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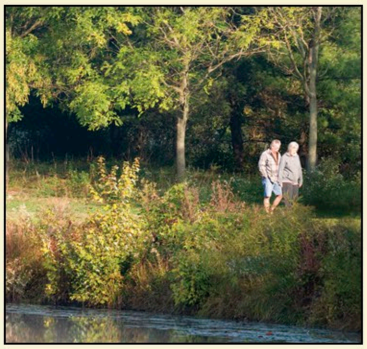
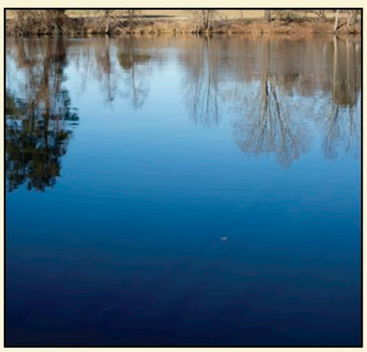
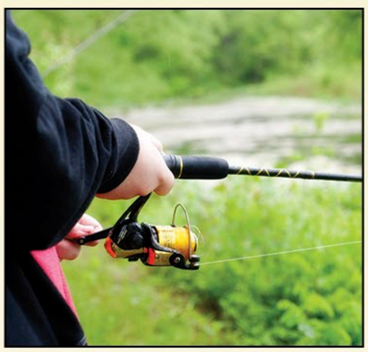
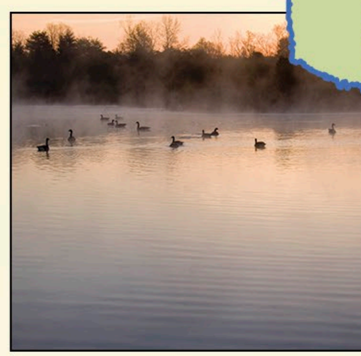
DEPARTMENT OF THE
ENVIRONMENT

December 31, 2014

Watershed Existing Condition Report for the Piscataway Creek Watershed





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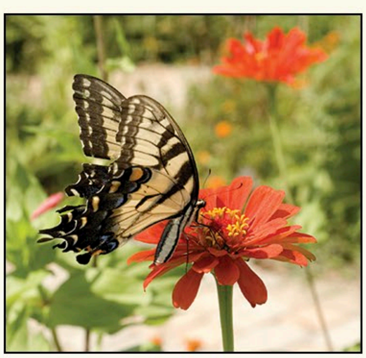


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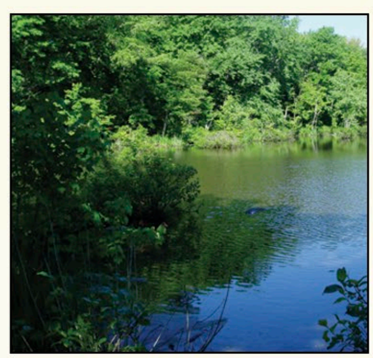

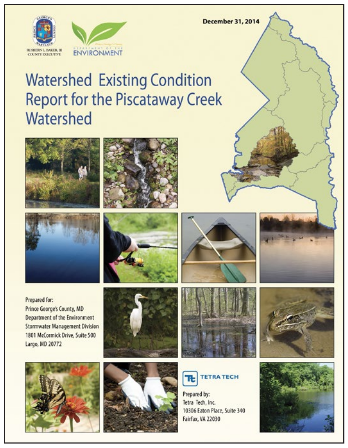

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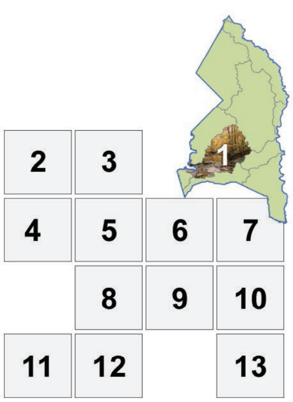

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Contents

Acronyms and Abbreviations .... **iv**

1 Introduction **1**

1.1 Purpose of Report and Restoration Planning 1
1.2 Impaired Water Bodies and TMDLs 3
1.2.1 Water Quality Standards 4
1.2.2 Problem Identification and Basis for Listing 6
1.2.3 TMDL Identified Sources 6
1.2.4 TMDL Values 7
1.2.5 Previous Studies 7

2 Watershed Description **9**

2.1 Physical and Natural Features 12
2.1.1 Hydrology 12
2.1.2 Climate/Precipitation 12
2.1.3 Topography/Elevation 13
2.1.4 Soils 15
2.2 Land Use and Land Cover 17
2.2.1 Land Use Distribution 17
2.2.2 Percent Imperviousness 19

3 Flow and Water Quality Conditions **24**

3.1 Water Quality Data 26
3.1.1 Fecal Bacteria 26
3.1.2 DO and BOD 27
3.1.3 Nitrogen 30
3.1.4 Phosphorus 32
3.1.5 Sediment 33
3.1.6 PCBs 35
3.2 Biological Station Data 35
3.3 Flow Data 38

4 Pollutant Source Assessments **40**

4.1 NPDES Permitted Facilities 40
4.1.1 MS4 (Phase I, Phase II, SHA, Federal) 40
4.1.2 Other NPDES Permitted Facilities 41
4.1.3 Wastewater 43
4.2 Nonpoint and Other Sources 46
4.3 Existing BMPs 46
4.4 Existing Condition Analysis 49
4.5 Stressor Loading Analysis 55

5 Next Steps **62**

6 References **64**

Appendix A: TMDL Factsheets **A-1**

Appendix B: NPDES Permitted Dischargers **B-1**

Table B-1. Active NPDES permits in the Piscataway Creek watershed in Prince George's County . B-1
Table B-2. Available permit limits for NPDES permits in the Piscataway Creek watershed in Prince George's County B-3
Table B-3. Summary of available discharge information for NPDES permits in the Piscataway Creek watershed in Prince George's County B-5

Figures

Figure 1-1. Schematic for typical pollution diet (TMDL). 2
Figure 2-1. Location of the Piscataway Creek watershed. 10
Figure 2-2. Population density (people per square mile) in the Piscataway Creek watershed. 11
Figure 2-3. Elevation in the Piscataway Creek watershed. 14
Figure 2-4. Hydrologic soil groups in the Piscataway Creek watershed. 16
Figure 2-5. Land use in the Piscataway Creek watershed. 18
Figure 2-6. Impervious areas in the Piscataway Creek watershed. 22
Figure 2-7. Percent impervious areas in the Piscataway Creek watershed. 23
Figure 3-1. Flow and water quality monitoring stations in the Piscataway Creek watershed. 25
Figure 3-2. Plot of *E. coli* over time in the Piscataway Creek watershed. 27
Figure 3-3. Plot of DO over time in the Piscataway Creek watershed. 29
Figure 3-4. Plot of BOD over time in the Piscataway Creek watershed. 30
Figure 3-5. Plot of total nitrogen over time in the Piscataway Creek watershed. 31
Figure 3-6. Plot of total phosphorus over time in the Piscataway Creek watershed. 33
Figure 3-7. Plot of TSS over time in the Piscataway Creek watershed. 35
Figure 3-8. Results of benthic invertebrate and B-IBI sampling in the Piscataway Creek watershed. 37
Figure 3-9. Plot of flow over time at Stations TIN0006 and USGS 1653600 in the Piscataway Creek watershed. 39
Figure 4-1. Permitted discharges in the Piscataway Creek watershed. 42
Figure 4-2. Sanitary sewer lines, overflow sites, and on-site wastewater systems in the Piscataway Creek watershed. 45
Figure 4-3. BMPs and associated drainage areas in the Piscataway Creek watershed. 48
Figure 4-4. Comparison of biological conditions and impervious areas in the Piscataway Creek watershed. 50
Figure 4-5. Comparison of biological conditions and BMP locations in the Piscataway Creek watershed. 51
Figure 4-6. Comparison of BMP locations and storm drain network in the Piscataway Creek watershed. 52
Figure 4-7. Comparison of BMP locations and impervious areas in the Piscataway Creek watershed. 53
Figure 4-8. Comparison of runoff and impervious areas in the Piscataway Creek watershed. 56
Figure 4-9. Comparison of total nitrogen and impervious areas in the Piscataway Creek watershed. 57
Figure 4-10. Comparison of total phosphorus and impervious areas in the Piscataway Creek watershed. 58
Figure 4-11. Comparison of TSS and impervious areas in the Piscataway Creek watershed. 59
Figure 4-12. Comparison of BOD and impervious areas in the Piscataway Creek watershed. 60
Figure 4-13. Comparison of fecal coliform bacteria and impervious areas in the Piscataway Creek watershed. 61

Tables

Table 1-1. Maryland bacteria water quality criteria 5
Table 1-2. Maryland dissolved oxygen water quality criteria 5
Table 1-3. Piscataway Creek source area tracking 7
Table 1-4. Piscataway Creek watershed baseline *E. coli* loads and TMDL values 7
Table 2-1. Average monthly (1975–2004) potential evapotranspiration (inches) 12
Table 2-2. Piscataway Creek watershed 2002 MDP land use........ 17
Table 2-3. Piscataway Creek watershed 2010 MDP land use in Prince George's County 19
Table 2-4: Piscataway Creek watershed impervious area in Prince George's County 21
Table 3-1. Summary of available bacteria data in the Piscataway Creek watershed........ 26
Table 3-2. Summary of available BOD and DO data in the Piscataway Creek watershed 28
Table 3-3. Summary of available total nitrogen data in the Piscataway Creek watershed........ 31
Table 3-4. Summary of available total phosphorus data in the Piscataway Creek watershed........ 32
Table 3-5. Summary of available TSS data in the Piscataway Creek watershed........ 34
Table 3-6. Summary of available flow and stream data in the Piscataway Creek watershed 38
Table 4-1. Phase II MS4 permitted federal, state, and other entities in Piscataway Creek watershed...... 41
Table 4-2. Wastewater treatment plants in Piscataway Creek watershed 43
Table 4-3. Summary SSO overflow (gallons) in the Piscataway Creek watershed by year 44
Table 4-4. List of BMP types in the Piscataway Creek watershed 47
Table 4-5. Summary of known BMP drainage areas, land uses, and impervious areas 54
Table B-1. Active NPDES permits in the Piscataway Creek watershed in Prince George's County.........B-1
Table B-2. Available permit limits for NPDES permits in the Piscataway Creek watershed in Prince George's County B-3
Table B-3. Summary of available discharge information for NPDES permits in the Piscataway Creek watershed in Prince George's County B-5

ACRONYMS AND ABBREVIATIONS

ANC	acid neutralizing capacity
B-IBI	Benthic Index of Biotic Integrity
BMP	best management practice
BOD	biochemical oxygen demand
BSID	Biological Stress Identification
cfs	cubic feet per second
COMAR	Code of Maryland Regulations
DA	drainage area
DMR	discharge monitoring report
DO	dissolved oxygen
EPA	Environmental Protection Agency
GIS	Geographic Information System
JBA	Joint Base Andrews
LA	load allocation
M-NCPPC	Maryland National-Capitol Park Planning Commission
MDE	Maryland Department of the Environment
MDP	Maryland Department of Planning
mL	milliliters
mg/L	milligrams per liter
MOS	margin of safety
MPN	most probable number
MS4	Municipal Separate Storm Sewer System
NADP	National Atmospheric Deposition Program
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
PCB	polychlorinated biphenyl
SR3	Sewer Repair, Replacement and Rehabilitation
SSO	sanitary sewer overflow
STORET	STOrage and RETrieval
SWMM	Stormwater Management Model
TMDL	Total Maximum Daily Load
TSS	total suspended solids
µg/L	micrograms per liter
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey

WIP	Watershed Implementation Plan
WLA	wasteload allocation
WSSC	Washington Suburban Sanity Commission
WTP	water treatment plant
WWTP	wastewater treatment plant

1 INTRODUCTION

On January 2, 2014, the Maryland Department of the Environment (MDE) issued Prince George's County (the County) a new municipal separate storm sewer system (MS4) permit. An MS4 is a series of stormwater sewers owned by a municipal entity (e.g., the County) that discharges the conveyed stormwater runoff into a water body (e.g., Piscataway Creek).

The County's new MS4 permit requires that the County develop local restoration plans to address each U.S. Environmental Protection Agency (EPA)-approved total maximum daily load (TMDL) with stormwater wasteload allocations (WLAs).

As a result of the County's new MS4 permit, restoration plans are being developed for all water bodies in the County that are subject to TMDL WLAs associated with the MS4 system. The County's MS4 system has been assigned WLAs in 10 separate TMDLs addressing pollutants in 5 water body systems:

- Anacostia River
- Mattawoman Creek
- Upper Patuxent River (including Rocky Gorge Reservoir)
- Potomac River
- Piscataway Creek

This Watershed Existing Conditions Report is an initial step in the restoration plan development process for the portions of the Piscataway Creek watershed that are within the County. It characterizes the watershed, includes a compilation and inventory of available information, provides a review of existing reports and data, and presents some additional data and spatial analyses.

1.1 Purpose of Report and Restoration Planning

Section 303(d) of the Clean Water Act and EPA's Water Quality Planning and Management Regulations (codified at Title 40 of the *Code of Federal Regulations* Part 130) require states to develop TMDLs for impaired water bodies. A TMDL identifies the maximum amount of pollutant load that the water body can receive and still meet water quality criteria. TMDLs provide the scientific basis for a state to establish water quality-based controls to reduce pollution from both point and nonpoint sources to restore and maintain the quality of the state's water resources (USEPA 1991).

Figure 1-1 shows a generalized TMDL schematic. The bar on the left represents the current pollutant load (sometimes called the baseline) that exists in a water body before a TMDL is developed. The elevated load causes the water body to exceed water quality criteria. The bar on the right represents the amount that the pollutant load will need to be reduced for the water body to meet water quality criteria. Another way to convey the required load reduction is by identifying the *percent reduction* needed.

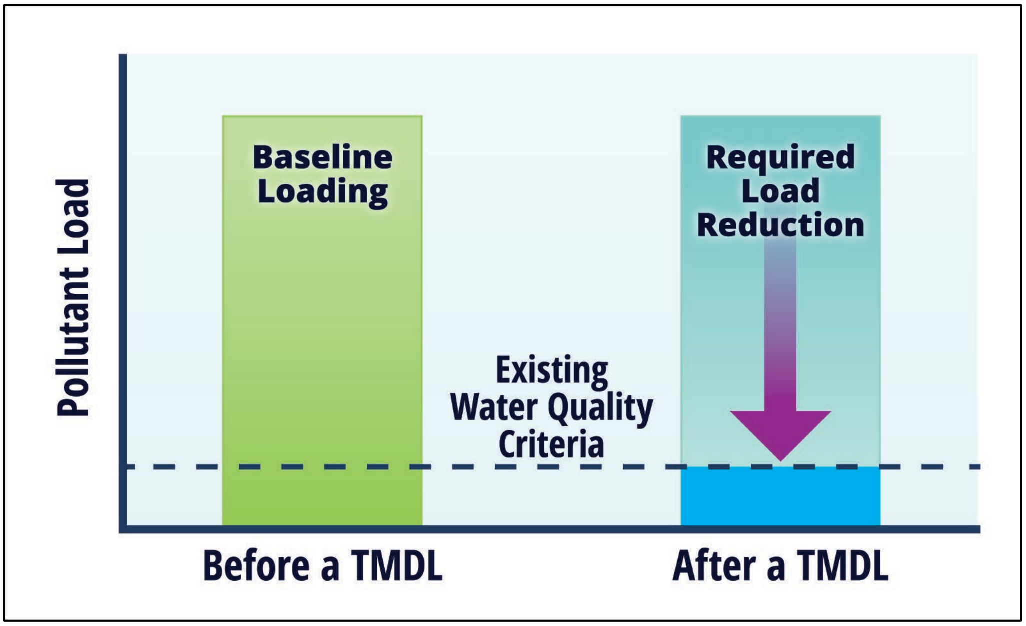


Figure 1-1. Schematic for typical pollution diet (TMDL).

