

PATUXENT RESERVOIRS WATERSHED PROTECTION GROUP



2015 ANNUAL REPORT
OF THE
TECHNICAL ADVISORY COMMITTEE

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Abbreviations

Abbreviation	Definition
aka	Also Known As
BMP	Best Management Practice
ca.	Approximately; about
chl- <i>a</i>	Chlorophyll- <i>a</i>
DEP	(Montgomery County) Department of Environmental Protection
DO	Dissolved Oxygen
DOT	(Montgomery County) Department of Transportation
DPW	(Howard County) Department of Public Works
ea	Each
EPA	U.S. Environmental Protection Agency
ESD	Environmental Site Design
FY	Fiscal Year
HC	Howard County
HSCD	Howard Soil Conservation District
LID	Low Impact Development
MAST	Maryland Assessment Scenario Tool
MC	Montgomery County
MDE	Maryland Department of the Environment
M-NCPPC	Maryland-National Capital Park and Planning Commission
MS4	Municipal Separate Storm Sewer System
MSCD	Montgomery Soil Conservation District
mg/L	Milligrams per Liter (equivalent to part per million)
µg/L	Micrograms per Liter (equivalent to part per billion)
PGC	Prince George's County
pH	Power of Hydrogen
PRWPG	Patuxent Reservoirs Watershed Protection Group
PSA	(Howard County) Planned Service Area
RC	(Howard County) Rural Conservation
RR	(Howard County) Rural Residential
SCD	Soil Conservation District
TAC	Technical Advisory Committee
TMDL	Total Maximum Daily Load
TOC	Total Organic Carbon
WLA	Waste Load Allocation
WSSC	Washington Suburban Sanitary Commission

Executive Summary

Two reservoirs on the Patuxent River, Triadelphia and Rocky Gorge (aka T. Howard Duckett), are significant water supply sources for the Washington D.C. metropolitan area serving residents primarily in Montgomery and Prince George’s Counties (Figure 1). The Patuxent Reservoirs’ 132-square mile watershed includes land mostly in Howard and Montgomery Counties (about 99%) and the remaining land is in Prince George’s and Frederick Counties (Figure 2).

In 1998, the Maryland Department of the Environment (MDE) identified both reservoirs as impaired by nutrients and identified Triadelphia Reservoir as impaired by sediment; consequently, MDE determined that the reservoirs were unable to achieve State water quality standards for their designated uses, one of which is public water supply. To address these impairments, the US Environmental Protection Agency (EPA) approved Total Maximum Daily Loads (TMDL) for both reservoirs in November 2008. A phosphorus TMDL was established for each reservoir, and a sediment TMDL was established for Triadelphia Reservoir.

Since 1997, the Technical Advisory Committee (TAC) has completed an Annual Report to summarize its accomplishments and identify funding needs to address watershed priority resource issues. This annual report provides an update of on-going efforts and those completed in 2015.

A work plan is provided at the end of this report (Table 6). The work plan lists implementation needs and items for each of the priority resources along with the responsible agency or agencies and the corresponding budget expenditure for the current year.

The following are highlights from 2015:

1. In 2012, the Policy Board approved a request for \$70,000 to determine progress made towards achieving the pollutant reduction goals specified in the TMDLs for the reservoirs. Modeled results of pollutant load reductions since 2000 revealed some progress towards meeting the TMDLs and the significant load reductions that remain (Table 1).

Table 1. Modeled Pollutant Load Reductions Achieved since 2000

	Phosphorus Rocky Gorge	Phosphorus Triadelphia	Sediment Triadelphia
TMDL Reduction Goal	48%	58%	29%
Achieved To-Date	17%	9%	8%
Remaining Gap	31%	49%	21%

2. Howard, Montgomery, and Prince George's Counties continue to make progress towards meeting local TMDL goals via their Municipal Separate Storm Sewer System (MS4) Permits. For Howard County, the phosphorus TMDL goal for both reservoirs is 15%. To-date, urban Best Management Practices (BMPs) reduced phosphorus loads by 4.2% and 7.4% for Triadelphia and Rocky Gorge watersheds, respectively. Detailed watershed assessments and restoration plans for the Patuxent Reservoirs watershed are scheduled to be completed in 2016. Meeting the required phosphorus reductions for Montgomery County's TMDL wasteload allocation (i.e., MS4 point sources of pollution) by implementing structural controls is estimated to cost over \$4 million for the Triadelphia Reservoir and over \$10 million for the Rocky Gorge Reservoir. Sediment reductions to the Triadelphia Reservoir will be easily met by existing high priority retrofit projects. Prince George's County recently completed its watershed restoration plans for all local watersheds with EPA approved TMDLs. The restoration plan covers about 136 acres of urban land use in the Patuxent Reservoirs Watershed. Although this plan only covers a small portion of the watershed, it is in close proximity to Rocky Gorge Reservoir. Proposed restoration activities to reduce phosphorus loads from the urban areas include stormwater BMPs in road right-of-ways and education programs to reduce phosphorus loads from fertilizer use and pet waste.
3. The Washington Suburban Sanitary Commission (WSSC) completed its 24th year of reservoir water quality monitoring to provide data for technical analysis and long-term trend evaluation to support protection of the reservoirs and drinking water supply. Chlorophyll-*a* and dissolved oxygen are two of the indicators of water quality presented in this annual report. Chlorophyll-*a* results from 2015 in Rocky Gorge Reservoir did exceed one of the two thresholds established by the MDE for public water supply reservoirs for the first time since using the criteria. Dissolved oxygen results from either reservoir did not fall below the MDE guidelines developed for reservoirs in Maryland.
4. Technical and financial assistance from the Howard and Montgomery Soil Conservation Districts (SCDs) resulted in the installation of 128 agricultural Best Management Practices (BMPs) in the Patuxent Reservoirs Watershed. In addition, the districts developed or revised 20 Soil Conservation and Water Quality Plans for about 2,264 acres (3.5 square miles) of farm land in the watershed.

The cooperative cost-share program dedicated to the Patuxent Reservoirs Watershed was recently improved to foster greater use into the future. In Montgomery County these updates have sparked new interest, especially among small equine farms. Montgomery SCD used \$5,000 of the Patuxent Cost-Share program during FY15. It is anticipated that the update in cost-share rates and the broadening of program applicability will lead to increased participation throughout the watershed.

5. A variety of successful outreach events occurred again in 2015 including: watershed and Adopt-A-Road clean-ups and annual WSSC-sponsored events (Children's Water Festival plus an expanded Family Campfire event adding a Watershed Fair).

Introduction

The Washington Suburban Sanitary Commission (WSSC) continues to provide potable water from the Patuxent Reservoirs system to about 650,000 customers, located mainly in eastern Montgomery County and Prince George's County (Figure 1). The Patuxent Reservoirs Watershed (the Watershed) encompasses about 132 square miles located almost entirely (99%) in Howard County (HC) and Montgomery County (MC), with the remaining drainage area located in Prince George's and Frederick Counties (Figure 2).

This year marks the 19th year that the Technical Advisory Committee (TAC) has completed an Annual Report, which summarizes accomplishments and funds expended to meet goals set by the TAC to protect the six priority resources. An update of activities in 2015 is provided of on-going efforts to address the implementation items for the Priority Resources. This Annual Report will be accompanied by a separate, supplemental document to provide detailed background information for items summarized in this report.

In 2003, the Goals-Setting Workgroup of the TAC re-evaluated the original list of action items and proposed a revised action plan, which was approved by the Policy Board. This revised list of action items or work plan, titled *Performance Measures and Goals for Priority Resources*, represents a continuation of the commitment to coordinate protection efforts in coming years (Table 5). This table contains goals, performance measures, implementation items, and a time line to achieve each goal for six priority resources selected by the TAC. Those priority resources include the following:

- Reservoirs and water supply
- Terrestrial habitat
- Stream systems
- Aquatic biota
- Rural character and landscape, and
- Public awareness and stewardship.

Although progress towards a number of these goals has been made over the years, the timelines established for the implementation items have generally not been met due to limited agency work programs and budgets and other priorities. The TAC will continue to implement items associated with each of the priority resources primarily through existing TAC agency responsibilities and work programs. A table of work plan expenditures is provided at the end of this report (Table 6) containing a list of implementation needs and action items for each of the priority resources, along with the responsible agency or agencies and the corresponding budget expenditure for the current year.

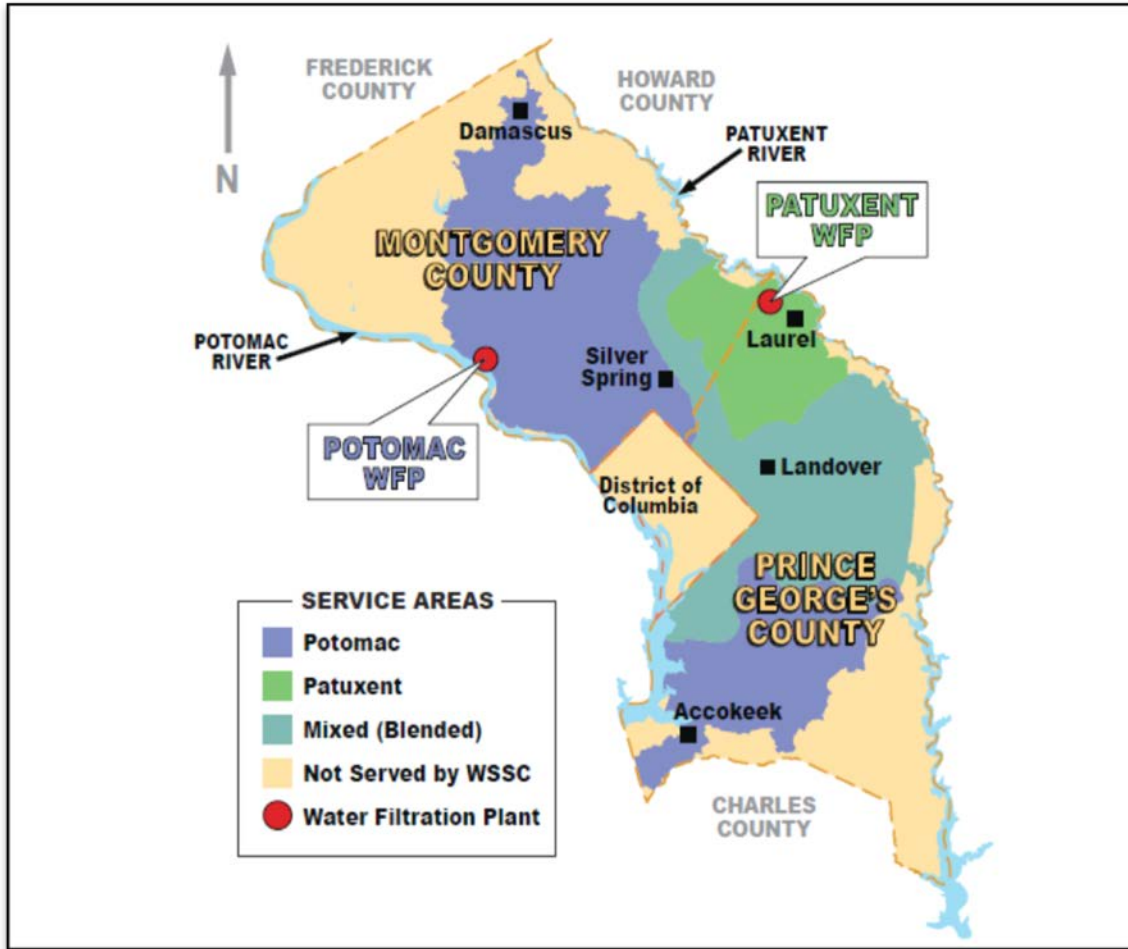


Figure 1. WSSC Drinking Water Service Area - Patuxent & Potomac Sources (excludes wholesale service to Howard and Charles Counties)

