partnership is taking hold in Prince George's County with the intention to rapidly accelerate the use of green solutions and create local jobs to reduce polluted runoff from thousands of acres of untreated parking lots, pavement, and rooftops. Anacostia River Accord to re-confirm the commitment to reduce trash in the river was signed by the District Mayor and Montgomery / Prince George's County Executives. The leadership by the District of Columbia for the effort to remedy the legacy toxics in sediments is applaudable.

In addition to the extensive mapping and study of toxic hotspots along the river that will be used to plan the cleanup of numerous individual sites, agency officials and community leaders have been convened by the District to improve and support a comprehensive cleanup plan of contaminated river sediments.

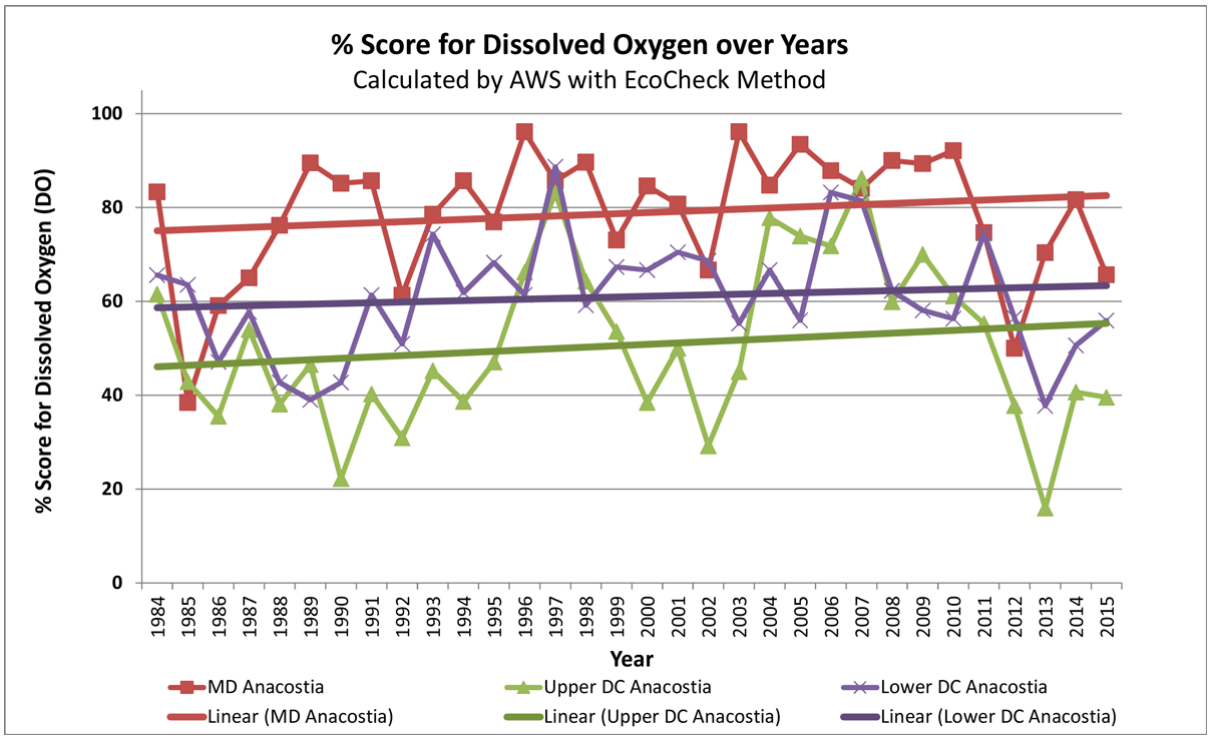
While these many initiatives have great promise, additional efforts are required to reduce river trash, establish land development policies that aim to improve or positively contribute to river health, fully identify upstream sources of toxic pollution and their treatment, and restore headwater streams damaged by intense runoff. The uneven nature of state, federal and private sector efforts must be substantially improved and accelerated or a whole new generation will be deprived of their right to grow up along a clean and healthy river, with fish safe to eat and waters fit for swimming.

But When?

The Anacostia Watershed Society is committed to collaborating with any and all to provide the residents and visitors to the Nation's Capital a healthy Anacostia River by 2025. Our future evaluations and report cards will show just how well our public and private institutions are performing the work necessary for these waters to meet the meaningful and understandable standard of fishable and swimmable that became federal law when the Clean Water Act was passed here in the District 44 years ago, in this very watershed.

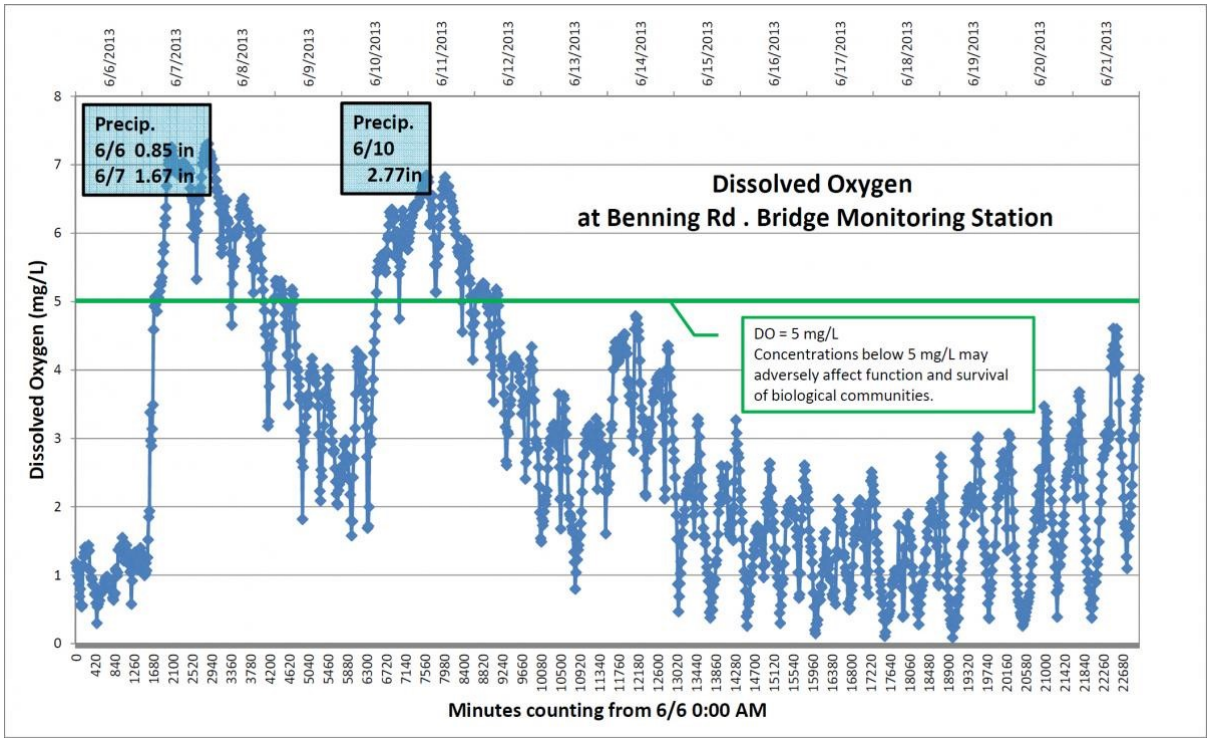
DATA ANALYSIS

Dissolved Oxygen



Click on charts for full size

The amount of dissolved oxygen (DO) has been steadily improving in all three sections of the river except in very recent years. The sharp drop in 2013 seems to be because of weather patterns (See Precipitation Pattern for more information) that was not favorable to DO. There were many intense rainfall events that regularly caused Combined Sewer Overflow events in downstream DC in both 2013 and 2014. The CSO events dump raw sewage mixed with rainwater into the river when it rains heavily. The discharge includes organic matter which will later be decomposed by bacteria. The decomposition consumes oxygen in the water. See the example graph below that shows how DO changes in an intense rainfall.



Because the CSO discharge is churned up, the discharge itself has high DO values. As the time passes by, decomposition will proceed and it consumes oxygen in the water resulting in prolonged low DO values.

Because the MD Anacostia (Section 1) receives oxygen-rich water from two large tributaries -- the Northwest and the Northeast Branches -- DO tends to be higher than in the DC portion (green and purple line/dots in the graph).

DC Water (formerly DC WASA) broke ground in October 2011 on the $2.6 billion Clean Rivers Project (CSO Long Term Control Plan) to control sewer overflows. The Anacostia River will see benefits from the project starting in 2018. The current schedule has the Blue Plains and Anacostia River Tunnels in service in March 2018, at which time the combined sewer overflows to the Anacostia River will be reduced by 81 percent. . Further, the project will reduce combined sewer overflows by 98 percent at completion in 2022. Both DC sections will then see significant improvement in DO levels. However, by improving existing infrastructure and maintaining it better, DC Water already reduced 40% of CSO by 2009 and 60% of it by 2011.