A TMDL for a given pollutant and water body is composed of the sum of individual WLAs for point sources and load allocations (LAs) for nonpoint sources and natural background levels. In addition, the TMDL must include an implicit or explicit margin of safety (MOS) to account for the uncertainty in the relationship between pollutant loads and the quality of the receiving water body. The TMDL components are illustrated using the following equation:

$$\text{TMDL} = \Sigma \text{ WLAs} + \Sigma \text{ LAs} + \text{MOS}$$

A WLA is the portion of the overall pollution diet that is assigned to permitted dischargers, such as the County's MS4 stormwater system. The County's new MS4 permit requires that the County develop local restoration plans to address each EPA-approved TMDL with stormwater WLAs.

A restoration plan is a strategy for managing the natural resources within a geographically defined watershed. For the County's Department of the Environment, this means managing urban stormwater (i.e., water from rain storms) to restore and protect the County's water bodies. Stormwater management is most effective when viewed in the watershed context—watersheds are land areas and their network of creeks that convey stormwater runoff to a common body of water. Successful stormwater management consists of both structural practices (e.g., vegetated roadway swale) and public outreach (e.g., pet waste campaigns and education) at both the public and private levels. The restoration plan development process will address changes to the County's priorities to comply with water quality regulations, to improve the health of the streams in the County, and to create value for neighborhoods in the County's watersheds.

The overall goals of 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.

The first stage in completing these goals is to develop restoration plans. These plans typically:

- Identify causes and sources of pollution.
- Estimate pollutant load reductions.
- Describe management options and identify critical areas.
- Estimate technical and financial assistance needed.
- Develop education component.
- Develop project schedule.
- Describe interim, measurable milestones.
- Identify indicators to measure progress.
- Develop a monitoring component.

This report begins the process by collecting data needed for restoration planning and characterization of the watersheds. This will help identify potential sources and causes of the pollution.

1.2 Impaired Water Bodies and TMDLs

MDE has included Piscataway Creek and its tributaries on its Section 303(d) list of impaired streams due fecal coliform bacteria (2006 non-tidal waters). In addition to the TMDL, MDE has identified the non-tidal portion of Piscataway Creek, Use IP – Water Contact Recreation, and Protection of Aquatic Life and Public Water Supply [*Code of Maryland Regulations* (COMAR) 6.08.02.08O(1)] in the state's 303(d) as impaired by nutrients (1996), sediments (1996), bacteria (fecal coliform) (2002), and impacts to biological communities (2004). The listings for nutrients and sediments are in the tidal portion of Piscataway Creek.

MDE developed TMDLs to address impairments caused by the violation of water quality standards for fecal coliform bacteria (*Enterococcus*). The percent reduction WLA for fecal coliform bacteria in Piscataway Creek is 42.6 percent. In addition, EPA recently (2010) developed an overall TMDL for the Chesapeake Bay watershed for nitrogen, phosphorus, and sediment. The percent reduction WLAs for nitrogen, phosphorus, and sediment varies by water body ranging from 10 percent to 26 percent for total nitrogen; 32 percent to 41 percent for total phosphorus; and 29 percent to 31 percent for total suspended solids. The County has developed a Watershed Implementation Plan (WIP) in response to the Chesapeake Bay TMDL (PGC DER 2012). Appendix A contains fact sheets on the TMDLs for these TMDLs. The fact sheets include information on the TMDLs' technical approaches, allocations, and other information. Although not listed as impaired, the tidal portions of Piscataway Creek are assigned a stormwater WLA in the tidal Potomac and Anacostia River Polychlorinated Biphenyl (PCB) TMDL (ICPRB 2007). This TMDL is discussed in more detail in the Watershed Existing Conditions Report for the Potomac and Anacostia rivers.

1.2.1 Water Quality Standards

Water quality standards consist of designated uses, criteria to protect those uses, and antidegradation policies to protect waters from pollution. States assign designated uses based on their goals and expectations for water bodies. Each water body is assigned a designated use that should be attainable. Water quality criteria consist of narrative statements or numeric values designed to protect the designated uses. Water quality criteria describe the physical, chemical, and biological conditions necessary to support each designated use and might not be the same for all uses.

Piscataway Creek's designated uses (COMAR 26.08.02.08 O) is *Use Class I: Water Contact Recreation, and Protection of Nontidal Warmwater Aquatic Life* in the main steam and tributaries, and *Use Class II: Support of Estuarine and Marine Aquatic Life and Shellfish Harvesting* in the open water downstream portion.

Maryland's General Water Quality Criteria states that "the waters of this State may not be polluted by…any material, including floating debris, oil, grease, scum, sludge and other floating materials attributable to sewage, industrial waste, or other waste in amounts sufficient to be unsightly; produce taste or odor; change the existing color to produce objectionable color for aesthetic purposes; create a nuisance; or interfere directly or indirectly with designated uses" [COMAR 26.08.02.03B(2)]. Specific water quality criteria also apply for the specific pollutants addressed in the TMDLs for the Piscataway Creek watershed and are discussed below.

Bacteria Water Quality Criterion

Table 1-1 presents the Maryland water quality standards for bacteria used for all areas.

Table 1-1. Maryland bacteria water quality criteria

Indicator	Steady State Geometric Mean Indicator Density
Freshwater	
E. coli	126 MPN/100 mL
Enterococci[a]	33 MPN/100 mL
Marine Water	
Enterococci	35 MPN/100 mL

Notes:
MPN=most probable number; mL=milliliters.
[a] Used in the Piscataway Creek TMDL analysis.

Nitrogen/Phosphorus Water Quality Criterion

Maryland does not have numeric criteria for nitrogen or phosphorus, so other parameters, such as dissolved oxygen (DO) are used in the TMDL process. Table 1-2 summarizes the Maryland DO criteria applicable to the nutrients and BOD TMDL.

Table 1-2. Maryland dissolved oxygen water quality criteria

Designated Use	Period Applicable	DO Criteria
MD Use I-P	Year-round	≥ 5 mg/L (instantaneous)
MD Use II: Migratory Fish Spawning and Nursery Subcategory	02/1–05/31	≥ 5.0 mg/L (instantaneous) ≥ 6.0 mg/L (7-day average)
MD Use II: Open Water Fish and Shellfish Subcategory	06/1–01/31	≥ 3.2 mg/L (instantaneous) ≥ 4.0 mg/L (7-day average) ≥ 5.5 mg/L (30-day average applicable all year) ≥ 4.3 mg/L (instantaneous for water temperature > 29 °C for protection of Shortnose Sturgeon)
MD Use III	Year-round	≥ 5 mg/L (instantaneous) ≥ 6 mg/L (1-day average)
MD Use IV	Year-round	≥ 5 mg/L (instantaneous)

Note: DO = dissolved oxygen; mg/L= milligrams per liter.

PCB Water Quality Criteria

Water quality criteria for toxic substances are found in COMAR 26.08.02.03-2 (*Numerical Criteria for Toxic Substances in Surface Waters*). The PCB human health criterion for consumption of organism and drinking water is 0.00064 micrograms per liter (µg/L), while the aquatic life criterion for freshwater is 0.014 µg/L, and for salt water is 0.03 µg/L. The Maryland impairment threshold for PCBs in fish tissue is 88 parts per billion (ICPRB 2007).

Sediment Water Quality Criterion

Non-tidal portions of the watershed are subject to Maryland's General Water Quality Criteria, for the protection of aquatic life. For tidal portions, it is based on average Secchi disk depth equal to or greater than 0.4 meters for April 1 through October 31 of each year. Secchi depth is a measure of water clarity. The criterion is meant to protect submerged aquatic vegetation in the tidal portions of the watershed.

1.2.2 Problem Identification and Basis for Listing

Documentation for TMDLs includes discussion of the issues driving development of the TMDL, such as a description of the problem conditions that prompted a Section 303(d) listing as well as any monitoring data that were used to document and support the listing. This section provides a summary of the various problems identified in the Piscataway Creek watershed and the data supporting the impairment decisions. The non-tidal stream reaches of the Piscataway Creek watershed in Maryland (non-tidal portion of Piscataway Creek and Tinkers Creek) have been listed for fecal coliform bacteria. Monitoring data collected in the Piscataway Creek during 2006 showed violations of seasonal *E. coli* criteria.

Because of the difficulties involved in direct measurements of fecal pathogens, fecal indicator bacteria are used as surrogates to determine fecal coliform criteria. Fecal coliform listings were based on a comparison of the criteria values (33 most probable number [MPN] enterococci, 126 MPN/100mL *E. coli*) with calculated annual and seasonal steady state geometric means for different flow strata. The steady state condition is defined as "unbiased sampling targeting average flow conditions and/or equally sampling or providing for unbiased sampling of high and low flows." (MDE 2006). It is determined through monitoring design or subsequent flow duration analysis. In the case of this TMDL, the monitoring was routine (i.e., it did not stratify monitoring such that samples collected were proportional to the duration of time the watershed experiences low, mid, and high flows). The assessment process involved separating monitoring data into flow categories to calculate the steady state geometric mean with respect to flow regimes. Data were then compared to criteria and the impairment assessment was made.

1.2.3 TMDL Identified Sources

Sources that contribute bacteria in the watershed include wildlife and domestic animals via nonpoint loading from land surfaces, and humans via septic systems, sanitary sewer overflows (SSOs), and municipal wastewater treatment plants. In the case of the Piscataway Creek watershed, bacterial source tracking used the antibiotic resistant analysis methods to determine the source of the TMDL values. The dominant sources in Piscataway Creek were found to be wildlife, followed by human, livestock, and pets. In a similar ranking, the dominant Tinkers Creek sources were found to be wildlife followed by human, pets, and livestock. Table 1-3 displays the actual proportions from the bacterial source tracking analysis. Note that, because wildlife cannot be effectively managed (except perhaps for Canada geese) and livestock is beyond the scope of the TMDL, which puts the onus of the WLAs upon the human and pet categories.

Table 1-3. Piscataway Creek source area tracking

Station	Percent Human	Percent Pet	Percent Livestock	Percent Wildlife
PIS0045	32.5%	9.7%	17.7%	40.1%
TIN0006	30.3%	15.0%	9.4%	45.3%

Source: Piscataway TMDL (MDE 2006)

1.2.4 TMDL Values

Table 1-4 summarizes the overall watershed-wide baseline loads from the Piscataway Creek TMDL, as determined by the TMDL report. Because of the prevalence of uncontrolled sources, MDE acknowledged that the WLA for the Piscataway Creek watershed (and other watersheds) represents a target unlikely to be attained even if nearly all human and pet sources were eliminated.

Table 1-4. Piscataway Creek watershed baseline *E. coli* loads and TMDL values

Station	Baseline Total Load (Billion MPN/day)	TMDL Load (Billion MPN/day)	Percent Reduction	WLA (Billion MPN/day)	WLA Percent Reduction
PIS0045	352	136	61.2%	46	53.4%
TIN0006	139	64	53.8%	36.8	53.4%
Total	490	201	59.0%	82.8	53.4%

Source: Piscataway TMDL (MDE 2006)

1.2.5 Previous Studies

In 2011 the County developed a Countywide WIP in response to the 2010 Chesapeake Bay Nutrient and Sediment TMDL. The WIP was finalized in 2012 and laid out a plan for best management practice (BMP) implementation and other restoration activities through 2017 and 2025. In addition to urban stormwater runoff, the WIP covered agricultural practices and upgrades to wastewater systems (i.e., municipal wastewater treatment plants and on-site wastewater systems). Although the plan is Countywide, aspects from it will be used to develop the restoration plan for the Piscataway Creek watershed. The County's final WIP can be viewed at www.mde.state.md.us/programs/Water/TMDL/TMDLImplementation/Documents/FINAL_PhaseII_Report_Docs/Final_County_WIP_Narratives/PG_WIPII_2012.pdf.[1]

In 2008 the County commissioned a state-of-the-art watershed analysis of Piscataway Creek entitled *Piscataway Watershed Assessment 2008/2009*. This analysis included several reports relevant to the current study: (1) *TASK 2.A. Land Use Analysis Final Report,* (2) *TASK 2.B. Flow Duration Analysis Final Report, and* (3) *TASK 2.G. Pollutant Loading Analysis Final Report.* The findings of these reports were summarized in the *Piscataway Creek Watershed Characterization 2011,* prepared by the County.

The first report was a thorough land use/land cover analysis that not only characterized the impervious and pervious land covers, but also determined how much impervious was connected to

[1] Accessed June 6, 2014.

stormwater outfalls thought a stormwater network as opposed to disconnected impervious that flows over the adjacent turf or field areas. A notable example of this is the runways at Joint Base Andrews (JBA).

The second report presented the results of a detailed Stormwater Management Model (SWMM) study that used aquifers to partition runoff into overland and subsurface flow regimes. This model was calibrated to the U.S. Geological Survey (USGS) gauge 1653600 for the 2000 water year, which included Hurricane Floyd. A salient finding of that study was that disconnection was a very important component of the water balance. This study showed great variations in stream power depending upon the extent of connected impervious.

The third report used the SWMM partitioning of overland runoff as opposed to subsurface flows to project cumulative pollutant loads. Because many particulate pollutants such as total suspended solids (TSS), particulate phosphorus, particulate nitrogen, and fecal coliform are filtered by the profile, the runoff volumes conveyed by disconnected pathways are substantially attenuated. By accounting for these variables, the final pollutant loading analysis highlighted major differences in the type and volume of pollutant loads.

2 WATERSHED DESCRIPTION

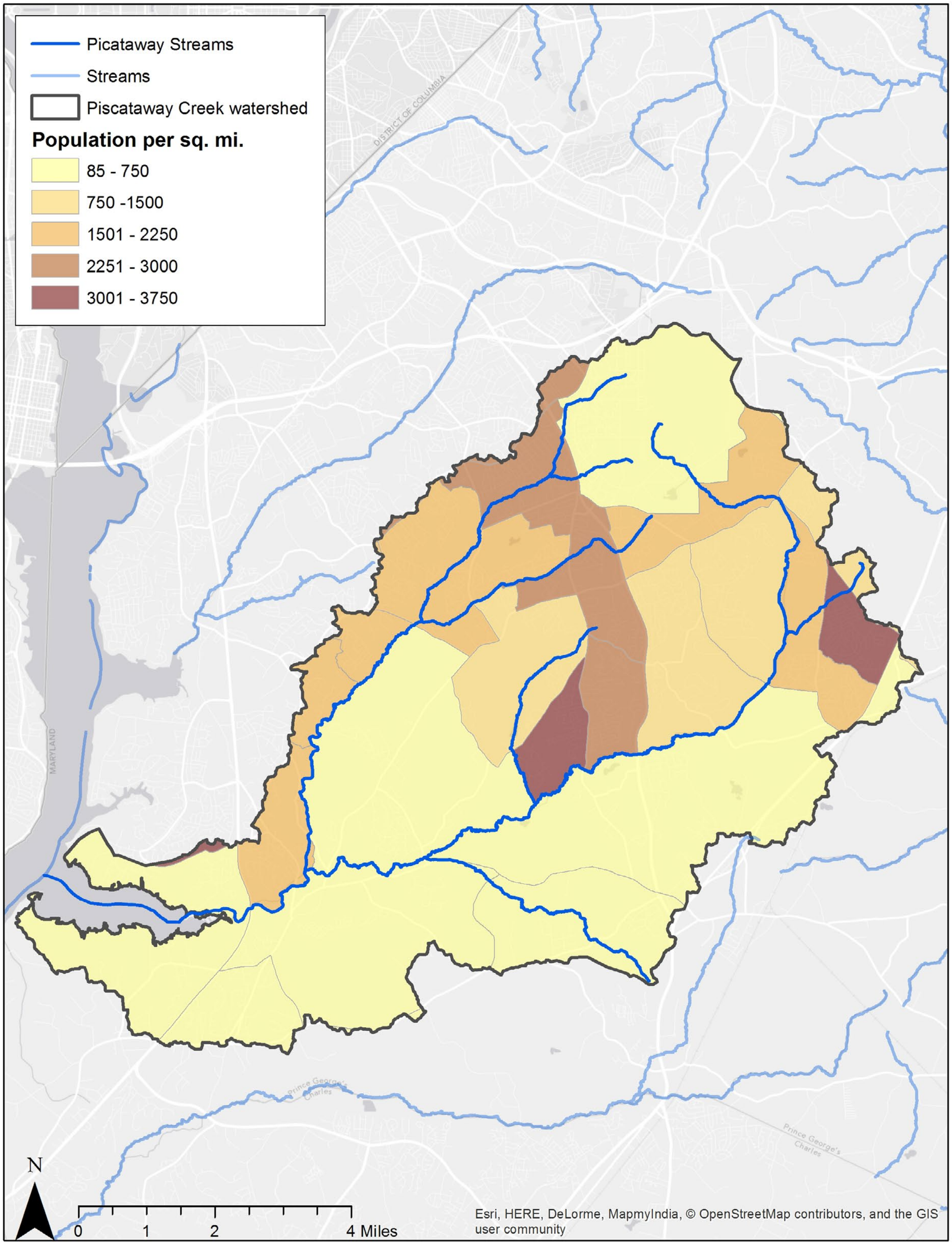
The Piscataway Creek watershed lies in the southwestern portions of the County (Figure 2-1). Because of its rural nature, there are no incorporated municipalities. It does include the communities of Clinton, Camp Springs and Woodyard, as well as many subdivisions and rural farmettes. The watershed also contains a large area of federal land (JBA, Law Enforcement Training Center) and some Maryland National-Capitol Park Planning Commission (M-NCPPC) parks.