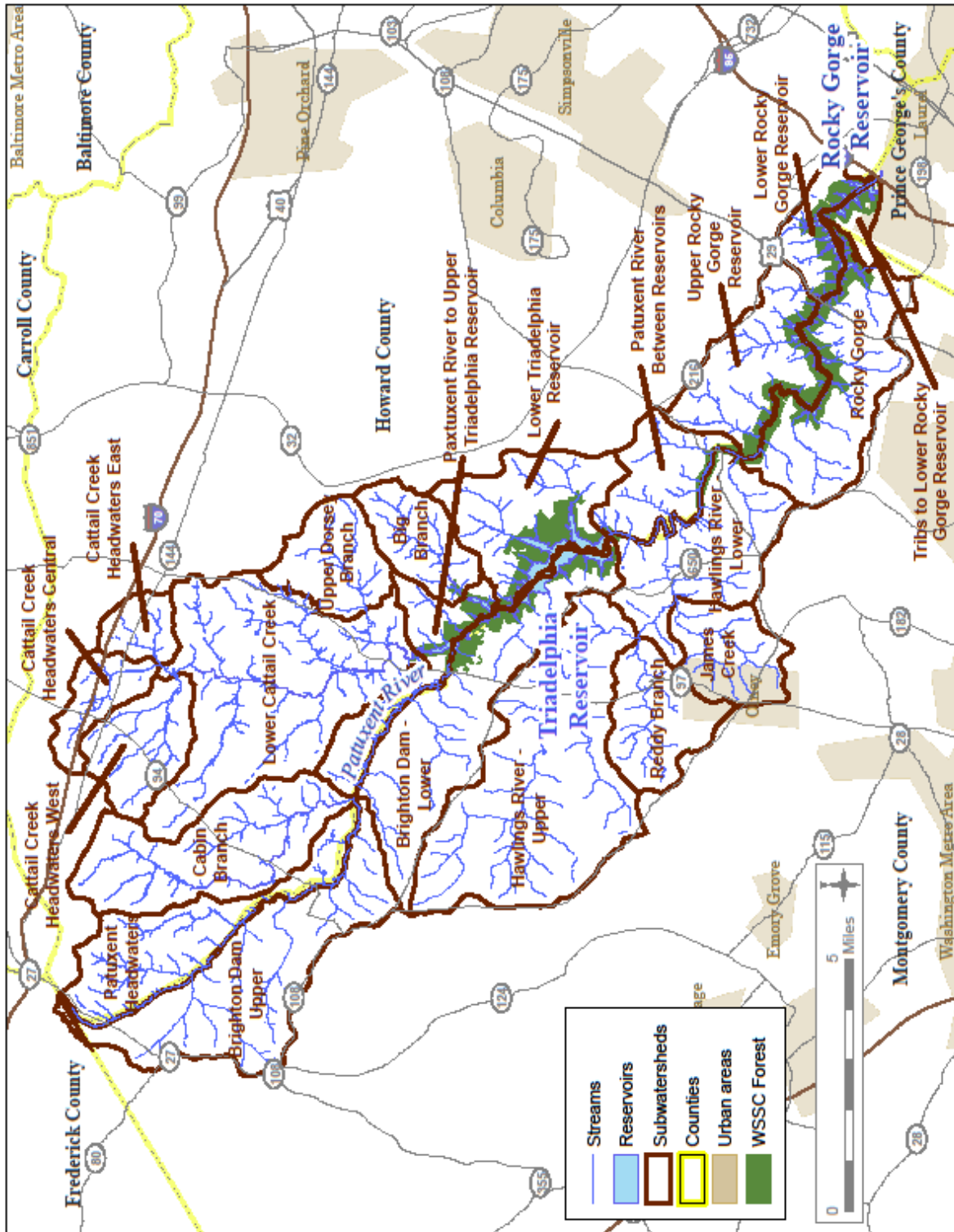


Figure 2. Patuxent Reservoirs Watershed (from Versar 2009)

Total Maximum Daily Load Implementation

In 1998, the Maryland Department of the Environment (MDE) identified both reservoirs as impaired by nutrients and identified Triadelphia Reservoir as impaired by sediment; consequently, MDE determined that the reservoirs were unable to achieve State water quality standards for their designated uses, one of which is a public drinking water supply. To address these impairments, the US Environmental Protection Agency (EPA) approved Total Maximum Daily Loads (TMDLs) for both reservoirs in November 2008. A phosphorus TMDL was established for each reservoir, and a sediment TMDL was established for Triadelphia Reservoir (29% reduction required). Significant phosphorus load reductions are required (58% for Triadelphia Reservoir, 48% for Rocky Gorge Reservoir) to meet Maryland's water quality standards.¹ Almost all of the needed phosphorus load reductions were allocated to non-point sources (NPS) of pollution (i.e., load allocation). Runoff from land uses such as low density residential and agricultural land, in addition to eroding stream banks are considered as NPS of pollution for the Patuxent Reservoirs Watershed.

Pollutant Load Estimation and TMDL Gap Analysis (c. 2000-2015)

During the December 2012 meeting of the Patuxent Reservoirs Watershed Protection Group (PRWPG), the Policy Board approved the TAC's recommendation to allocate \$70,000 in Fiscal Year 2014 (FY14) for a consultant or temporary staff position. The funding was allocated to assess progress made towards achieving the pollutant reduction goals specified in the TMDLs for the reservoirs.

A Memorandum of Understanding was signed between the four TAC funding agencies, Montgomery and Prince George's Counties, the Maryland-National Capital Park and Planning Commission (M-NCPPC), and the Washington Suburban Sanitary Commission (WSSC). The latter agency served as project manager, using a contract with environmental consultant EA Engineering, Science & Technology to perform the work. The scope of work included developing a methodology to account for pollutant load estimates and load reductions; compiling a database of structural and non-structural Best Management Practices (BMPs) installed since the baseline year for the TMDL, c. 2000; and estimating the pollutant load reductions achieved since 2000, as well as the "gap analysis" of remaining load reductions needed to meet the TMDL goals. The geodatabase developed with this project will be provided to the TAC together with an instruction guide to allow ongoing tracking of subsequent BMPs and load reductions.

Obtaining data was challenging, as well as reconciling differences between the modeling approaches used in 2003 for the original TMDL development and the later models used by the

¹ Maryland Department of the Environment. June 2008. *Total Maximum Daily Loads of Total Phosphorus and Sediments for Triadelphia Reservoir (Brighton Dam) and Total Maximum Daily Loads of Total Phosphorus for Rocky Gorge Reservoir, Howard, Montgomery and Prince George's Counties, Maryland*. Baltimore, MD.

Counties for tracking and reporting their MS4 National Pollutant Discharge Elimination System (NPDES) permit pollutant load reductions. Agricultural BMPs could not be identified by geographic means (as was done for the urban stormwater BMPs) but rather was reported by County and by 8-digit subwatershed. In addition to accounting for load reductions from urban and agricultural BMPs, a major consideration for the analysis was the change in land use that has occurred since the TMDL baseline.

For the Triadelphia Reservoir watershed, which includes portions of Howard and Montgomery Counties, it is estimated that sediment loading since c. 2000 has been reduced by 1,338 tons/yr or 8% compared to the TMDL goal of 29%, leaving a gap of 21% still to be met.

Also for the Triadelphia Reservoir watershed, it is estimated that the phosphorus loading since c. 2000 has been reduced by 4,118 lbs/yr or 9% compared to the TMDL goal of 58%, leaving a gap of 49% still to be met. For the Rocky Gorge Reservoir watershed, which includes portions of Howard, Montgomery and Prince George's Counties, it is estimated that the phosphorus loading since c. 2000 has been reduced by 3,897 lbs/yr or 17% compared to the TMDL goal of 48%, leaving a gap of 31% still to be met.

Municipal Separate Storm Sewer System (MS4) Permit Implementation Plans

According to the TMDL document, one way to provide assurance that the TMDLs will be implemented is through the MS4 permits that regulate urban stormwater systems. Every county within the Watershed has been assigned an MS4 permit by the MDE. Renewed MS4 permits now contain a requirement for each jurisdiction to meet its waste load allocation (WLA) or point source load for all local TMDLs. While reductions required under the MS4 permit are important, MDE modeled sources of pollution in the Watershed and the WLA represents just 15% of the total reductions needed to achieve the TMDL goals.

Howard County

Howard County reports on progress towards meeting MS4 permit requirements in its NPDES Annual Report. Howard County also reported on its strategy to meet the MS4 permit impervious restoration requirement and its TMDL goals in its Countywide Implementation Strategy (CIS). Annual Report number 20 and the CIS, submitted to MDE in December 2015, are available through the County government's [Stormwater Management web page](#).

To-date, BMPs within the Patuxent Reservoirs watersheds of Howard County produce the following pollutant load reductions based on the approved Maryland Assessment Scenario Tool (MAST) pollutant load removal efficiencies (Table 2), as presented in the CIS.

Table 2. Pollutant Reductions to Patuxent Reservoirs from Howard County Urban BMPs

Reservoir	Target Reduction	Phosphorus
Triadelphia	15% (129 lbs)	4.2% (112 lbs)
Rocky Gorge	15% (398 lbs)	7.4% (64 lbs)

Differences between the values presented in Annual Report number 19 and the CIS are the result of updated modeling methods and updated BMP information.

Detailed watershed assessments and restoration plans for the Patuxent Reservoirs watershed are scheduled to be completed in 2016. Opportunities for restoration will be identified in these plans including BMP conversions, new BMPs, outfall stabilization, stream restoration, and reforestation.

Montgomery County

Draft reports of the watershed implementation plans for the [Patuxent Reservoirs Watershed Assessment](#) were published in 2014. Refer to the 2014 Annual Report of the TAC for a summary of project types needed to achieve the County’s waste-load allocations. Meeting the required phosphorus reductions by implementing structural controls is estimated to cost over \$4 million for the Triadelphia Reservoir and over \$10 million for the Rocky Gorge Reservoir. Sediment reductions to the Triadelphia Reservoir will be easily met by existing high priority retrofit projects.

Prince George’s County

County Restoration Plans

Prince George’s County recently completed its watershed restoration plans for all local watersheds with EPA approved Total Maximum Daily Loads (TMDL). The watershed restoration plans were developed to fulfill requirements of the County’s MS4 permit that was issued in January 2014. The plans which were originally submitted to MDE in December 2014 were revised per comments from MDE and resubmitted in December 2015.

Each restoration plan outlines a strategy for managing urban stormwater and reduces polluted stormwater from entering local water bodies. Through a combination of structural practices (e.g., bio-retention, swales) and programmatic activities (e.g., pet waste campaigns, urban nutrient management programs), each restoration plan accounts for how urban pollutant loads will be reduced to eventually meet the TMDL target loads. The plans only target urban stormwater pollution and therefore other sector loads, such as agricultural loads or industrial facility loads, are not addressed in the plans.