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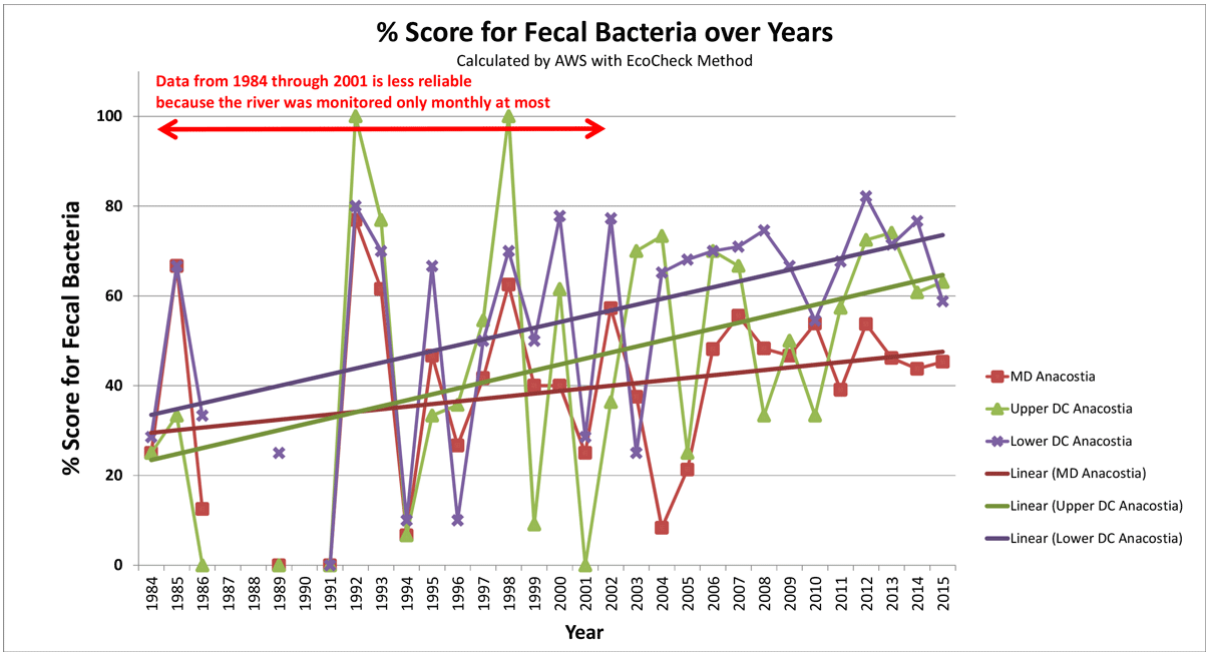
Fecal Bacteria



Many Anacostia watershed residents know of the Combined Sewer Overflow problems in DC. The sewer system in DC is designed to overflow into the river when a rain event exceeds approximately a half inch. However, contrary to public perception, downstream DC water is cleaner than the upstream MD water in the Anacostia in terms of fecal bacteria. There are two possible reasons that might account for this: (1) the tidal action washes the mouth of the Anacostia with much cleaner Potomac River water twice a day, and (2) there is large amount of fecal matter input from Maryland. Washington Suburban Sanitary Commission (WSSC) in Maryland and DC Water are working to repair sewer leaks and implement remediation projects to reduce sewer overflows. However, there is quite a large uncontrolled portion of fecal matter from wildlife.

According to **a study conducted by AWS and Charles Hagedorn of Virginia Tech University**, funded in part by Chesapeake Bay Trust (CBT), approximately 70 percent of fecal bacteria from Maryland is attributed to wildlife. Approximately 7-8 % of fecal bacteria is from canine. Feces excreted on impervious surfaces by birds, squirrels, raccoons, deer, mice, rats, etc. is washed away by rainfall and is carried into streams. Though the largest source of fecal bacteria may be wildlife, its transport to the river is caused by the impervious surfaces we have created. In natural settings, wildlife feces tend to decompose on site and most rainwater infiltrates into the ground and will not cause fecal bacteria pollution in streams.

All river sections show steady improvement over the years with the District portions improving faster. , In 2015 the upper 2 sections improved a little and the Lower DC Anacostia declined. On average the score for the entire Anacostia declined (from 60 to 56). The %Score for Fecal Bacteria is on track for improvement. However, the Maryland portion of the river (MD Anacostia) seems to be leveling out or even declining in recent years. We need to see if MD Anacostia is really improving or not. This is especially important because we see a similar trend in Chlorophyll *a*. It leveled out or is declining in recent years in MD Anacostia.

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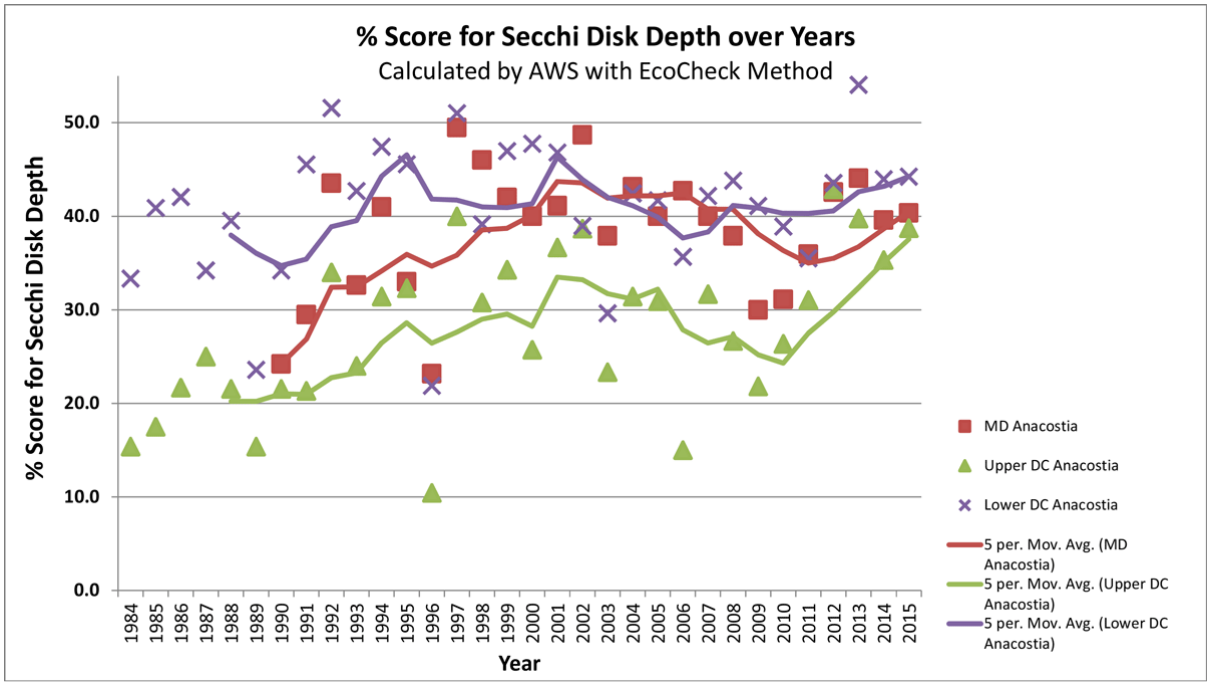
Water Clarity (Secchi Disk Depth)



Water clarity indicators (**Secchi Disk Depth tests**) have been low for all sections in all years for which data is available. In almost all cases, the score was below 50 percent. In the graph above, the trend line (not the scatter plots) is the average value of scores for the past five years. This method clearly illustrates the trend.

From 2001 until 2009 water clarity in Maryland and Upper DC (Sections 1 and 2) had been declining. The best average score for these sections was in 2001. Since then, the average has been declining until recently. In the Lower DC Anacostia (Section 3) the best average score was in 1995. Since then the average was declining until about 2006. However, there seems to be improvement in the past several years in all sections. Responding to the recent water clarity improvement, submerged aquatic vegetation (SAV) reappeared in 2013 after being absent from the Anacostia River for ten years. (See the **trend analysis for SAV below** for details.)

In order to accelerate resolving this grave issue, stringent regulations on stormwater runoff should be implemented because the increased peak stream flows resulting from flashy stormwater runoff from increased impervious surfaces have been eroding the streambanks and scouring streambeds, making the water cloudy. According to a study conducted for the Total Maximum Daily Loads (TMDL) for sediment, about 73% of sediment is coming from streambank erosion. The study was conducted for suspended sediment particles in the water. When heavier particles of sediment are taken into consideration, it is safe to say that more than 73% of sediment is coming from streambank erosion.

Water Clarity has been responding to the CSO reduction very well. In 2009 CSO was reduced by 40%. Upper DC Anacostia, where it receives largest amount of sewage from CSO, responded to it immediately in 2010. In 2011 CSO

was reduced by 60%. Responding to the reduction, Water Clarity in, especially, Upper DC Anacostia has been rapidly improving.