The mainstem of the Piscataway Creek is 18.2 miles long, beginning at JBA and ending at the Potomac River below Washington, D.C. across from Mt. Vernon. The watershed is 67.6 square miles. It has been inhabited for more than 4,000 years, but European colonization began in the 1700s. Historically a predominately forested watershed, agriculture dominated through the late 1800s, after which time urbanization began to replace agricultural land uses. Currently, the northern portion of the watershed is almost fully developed into the communities of Clinton, Camp Springs and JBA, surrounded by medium- and low-density residential development.

The southern region comprises the area between Louise F. Cosca Regional Park and Piscataway Creek drainage. The land use to the south is mostly forested, with some open and row-crop agricultural land. There is extensive low-density residential development, with some commercial and light industrial. Butler Branch (tributary to Piscataway Creek) flows through Louise F. Cosca Regional Park and forms a lake within the park. To the south the land is more forested and agricultural, with the encroachment of many new home estates. To the south along Indian Head Highway (Route 210) there is extensive suburban development.

The population of the Piscataway Creek watershed is more than 121,230 persons. Figure 2-2 presents the population density (2010 U.S. Census population per square mile of the census tract). The focus of development extends along Route 5 through the center of the watershed. Several large developments dominate two tracts in the south that have the highest density.

Figure 2-1. Location of the Piscataway Creek watershed.



Source: Population data is from 2010 US Census

Figure 2-2. Population density (people per square mile) in the Piscataway Creek watershed.

2.1 Physical and Natural Features

2.1.1 Hydrology

The Piscataway Creek watershed is made up of two major subwatersheds. The mainstem of the Piscataway Creek is 18.2 miles long, beginning at JBA and ending at the Potomac River below Washington, D.C. It also comprises Tinkers Creek, which is 9.1 miles long, and originates at JBA. There are also several named tributaries to these mainstem creeks. In the Piscataway Creek watershed, these comprise Burch Branch, Butler Branch, Dower House Branch, and many other unnamed tributaries. In Tinkers Creek, these comprise Meetinghouse Branch, Pea Hill Branch, and Haynes Branch. Below the confluence with Tinkers Creek, the Piscataway becomes tidal for 2.8 miles. The creek and its tributaries follow a dendritic pattern, a branching tree-like effect. The main source of water in the coastal plain is ground water. Because unconsolidated sediments underlie the region, precipitation usually sinks in easily.

The majority of the land in the northern watershed is drained by MS4 outfalls. The tributary system of Tinkers Creek is described as *flashy*, meaning there is a quick rise in stream level due to rainfall as a result of its high proportion of directly connected impervious area. Its streams have storm flow rates many times higher than that from the rural and forested subwatersheds in the southeast.

2.1.2 Climate/Precipitation

The Piscataway Creek watershed is in a temperate area. The National Weather Service Forecast Office (2014b) reports a 30-year average annual precipitation of 39.74 inches. No strong seasonal variation in precipitation exists. On average, winter is the driest with 8.48 inches, and summer is the wettest with 10.44 inches (National Weather Service Forecast Office 2014a).The average annual temperature is 58.2 degrees Fahrenheit. The January normal low is 28.6 °F and the July normal high is 88.4 °F.

Evapotranspiration accounts for water that evaporates from the land surface (including water bodies) or is lost through plant transpiration. Evapotranspiration varies throughout the year because of climate, but is greatest in the summer. Potential evapotranspiration (Table 2-1) is the environmental demand for evapotranspiration.

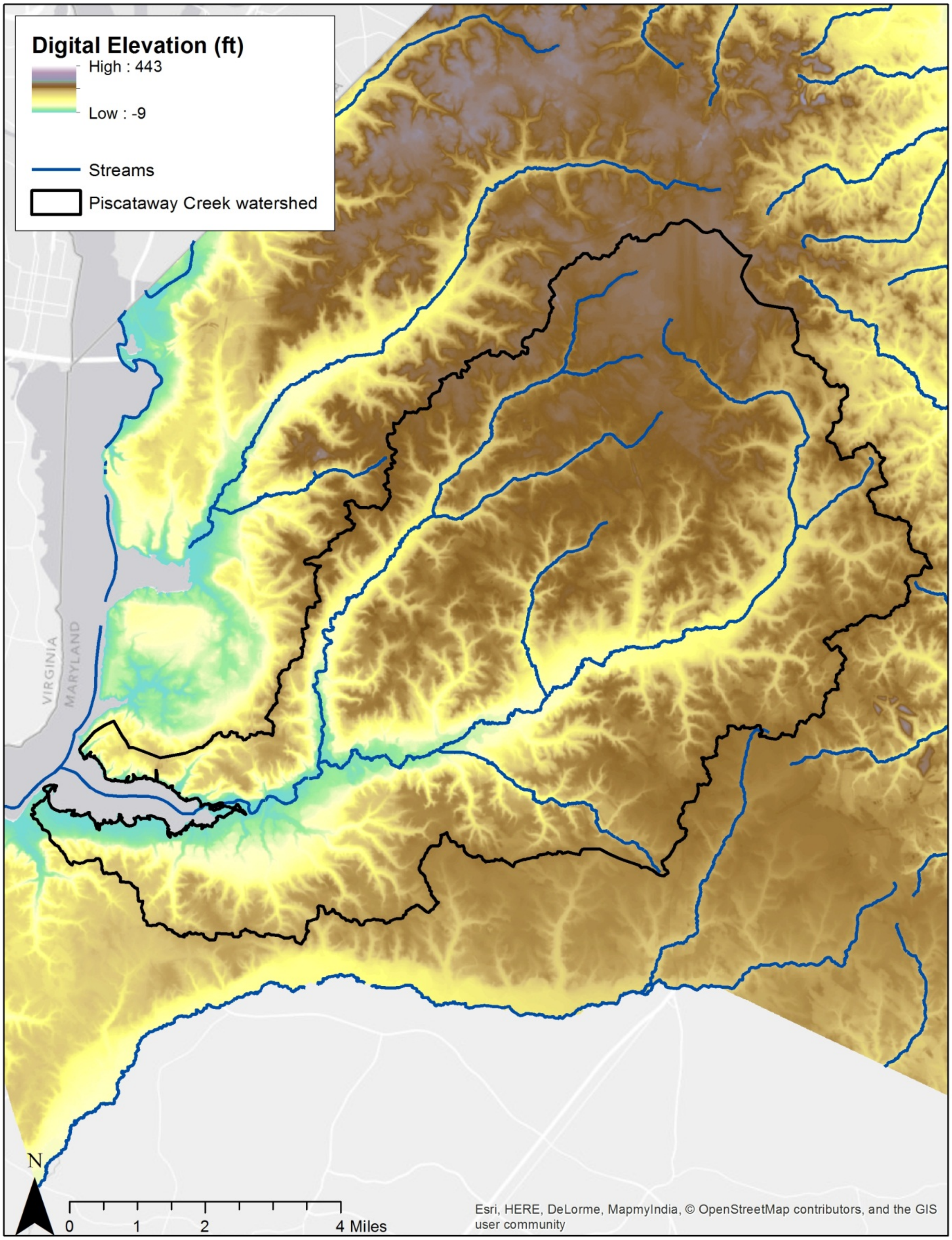
Table 2-1. Average monthly (1975–2004) potential evapotranspiration (inches)

January	February	March	April	May	June
0.60	0.86	1.69	2.74	3.86	4.30
July	**August**	**September**	**October**	**November**	**December**
4.59	4.01	2.85	1.88	0.98	0.62

Source: NRCC 2014

2.1.3 Topography/Elevation

According to the Maryland Geological Survey, the majority of the watershed is in the coastal plain, which is underlain by unconsolidated sediments, including gravel, sand, silt, and clay (MGS 2014). The coastal plain is characterized by gentle slopes, meandering streams, and lower relief. The watershed is gently rolling hills with elevations typically only between sea level and 280 feet. The highest elevations in the watershed are in the northern portion at JBA, with the lowest portions following the tidal mainstem of Piscataway Creek (Figure 2-3).



Source: DEM is from Prince George's County

Figure 2-3. Elevation in the Piscataway Creek watershed.

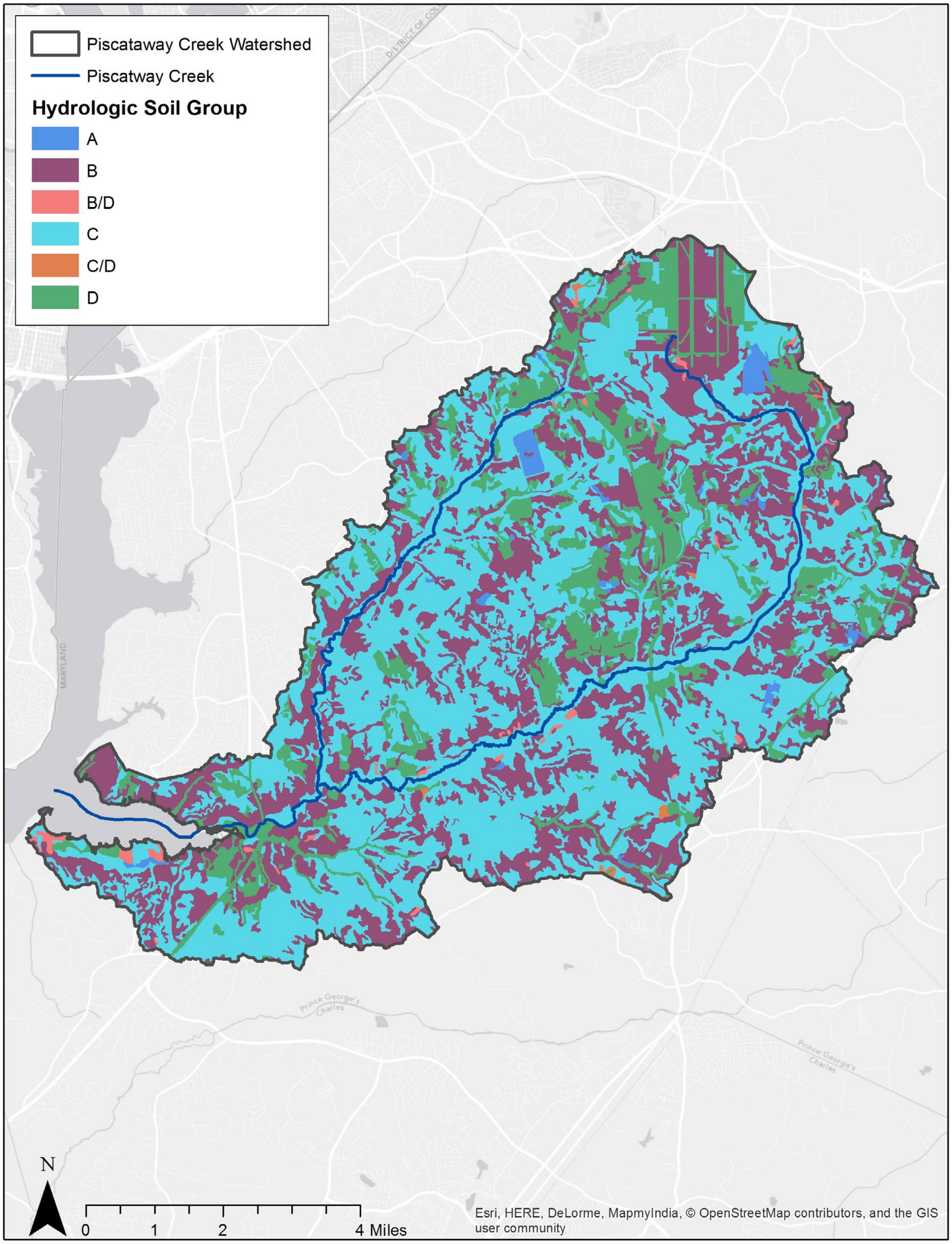
2.1.4 Soils

The Piscataway Creek watershed is in the coastal plain province. Unconsolidated sediments including gravel, sand, silt, and clay underlie this physiographic province. The mainstem of the non-tidal Piscataway Creek and its tributaries lie predominantly in the Matapeake and Woodstown soil series. These soils are moderately deep, well-drained to poorly drained, dominantly gently sloping soils that have a compact subsoil or substratum. The dominant soil series in Tinkers Creek are urban land and udorthents, soils disturbed by development. Along the bottomlands, the Aquasco soil series consists of poorly drained soils of the flood plains and soils in marshes that are subject to tidal flooding.

The U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) has defined four hydrologic soil groups, providing a means for grouping soils by similar infiltration and runoff characteristics during periods of prolonged wetting. Poorly drained clay soils (Group D) have the lowest infiltration rates, resulting in the highest amount of runoff, while well-drained sandy soils (Group A) have high infiltration rates, with little runoff.

Soils in the watershed are frequently also classified as “urban land complex” or “udorthent” soils. These are soils that have been altered by disturbance because of land development activities. Soils affected by urbanization can have a higher density because of compaction during construction activities, and might be more poorly drained. Note that natural pervious land covers on Group B soils have very little runoff compared to that from disturbed soils.

Figure 2-4 presents the USDA hydrologic soil group data. All of this data is from the NRCS SSURGO database. Group A is the least represented in the watershed at 1.1 percent. The valleys slope parts of the watershed is underlain by group B soils (33.2 percent), while both bottomlands and uplands are dominated by group C soils (50.8 percent). Instead of being found in the stream valleys, the slowest draining group D soils are found on the hillslopes.



Source: 2002 Soils are from USDA NRCS

Figure 2-4. Hydrologic soil groups in the Piscataway Creek watershed.

2.2 Land Use and Land Cover

Land use, land cover, and impervious area are some of the most important factors that influence the amount of pollution entering the County's water bodies. Pollutants, like excess nitrogen or bacteria, vary on the basis of different land uses (e.g., commercial, agriculture, and parks). Increased impervious area increases the amount of runoff a rain event produces, thus transporting more pollutants to a water body in a shorter period of time.

2.2.1 Land Use Distribution

Land use information for the watershed is available from the previous watershed reports, TMDL reports, and previous restoration planning efforts, in addition to the Maryland Department of Planning (MDP) 2010 land use update (MDP 2012). Data from previous reports and the 2010 MDP are presented below for comparison and to illustrate how land use has changed in the watershed. However, only the MDP land use data are available as geographic information system (GIS) data, so these data are what will be used in the restoration plan. Land uses are made of many different land covers, such as roads, roofs, turf, and tree canopy. The proportion of land covers in each land use control the hydrologic and pollutant loading response of such uses.

Land use analysis for the Piscataway Fecal Coliform TMDLs used 2002 MDP GIS land uses, which were then aggregated into more general categories by subwatershed (MDE 2006). The analysis included low-density, medium-density, and high-density residential, commercial and industrial land in the urban land use category (Table 2-2), which comprises 47 percent of the watershed. Agricultural land includes cropland and pasture.

