

7.0 Permit Requirements

F. Watershed Assessment and Planning

Baltimore County shall continue to update and revise watershed assessments that have been developed for its 10 urban watersheds (Baltimore Harbor, Bird River, Back River, Gwynns Falls, Jones Falls, Little Gunpowder, Loch Raven, Lower Gunpowder River, Middle River, and the Patapsco River). The overall goal is to ensure that each County watershed is thoroughly evaluated and has an action plan to maximize water quality improvements. Additionally, the County shall encourage the public to participate in the development and implementation of watershed restoration activities. At a minimum, the County shall:

1. Continue to perform and update detailed assessments in all of its urban watersheds. These watershed assessments shall include:
 - a. Determining current water quality conditions;
 - b. Identifying and ranking water quality problems;
 - c. Identifying all structural and non-structural water quality improvements opportunities;
 - d. Reporting the results of a visual watershed inspection;
 - e. Specifying how the restoration efforts will be monitored; and
 - f. Providing an estimated cost and a detailed implementation schedule for those improvement opportunities identified above.
2. By 6/15/2006, the County shall complete the prioritization process for selecting subwatersheds for restoration started during the previous permit term. These subwatersheds shall contain at least 20% of the County's impervious cover. Restoration efforts resulting from this prioritization process shall be in addition to typical stormwater management facility maintenance; and
3. By the end of this permit term, the County shall propose for restoration subwatersheds containing another 10% of the County's impervious surface area with poor or no stormwater management. These sub-watersheds shall be in addition to the 20% already proposed for restoration under the requirements above.

G. Watershed Restoration

The County shall implement those practices identified in Part III. F. above to control stormwater discharges to the maximum extent practicable. The overall goal is to maximize the water quality in the County's urban watersheds, using efforts that are definable and the effects of which are measurable. At a minimum, the County shall:

1. Complete the implementation of those restoration efforts that were identified and initiated during the previous permit term to restore 10% of the County's impervious surface area.
2. Within one year of permit issuance, begin to implement restoration of an additional 10%

of the County's impervious surface area. .

3. Annually, Baltimore County shall update its impervious surface restoration accounting sheets for each of its urban watersheds. At a minimum, these data shall include:
 - a. Total impervious acres for each urban watershed;
 - b. A schedule and cost estimate for the design, construction, and completion for each retrofit project;
 - c. The impervious acres controlled or restored within each watershed; and
 - d. The monitoring data and surrogate parameter analyses used to determine water quality improvements.

J. Total Maximum Daily Loads

Stormwater BMPs and programs implemented as a result of this permit must be consistent with available waste load allocations (WLA's)[see 40 CFR122.44(d)(1)(vii)(B)] developed under a Total Maximum Daily Load (TMDL). MDE has determined that owners of storm drain systems that implement the requirements of this permit will be controlling stormwater pollution to the maximum extent practicable. Therefore, satisfying the conditions of the permit will meet WLA's specified in TMDL's developed for impaired water bodies. If assessment of the stormwater management program indicates TMDL WLAs are not being met, additional or alternative stormwater controls must be implemented to achieve WLAs.

7.1 Introduction

Environmental consultants managed by the Department of Environmental Protection and Resource Management (DEPRM) – Watershed Management and Monitoring Section have prepared watershed management plans for 10 of the 14 8-digit watersheds located in Baltimore County. The remaining four watersheds do not have significant urban components and therefore are not required to have watershed management plans for this permit. These watershed management plans and the four watersheds that do not have plans will be enhanced through the creation of Action Plans that will set restoration goals, identify steps to achieve those goals, provide an implementation schedule and a monitoring plan. The Action Plans will be prepared with the input from stakeholders within the planning area and identify opportunities for citizen based watershed restoration. The Action Plans will include the identification of potential stormwater management conversion sites, capital projects, as well as citizen based stream restoration opportunities, operational program implementation, and an implementation schedule. In 2004, DEPRM hired a consultant to assist in engaging stakeholders in development of the Action Plans.

This section includes updates on the status of the watershed management plans, Small Watershed Action Plans (SWAPs) and Capital Improvement Program's (CIP) restoration projects. Although the major focus of the implementation of the watershed management plans centers on capital projects, this component cannot alone satisfy water quality improvement. In Baltimore County water quality improvement is a multi-faceted effort involving other components such as sediment control, storm drain inlet cleaning, street sweeping, recycling, solid & hazardous waste management, illicit connection reduction, citizen education, sanitary sewer system infiltration/exfiltration reduction and others. These County-wide programs are described in other sections of this report.

The County’s capital budget includes the current budget year and the subsequent 5 years. The capital budget is on a two-year cycle tied to bond referenda. Additional funding for these projects is provided by the Maryland Department of the Environment (MDE) through the Small Creeks and Estuaries and the Stormwater Pollution Control Cost-share Programs, the 319 program, and by the EPA Chesapeake Bay/Habitat Restoration Program. Starting in FY09, additional funding was made available through the Chesapeake and Atlantic Coastal Bays 2010 Trust Fund. Section 11 details the entire funding budget for watershed planning and restoration implementation in Baltimore County.

7.2 Status of Watershed Management Plans

7.2.1 Water Quality Management Plans

Water quality management plans have been completed for ten of the fourteen major watersheds in Baltimore County. The four remaining watersheds have limited urban development and therefore are not required by the NPDES – Municipal Stormwater Discharge Permit to have water quality management plans. However, recognizing the benefits of a watershed management plan, Baltimore County has completed the development of a Prettyboy Watershed Plan under the State’s Watershed Restoration Action Strategy (WRAS) process. Harford County in conjunction with stakeholders has also completed the WRAS process to develop a watershed plan for Deer Creek watershed. Table 7-1 presents the watersheds and the year of completion of the water quality management plan. The recently completed Gwynns Falls Watershed Management Plan was a cooperative effort between Baltimore County and Baltimore City.

Table 7-1: Status of Watershed Management Plans

Watershed	Watershed Plan Status	Completion Date
Upper Western Shore		
Deer Creek	WRAS	6/30/07
Prettyboy Reservoir	WRAS	1/4/08
Loch Raven	Complete	9/30/96
Lower Gunpowder Falls	Complete	9/30/98
Little Gunpowder River	Complete	3/31/02
Bird River	Complete	3/29/96
Gunpowder River	Not Required	
Middle River	Complete	3/30/01
Patapsco/Back River		
Liberty Reservoir	Not Required	
Patapsco	Complete	9/30/98
Gwynns Falls	Complete	12/1/04
Jones Falls	Complete	9/30/96
Back River	Complete	9/30/96
Baltimore Harbor	Complete	3/30/01

Baltimore County enlisted the services of consultants for the preparation of the Watershed Management Plans. While the details of each plan vary, a common framework is incorporated into each plan. This framework includes:

1. watershed modeling using US EPA Stormwater Management Model (SWMM);
2. stream stability assessment using Rosgen classification methodology Levels I,II,III;
3. identification and ranking of water quality problems;
4. development of non-point source control management strategies;
5. prioritization of programs and projects; and

6. preparation of the final document, integrating the above tasks and preparing maps and tables to relate results.

Two of the watershed management plans (Middle River and Baltimore Harbor) did not include a stream stability assessment due to the limited mileage of open stream channels. These two watershed management plans did, however, include tidal estuarine water quality models, which were not a component in any of the other plans. The completed watershed management plans have been previously submitted to MDE and may be consulted for greater detail.

Table 7-2 indicates the consultants that have prepared the plans and the cost associated with each plan. The total cost for the preparation of the watershed management plans is slightly over two million dollars.