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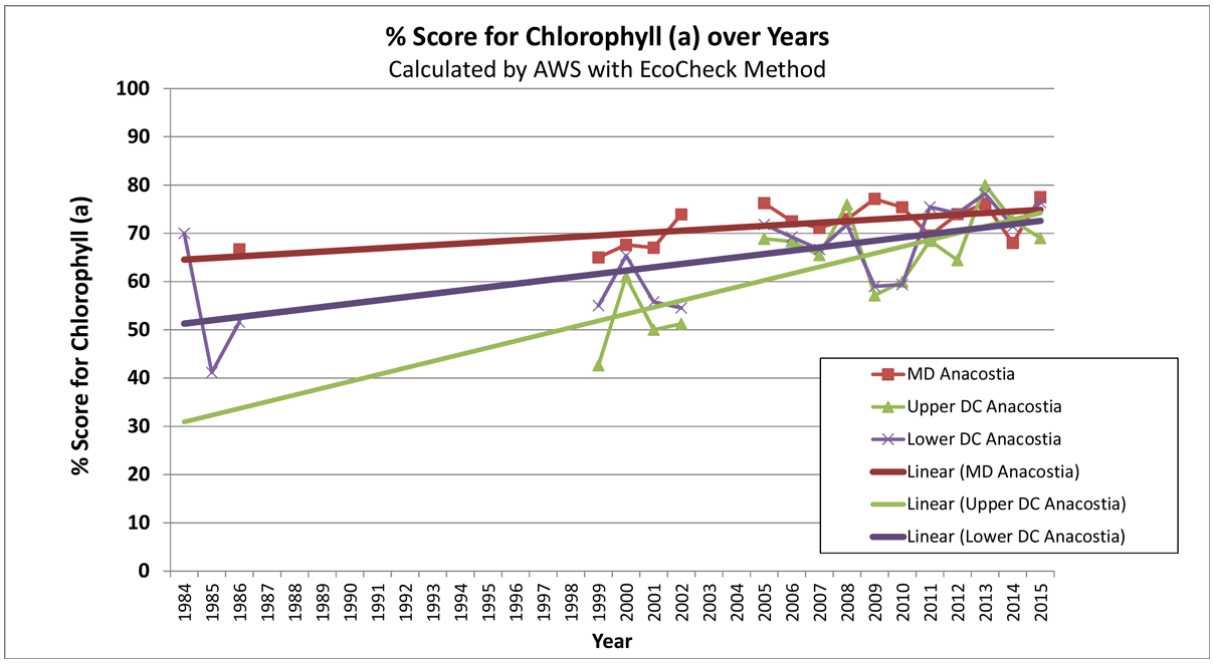
Chlorophyll/Nutrients



%Scores for Chlorophyll *a* are improving. However, the overall better score in Maryland (Section 1) does not mean that there are no excessive nutrients coming from Maryland. Because Chlorophyll *a* is a green pigment in plants, algae, and cyanobacteria, it does not accurately reflect the nutrient amounts in water. There is a lag time between discharge of nutrients and their uptake by plants, etc.

In the free-flowing tributaries of the Anacostia, discharged nutrients travel to the tidal Anacostia. Because the tidal river moves slowly, there is plenty of time for microalgae to take up nutrients. Thanks also to the ample sunlight for photosynthesis in the tidal Anacostia, the DC portions of the river (Section 2 and Section 3) tend to have higher Chlorophyll *a* values, resulting in lower scores. Both upstream and downstream communities need to stop nutrients from entering runoff (fertilizer, for example) from properties.

It is very interesting to see the DC sections (Sections 2 and 3) have been better than the MD section (Section 1) in the past 2 years. DC Anacostia is improving faster than MD Anacostia with the MD section potentially becoming static or even declining in recent years. Chlorophyll is the green pigments of plants that converts sunlight into organic compounds.

Chlorophyll is the green pigment of plants that converts sunlight into organic compounds during photosynthesis. There are seven known types of chlorophyll; Chlorophyll *a* and Chlorophyll *b* are the two most common forms. Chlorophyll *a* is used as a measure of microalgae biomass, which is controlled by factors such as water temperature,

light, and nutrient availability. Too much algae leads to large algal blooms that can reduce water clarity. Also, once an algae bloom dies, it depletes water of oxygen when it is decomposed.

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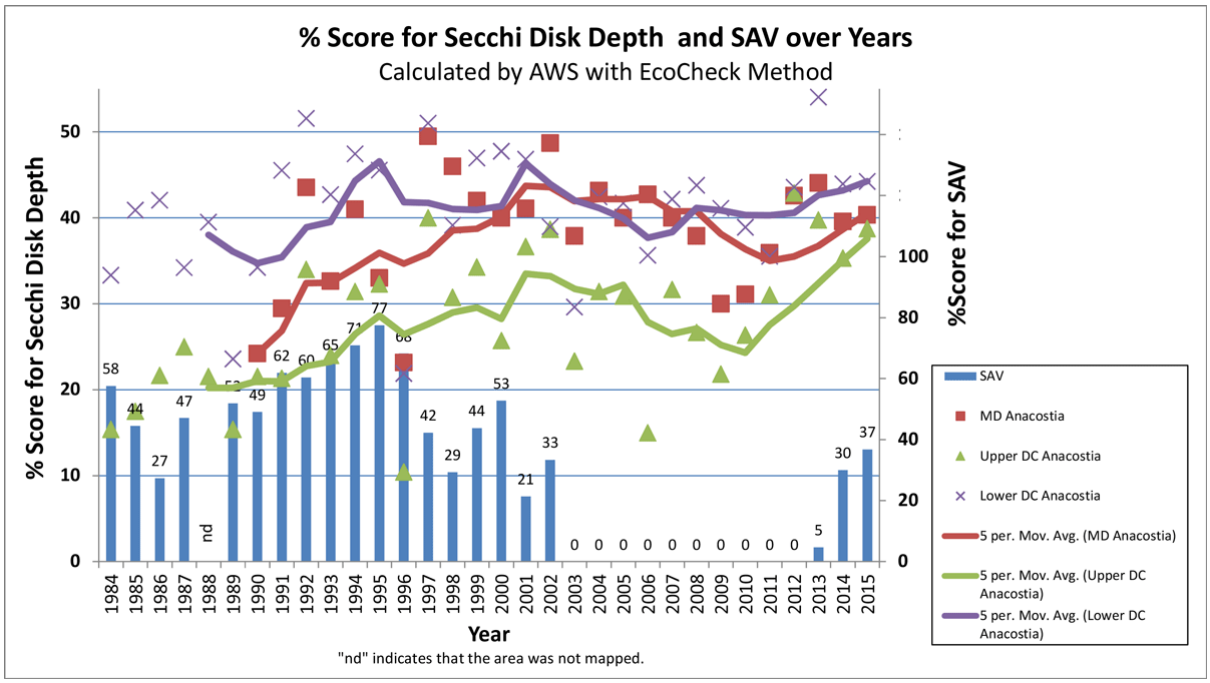
Submerged Aquatic Vegetation



SAV data source: http://web.vims.edu/bio/sav/index.html

Submerged Aquatic Vegetation (SAV) are plants that cannot withstand excessive drying and therefore live with their leaves at or below the water surface. Such vegetation constitutes an important habitat for young fish and other aquatic organisms.

AWS's goal for restoring SAV in the Anacostia is 20 acres, a goal identified in the Anacostia Watershed Restoration Indicators and Targets for Period 20012010 by scientists at Metropolitan Washington Council of Governments (COG).

In the graph as soon as the degradation of water clarity in the Lower DC Anacostia (Section 3) was observed in 1995, the acreage of SAV started to decline. No SAV had been observed in the Anacostia since 2003 until 2012, the score for the time duration had been zero (0) for over a decade. While there was no SAV in the tidal Anacostia, it is known that there has been SAV in nontidal tributaries to the Anacostia River.

However, in 2013, 0.9 acres of SAV (thus, the %Score is approximately 5% 0.9/20x100) was identified in Washington Channel and we learned that SAV is coming back to the Anacostia River!

AWS is not certain why SAV was present in the past --particularly in the 1980s and 1990s when the water clarity seemed worse than or equal to the current clarity. However, we have several hypotheses:

· The nature of the cloudiness of the water was different. There are many factors that make the water cloudy. Recent cloudiness may be complex combination of sediment particles due to erosion, decaying organic matter from sewage, algae bloom, etc. while past cloudiness may have mainly come from sediment particles.

· The river was monitored less often in the 1980s and 1990s. The water quality data may then be less reliable during the time period.

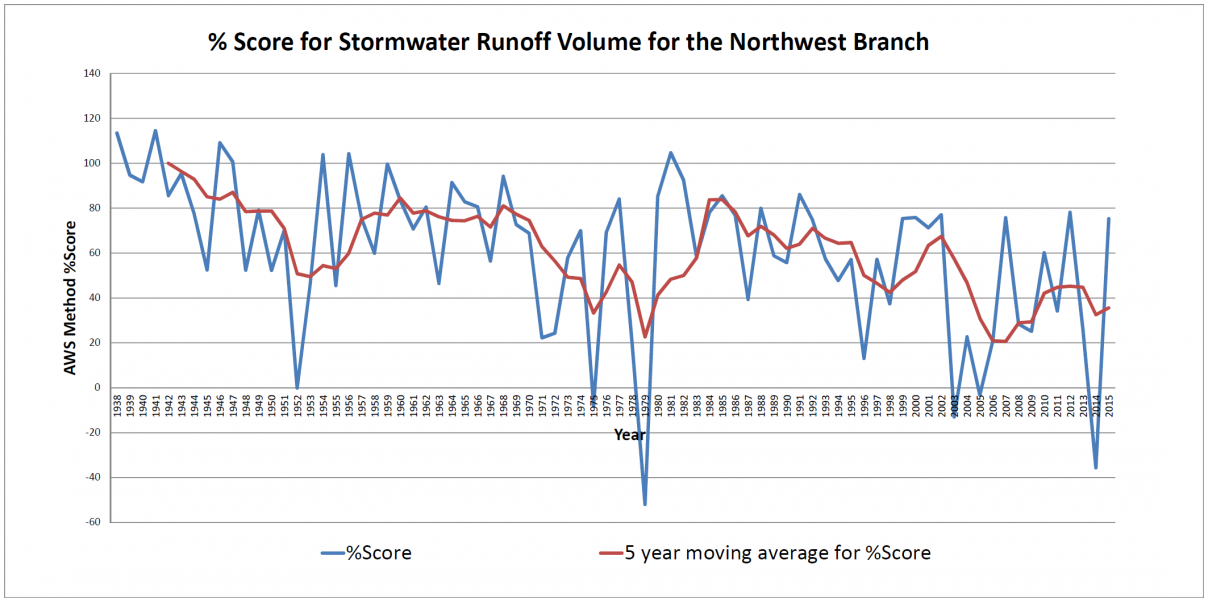
· The SAV may have suffered in the 1980s and 1990s, but may still have been resilient to the pollution.