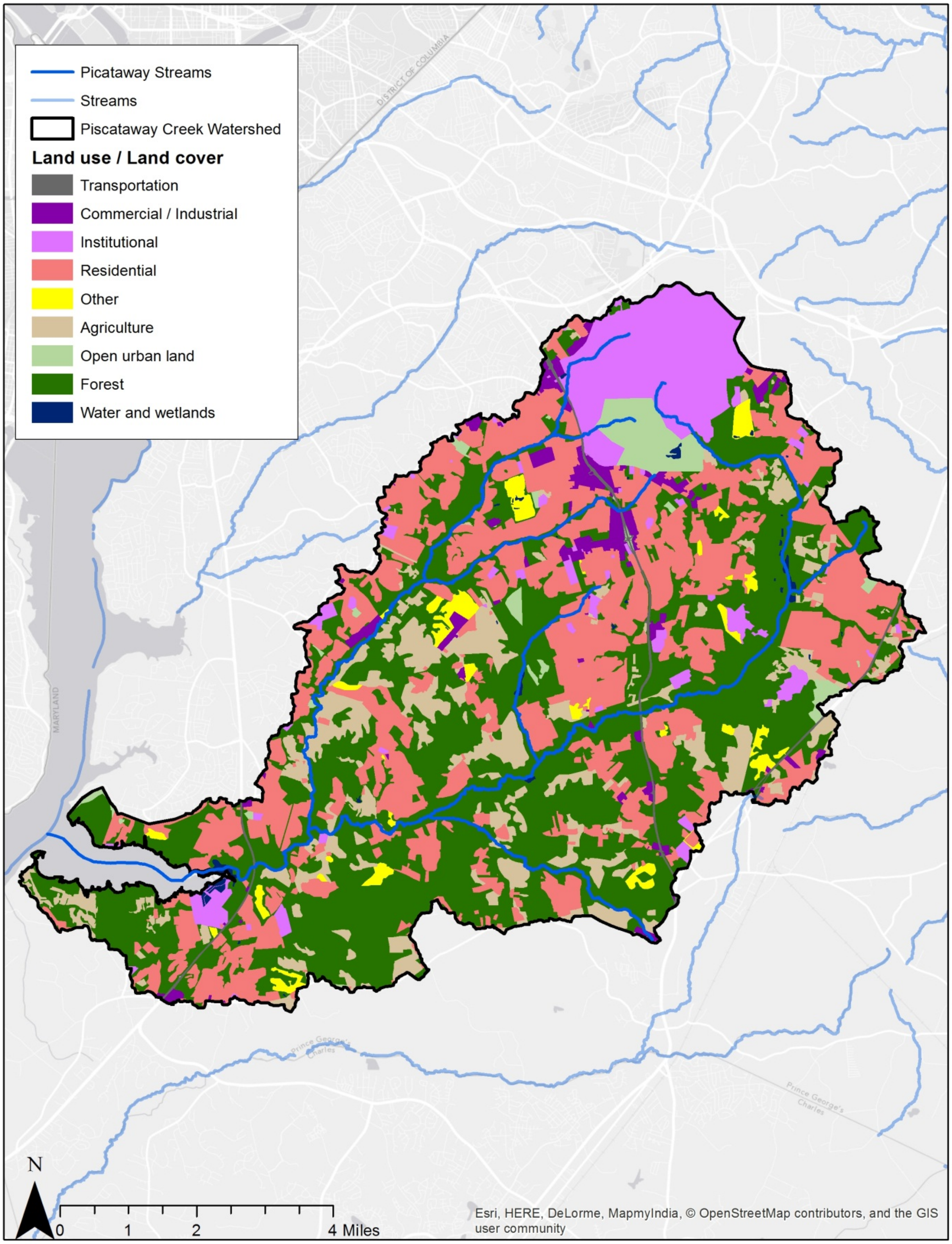
Table 2-2. Piscataway Creek watershed 2002 MDP land use

Water Body	Urban (%)	Agricultural (%)	Forest (%)
Piscataway	46.6%	10.1%	42.6%

Source: MDE 2006.

Figure 2-5 shows the 2010 MDP land use for the watershed. The large area of institutional land in the northern part of the County is JBA, with the open area being the golf course. The majority of the watershed comprises residential development, primarily medium density (less than 0.5-acre lots). There is extensive forest along the bottomlands of the mainstem and the lower reaches of Tinkers Creek. Forest and agricultural land uses predominate in the south and in the tidal reaches. The 2010 mapping showing agricultural areas between Tinkers Creek and Piscataway Creek is undergoing extensive development, so it is not entirely correct in this area.

Table 2-3 summarizes the areas. The urban area in the watershed is largely residential land (31 percent of the watershed), with the majority being medium-density residential (42 percent of urban land). There are also significant areas of forested land (43 percent); institutional land (such as schools, government buildings, and churches) (8 percent); and commercial/industrial land (2 percent). Knowing this information will help during later stages of restoration planning because it will influence the types of water quality control practices—commonly known as BMPs—and where they can be installed. For instance, certain BMPs are preferred in medium-density residential areas, while other types are preferred in industrial areas.



Source: MDP 2010

Figure 2-5. Land use in the Piscataway Creek watershed.

Table 2-3. Piscataway Creek watershed 2010 MDP land use in Prince George's County

Land Use	Acres	Percent of Total	Percent of Land Use Grouping
Agriculture	**4,356.6**	**10.05%**	**100.0%**
Agricultural building	58.3	0.13%	1.3%
Cropland	3,065.5	7.08%	70.4%
Feeding operations		0.00%	0.0%
Large lot subdivision (agriculture)	95.8	0.22%	2.2%
Orchards/vineyards/horticulture		0.00%	0.0%
Pasture	1,118.6	2.58%	25.7%
Row and garden crops	18.3	0.04%	0.4%
Forest	**18,477.2**	**42.64%**	**100.0%**
Brush	439.6	1.01%	2.4%
Deciduous forest	12,854.9	29.67%	69.6%
Evergreen forest	536.9	1.24%	2.9%
Large lot subdivision (forest)	1,070.3	2.47%	5.8%
Mixed forest	3,575.4	8.25%	19.4%
Other	**882.6**	**2.04%**	**100.0%**
Bare ground	728.9	1.68%	82.6%
Beaches		0.00%	0.0%
Extractive	153.7	0.35%	17.4%
Urban	**19,341.1**	**44.64%**	**100.0%**
Commercial	847.2	1.96%	4.4%
High-density residential	335.9	0.78%	1.7%
Industrial	193.9	0.45%	1.0%
Institutional	3,607.0	8.32%	18.6%
Low-density residential	4,850.0	11.19%	25.1%
Medium-density residential	8,165.1	18.84%	42.2%
Open urban land	1,016.2	2.35%	5.3%
Transportation	325.8	0.75%	1.7%
Water and wetlands	**271.1**	**0.63%**	**100.0%**
Water	167.1	0.39%	61.7%
Wetlands	103.9	0.24%	38.3%

Source: MDP 2012.

2.2.2 Percent Imperviousness

According to Prince George's County Code, impervious area means an area that is covered with solid material or is compacted to the point where water cannot infiltrate into underlying soils (e.g., parking lots, roads, houses, patios, swimming pools, compacted gravel areas, and so forth) and where natural hydrologic patterns are altered.

Impervious areas are important in urban hydrology, in that the increased paved areas (e.g., parking lots, rooftops, and roads) decrease the amount of water infiltrating the soils to become ground water and increase the amount of water flowing to the stream channels in the watershed. This increased flow not only brings additional nutrients and other pollutants, but also increases the velocity of the streams, which causes erosion and increased sediment making the water muddy during periods of elevated flow, such as during rain events.

Impervious area is made up of several types including buildings (e.g., roofs), parking lots, driveways, and roads. Each type has different characteristics and contribute to increased runoff and pollutant loadings in different ways. For instance driveways have a higher nutrient loading potential to waterways than roofs, due to factors such as grass clippings and potential fertilizer (accidentally spread on the drive way). Sidewalks will have a higher bacteria loading than driveways due to the amount of dogs that are walked along sidewalks. Besides the different types of impervious area, there are two subgroups of impervious land: connected and disconnected. On connected impervious land, rainwater runoff flows directly from the impervious surface to stormwater sewers, which in turn flow directly to streams. In disconnected impervious cover areas, rainwater runoff flows over grass, meadows, or forest areas before being intercepted by stormwater sewers, which then flow to streams. Directly connected impervious cover is substantially more detrimental to stream health and quality than disconnected land cover because the highly efficient conveyance system (stormwater pipes) associated with directly connected impervious cover increases both flow and pollutant transport to nearby streams.

Similar to the land use data, information on impervious area is available from the previous reports, in addition to 2009 County-specific information. Data from previous reports and the 2009 County data are presented below for comparison and to illustrate how impervious area has changed in the watershed. Only the 2009 County impervious data are available as GIS data; therefore, these data will be used in the restoration plan.

The impervious cover obtained from the impervious cover mapping provided by the County was remarkably detailed, showing virtually every possible impervious surface down to individual walkways and patios. With more than 20 different type categories and several surface categories, its data had to be manipulated to aggregate similar categories for the runoff and pollutant loading projections addressed in this document.

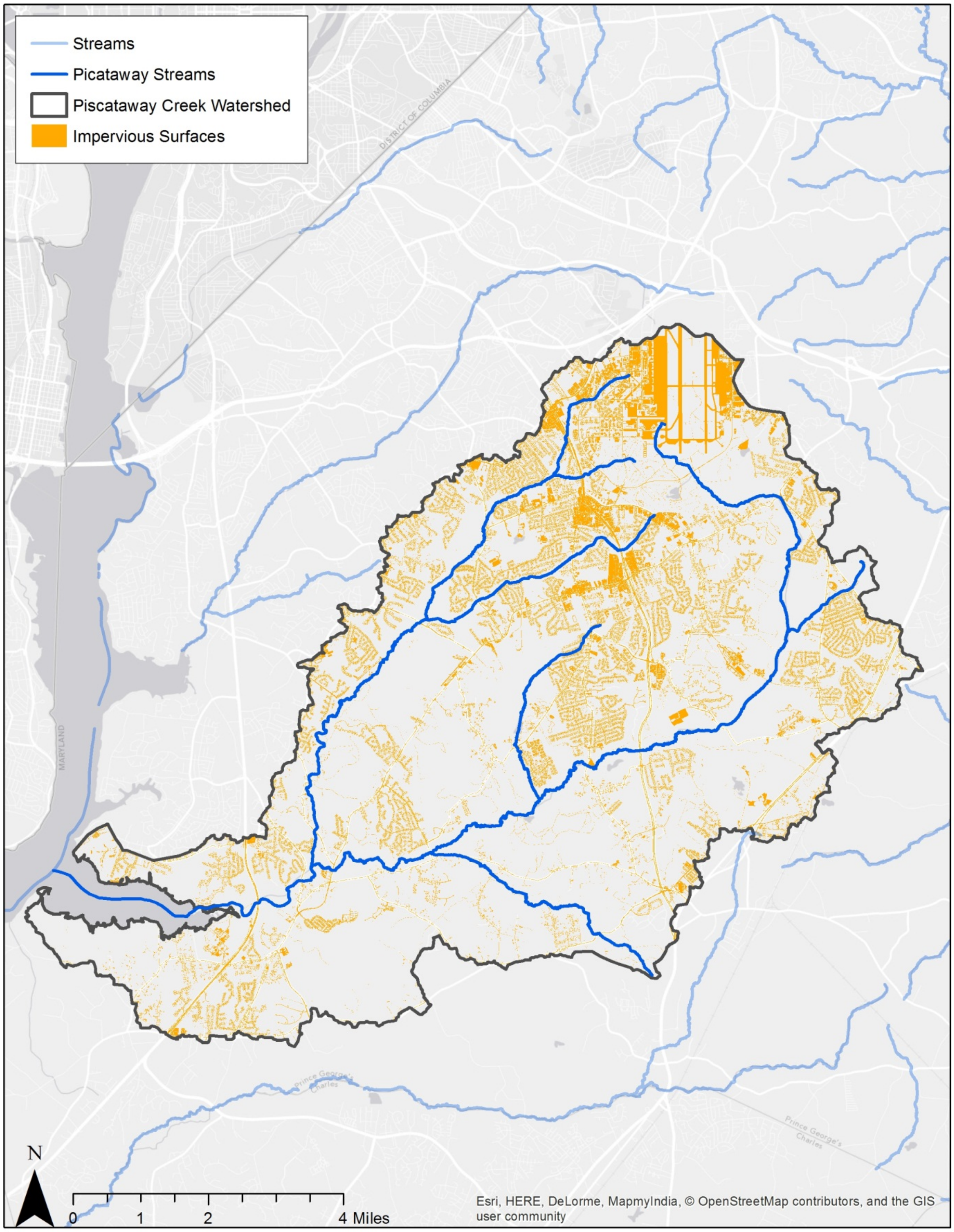
Table 2-4 presents the 2009 impervious area information for the County's portion of the watershed. The majority of the impervious area in the watershed is composed of buildings (25 percent of impervious area), roads (28 percent of the impervious area), and parking lots (13 percent of the impervious area). Impervious areas are most concentrated in the Tinkers Creek and JBA portions of the watershed, which correspond to most of the urban areas.

Table 2-4: Piscataway Creek watershed impervious area in Prince George's County

Impervious Type	Area (acres)	Percent of Impervious Area	Percent of Total Watershed Area
Aviation	494.7	8.5%	1.1%
Drives	613.0	10.5%	1.4%
Gravel	288.0	5.0%	0.7%
Other	297.1	5.1%	0.7%
Parking	775.2	13.3%	1.8%
Railroad	0.0	0.0%	0.0%
Roads	1,620.1	27.9%	3.7%
Roofs	1,467.2	25.2%	3.4%
Walkways	256.7	4.4%	0.6%
Total	5,812.0	100.0%	13.4%

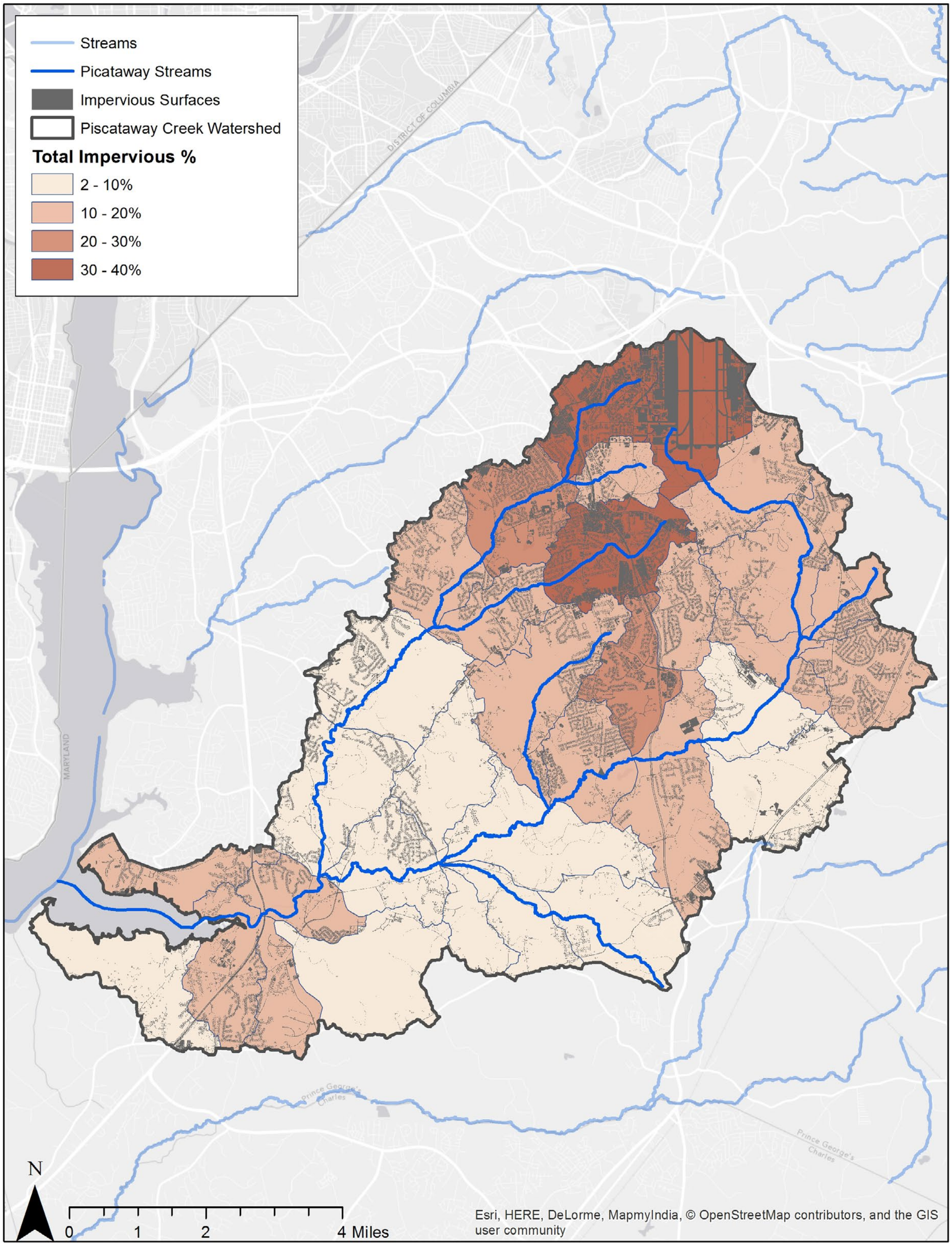
Source: M-NCPPC 2014.