Table 7-2: Watershed Management Plans Consultants and Costs

Watershed	Consultant	Cost
Loch Raven Reservoir	Tetra Tech, Inc.	\$180,827
Lower Gunpowder Falls	Parsons, Brinkerhoff, Quade & Douglas, Inc.	\$262,461
Little Gunpowder Falls	Biohabitats, Inc.	\$210,076
Bird River	Dames & Moore, Inc.	\$165,450
Middle River	Versar, Inc.	\$155,224
Patapsco River	Tetra Tech, Inc.	\$284,100
Gwynns Falls*	Parsons Brinkerhoff	\$326,422
Jones Falls	Dames & Moore, Inc.	\$168,251
Back River	Camp, Dresser & McKee, Inc.	\$149,905
Baltimore Harbor	Roy F. Weston, Inc.	\$145,021
Total Cost		\$2,047,737.00

*Includes Cost for Baltimore City Portion of the Plan

7.2.2 *Small Watershed Action Plans (SWAPs)*

In 2005, Baltimore County initiated a new round of watershed planning, entitled Small Watershed Action Plans (SWAPs). The SWAP planning process is meant to bring together the many mandates that the County is charged to meet in each individual watershed, including the requirements of the NPDES – Municipal Stormwater Discharge Permit, Total Maximum Daily Loads (TMDLs), goals in the Chesapeake 2000 and the Tributary Strategies, the Reservoir Management Program and the Baltimore Watershed Agreement. The small watershed action planning process is designed to bring all these individual mandates together at a subwatershed level that will help residents understand the intent of each program, how to most efficiently meet the goals, and define the roles of the partners. The SWAPs will build on the previously completed technical Water Quality Management Plans listed in Section 7.2.1.

Stakeholders are invited to participate in the development of each SWAP. A series of three meetings are held over the course of the development of each SWAP. The first introduces the stakeholders to the process and solicits their input on the characterization of the planning area and goals. The second meeting presents the final characterization document and solicits input on preferred restoration options. The third meeting presents the SWAP, which includes not only County actions and projects, but also citizen based and business based restoration activities and options. Planning areas were selected on similarity of impacts within each area, allowing focus on specific issues related to the stakeholders that live and work within each planning area. Twenty-three planning areas have been delineated.

The Lower Jones Falls and Upper Back River SWAPs were completed in the fall of 2008 with funding from an U.S. Environmental Protection Agency – Region III Water Quality Cooperative Assistance grant. This funding permitted the hiring of contractual staff and the Center for Watershed Protection to assist in the development of the Action Plans. These two SWAPs were developed in conjunction with Baltimore City, Herring Run Watershed Association, and Jones Falls Watershed Association. A Watershed Restoration Action Strategy (WRAS) was developed in January 2008 for the Prettyboy watershed. This was in partnership with DNR, MDE, Carroll County, York County PA, the Soil Conservation Districts, and the Prettyboy Watershed Alliance. These same organizations are continuing with semi-annual meetings to follow-up on implementation of the plan.

Four SWAPs are currently under development. The Goodwin-Hunt Valley-Loveton SWAP in the Loch Raven Watershed, and the Lower Patapsco SWAP in the Patapsco River Watershed have been on hold until later in 2009. The Northeastern Jones Falls SWAP, and the Tidal Back River SWAP are currently in active development. The two active SWAPs are anticipated to be completed in early 2010.

7.3 Obtaining Pollution Reduction Numbers

7.3.1 Stream Restorations

The calculation of pollutant load reductions due to stream restoration were based on the re-analysis of the Spring Branch data presented in the NPDES 2006 Annual Report, which resulted in the following pollutant load reduction estimates:

- Total Nitrogen – 0.202 pounds per linear foot of stream restoration
- Total Phosphorus – 0.0107 pounds per linear foot of stream restoration
- Total Suspended Solids – 3.58 pound per linear foot of stream restoration

7.3.2 Shoreline Enhancement Projects

To obtain nutrient reduction numbers associated with shoreline enhancement projects, it must be determined how much sediment the project is theoretically preventing from entering a waterway. To calculate an estimate of annual erosion at a given shoreline site, the equation $V=LEB$ is used, where ‘V’ is volume eroded, ‘L’ is length of shoreline, ‘E’ is erosion rate and ‘B’ is bank height. This equation yields a volume expressed in cubic feet per year. Cubic feet are converted to pounds using a soil bulk density of 93.6 lb/ft³. Pounds are then converted to tons using a factor of 0.0005. Lengths of shoreline and bank heights are taken from engineering and project plans prepared by consultants for Baltimore County and erosion rates from Department of Natural Resources website, <http://shorelines.dnr.state.md.us> are used.

Nitrogen and Phosphorus loading rates for shorelines are taken from ‘*Eroding Bank Nutrient Verification Study for the Lower Chesapeake Bay*’, published February 1992. The mean total N and total P loading concentrations in the study are 0.73 lb/ton and 0.48 lb/ton respectively (p. 44).

7.3.3 Stormwater Retrofits

Drainage areas for stormwater management facilities are delineated to determine the acreage on which to apply the pollution reduction efficiencies shown in Table 7-3. Efficiencies are applied to pollutant loads based on land use of these drainage areas.

Table 7-3 Percent Removal Efficiency of BMPs

BMP	Pollutants		
	TSS	TP	TN
Detention Facilities	10	10	5
Extended Detention Facilities	60	20	30
Wet Ponds	80	50	50
Infiltration Practices	90	70	50
Filtration Practices	85	60	40
Detention Facilities = Detention Pond and Hydrodynamic Devices (DP, OGS, and UGS) Extended Detention Facilities = Extended Detention Ponds (EDSD, EDSW, ED) Wet Ponds and Wetlands = Wet Pond and Shallow Marsh (WP and SM) Infiltration Practices = Infiltration Trench and Infiltration Basins (IB, IT and ITWQC), Porous Paving (PP), and Dry Wells (DW) Filtration Practices = Sand filters and Bioretention Facilities (SF, BIO)			

Section 10.2 describes the calculation of pollutant loads for both watersheds and for the drainage area to stormwater management facilities. The pollutant load reductions for stormwater management facility retrofits and conversions uses the loads calculated in accordance with Section 10.2 and the pollutant removal efficiencies based on facility type found in Section 1 – Table 1-8.

7.3.4 Community Reforestation Program

Baltimore County’s reforestation program plants trees on public and private land, in stream buffers and open areas. Nutrient reductions associated with buffer plantings are obtained using the sum of a reduction efficiency and a land use change. A reduction efficiency of 25% for Nitrogen and 50% for Phosphorus is applied to 4X the area planted for nitrogen and 2X the area planted for phosphorus. The land use change is from pervious urban nutrient load to forested nutrient load, using loading rates from the Phase 4.3 Chesapeake Bay Program Model. Open area plantings (non-buffer) simply use this land use change to calculate load reductions.