· The overall nature of pollution may have changed. In more recent years, numerous types of pollutants including chemicals such as pharmaceuticals, pesticides, herbicides, and heavy metals on top of water cloudiness may have helped eliminate the plants.

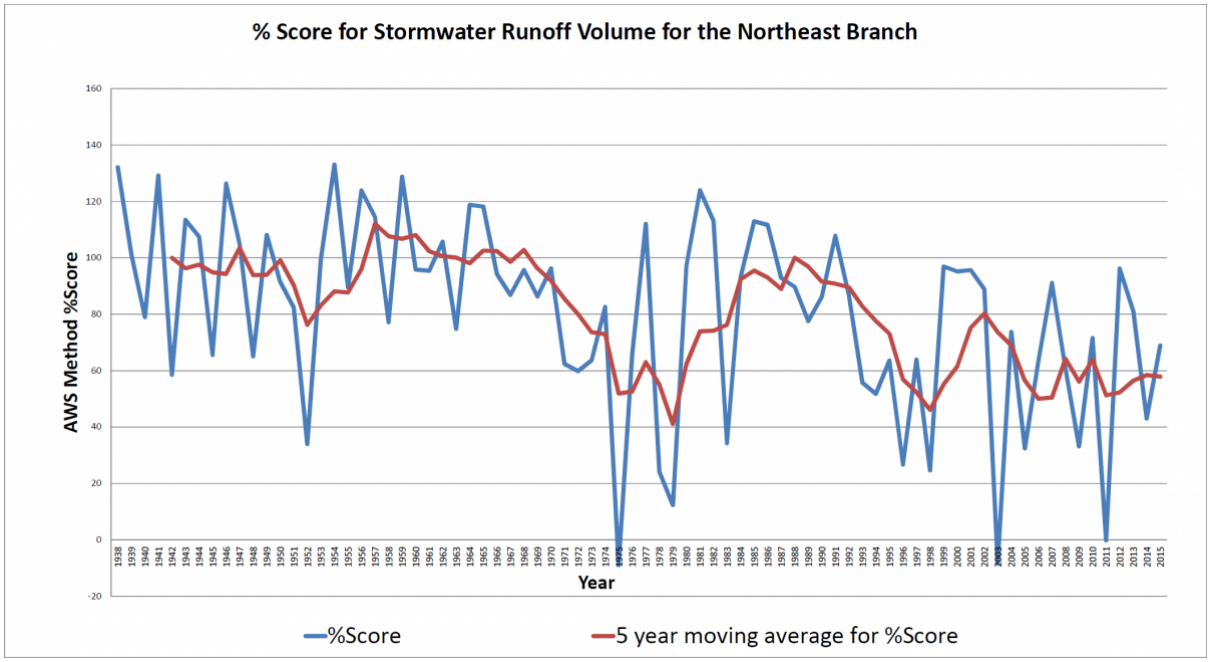
[Back to To List of Data Tested]

Stormwater Runoff Volume

Northwest Branch



Northeast Branch



%Scores for Stormwater Runoff Volume have been steadily decreasing as long as stream discharge (flow) data is available. AWS is expecting that this trend will change and start to show improvement, though it will take time due to the vast areas of impervious surfaces that must be retrofitted with water-infiltrating green infrastructure to measurably reduce runoff.

It will be instructive to monitor differences in rates of runoff reductions in the Anacostia's Northeast and Northwest Branches where different standards and practices exist. The Northeast Branch is mainly in Prince George's County while the Northwest Branch flows largely through Montgomery County.

While new development throughout Maryland is required to treat runoff from a 1-year/24-hour storm (approx. 2.7 inches), the key to reduce stormwater runoff and restore the Anacostia is to treat runoff reduction for existing development. Montgomery County regulations now require that redevelopment projects treat 2.6" of rain. However, Prince George's County only requires treating 0.5 inches until 2016 and just 0.75 inches beyond that. Because of the difference in regulation over redevelopment, it is expected that the Northwest Branch will have better reduction about peak stream discharges.

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PRECIPITATION IMPACT

- **Intense Rainfall Analysis**
- **Daily Precipitation Analysis**

Intense Rainfall Analysis

The %Score of dissolved oxygen (DO) for the entire Anacostia in 2015 decreased from 58 to 54 though the precipitation pattern in terms of intense rainfall events was in favor of DO. There are many factors that influence water quality as discussed below. Thus, the relationship between the precipitation pattern and %Score of DO is quite complex. Also, AWS found that discussing only intense rainfall events may not be appropriate to explain the %Score of DO because rainfall events actually brings oxygen rich water to the river. Rain drops are exposed to air. Thus, rainwater is rich in DO. Moderate precipitation that will not cause Combined Sewer Overflow will bring large amount of dissolved oxygen to the river improving %Score of DO. From the point of view, AWS added Daily Precipitation Analysis section on this page next to this section.

Because the District has a Combined Sewer Overflow (CSO) system that carries raw sewage and rainwater in the same pipe, the mixture will be discharged when it rains approximately more than 0.5 inches. After an intense rainfall, AWS has observed from monitoring that DO values become very low for approximately 2 weeks. An example graph is inserted below.

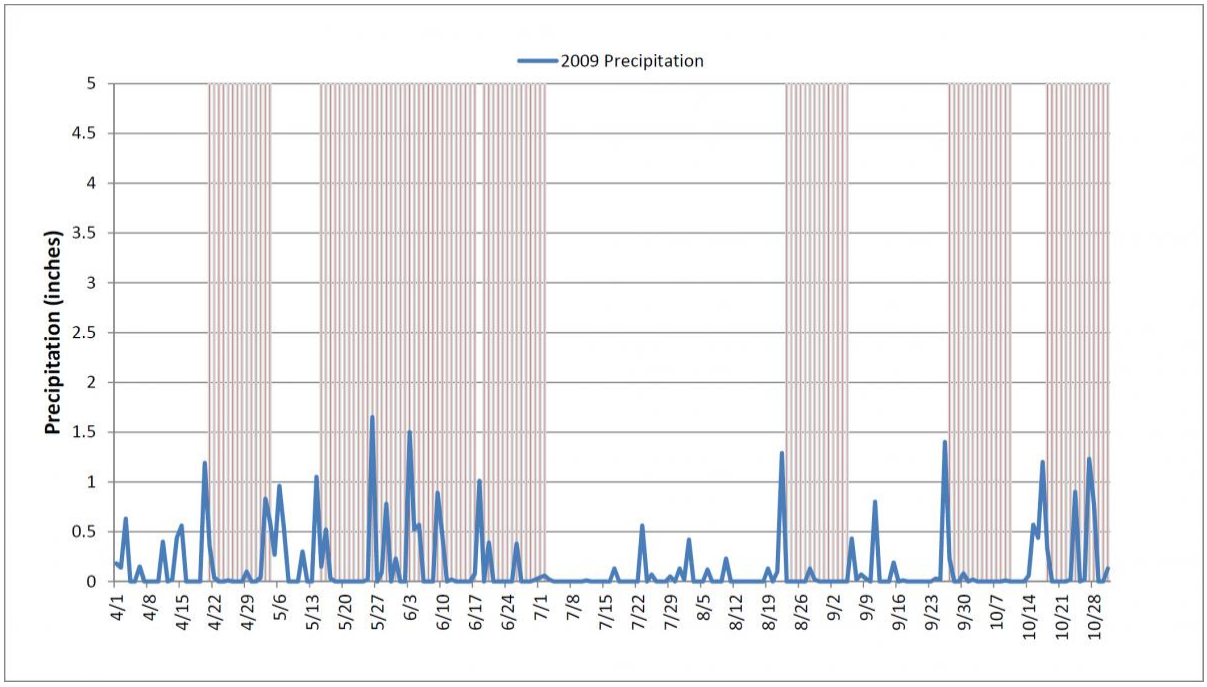
Year	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Intense Rain Days	104	48	55	58	93	103	60
% DO Score	72	70	68	48	41	58	54

Intense Rain Days = Number of days that had intense (equal to or greater than 1 inch) precipitation in the previous 14 days

It turned out that we had intense rainfall events in 2009, 2013, and 2014 frequently from April through October, the time duration from which we use the DO data for our assessment. However, we had high %Score in 2009. Also we had low %Scores when we had less intense rainfall events in 2012 and 2015. It seems that intense rainfall events alone do not explain %Score of DO very well.

The graphs for each year are shown below (click on graphs for full size). The shaded areas represent the days that had intense rainfall events in 14 days prior to those day.

In 2009, one more day was influenced negatively by intense rainfall than in 2014, however, DO values were better than those in 2014 (i.e., %Score (72) in 2009 was higher than that (58) in 2014). This is probably because the intensity of rainfall was stronger in 2014 than in 2009 though the frequency was similar. Also, the tide might have influenced DO values. If there is an intense rainfall when the tide is coming in, the CSO discharge will be carried to upstream portion of the Anacostia, thus, the negative influence will remain longer. There are many factors that influence DO values.The weather pattern is definitely one of the most influential factors.