Figure 2-6 shows the extent of impervious area throughout the watershed, while Figure 2-7 shows the corresponding percentage impervious area calculated for each subwatershed, being used in the restoration planning process. As the figures illustrate, impervious areas are most concentrated in the southwestern portion of the watershed, which corresponds to the locations of the majority of the urban areas. As with land use, the impervious areas are important to know for restoration planning.



Source: 2009 impervious area from M-NCPPC 2014.

Figure 2-6. Impervious areas in the Piscataway Creek watershed.



Source: 2009 impervious area from M-NCPPC 2014.

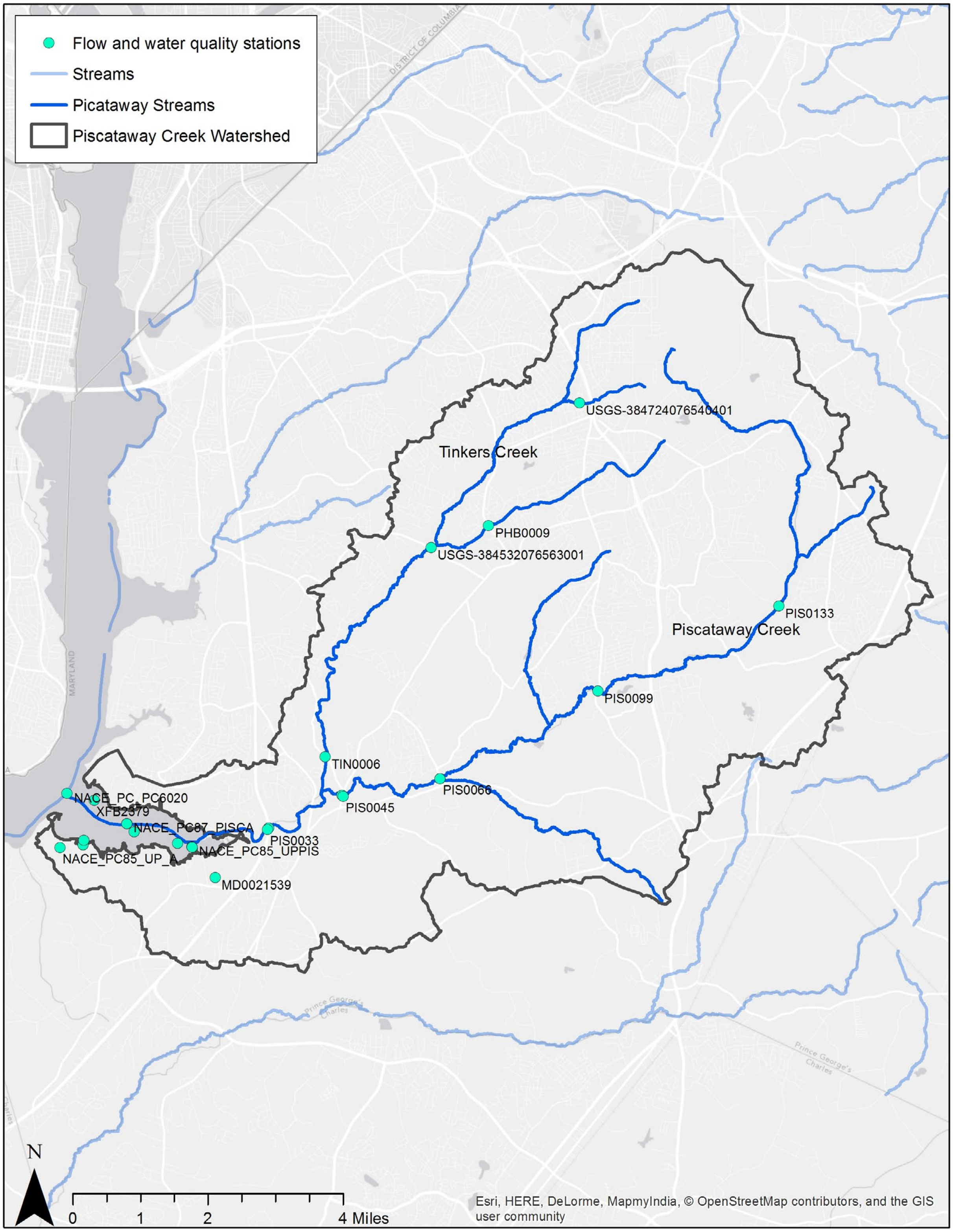
Figure 2-7. Percent impervious areas in the Piscataway Creek watershed.

3 Flow and Water Quality Conditions

Water quality and flow information are important parts of TMDL development and restoration planning. The water quality data helps illustrate the health of a water body. Flow data is important because it shows how water moves through the watershed. Historical flow data can also show the increase of urban stormwater runoff entering into water bodies, where, prior to development, the water infiltrated into the soils. Figure 3-1 shows the locations of water quality and flow monitoring stations in the Piscataway Creek watershed.

Water quality and flow data are available from several different sources. The TMDL reports provide the water quality information used in their development. These reports were the sole source of PCB water quality data. Data were also obtained from the *Water Quality Portal* (www.waterqualitydata.us/). This source is sponsored by EPA, USGS, and the National Water Quality Monitoring Council and collects data from more than 400 federal, state, local, and tribal agencies. EPA's STORET (STOrage and RETrieval) Data Warehouse was also searched for additional information. MDE was contacted and provided supplemental recent data that were not found in the *Water Quality Portal* or STORET. The final data source was the County's MS4 long-term monitoring program.

The County implements its biological monitoring program to provide credible data and valid, defensible results to address questions related to the status and trends of stream and watershed ecological condition. Biological monitoring data are used to provide problem identification; documentation of the relationships among stressor sources, stressors, and response indicators; and evaluation of environmental management activities, including restoration.



Source: USGS and EPA Water Quality Portal

Figure 3-1. Flow and water quality monitoring stations in the Piscataway Creek watershed.

3.1 Water Quality Data

3.1.1 Fecal Bacteria

Pathogens are microscopic organisms known to cause disease or sickness in humans. Pathogen-induced diseases are easily transmitted to humans through contact with contaminated surface waters, often through recreational contact or ingestion. Fecal bacteria (e.g., fecal coliforms, *E. coli*, fecal streptococci, and enterococci) are microscopic single-celled organisms found in the wastes of warm-blooded animals. Excessive amounts of fecal bacteria in surface waters have been shown to indicate an increased risk of pathogen-induced illness to humans, causing gastrointestinal, respiratory, eye, ear, nose, throat, and skin diseases (USEPA 1986). In water quality analysis, fecal bacteria are used to indicate the potential for pathogen-contaminated waters. Two in particular, *E. coli* and enterococci, have shown a strong correlation with swimming-associated gastroenteritis; thus, EPA recommends their use in water quality criteria for protecting against pathogen-induced illness in association with primary contact recreational activities.

Table 3-1 presents data summaries for the three stations within the Piscataway watershed with fecal bacteria data. Two of the stations monitor for *E. coli* and one for fecal coliform. The data from the two stations monitoring for *E. coli* are presented in Figure 3-2. The fecal coliform data is from more than 30 years ago. The more recent, but limited, *E. coli* data that are available do not appear to show any significant trends across time. The stations, one on Piscataway Creek and one on Tinkers Creek, a tributary to the Piscataway, appear to have similar *E. coli* counts. Both stations have mean counts of 253/100ml.

Table 3-1. Summary of available bacteria data in the Piscataway Creek watershed

Station ID	Station Name/ Description	Parameter	Date		Number of Records	Value (counts/100mL)		
			Min.	Max.		Min.	Mean	Max.
PIS0045	Piscataway Creek	*E. coli*	10/23/02	10/20/03	25	10	253	1,350
TIN0006	Tinkers Creek	*E. coli*	10/23/02	10/20/03	25	10	253	2,010
USGS 1653650	Piscataway Creek near South Piscataway, MD	Fecal Coliform	07/21/72	01/21/74	16	46	1,096	6,600

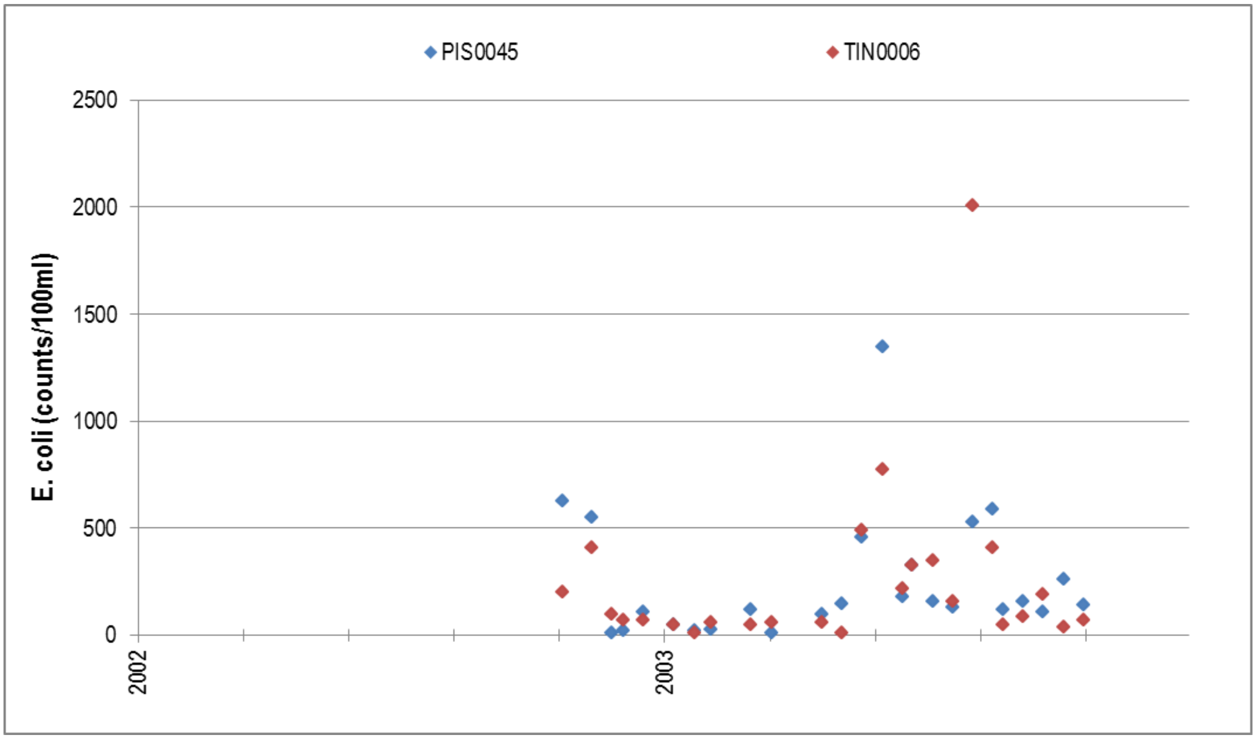


Figure 3-2. Plot of *E. coli* over time in the Piscataway Creek watershed.

3.1.2 DO and BOD

DO and biochemical oxygen demand (BOD) are parameters of concern commonly associated with nutrient impairments and eutrophication-impacted water bodies.

Aquatic organisms require adequate concentrations of DO for survival. DO levels are typically cyclical because they are influenced by temperature and photosynthesis, with levels often falling at night in impaired water bodies. Maryland has numeric criteria for DO that specify minimum concentrations.

BOD is used as an indicator of organic pollution in a water body. It is determined by measuring the DO used by microorganisms during the decomposition of organic matter over a period of time (typically 5 days) at a temperature of 20 degrees Celsius. It is often associated with the discharge streams of wastewater treatment plants but can be attributed to stormwater runoff, agriculture feed lots, and septic systems as well as more natural sources such as leaves and woody debris and dead plants and animals. Maryland does not have numeric criteria for BOD; however, water quality modeling can be used to estimate appropriate BOD levels for streams given available information for flows and source loads. Unpolluted surface waters typically have BOD values of 2 milligrams per liter (mg/L) or less.

Table 3-2 presents data summaries for stations within the watershed. Six stations have BOD data and 19 have DO data. Two stations (PIS0033 and XFB1986) have the longest DO and BOD records, with data collected approximately monthly from 1986 through 2012. The mean BOD at these stations is similar 2.77 mg/L and 2.85 mg/L.   DO concentrations differ between the two stations. PIS0033 has a minimum DO of 0.67 mg/L and a mean DO of 8.65 mg/L, while XFB1986 has a minimum DO of 4.10 mg/L and a mean of 9.46 mg/L. Figure 3-3 shows DO data from stations with the most data, and Figure 3-4 shows BOD from stations with the most data. There is no discernable trend in DO or BOD concentrations over time or across stations, although PIS0033 does have several excursions below 4 mg/L DO in the 1990s and early 2000s and more recent data from PIS0033 does not drop below 4 mg/L.