7.3.5 Activities of Volunteer Organizations

Many of the activities that local watershed groups and their volunteers engage in have nitrogen and phosphorus reducing capabilities. Using loading rates and reduction efficiencies from the Phase 4.3 Chesapeake Bay Program Watershed Model, the following Best Management Practices (BMPs) yield nutrient reduction numbers:

- Downspout Disconnection & Rain Barrels - Rooftop acres disconnected is estimated and the loading rate for impervious surface associated with the geographical area is applied to this acreage. At this point in time, these two BMPs are classified as an ‘infiltration’ practice and the total nitrogen and total phosphorus reduction efficiencies, 50% and 70% respectively, are applied to the estimated load.
- Rain Gardens - Rain gardens drain specific areas of pervious and/or impervious surface. Using nutrient loads based on these two land use types, and applying ‘infiltration’ reduction efficiencies to these loads, nutrient reduction numbers for rain gardens can be determined.
- Stream Buffer Tree Plantings - Nutrient reductions associated with buffer plantings are obtained using the sum of a reduction efficiency plus a land use change. A reduction

efficiency of 25% for Nitrogen and 50% for Phosphorus is applied to 4X the area planted for nitrogen and 2X the area planted for phosphorus. The land use change is from pervious to forest is calculated using the respective loading rates for Nitrogen and Phosphorus per acre for these land use types. The difference between these figures represents the reduction per year in the associated nutrient.

- Street Tree/Open Space Plantings - Here the land use conversion from pervious acres to forest acres described above is used to determine nutrient reduction.

7.4 Capital Restoration Projects - Upper Western Shore Watersheds

The Upper Western Shore watersheds include: Deer Creek in the Susquehanna River Basin, and Prettyboy Reservoir, Loch Raven Reservoir, Lower Gunpowder Falls, Little Gunpowder Falls, Bird River, Gunpowder River and Middle River in the Gunpowder Falls River Basin. Five of the eight watersheds require watershed management plans based on NPDES requirements on the amount of urban development within the watershed.

7.4.1 Deer Creek

Due to the rural nature of this watershed a watershed management plan is not required by the NPDES – Municipal Stormwater Discharge Permit. Baltimore County's portion of this watershed is approximately eleven square miles. There are no capital improvement projects currently planned for this watershed. Deer Creek is part of the Susquehanna River Basin. The predominate land use in the watershed is agriculture. A Deer Creek WRAS was prepared by Harford County. Baltimore County participated in that effort.

7.4.2 Prettyboy Reservoir

The Prettyboy Reservoir serves as a holding reservoir for the Loch Raven Reservoir. When the Loch Raven Reservoir water levels are low, water is released from Prettyboy Reservoir to maintain the levels in Loch Raven. Water is also released from Prettyboy Reservoir during the summer to maintain the low temperatures necessary to support the trout fishery in Gunpowder Falls.

The Prettyboy Reservoir watershed in Baltimore County is approximately thirty-seven square miles. Its predominate land uses are agriculture and forest. The Prettyboy Reservoir watershed has been listed as impaired by Maryland Department of the Environment for nutrients, mercury in fish tissue, heavy metals, bacteria, and biological impairment. In 2003 a Water Quality Analysis for heavy metals, that indicated no impairment was submitted to EPA and approved. A copy of the document can be found on the web at:

http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/ApprovedFinalTMDL/WQA_prettyboy_final_metals.asp

A TMDL for mercury in fish tissue was prepared and submitted to EPA and approved in 2004. The major source of mercury is from air deposition due to discharges from power plants and incinerators. As such, the major factor in reducing mercury contamination in Prettyboy Reservoir is reductions in emissions, with secondary actions including hazardous waste collection days and "e-cycling". The document may be found on the web at:

http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/ApprovedFinalTMDL/TMDL_final_prettyboy_Hg.asp

November of 2002 and a final one completed in 2003. Residents have organized an environmental organization called the Prettyboy Watershed Alliance and are actively engaged in restoration and resource management activities within the watershed.

The Prettyboy watershed was selected by Maryland Department of the Environment for the preparation of a Watershed Restoration Action Strategy (WRAS). The WRAS was completed in January 2008. The WRAS specifically addressed the nutrient TMDL, along with other stakeholder-identified goals. The completed WRAS can be found on DEPRM's web site at www.baltimorecountymd.gov/go/prettyboy.

To expand the County's overall restoration strategy, DEPRM developed the *Watershed Association Restoration Planning and Implementation Grant* Program. This grant program was developed to address staffing needs of local Watershed Associations. The intent of the grant is to provide part-time funding for staff of volunteer groups. These groups assist the county with participation in County restoration planning, identification of restoration projects, implementation of restoration projects, identify Stream Watch participants, offer educational activities, and can use the grant to leverage additional funding. Annual funding is limited up to \$30,000 with a minimum of 1000 hours of staff time to be expended on projects.

The Prettyboy Watershed Alliance (PWA) has received two grants under this program. The organization uses the funds to increase their membership, expand their base of volunteers, engage citizens with Stream Watch, participate in the Prettyboy WRAS, and develop partnerships with local schools.

7.4.3 Loch Raven Reservoir Watershed

The Loch Raven Reservoir watershed is listed as impaired by heavy metals, mercury, nutrients, sediment, and biological impairments. In 2008, the draft *2008 Integrated Report of Surface Water Quality in Maryland* listed Loch Raven Reservoir watershed as impaired by bacteria, and with the new biological listing criteria listed the entire watershed as biologically impaired, but removed the individual impairment listing for 12-digit watersheds.

A Water Quality Analysis for heavy metals was performed and submitted to EPA for approval. No impairment for heavy metals was found. The document may be found on the web at: http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/ApprovedFinalTMDL/WQA_lochraven_final_metals.asp

A TMDL for mercury in fish tissue was prepared and submitted to EPA and approved in 2004. The major source of mercury is from air deposition due to discharges from power plants and incinerators. As such, the major factor in reducing mercury contamination in Loch Raven Reservoir in reductions in emissions, with secondary actions including hazardous waste collection days and "e-cycling". The document may be found on the web at: http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/ApprovedFinalTMDL/TMDL_final_lochraven_Hg.asp

The nutrient and sediment TMDLs for Loch Raven Reservoir were approved by EPA in March 2007. As with the Prettyboy Reservoir, Total Phosphorus was found to be the limiting nutrient. The TMDL calls for a 50% reduction in Total Phosphorus and a 25% reduction in sediment. The sediment reduction is intended to extend the longevity of the reservoir by reducing the rate of infilling of the reservoir. The document can be found on the web at:

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The Gunpowder Valley Conservancy (GVC) geographically includes the Loch Raven Reservoir, Lower Gunpowder, Little Gunpowder, Gunpowder River and Bird River watersheds within their organization. The GVC applied for and received their third grant under this program. The organization intends to use the funds to expand their membership base, identify new volunteers, improve their web communication, organize tree planting and clean-up projects, engage citizens in Stream Watch, and conduct neighborhood outreach events. The GVC geographic range includes all of the Gunpowder Basin, therefore the restoration activities can occur anywhere within the basin.

7.4.4 Lower Gunpowder Falls Watershed

The Lower Gunpowder Falls watershed exhibits a diversity of land uses, with the portion below the mainstem of the Gunpowder River within the Perry Hall planned growth area, and the portion above the mainstem devoted mainly to agriculture and forest cover. The Lower Gunpowder Falls is listed by MDE as being impaired by heavy metals, nutrients, and as being biological impaired. In 2008, the draft *2008 Integrated Report of Surface Water Quality in Maryland* listed Lower Gunpowder Falls watershed as biologically impaired according to the new biological listing criteria, but removed the individual impairment listing for 12-digit watersheds.

A Water Quality Assessment for heavy metals was conducted in 2003 and submitted to EPA for approval indicating that the waters were not impaired by heavy metals. The document can be found on the web at:

http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/ApprovedFinalTMDL/WQA_lowergunpowder_final_metals.asp

The draft *2008 Integrated Report of Surface Water Quality in Maryland* indicates that the Lower Gunpowder Falls is a high priority for development of a nutrient TMDL within the next two years. Maryland Department of the Environment is waiting on the final development of the Chesapeake Bay Model – Phase V prior to initiating the model for the Lower Gunpowder Falls TMDL development.