2009 Precipitation
Precipitation (inches)
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
4/1
4/8
4/15
4/22
4/29
5/6
5/13
5/20
5/27
6/3
6/10
6/17
6/24
7/1
7/8
7/15
7/22
7/29
8/5
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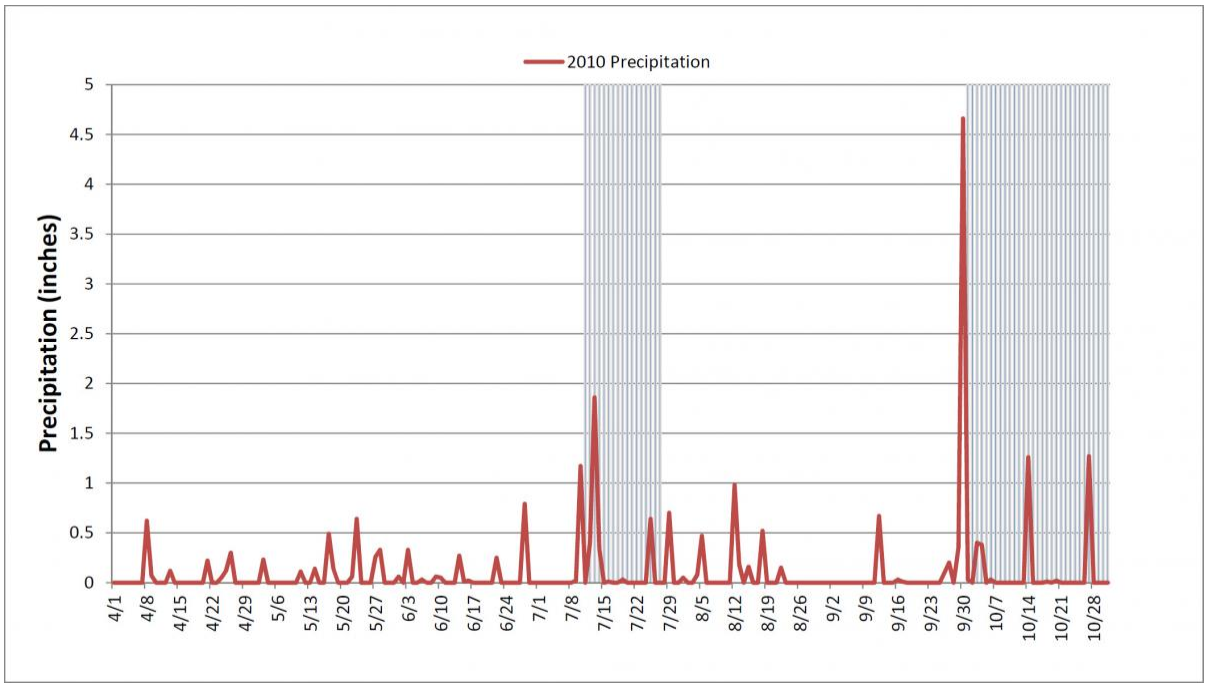
9/23
9/30
10/7
10/14
10/21
10/28


2010 Precipitation
Precipitation (inches)
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
4/1
4/8
4/15
4/22
4/29
5/6
5/13
5/20
5/27
6/3
6/10
6/17
6/24
7/1
7/8
7/15
7/22
7/29
8/5
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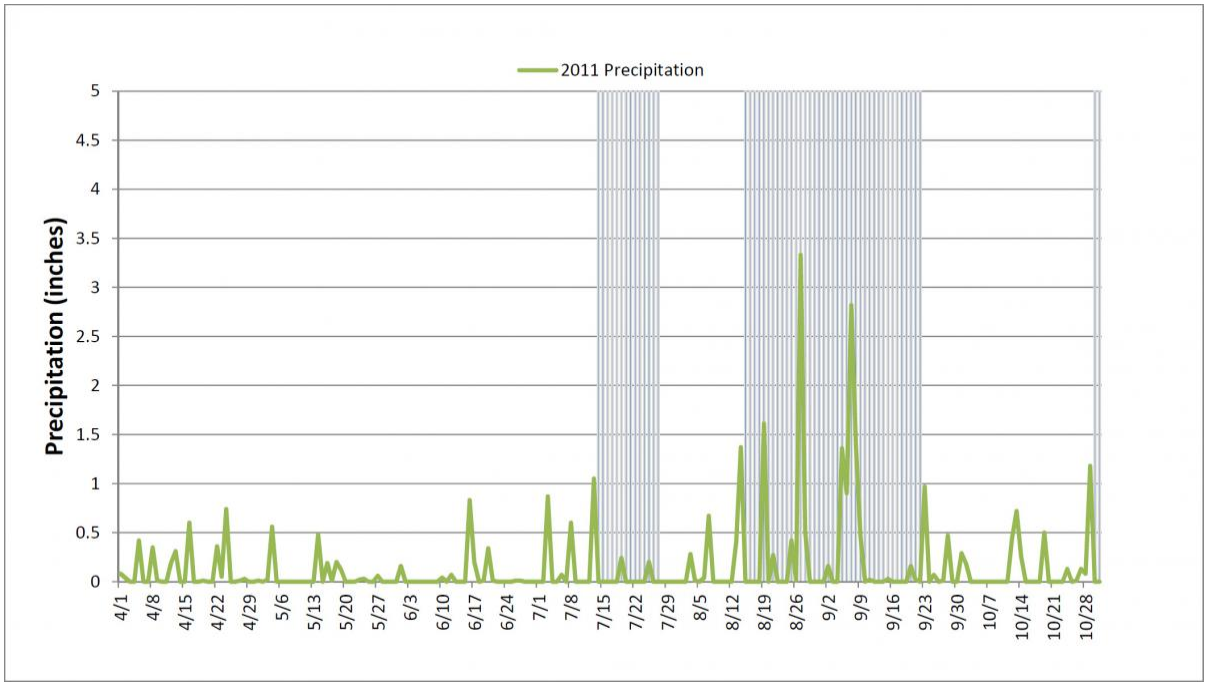
9/9
9/16
9/23
9/30
10/7
10/14
10/21
10/28


2011 Precipitation
Precipitation (inches)
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
4/1
4/8
4/15
4/22
4/29
5/6
5/13
5/20
5/27
6/3
6/10
6/17
6/24
7/1
7/8
7/15
7/22
7/29
8/5
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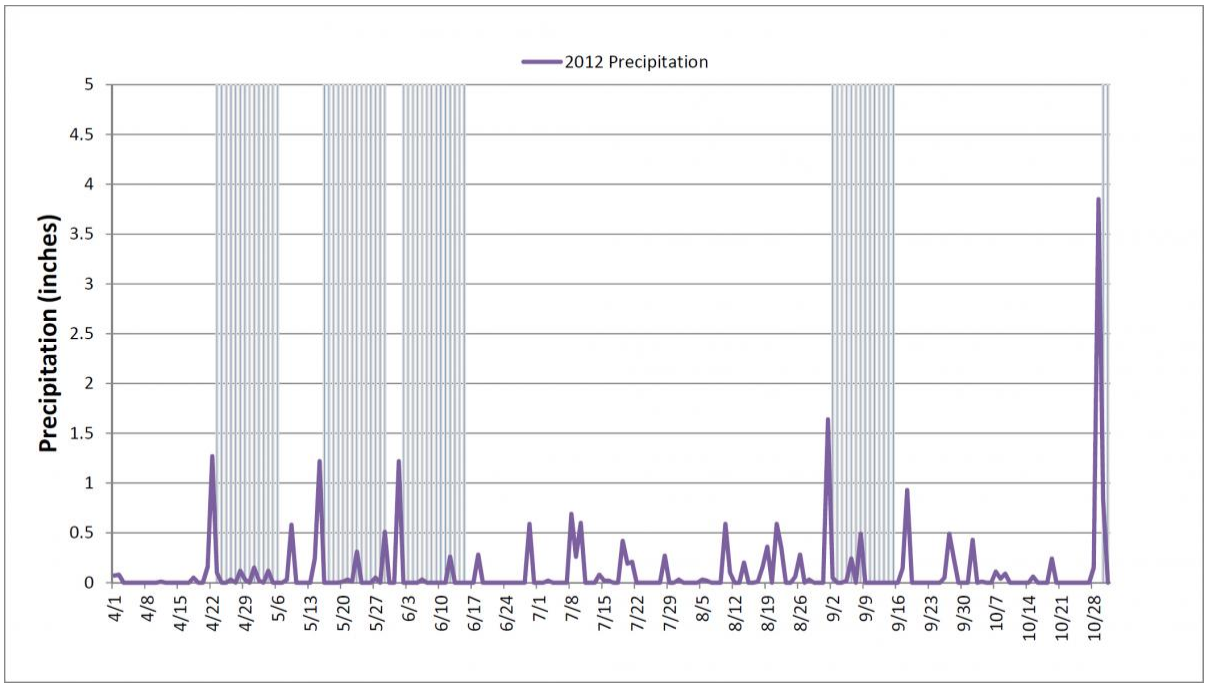
9/23
9/30
10/7
10/14
10/21
10/28


