SEVERN RIVER

PRELIMINARY WATERSHED AUDIT

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SUMMARY

Severn River and its tributaries are plagued by a number of water quality problems. Many of these problems could be due to activities regulated by current clean water laws but are failing to control pollution to the degree legally required. To determine if this is the case Community & Environmental Defense Services (CEDS) conducted a Preliminary Watershed Audit within the 57 square mile area draining to the Severn River. The Audit was conducted in concert with the Severn River Association, which is the oldest and one of the most successful watershed organizations in the nation.

The Audit focused on the following regulated activities most likely to be major causes of Severn River stress:

- construction site erosion and sediment control;
- existing stormwater Best Management Practices (BMPs);
- compliance with Environmental Site Design (ESD) requirements;
- Forest Conservation compliance;
- point source discharges, and
- sewage collection systems.

An equestrian operation was also evaluated at the request of Severn River advocates.

Following is a summary of the findings, which clearly show compliance is far from complete. However, each instance of noncompliance also offers an extremely important opportunity to curb Severn River pollution. Recommendations are offered in this report for improving compliance through a full Watershed Audit. The full Audit can be performed by volunteers or CEDS can complete the Audit on behalf of Severn River advocacy groups.

Construction Sites: Of nine construction sites located in the Severn River watershed, only three were active. On all three there were large areas of exposed soil. Stabilizing these soils with mulch, grass seed or stone (for road beds) would reduce soil erosion and sediment pollution by 90% to 99%. The lack of greater use of stabilization has likely allowed hundreds of tons of eroded soil to escape and pollute the Severn River as well as her tributaries. In fact, large amounts of sediment had recently been deposited along one Severn tributary, just below the point where runoff discharges from a massive construction site. CEDS referred all three sites to the County Inspections Division. Since then the quality of control has improved somewhat on two of the three sites.

Stormwater BMPs: About 2,000 stormwater Best Management Practices (BMPs) are present in the watershed and could be treating runoff from 35% of the existing developed areas. Examples of these BMPs include the ponds present in most communities built since the early 1970s and those long, rectangular stone-filled infiltration trenches you see along I-97 and other highways. These BMPs could be keeping up to 1.4 million pounds of pollution out of the Severn every year. However, CEDS evaluations of a small number of these BMPs indicates that a third to nearly all

(depending upon BMP type) are no longer functioning properly. As a result pollution retention is well below 1.4 million pounds per year. If these findings are representative then an extremely important opportunity is being missed to preserve and enhance the Severn River system. CEDS referred the problem BMPs to the County Inspections Division.

Environmental Site Design: In 2009, Maryland adopted a new approach to stormwater management known as Environmental Site Design (ESD). Unlike past approaches, ESD requires the applicant to identify streams, wetlands, steep slopes, forests and other sensitive resources ***first***, then design a development project to avoid these resources. ESD also requires that buildings and other impervious surfaces be laid out to drain to permeable soils suited to the use of small, highly-effective BMPs. These BMPs can usually fit into areas normally set aside for landscaping. As a result ESD should result in better aquatic resource protection, with lower maintenance needs, and reduced installation costs for the developer. CEDS reviewed four subdivision applications submitted to the County within the past 90 days. Only one of the four projects was required to comply with ESD requirements. Another received a waiver. The other two appeared to have been submitted well before the date ESD became mandatory. While the first project was somewhat compliant with ESD requirements, the County has insisted that the applicant make a greater effort. The County is to be commended for this action which will likely cost the applicant little but could greatly improve Severn River protection. Only one of the four projects will fully meet forest conservation requirements onsite, which is an important part of ESD. The other three will pay a fee-in-lieu to satisfy a portion of forest conservation requirements. While the largest of the four sites pre-dates ESD, it none the less has excellent ESD potential. In fact, a third of the lots are proposed to use ESD practices. In our full Audit recommendations CEDS urged Severn advocates to work with the three owners-developers to explore potential cost savings by making greater use of ESD. While the one ESD waiver is cause for concern, the County's firm stance on the other project is very encouraging.

Forest Conservation: Since the early 1980s projects within a thousand feet of tidewater have been required to retain a portion of a site as forest. Beginning in 1991, all other development projects have been required to maintain 15% to 50% of a site as forest. CEDS compared the forest conservation easements shown on plats of projects approved since the early 1990s with the actual forest shown on recent aerial photos. We found that the forest conservation easement areas shown on the plats were consistent with what actually exists at all of the sites. Congratulations to the County on what appears to be a high degree of compliance.

Point Source Discharges: According to the US EPA Environmental Compliance History Online (ECHO) website, there are two facilities that hold State NPDES permits to discharge to Severn River or its tributaries: the Annapolis Water Reclamation Facility (WRF) and the Naval Support Activity (NSA) Annapolis WWTP. Compliance monitoring data from ECHO shows that the Annapolis WRF has not exceeded allowable pollution discharge limits during the past three years. The County is also to be congratulated for upgrading this plant to further reduce pollution releases. The ECHO data erroneously reported a number of violations of pollution discharge limits at the second facility. However, the owner-operator of this facility states that no

violations have occurred, which of course we fully accept. ECHO does have a history of error which is why CEDS asked the owner-operator if the data was accurate.

Sewage Collection System: Sewerlines, pumping stations, and other collection system components ramify large portions of the Severn River watershed. This system delivers wastewater to treatment facilities such as the Annapolis WRF. On rare occasions sewage escapes from the collection system with dire consequences for nearby waters and residents. During the Preliminary Audit CEDS looked at a very small portion of the system and did not see any indications of a problem. A number of recommendations are offered in this report for a more comprehensive evaluation.

Equestrian Area: A two-acre area of exposed and eroding soil exists not far from Severn Run. The area is being used as a fenced horse pasture. Severn River advocates asked CEDS to take a look at this area as part of the Preliminary Audit. After confirming that the area is cause for concern, CEDS asked the Anne Arundel Soil Conservation District to contact the owner about options to accommodate a reasonable number of horses while resolving the soil erosion problem. The District has since sent a letter to the owner offering their assistance.

Watershed Implementation Plan Implications: Anne Arundel County is in the process of drafting a Watershed Implementation Plan (WIP) as part of the Chesapeake Bay Pollution Diet-Total Maximum Daily Load (TMDL) effort. In fact, the County is creating what will be the model for other Maryland jurisdictions with large areas of suburban-urban land uses. The WIP will set forth an overall strategy for reducing nitrogen, phosphorus and sediment loads to a level which will allow the Chesapeake Bay to recover while safeguarding tributaries like the Severn.

The load targets can only be achieved if there is a high degree of compliance with the BMPs and other measures which will make up the WIP strategy. Based upon this Preliminary Watershed Audit there is clear evidence that the current degree of compliance is insufficient to achieve the TMDL targets through the WIP. CEDS does not believe this is due to any lack of motivation on the part of County staff. In fact, the author is consistently impressed by the dedication of the many County officials contacted through this Audit and how much they accomplish in spite of dwindling budgets.

The problem is that these programs are largely out of sight for the public at large and few notice when budgets are cut. For example, in the 1990s the County had a Stormwater Inspection Section with a supervisor and six inspectors. Today, but one inspector remains. Current law requires that each stormwater facility be inspected once every three years. The WIP strategy requires annual inspections to credit existing BMPs with pollutant removal. Of course, one inspector cannot visit all stormwater BMPs in the County once every three years much less annually. It is our hope that this Audit serves to help all Severn River watershed residents appreciate the importance of clean water laws to their health and quality of life. If this goal is achieved then perhaps the ensuing increase in public support, along with a combination of creativity and modest budget increases, will allow the County to approach that elusive goal of

full compliance and, eventually, a Severn River which is healthier and even more beautiful than today.

INTRODUCTION

The purpose of a CEDS Watershed Audit is to identify opportunities to quickly enhance aquatic resource health by increasing compliance with existing clean water laws. Through a ***Preliminary*** Audit CEDS examines a small portion of regulated activities within a watershed to gauge the relative magnitude of compliance. If the Preliminary review shows a significant degree of noncompliance, then a full Watershed Audit is warranted. Further detail on CEDS Watershed Audits can be found at: ceds.org/audit.

In September, 2011, CEDS began searching for a watershed organization to partner with for the first Preliminary Audit. A number of watershed groups were asked about their interest in an Audit, with the most enthusiastic response coming from the Severn River Association. In many ways, the Severn River and the Association are ideal for this first Audit. The Severn River Association is the oldest watershed organization in the country. The Association also has a long history of highly-effective and principled advocacy on behalf a troubled, yet beautiful River.

The assumption underlying CEDS Watershed Audits is that compliance with clean water laws is less than 100%. Without something approaching full compliance our efforts to preserve remaining high quality waters and restore those degraded will be jeopardized.

Unfortunately, there's substantial evidence showing compliance is far from complete. For example, a 2009 New York Times investigation revealed that nationwide 23,000 companies and other facilities had violated their pollution discharge limits 506,000 times over a five-year period[1]. In 2008, the Washington Post reported that work loads for Maryland Department of the Environment (MDE) enforcement staff had risen from 1,000 permits per inspector in 2003 to 1,500/inspector by 2008[2]. In 2010, the Center for Progressive Reform released a detailed analysis of how MDE's enforcement capabilities had eroded since 2000[3].

Perhaps nothing illustrates the need to expand MDE enforcement capabilities better than construction site erosion and sediment control. MDE is the primary erosion-sediment control enforcement authority for nearly 13,000 construction sites, mostly located in nine counties. State law requires that each site be inspected once every two weeks. However, in Fiscal Year 2010, MDE inspected but 17% of these sites. In other words, the typical site would be inspected once every six years![4]

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[1] See: http://www.nytimes.com/2009/09/13/us/13water.html

[2] See: http://www.washingtonpost.com/wp-dyn/content/article/2008/09/22/AR2008092202962_pf.html

[3] See: http://www.progressivereform.org/articles/mde_report_1004FINALApril.pdf

[4] See: http://www.mde.state.md.us/aboutmde/DepartmentalReports/Documents/www.mde.state.md.us/assets/document/aboutMDE/MDE_FY10_Enforcementreport.pdf

While there seems to be widespread consensus that clean water law enforcement is critical to preserving and restoring our waters, there also seems to be very few advocacy groups conducting the independent evaluations needed to identify problem areas. Even fewer are mobilizing the public support essential to improving compliance at the local level. Part of the reason for this lack of independent accountability may be the apparent complexity of evaluating enforcement effectiveness along with the ensuing controversy and conflict arising when significant problems are uncovered.

In designing Watershed Audits, CEDS sought to resolve the complexity issue in two ways. First, by focusing on those regulated activities which are the most common and, therefore, most likely to be present within a particular watershed. Second, by utilizing basic, low-tech methods for assessing clean water law compliance.

With regard to the issues of controversy and conflict, CEDS learned long ago that a *cooperation first/public opinion approach* is the most effective way to resolve land use and environmental issues.