The Lower Gunpowder Falls Watershed Management Plan was completed in 1999. The plan has been submitted to MDE. Previous reports have discussed various aspects of the plan. The development of a SWAP within the Lower Gunpowder Falls is not anticipated to take place in the next several years. The timing of the development of the SWAPs for the Lower Gunpowder will depend on the development of TMDLs for the watershed. Table 7-6 presents the status of the capital improvement projects in the Lower Gunpowder watershed.

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Dark Head Park II (repair)	SE	na	15,094	99	na	na	na	
Norman Creek	STWET	25	131,151	95	168.7	23.0	2,484	3.5
Tall Trees	SR	(1,000)	1,100,000 combined	06	202.0	10.7	3,580	
Tall Trees	RET	135		06	602.8	71.4		40.9
Frog Mortar	RET		82,000	08	441.1	57.7		18.3
Projects Under Design or Construction								
Galloway Creek	RET		150,000	10				
Proposed Projects								
None								
Totals		182 (4,830)	2,282,058		2,324.5	686.2	2,114,286	69.6

Abbreviations

CNV: SWM Pond Conversion

NEXT: New Extended Detention Pond

NWET: New Wet Pond

SCR: StormCeptor

SR: Stream Restoration

SE: Shoreline Enhancement

HAB: Habitat improvement

TBD: To Be Determined

RET: Retrofit

STWET: Stormwater Wetland

7.5 Capital Restoration Projects - Patapsco/Back River Watersheds

The Patapsco/Back River Basin watersheds include: Liberty Reservoir, Patapsco River, Gwynns Falls, Jones Falls, Back River and Baltimore Harbor. Five of the six watersheds require watershed management plans based on the amount of urban development within the watershed.

7.5.1 Liberty Reservoir Watershed

The Liberty Reservoir is listed as impaired for nutrients, metals, sediment, bacteria, with some streams listed as being impaired biologically. A TMDL for mercury in fish tissue was prepared and submitted to EPA for approval in December 2002. The major source of mercury is from air deposition due to discharges from power plants and incinerators. As such, the major factor in reducing mercury contamination in Loch Raven Reservoir in reductions in emissions, with secondary actions including hazardous waste collection days and “e-cycling”. The document may be found on the web at:

http://www.mde.state.md.us/assets/document/tmdl/liberty/Liberty_main_pn.pdf

A Water Quality Analysis for chromium and lead was performed and submitted to EPA. EPA concurred (November 10, 2003) that no impairment by chromium and lead is occurring. The document may be found on the web at:

[http://www.mde.state.md.us/assets/document/Liberty%20Reservoir%20WQA_final\(1\).pdf](http://www.mde.state.md.us/assets/document/Liberty%20Reservoir%20WQA_final(1).pdf)

The changes in the biological listing criteria in the draft *2008 Integrated Report of Surface Water Quality in Maryland* resulted in the entire Liberty Reservoir watershed being listed as biologically impaired. A bacteria TMDL for the Liberty Reservoir was submitted to EPA for approval in September of 2008. The document may be found on the web at:

http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/Pub_Notice/TMDL_PN_Liberty_bacteria.asp

A nutrient TMDL for the Liberty Reservoir watershed is currently being prepared by MDE.

A watershed management plan is not required for the Liberty Reservoir watershed for the NPDES – Municipal Stormwater Discharge Permit due to the limited urban development. The

Liberty Reservoir serves as a drinking water reservoir for portions of Carroll County, Howard County, Baltimore County, Anne Arundel County and Baltimore City. Much of the Baltimore County portion of the drainage area to Liberty Reservoir is under forest cover. While there are no planned capital improvement projects for this watershed, its importance as a water supply reservoir require that additional planning of preservation and reforestation activities be considered in the future.

7.5.2 Patapsco River Watershed

The Patapsco River watershed is listed as impaired for nutrients, sediment, metals, and as being biologically impaired. The changes in the biological listing criteria in the draft *2008 Integrated Report of Surface Water Quality in Maryland* resulted in the entire Patapsco River watershed being designated as biologically impaired.

The Patapsco River Watershed Management Plan was submitted to Maryland Department of the Environment in 2000. Table 7-11 provides a summary of the capital improvement projects in the Patapsco River watershed. One retrofit and five stream restoration projects have been completed in the Herbert Run and Bens Run subwatersheds. A retrofit project was also completed in conjunction with the County's Department of Public Works. An additional stream restoration project is in the design and construction phase. A total of 4,750 linear feet of stream channel has either been restored or is in design to be restored. Additional funding for projects is allocated in the capital budget through FY2012.

A Total Maximum Daily Load (TMDL) has been completed for nutrients, and was submitted to EPA on December 14, 2006 for consideration. The nutrient TMDL was approved by EPA in December 2007. This TMDL covers all of the watersheds draining to Baltimore Harbor. The TMDL has estimated that a 15% reduction in urban non-point source load will be needed, along with upgrades to the Patapsco WWTP to meet water quality standards for tidal Baltimore Harbor. The document can be found on the web at:

http://www.mde.state.md.us/assets/document/harbor-main-051906_PN.pdf

A water quality Analysis for nutrients is open for public comment until June 19, 2009. A TMDL for sediments is also open for public comment until June 19, 2009.

A SWAP has been initiated in the lower urban portion of the Patapsco River watershed. One of the goals for this SWAP will be to reduce nitrogen and phosphorus urban non-point pollutant loadings by 15% through a combination of County actions and projects, and citizen and business actions. The SWAP is anticipated to be completed once additional resources are acquired.

To expand the County's overall restoration strategy, DEPRM developed the *Watershed Association Restoration Planning and Implementation Grant* Program. This grant program was developed to address staffing needs of local Watershed Associations. The intent of the grant is to provide part-time funding for staff of volunteer groups. These groups assist the county with participation in County restoration planning, identification of restoration projects, implementation of restoration projects, identify Stream Watch participants, offer educational activities, and can use the grant to leverage additional funding. Annual funding is limited up to \$30,000 with a minimum of 1000 hours of staff time to be expended on projects.

The Friends of Patapsco Valley and Heritage Greenway (FPVHG) applied for their forth grant under this program. The organization intends to use the funds to expand their base of volunteers,

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One hundred and twenty-five (125) acres of urban land have been address through enhanced stormwater management through conversion of existing stormwater management facilities or retrofits of uncontrolled urban discharge. A total of 4,235 feet of stream restoration has been completed. A complete assessment of potential projects is underway for the Scotts Level Branch. This subwatershed was identified in the watershed Management Plan and through staff discussions as one for DEPRM to identify and implement all feasible capital projects. Long term monitoring will be ongoing as well in an effort to quantify the water quality improvements. Over \$6,000,000 have been allocated for restoration within the Gwynns Falls in fiscal years 2010 through 2014.

To expand the County’s overall restoration strategy, DEPRM developed the *Watershed Association Restoration Planning and Implementation Grant* Program. This grant program was developed to address staffing needs of local Watershed Associations. The intent of the grant is to provide part-time funding for staff of volunteer groups. These groups assist the county with participation in County restoration planning, identification of restoration projects, implementation of restoration projects, identify Stream Watch participants, offer educational activities, and can use the grant to leverage additional funding. Annual funding is limited up to \$30,000 with a minimum of 1000 hours of staff time to be expended on projects.