2012 Precipitation
Precipitation (inches)
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
4/1
4/8
4/15
4/22
4/29
5/6
5/13
5/20
5/27
6/3
6/10
6/17
6/24
7/1
7/8
7/15
7/22
7/29
8/5
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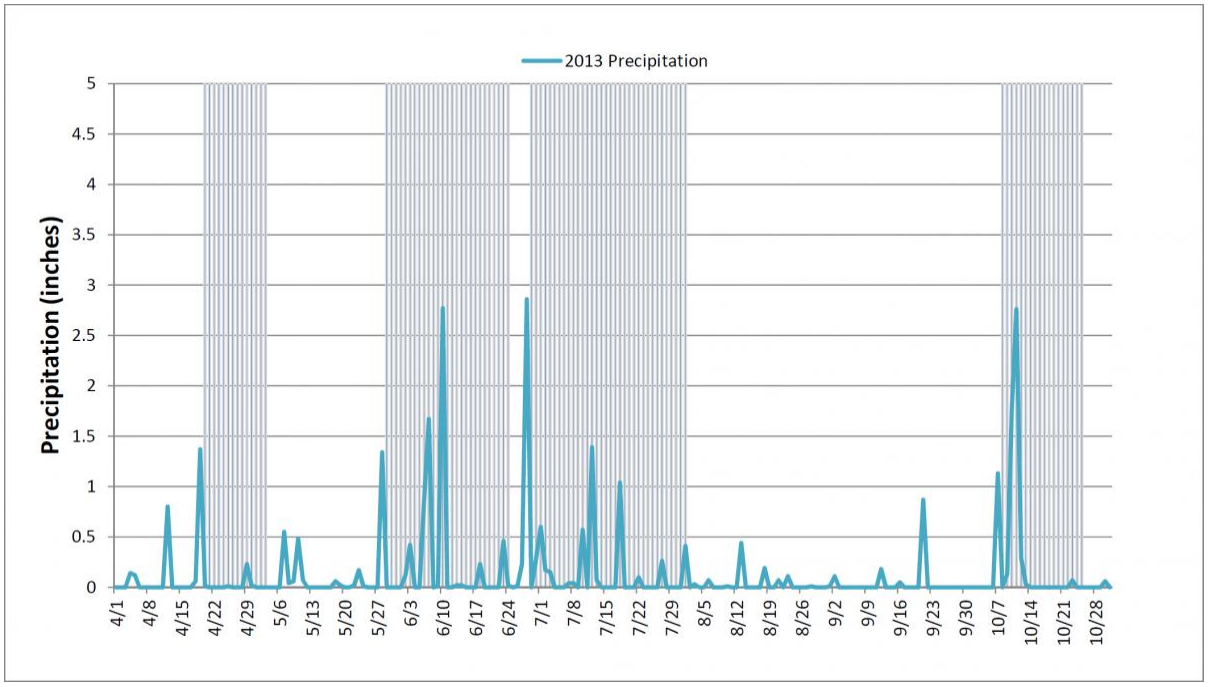
9/23
9/30
10/7
10/14
10/21
10/28


2013 Precipitation
Precipitation (inches)
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
4/1
4/8
4/15
4/22
4/29
5/6
5/13
5/20
5/27
6/3
6/10
6/17
6/24
7/1
7/8
7/15
7/22
7/29
8/5
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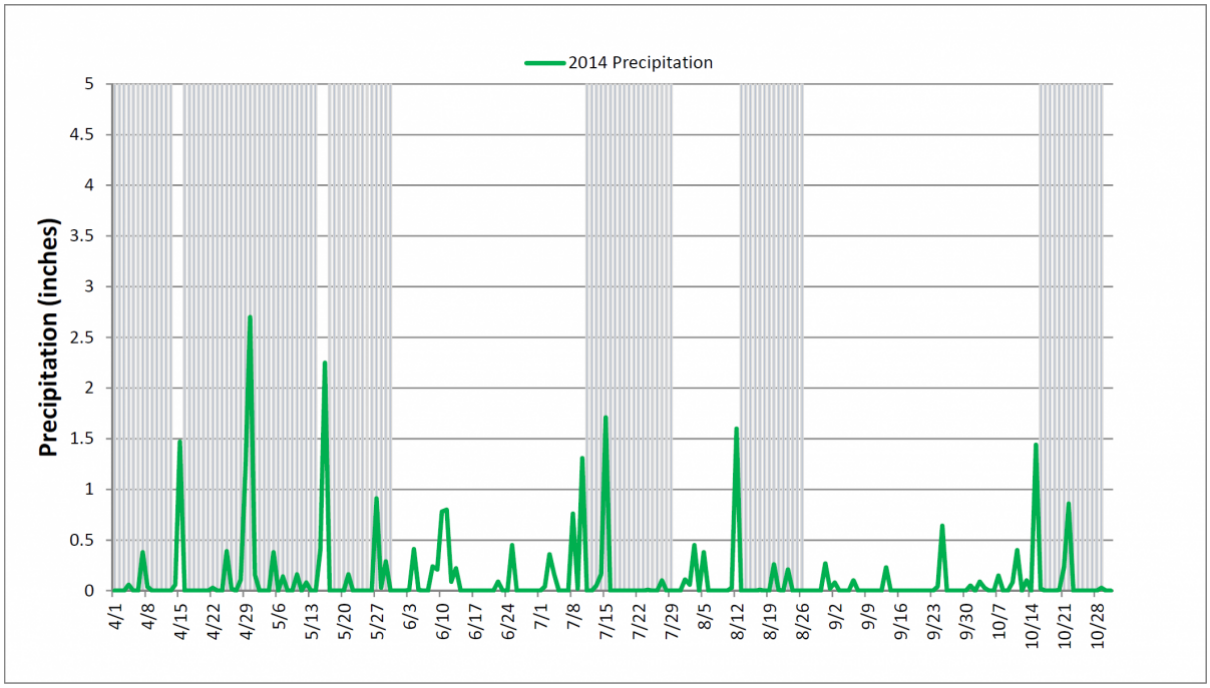
9/23
9/30
10/7
10/14
10/21
10/28


2014 Precipitation
Precipitation (inches)
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
4/1
4/8
4/15
4/22
4/29
5/6
5/13
5/20
5/27
6/3
6/10
6/17
6/24
7/1
7/8
7/15
7/22
7/29
8/5
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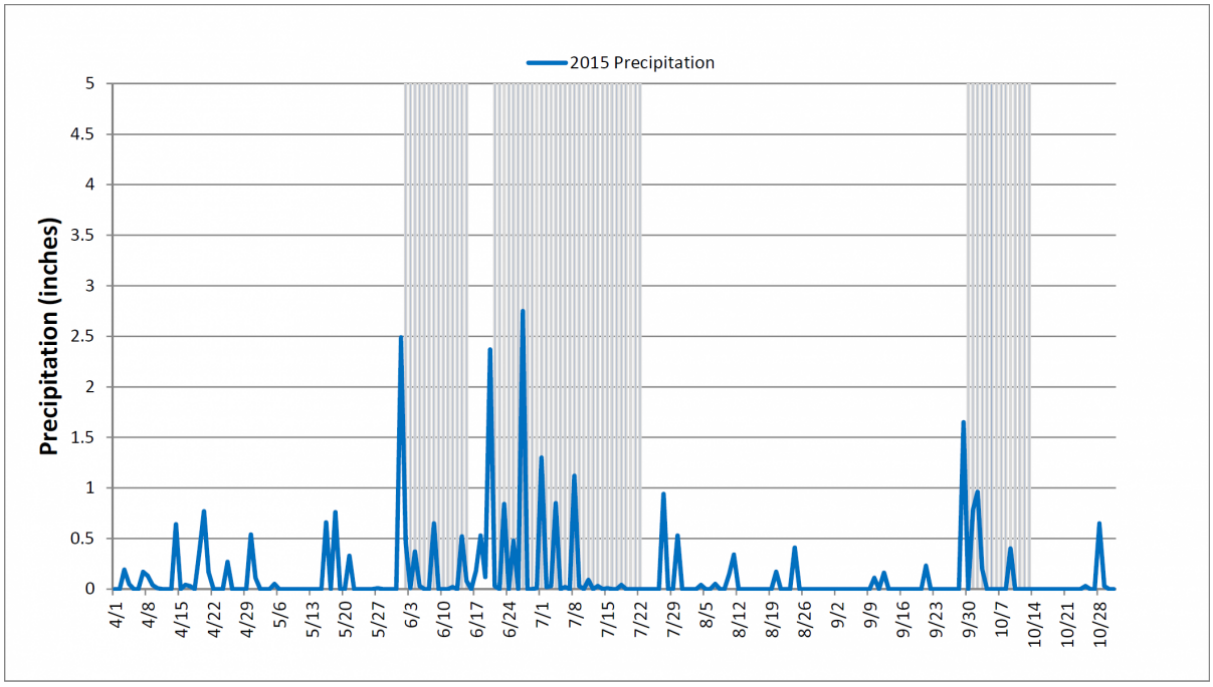
10/28