The overall goals of the County's watershed restoration planning are to:

- Protect, restore, and enhance habitat in the watershed.
- Restore watershed functions, including hydrology, water quality, and habitat, using a balanced approach that minimizes negative impacts.
- Support compliance with regional, state, and federal regulatory requirements.
- Increase awareness and stewardship within the watershed, including encouraging policymakers to develop policies that support a healthy watershed.

Rocky Gorge Reservoir Watershed

The portion of the Rocky Gorge Reservoir watershed in the County is addressed by one of the County's developed restoration plans. This restoration plan, called "Restoration Plan for the Upper Patuxent River and Rocky Gorge Reservoir Watersheds in Prince George's County", addresses the reduction of specific pollutants in urban runoff to meet TMDL established targets in the two watersheds. For the Rocky Gorge Reservoir watershed, the only impairment for which a TMDL is issued is total phosphorous (TP) and hence the restoration plan primarily targets TP reduction. The area of the watershed in the County is approximately 595 acres, of which only 23% consists of urban land-use; the remainder is either agricultural or natural (undisturbed) land areas. The predominant land-use in the urban area is low-density residential. The TMDL established pollution reduction target for urban areas in the Rocky Gorge Reservoir watershed for TP is 15% (from the TMDL baseline year). In the restoration plan, the County developed a new model to account for TP loads generated from within the urban areas in the County and calibrated this model to closely match the regulatory TMDL loads which had been established using different models that don't easily allow for accounting for load reductions from restoration strategies. The County used the Watershed Treatment Model (WTM) to calculate the generated pollutant load as well as the load reductions from the implementation of restoration strategies.

Rocky Gorge Reservoir Watershed Restoration Plan

The following are some of the key aspects of the Rocky Gorge Reservoir restoration plan:

- Total urban area of the watershed - 136 acres (23% of the County portion of the watershed)
- Generated annual TP load from urban areas – 177 pounds (from County model)
- Required reduction of annual TP load from urban areas – 26.5 pounds (15% reduction rate)
- Number of existing restoration BMPs - 0
- Proposed restoration activities to lower TP loads from urban areas
 - Installation of stormwater Best Management Practices (BMPs) in Right-Of-Way (ROW) areas
 - Implementation of Urban Nutrient Management programs to reduce fertilizer use on lawn areas

- Implementation of a Pet Waste Campaign to promote proper disposal of pet waste

The total expected reduction from restoration activities is 27.1 pounds per year (Table 3).

Table 3 Expected Load Reductions from Prince George’s Restoration Plan for Rocky Gorge watershed

Restoration Activity	Expected Load Reduction (pounds/year)
Stormwater BMPs	13.7
Urban Nutrient Management	12.4
Pet Waste Education Campaign	1.0
Total	27.1

The County therefore plans to lower the TP load from within its urban area by approximately 27 pounds per year to comply with the Rocky Gorge Reservoir TMDL. While the County’s restoration plans suggest a 15 year timeline to generally meet TMDL targets, given the small level of reduction required for the Rocky Gorge Reservoir watershed, it is expected this target will be met much sooner than the 2030 County established target year to meet most TMDL targets in its watersheds.

While the restoration plans specify the strategies to be employed by the County to lower specific pollutant loads, they do not specifically assign projects that will be implemented. In that sense, the plans are planning-level documents, and in the coming years the County will assign various projects throughout its watersheds based on opportunities, available funding and pollution reduction priorities. In addition, since new restoration technologies and research on effectiveness of programs are still emerging, the County will adapt the restoration plan strategies, when necessary, to best meet the goal of lowering stormwater pollutant loads in the most effective manner.

Annual Progress on Implementation Items for the Priority Resources

Reservoir and Water Supply

Reservoir Water Quality Monitoring

The WSSC completed its 24th year of reservoir water quality monitoring to provide data for technical analysis and long-term trend evaluation to support protection of the reservoirs and drinking water supply. Three sites or more on each reservoir are normally monitored bi-weekly, except during winter months. The parameters measured monthly are alkalinity, chloride, chlorophyll-*a*, color, phosphorus, nitrogen, sodium, total organic carbon, and turbidity. In addition, in-situ transparency and depth profile measurements of conductivity, dissolved oxygen, oxidation-reduction potential, pH, and temperature were measured bi-weekly.

According to the TMDL document for the Patuxent Reservoirs, *“The water quality goal of the nutrient TMDLs is to reduce high chlorophyll-*a* concentrations that reflect excessive algal blooms, and to maintain dissolved oxygen at a level supportive of the designated uses for Triadelphia and Rocky Gorge Reservoirs. The water quality goal of the sediment TMDL for Triadelphia Reservoir is to increase the useful life of the reservoir for water supply by preserving storage capacity.”*

Chlorophyll-*a*

Chlorophyll-*a* (chl-*a*) is one type of chlorophyll present in all algae, and it is often used as a surrogate for algal abundance. The monitoring results for this constituent are summarized in this report and used as one indicator of reservoir water quality. The MDE amended Maryland’s water quality standards by adding chl-*a* criteria for public water supply reservoirs in 2010 (Code of Maryland Regulations 26.08.02.03-3). The two criteria for public water supply reservoirs are:

1. *The arithmetic mean of a representative number of samples of chlorophyll-*a* concentrations, measured during the growing season (May 1 to September 30) as a 30-day moving average may not exceed 10 micrograms per liter (µg/L); and*
2. *The 90th-percentile of measurements taken during the growing season may not exceed 30 micrograms per liter.*

Weekly, active chl-*a* samples collected from the Patuxent Water Plant raw water are used to determine compliance with the first criterion. The 30-day moving average did not exceed the 10 µg/L threshold during the growing season (Figure 3). The moving average increased at the end of August and peaked in late September (about 8 µg/L).

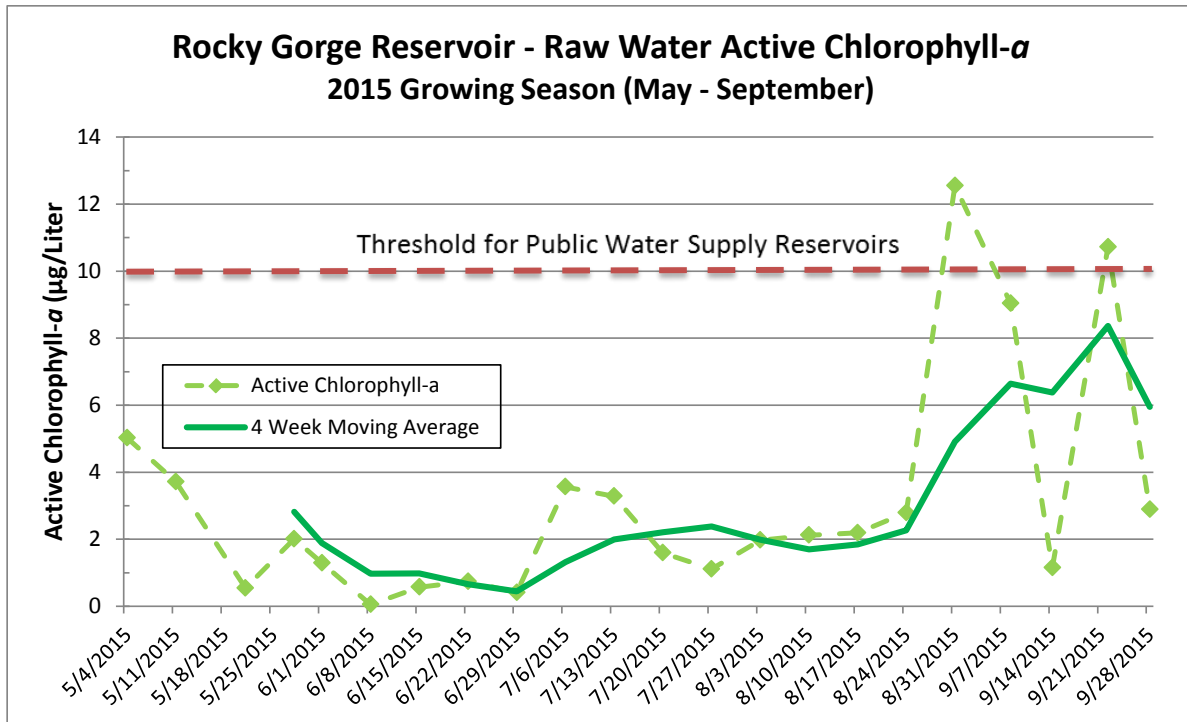


Figure 3. Chlorophyll-*a* results for 2015 growing season from Patuxent Water Plant

Five sets of chl-*a* samples were collected from the reservoirs during the 2015 growing season (May-September). *Active* chl-*a* results were used to better indicate living algal biomass rather than *total* chl-*a*. The top whisker corresponds to the 90th percentile value (Figures 4-5). The 90th percentile threshold was exceeded in Rocky Gorge (36.7 µg/L) for the first time since using this criterion, but was not exceeded in Triadelphia (12.9 µg/L) in 2015.

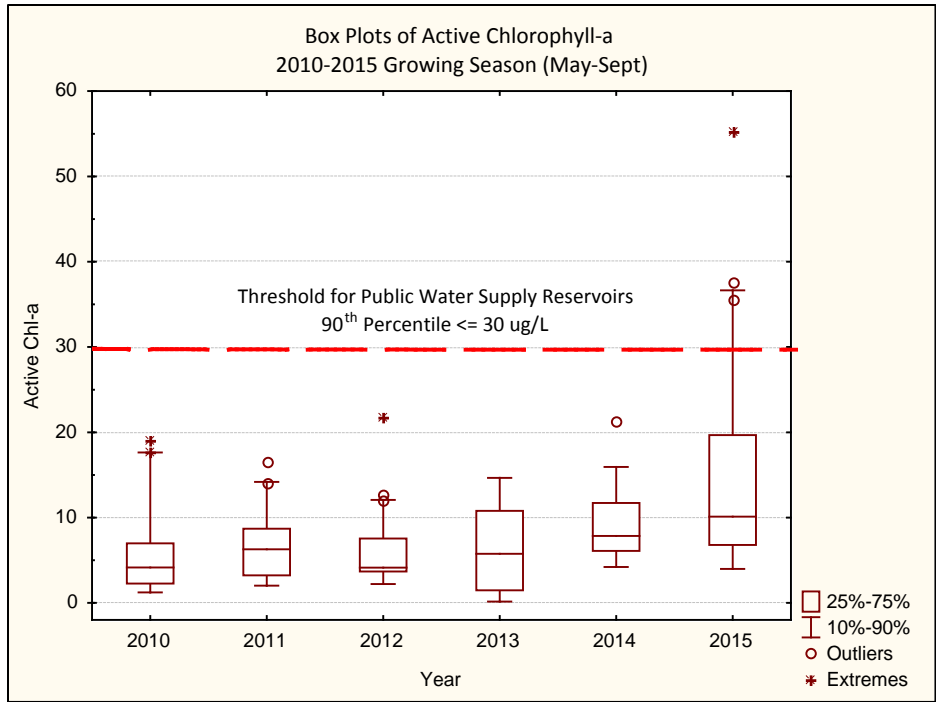


Figure 4. Annual box plots (2010-2015) of growing season chlorophyll-a for Rocky Gorge