By "cooperation first" we mean exhausting all opportunities to work with a responsible party (a.k.a. polluter) to find solutions which are highly-effective in protecting aquatic resources yet can be most easily implemented. In other words, for each problem there might be a dozen possible solutions. Some of these are highly-effective, yet very expensive. Others may be adequate to achieve aquatic resource protection goals and are easier for the responsible party to implement. Through cooperation-first we seek that ideal solution which protects water quality yet allows the responsible party to achieve their goals.

However, should the party refuse to work cooperatively then we seek the help of elected officials, agency heads, and others in urging the party to do the right thing. If this added encouragement does not result in positive action then an ever increasing number of influential individuals, organizations, media, and others are asked to help. In most cases the party's desire to maintain a positive public image prompts full cooperation.

We call this approach *Equitable Solutions*, which is described in detail at: ceds.org/eqs. Of course Equitable Solutions only work if they are truly win-win and advocates go the extra mile to work cooperatively with the responsible party.

CEDS also developed *Smart Legal Strategies* for those rare situations where Equitable Solutions fail. Traditionally, advocates have relied upon 60-day letters and other legal action to address clean water law noncompliance. Through Smart Legal Strategies, CEDS examines a much wider range of opportunities to improve water quality. Once the best opportunity is found CEDS researches past decision-making history and other factors rarely examined through conventional legal action. The net result is a tripling of success in the courts at a much lower cost. For further detail on Smart Legal Strategies visit: ceds.org/sls.

Watershed Audits are also designed to expand active public involvement in maintaining aquatic resource health. In fact, this is the ultimate goal of an Audit. Without a sizeable and well-informed public constituency it is very difficult to achieve a high degree of compliance with laws designed to protect the health of our families and the waters which add so much to our quality of life.

An expanded and active constituency is essential to not only achieving compliance initially but to keep it high over a period of years. Fortunately, the Severn already has an extremely active and well-organized constituency thanks to the Severn River Association.

Audits can help advocates increase their effectiveness by providing them with an independent source of information about the level of clean-water law compliance and how well particular measures are working. The Audit also allows advocates to expand the base of public support critical to providing government with the resources and political will needed to reap the full benefits of clean-water laws. CEDS anticipates that the Audit can add to this constituency through actions such as helping the thousands of watershed residents who live near construction sites, stormwater BMPs, sewage pumping stations, etc., understand how their efforts can protect their quality of life, including waters near their home as well as the Severn.

SEVERN RIVER CURRENT CONDITION

Table 1, on the next page, provides data on land use and pollutant loads within the Severn River system. This data was generated by the Chesapeake Bay Program Watershed Model[5]. Table 1 shows that the Severn River drains a land area of 57.2 square miles. County documents give the land area draining to the Severn River as 67 square miles.[6] The Severn River watershed is shown on the map following Table 1.

The Severn River watershed is 42% forest and 55% developed lands, with a small amount of agriculture. Stormwater runoff from developed lands is the dominant source of nutrients and solids (sediment) followed by septic systems (with regard to nitrogen) and a municipal wastewater treatment plant (Annapolis WRF). The sediment mostly comes from erosion at storm drain outfalls and scouring along downstream channels.

In *Aquatic Biological Assessment of the Watersheds of Anne Arundel County, Maryland: 2004*, data is presented on the health of selected Severn River tributaries.[7] This report noted moderately high levels of sediment deposition throughout the areas sampled. Only 20% of the streams were of good quality, the other 80% were poor. Runoff from impervious areas was cited

[5] See: http://www.chesapeakebay.net/phase5.htm

[6] See http://www.aacounty.org/DPW/Watershed/SevernRiverCurrentConditionRevised7_28_03.pdf

[7] See: http://www.aacounty.org/DPW/Watershed/Aquatic_Bioassessment_Annual_Report_Final_2004.pdf

Table 1: Severn River Land Use & Pollutant Loads

Land Use - Source	Acres	Percent Of Total	Nitrogen		Phosphorus		Solids	
			Pounds/Yr	Percent	Pounds/Yr	Percent	Pounds/Yr	Percent
Forest	15,251	41.6%	27,209	6.2%	905	2.4%	444,426	9.4%
Harvested forest	152	0.4%	2,239	0.5%	76	0.2%	42,714	0.9%
Pasture	218	0.6%	930	0.2%	126	0.3%	9,436	0.2%
Cropfield	679	1.9%	6,295	1.4%	498	1.3%	278,029	5.9%
Animal feeding operations	2	0.0%	419	0.1%	70	0.2%	602	0.0%
Nursery	4	0.0%	545	0.1%	254	0.7%	1,646	0.0%
Developed Lands	19,983	54.6%	160,046	36.3%	14,698	39.1%	3,660,302	77.5%
Construction Site	124	0.3%	1,732	0.4%	397	1.1%	152,234	3.2%
Nontidal Waters - Atmospheric pollutant deposition	212	0.6%	2,328	0.5%	127	0.3%	0	0.0%
Septic Systems			129,116	29.3%	0	0.0%	0	0.0%
Wastewater Treatment Plants:						0.0%		0.0%
Municipal			94,099	21.4%	12,167	32.4%	109,527	2.3%
Industrial			15,485	3.5%	8,245	21.9%	21,512	0.5%
Total	**36,625**	**100.0%**	**440,443**	**100.0%**	**37,563**	**100.0%**	**4,720,428**	**100.0%**

Source: Chesapeake Bay Program Watershed Model 2010 Edge Of Stream Progress Values


Patapsco
Severn
Magothy
Little
Patuxent
Anne
Arundel
Severn
BOWIE
ANNAPOLIS
South
Patuxent
HIGHLAND BEACH
BOWIE
97
595
595
50
32
175
997
450
665
785
70
435
672
179
450
387
553
253
424
909
197
214
908
2
3
174
170
917
779
100
177
618

as the most likely cause of degraded stream quality. Scouring flows from these impervious surfaces during major storms causes accelerated channel erosion releasing large quantities of sediment. However, an upstream site on Jabez Branch - a high-quality tributary - was poor while a downstream station was of good quality. The report is silent on why such a dramatic difference exists.

According to the 2006 *Severn River Watershed Management Master Plan Current Conditions Report*[8], 18% of the Severn River watershed is covered by buildings, parking lots, streets, and other impervious surfaces. Highly-sensitive aquatic resources, such as Jabez Branch, begin showing negative effects when just 2% of a watershed is covered by buildings, streets, parking lots and other impervious surfaces. Tidal waterways, like the Severn and its creeks, begin exhibiting dissolved oxygen deficiencies at a watershed imperviousness of 8%. Most nontidal waters also exhibit stress at about 8% impervious area. The 2006 report noted that on a scale of 1 to 5, with 5 being excellent quality, the 152 miles of nontidal streams of the Severn River system averaged 2.6 or "poor" quality. The overall poor quality of Severn River tributaries is attributable to the extensive impervious areas draining to these waters. Jabez Branch had the highest quality with a score of 4.4.

According to the *2010 Severn Riverkeeper Monitoring Project Report*[9], the River suffers a dissolved oxygen deficiency which is most acute in the vicinity of Round Bay and upriver. Low dissolved oxygen levels limit fish, shellfish, and other aquatic species. It can also lead to odor problems. Excessive inputs of organic matter and nutrients are the most common cause of dissolved oxygen depletion. The Severn Riverkeeper reported on a massive kill of nearly 30,000 fish which occurred in July, 2010 and was attributed to low dissolved oxygen levels. The Riverkeeper report also noted that water clarity is poorest at the head of the river, where Severn Run enters, then peaks at Round Bay. Submerged aquatic vegetation provides essential habitat for many river dwellers and does best where water clarity is good. Poor water clarity may be due to excessive inputs of eroded soil from the watershed and/or high algal densities caused by elevated nutrient inputs.

REGULATED ACTIVITIES INCLUDED IN THIS PRELIMINARY AUDIT

As stated previously, the purpose of a CEDS Watershed Audit is to reduce pollution loads and other aquatic resource impacts by bringing existing activities into compliance with clean water laws. Through a Preliminary Audit CEDS assesses the current level of compliance by evaluating a small sampling of regulated activities. A listing of activities included in a Maryland Preliminary Audit will be found in Appendix A along with some indicators of compliance, This preliminary evaluation shows whether a full Watershed Audit is warranted and, if so, which regulated activities should be pursued first.

[8] See http://www.aacounty.org/DPW/Watershed/SevernRiverCurrentConditionRevised7_28_03.pdf

[9] See http://www.severnriverkeeper.org/pdf/2010SevernRiverkeeperMonitoringProjectReport-1.pdf

Since the Severn River watershed is dominated by urban-suburban land uses, the Preliminary Audit focused on the following activities regulated by clean water laws:

- Construction Site Erosion and Sediment Control Quality;
- Existing Stormwater Best Management Practices (BMPs);
- Environmental Site Design (ESD);
- Forest Conservation;
- Point Source NPDES Discharges; and
- Sewage Pumping Stations.

Additionally, communications with Severn River advocates indicated that a problem may exist at an equestrian operation not far from Severn Run. This activity was added since it could be regulated by County and State laws.

WHY SITE NAMES & LOCATIONS ARE NOT GIVEN

As stated in the introduction, CEDS seeks to achieve correction of water quality problems through the Equitable Solutions, cooperation first approach. It is only after all reasonable efforts to achieve cooperation are exhausted that CEDS uses the responsible party's (a.k.a. polluter's) desire to maintain a positive public image as leverage to halt pollution. Therefore, it would be inconsistent with cooperation-first to publish the name and location of sites found to be causing more pollution than permitted by clean water laws since we have yet to contact the site owner. However, one facility is named because of commendable action to enhance the Severn River - the Annapolis WRF. The Naval Support Activity Annapolis WWTP is also identified at the request of the owner-operator.

CONSTRUCTION SITE EROSION & SEDIMENT CONTROL

Table 1, shows that construction sites account for just 0.3% of all the land within the basin but 3.2% of the sediment (and 1% of the phosphorus) delivered to streams within the watershed. Without effective control the sediment released from a typical construction site can damage three miles of downstream waters with recovery taking a decade to a century.[10] CEDS estimates that for each dollar spent keeping sediment on a construction site a minimum of $42 in damages is avoided[11]. Of course sediment from watershed construction activity could be a significant cause of the reduced water clarity noted by the Severn Riverkeeper in the upper river and Round Bay.

The Maryland Department of the Environment (MDE) is required to assess the effectiveness of local erosion and sediment control programs once every three years. The latest triennial review was conducted in October and November, 2010. MDE evaluated the quality of control on ten of the 450 or so construction sites active within Anne Arundel County. MDE found that the quality of control was acceptable on 70% of the sites. Enforcement action then

[10] See: http://water.epa.gov/polwaste/nps/urban/appendix.cfm

[11] See: ceds.org/esp

brought two of the three failed sites into compliance. It appears though that a site could have failed to fully stabilize disturbed soils yet still be found acceptable by MDE.