Table 3-2. Summary of available BOD and DO data in the Piscataway Creek watershed

Station ID	Station Name/ Description	Parameter	Date		Number of Records	Value (mg/L)		
			Min.	Max.		Min.	Mean	Max.
NACE_PC_PISCA	Center of Piscataway Creek Embayment	BOD	05/29/86	09/24/86	7	1.00	2.43	5.00
PIS0033	PIS0033	BOD	01/06/86	12/12/12	247	0.170	2.77	23.60
PIS0045	Piscataway Creek	BOD	10/03/00	07/23/02	24	0.700	1.78	2.80
USGS1653650	Piscataway Creek near South Piscataway, MD	BOD	09/29/72	12/06/73	6	0.700	2.87	7.60
XFB1986	XFB1986	BOD	01/06/86	12/12/12	287	0.350	2.85	11.50
XFB2379	Piscataway Creek	BOD	03/27/01	09/24/02	12	1.60	2.53	3.30
MD0021539	Piscataway	DO	04/14/08	09/18/08	2	7.90	8.50	9.10
NACE_OEP_XFB19	Center of Piscataway Creek Embayment	DO	01/06/86	12/08/86	30	5.30	8.27	13.90
NACE_PC_MARSH_A	Marsh 1/2 Mile Southeast of Mockley Point	DO	11/03/76	08/16/77	42	1.40	7.65	13.00
NACE_PC_PC6010	Piscataway Creek 1/4 Mile West of Calvert Manor	DO	11/03/76	08/16/77	7	8.50	11.03	13.00
NACE_PC_PISCA	Center of Piscataway Creek Embayment	DO	10/02/79	05/29/86	8	6.00	9.18	12.70
NACE_PC85_MAR_A	Marsh 1/2 Mile Southeast of Mockley Point	DO	10/02/79	09/17/84	44	4.40	8.53	18.20
NACE_PC85_UP_A	Upland Creek Where It Drains Into Marsh_A	DO	10/02/79	09/18/84	6	0.400	4.47	8.70
NACE_PC85_UPPIS	Piscataway Creek 1/4 Mile West of Calvert Manor	DO	06/19/84	06/19/84	1	11.20	11.20	11.20
PHB0009	Pea Hill Branch	DO	01/29/08	12/16/08	12	6.20	8.85	12.10
PIS0033	PIS0033	DO	01/06/86	12/12/12	414	0.670	8.65	14.98
PIS0045	Piscataway Creek	DO	10/03/00	07/23/02	28	2.60	9.25	14.50
PIS0063	Piscataway Creek	DO	01/29/08	12/16/08	12	4.80	8.88	12.50

Station ID	Station Name/ Description	Parameter	Date		Number of Records	Value (mg/L)		
			Min.	Max.		Min.	Mean	Max.
PIS0066	Piscataway Creek	DO	01/29/08	12/16/08	12	4.80	8.88	12.50
PIS0099	Piscataway Creek	DO	01/29/08	12/16/08	12	6.10	8.71	12.40
PIS0133	Piscataway Creek	DO	01/29/08	12/16/08	12	5.00	8.59	12.20
TIN0006	Tinkers Creek	DO	01/29/08	12/16/08	12	4.20	8.11	12.40
XFB1793	Piscataway Creek	DO	03/27/01	09/24/02	12	8.00	11.17	14.70
XFB1986	XFB1986	DO	01/06/86	12/12/12	529	4.10	9.46	16.60
XFB2379	Piscataway Creek	DO	10/03/00	09/24/02	41	5.00	8.50	12.90

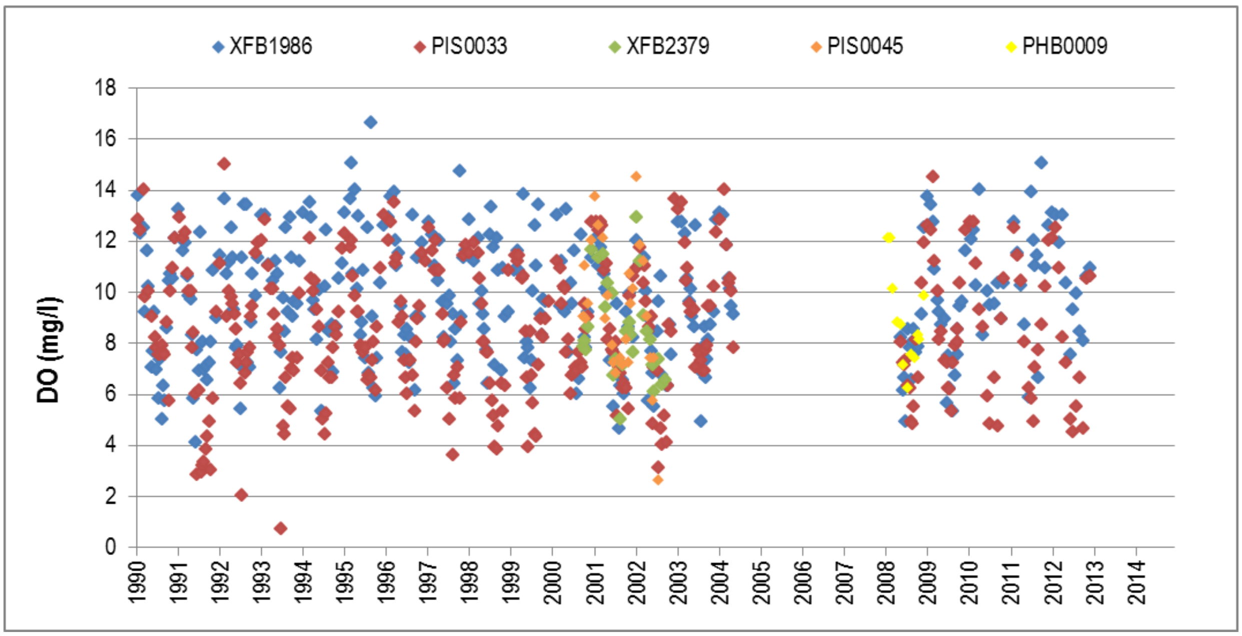


Figure 3-3. Plot of DO over time in the Piscataway Creek watershed.

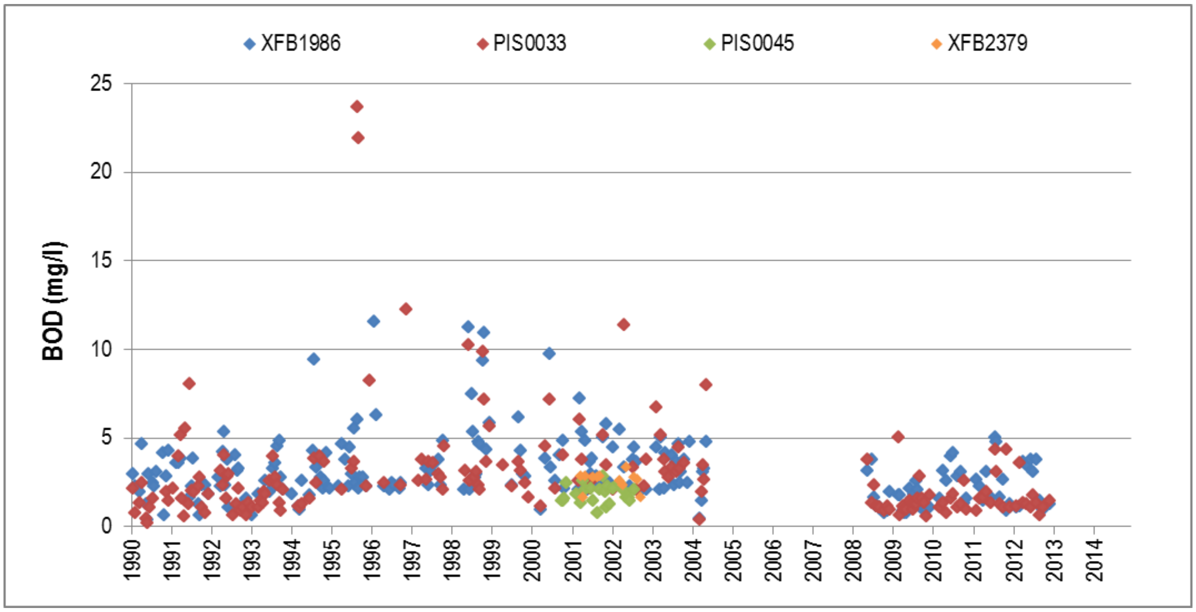


Figure 3-4. Plot of BOD over time in the Piscataway Creek watershed.

3.1.3 Nitrogen

Nitrogen at levels higher than 10 mg/L can lead to a condition called methemoglobinemia in infants and at levels higher than 100 mg/L can lead to taste problems and physiological distress (Straub 1989). However, a more common effect of excess nitrogen and its constituent parameters is that it plays an important role in eutrophication of water bodies. *Eutrophication* is the over-enrichment of aquatic systems by excessive inputs of nutrients; it is associated with an overabundance of aquatic plant growth including phytoplankton, periphyton, and macrophytes. Nitrogen acts as a fertilizer for aquatic plant communities, leading to explosive plant growth followed by die-off and depletion of DO levels as the dead plant matter decays. Maryland does not specify numeric standards for nitrogen species; however, many TMDLs identify as endpoints levels of nitrogen associated with maintaining DO levels to support aquatic life.

Table 3-3 presents data summaries for stations within the watershed. There is a lack of recent data on total nitrogen concentrations in Piscataway Creek watershed, with 2008 being the most recent sampling. Stations PIS0033 and XFB1986 have the longest period of record (1986-2000) and the most data points. Figure 3-5 shows that total nitrogen concentrations in the Tidal Piscataway (Station XFB1986) are consistently higher than the Main Stem of the nontidal Piscataway (PIS0033). This trend continues when sampling was relocated to XFB2379 (tidal), and USGS1653600 and PIS0045 (nontidal), although there are far fewer data points at the newer stations. The mean and maximum nitrogen concentrations at PIS0033 are 1.20 mg/L and 4.59 mg/L, while at XFB1986 they are 2.69 mg/L and 6.10 mg/L, respectively.

Table 3-3. Summary of available total nitrogen data in the Piscataway Creek watershed

Station ID	Station Name/Description	Date		Number of Records	Value (mg/L)		
		Min.	Max.		Min.	Mean	Max.
PHB0009	Pea Hill Branch	01/29/08	12/16/08	12	0.590	0.945	1.26
PIS0033	PIS0033	01/06/86	04/24/00	260	0.0475	1.200	4.59
PIS0045	Piscataway Creek	10/03/00	07/23/02	38	0.277	0.731	1.31
PIS0063	Piscataway Creek	01/29/08	11/05/08	11	0.246	0.651	1.04
PIS0066	Piscataway Creek	01/29/08	11/05/08	11	0.246	0.651	1.04
PIS0099	Piscataway Creek	01/29/08	12/16/08	12	0.222	0.634	1.08
PIS0133	Piscataway Creek	01/29/08	12/16/08	12	0.333	0.742	1.27
TIN0006	Tinkers Creek	01/29/08	12/16/08	12	0.440	0.882	1.61
USGS1653600	Piscataway Creek at Piscataway, MD	10/24/00	10/18/02	83	0.200	0.892	3.00
USGS384532076563001	Pea Hill Branch at Camp Springs, MD	05/02/00	05/02/00	1	0.740	0.740	0.74
USGS384724076540401	Paynes Branch at Clinton, MD	04/05/00	04/05/00	1	1.40	1.400	1.40
XFB1793	Piscataway Creek	03/27/01	09/24/02	12	0.506	1.040	1.99
XFB1986	XFB1986	01/06/86	04/24/00	258	1.05	2.690	6.10
XFB2379	Piscataway Creek	10/03/00	09/24/02	29	1.30	2.090	3.67

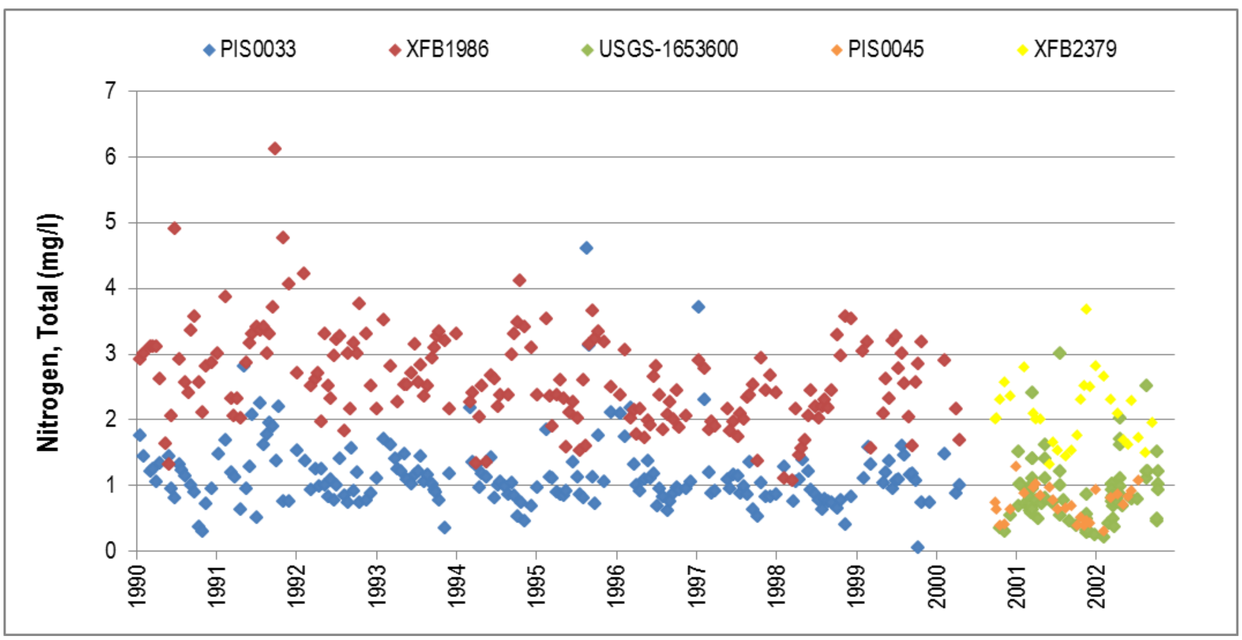


Figure 3-5. Plot of total nitrogen over time in the Piscataway Creek watershed.

3.1.4 Phosphorus

Like nitrogen, excessive loading of phosphorus into surface water bodies can lead to eutrophication by fueling aquatic plant growth. Phosphorus in fresh and marine waters exists in organic and inorganic forms. The most readily available form for plants is soluble inorganic phosphorus ($H_2PO_4^-$, HPO_4^{2-}, and PO_4^{3}), also commonly referred to as soluble reactive phosphorus. Phosphorus is also able to sorb to sediment particles and is carried into water bodies by upland and streambank erosional processes. Maryland does not have numeric criteria for phosphorus.

Table 3-4 presents data summaries for stations within the watershed. As with nitrogen, there is a lack of recent data on total phosphorus concentrations in Piscataway Creek watershed, with 2008 being the most recent sampling. Stations PIS0033 and XFB1986 have the longest period of record (1986-2000) and the most data points (255). Figure 3-6 shows there is no discernable decrease in phosphorus concentrations over time for the stations with the most data. USGS1653600 does appear to trend somewhat higher than other stations, with a mean total phosphorus concentration of 0.208 mg/L, compared to 0.113 mg/L at PIS0033 and 0.093 mg/L at XFB1986. Stations on Pea Hill Branch have lower mean total phosphorus concentrations than those on Piscataway Creek.

Table 3-4. Summary of available total phosphorus data in the Piscataway Creek watershed

Station ID	Station Name/Description	Date		Number of Records	Value (mg/L)		
		Min.	Max.		Min.	Mean	Max.
PHB0009	Pea Hill Branch	01/29/08	12/16/08	12	0.019	0.040	0.098
PIS0033	PIS0033	01/06/86	04/24/00	255	0.010	0.113	0.700
PIS0066	Piscataway Creek	01/29/08	11/05/08	11	0.030	0.101	0.179
PIS0099	Piscataway Creek	01/29/08	12/16/08	12	0.030	0.071	0.162
PIS0133	Piscataway Creek	01/29/08	12/16/08	12	0.033	0.067	0.175
TIN0006	Tinkers Creek	01/29/08	12/16/08	12	0.031	0.109	0.281
USGS1653600	Piscataway Creek at Piscataway, MD	10/24/00	10/18/02	83	0.041	0.208	2.030
USGS1653650	Piscataway Creek near South Piscataway, MD	09/29/72	12/06/73	6	0.030	0.222	0.640
USGS384532076563001	Pea Hill Branch at Camp Springs, MD	05/02/00	05/02/00	1	0.047	0.047	0.047
USGS384724076540401	Paynes Branch at Clinton, MD	04/05/00	04/05/00	1	0.042	0.042	0.042
XFB1986	XFB1986	01/06/86	04/24/00	255	0.014	0.093	0.395

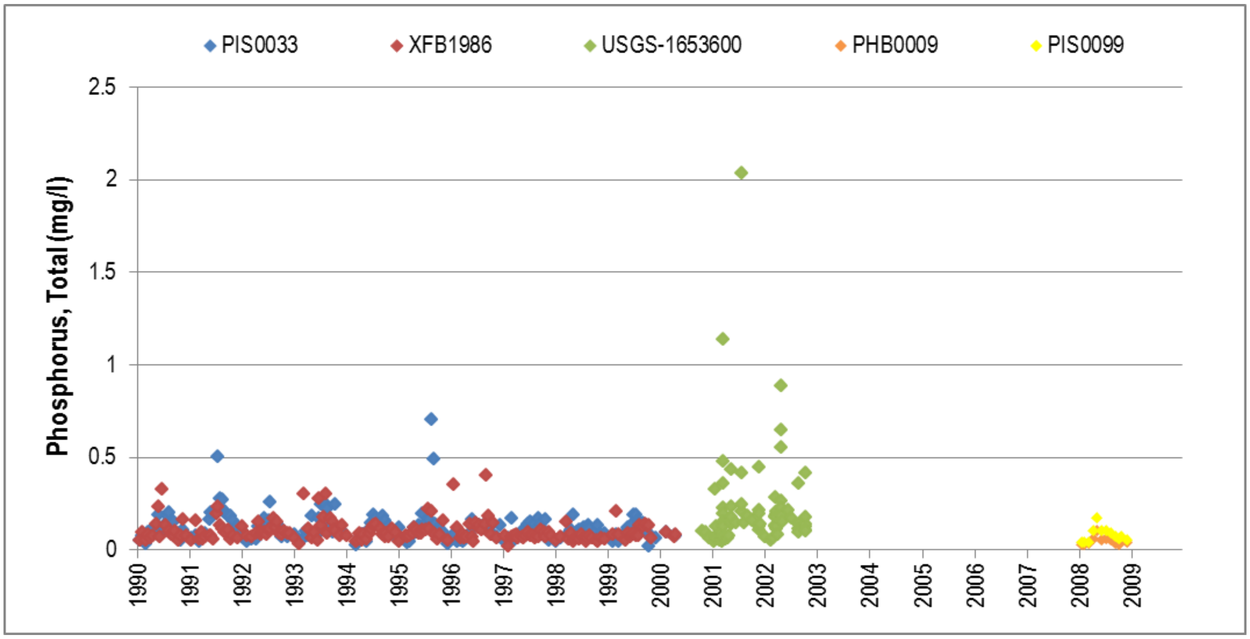


Figure 3-6. Plot of total phosphorus over time in the Piscataway Creek watershed.