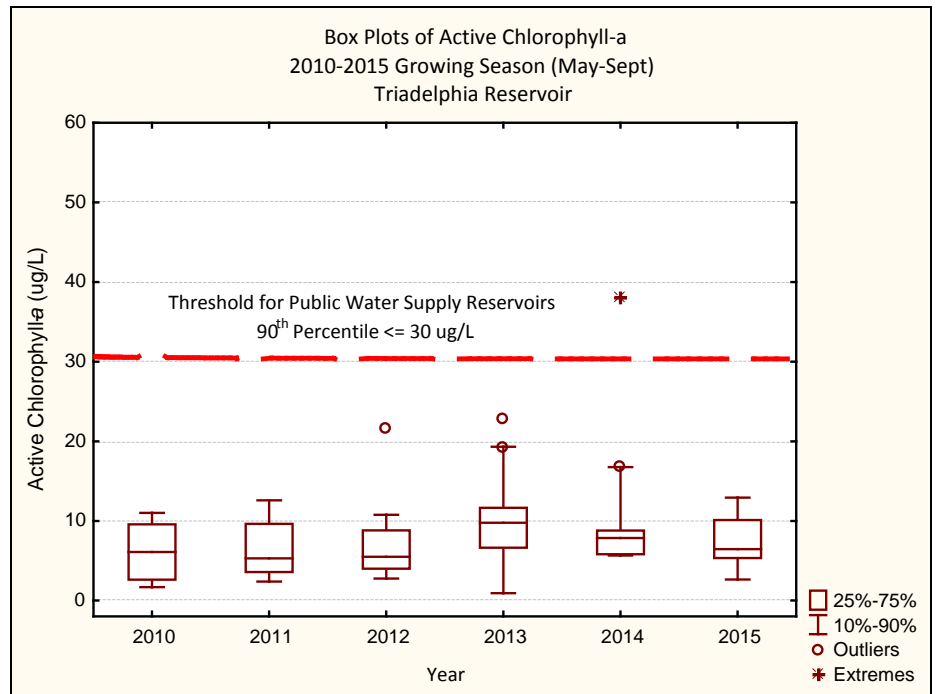


Figure 5. Annual box plots (2010-2015) of growing season chlorophyll-a for Triadelphia

Dissolved Oxygen

Maryland's water quality standard for dissolved oxygen (DO) of 5 milligrams/Liter (mg/L) is the minimum threshold for all state waters, except when natural conditions, such as thermal stratification in reservoirs, cause DO concentrations to fall below this threshold. Bottom (hypolimnetic) waters of deep portions of reservoirs can become depleted of oxygen during summer months when thermal stratification prevents oxygen from entering into deeper waters and the remaining oxygen is consumed during decomposition of organic matter (e.g., decaying algae). Maryland adopted guidelines for interpreting DO and chl-*a* criteria for thermally stratified reservoirs in 2006 (MDE 2012). Historically, these hypoxic, or low DO conditions, have occurred seasonally within both Patuxent Reservoirs, although these conditions are more pronounced in Triadelphia Reservoir.

The three MDE guidelines² to help determine compliance with water quality standards pertaining to DO include:

1. *A minimum DO concentration of 5 mg/L to be maintained in surface layers at all times (except during periods of spring and fall overturn);*
2. *A minimum DO concentration of 5 mg/L to be maintained throughout water column when reservoir is well mixed (non-summer months); and*
3. *Hypoxia (generally thought to be less than 2 mg/L DO) in bottom waters will be addressed by MDE on a case-by-case basis.*

Depth-time (or contour) plots of DO for each reservoir illustrate the degree of hypoxia (<2 mg/L) throughout the water column over time (Figures 6 and 7). The stoplight color pattern of these figures identifies the areas within each reservoir during 2015 where DO concentrations are above Maryland's water quality standard of 5 mg/L (green), between 2 mg/L and 5 mg/L (yellow), and below 2 mg/L (red). For these plots, data are shown for the monitoring stations located nearest the dams of both reservoirs.

As is typical near the Duckett Dam, Rocky Gorge Reservoir exhibited little thermal stratification during 2015, and Triadelphia Reservoir exhibited a more pronounced thermal stratification for a longer period of time than did Rocky Gorge Reservoir. The fall over turn was completed by mid-September in Rocky Gorge Reservoir, but was not completed until mid-November in Triadelphia Reservoir.

² Maryland Department of the Environment. *Guidelines for Interpreting Dissolved Oxygen and Chlorophyll-a Criteria in Maryland's Seasonally Stratified Water-Supply Reservoirs*. Revised February 2012.

Guideline 1

This guideline was satisfied for both reservoirs given that the brief period in September when DO fell below 5 mg/L in Rocky Gorge Reservoir occurred during its fall over turn.

Guideline 2

The DO was measured on several occasions when the reservoir was well mixed (early spring and late autumn) and this guideline was met for both reservoirs during those monitoring events.

Guideline 3

Hypoxia occurred in the bottom waters of both reservoirs. Similar to results from recent years, hypoxic conditions occurred more frequently and to a greater extent in Triadelphia compared to Rocky Gorge. Hypoxia occurred in the bottom waters of Triadelphia beginning in mid-May and persisted until early November; hypoxia occurred in the bottom waters of Rocky Gorge Reservoir beginning in mid-June and persisted until mid-September.

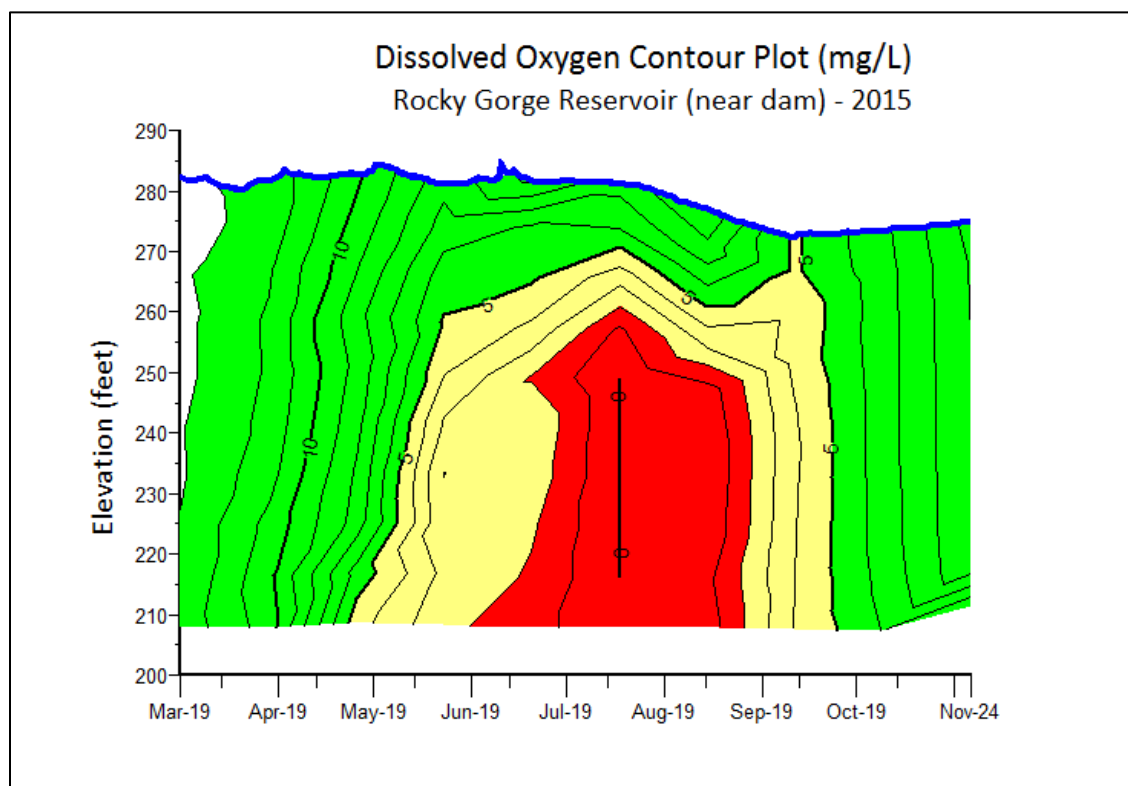


Figure 6. Contour plot of DO concentrations in Rocky Gorge Reservoir

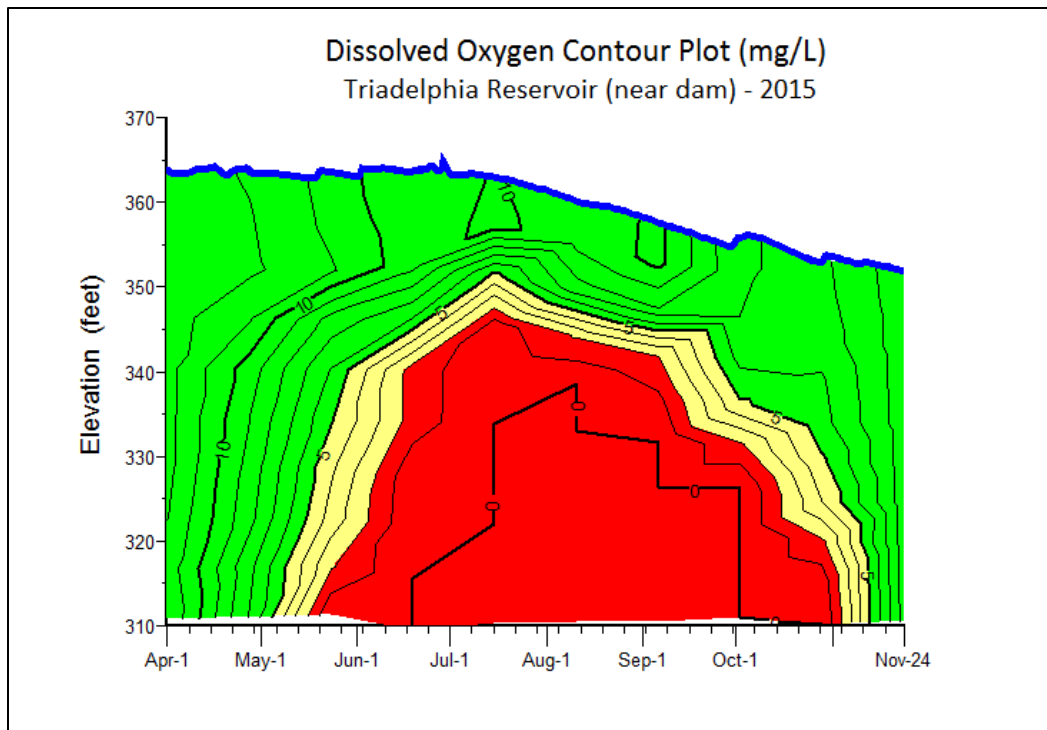


Figure 7. Contour plot of DO concentrations in Triadelphia Reservoir

Terrestrial Habitat

The focus of this priority resource continues to be the preservation and management of forested land that provides water quality benefits to the reservoirs and their tributaries. Forests provide numerous, well-documented water quality benefits such as filtering and infiltrating runoff, stabilizing stream banks, and reducing thermal impacts, as well as providing habitat for wildlife.