Construction Site Identification & Evaluation

CEDS located construction sites in the watershed by searching recent (August 2010) aerial photographs for large areas of exposed soil. Sites were also noted while driving many of the watershed roads.

CEDS found nine construction sites. While there are no doubt a number of other sites in the Severn River watershed, this was an adequate number for the Preliminary Watershed Audit. All nine sites were evaluated by CEDS from areas open to the public. CEDS focused on temporary stabilization measures (mulching-seeding) rather then perimeter controls (silt fence, traps and basins). The reason for this focus is that temporary stabilization can reduce offsite sediment pollution by 90% to 99% whereas silt-fence and other perimeter controls can only achieve a 33% to 70% reduction. Also, it is easier to evaluate the condition of temporary stabilization when compared to assessing the condition of perimeter controls. In fact, CEDS developed a new approach for citizen sediment pollution advocacy known as *Exposed Soil = Pollution* (ceds.org/esp). ES=P is far more effective then past approaches in engaging the public in this activity. In fact, a primary goal of the Audits to instill the widespread perception among watershed residents that exposed soil does equal pollution. If successful, then bare soil on a construction site may become as socially unacceptable as a junk car parked on a lawn or littering.

Because it is so effective in protecting aquatic resources, the Maryland sediment control regulations require that construction site soils be treated with mulch, grass seeding, stone on road beds, and other temporary stabilization measures within 7- to 14-days of initial disturbance[12]. The draft *2011 Maryland Standards & Specifications for Soil Erosion and Sediment Control*[13] tightens the requirement by calling for stabilization of perimeter areas within three days of initial disturbance and seven days for all other areas. Of course, the draft is not yet effective.

The intent is that site clearance, filling, and grading initially occur along the downslope perimeter of the site where collection measures (dikes, swales, silt fence, etc.) convey runoff to sediment trapping measures (silt fence, traps and basins). Sediment is trapped mostly by slowing runoff which allows eroded soil to settle from suspension. Of the three major soil fractions, sand and coarser silts will be trapped in these measures while clays and other finer particles discharge into nearby waterways along with much of the associated pollution.

The perimeter area must be treated with temporary stabilization measures within seven days from the start of clearance. Interior portions of the site to be developed in the near future:

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[12] See: http://www.dsd.state.md.us/comar/getfile.aspx?file=26.17.01.07.htm

[13] See: http://www.mde.state.md.us/programs/Water/StormwaterManagementProgram/SoilErosionandSedimentControl/Documents/2011%20ESC%20Standards%2005232011%20web%20version.pdf

are cleared, brought up to rough grade within a maximum of two weeks, and treated with temporary stabilization measures. Weeks and even months can elapse between the time when rough grade is achieved and the onset of final stabilization occurs at building completion. This is why it is vitally important that site development be planned to reach rough grade within a maximum of two weeks at which point road beds are stabilized with stone and all other areas treated with mulch and seed. The only exception are areas where building foundations are actually (immediately) under construction.

The amount of stone and mulch must be sufficient to fully screen the underlying soils from view. Similarly grass must be sufficiently thick that no soil shows through. It usually takes several seedings to get a good growth of grass; not just the one applied on most sites. In fact, a well-stabilized site will have grass of two or three heights intermixed. As long as soil remains visible it also remains susceptible to erosion and nearby waters may still suffer mud pollution come the next big rain. On far too many sites soils are left exposed and eroding rather then being stabilized.

Findings - Construction Site Evaluations

CEDS found that one of the nine Severn River watershed construction sites was at the final stabilization stage. All previously disturbed soils had been protected with a good growth of grass.

Soil disturbance and vegetation clearance had yet to begin on another site.

Four of the nine sites were mostly inactive but generally well stabilized. Discussions with County inspection staff indicated that the largest of these four sites had been the subject of very intensive enforcement activity. By the time CEDS viewed this massive 60-acre site it was close to being a model for how effective erosion and sediment control should be applied. The biggest problem with this site was that a massive amount of land had been cleared before construction had started on a single home. Even with good erosion and sediment control, sediment losses are substantially higher once soil is disturbed compared to the undisturbed forest which had existed on this site. Nevertheless, the County is to be commended for the excellent control achieved.

Only three sites were active, which is the condition where maintaining erosion and sediment control compliance is the most challenging. On all three sites there were large areas of exposed soil which either had not been treated with temporary stabilization measures or the mulch and grass was too thin to prevent erosion. On two sites, construction was inactive on 90% of the site. There was no reason why this 90% could not have been treated with temporary stabilization measures. Plus perimeter sediment controls on the largest of these sites were failing at the time of the CEDS evaluation but were subsequently repaired. About a third of the remaining site was inactive and could have been treated with temporary stabilization measures. A portion of the inactive area had been mulched with straw, but too thinly to prevent erosion.

Again, to be effective, mulch must be applied at a volume and depth sufficient to obscure the underlying soil from view.

Construction Site Referral to County Inspections Division
The deficiencies summarized above were referred to the County Environmental Programs & Infrastructure Inspections Division. Following is the text of the referral message. Division staff responded promptly that the referral would be looked into. Footnotes are also provided below giving an update on improvements which have occurred at two of these three sites.

> **Site A:** Much of this massive, 18.5-acre commercial site is exposed soil and construction is active on only 10% of the site. It appears rough grade was achieved quite some time ago and large areas appear to be at final grade. In other words, these soils have been exposed well past the 14-day limit set forth at COMAR 26.17.01.07B for applying mulching, seeding and other temporary stabilization measures[14]. Of course, temporary stabilization is ***THE*** most effective method of preventing erosion and can reduce offsite sediment pollution by 90% to 99% versus the 33% to 70% reduction achievable with traps, basins and other structural practices. The sediment basin at the west end of the site was full of extremely muddy water on October 16th, two days since the last rain. Very little flow was coming from the outfall of this basin. It appears that the dewatering device had failed.[15] The *1994 Maryland Specifications for Soil Erosion and Sediment Control* requires that half of the basin storage be dry and the other half wet[16]. The lack of dry storage seriously comprises the effectiveness of the basin in retaining sediment onsite. In fact, a large amount of sand has been recently deposited on the floodplain just downstream of the basin outfall.
>
> **Site B:** Several soil stockpiles have not been treated with temporary stabilization measures on this partially completed 6.6-acre residential development site. Additionally much of the other disturbed soils has an extremely sparse amount of mulch, certainly far less then that needed to effectively control erosion.[17]
>
> **Site C:** The single residential road is completed and several lots are being developed. However, 90% of the site is inactive yet none of the disturbed soils have been treated with temporary stabilization measures.

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[14] See: http://www.dsd.state.md.us/comar/getfile.aspx?file=26.17.01.07.htm

[15] By October 22nd the basin had drawn down and the dewatering device was apparently working again.

[16] See: http://www.ccgov.org/uploads/PublicWorks/1994ErosionSed.pdf

[17] County inspection staff say the stockpiles will shortly be removed or stabilized.

Watershed Implementation Plan Implications

The importance of temporary stabilization is, of course, widely recognized. It appears that the Chesapeake Bay Program Watershed Model is based on the assumption that 66% of a typical construction site will be treated with temporary stabilization measures[18]. This model serves as an important component in the development of Watershed Implementation Plans. Based on this extremely limited evaluation, 10% to 30% stabilized may be a more accurate figure than 66%. But, again, this evaluation is nothing more than an indication; not a representative sampling of the Severn watershed much less larger areas. However, the implications of the 10% - 30% stabilization rate are dire with regard to efforts to preserve and restore the Severn River system and the Bay. It is imperative that we advocates do a better job of supporting efforts to improve erosion and sediment control quality.

Full Watershed Audit Recommendations - Construction Sites

CEDS would assist Severn River advocates in reducing erosion and sediment pollution by:

1. Tactfully urging the owner-developer of Sites A, B, and C to:

    a. Quickly maximize the exposed soils treated with temporary stabilization measures; and

    b. If this first approach fails to produce a reasonable response then a series of actions should be carried out to increase the amount of public pressure on the owner-developer to increase Severn River protection measures;

2. Identify all construction sites and other areas of exposed soil within the Severn River watershed by:

    a. Requesting a listing of active sites from County inspection officials;

    b. Driving all of the arterial and collector roads;

    c. Seeking the assistance of a pilot to fly the watershed; and

    d. Evaluate each site for opportunities to work with the owner-developer-contractor to protect the Severn by maximizing soil stabilization.

3. Initiate an aggressive campaign to instill a mind-set among watershed residents that whenever they see exposed soil on a construction site a nearby waterway will likely become polluted come the next runoff event. This *Exposed Soil=Pollution* mind-set would create a tremendous amount of public support for contractor, developer, and

[18] See: ftp://ftp.chesapeakebay.net/modeling/P5Documentation/SECTION_9.pdf

County efforts to maximize construction site stabilization. For further detail see: ceds.org/esp

EXISTING STORMWATER BEST MANAGEMENT PRACTICES

Table 1, based on the most recent Chesapeake Bay Program Watershed Model output, shows that existing developed lands cover 55% of the Severn watershed and account for 36% to 79% of the pollution entering the River[19]. As stated earlier in this report, overall 18% or 9,000 acres of the Severn River watershed is covered by buildings, streets, parking lots and other impervious surfaces. Highly-sensitive aquatic resources, such as Jabez Branch, begin showing negative effects when just 2% of a watershed is covered by impervious surfaces. Tidal waterways, such as the Severn and its creeks, begin exhibiting dissolved oxygen deficiencies at a watershed imperviousness of 8%. Most nontidal waters also exhibit stress at about 8% impervious area.

Stormwater BMPs can do much to reduce the aquatic resource impact of impervious surfaces. Of course this benefit is only achieved if the BMPs were installed correctly and maintained in good working order.

In addition to aquatic resource impacts, failing stormwater BMPs can create other problems when not properly maintained. Stormwater infiltration measures, filters, bioretention, and others are designed to drain completely with 48- to 72-hours of a runoff event. This design not only enhances water quality but prevents problems such as mosquito proliferation.[20] When these measures fail and retain water for longer periods, nearby residents can experience more problems with mosquitos and other pests.

Identification of Existing Stormwater BMPs

CEDS reviewed the 2010 Maryland Urban BMP Database compiled by the Maryland Department of the Environment (MDE). The MDE database indicated more than 2500 BMPs were present in the Severn River watershed. After eliminating duplicates, it appears that there are about 2,000 BMPs in the watershed. Table 2, on the next page of this report, lists the BMPs by type. Table 2 also shows the portion of all BMPs accounted for by each type along with the average area served, total acres served, and the average year each type of BMP was constructed. Also provided is the average pollutant removal efficiency for a number of BMP types. These pollutant removal rates were obtained from the MDE report *Accounting for Stormwater Wasteload Allocations and Impervious Acre Treated*[21] and the *2006 Severn River Watershed Management Master Plan Current Conditions Report*[22].