3.1.5 Sediment

Sediment is a natural component of water bodies, but like nutrients, sediment in excess amounts can impair designated uses. Sediments deposited on stream beds and lake bottoms impair fish spawning ability and food sources and reduce habitat complexity and cover from prey. Very high levels of sediment can affect the ability of fish to find prey and can also clog gills. High levels of sediment impair water clarity and adversely affect aesthetics, among other things. In addition, because of the ability of phosphorus to sorb to sediment, it can serve as a source of phosphorus to water bodies. Sediment is a common cause of impairment for water bodies listed for biological impairments. Maryland does not have numeric sediment or TSS criteria.

Table 3-5 presents data summaries for stations within the watershed. TSS data are limited. The most recent and longest records are associated with stations PIS0033 and XFB1986, which have data from 1986 through 2012. Several additional stations along Piscataway Creek have monthly data for the year 2008, but there is no other recent data. Mean TSS concentrations for PIS0033 and XFB1986 are 12.07 mg/L and 22.27 mg/L, respectively. Maximums range from 152.50 mg/L at PIS0033 to 270.00 mg/L at XFB1986. Figure 3-7 shows that there may be a slight downward trend in TSS concentrations from 1990 through 2012. There is a clearer trend that XFB1986 has consistently higher TSS concentrations than PIS0033, indicating higher TSS concentrations in the tidal portions of Piscataway Creek than the nontidal portions. This trend is also apparent at the other tidal (XFB2379) and nontidal (PIS0045) stations.

Table 3-5. Summary of available TSS data in the Piscataway Creek watershed

Station ID	Station Name/Description	Date		Number of Records	Value (mg/L)		
		Min.	Max.		Min.	Mean	Max.
NACE_OEP_XFB19	Center of Piscataway Creek Embayment	01/06/86	12/08/86	17	5.00	16.58	41.00
NACE_PC_MARSH_A	Marsh 1/2 Mile Southeast of Mockley Point	10/26/76	08/16/77	45	1.00	25.40	140.00
NACE_PC_PC6010	Piscataway Creek 1/4 Mile West of Calvert Manor	11/03/76	08/16/77	7	4.00	29.71	48.00
NACE_PC_PISCA	Center of Piscataway Creek Embayment	10/02/79	09/17/84	7	8.00	31.43	57.00
NACE_PC85_MAR_A	Marsh 1/2 Mile Southeast of Mockley Point	10/02/79	09/17/84	56	5.00	30.23	128.00
NACE_PC85_UP_A	Upland Creek Where It Drains Into Marsh_A	10/02/79	09/17/84	6	17.00	41.33	59.00
NACE_PC85_UPPIS	Piscataway Creek 1/4 Mile West of Calvert Manor	06/19/84	06/19/84	1	11.00	11.00	11.00
PHB0009	Pea Hill Branch	01/29/08	12/16/08	12	2.00	11.71	84.00
PIS0033	PIS0033	03/03/86	12/12/12	382	1.00	12.07	152.50
PIS0045	Piscataway Creek	10/03/00	07/23/02	38	2.40	6.79	26.20
PIS0063	Piscataway Creek	01/29/08	12/16/08	12	2.40	14.02	57.00
PIS0066	Piscataway Creek	01/29/08	12/16/08	12	2.40	14.02	57.00
PIS0099	Piscataway Creek	01/29/08	12/16/08	12	2.40	11.65	71.00
PIS0133	Piscataway Creek	01/29/08	12/16/08	12	2.40	15.02	102.50
TIN0006	Tinkers Creek	01/29/08	12/16/08	12	2.40	38.78	248.00
USGS1653650	Piscataway Creek near South Piscataway, MD	12/13/72	12/06/73	5	11.00	147.00	580.00
XFB1793	Piscataway Creek	03/27/01	09/24/02	12	2.40	26.02	140.00
XFB1986	XFB1986	01/06/86	12/12/12	415	3.00	22.27	270.00
XFB2379	Piscataway Creek	10/03/00	09/24/02	29	6.00	21.42	112.70

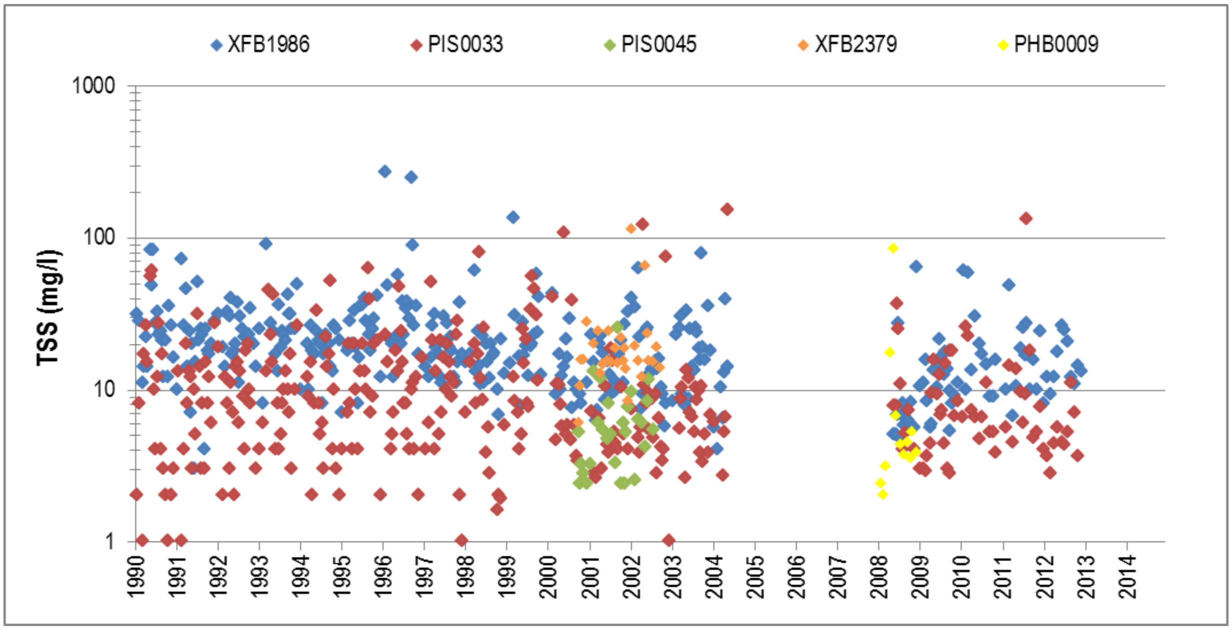


Figure 3-7. Plot of TSS over time in the Piscataway Creek watershed.

3.1.6 PCBs

PCBs are a class of man-made compounds widely used from the 1940s through the 1970s in manufacturing and industrial applications because of their exceptional fire-retardant and insulating properties. They were found to possess certain negative characteristics that led to a ban on their manufacture in the United States in 1979. They have been demonstrated to cause cancer and can negatively affect the immune, reproductive, nervous, and endocrine systems. Other qualities of PCBs make them particularly problematic environmentally. They are hydrophobic and tend to become concentrated in sediment and in fatty tissues of animals. They bioaccumulate and do not break down over time. Small organisms that ingest PCB-contaminated sediment or food are then eaten by larger organisms contributing to accumulation of PCBs in the tissues of the larger organisms. Consumption of PCB-contaminated fish is a primary pathway of PCB exposure in humans.

Although PCBs are no longer manufactured, they continue to exist in the environment and might still be released from legacy pollution through fires or leaks from old PCB-containing equipment, accidental spills, burning of PCB-containing oils, leaks from hazardous waste sites, and so on. There are no PCB water quality data available for Piscataway Creek watershed.

3.2 Biological Station Data

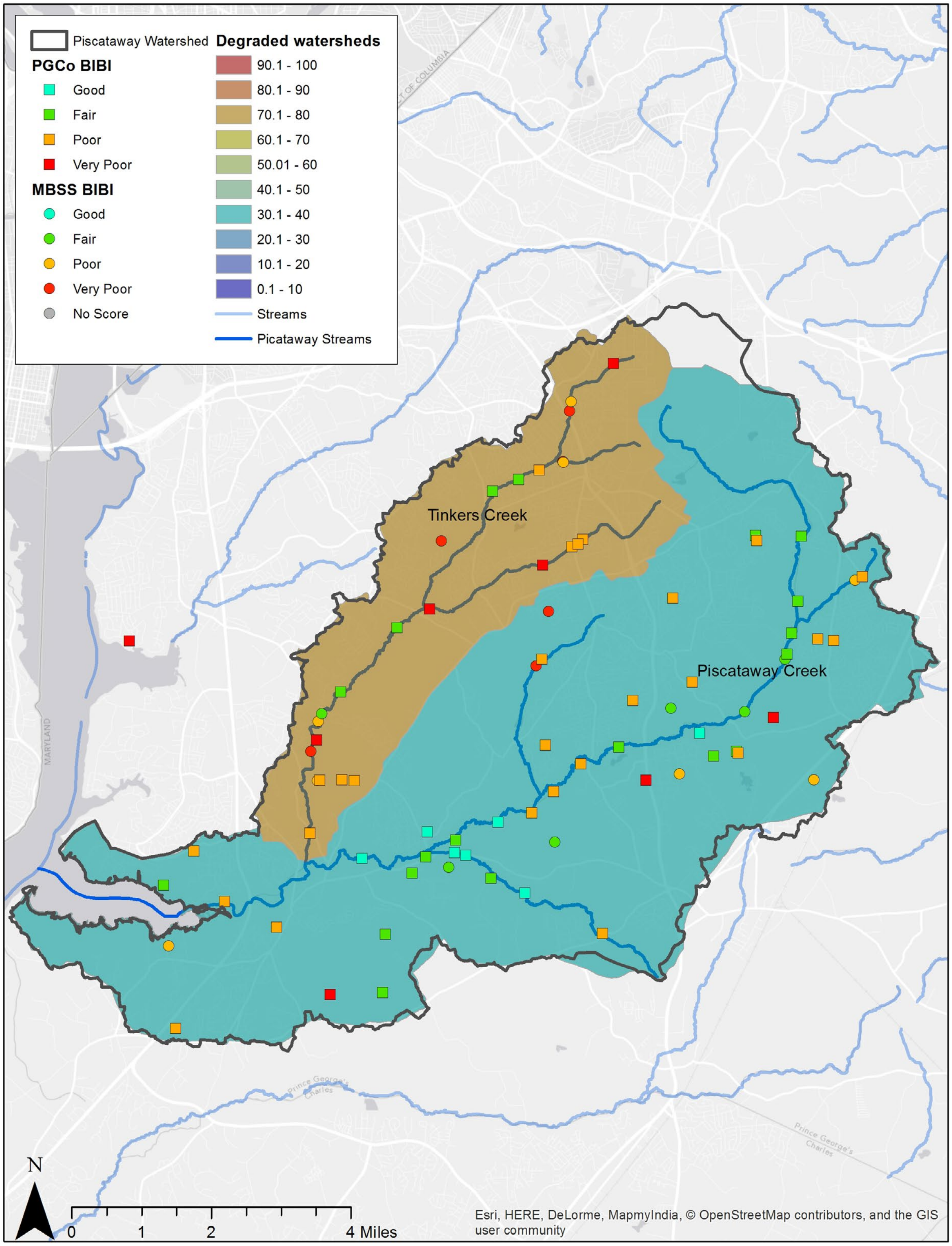
Since 1999 two rounds of a Countywide bioassessment study have been completed; the first round from 1999 to 2003 and the second round from 2010 to 2013. In 2013, the third and final year of Round 2, 10 subwatersheds or subwatershed groups were assessed, including 1 in the Anacostia River basin, 5 in the Patuxent River basin, and 4 in the Potomac River basin (Millard et al. 2013). Using the Maryland Department of Natural Resources Benthic Index of Biotic Integrity (B-IBI), approximately 50 percent of the sites assessed during Year 3 were rated biologically impaired (Poor or Very Poor B-IBI rating).

Figure 3-8 provides results of the second round of benthic invertebrate and B-IBI sampling in the Piscataway Creek watershed. It illustrates that 79 percent of sites in Tinkers Creek are rated as biologically degraded, having B-IBI ratings of Poor to Very Poor. Notwithstanding the extensive impervious area of JBA, 40 percent of the sites were rated Good in the Piscataway Creek mainstem. These improvements reflected an increase in biological rating of Fair compared to the Poor allocated to Tinkers Creek. Likewise, habitat ratings were partially supporting versus non-supporting.

Degraded stream miles account for 15 percent of total stream miles in the Piscataway Creek basin in Round 1. The percent of degraded stream miles in Piscataway Creek increased by 50 percent from the Round 1 assessments to 22.5 percent of the total stream miles in the Round 2 assessments. The Round 2 assessment report suggests that not only have the County's overall efforts to manage and restore water quality not resulted in improvements in the Piscataway Creek watershed, but that additional development measures might not be adequate, or that runoff stresses from legacy development might continue to degrade streams (Millard et al. 2013).

MDE performed a biological stress identification (BSID) study in the nearby Mattawoman Creek watershed published in March 2014 (MDE 2014). The parameters used in the BSID analysis were segregated into land use sources and stressors representing sediment, in-stream habitat, riparian habitat, and water chemistry conditions. Through the BSID analysis, MDE identified land use sources and water chemistry parameters significantly associated with degraded fish or benthic biological conditions (MDE 2012; USEPA 2013). Sediment conditions, riparian habitat conditions, and in-stream habitat conditions did not show significant association with Poor to Very Poor stream biological conditions (i.e., removal of stressors would result in improved biological community). Specifically, high chlorides, high conductivity, low field pH, and acid neutralizing capacity (ANC) below chronic level have been identified to show a high level of correlation with Poor to Very Poor stream biological conditions.

Many stressors identified in MDE (2014) are applicable to the Upper Patuxent River and Western Branch watersheds. One of the stressors is the application of road salts during winter seasons that can become a source of chlorides and high conductivity levels. On-site septic systems and stormwater discharges are also likely sources of elevated concentrations of chlorides, sulfates, and conductivity. Currently there are no specific numeric criteria in Maryland that quantify the impacts of these stressors on non-tidal stream systems. Low ANC below chronic level can be caused by repeated additions of acidic materials, like those found in atmospheric deposition (NADP 2012). The results of the National Atmospheric Deposition Program/National Trends Network (NADP 2012) indicate that Maryland is in or near the region of most acidic precipitation and receives some of the highest concentrations of sulfate and nitrate deposition in the United States (MD DNR 2010).



Source: Biotic Integrity from MD DNR, degraded watersheds from Tetra Tech
MBSS = Maryland Biological Stream Survey

Figure 3-8. Results of benthic invertebrate and B-IBI sampling in the Piscataway Creek watershed.

3.3 Flow Data

Flow in a water body is the result of several factors, with the most significant being rainfall and subsequent runoff; snow melt; ground water inflow into a water body; and release of water from upstream holding facilities such as reservoirs or stormwater detention systems. Flow can change over time as urbanization occurs. Urbanization results in increased impervious area (e.g., roof tops, parking lots, and roads). This area prevents water from infiltrating into the ground, resulting in more water flowing to streams during rainfall events, creating higher peak flows. These peak flows can bring higher levels of sediment and other pollutants into the water body.