In terms of water quality protection, it is beneficial that almost the entire main stem of the Patuxent River upriver of the reservoirs is forested land and that it is publically owned. According to the 2007 Maryland Department of Planning land use data, about 31% of the land within the Patuxent Reservoirs Watershed is forested³. Publically owned forests account for 58% of the total (Figure 8). The Maryland Department of Natural Resources (DNR) manages the largest amount of forests in the watershed within the Patuxent River State Park (about 22,300 acres) followed by the WSSC, which manages about 5,500 acres that surround both reservoirs. The TAC agencies also continue to protect and plant new forest in the Watershed.

³ Boado, A., Roth, N., B. Morgan. *Patuxent Reservoirs Interim Watershed Management Report*. Prepared by Versar, Inc., Columbia, MD for the Patuxent Reservoirs Watershed Protection Group's Technical Advisory Committee. December 2009

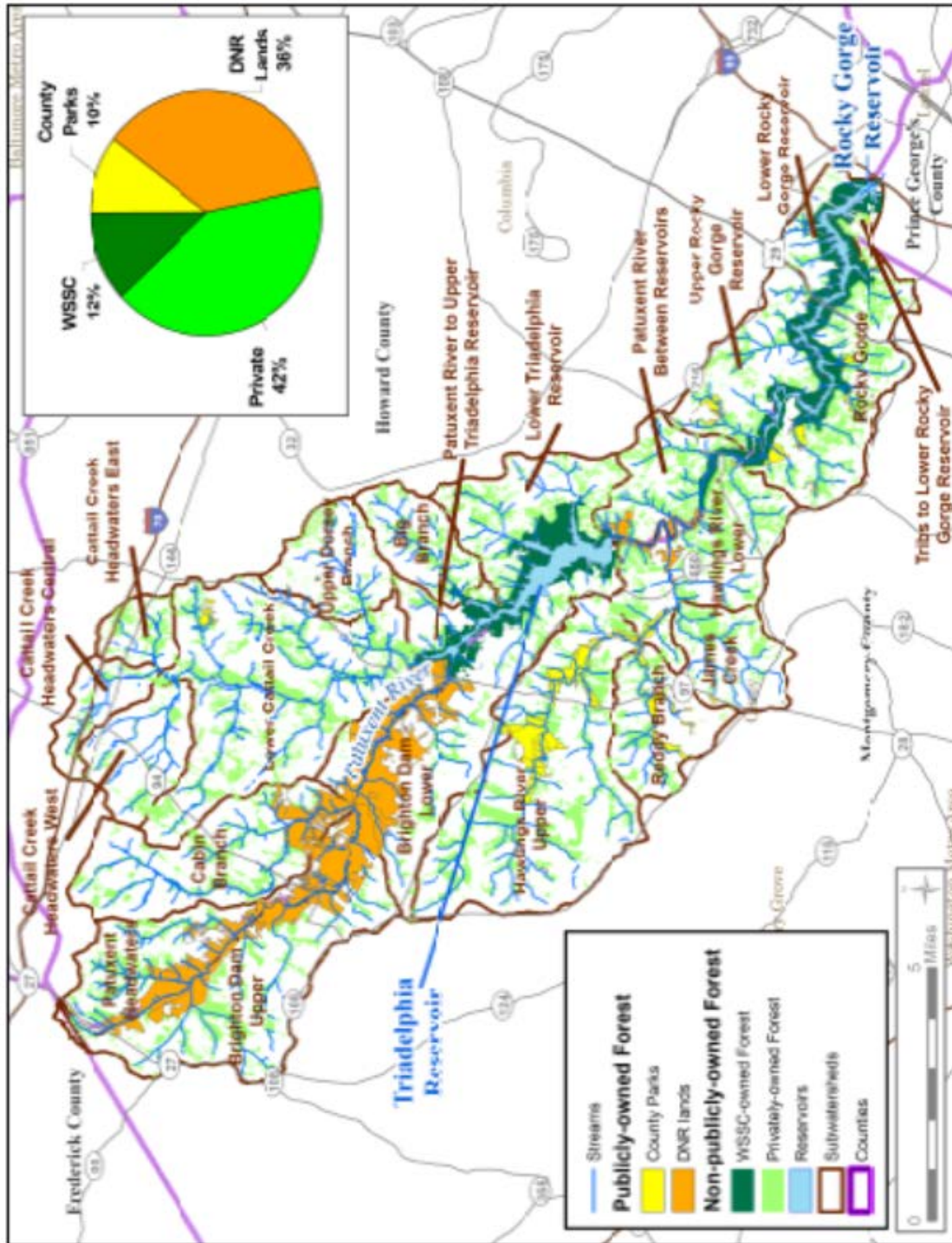


Figure 8. Forest Cover by ownership in the Patuxent Reservoirs Watershed

Howard County Stream ReLeaf and Tree Canopy Programs

Howard County’s Department of Recreation and Parks (DRP) manages both the Stream ReLeaf and Tree Canopy tree planting programs on private property. The DRP planted a total of 249 trees in the Patuxent Reservoirs Watershed in 2015, primarily through the Tree Canopy Program. Trees planted via the Tree Canopy Program can be planted anywhere on a property, but Stream ReLeaf trees are planted to establish stream buffers.

Mangum’s Branch Property Acquisition

During 2015, a total of 36.52 acres of parkland in the Watershed within Montgomery County was added to the M-NCPPC park system, as part of the Patuxent River Watershed Conservation Park. The Mangum’s Branch properties are located just west of Old Columbia Pike near Burtonsville (Figure 9). The properties are mostly forested and contain tributaries to the Rocky Gorge Reservoir.

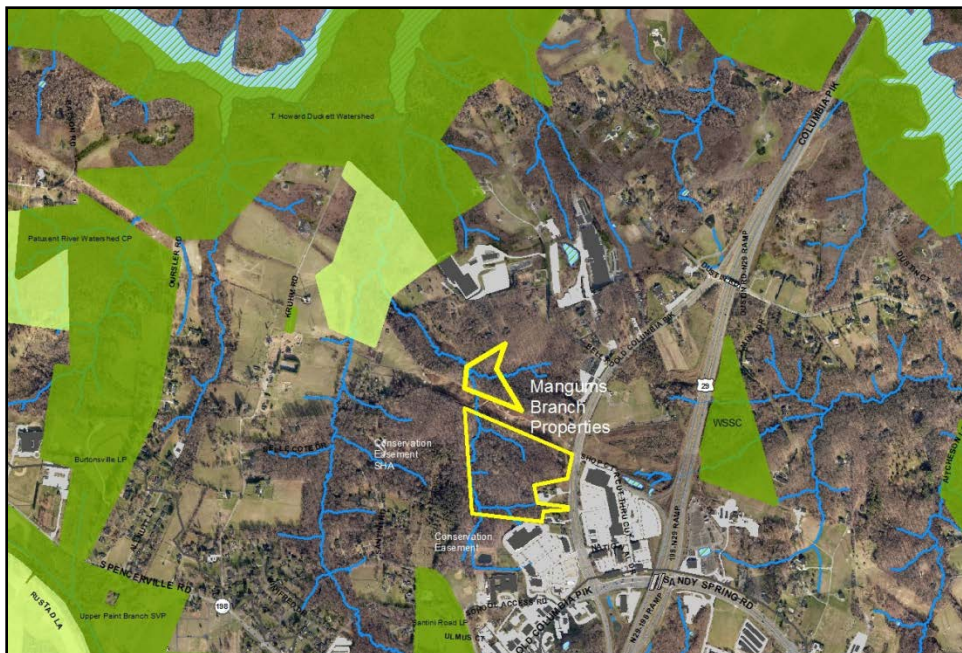


Figure 9 Mangums Branch Properties (shown in yellow) near Burtonsville

Oaks Landfill Reforestation

A Montgomery County reforestation project began in 2011 at the Oaks Landfill in Laytonsville to convert mowed fields to a forest of native trees. This tree planting is designed to meet the MDE’s criteria in the August 2014 “Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated.” In order to claim impervious acre credit, the trees were planted in a density of 100 trees per acre. Once the trees grow to a size where 50% of the trees are 2 inches or greater in diameter at 4.5 feet above ground level, the County will claim 19 acres of impervious acreage equivalent treated. Reforestation and maintenance is being funded by two grants through the Chesapeake and Atlantic Coastal Bays 2010 Trust Fund, totaling \$257,400.

There is also on-going invasive species control on an additional six acres, with plans to complete supplemental planting to increase stocking.

<u>Year</u>	<u>Acres Planted</u>
2011	3.5
2014	41.8
2016 (planned)	22.4
Total	67.7

White-tailed Deer Management

One of the TAC’s goals for this priority resource is to ensure forests are self-sustaining and capable of long-term natural regeneration, and one way to implement this goal is by managing the white-tailed deer population within the watershed. The Department of Natural Resources (DNR), the Montgomery County Department of Parks, the Howard County Department of Recreation and Parks, and the WSSC continued to implement their deer hunting programs in 2015. Deer population control is needed given the many harmful effects associated with an over-abundance of deer including deer-vehicle collisions, agricultural crop damage, and damage to a naturally regenerating and self-sustaining forest ecosystem.⁴

Howard County Department of Recreation and Parks

The Howard County Department of Recreation & Parks Deer Management Program includes annually scheduled bow and shotgun managed hunts and sharpshooting in County parks and open space. The managed hunts and sharpshooting are held in an effort to help maintain a stable, balanced white-tailed deer population in parks where deer browsing has been shown to reduce biodiversity. Since the program began in 1998, there has been an observable improvement in habitat quality and vegetation abundance in many of the parks where managed hunting and sharpshooting has taken place.

Patuxent River State Park

The DNR’s Wildlife and Heritage Service manages the deer population in Maryland. DNR lands include the majority of parkland in the Patuxent Reservoirs Watershed, with extensive areas adjacent to the Patuxent River. Annual deer harvest totals in Patuxent River State Park have increased since 2000 with a slight decrease in annual totals since 2014 (Figure 10). Totals reported include data from Howard and Montgomery Counties.

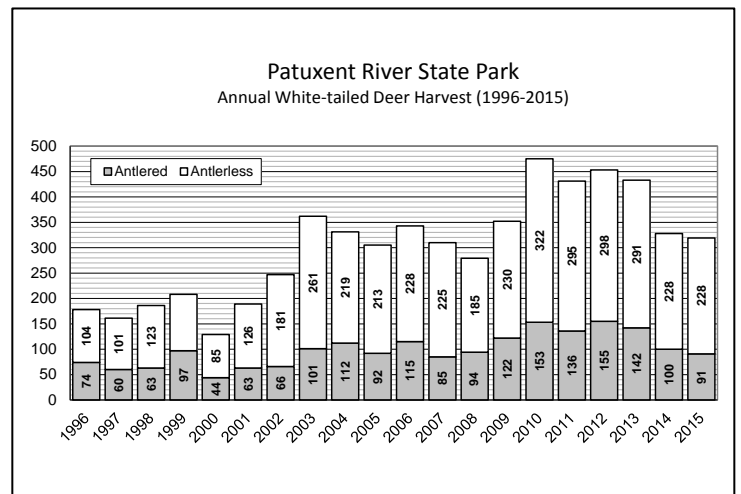


Figure 10. Patuxent River State Park Annual Deer Hunts (1996-2015)

⁴ The Montgomery County Deer Management Work Group. *Comprehensive Management Plan for White-tailed Deer in Montgomery County, MD*. Revised 2004.