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[19] See http://www.aacounty.org/DPW/Watershed/SevernRiverCurrentConditionRevised7_28_03.pdf

[20] ee: http://www.mde.state.md.us/assets/document/SWM_Mosquito(1).pdf

[21] See: http://www.mde.state.md.us/programs/Water/StormwaterManagementProgram/Documents/NPDES%20Draft%20Guidance%206_14.pdf

[22] See http://www.aacounty.org/DPW/Watershed/SevernRiverCurrentConditionRevised7_28_03.pdf

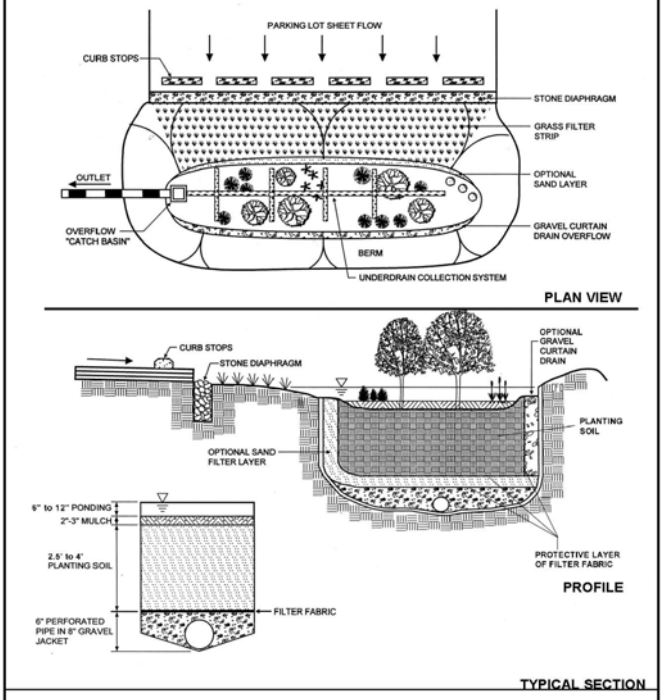
Table 2: Severn River Stormwater Best Management Practices

Type	Number	Percent	Average Drainage Acres	Acres Treated	Average Year Built	POLLUTANT REMOVAL (%)			
						Nitrogen	Phosphorus	Solids	Copper
Baysaver	1	0.0%	0.00	0	1985	5%	10%	10%	
Bioretention	60	3.0%	0.57	34	1999	40%	60%	80%	97%
Dry Pond	193	9.6%	10.84	2,093	1991	5%	10%	10%	
Dry Well + Rooftop Disconnect	47	2.3%	0.45	21	1997	50%	60%	90%	88%
Extended Detention Pond - Dry	115	5.7%	9.73	1,119	1996	20%	20%	60%	10%
Extended Detention Pond - Wet	77	3.8%	11.26	867	1994	20%	45%	60%	57%
Infiltration Basin	56	2.8%	6.68	374	1996	80%	85%	95%	99%
Infiltration Trench	353	17.6%	0.61	215	1998	80%	85%	95%	99%
Infiltration Trench - Complete Exfiltration	756	37.6%	1.61	1,217	1997	80%	85%	95%	99%
Infiltration Trench - Partial Exfiltration	138	6.9%	1.47	202	1996	40%	60%	80%	88%
Natural Area Conservation	17	0.8%	0.41	7	1994				
Open Channel Use	14	0.7%	2.50	35	1998	45%	45%	70%	
Oil Grit Separator	4	0.2%	2.63	11	1998	5%	10%	10%	
Other	4	0.2%	1.00	4	2001				
Porous Pavement	1	0.0%	4.00	4	1988	50%	60%	90%	
Rain Gardens - Rooftop Runoff	22	1.1%	0.05	1	1989	50%	60%	90%	97%
Rooftop Runoff Disconnection	37	1.8%	0.41	15	1997	50%	60%	90%	
Sand Filter	1	0.0%	2.00	2	1985	40%	60%	80%	88%
Sheetflow To Buffer	7	0.3%	8.99	63	1991	50%	60%	90%	
Shallow Marsh	14	0.7%	2.83	40	2000	20%	45%	60%	40%
Swales	16	0.8%	0.90	14	1994	50%	60%	90%	
Underground Storage	10	0.5%	2.15	21	1990	20%	45%	60%	
Wet Pond	66	3.3%	9.80	647	1995	20%	45%	60%	57%
Total	**2,009**			**7,006**	**1994**				

Solids, nitrogen and phosphorus pollutant removal rates are based on Table 4, *Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated*:
http://www.mde.state.md.us/programs/Water/StormwaterManagementProgram/Documents/NPDES%20Draft%20Guidance%206_14.pdf

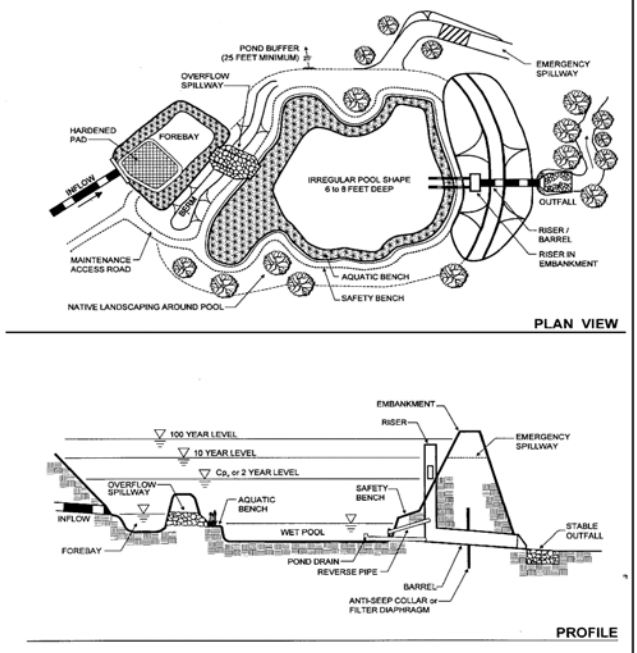
Copper reductions are based on *Severn River Watershed Management Master Plan Current Conditions Report*

F-6 | **Figure 3.17** Example of Bioretention | F-6



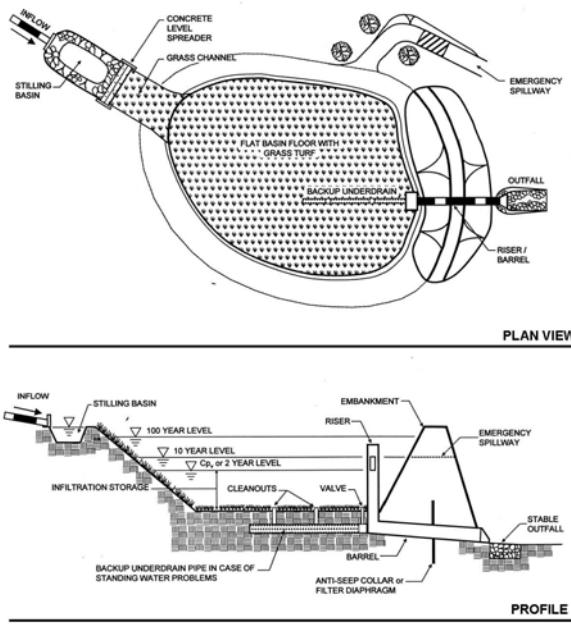
Bioretention combines open space with stormwater treatment.

P-2 | Figure 3.2 Example of Wet Pond | P-2



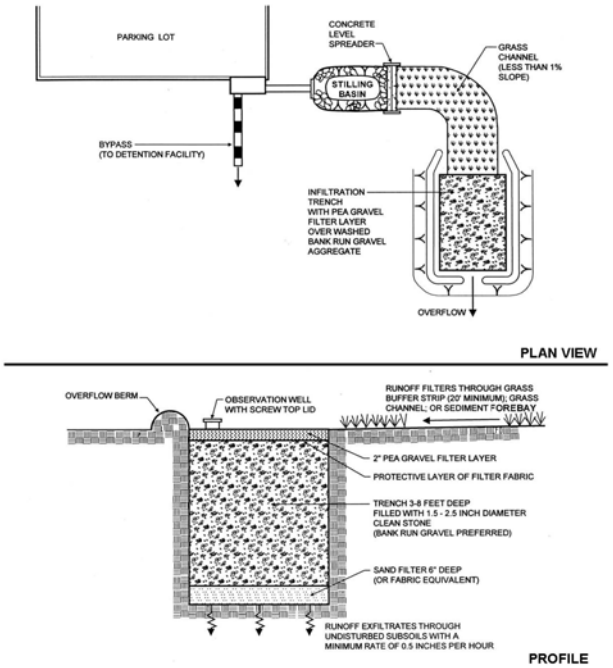
A wet pond provides all of water quality volume storage in a permanent pool.

I-2 | **Figure 3.11** Example of Infiltration Basin | I-2



The WQ_v is retained in an infiltration basin, where it percolates through the floor of the basin in a two day period.

I-1 | **Figure 3.10** Example of Infiltration Trench | I-1



The infiltration trench provides Re_v and WQ_v in one location.

These illustrations are from the 2000 Maryland Stormwater Water Design Manual

The MDE database included coordinates for many of the BMPs. CEDS transferred the coordinates for a sampling of the more effective BMPs to Google Earth. These more effective BMPs are: bioretention, infiltration basin, infiltration trench, and wet pond *(see illustrations following Table 2)*. The right-hand columns in Table 2 show that these BMP types have the highest pollutant removal rates.

Findings - Stormwater BMP Evaluations

CEDS was able to locate BMPs on sixteen past development projects within the watershed. Others could not be found which is may be due to: incorrect coordinates, the BMP was never installed, it was placed underground, or for other reasons. Each facility was evaluated using the criteria presented in Appendix B of this report. Following are the results from evaluations of these four most effective existing BMP types.

Bioretention: A typical bioretention facility consists of a trench four feet deep, four feet wide and, say, 20 feet long. It is lined with filter cloth then filled with a planting soil and a layer of mulch on top. The surface is depressed six- to twelve-inches below the first point where runoff could flow from the facility. This depression is sized to store the first inch of runoff from the impervious surfaces draining to the facility. As runoff percolates from the storage depression down through the mulch and planting soil, 40% to 80% of the runoff pollutants are removed. If permeable, unsaturated soils lie beneath the facility then further pollutant removal occurs as the runoff trickles through earth to recharge the water table. When placed above saturated or low-permeability soils a gravel layer and pipe under drain is installed at the bottom. The drain then conveys the treated runoff to a nearby storm drain inlet or other outfall.

According to the Maryland Urban BMP Database, there may be as many as 60 bioretention facilities within the Severn River watershed. These facilities could be keeping 20- to 9700-pounds of pollutants a year out of the Severn River, assuming all had been properly installed and maintained. CEDS evaluated six existing bioretention facilities. Two were clearly working well. Three were questionable and one had failed completely. Two of the questionable facilities may lack sufficient area in the surface depression to retain the first inch of runoff until it can be treated. The third looked good but it is questionable whether any impervious surface runoff is actually reaching the facility. With regard to the failed facility, the surface depression has filled in completely. Further detail is provided in the section below regarding the referral made to County inspection staff.