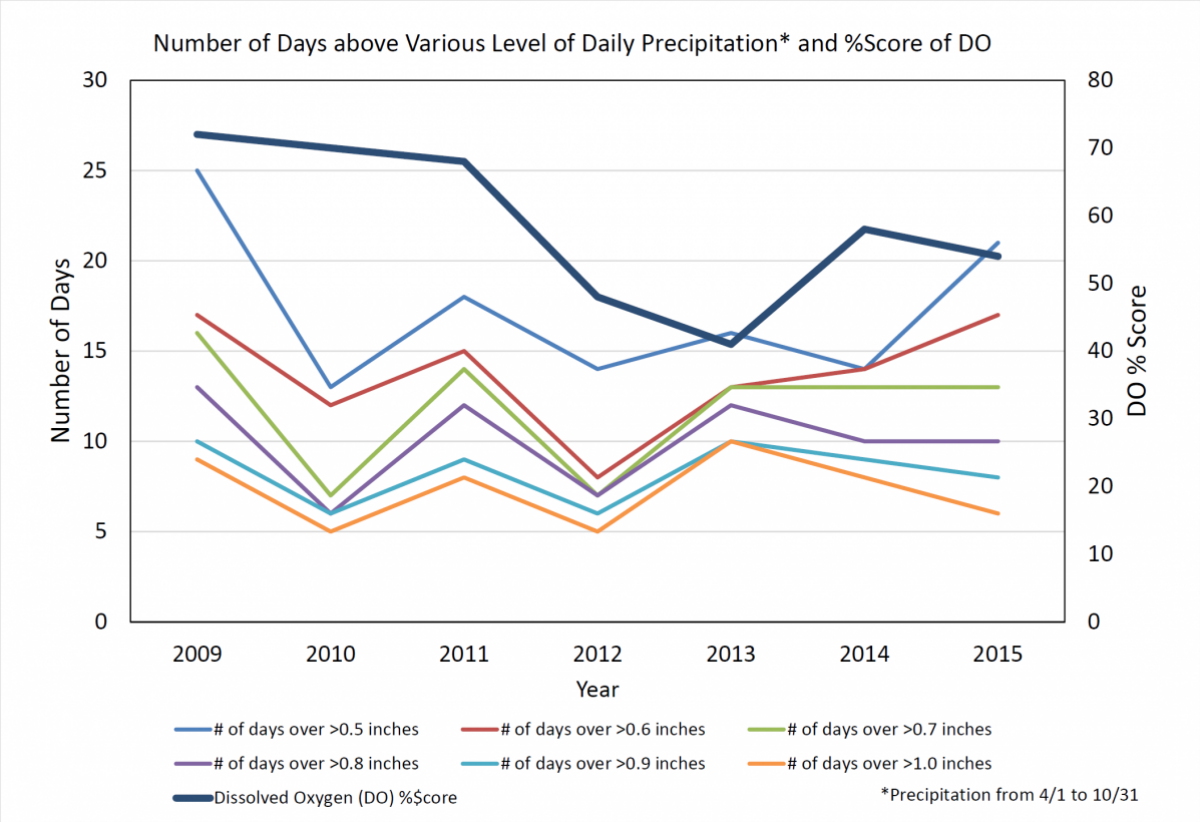
Daily Precipitation Analysis

Since the intense rainfall analysis cannot explain %Scores of DO very well, AWS started Daily Precipitation Analysis from 2017 State of the River Report (data year is 2015). We have counted number of days over various amount of precipitation. The result was summarized in the table and graph below.

%Score of DO and Number of Days over Various Precipitation*

YEAR	2009	2010	2011	2012	2013	2014	2015
# of days over >0.5 inches	25	13	18	14	16	14	21
# of days over >0.6 inches	17	12	15	8	13	14	17
# of days over >0.7 inches	16	7	14	7	13	13	13
# of days over >0.8 inches	13	6	12	7	12	10	10
# of days over >0.9 inches	10	6	9	6	10	9	8
# of days over >1.0 inches	9	5	8	5	10	8	6
%Score of DO	72	70	68	48	41	58	54

Daily precipitation data from 4/1 through 10/31 was used.



The above graph can explain the %Score better. Generally when we have many smaller amount of precipitation events (blue thin line, # of days over >0.5 inches), the %Score is higher. When we have higher number of intense rainfall events (orange line, # of days over >1.0 inches), the %Score is generally worse.

In 2015 the number of smaller precipitation events was high but the number of larger precipitation events were also relatively high. This may account of the lower %Score of DO.

The pattern in 2015 and 2011 is similar in the above graph. However, in 2011 intense rainfall events occurred around the same time period from 7/15 to 7/29 and from 8/15 to 9/23 leaving other time period free from intense rainfall events. This might have allowed having the high %Score in 2011.

ASSESSMENT METHODS

To evaluate the data for the State of the River report card, the Anacostia Watershed Society employs a variety of scientific methods. Currently there is not a standard grading system to assess Stormwater Runoff Volume, Toxics, and Trash. These factors are very important to the health of the Anacostia River, so we created our own method, and we explain our scientific process here.

- **Water Quality Parameters**
- **Stormwater Runoff Volume**

- Toxics and Trash

Water Quality Parameters

The EcoCheck method developed by the Mid-Atlantic Tributary Assessment Coalition was used to assess the river for water quality parameters as described on the **Parameter Trend Analysis page**: Dissolved Oxygen, Fecal Bacteria, Chlorophyll *a*, Secchi Disk Depth (Water Clarity), and Submerged Aquatic Vegetation (SAV).

The link to the manual is **here** (pdf file, 8.3 MB).

Though AWS uses the EcoCheck protocol to calculate the %Scores for the water quality parameters, unlike other years, in 2014 and beyond AWS did not use the manual's grading system (A through D and F) because it employs equal interval breaks for grading. Feedback from the public indicated that the EcoCheck grading system is confusing because of its similarity to a school grading system while the interval breaks are different. The EcoCheck grading of C (>=40 and <60 by the EchoCheck %Score) indicates the river is given a passing grade for a swimmable and fishable, but in actuality it is not). In order to make our grading more understandable and relatable to the general public, in 2014 and beyond, AWS is using a school grading system for the State of the Anacostia River Report.

Stormwater Runoff Volume

Initially, AWS wanted to measure the areas of impervious surfaces throughout the watershed. However, measuring impervious surfaces had various difficulties:

· AWS relies on government data which is not released on a regular schedule.

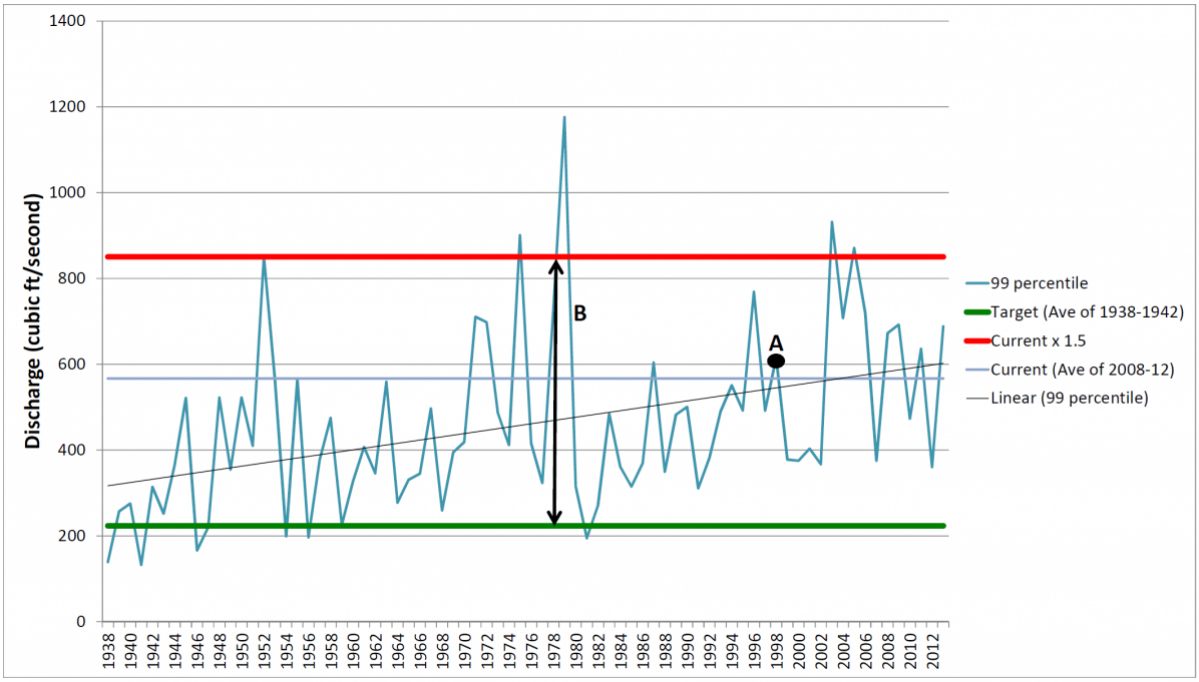
· There are several methods to calculate imperviousness that produce different results.

· There are 3 jurisdictions in the Anacostia watershed and they do not all use the same methods for calculations.

· Green infrastructure is continuously being installed and each technique/practice has a different capacity to manage stormwater. It is not clear how those differences will be taken into account as pervious surfaces.

Because of those factors, AWS decided to use peak streamflow data for the Stormwater Runoff Volume analysis because the excessive runoff is generated by impervious surfaces, which will generate sharper peak streamflows when it rains.. It is not practical to measure the volume of stormwater runoff. However, the runoff will be concentrated in streams and it is known that peak stream discharges (flows) have been increasing. United States Geological Survey (USGS) has been measuring stream discharge since 1938 in the Northwest and the Northeast Branches of the Anacostia River. The historic data was used to calculate the Stormwater Runoff Volume %score.

First, the 99th percentile of daily stream discharge was calculated for each year. Then, the values were plotted on a graph as shown below. The reason we use the 99th percentile is to eliminate values from most extreme events such as hurricanes. Using a 99th percentile value for a given year, the highest values for about 4 days will be dropped out.