Montgomery County Department of Parks

During 2015, the Montgomery County Department of Parks continued to implement its Deer Management Program, which reduces the number of deer in M-NCPPC parkland, and the adverse effects of deer overpopulation on forest and other ecosystems. The M-NCPPC Deer Management Program focusses on large wooded areas within parkland and along stream valley parks. Within the Patuxent River Reservoirs Watershed, the program has centered on the Rachel Carson Park. The program has been effective in reducing deer. Prior to program implementation, the deer density in Rachel Carson Park was about 180 deer/sq. mile. By 2012 the deer population in the park was reduced to a density of about 29 deer/sq. mile.

WSSC

The WSSC continued its managed hunting program on most of its 5,500 acres of land surrounding both reservoirs. For the 2015-16 hunting season, 22 managed hunts occurred in eight areas surrounding both reservoirs. The most recent hunting season began in October 2015 and finished in January 2016. Figure 11 presents the total number of deer harvested on WSSC owned lands from 2001 to 2015.

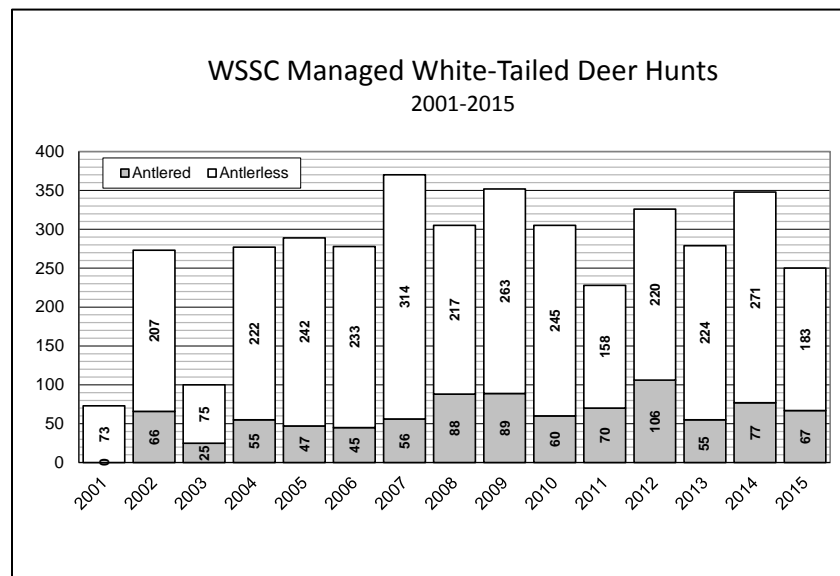


Figure 11. WSSC Deer Hunt Totals (2001-2015)

Stream Systems

Stream corridor management activities include stream channel stabilization and restoration, and implementing streamside BMPs. These activities are targeted at stream channel reaches that were identified in stream corridor assessment surveys as severe problem areas for erosion. These activities help restore and protect the stream system, improve habitat and water quality for aquatic biota, and support protection of the reservoirs and water supply (i.e., minimize loss of capacity due to sedimentation).

Cherrytree Farms Stream Restoration Project

The fifth year of post-construction monitoring by Howard County for the Cherrytree Farms stream restoration project was completed in December 2015. The restoration reach is an unnamed tributary to the Rocky Gorge Reservoir and is adjacent to Sand Cherry Lane in Scaggsville. The project area consists of a total of approximately 670 linear feet. Construction of the restored channel was completed in April 2010. Overall, results from five annual monitoring assessments indicate that minor channel adjustments are occurring, but do not appear to pose a threat to the overall stability of the channel, but do appear to be worsening over time. No rehabilitation repairs were recommended at this time, however monitoring will continue with a sixth year in 2016. The report also noted that vegetation establishment has improved greatly throughout the site over the monitoring years. Many volunteer species have become established in areas that were previously bare, and planted trees, shrubs, and live stakes have grown substantially.

Aquatic Biota

Tributary Biological and Habitat Monitoring

Biological and habitat monitoring of the tributaries is used to track progress in protecting the stream system and aquatic biota, as land cover changes occur and stream restoration and streamside BMPs are implemented. These monitoring efforts can also identify problem areas and provide indicators for possible problem sources to help guide future restoration efforts.

Howard County

The Howard County Department of Public Works, Stormwater Management Division initiated the Howard County Biological Monitoring and Assessment Program in the spring of 2001. The program involves monitoring the biological and physical condition of the county's water resources to monitor status and detect trends at the stream level, the watershed level, and ultimately the county level. The Department of Public Works (DPW) initiated the program to establish a baseline ecological stream condition for all of the county's watersheds⁵. A second

⁵ Rogers, G., B. Franks, T. Hage, and M. Southerland. *Howard County Biological Monitoring and Assessment, Upper Brighton Dam, Lower Brighton Dam, and Cattail Creek Watersheds – 2012*. Prepared by Versar, Inc., Columbia, MD for Howard County, Department of Public Works, Stormwater Management Division, Columbia, MD. December 2012.

round of monitoring was done in the Cattail Creek and Brighton Dam watersheds in 2005 and in the Rocky Gorge watershed in 2009. The third round of sampling the Cattail Creek and the Upper and Lower Brighton Dam watersheds was completed in 2012.

Biological results from aquatic insect (aka benthic macroinvertebrate) samples indicate these subwatersheds are in good to fair condition. Of the thirty sites surveyed, twenty-two (73%) received an overall benthic index rating of good, six (20%) received a rating of fair, and two (7%) received a rating of poor. The habitat assessment results indicate average subwatershed physical habitat conditions that were often supporting biological conditions similar to reference streams in all three sub-watersheds. Of the thirty sites surveyed, nine (30%) were comparable to reference streams, eighteen (60%) were supporting, one (3%) was partially supporting and two (7%) were non-supporting. The complete report, including a comparison of the three rounds of survey results, can be found at the DPWs' [Watershed Survey web page](#).

The DPW plans to conduct its biomonitoring program in the Rocky Gorge watershed in 2016.

Montgomery County

The Department of Environmental Protection (DEP) Biological Monitoring Group performed monitoring in the Patuxent Reservoirs watershed in 2015. Results of that monitoring will be available in 2016.

In 2016, DEP will also perform the 10th year monitoring of the Hawlings River Stream Restoration Project. The monitoring will evaluate fish and benthic organisms, habitat and geomorphology as these parameters relate to project goals. Results will be available in 2017.

Rural Character and Landscape

The aim of this priority resource is to preserve open spaces while maintaining an economically viable and environmentally protective agricultural community.

Agricultural Preservation Easement enrollments

One Howard County farm was enrolled in the County Agricultural Land Preservation Program during 2015. The 57.3 acre farm along Annapolis Rock Road is adjacent to the Patuxent River State Park and is located in the Triadelphia Reservoir watershed.

Agricultural Progress

A summary of the progress made during 2015 by both the Howard and Montgomery Soil Conservation Districts (SCDs) is provided in Table 4. The SCDs use funding from local, state and federal programs to provide technical and financial assistance to landowners for the installation of agricultural BMPs. The numbers reported account for activity from July 1, 2014 through June 30, 2015. Note that estimated pollutant load reductions have been assigned in the Chesapeake Bay Program Model for nutrients and total suspended solids for BMPs shaded in Table 4. Estimating load reductions from agricultural BMPs was part of the TAC's assessment of progress made thus far toward achieving the reservoir TMDL goals.

Table 4. Agricultural Progress for 2014-15 in the Patuxent Reservoirs Watershed

	Howard SCD	Montgomery SCD	Total
Conservation Plans developed (acres)	8 (868.7)	8 (866)	16 (1734.7)
Conservation Plans revised (acres)	2 (425.1)	2 (104.5)	4 (529.6)
Best Management Practices Installed	40	88	128
Best Management Practice			
Ag Waste Storage Structure	-	1	1
Conservation Crop Rotation (acres)	-	34.8	34.8
Contour Farming (acres)	-	40.2	40.2
Cover Crop (acres)	26 (1167.9)	8 (2553)	34 (3720.9)
Field Border (feet)	-	1,380	1,380
Grade Stabilization Structure	2	-	2
Grassed Waterways (acres)	7 (3.4)	3 (2.25)	10 (5.7)
Heavy Use Area Protection (acres)	-	-	-
Livestock Exclusion Fencing (feet)	697	2 (4,762)	3 (5459)
Livestock Watering System/Watering Facility	10	1	11
Nutrient Management (acres)	-	2 (99)	2 (99)
Pipeline (feet)	-	465	465
Residue Management – Mulch Till (acres)	-	173.4	173.4
Residue Management – No Till (acres)	-	-	-
Roof Runoff System	-	1	1
Spring Development	1	-	1
Stream Crossing	1	-	1
Waste Utilization/Recycling (acres)	-	6 (211.0)	6 (211.0)

Two charts are also included to summarize progress of the SCDs since 2000. The MDE used the water quality data collected from 2000 to establish the TMDLs for the reservoirs and used WSSC data from 1998-2003 for model calibration. Therefore, summarizing the cumulative progress since that time period provides a partial means to support an assessment of pollutant reductions since the EPA established the reservoir TMDLs. The charts show the number of farm acres with an established Soil Conservation and Water Quality Plan (farm plan) (Figure 12) and the number of BMPs installed (Figure 13). In 2015 farm plans were written for 1,735 acres (2.7 square miles). Since 2000, farm plans have been written for 20,300 acres (31.7 square miles), and 2,442 BMPs have been installed.