Infiltration Basin: While an infiltration basin resembles a pond, it is constructed on permeable soils well above the water table. The first inch of runoff from impervious surfaces is stored while it soaks through the sides and floor of the basin. Runoff must infiltrate completely from the basin within a maximum of two days. In other words, most of the time the basin should be dry. There should be no point within say a foot or two of the floor where runoff could flow from the basin except by infiltrating into bottom soils. This one- to two-foot depth ensures pollutants are retained within the basin instead of flowing into downstream waters.

The Maryland Urban BMP Database indicates that there are 56 infiltration basins within the Severn River watershed. Collectively these basins could be keeping 300- to 128,000-pounds of pollutants out of the Severn every year. However, all four of the infiltration basins examined by CEDS had failed completely.

CEDS verified that the four facilities had been designed as infiltration basins by downloading stormwater plans from the County Department of Public Works Engineering Record Drawing website[23]. These plans confirmed that three of the four facilities were infiltration basins. The plans for the fourth were indeterminate, though the Maryland Urban BMP Database did list it as an infiltration basin.

All four basins contained well established wetlands. Runoff had ceased to drain from all facilities within the required two-day maximum. In fact, all four had converted to shallow marshes which have a fourth to two-thirds the pollutant removal capability of an infiltration basin. In other words, 33% to 75% of the pollutants which should been retained in these basins had discharged into Severn River tributaries. Furthermore, little recharge is occurring so less groundwater flows into nearby wetlands and streams during dry weather, which greatly exacerbates the aquatic resource impact.

Infiltration basins have a history of failure which usually results from fine sediments clogging the basin floor. Once clogging occurs runoff can no longer infiltrate through the basin floor or sides. The basin begins retaining runoff for ever longer periods until a wetland forms.

It is not known what sort of maintenance the basins received. Once the basins started retaining runoff longer then two days floor permeability could have been restored with discing or removal of the clogged soil layer. This and other maintenance practices might have allowed the basins to continue functioning to the present. It is also possible that the basins can still be restored as infiltration facilities if the accumulated sediments were removed down to the depth where permeable soil still exists.

Infiltration Trench: An infiltration trench is excavated into permeable soils with the bottom at least four feet above the water table. The trench is lined with filter cloth. A six-inch layer of sand is placed on the bottom, then the remainder of the trench is filled with two-inch stone with a layer of pea gravel at the surface. An observation well is installed to verify that the trench drains completely within two days of a runoff event. Impervious surface runoff must first flow through a 20-foot long grass filter strip or other measures to remove sediment which would otherwise clog the trench-soil interface.

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[23] See: http://gis-world.aacounty.org/DPWCounter/DPWEnter.aspx?ReturnUrl=%2fDPWCounter%2fDPWSplit.aspx

There are more infiltration trenches in the Severn River watershed then all other stormwater BMPs combined. In fact, 62% of all Severn BMPs are infiltration trenches. About 10% were apparently placed in soils with either low permeability or a high water table since they were fitted with a perforated pipe under drain. The under drain carries runoff to a storm drain or other discharge point once it percolates to the trench bottom. If all the infiltration trenches are working properly then they are keeping an astounding 1,300- to 548,000-pounds of pollutants out of the Severn every year.

Coordinates from the Maryland Urban BMP Database were plotted for fifteen infiltration trenches within the Severn watershed. CEDS was able to find nine of these facilities.

Four trenches were supposed to be located on residential lots, two of which had what appeared to be an observation well in the lawn indicating the trench was present. The other two were uncertain.

Two trenches serve residential subdivisions and observation wells were present. However, the caps were tightly in place so rather then risk damage no attempt was made to check water depth.

Three trenches were present along MD 3, two of which had observation wells with the depth to water 9- to 13-feet below the surface. While this indicated the trenches were draining within the required 48 hours, it could not be determined how much storage volume remained within the stone reservoirs.

An infiltration trench was supposed to be present at a new office building along Generals Highway but the only visible structure was stone extending a foot from the building foundation. Observation wells were not present.

Another office building nearby had a three-foot by one-foot deep swale running along three of four sides. Building and parking lot runoff discharges to the swale, which somewhat resembles a bioretention facility in having a mulched surface with landscape plantings. Unfortunately the swales drain to two inlets with no storage below the lip of the inlet. In other words, it is very uncertain just how much runoff actually infiltrates within the swale and how much simply discharges into Severn tributaries via the storm drain inlets.

Unlike most BMPs, it's hard to tell how well an infiltration trench is working by looking for indicators visible at the surface. So, in summary, it is uncertain how many of the 1200+ Severn River watershed infiltration trenches are present and functioning as designed. Recommendations are provided below in the full Watershed Audit section for resolving this uncertainty.

Wet Pond: As the name implies, a wet pond holds a permanent pool of water. The permanent pool provides a place where pollutants can be retained until accumulation reaches the point

where clean-out is needed. Without this storage area pollutants deposited during small, frequent rains could be scoured from the pond during major storm events. Facilities built in accordance with the *2000 Maryland Stormwater Design Manual*[24] must have a forebay (small pond) to trap sediments carried by in inflowing runoff which otherwise would rob storage capacity from the main pond.

The are 68 wet ponds within the Severn River watershed which could be retaining 300- to 140,000-pounds of pollutants each year.

CEDS examined four wet ponds within the Severn watershed, only one of which still had an open pool of water for retaining pollutants. The other three had filled with sediments up to the point where runoff can flow from the pond. Thus these three facilities had no area to store pollutants, with most flowing downstream. These three facilities had become shallow wetlands.

Stormwater BMP Referral to County Inspection Division

Following is the text of a message sent to County inspection authorities alerting them to BMP deficiencies found at a number of the sixteen existing developed areas. Of course the actual site name and location was provided to the authorities.

> During the Severn River Preliminary Watershed Audit I looked at 17 existing stormwater management facilities. I came across only one that appeared as though it might require immediate attention in the near future, which was Site D. Unlike most of the pond embankments I saw, this one is severely overgrown with trees. It is my understanding that trees are prohibited on pond embankments because of the increased danger of embankment failure. I also attached plans for this facility from the DPW Record Drawings website.
>
> The following facilities also appear to be in need of maintenance, though the situation is not as critical. I realize that stormwater facility maintenance is a very difficult issue to deal with. I also realize that correcting the following may not be possible in the near future. But I would be remiss if I failed to alert you to these apparent deficiencies.
>
> **Site D:** According to plans from the DPW website this facility was designed as an infiltration basin. It now has an extensive growth of cattails and other wetland vegetation. Given that infiltration basins are supposed to drain completely within 72 hours of a runoff event, the presence of wetland vegetation indicates the facility no longer exfiltrates. Of course a properly functioning infiltration benefits provides about twice the environmental benefits of a shallow marsh facility.

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[24] See: http://www.mde.state.md.us/programs/Water/StormwaterManagementProgram/SedimentandStormwaterHome/Pages/Programs/WaterPrograms/SedimentandStormwater/home/index.aspx

Infiltration Basins
According to the MDE Stormwater Facility database, the following facilities were also designed as infiltration basins, but have since reverted to wetlands:

- Site F; and
- Site G.

Wet Ponds
The MDE database indicates that the following facilities were originally designed as wet ponds but now appear to be shallow marshes. As a result most of the area for retaining pollutants below the first discharge point has filled with sediments. If this is correct then pollutant retention in these facilities may be far below that attainable with the original design.

Site H: The DPW plan for this facility indicates it was originally designed as a wet pond, but cattails have now taken over about half the surface area. I assume the cattails and underlying sediments have substantially reduced the storage volume, perhaps to the point of reaching the clean-out elevation.

Site I: Completely filled with sediment and has reverted to a shallow marsh.

Site J: Completely filled with sediment and has reverted to a shallow marsh.

Bioretention Facilities
Three of the six bioretention facilities assessed by CEDS were not achieving the full benefits attainable with this practice.

Site K: It appears that this facility was designed to treat runoff from a short section of road. However, it is questionable whether the rip-rap channel receiving road runoff would actually convey stormwater into the bioretention facility. Instead the runoff may flow into an adjoining forest.

Site L: The storm drain plans from the DPW website show that a bioretention facility is supposed to exist between a parking lot and a wet pond. There is a mulched area present but it lacks the 12-inch depression needed to store parking lot runoff until it can percolate down through the bioretention filter bed. In fact, if a depression ever existed it is now filled completely. Also, the wet pond is full of cattails.

Site M
In 2008, a large convenience store and gas station was constructed at this site. While the plat shows that stormwater management is required for this site, I did not see any facilities at this location. Is there an underground stormwater facility?

The County responded promptly to this message with the following:

> *"Because of budget cuts over the years I only have 1 inspector doing SWM Maintenance inspections, so your e-mail is more then welcome. I will have these logged into the Department's Compliance Database, which can be followed on the I&P page of the County Citizens Information Website."*

Watershed Implementation Plan Implications

Table 2, indicates that the 2,000 or so BMPs may serve 7,000 acres or 35% of the developed land within the Severn River watershed. If these BMPs had been maintained in good working order they could be achieving a substantial reduction in pollution inputs to the River and tributaries.

In the 1990s, Anne Arundel County had a Stormwater Inspection Section that consisted of a supervisor and six full-time inspectors. This Section conducted construction, maintenance and illicit stormdrain discharge inspections. Around 2002 the budget for this vitally important function dwindled to the point where only one inspector remains.

State law requires that each stormwater BMP be inspected at least once every three years.[25] The Chesapeake Bay Program Watershed Model guidance only credits pollutant removal achieved in existing stormwater BMPs if each is inspected once a year to ensure it is working properly.[26] With only one full-time inspector is it difficult to envision how all existing stormwater BMPs are being evaluated once every three years. It appears that one inspector can evaluate about a thousand existing stormwater BMPs in a year for maintenance needs. It also appears that about 11,000 stormwater BMPs are present in Anne Arundel County. If these numbers are right then a minimum of eleven inspectors will be needed to meet the annual BMP evaluation requirement. Given this it is imperative that Severn River advocates provide the County with the support essential to achieving this goal.

The Watershed Implementation Plan (WIP) will no doubt rely heavily upon existing BMPs to achieve the pollutant load reductions critical to restoring the Severn to a higher level of quality. BMPs resembling these would likely be installed as retrofits in areas not presently served by highly-effective measures. In other words, the Preliminary Audit indicates the need to substantially upgrade BMP installation and maintenance if the benefits envisioned in the WIP are to be achieved.

Full Watershed Audit Recommendations - Existing Stormwater BMPs

CEDS would assist Severn River advocates with the following tasks.