The Gwynns Falls Watershed Association applied for and received their second grant under this program. The organization intends to use the funds to expand their base of volunteers, increase their membership, organize stream clean ups, engage citizens in Stream Watch, and outreach to schools and institutions.

Table 7-12: Gwynns Falls Watershed – CIP Status

Capital Improvement Projects Through 2008								
Gwynns Falls Watershed								
Project	Facility Type	DA (LF)	Cost	Date	Removal Rate (lb./year)			Impervious Acres
					TN	TP	TSS	
Completed Projects								
Greenshire Court	SR	(135)	17,690	99	27.3	1.4	483	3.9
Dead Run @ Security/McD	BE	(250)	23, 690	02				
Rutherford Business Ctr.	CNV	56	134,000	03	265.6	30.5	13,188	22.9
Dead R@ HS Ftbridge/wall	SR	(200)	141,000	03	40.4	2.1	716	1.7
Woodlawn HS retrofit	RET/BE	8.9	206,000	03	51.6	9.5	1,399	3.8
Dead Run@ Whitehead Rd	SCR/BE	60	155,000	03				
DR@Woodlawn Dr (Fox)	SR	(450)	232,594	04	90.9	4.8	1,611	24.8
Dead R @ Dogwood Rd	BE	(1,200)	Na	04				
Chartley SR	SR	(2,000)	970,000	06	404.0	21.4	7,160	13.4
Projects Under Design or Construction								
Scotts Level, Feasibility	RET		150,000	09				
Gwynns Falls @ Gwynnbrook - cd	SR		na	09	na	na	na	
Proposed Projects								
I70 Interchange WQ	RET		1,100,000	10				
Scotts Level Retrofit	RET		300,000	10				
Scotts Level I (Design)	SR		500,000	10				
Scotts Level I (Con)	SR		1,250,000	12				
Western Hills Ret	RET		300,000	12				
West View Park Des-Con	SR		1,450,000	12				
Scotts Level II	SR		800,000	14				

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Roland Run - Essex Rd.	SR	(400)	479,488	98	80.8	4.3	1,432	
Roland Run – Sem. Ave.	SR	(100)	Inc. above	98	20.2	1.1	358	
Towson Run – VFW Hall	SR	(600)	349,869	00	121.2	6.4	2,148	70.6
Roland Run – Jeffers Rd.	SR	(1,550)	451,083	02	313.1	16.6	5,585	66.0
Wood Valley	SR	(2,000)	1,077,510	04	404.0	21.4	7,160	24.9
Roland Run-Riderwd. Hills	SR	(2,400)	1,100,000	07	484.8	25.7	8,592	98.3
Projects Under Design or Construction								
Roland Run @Greenspring	SR	(3,500)	1,500,000	09	707.0	37.5	12,530	
Roland Run @Greenspring	RET		620,000	09				
Proposed Projects								
Towson Run @ Cloisters	RET		700,000	10				
Roland Run @ Kellog (D)	SR		200,000	10				
Roland Run @ Kellog (C)	SR		600,000	10				
Totals		133 (10,550)	7,385,309		3,203.6	244.7	53,383	323.1

Abbreviations

CNV: SWM Pond Conversion
 NWET: New Wet Pond
 SR: Stream Restoration
 DET: Detention Pond
 HAB: Habitat improvement
 cd: Consent Decree requirement

NEXT: New Extended Detention Pond
 SCR: StormCeptor
 SE: Shoreline Enhancement
 TBD: To Be Determined
 BE: Buffer Enhancement

In conjunction with Baltimore City a SWAP for the lower portion of the Jones Falls watershed was completed in the fall of 2008. It is available on DEPRM's web site at http://www.baltimorecountymd.gov/Agencies/environment/watersheds/ep_jonesmain.html. EPA Region III awarded Baltimore County a Water Quality Cooperative Assistance Grant in the amount of \$200,000 for the creation of two SWAPs. The one for the Jones Falls includes the subwatersheds of Slaughterhouse Run, Moores Run, Western Run and the Baltimore City portion of the Jones Falls.

A SWAP for Northeastern Jones Falls is currently being developed. The SWAP will address the reductions of nitrogen and phosphorus loads necessary to meet water quality standards. It is anticipated to be completed in 2009.

To expand the County's overall restoration strategy, DEPRM developed the *Watershed Association Restoration Planning and Implementation Grant* Program. This grant program was developed to address staffing needs of local Watershed Associations. The intent of the grant is to provide part-time funding for staff of volunteer groups. These groups assist the county with participation in County restoration planning, identification of restoration projects, implementation of restoration projects, identify Stream Watch participants, offer educational activities, and can use the grant to leverage additional funding. Annual funding is limited up to \$30,000 with a minimum of 1000 hours of staff time to be expended on projects.

The Jones Falls Watershed Association (JFWA) has applied for their third grant under this program. The organization intends to use the funds to expand their base of volunteers, increase their membership, organize buffer plantings and removal of invasive plants, engage citizens in Stream Watch, and outreach to schools and institutions.

7.5.5 Back River Watershed

The Back River Watershed Management Plan was submitted to Maryland Department of the Environment in 1997. Table 7-14 provides a summary of the capital improvement projects in the Back River watershed either completed, in design or proposed.

Seven stormwater retrofit/conversion projects, addressing 598 acres of drainage area, have been completed. Eight stream restoration projects addressing 10,181 linear feet of degraded stream channel have either been completed or are in the design phase.

A TMDL for nutrients has been completed for the Back River watershed and approved by EPA June 29, 2005. The TMDL identifies a 15% reduction from urban non-point sources as necessary to meet water quality standards in tidal Back River, along with nutrient reductions from the Back River WWTP. This document can be viewed on the web at:

http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/ApprovedFinalTMDL/TMDL_final_backriver_eutro.asp

In addition to the nutrient TMDL, MDE has developed a TMDL for chlordane (EPA approval December 17, 1999) and a TMDL for bacteria approved by EPA December 4, 2007. A Water Quality Assessment was performed for zinc (EPA concurrence December 23, 2004) indicating no impairment due to zinc. These documents can be viewed on the web at:

http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/ApprovedFinalTMDL/tmdl_backriver.asp

http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/Pub_Notice/TMDL_PN_herringrun_bacteria.asp

http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/ApprovedFinalTMDL/WQA_final_backriver_zinc.asp

In conjunction with Baltimore City a SWAP for the upper portion of the Back River watershed was completed in the fall of 2008. It is available on DEPRM's web site at www.baltimorecountymd.gov/go/backriver. EPA Region III awarded Baltimore County a Water Quality Cooperative Assistance Grant in the amount of \$200,000 for the creation of two SWAPs. One of these SWAPs was for Back River and includes fourteen of the upper subwatersheds.

To expand the County's overall restoration strategy, DEPRM developed the *Watershed Association Restoration Planning and Implementation Grant* Program. This grant program was developed to address staffing needs of local Watershed Associations. The intent of the grant is to provide part-time funding for staff of volunteer groups. These groups assist the county with participation in County restoration planning, identification of restoration projects, implementation of restoration projects, identify Stream Watch participants, offer educational activities, and can use the grant to leverage additional funding. Annual funding is limited up to \$30,000 with a minimum of 1000 hours of staff time to be expended on projects.

The Herring Run Watershed Association (HRWA) has received grants for three consecutive years under this. The organization intends to use the funds to expand their base of volunteers, increase their membership, organize street tree planting projects, organize stream clean up events, engage citizens in Stream Watch, and outreach to schools.