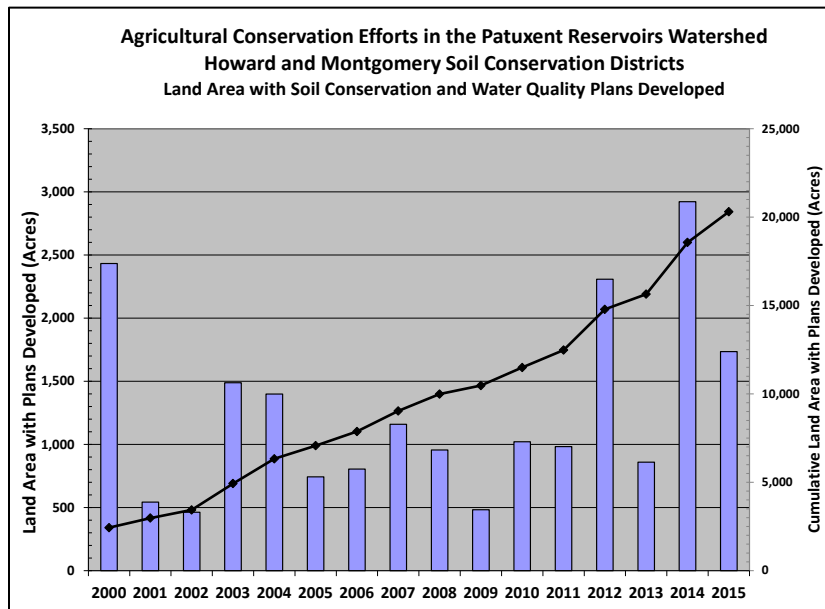


Figure 12. Farm Acres with Soil Conservation and Water Quality Plans

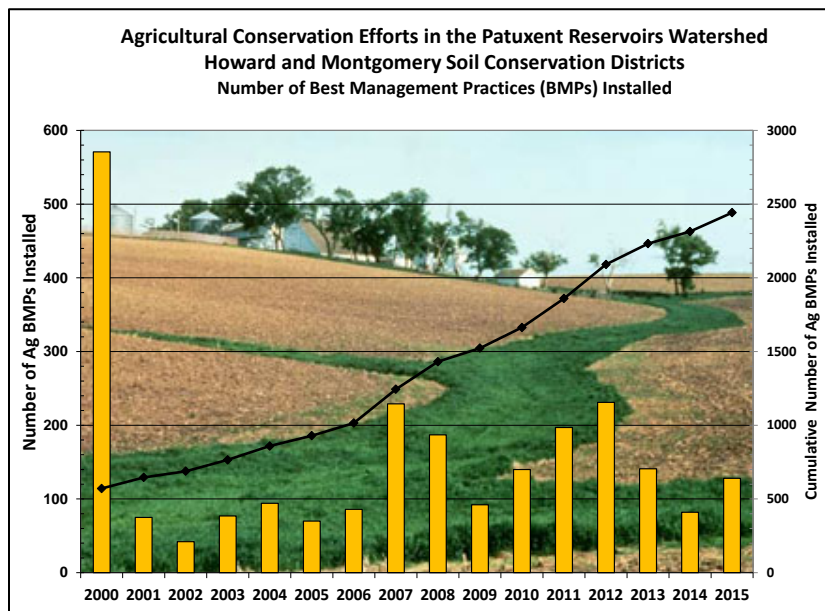


Figure 13. Number of Best Management Practices Installed

Patuxent Reservoirs Watershed Agricultural Cost-Share Program

In 1998, the Patuxent Reservoirs Watershed Protection Group created the *Patuxent Reservoir Protection Strategy Memorandum of Understanding (MOU)*, which established the Patuxent Reservoirs Watershed Agricultural Cost-Share Program. This cost-share program focuses on implementing BMPs that will benefit nearby stream systems. The program is targeted at small agricultural operations that may not qualify for other State and federal cost-share programs. In the Patuxent Reservoirs Watershed, many of these operations are small horse farms.

Collaboration last year among partnership agencies led to changes to the agricultural cost-share program. A subcommittee was tasked with developing recommendations to improve the usefulness of the cost-share program by broadening the practices and landowners that could qualify for assistance. Many details of the original program established fifteen years ago were outdated and did not reflect current conservation objectives. The subcommittee drafted a new MOU that underwent a succession of technical and legal reviews. The new MOU went into effect on May 27, 2014, which released new funding for the program. The subcommittee is optimistic that these amendments to the program will elicit additional interest from the agricultural community.

The remaining funds in this cost-share program as of June 30, 2015 are:

HSCD	\$50,752
MSCD	<u>\$34,845</u>
Total	\$85,597

Efforts this year have focused on restructuring the terms of the agricultural cost share application and process. Members of the subcommittee that revamped the MOU were also involved in the process of updating the guidelines for the cost-share program to better reflect the current needs of agricultural landowners in the reservoirs watershed area. The revised documents and program details were completed in the spring of 2015.

Although historical interest in the program had been spotty in Montgomery County, these updates have sparked new interest, especially among small equine farms. Montgomery SCD used \$5,000 of the Patuxent Cost-Share program during FY15. A roof runoff and heavy use area were installed in FY15, and Montgomery has 2 more projects underway in FY16. It is anticipated that the update in cost-share rates and the broadening of program applicability will lead to increased participation throughout the watershed.

Howard County Land Use

The majority of the Patuxent Reservoirs Watershed in Howard County is outside the Planned Service Area (PSA) for public water and sewer service, and is zoned Rural Residential (RR), for low density residential development, or Rural Conservation (RC), for farming and low density, clustered residential development. A small portion of the watershed is within the PSA and is zoned for more dense residential development.

Howard County adopted a new comprehensive plan, PlanHoward 2030, in 2012. This was followed by the Comprehensive Zoning Plan process in 2013, to implement key policy recommendations in PlanHoward 2030. During this process, a large parcel of just over 91 acres in Fulton, known as Maple Lawn South, was rezoned from Rural Residential to Residential-Environmental Development (R-ED) with a Mixed Use Development (MXD) overlay district. This parcel was designated in PlanHoward 2030 to be included in an expansion of the PSA, because it is close to US Route 29 and the Maryland Transportation Administration commuter bus service/park and ride lot, as well as immediately adjoining the approved Maple Lawn Mixed Use Development, which was designated as a mixed use growth area in the 1990 General Plan.

In 2014, Howard County approved an Environmental Concept Plan (ECP-14-093) for this property that proposed 176 single family detached homes in compliance with the R-ED zoning district, which has a 50% open space requirement. A Preliminary Equivalent Sketch Plan (SP-15-014) was approved in 2015 and a Final Plan (F-16-021) to record the subdivision is currently under review.

In 2014, the County Council convened a Task Force to study current zoning regulations for mulching, composting and wood processing facilities, and to make recommendations for changes to these regulations, if necessary. Bert Nixon was appointed to be a member of the Task Force, which began meeting regularly in July 2014. The Task Force was unable to fully resolve some issues, resulting in both a majority and a minority report being submitted to the County Council in March 2015. In August 2015, the Dayton Rural Preservation Society submitted a Zoning Regulation Amendment (ZRA-160) request to the County, which proposed to “incorporate recommendations of the Mulch and Wood Task Force . . . Specific regulations are a composite of the recommendations of the majority and minority members on the task force as written by the minority members.” This ZRA is currently under review by the Department of Planning and Zoning.

Public Awareness and Stewardship

The TAC agencies and other groups in the watershed continued to coordinate public outreach and involvement initiatives during 2015. Under the coordination of WSSC's Communications and Community Relations Office staff, there were about 55 environmental stewardship events in 2015, as well as other successful outreach events coordinated by other TAC agencies that occurred in Howard, Montgomery, and Prince George's Counties.

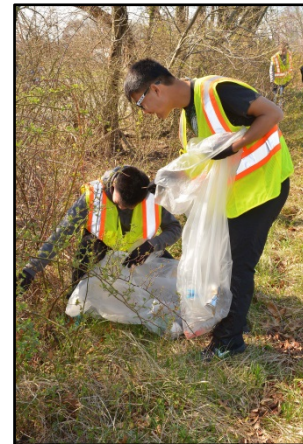
Montgomery County Department of Parks

The Montgomery County Department of Parks coordinated two trash cleanups in the Patuxent Reservoirs Watershed in 2015, both in conjunction with the Olney Mill Community Association (spring and fall cleanups). At those two cleanups 55 volunteers worked for 180 total hours and removed 635 pounds of trash and 150 pounds of recyclables.

Under the Montgomery County Department of Parks Weed Warrior Program, which coordinates volunteer efforts to remove invasive plants from natural areas, a total of 268 person-hours within the Patuxent watershed were logged during 2015. Some of the Weed Warrior group efforts are coordinated with other events, such as Earth Day, to draw more attention to the environmental needs of natural areas and the importance of stewardship.

Patuxent River Clean-up

In cooperation with the office of the Patuxent Riverkeeper, the WSSC's Communications and Community Relations Office participated once again in the annual *Patuxent River Clean-up*. The designated clean-up day was April 11, 2015, but there was work that occurred throughout the month of April to accomplish the massive clean-up. Approximately 60 volunteers from the neighboring communities, school groups, and Boy and Girl Scout troops formed work crews at eight WSSC recreation areas, collecting hundreds of pounds of trash and recyclables. All clean-up efforts for the month were included in the final tallies reported to the Riverkeeper. Site leaders for this effort volunteered their time to organize, recruit, and report for this clean-up event.



RainScapes Rewards Program

The Montgomery County DEP continued its countywide RainScapes Rewards Program to provide rebates to property owners who voluntarily install practices that capture and store runoff from rooftops and paved areas in their yards, thus reducing storm water impacts downstream.

The majority of these projects have been urban tree canopy plantings. Combined savings are possible for these projects using \$25 coupons from both the Maryland DNR and the M-NCPPC, and the RainScapes \$200 per tree rebate. Rainwater harvesting practices using rain barrels or

cisterns are the second most popular practice for the rebate program. No rain gardens have been installed in the Reservoirs Watershed through the RainScapes Rewards program.

By the end of FY15, there were 32 projects installed in the Patuxent Reservoirs Watershed, managing runoff from 1.2 acres of impervious surfaces. There were 16 tree canopy projects, along with 12 rain barrels, three rooftop disconnection projects, and one pervious paver project installed.

Environmental Outreach – WSSC’s “Watershed” Property Surrounding the Reservoirs



2015 was the 10th Anniversary for WSSC’s Children’s Water Festival. During this two-day event almost 700 4th grade students from Montgomery and Prince George’s counties gathered at Brighton Dam to learn about water and the importance of protecting local waterways and ecosystems. Students rotated among 12 activity stations including: recycling, watersheds, water pollution, and water conservation.

During the spring, WSSC hosted over 300 students during 8 field trips to its watershed property. Many of the students were participating in Trout Unlimited’s Trout in the Classroom program.

During the field trip students not only released trout into the river but also learned about where their drinking water comes from, why it is important to protect local watersheds and actions they can take to avoid polluting waterways.



On September 26th WSSC hosted the 15th annual Family Campfire at Brighton Dam. An addition to this event was the “Watershed Fair” which provided time for community members to meet organizations that work to protect the Patuxent River Watershed. Not only were a number of TAC agencies represented, but so were local recreation groups and non-profit environmental education organizations.

WSSC also started a trail maintenance public stewardship program. During the fall volunteers helped to re-blaze and clean up over 15 miles of trails along the Rocky Gorge Reservoir. Other public stewardship events included clean-ups, garden maintenance, and invasive species removal.

Table 5. Performance Measures and Goals for Priority Resources

Priority Resources: Goals & Performance Measures				
Resource: Reservoir/Water Supply				
Issue: The public need for a sufficient quantity of safe and high quality drinking water calls for adopting a proactive and multi-barrier approach, which starts with utilizing raw water of the highest quality and sustainable quantity, now and in the future. To achieve this for the Patuxent water filtration plant, we need to control reservoir eutrophication, reduce disinfectant by-products precursors, and limit reservoirs capacity loss.				
Measures	Goals	Implementation Items	Time Line	Responsible Partner
Chlorophyll- <i>a</i> (chl- <i>a</i>)	<ul style="list-style-type: none"> Chl-<i>a</i> not to exceed a 10 µg/L mean during the growing season and not to exceed a 30 µg/L instantaneous concentration 	<ul style="list-style-type: none"> Perform reservoir monitoring for chl-<i>a</i>, DO, and TOC during the growing season 	Ongoing	WSSC
Dissolved oxygen (DO)	<ul style="list-style-type: none"> DO not to fall below 5 mg/L at any time in the epilimnion, not to fall below 5 mg/L in the entire water column during completely mixed periods, and not to fall below 10% saturation at any time in the hypolimnion 	<ul style="list-style-type: none"> Perform reservoir monitoring for CHL-<i>a</i>, DO, and TOC during the growing season 	Ongoing	WSSC
Suite of water quality parameters in reservoir monitoring protocol	<ul style="list-style-type: none"> Five-year data trend analysis for other monitored water quality parameters shows no net deterioration 	<ul style="list-style-type: none"> Develop and begin implementation of a plan to reduce nutrients, based on model/TMDL requirements Update trend analysis for reservoir water quality parameters on a 5-year cycle 	Ongoing Next Update: 2014	TAC WSSC
Total organic carbon (TOC)	<ul style="list-style-type: none"> TOC – 20% annual reduction goal, with 40% reduction for peak quarter at the location where water is withdrawn for treatment purposes 	<ul style="list-style-type: none"> Perform reservoir monitoring for CHL-<i>a</i>, DO, and TOC during the growing season 	Ongoing	WSSC
Sediment	<ul style="list-style-type: none"> Sediment accumulation rate not to exceed previous years 	<ul style="list-style-type: none"> Perform bathymetric survey of reservoirs at 10 year intervals or less 	Next Survey in 2014/2015	WSSC

Priority Resources: Goals & Performance Measures (continued)

Resource: Terrestrial Habitat

Issue: Preservation of forests provides water quality benefits by reducing sediment and nutrient loading of streams from surrounding land uses.