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[25] See: http://www.dsd.state.md.us/comar/getfile.aspx?file=26.17.02.11.htm

[26] See: ftp://ftp.chesapeakebay.net/modeling/P5Documentation/SECTION_6.pdf

1. Contact the owners of the two bioretention facilities which may lack sufficient storage capacity and request permission to check capacity using the Rain Gage & Float Method *(see Appendix C)*;

2. Contact those who live near or own the two good condition bioretention facilities to thank them and encourage continued good maintenance;

3. Obtain stormwater plans for sites that were supposed to have BMPs but did not, such as the Site M convenience store/gas station, then determine if the required BMPs were installed;

4. Encourage the owners of the failing bioretention facility to make the necessary repairs;

5. Begin discussions with the County about examining the failed infiltration basins as possible restoration projects;

6. With regard to infiltration trenches:

    a. CEDS urges Severn River advocates to work with County inspection staff to compile a list of infiltration trenches known to exist;

    b. Advocates should then use a variation of the Rain Gage & Float Method to determine if selected trenches overflow with less than an inch of rain in 24 hours; and

    c. Advocates should seek an arrangement with the County Inspections Division to visit a dozen or so randomly selected trenches just after 48 hours has passed since a rainfall of a half- to one-inch. The County inspectors could remove the observation well caps so everyone can determine if each trench has drained completely. If conducted once or twice a year, this exercise should give a good indication of how well infiltration trenches are performing throughout the watershed.

7. Train volunteers in methods to assess stormwater BMPs with the goal of covering all of the highly-effective existing BMPs in the watershed;

8. Educate nearby residents about the benefits of well-maintained BMPs (better water quality, fewer mosquito and odor problems, enhanced property value, etc.). Request their help in monitoring and maintaining the BMP. When one considers the number of people who live near the 2,000 Severn River BMPs, this could potentially create a very large and highly-motivated constituency; and

9. Support Anne Arundel County in expanding their capabilities to inspect and maintain stormwater BMPs.

ENVIRONMENTAL SITE DESIGN

In 2009, the Maryland Department of the Environment (MDE) adopted a new approach called Environmental Site Design (ESD). This new approach places greater emphasis on preserving forests and minimizing disturbance of steep slopes, highly-erodible soils, and other sensitive areas. In addition, small highly-effective filtering-infiltration facilities now serve as the primary measures to treat runoff rather than the past pond-based approach. So, instead of retaining pollutants in pond bottom sediments where they can be flushed into downstream waters during large runoff events, pollutants are trapped below the soil surface. Most ESD measures are also designed to function as filters which then release treated runoff into underlying soils. Filters are generally more effective then ponds in removing pollutants. Infiltrating runoff into underlying soils is critical to maintaining the volume of dry-weather inflow to wetlands, streams, and tidal waters. By utilizing measures with a small drainage area, ESD practices should require less maintenance.

Identification & Evaluation of Projects for ESD Compliance

The new ESD requirements became effective in May, 2010. In the summer and fall of 2010 CEDS conducted a series of workshops throughout Maryland to instruct watershed advocates in how to support local governments and the development industry in maximizing the aquatic resource benefits of ESD. The content of these workshops is available at: ceds.org/esd. This website also presents the criteria recommended by CEDS for conducting a preliminary evaluation of a project for compliance with ESD requirements.

Most newly submitted projects must comply with ESD requirements. To assess the level of compliance CEDS reviewed the County's recent Subdivision Applications website[27]. We looked for new projects submitted within the past 90 days for sites in the Severn River watershed. Four projects were identified. County planning staff were very helpful in providing access to the plans for these projects. Following is a preliminary analysis of the degree to which each project complies with ESD requirements.

Site N: This 15.46-acre site is proposed to be developed as 38 single-family detached homes. Forest covers 10.56 acres of the site of which 3.56-acres would be retained. About two-thirds of the soils on the site are well-suited to ESD practices. The ESD Concept Plan showed that each lot would have two rain gardens. One rain garden would treat runoff from the front roof of each home and driveway. A smaller rain garden would treat runoff from the rear of each house. Sheetflow to conservation areas will also be utilized. It appears that a substantial portion of the road runoff will be treated with a submerged gravel wetland. CEDS would prefer that road runoff be treated with measures that can be placed above the water table in the better soils on the site. This approach would achieve greater groundwater recharge, provide better pollutant retention, and utilize measures which are easier to maintain. CEDS understands that the County has denied approval for the plan because the applicant did not reduce lot sizes, as requested by

[27] See: http://www.aacounty.org/LandUse/SubAppls.cfm

the County. Smaller lot sizes would have allowed more of the impervious surfaces to drain to the two-thirds of the site with soils suited to the most effective ESD practices.

Site O: This project is proposed for a 7.86-acre site. The site is 83% forest of which a third will be cleared. While the applicant was required to reforest 1.07 acres, only a third will be provided on the site. The applicant will pay a fee-in-lieu of onsite reforestation for the remainder. The site will be developed as seven single-family detached homes clustered on half-acre lots. The County issued a waiver allowing the applicant to avoid ESD requirements. Stormwater management will consist of dry-wells treating roof runoff from three of the seven homes and a large infiltration trench treating runoff from the remaining homes and road. While the infiltration trench may initially provide treatment just as good as ESD practices, long-term effectiveness may be less assured. Generally, likelihood of failure (clogging) becomes greater as the drainage area of infiltration practices increases. ESD infiltration practices treat a very small drainage area and incorporate other features which reduce the likelihood of failure. This project would have substantially less negative impact to the Severn River system if forest conservation requirements were met onsite and ESD had not been waived.

Site P: This 35-acre site would consist of 67 single-family homes on quarter-acre lots. About 30 acres is forest, 75% of which will be cleared. In fact, this is one of the construction sites evaluated by CEDS and the forest was cleared recently. Though the applicant is required to reforest 5.15 acres onsite, a fee-in-lieu of has been requested for 85% of this. Stormwater management will consist of a single wet pond with a forebay. There is no indication that ESD practices will be used.

Site Q: This 66.9-acre site is proposed to be developed as 77 single-family detached homes. The site is 85% forest of which a fourth will be cleared. All forest conservation requirements are being met onsite; the only one of these four projects to do so. There are 10 acres of wetlands on the site, a portion of which will be disturbed. However, it looks like mitigation for this impact will also occur onsite. Stormwater management will consist of a single large detention pond with forebay, two large bioretention areas, and 27 of the 77 lots will have dry-wells or rain gardens. More than 90% of the soils on this site are ***the*** best for ESD practices. These soils also have an extremely low susceptibility to erosion. Given the avoidance of erodible soils, the relatively large amount of forest being preserved, and the fact that a third of the lots are proposed to benefit from dry-wells and rain gardens, the applicant should consider bringing the entire project up to ESD standards. Besides reducing Severn River impacts this step could save the applicant considerable money by eliminating the need for the detention pond and perhaps one or both of the large bioretention area. They might even fit in another lot or two while allowing more forest to be retained.

Watershed Implementation Plan Implications

Environmental Site Design is essential to gaining the benefits of development activity within the Severn River system, but with far less impact to aquatic resource health. The County's firm position on ESD with regard to the one site (N) is encouraging. However, the one ESD waiver

along with a fee-in-lieu of meeting forest conservation requirements on site could signify something less then full use of this extremely effective approach.

Full Watershed Audit Recommendations - ESD
CEDS would assist Severn River advocates in reducing stormwater pollution and loss of groundwater recharge by:

1. Contacting the owner-developer of Site O, Site Q, and Site P and encourage each to explore the possible benefits of making greater use of Environmental Site Design.

    a. Should they agree to do so then advocates should support the applicant in working with the County to switch to ESD;

    b. Advocates should also consult with nearby residents to identify opportunities to resolve their concerns and thereby expand community support. Some projects, like Site P, have been very controversial among area residents. Site P is also challenging because the site has been cleared and roads are installed in the first of two phases. However, not a single house is under construction in either phase; and

    c. If the owner-developer does not wish to cooperate then advocates should verify that the three projects were in-fact exempt from ESD requirements.

2. Identify all development projects in the Severn River watershed which are in the review process but are not yet under construction. The plans for each should be reviewed for opportunities to support the County and applicant in making maximum use of ESD to protect the River.

FOREST CONSERVATION

Since the mid-1980s development within a thousand feet of the Severn and its tidal creeks has been required to retain a portion of the forest present on each site. With the passage of the Maryland Forest Conservation Act in the early 1990s, this became law in all other portions of the watershed. There is a growing amount of scientific research that sensitive aquatic resources cannot be preserved by just limiting impervious area and using highly-effective BMPs. A minimum amount of forest must also be retained within a watershed. At this point it appears that at least 50% of a watershed must remain in forest to preserve sensitive aquatic resources.[28] The Maryland Forest Conservation Act requires retaining 15% to 50% of a development site in forest. The 15% figure applies to sites zoned for very intense development. As development intensity decreases forest retention rises towards the 50% threshold.

[28] CWP 2003. *Impacts of Impervious Cover on Aquatic Systems.* The Center for Watershed Protection, 8391 Main Street, Ellicott City, Maryland 21043. www.cwp.org and *Baltimore County WRE Technical Memo - C Impervious Cover Analysis,* from Baltimore County Department of Environmental Protection, Towson, MD.

Forest Conservation Easement Identification & Evaluation
Portions of a site to remain in forest or where trees are to be planted are required to be shown as forest conservation easement areas on the plat approved for each project. To assess the degree to which these forests had been preserved or planted, CEDS obtained the plats for most of the projects which were evaluated for the condition of existing stormwater BMPs. These plats were obtained from the Maryland State Archives website.[29] To determine if the platted forest conservation areas had been preserved each was compared with the forest shown on Google Earth. The Google Earth imagery dated from August, 2010. Following are the results.

Findings - Forest Conservation Evaluations
The forest shown on Google Earth was generally the same as that shown on the plats for the following sites: Site G, Site R, Site S, and Site T.

Site I was approved prior to the adoption of forest conservation requirements. However, the plat did show a wetlands easement area, which is still intact based on Google Earth.

Though Site L was platted in 2003, well after the effective date, the plat does not show a forest conservation easement. But a nontidal wetlands buffer is depicted on the plat and recent aerial photos show it to be free of intrusion.

Watershed Implementation Plan Implications
Retention of a minimum amount of forest is critical to maintaining healthy aquatic systems. The apparently high degree of compliance achieved with forest conservation bodes well for the County's ability to implement strategies to retain and perhaps expand forests which will no doubt be part of Watershed Implementation Plans.

Full Watershed Audit Recommendations - Forest Conservation
CEDS would assist Severn River advocates in ensuring that forest conservation requirements continue to be fully met by:

1. Examining a larger sampling of older plats outside the critical area;

2. Examining plats within the critical area for compliance with those forest retention requirements;

3. Verifying that the fees paid in lieu of onsite forest retention-planting were paid and used properly within the Severn River watershed; and

4. Determine if existing requirements are achieving the goal of retaining a minimum of 50% of most of the watershed as forest.