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completed in the Baltimore Harbor watershed. The capital budget contains money for one additional retrofit project.

A TMDL for nutrients has been completed for the Patapsco Basin, including the Baltimore Harbor watershed. The nutrient TMDL was approved by EPA in December 2007. The TMDL identifies a 15% reduction from urban non-point sources as necessary to meet water quality standards in tidal Baltimore Harbor. The document can be viewed on the web at the location given under the discussion of the Patapsco watershed in section 7.4.2 above. In addition, a TMDL for chlordane (EPA approval March 23, 2001) has been developed. This document can be viewed on the web at:

http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/ApprovedFinalTMDL/tmdl_balto_harbor.asp

A number of Water Quality Assessments have been performed in Baltimore Harbor resulting in the delisting of Baltimore Harbor as being impaired by zinc, lead, and chromium (EPA concurrence January 18, 2005). These documents can be found on the web at:

http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/ApprovedFinalTMDL/WQA_fina_l_harbor_Cr.asp

http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/ApprovedFinalTMDL/WQA_fina_l_harbor_Zn_Pb.asp

Table 7-15: Baltimore Harbor Watershed – CIP Status

Capital Improvement Projects Through 2008								
Baltimore Harbor Watershed								
Project	Facility Type	DA (ft.)	Cost	Date	Removal Rate (lb./year)			Impervious Acres
					TN	TP	TSS	
Completed Projects								
Concrete Homes	SE	(430)	65,000	90	133.4	87.7	365,452	
Watersedge Park	SE	(480)	92,000	90	72.8	47.9	199,400	
Merritt Point Park	SE	(1880)	175,000	90	128.5	84.5	352,000	
Bear Creek I	SE	(475)	66,000	90	112.6	74.1	308,599	
West Inverness	SE	(230)	19,000	90	14.1	9.3	38,800	
Geise Ave.	RET				1.0	0.2		0.5
Chink Creek	RET	12.6		90	86.6	11.4		3.3
Hughes Ave	RET	17		90	12.0	3.1		5.0
Charlesmont	SE	(750)	47,000	93	76.9	50.5	210,600	
Sandy Plains Elem.	SE	(380)	108,000	98	82.7	54.4	226,568	
Tabasco Cove	STWET	135	128,209	96	689.5	72.9	40,851	70.7
Lynch Point Cove	NWET	27	247,660	97				
North Point Creek	NEXT	90	117,277	98	512.5	68.5	8,081	17.0
Schoolhouse @ Oakleigh	SCR	61.5	419,133	98	10.4	2.3	4,259	10.9
Schoolhouse Cove	SCR	61.5	419,133	98	25.4	5.9		21.8
Bear Creek II Shore	SE	(700)	138,558	99	83.2	54.7	228,010	
Bear Creek II SD Retrofit	NWET	12	93,026	99	86.6	11.4	1,672	4.7
Sandy Plains Elem.	SE	380	97,349	99	82.7	54.4	226,568	
Watersedge Park II (repair)	SE	(90)	21,062	99	0.0	0.0	0.0	
Lynch Cove Retrofit site-I	STWET	217	500,000 combined	03	1,564.7	198.4	3,565	84.9
Lynch Cove Retrofit site-II	STWET	109		03	732.1	88.5	3,565	52.9
West Inverness	SE		372,000	03	14.1	9.3	38,750	
Fleming Park	SE	(1767)	540,303	07	25.6	16.9	70,228	

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1999	6.2	90.2	14.1
2000	5.8	159.7	23.6
2001	15.2	433.6	64.1
2002	13.6	330.5	46.9
2003	18.8	544.1	81.5
2004	16.5	412.3	60.8
2005	25.4	398.5	60.5
2006	19.4	237.4	36.3
2007	16.1	429.6	64.7
Totals	155.1	3,845.1	572.7

Table 7-17: Baltimore County Reforestation Projects by Watershed through 2008

Watershed	Acres Planted	N Reduction (lbs/yr)	P Reduction (lbs/yr)
Upper Western Shore			
Loch Raven	56.12	1644.5	244.6
Lower Gunpowder	1.25	35.5	5.3
Bird River	5.5	166.8	23.1
Gunpowder	20.86	478.7	73.5
Middle River	3.8	115.0	17.3
Upper Western Shore Totals	87.6	2440.5	363.8
Patapsco/Back River			
Liberty	1.0	24.4	3.6
Patapsco	38.8	616.5	92.1
Gwynns Falls	1.5	42.6	6.3
Jones Falls	13.7	332.4	48.6
Back River	8.9	270.4	40.6
Baltimore Harbor	3.0	90.8	13.6
Patapsco/Back River Totals	66.9	1,377.1	204.8
Grand Totals	154.5	3,817.6	568.5

7.7 Volunteer Organizations

Baltimore County has several very active volunteer organizations whose mission is focused on enhancement of environmental resources. In an effort to expand their ability to organize and conduct restoration activities, DEPRM developed a grant program entitled, *Watershed Association Restoration Planning and Implementation Grant* program. This grant program was developed to keep permanent staff with the county's local Watershed Associations. The groups continue implementation of restoration projects and educational activities, and also participate in County restoration planning, support the Stream Watch program, and the money can be used to leverage additional grant funding. We also capture an accounting of the groups' efforts and then add these restoration activities into our County's totals for meeting nutrient reduction goals. Annual funding for each group is limited up to \$30,000 with a minimum of 1000 hours of staff time to be expended each year. Table 7-18 below is the nutrient reductions by group.

Table 7-18: Watershed Groups' Projects Resulting in Nutrient Reductions

Watershed Group	Project	N Reduction (lbs/yr)	P Reduction (lbs/yr)
2006			
Gunpowder Valley Conservancy	Buffer Plantings	130.4	18.6
Herring Run Watershed Association	Rain Barrels	0.9	0.1

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	Tree Plantings	3.5	0.6
Jones Falls Watershed Association	Buffer Plantings	52.1	7.4
	Tree Plantings	18.1	2.8
Friends of Patapsco Valley	Tree Plantings	8.9	1.4
2007			
Gunpowder Valley Conservancy	Buffer Plantings	195.6	27.8
Herring Run Watershed Association	Rain Barrels	0.9	0.1
	Buffer Plantings	9.1	1.3
	Tree Plantings	0.4	0.1
Jones Falls Watershed Association	Buffer Plantings	104.3	14.8
	Rain Barrels	0.8	0.1
	Rain Garden	7.9	1.6
Friends of Patapsco Valley	Buffer Plantings	40.1	5.7
	Tree Plantings	8.9	1.4
	Rain Garden	1.0	0.1
Totals		582.9	83.9

7.8 Additional Restoration Efforts

7.8.1 Growing Home Campaign

The *Growing Home Campaign* provides a needed alternative for the control of urban non-point source pollution. There are approximately 130,000 acres of land within Baltimore County's urban area delineated by the County's Urban Rural Demarcation Line (URDL). Residentially zoned land covers approximately 100,000 acres. Overall only about 20% of the County's urban area is managed by stormwater facilities, half of which are older stormwater detention ponds providing no significant water quality functions. Additional significant acreage of residential development exists outside the URDL at lower densities. DEPRM's watershed water quality management plans have identified a relatively small number of feasible locations for construction of stormwater water quality retrofits on public land. The Growing home Campaign is one way the County is gaining stormwater benefits from private lands and includes a cost share component. Tables 7-19 and 7-20 show the number of trees purchased and their planting location by watershed. Future reports will attempt to quantify the stormwater benefit from this program.