Click on chart for full size

An average of 99th percentile daily stream discharges for the years 1938 to 1941 and that for 2008 to 2012 were calculated respectively. The former is a tentative target for a 99th percentile peak stream discharge. Because we did not want to have negative values, the average for 2008-2012 was multiplied by 1.5 for use as a baseline. From this baseline of peak stream discharge, we can determine the amount of stream discharge to be reduced (B in the graph).

The tentative goal is still reasonable because in the period of 1938 - 1941, there is documentation of people who swam in the Anacostia River. However, we know that the Anacostia River had been degrading long before then due mainly to agricultural activities, sewage influx, and dumping. As we learn more, we may revise the goal in the future.

The score was then calculated using the target and the baseline.

For example, the 99th percentile peak stream discharge in a given year is indicated as “A” in the graph. Then the score was calculated using this formula:

%Score = (Baseline (current x 1.5 in the graph) - A) / B x 100

With highly fluctuating annual values, to keep an accurate assessment AWS used 5-year moving averages. The score for 2012 is actually an average of scores from 2008 through 2012. The scores were calculated for the Northwest and the Northeast Branches and the average value was used for the Anacostia River's score for Stormwater Runoff Volume.

Toxics and Trash

Calculating the score for Toxics and Trash is very difficult due to the complexity of assessing a wide ranges of factors. There are many toxic chemicals in the river such as pharmaceuticals, PCB, PAH, pesticide, herbicide, and heavy metals, to name a few. There are about 200 congeners of PCB and numerous chemicals in the group of Polycyclic Aromatic Hydrocarbons (PAHs). The standard toxicity level is different for each chemical. In addition, there are chemicals that even do not have a safe standard for humans and wildlife. Quantifying the amount of trash in the Anacostia River watershed accurately each year is also very difficult, even though unlike chemicals, you can see it plainly with the naked eye!

All of these challenges make interpreting the data and comparing it to a scientifically rigorous standard in a reasonable manner nearly impossible.

Therefore, the Anacostia Watershed Society decided to take a different approach from strictly scientific scoring. AWS decided to apply the Business Confidence Index method to these important parameters. We listed actions to be taken for Toxics and Trash. Then, AWS professionals discussed how much work had been done for each action. It is like an Environmental Confidence Index for Toxics and Trash.

This method produces reasonably understandable and intuitive scores. Also this method gives a good sense to the public about what actions should be taken and where we are to remedy the problems. We will continue to monitor the accuracy of this method, and the system will receive improvements as fit.

The table calculating our scores for Toxics and Trash is shown below.

Toxics		Yes		Some		No	Year				
							1989	2013	2014	2015	2016
Technical research is adequate?		1	0.75	0.5	0.25	0	0	0.5	0.54	0.6	0.69
plan to remove toxics		1	0.75	0.5	0.25	0	0	0	0.19	0.29	0.31
political will		1	0.75	0.5	0.25	0	0	0.25	0.5	0.6	0.7
funding	Funding for planning: 0.5, for implementation: 0.5	1	0.75	0.5	0.25	0	0	0.25	0.25	0.25	0.35
implementation/remediation		1	0.75	0.5	0.25	0	0	0	0.04	0.22	0.22
fish tissue testing result show safe to eat?		1	0.75	0.5	0.25	0	0	0	0	0	0
declaration of fishable Anacostia by governments		1	0.75	0.5	0.25	0	0	0	0	0	0
	Max Score	7		%Score			0	14.3	21.7	28.0	32.4

*There are detailed sub-matrices to fill in this matrix.

Trash		Yes		Some		No	Year				
							1989	2013	2014	2015	2016
Technical research is adequate?		1	0.75	0.5	0.25	0	0	1	1	1	1
solid plan to remove trash in MS4		1	0.75	0.5	0.25	0	0	0.5	0.5	0.5	0.5
political will		1	0.75	0.5	0.25	0	0	0.5	0.6	0.7	0.75
funding		1	0.75	0.5	0.25	0	0	0.5	0.5	0.5	0.55
implementation		1	0.75	0.5	0.25	0	0	0.5	0.5	0.5	0.5
regulation for behavior change (bag bill, bottle/can deposit, Styro ban, etc)		1	0.75	0.5	0.25	0	0	0.25	0.34	0.52	0.52
Trash reduction can be seen at Nash Run trap/Earth Day cleanup event		1	0.75	0.5	0.25	0	0	0	0	0	0.13
delcalation of Trash Free Anacostia?		1	0.75	0.5	0.25	0	0	0	0	0	0
	Max Score	8		%Score			0	40.6	43.0	46.5	49.3

*There are detailed sub-matrices to fill in this matrix.

WHAT YOU CAN DO

Our ultimate goal is a swimmable and fishable Anacostia River. Through our various programs, AWS is inching toward the goal. **Stormwater runoff** is the biggest contributor to the pollution to the Anacostia River. It carries all kinds of pollutants from impervious surfaces such as roofs, roads, parking lots--even lawns. The volume and velocity of this concentrated runoff flowing into stream scours the streambed and erodes stream banks, sending tons of sediment into the river, and eventually the Chesapeake Bay. As growth creates more pavement and other impervious surfaces, we increase this damaging flow. We all pollute the Anacostia with our roofs, roads, parking lots, and lawns.

To restore the river, we need to reduce stormwater runoff, as well as the fecal bacteria, trash, and chemicals that pollute the water. The good news is, you can help! Here are a few ways to help protect and restore the Anacostia River:

Green your neighborhood, home, and garden:

- Apply to our **Watershed Stewards Academy** and become a leader in your community.
- Are you a 7th or 8th grader? **Participate in our Saturday Environmental Academy!**
- Prevent rain from running off your property using rain barrels or cisterns, and use the water for irrigating your yard.
- Plant native trees, shrubs and flowers. They evolved for our climate so they need less watering and less fertilizer. Native plants usually establish deeper root systems that help rain soak into the ground. The portion that the plants don't use will recharge ground water.
- Build a rain garden. It's as simple as creating a depression in your yard and planting native plants and flowers inside. The garden holds and filters runoff, and looks beautiful, too!
- Use fertilizer wisely and sparingly. Use fertilizers that leach nutrients (nitrogen and phosphorus) very slowly.
- Don't flush hazardous waste, motor oil, antifreeze, or harsh cleansers down the toilet or the drain.
    - **District of Columbia**
        - Get rebates for your green roof: **http://www.anacostiaws.org/green-roofs**
        - Get rebates to treat stormwater: **http://www.anacostiaws.org/riversmart-communities**
    - **Prince George's County**
        - Get rebates to treat stormwater: **http://www.princegeorgescountymd.gov/310/Rain-Check-Program**
    - **Montgomery County**
        - Get rebates to treat stormwater: **http://www.montgomerycountymd.gov/dep/water/rainscapes-rebates.html**

Report pollution from construction sites

The number of inspectors at government agencies are limited. Thus, we need to report pollution events strategically to maximize their time. A tip we have learned is to report significant pollution sites/events that are clearly in violation of laws and regulations in a level-headed manner. Over time contractors and sub-contractors will be educated by the inspectors about sediment control.

Here is one way to report pollution efficiently.

- **Watch this video** to learn how to find construction sites worth reporting. It is best to conduct a field survey because aerial photos are not current. Do not trespass the property.
- If you find it worth reporting, use this website: **https://www.surveymonkey.com/r/ESP-PA**
- For more information, visit: **http://ceds.org/esp.html**

Other simple ways to help out:

- Bring your own bags to the store! Plastic bags are a major trash source in the river.
- **Become a member** of the Anacostia Watershed Society
- Follow us on **Facebook** and **Twitter** for updates on campaigns and public events, plus fun photos from the field
- **Receive News and Action Alerts from AWS**. Stay informed of the latest watershed issues by subscribing to our free email updates & event announcements. Or just enter your email address in the "Subscribe" box on this page over on the right.

Get local:

The Anacostia Watershed is huge--176 square miles!--and you can help out even more with groups in your own neighborhood. Use this map to find out which subwatershed you live in:

View **Anacostia Subwatershed Boundary Map**

Here are links to some of the subwatershed groups in our area:

- **Beaverdam Creek Watershed Watch Group**
- **Citizens to Conserve and Restore Indian Creek**
- **Earth Conservation Corps**
- **Eyes of Paint Branch**
- **Friends of Brier's Mill Run**
- **Friends of Dueling Creek**
- **Friends of Kenilworth Aquatic Gardens**
- **Friends of Lower Beaverdam Creek**
- **Friends of Quincy Run**
- **Friends of Sligo Creek**

- Friends of Still Creek
- Friends of the National Arboretum
- Groundwork Anacostia
- Neighbors of the Northwest Branch
- Pope Branch Park Restoration Alliance
- Washington Parks and People

THANK YOU!

The Anacostia Watershed Society would like to thank the following organizations for technical assistance and/or funding for this report card:

- The Keith Campbell Foundation for the Environment

- Mid Atlantic Tributary Assessment Coalition

- District Department of Energy and Environment (DOEE)

- American Chemical Society

- USDA Environmental Microbial and Food Safety Laboratory for the use of a laboratory to allow us to analyze water for fecal bacteria

Thanks also to the AWS staff and consultants who contributed to the report:

- Jim Foster, AWS President

- Masaya Maeda, Water Quality Specialist

- Maureen Farrington, Marketing Manager

- Matthew Gallagher, Manager of Community-Based Restoration

- Mike Bento, Communications Consultant, Engage Strategies