[29] See: http://www.msa.md.gov/megafile/msa/stagser/s1500/s1529/html/0000.html

POINT SOURCE NPDES DISCHARGES

The Maryland Department of the Environment (MDE) is responsible for issuing and enforcing NPDES discharge permits. Each permit carries limits on the amount of pollution that can be discharged. Of course, these limits are set to prevent a violation of water quality standards. The permittee is required to monitor pollutant levels in the treated effluent. This data is then submitted to MDE in the form Discharge Monitoring Reports (DMRs). For larger dischargers (>500,000 gallons/day) MDE personnel periodically inspect the facility and may conduct independent effluent sampling.

Point Source Discharge Identification & Evaluation

According to the U.S. Environmental Protection Agency's Environmental Compliance History Online (ECHO)[30] website, there are two point sources with NPDES permits to discharge within the Severn River system: the Annapolis Water Reclamation Facility (WRF) and the Naval Support Activity (NSA) Annapolis Wastewater Treatment Plant (WWTP).

Annapolis Water Reclamation Facility: The Annapolis WRF has a capacity to treat 13 million gallons a day (mgd) of wastewater from a population of 81,620 living in a 30 square mile area[31]. Presently about 10 mgd are discharged into the Severn River near the confluence with the Chesapeake Bay. According to the ECHO website, the effluent from Annapolis WRF has not exceeded the limits set forth in the NPDES permit for the last three years. Nor has this facility been cited for any other violation. The County is in the process of upgrading this facility for Enhanced Nutrient Removal (ENR)[32]. With ENR nitrogen levels in the effluent will be reduced from the current 8 milligrams per liter (mg/l) to just 3 mg/l. Phosphorus will be reduced from 2.0 to 0.3 mg/l. When the ENR upgrades are completed in 2013 they should benefit the Severn and the Chesapeake considerably. Anne Arundel County is to be commended for this action.

Naval Support Activity (NSA) Annapolis Wastewater Treatment Plant: According to ECHO, discharge permit violations have occurred at this facility. However, the ECHO website is known to contain errors. Because of this we asked the owner-operator of the NSA WWTP to verify the ECHO data. They informed us that in fact no violations have occurred in recent years. Of course we have no reason to dispute this.

Watershed Implementation Plan Implications

Upgrading the Annapolis WRF to Enhanced Nutrient Removal is likely to be one of the most important Watershed Implementation Plan measures. Congratulations to Anne Arundel County.

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[30] See: http://www.epa-echo.gov/echo/index.html

[31] See: http://www.aacounty.org/PlanZone/MasterPlans/WaterSewer2007/Index.cfm

[32] See: http://www.aacounty.org/DPW/Engineering/ResourcesCapProj/Annapolis_WRF_ENR.pdf

Full Watershed Audit Recommendations - Point Source Discharges
CEDS would assist Severn River advocates in exploring options to further minimize the effects of point source discharges by:

1. The ECHO data provides only part of the picture of what is happening with regard to point source discharges. The ECHO data can also be inaccurate. Therefore, advocates should consider the following steps to gain a more complete understanding of opportunities to enhance the Severn at the existing point source discharges:

    a. Submit a Public Information Act request to the Maryland Department of the Environment (MDE) for access to all records, inspection reports, and other documents for the permitted discharges;

    b. Contact the owner-operator of each facility and request a tour; and

    c. Examine waters in the vicinity of each discharge to verify the absence of indicators that pollution releases exceeded allowed limits.

2. A much larger number of permitted discharges existed in the Severn River watershed just a decade ago. The receiving waters above and below the former points of discharges should be examined to ensure pollution releases have ceased and recovery is well underway;

3. Watershed snapshots should be conducted at a large number (25-75) of waterway access points to pin-point undocumented (illicit) discharges. The points would be sampled within a one- or two-day period. The snapshot should begin with basic parameters such as conductivity, pH and temperature. Large differences in these basic parameters may indicate a discharge between two points on the same waterway or on one small tributary when compared to nearby streams with similar land use. More comprehensive testing would then show whether a suspected discharge is adversely affecting aquatic resource health; and

4. Particular attention should be paid to tributaries potentially influenced by the Millersville landfill. Additionally, a Public Information Act request should be sent to the Maryland Department of the Environment for access to all ground and surface water monitoring data as well as inspection reports.

SEWAGE COLLECTION SYSTEM

The Anne Arundel County Water & Sewer Plan shows an extensive network of sewerlines and pumping stations throughout the Severn River watershed.[33] This system of pipes and pumping stations carry wastewater from homes, businesses and other sources for treatment at central

[33] See: http://www.aacounty.org/PlanZone/MasterPlans/WaterSewer2007/Index.cfm

facilities. While sewage releases from the system are far less common then they once were, spills can still happen. For example, last September a Baltimore County sewerline ruptured and released 70 million gallons of sewage into the Patapsco River.[34] In 2005, 10,000 gallons of sewage spilled into Weems Creek from the Jennifer Road pumping station.[35] That same year 120,000 gallons of sewage entered a Magothy River tributary.

The County Water & Sewer Plan shows dozens of sewage pumping stations throughout the Severn River watershed. During the Preliminary Audit CEDS examined three pumping stations for any external indications of recent sewage releases. None were found. We did come across an old sewerline that crosses a Severn tributary about a foot above the water surface. We asked if this pipe might be susceptible to damage by flood borne logs or other objects. The County Bureau of Utility Operations responded:

> *"Followup reveals that due to the elevations this sewer was designed as an above ground structure. It is actually designed as a stream crossing on pilings. The material is ductile iron which is somewhat resistant to flood borne objects."*

Full Watershed Audit Recommendations - Sewage Collection System
CEDS would assist Severn River advocates in ensuring that sewage spills remain rare events by:

1. Becoming sufficiently knowledgeable about the sewage collection system to provide the County Bureau of Utility Operations with the public support needed to keep the system in good working order, otherwise these out-of-sight/out-of-mind infrastructure components may be starved for operation-maintenance resources during these extremely tight budgetary times;

2. Research the frequency with which ductile iron pipes are damaged by flood borne objects and then, if the probability of damage is significant, support the County in enhancing pipe protection;

3. View all of the pumping stations in the watershed from nearby public area to see if there are any indications of a recent sewage release;

4. Ask those who live near pumping stations if they have ever noticed odors, alarms, or other indicators of a sewage spill, then make certain these neighbors know whom to call if an incident ever occurs;

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[34] See: www.baltimoresun.com/news/baltimore-county/bs-md-co-sewage-spill-20110901,0,5471650.story

[35] See: http://www.tidalfish.com/forums/showthread.php/45442-sewage-spill-in-the-Severn-what-s-new

5. Meet with County Bureau of Utility Operations staff to learn of any problem areas within the watershed, then support the Bureau in obtaining the resources needed to resolve each problem;

6. Monitor the sewer allocation process to ensure new development does not exceed available capacity; and

7. Tour randomly selected pumping stations with County Bureau of Utility Operations staff to verify that back-up system and other critical components are in good working order.

EQUESTRIAN AREA

Before launching this Preliminary Audit we asked Severn River advocates if there were any issues they would like CEDS to investigate. The advocates suggested an area 900 feet from the nearest Severn River tributary. Horses are being kept within an area of about two acres. Most of the area is bare soil fully exposed to erosive forces. It appears that too many horses are being kept in the area. However, there may be other factors at play. Therefore we asked the Anne Arundel County Soil Conservation District to take a look at the situation. District professionals did visit the area and have seht a letter to the owner offering to assist in resolving the erosion.

No doubt the owner is aware that a problem exists but is probably uncertain how to correct it given the resources at their disposal. The District certainly has the technical expertise to advise the owner on solutions. It is also possible some financial assistance may be available if the owner lacks the funds to implement the solution. However, if the owner should prove uncooperative there are other options available.

For example, the Anne Arundel County Zoning Regulations do limit the number of horses which can be kept on residentially zoned property, such as this site. If an owner wishes to exceed the limit then a Conditional Use Permit must be obtained. County zoning staff say no such permit has been issued for this location. Of course it has yet to be determined if a permit is even required. Additionally, the Agricultural Sediment Pollution Control regulations[36] allow the Maryland Department of the Environment (MDE) to take enforcement action. Both of these more coercive options should only be considered when all cooperative efforts have been exhausted, including assistance with funding (if warranted).

[36] See: http://www.dsd.state.md.us/comar/SubtitleSearch.aspx?search=26.17.03.*

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Appendix A
CEDS Preliminary Watershed Audit Checklist Maryland

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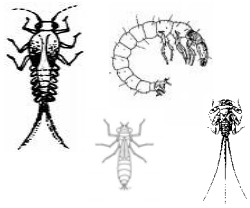
CEDS PRELIMINARY WATERSHED AUDIT CHECKLIST - MARYLAND

Through CEDS Watershed Audits *(ceds.org/audit)* activities are identified which are releasing more pollution then permitted by clean water laws. Two new approaches developed by CEDS are utilized to rapidly bring these activities into compliance: Equitable Solutions *(ceds.org/eqs)* and Smart Legal Strategies *(ceds.org/sls)*.

Preliminary Watershed Audits are used to get a feel for the extent of pollution releases within a specific watershed. The preliminary assessment is used to determine if the magnitude of pollution releases and noncompliance justifies a full Watershed Audit. Following are the activities routinely assessed during a Maryland Preliminary Audit along with "starting-point" indicators. But not all activity locations within a watershed are evaluated during the preliminary audit; just a representative sampling. More thorough methods are applied to all sources if a full Watershed Audit is warranted. For other state checklists contact CEDS: Help@ceds.org or 1-800-773-4571.