Table 7-19: Number of Trees Planted in the Upper Western Shore Basin

	Deer Creek	Prettyboy Reservoir	Loch Raven	Lower Gunpowder	Little Gunpowder	Bird River	Gunpowder River	Middle River
2006	25	4	195	70	11	36	0	16
2007	12	3	153	87	31	72	23	35
2008	16	11	192	95	25	26	0	37

Table 7-20: Number of Trees Planted in the Patapsco/Back River Basin

	Liberty Reservoir	Patapsco L. N. Br.	Gwynns Falls	Jones Falls	Back River	Baltimore Harbor
2006	0	19	34	43	58	2
2007	5	67	74	74	77	12
2008	2	49	48	149	84	37

7.8.2 Tree-Mendous Maryland Program in Baltimore County

Baltimore County continues to partner with the MD DNR to actively promote the Tree-Mendous Maryland Program. In 2008, DEPRM provided technical assistance and received requests for

free delivery of 18 orders, totaling 466 trees. The Tree-Mendous Maryland program in Baltimore County continues to be a valuable component of the effort to increase urban, suburban, and rural forest cover in Baltimore County. During the course of the 38 planting seasons since the program has been in existence, DEPRM has delivered almost 13,000 trees in 509 orders requesting free delivery, serving school and neighborhood groups in hundreds of communities. Figure 7-1 below indicates the numbers of trees delivered by Baltimore County since program inception. Since 2004, DEPRM has been tracking the total number of Tree-Mendous trees ordered by Baltimore County groups versus the number delivered free by DEPRM. When tree orders that did not request free delivery are factored in for the years 2004 to 2008, the approximate number of Tree-Mendous trees planted yearly in the County remains at about 1,200 trees. Future reports will attempt to quantify the stormwater benefit from this program.

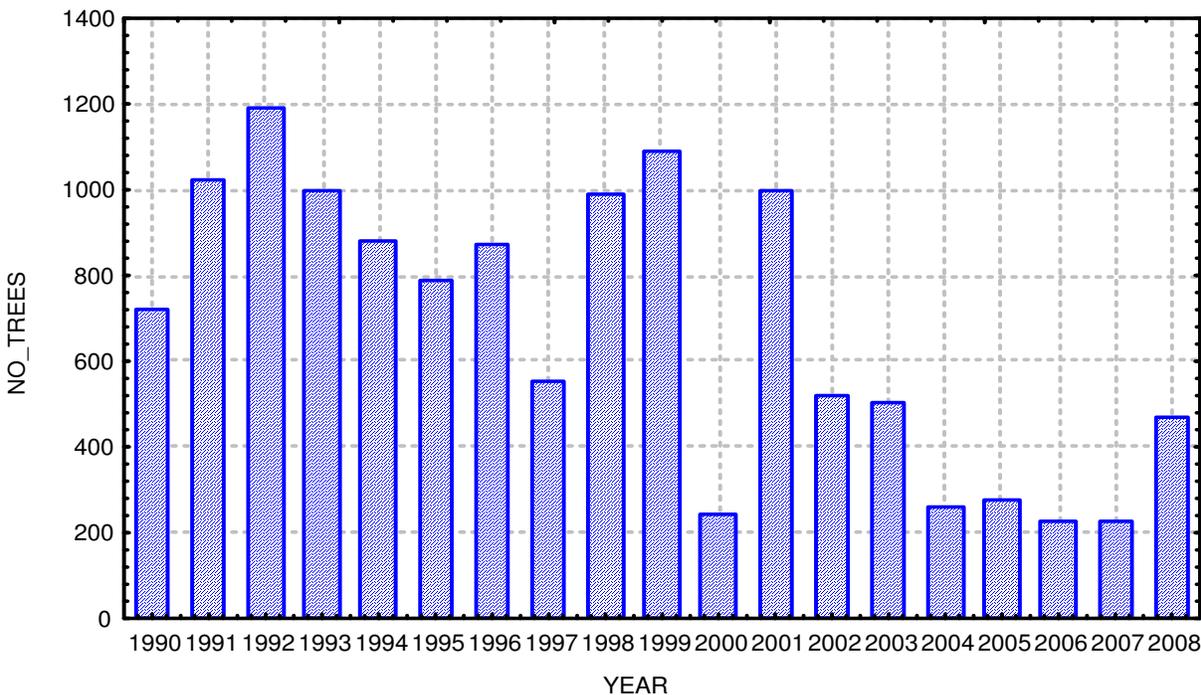


Figure 7-1: Number of trees obtained through the Tree-Mendous Maryland Program with technical assistance and free tree delivery by DEPRM between 1990 and 2008.

7.9 Pollution Reduction Tracking Database

The pollution reduction tracking database currently tracks reductions from capital construction projects. It includes elements that are shown in the pollutant reduction tables in this section. In addition, pollutant reduction attributable to certain types of restoration (stream channel restoration and buffer planting) must continue to be monitored and assessed. Spring Branch has provided the data for a preliminary estimate of pollutant load reduction per linear foot of restored stream channel. A grant project that DEPRM and the Water Environment Research Federation (WERF) have completed provides information on pollutant reduction benefits of urban forested riparian buffers. The Chesapeake Bay Program has assigned a tentative pollutant removal efficiency of 25% for Total Nitrogen and 50% for Total Phosphorus and Total Suspended Solids.

In addition to the pollutant removal efficiencies the Chesapeake Bay Program counts urban forest riparian buffers as a land use conversion. The establishment of DEPRM’s Community

Reforestation Program (CRP) provides a dedicated workforce for planting, monitoring, and maintaining forest mitigation projects. The County is including reduction efficiencies for these projects for the first time in this current 2009 report. The calculation method for pollutant reduction uses a land use conversion to forest cover. An additional reduction is taken for forest planted within a riparian buffer. These methods are described in Section 7.3.4.

7.10 Impervious Surface Calculation

The impervious surface acreage in Baltimore County was calculated by using a GIS planimetric building footprint data layer and a planimetric roadway data layer that was created from aerial photography flown from 1995-1997. The building data layer does not include sidewalks or driveways. The roads data layer includes parking lots. The data are presented by watershed in Table 7-15. A new planimetric data layer for both buildings and roadways, based on 2005 aerial photography, is available for this reporting year. The new impervious cover based on the 2005 aeriels is also presented in Table 7-21.

Using this methodology a total impervious coverage increased from 36,300 acres to 40,900 acres over the 8-year period. This represents ~575 acres of new impervious cover each year.