Measures	Goals	Implementation Items	Time Line	Responsible Partner
Forest Cover	<ul style="list-style-type: none"> Maintain and increase forest cover Increase forest interior habitat 	<ul style="list-style-type: none"> Encourage private property owners to participate in tree planting programs Ensure publicly owned parkland and open space is forested to the maximum extent possible 	Ongoing	TAC
			2006 – 2023	TAC
Forest Connectivity	<ul style="list-style-type: none"> Improve forest connectivity (larger forest tracts are connected by forest corridors) 	<ul style="list-style-type: none"> Target reforestation and forest conservation programs to increase forest connectivity and forest interior habitat 	Ongoing	TAC
Forest Size	<ul style="list-style-type: none"> Increase forest size 	<ul style="list-style-type: none"> Encourage private property owners to participate in tree planting programs Ensure publicly owned parkland and open space is forested to the maximum extent possible 	Ongoing	TAC
			2006 – 2023	TAC
Forest Diversity	<ul style="list-style-type: none"> Ensure diverse forest communities (communities contain a variety of species and ages) 	<ul style="list-style-type: none"> Develop a forest management plan to ensure forest diversity and long-term natural regeneration, identifying and addressing potential problems such as excessive deer populations, invasive species and human impacts 	2006 – 2013 WSSC Plan completed FY08	TAC WSSC
Forest Sustainability	<ul style="list-style-type: none"> Ensure forests are self-sustaining and capable of long-term natural regeneration 	<ul style="list-style-type: none"> Implement deer management programs Implement strategies for control of invasive plants 	Ongoing	TAC
			Ongoing	TAC

Priority Resources: Goals & Performance Measures (continued)

Resource: Stream System

Issue: Preventing stream habitat degradation - The stream system includes all intermittent and perennial streams and their adjacent floodplains. A stable stream system provides significant nutrient and sediment removal during both baseflow and storm flow events. The stream and its associated riparian buffer are also important as sources of high quality food and habitat for both aquatic and terrestrial organisms.

Measures	Goals	Implementation Items	Time Line	Responsible Partner
Buffer corridor width and continuity	<ul style="list-style-type: none"> A minimum 35-foot riparian buffer on all streams on properties that were developed prior to current stream buffer requirements 	<ul style="list-style-type: none"> Establish and maintain minimum 35-foot riparian buffers on all publicly-owned land Accelerate programs to establish and maintain streamside buffers to a minimum of 35 feet on privately-owned lands to the maximum extent possible 	<p>2006 – 2013</p> <p>2006 – 2023</p>	<p>WSSC, M-NCPPC, HC, MC</p> <p>WSSC, M-NCPPC, HC, HSCD, MC, MSCD</p>
Stream bank and stream channel stability	<ul style="list-style-type: none"> No areas of "severe" or "very severe" stream bank erosion based on the Stream Corridor Assessments and other locally collected data. 	<ul style="list-style-type: none"> Establish and maintain streamside fencing programs to keep all livestock out of streams to the maximum extent possible Address <u>significant</u> areas of stream bank and channel instability through stream restoration projects and storm water retrofits to the maximum extent possible 	<p>2006 – 2013</p> <p>2006 – 2013</p>	<p>HSCD, MSCD</p> <p>HC, HSCD, M-NCPPC, MC</p>

Priority Resources: Goals & Performance Measures (continued)

Resource: Aquatic Biota

Issue: Biological Integrity– This is the condition of the benthic macroinvertebrate communities based on a comparison to a reference stream in Montgomery County. A reference stream is relatively undisturbed and therefore the best quality to be expected in the region that includes the Patuxent Reservoirs Watershed.

Measures	Goals	Implementation Items	Time Line	Responsible Partner
IBI - Index of Biological Integrity	<ul style="list-style-type: none"> No subwatershed with a benthic IBI indicating "fair" or "poor" condition 	<ul style="list-style-type: none"> Pursue cost-share funds to construct agricultural BMPs, stream restoration, and storm water retrofit projects to address factors contributing to degraded biological integrity Mitigate runoff impacts from land use changes 	2006 – 2023	HC, HSCD, MC, MSCD, M-NCPPC
			2006 – 2023	HC, MC, M-NCPPC
	<ul style="list-style-type: none"> Preserve conditions in subwatersheds with "excellent" and "good" benthic IBIs 	<ul style="list-style-type: none"> Protect existing habitat and water quality of streams in high-quality subwatersheds to the maximum extent possible by pursuing programs to maintain or increase existing land cover 	2006 – 2023	HC, HSCD, MC, MSCD, M-NCPPC

IBI - Index of Biological Integrity is also referred to as Index of Biotic Integrity in Maryland Biological Stream Survey publications.

Priority Resources: Goals & Performance Measures (continued)

Resources: Rural Character and Landscape

Issue: Preserving open spaces and maintaining an economically viable and environmentally protective agricultural community.

Measures	Goals	Implementation Items	Time Line	Responsible Partner
Agricultural Preservation Enrollment <ul style="list-style-type: none"> Total acres enrolled Number of farms enrolled 	<ul style="list-style-type: none"> Preserve the agricultural and rural nature, and open space of the watershed 	<ul style="list-style-type: none"> Continue easement acquisition through agricultural land preservation programs Continue agricultural economic development programs 	Ongoing	HC, MC
			Ongoing	HC, MC
Agricultural Demographics <ul style="list-style-type: none"> Acres of agricultural land Market value of agricultural production Size of farms Types of farms 	<ul style="list-style-type: none"> Preserve the agricultural and rural nature, and open space of the watershed 	<ul style="list-style-type: none"> Continue zoning and land use policies in the watershed to maintain rural character Continue agricultural economic development programs 	Ongoing	HC, M-NCPPC
			Ongoing	HC, MC
Open Space and Parkland Acquisition and Easement Programs <ul style="list-style-type: none"> Acres of open space land preserved by non-agricultural easements or acquisition 	<ul style="list-style-type: none"> Create a landscape that is protective of water quality 	<ul style="list-style-type: none"> Utilize effective open space land management practices that are beneficial to water quality 	Ongoing	HC, M-NCPPC, WSSC
Participation in agricultural conservation programs and percent of conservation plans that are implemented	<ul style="list-style-type: none"> Create a landscape that is protective of water quality 	<ul style="list-style-type: none"> Encourage participation in other conservation and open space preservation programs Encourage enrollment in federal and state nutrient management and stream protection programs Promote greater utilization of funding provided by the Reservoir Protection Group to supplement federal and state agricultural programs Create and routinely update an electronic map based system to track BMP implementation 	Ongoing	HC, MC, M-NCPPC
			Ongoing	HSCD, MSCD
			Ongoing	HSCD, MSCD
			2006 – 2013	HSCD, MSCD

PRIORITY RESOURCES: GOALS & PERFORMANCE MEASURES (continued)

Resource: Public Awareness and Stewardship

Issue: Awareness and support by residents and resource users

Measure	Goals	Implementation Items	Time Line	Responsible Partner
Residents participating in stewardship activities	<ul style="list-style-type: none"> • Citizen action to improve watershed resources – see evidence of watershed friendly activities and practices • 10 to 15 stewardship offerings per year 	<ul style="list-style-type: none"> • Identify citizen groups throughout watershed and be available for presentations upon request • Organize stewardship events and participate in other community events • Recognize good stewards through annual awards • Form “Friends of the Watershed” group of citizen volunteers that will take on tasks such as newsletter preparation and some Earth Month planning 	<p>2006 – 2009</p> <p>Ongoing</p> <p>2006 – 2008</p> <p>2006 – 2009</p>	<p>TAC</p> <p>TAC</p> <p>MC, PGC, HC, M-NCPPC TAC</p>
Schools participating in mentoring	<ul style="list-style-type: none"> • School and community involvement – 20 participating Green School partners by end of 2003 and 5 additional schools participating each year thereafter until all 43 are attained 	<ul style="list-style-type: none"> • Continue and expand Green Schools Mentoring Partnership 	<p>Ongoing</p>	<p>WSSC, HC, MC, PGC, M-NCPPC</p>
Active support by elected officials	<ul style="list-style-type: none"> • Routine communication with elected officials 	<ul style="list-style-type: none"> • Routine communication with elected officials 	<p>Ongoing</p>	<p>TAC</p>
Routine coverage by media	<ul style="list-style-type: none"> • Expanded media coverage of watershed events – print, radio and TV 	<ul style="list-style-type: none"> • Increase communication with media • Support regional efforts to establish media-savvy campaigns that emphasize water quality protection 	<p>2006 – 2009</p> <p>2006 – 2008</p>	<p>TAC</p>

Table 6. Work Plan Expenditures for Current Fiscal Year

PATUXENT RESERVOIRS WATERSHED WORK PROGRAM FOR FY15				
PRIORITY RESOURCES PROTECTED	IMPLEMENTATION NEED	IMPLEMENTATION ITEM	AGENCY	FY 2015
Reservoir/Water Supply	Reservoir and tributary water chemistry and flow monitoring	Reservoir monitoring and lab analysis	WSSC	\$162,000 (in-kind)
		5 US Geological Survey stream flow gauging stations	WSSC	\$60,000
ALL Priority Resources	Management of agricultural cost-share initiatives	Program oversight for voluntary implementation of agricultural BMPs through existing local, State of Maryland, and Federal programs	HSCD, MSCD	\$165,000 (SCD in-kind)
	Patuxent Reservoirs Watershed MOU and Cost-Share Agreement	Cost-share funds spent	HSCD, MSCD	\$5,000
ALL Priority Resources	Public outreach and involvement initiatives	RainScapes Rewards	MC	Rebates available to county residents for Low Impact Development (LID)
ALL Priority Resources	Public outreach and involvement initiatives	Earth Month, and other outreach activities	WSSC	\$140,000 (in-kind)
			Other TAC agencies	\$2,500 (in-kind)

PATUXENT RESERVOIRS WATERSHED WORK PROGRAM FOR FY15				
PRIORITY RESOURCES PROTECTED	IMPLEMENTATION NEED	IMPLEMENTATION ITEM	AGENCY	FY 2015
ALL Priority Resources	Complete Annual Report and Technical Supplement	Compilation and editing	WSSC	\$10,000
			Other TAC Agencies	In-kind
	Coordination and Collaboration	Provide administrative support & coordination among partners	WSSC	\$35,000
Reservoir/Water Supply Stream System Aquatic Biota Public Awareness & Stewardship	TMDL Implementation	Begin scoping study for TMDL Implementation Plan for both reservoirs	MC, M-NCPPC, PGC, WSSC	\$70,000
TOTAL FUNDING				\$649,500