WATERSHED ACTIVITY	PRELIMINARY INDICATOR OF EXCESSIVE POLLUTION RELEASES	PROBLEM INDICATED	
		YES	NO
Point NPDES Discharge Permits	**Does the USEPA PCS/ECHO (epa-echo.gov) database show any permitted discharges within the watershed?** **If yes, then have there been any permit violations during the past three years?** **When the activity is viewed from adjoining public areas, is there any indication of spills or other pollution releases (these releases wouldn't be noted in the online compliance data)?** **Is there a significant difference in the biological community, physical characteristics, or other indicators at points upstream and downstream of the discharge point?**		
Construction Sites **ceds.org/esp**	**Is there any point where runoff from exposed soil could flow from the site without passing through a trapping device? Trapping devices, such as silt fences/barriers, sediment traps and basins, straw bale dikes, etc. can reduce sediment pollution by 50%.**		
	Exposed Soil = Pollution: Mulch and grass seeding can cut sediment pollution by 90%.		
	1. Is there any area of exposed soil along the edge of the site which is not covered with enough mulch or grass to obscure the underlying soil?		
	2. Are there areas of exposed soil elsewhere on the site where heavy equipment has not operated for at least a month?		
Stormwater Management **(Pre-ESD)**	**Go to the lowest point on residential, commercial, or other development sites.** **Is a stormwater pond present?** **If yes and the pond was created by placing an earth embankment across a shallow valley then are any of the following indicators of possible embankment failure present: trees growing on the embankment, embankment erosion, seepage or erosion along the outside of the pipe spillway, or low spots along an otherwise level embankment?** **If the pond was built in the last ten years, then runoff should first enter a smaller pond known as a forebay. Does the forebay appear to be more than 50% full or has sediment spilled from the forebay into the main pond?** **If sand-filters or bioretention facilities are present, then:** **a. is standing water present when more then three days have passed since the last rain?** **b. Is there an average of 12 inches of depth between the surface of the filter-bioretention bed and the first point where runoff could exit?**		

WATERSHED ACTIVITY	PRELIMINARY INDICATOR OF EXCESSIVE POLLUTION RELEASES	PROBLEM INDICATED	
		YES	NO
Environmental Site Design (ESD) **ceds.org/esd**	**It is unlikely projects will exist which utilize ESD. So obtain the ESD Concept Plan for several of the most recently proposed development projects within the watershed.** **1. If wetlands, streams or other waters are present on or next to the site, then does the plan show buffer areas adjoining these sensitive resources?** **2. Do the plans show a forest conservation easement or other areas which will remain in forest or will be planted with trees?** **3. Do the plans show that all existing and proposed impervious areas will drain to one or more of the 15 ESD practices *(see Preliminary Review at ceds.org/esd)*?**		
Industrial-Commercial Areas	**Is there anything flowing from storm drains or other pipes besides clear, cool, odorless water?** **Are any barrels or other storage containers present near a waterway or in the floodplain?**		
Mining **(other then coal)**	**Does the MDE Non-Coal Surface Mine Location Maps webpage show sites within the watershed?** **If yes, then have all disturbed soils within each site been stabilized with vegetation, except those being actively mined?** **Do remaining exposed areas drain to large settling ponds?** **Are waters below the mine muddier than those above?** **Does there appear to be more unvegetated sand-gravel bars in the channel below the site then above, possibly indicating large sediment releases in the past?** **Is there a substantial difference in the volume of water flow above and below the mine, which may indicate flow depletion due to the mine?**		
Sewerlines & Pumping Stations	**Is a recent overflow indicated by the presence of toilet paper or other sewage components present around sewerline manholes or downslope of pumping stations?** **Do those living near pumping stations recall problem indicators such as audible alarms, flashing lights, sewage spills, or sudden increases in foul odors?**		
Forest Conservation & Buffers	**Note residential, commercial or other sites present in the watershed which were likely developed since the early 1990s.** **Does the <u>plat</u> for each site show a Forest Conservation Easement and/or Undisturbed Buffer?** **If yes, then do recent aerial photos show that the Easement/Buffer area remains in forest?**		
Cropfields ***(Maryland law mandates control of severe farm pollution.)***	**Is there evidence of erosion (rills or gullies)?** Conservation tillage practices keep lots of crop residue on the surface and greatly reduces erosion.		
	Are soils exposed between harvest and spring planting? The absence of winter cover crops cause lead to excessive soil loss and nutrient-pesticide pollution.		
Pastures	**Is there evidence of erosion (rills or gullies)?** Pasture erosion frequently indicates too many head of livestock are being grazed.		
	Do livestock have free access to waterways? Fencing off streams and providing alternate water sources greatly reduces pollution.		
Livestock Confinement Areas	**Are barnyards, chicken houses, or other livestock confinement areas within 100 feet of a waterway or located in a floodplain?**		
	Are confinement areas under a roof or other measure to prevent rainwater and runoff from washing waste into nearby waterways?		

WATERSHED ACTIVITY	PRELIMINARY INDICATOR OF EXCESSIVE POLLUTION RELEASES	PROBLEM INDICATED	
		YES	NO
Manure	**Is manure uncovered making it susceptible to rainwater washoff?**		
	Is the vegetation between the manure and waterway something less then dense and well-established? Dense vegetation reduces the amount of manure pollution which can wash into nearby waterways.		
	Is manure stored within 100 feet of a waterway? If manure is stored too close to a waterway then even the densest vegetation may not prevent runoff pollution.		
	Is manure stored within the 100-year floodplain? On most streams and rivers the floodplain can be estimated by doubling the depth from channel bottom to bank tops.		
	Has manure been applied to frozen soil or snow where most will runoff with snow melt or the next rain?		
Logging - Timber Harvesting	**Other then at waterway crossings, has harvesting or any other disturbances occurred within 50 feet of a lake, pond or stream?** The 50-foot Streamside Management Zone (SMZ) is increased two feet for each 1% slope of the adjoining land. The harvest plan may allow some disturbances within the SMZ.		
	Has more then a week passed since soils within the SMZ were disturbed, yet the exposed soil has not been treated with mulching and seeding?		
	Can equipment drive through waterways rather then crossing over on a bridge?		
Water Quality	**Are any portions of the watershed on the impaired waters (303d) list (water.epa.gov/lawsregs/lawsguidance/cwa/tmdl)?**		
	Does recent water quality data show a violation of water quality standards?		
	Does the data show a significant difference in physical, chemical or biological characteristics between:		
	a. two points on the same waterway; or		
	b. tributaries with similar land use		
	even though water quality standards are not exceeded.		
	Is there a difference in the appearance of a waterway from one access point to another? A difference in water color, transparency, odors, surface scum, temperature, or other characteristics between one access point and another may indicate a pollution source between the two.		
	Nontidal Streams: Are pollution sensitive organisms present at one access point but not the next downstream? Pollution sensitive organisms usually have six legs and live on rocks or logs in shallow, swift flowing riffle areas. The abrupt disappearance of pollution-sensitive organisms may indicate a pollution source between the two access points. Searching for these organisms provides a quick, highly-reliable means of detecting 90% of all stream or river pollution problems. 		

OTHER POLLUTION SOURCES OBSERVED/NOTES:

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Appendix B
CEDS Stormwater Management Facility Field Checklist - Maryland

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CEDS STORMWATER MANAGEMENT FACILITY FIELD CHECKLIST - MARYLAND

Site:_____ Date/Time:_____

Location:_____ WP:_____

Evaluated By:_____ Facility Condition: ☐ Good ☐ Fair ☐ Poor

FACILITY TYPE

Photos:

PRE-2000: ☐ Dry Pond ☐ Ext Det (ED) ☐ ED Shallow Marsh ☐ Wet Pond ☐ Infiltration Basin

☐ Infiltration Trench Other:_____

2000 MARYLAND STORMWATER DESIGN MANUAL FACILITY TYPES

☐ Micropool Extended Detention Pond (P1)
☐ Wet Pond (P2)
☐ Wet Extended Detention Pond (P3)
☐ Multiple Pond System (P4)
☐ Pocket Pond (P5)
☐ Shallow Wetland (W1)
☐ ED Shallow Wetland (W2)
☐ Pond/Wetland System (W3)
☐ Pocket Wetland (W4)
☐ Infiltration Trench (I1)
☐ Infiltration Basin (I2)
☐ Surface Sand Filter (F1)
☐ Underground Sand Filter (F2)
☐ Perimeter Sand Filter (F3)
☐ Organic Filter (F4)
☐ Pocket Sand Filter (F5)
☐ Bioretention (F6)
☐ Dry Swale (O1)
☐ Wet Swale (O2)
☐ Underground facility
☐ Other:_____

PRETREATMENT

Forebay Present: ☐ Yes ☐ No Forebay >50% full: ☐ Yes ☐ No Has sediment overflowed: ☐ Yes ☐ No

Forebay Dimensions (feet): Length_____ x Width_____ x Average Depth_____ = Volume_____

Filter Strip Required: ☐ Yes ☐ No Filter Strip Present: ☐ Yes ☐ No ☐ NA Filter Strip Width:_____ Feet

Is coarse sediment reaching the facility? ☐ Yes ☐ No ☐ Uncertain

POND EMBANKMENT

Embankment Present: ☐ Yes ☐ No Embankment maximum height:_____Feet

Problem indicators present: ☐ Yes ☐ No If Yes, which: ☐ Trees on embankment ☐ Low spot ☐ Burrows

☐ Spillway piping ☐ Erosion Other:_____

Emergency Spillway Present: ☐ Yes ☐ No Spillway free of obstructions? ☐ Yes ☐ No

POND POOL AREA

Pollutant Retention Area Present: ☐ Yes ☐ No Is the Pool Length1.5 Times the Width: ☐ Yes ☐ No

Dimensions Below First Point Where Pollutants Could Flow From Pool (feet): ☐ Cannot determine

Original: Length_____ x Width_____ x Maximum Depth_____ = Volume_____

Current: Length_____ x Width_____ x Maximum Depth_____ = Volume_____

Pool Vegetation Present: ☐ Yes ☐ No Type: ☐ Cattails ☐ Other:_____

FILTERING PRACTICES *(Infiltration Basin/Trench, Bioretention, Sand Filter, Dry Swale)*

Standing water present: ☐ Yes ☐ No

Observation well present: ☐ Yes ☐ No water in observation wells: ☐ Yes ☐ No Feet to water:_____

If water is present, then has 72 hours elapsed since the last runoff event? ☐ Yes ☐ No ☐ Not applicable

Average depth below first point where pollutants could flow from filter area (feet):_____ ☐ Cannot determine

Stone diaphragm present: ☐ Yes ☐ No ☐ Uncertain Is diaphragm full of sediment? ☐ Yes ☐ No

Has the practice lost more than 50% of original volume, which clean-out point been reached? ☐ Yes ☐ No

DOWNSTREAM CONDITION

Evidence of recent erosion below outfall: ☐ Yes ☐ No If Yes, type: ☐ Exposed roots on banks

☐ Abrupt drop in bed elevation Other:_____

NOTES & FACILITY/SITE SKETCH

Appendix C
Rain Gage & Float Method

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Rain Gauge & Float Method

A number of stormwater Best Management Practices (BMPs) are designed to treat the first inch of runoff from the buildings, streets, and other impervious surfaces draining to the facility. Most facilities contain a storm drain inlet, like that pictured above, or some other point where runoff in excess of the first inch can flow from the practice. A common cause of failure is the accumulation of sediments and other materials which rob storage capacity. This causes runoff to flow from the facility before it is treated. CEDS uses the Rain Gage & Float Method to check for adequate capacity. Here's how it works. About once a month a storm occurs in Maryland which produces an inch or so of runoff from impervious surfaces. Most practices should be able to store this amount without overflow. So when a rain of say, a half-inch or more is forecast, place a rain gage next to the practice. Next, place a floating object at the point where excess runoff would flow from the practice, such as in the storm drain inlet you see above. Be sure to tie a string to the float and then to a fixed object. After the storm passes see if the float is where you left it. If it is and the gage shows that an inch or more of rain fell, then great. The practice treated the Water Quality volume without overflow. If the float washed away with less then an inch of rain then the practice may need to be cleaned.