Table 7-21: Baltimore County Impervious Area by Watershed – Changes Between 1997 and 2005

Watershed	Drainage Area (acres)	Total Acres Impervious 1997	% Impervious 1997	Total Acres Impervious 2005	% Impervious 2005
Upper Western Shore Watersheds					
Deer Creek	7,131	167.2	2.35	193.4	2.71
Prettyboy Reservoir	25,545	463.7	1.81	528.2	2.07
Loch Raven Reservoir	139,554	6,277.3	4.50	7,203.9	5.16
Lower Gunpowder Falls	29,471	2,091.3	7.10	2,474.4	8.40
Little Gunpowder Falls	17,229	598.6	3.47	702.4	4.08
Bird River	16,463	2,125.9	12.91	2,836.4	17.23
Gunpowder River	6,065	346.2	5.71	436.5	7.20
Middle River	6,520	1,300.2	19.94	1,442.2	22.12
Upper Western Shore Totals	247,978	13,370.4	5.55	15,817.4	6.38
Patapsco/Back River Watersheds					
Liberty Reservoir	17,555	528.0	3.01	685.5	3.90
Patapsco River	33,186	4,125.1	12.43	4,574.2	13.78
Gwynns Falls	28,643	6,152.5	21.48	6,989.6	24.40
Jones Falls	25,945	3,513.6	13.54	3,890.3	14.99
Back River	23,248	5,255.9	22.61	5,846.4	25.15
Baltimore Harbor	11,453	2,973.0	25.96	3,124.8	27.28
Patapsco/Back River Totals	140,030	22,548.1	16.10	25,110.8	17.93
County-Wide Totals	388,008	36,301.6	9.35	40,928.2	10.55

To meet the current NPDES permit requirement Baltimore County must provide restoration for impervious land areas that are equal to or greater than 20% of the County’s urban impervious cover. Roads and buildings that are owned by the Maryland State Highway Administration and other state agencies, along with federally owned property, do not have to be addressed by Baltimore County. Therefore the roadways and building that are owned by the Maryland State Highway Administration, other state agencies, and the federal government were identified and the acreage of impervious cover associated with those were removed from Baltimore County’s requirement. The results are presented in Table 7-22. The roadways and buildings owned by the

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state and federal government account for 4,482 acres of impervious area in Baltimore County or 11% of the total impervious area.

Table 7-22 calculates that Baltimore County is required to manage 10% of 36,446 acres, which equals 3,645 acres of impervious cover each 5-year permit term. Baltimore County is required to manage 20% of the county impervious area by June 2010. This is currently accounted for through the construction of restoration projects and state-of-the-art stormwater management facilities (see Section 1) and also through street sweeping and storm drain inlet cleaning (see Section 3). Watershed management plans list specific potential projects that address water quality restoration. The capital budget provides funds on a watershed basis for implementation of the projects found to be feasible. The specific projects completed and currently under design or construction are listed in Tables 7-4 through 7-15 by watershed. Unidentified projects for each watershed are also listed by type.

Table 7-22: Baltimore County and Maryland State Highway Impervious Acreage

Watershed	Impervious Acres in Baltimore Co.	Impervious Acres owned by SHA	Remaining Impervious Acres
Upper Western Shore Watersheds			
Deer Creek	193.4	27.8	165.5
Prettyboy Reservoir	528.2	21.7	506.5
Loch Raven Reservoir	7,203.9	643.9	6,560.0
Lower Gunpowder Falls	2,474.4	192.9	2,281.5
Little Gunpowder Falls	702.4	90.5	611.9
Bird River	436.5	283.6	396.0
Gunpowder River	2,836.4	40.4	2,552.7
Middle River	1,442.2	279.8	1,162.3
Upper Western Shore	15,817.4	1580.6	14,236.4
Patapsco/Back River Watersheds			
Liberty Reservoir	685.5	123.9	561.6
Patapsco River	4,574.2	721.3	3,852.9
Gwynns Falls	6,989.6	727.6	6,261.9
Jones Falls	3,890.3	467.7	3,422.6
Back River	5,846.4	548.8	5,297.6
Baltimore Harbor	3,124.8	312.0	2,812.8
Patapsco/Back River	25,110.8	2901.3	22,209.4
County-Wide Totals	40,928.2	4,481.9	36,445.8

The drainage areas for most of the completed projects and the associated impervious acreage have been delineated with the use of GIS. The drainage area for each CIP project that has been completed was delineated using topography or consultant information. An associated GIS data layer was created of all the CIP project drainage areas. The area of impervious surfaces within each digitized drainage area was measured. The total of these impervious surfaces was categorized by watershed and is included in Table 7-23.

The impervious acreage addressed by completed capital improvement projects is listed in Table 7-23. Baltimore County through its Capital Improvement Program has addressed 2,781 acres of its impervious acreage required under the current NPDES permit. In addition, 4,005.0 acres of impervious cover has been address through installation of stormwater management that does not have any further potential for retrofits (e.g. stormcepters, underground storage) or is already providing advanced water quality benefits (e.g. extended detention). This results in a total of

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18.6% of the impervious area in the County addressed through water quality controls. Section 10 contains a complete accounting of pollutant load reduction and impervious acres addressed.

Table 7-23: Impervious Acreage Addressed by Completed Capital Projects and Advanced Treatment SWM Facilities

Watershed	Impervious Acres to be Addressed	CIP Projects Drainage Area	CIP Project Impervious Acres Addressed	SWM Advanced Treatment Impervious Acres Addressed	Total Impervious Area Addressed	Total Percent of Impervious Addressed
Upper Western Shore						
Deer Creek	165.5	0	0	0.0	0	0.0%
Prettyboy Reservoir	506.5	0	0	4.6	4.6	0.6%
Loch Raven Reservoir	6,560.0	2,341.9	472.8	615.4	1,088.2	16.6%
Lower Gunpowder Falls	2,281.5	2,324.3	434.0	256.8	690.8	30.3%
Little Gunpowder Falls	611.9	0	0	27.8	27.8	4.5%
Bird River	2,552.7	2,193.2	513.8	414.5	928.3	36.4%
Gunpowder River	396.0	65.9	17.6	27.7	45.3	11.4%
Middle River	1,162.3	232.7	69.6	82.5	152.1	13.1%
Upper Western Shore Totals	14,236.4	7,158.0	1,507.8	1429.3	2,937.1	20.6%
Patapsco/Back River						
Liberty Reservoir	561.6	0	0	33.2	33.2	0.6%
Patapsco River	3,852.9	486.2	138.7	395.2	533.9	13.9%
Gwynns Falls	6,261.9	113.9	70.5	1,209.3	1,279.8	20.4%
Jones Falls	3,422.6	1,013.1	323.1	371.9	695.0	20.3%
Back River	5,297.6	1,703.5	469.4	518.0	987.4	18.6%
Baltimore Harbor	2,812.8	696.2	271.8	48.1	319.9	11.4%
Patapsco/Back River Totals	22,209.4	4,012.9	1,273.5	2,575.7	3,849.2	17.3%
County-Wide Totals	36445.8	11,170.9	2,781.3	4005.0	6786.3	18.6%

The recently developed SWAPs and those currently under development will provide information to determine the extent of the restoration options necessary to meet TMDL determined pollutant load reductions, and the Maryland Chesapeake Bay Tributary Strategies. At the same time these plans will satisfy the NPDES – MS4 permit to address impervious area. Table 7-24 presents the information of the impervious cover that will be addressed by these five plans.

Table 7-24: County Impervious Cover Addressed by the Current SWAPs

Planning Area	Status	County Drainage Area (acres)	Total Impervious Area	% County Imp. Area (total = 36,446)
Prettyboy WRAS	Complete	25,545	507	1.4
Lower Jones Falls SWAP	Complete	5,485	1,052	2.9
Upper Back River SWAP	Complete	15,395	4,218	13.6
Spring Branch SWAP*	Complete	1,006	187	0.5
Tidal Back River SWAP	In Development	7,720	1,424	3.9
Northeastern Jones Falls SWAP	In Development	7,463	1,705	4.7
Loch Raven Reservoir Urban Southwest	In Development	9,126	1,823	5.9
Lower Patapsco	Delayed	17,569	3,365	10.9
Total		89,309	14,281	44.0

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*The Spring Branch SWAP will become a part of the Loch Raven Reservoir Urban Southwest SWAP.

As can be seen from the Table 7-24, over forty percent of the impervious area in the County will be addressed by these seven plans. As projects are implemented as prioritized through these plans or in other portions of the County, the impervious area addressed by those projects will be added to Table 7-23.