Table 3-6 presents the available flow and related stream change information. USGS gauge 1653600 is at the mainstem just before the confluence with Tinkers Creek. It has the longest period of record, albeit with several gaps. It was used to calibrate the SWMM model referenced in the background documents.

Figure 3-9 presents flow at the stations in Tinkers Creek and mainstem Piscataway Creek. Overall, Tinkers Creek has less variable flow than the mainstem Piscataway Creek. Some peak flows in Piscataway Creek are higher than in Tinkers Creek, perhaps due to the much larger drainage area; however there many more lower flows too. Flow data is somewhat limited, and without a more complete record, it is difficult to derive any conclusions from this data.

Table 3-6. Summary of available flow and stream data in the Piscataway Creek watershed

Station ID	Station Name/ Description	Parameter	Units	Date		Number of Records	Value		
				Min.	Max.		Min.	Mean	Max.
MD0021539	Piscataway	Flow	cfs	04/14/08	09/18/08	2	46.45	47.08	47.70
PHB0009	Pea Hill Branch	Flow	cfs	01/29/08	11/05/08	10	0.600	5.45	37.48
PIS0033	PIS0033	Depth	feet	07/28/86	07/28/86	1	0.000	0.000	0.000
PIS0045	Piscataway Creek	Flow	cfs	10/03/00	10/20/03	50	1.09	27.27	90.82
PIS0099	Piscataway Creek	Flow	cfs	01/29/08	11/05/08	8	1.10	20.09	105
PIS0133	Piscataway Creek	Flow	cfs	07/22/08	11/05/08	3	1.24	2.80	4.41
TIN0006	Tinkers Creek	Flow	cfs	10/23/02	11/05/08	32	0.090	31.71	90.82
PHB0009	Pea Hill Branch	Flow	cfs	01/29/08	11/05/08	10	0.600	5.45	37.48
USGS1653600	Piscataway Creek at Piscataway, MD	Depth	feet	11/25/74	10/18/02	288	1.46	3.08	7.84
USGS1653600	Piscataway Creek at Piscataway, MD	Flow, instantaneous	cfs	11/25/74	10/18/02	145	0.020	83.57	1,330
USGS384532076563001	Pea Hill Branch at Camp Springs, MD	Flow, instantaneous	cfs	05/02/00	05/02/00	1	0.360	0.360	0.360
USGS384724076540401	Paynes Branch at Clinton, MD	Flow, instantaneous	cfs	04/05/00	04/05/00	1	1.70	1.70	1.70
XFB1793	Tidal Piscataway	Depth	feet	03/27/01	09/24/02	11	1.97	4.00	8.53

Station ID	Station Name/ Description	Parameter	Units	Date		Number of Records	Value		
				Min.	Max.		Min.	Mean	Max.
XFB1986	Tidal Piscataway	Depth	feet	01/06/86	12/12/12	413	1.64	4.75	9.19
XFB2379	Tidal Piscataway	Depth	feet	10/03/00	09/24/02	29	3.61	6.17	47.70

Note: cfs = cubic feet per second.

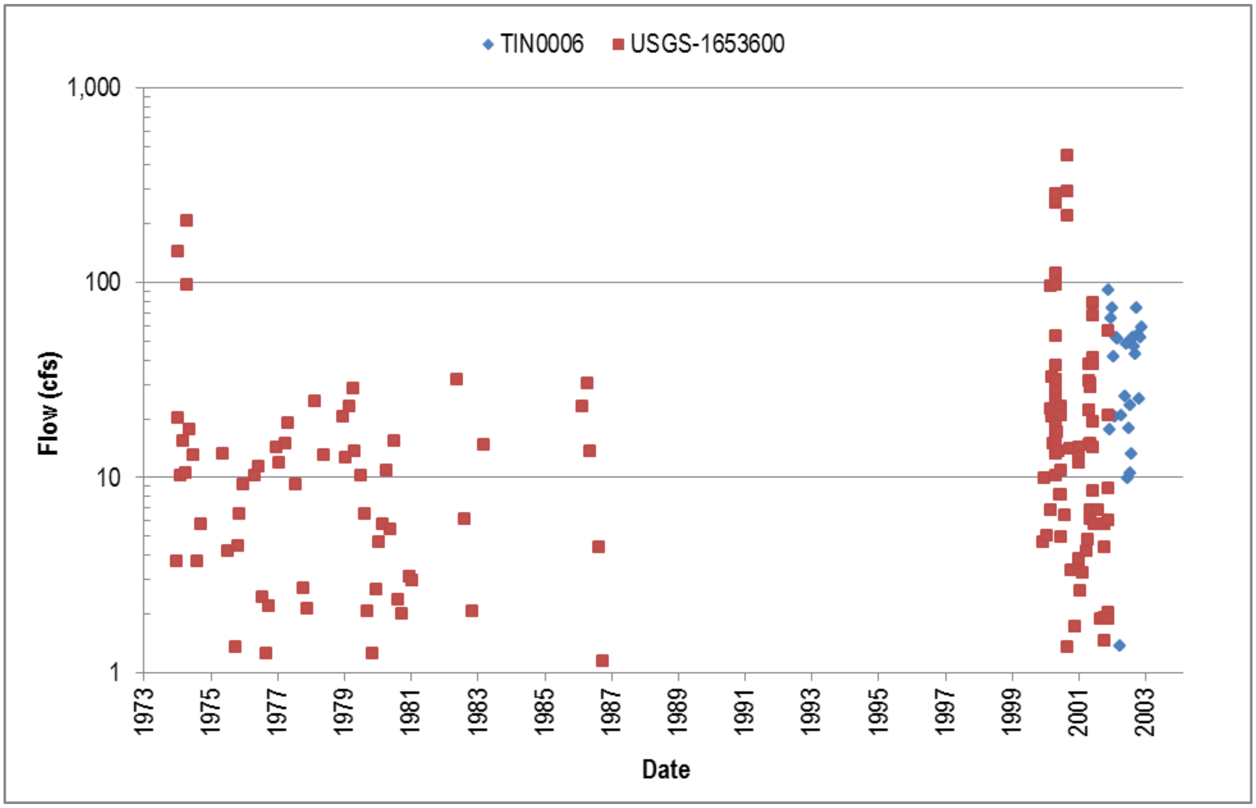


Figure 3-9. Plot of flow over time at Stations TIN0006 and USGS 1653600 in the Piscataway Creek watershed.

4 POLLUTANT SOURCE ASSESSMENTS

Point sources are permitted through the National Pollutant Discharge Elimination System (NPDES) program. Nonpoint sources are diffuse sources that typically cannot be identified as entering a water body through a discrete conveyance at one location. Nonpoint sources can originate from land activities that contribute nutrients or TSS to surface water as a result of rainfall runoff. For the TMDLs in this report, all sources of pollutant loading not regulated by NPDES permits are considered nonpoint sources.

4.1 NPDES Permitted Facilities

Under Title 40 of the *Code of Federal Regulations* section 122.2, a *point source* is described as a discernible, confined, and discrete conveyance from which pollutants are or may be discharged to surface waters. The NPDES program, established under Clean Water Act sections 318, 402, and 405, requires permits for the discharge of pollutants from point sources, including urban stormwater systems, known as MS4s. The County is an MS4-permitted discharger.

4.1.1 MS4 (Phase I, Phase II, SHA, Federal)

Stormwater discharges are generated by runoff from urban land and impervious areas such as paved streets, parking lots, and rooftops during precipitation events. These discharges often contain high concentrations of pollutants that can eventually enter nearby water bodies.

Under the NPDES stormwater program, operators of large, medium, and regulated small MS4s must obtain authorization to discharge pollutants. The Stormwater Phase I Rule (55 *Federal Register* 47990, November 16, 1990) requires all operators of medium and large MS4s to obtain an NPDES permit and develop a stormwater management program. Medium and large MS4s are defined by the size of the population in the MS4 area, not including the population served by combined sewer systems. A medium MS4 has a population between 100,000 and 249,999. A large MS4 has a population of 250,000 or more. The Stormwater Phase II Rule (64 *Federal Register* 68722, December 8, 1999) applies to operators of regulated small MS4s with a population less than 100,000 not already covered by Phase I; however, the Phase II Rule is more flexible and allows greater variability of regulated entities than does the Phase I Rule. Regulated, small MS4s include those within boundaries of urbanized areas as defined by the U.S. Census Bureau and those designated by the NPDES permitting authority. The NPDES permitting authority may designate a small MS4 under any of the following circumstances: the MS4's discharges do or can negatively affect water quality; population exceeds 10,000; population density is at least 1,000 people per square mile; or contribution of pollutant loadings to a physically interconnected MS4 is evident. There are no municipal Phase II MS4 entities in Piscataway Creek.

In addition to municipalities, certain federal, state, and other entities are also required to obtain a Phase II MS4 permit. Table 4-1 presents these permitted non-municipal entities within the Piscataway Creek watershed.

Table 4-1. Phase II MS4 permitted federal, state, and other entities in Piscataway Creek watershed

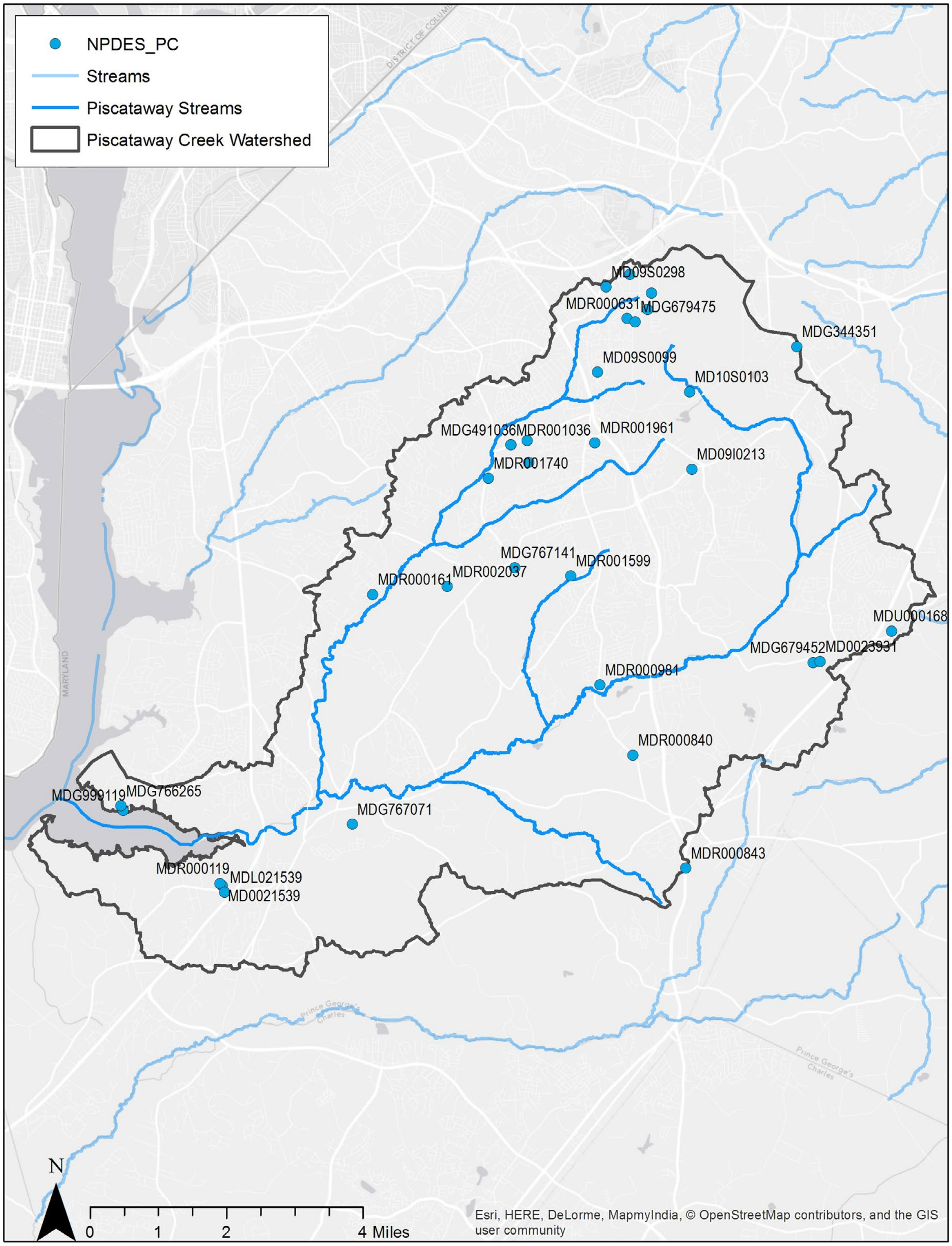
Agency	Installation/Facility
Federal Law Enforcement Training Center	Cheltenham
U.S. Department of the Air Force	Joint Base Andrews
Maryland State Highway Administration	Multiple (outside Phase I Jurisdictions)
Maryland Transportation Authority	Multiple Properties

4.1.2 Other NPDES Permitted Facilities

NPDES permit information was obtained from MDE's website and EPA's Integrated Compliance Information System. Figure 4-1 shows the locations of the permitted facilities that discharge to surface water in the watershed. Because of the number of facilities, Appendix C lists information on the facilities and their available information. Depending on permit conditions, a discharger is required to submit a discharge monitoring report (DMR) that reports pollutant concentration or loading data along with other information, such as flow or pH. The required information varies by discharger, and depends on the type of facility. Appendix C also includes summaries of available relevant permit limit (4 facilities) and DMR data (32 facilities).

The permit review revealed that there are 32 permitted facilities in the watershed. Of these, 10 are listed as discharging stormwater. Other facilities are permitted for discharging from construction sites, mining facilities, de-watering activities, refuse sites, and swimming pools.

The County maintains stormwater pollution prevention plans (SWPPP) for its facilities. There currently are ten County facilities and nine other municipal facilities covered by the NPDES General Industrial permit and which require a SWPPP. The County currently conducts field verification of these facilities to assure that each SWPPP accurately reflects the environmental and industrial operations of the facility. If deficiencies in the SWPPP are noted, the County provides the required technical support to upgrade the plans. The County also monitors all SWPPP implementation activities through its database tracking system and provides MDE with an annual report documenting the status of each County-owned facility SWPPP.



Source: MDE and EPA ICIS database

Figure 4-1. Permitted discharges in the Piscataway Creek watershed.

4.1.3 Wastewater

Wastewater facilities may include those publicly owned treatment works providing wastewater treatment and disinfection for sanitary sewer systems, or industrial facilities providing treatment for process waters. In the Piscataway Creek watershed two facilities are permitted to discharge treated sanitary wastewater in the watershed (Table 4-2). These facilities do not fall under the purview of the MS4 permit.

Table 4-2. Wastewater treatment plants in Piscataway Creek watershed

NPDES ID	Facility Name	Permit Type	Facility Type	Date Issued	Effective Date	Expiration Date
MD0021539	Piscataway WWTP	NPDES Individual Permit	WWTP	04/13/10	05/01/10	04/30/15
MD0023931	Cheltenham Boy's Village WWTP & WTP	NPDES Individual Permit	WWTP	05/10/10	06/01/10	05/31/15

Note: WWTP = wastewater treatment plant, WTP = water treatment plant.

Sanitary sewers occasionally unintentionally discharge raw sewage to surface waters in events called SSOs. These events contribute nutrients, bacteria, and solids into local waterways. SSOs can be caused by sewer blockages, pipe breaks, defects, and power failures. The Maryland Reported Sewer Overflow Database contains bypasses, combined sewer overflows, and SSOs reported to MDE from January 2005 through the most recent update. Data on SSOs in the County were obtained from the database and are summarized in Table 4-3.

Since 2005 an estimated 71.4 million gallons of sanitary overflows have been reported in Piscataway Creek watershed alone. For that period, the average amount of annual overflow has been 5.5 million gallons, with a minimum of 1,536 and a maximum of 33 million gallons, which occurred in 2010. These are very high SSO volumes. Figure 4-2 shows the locations of SSOs.

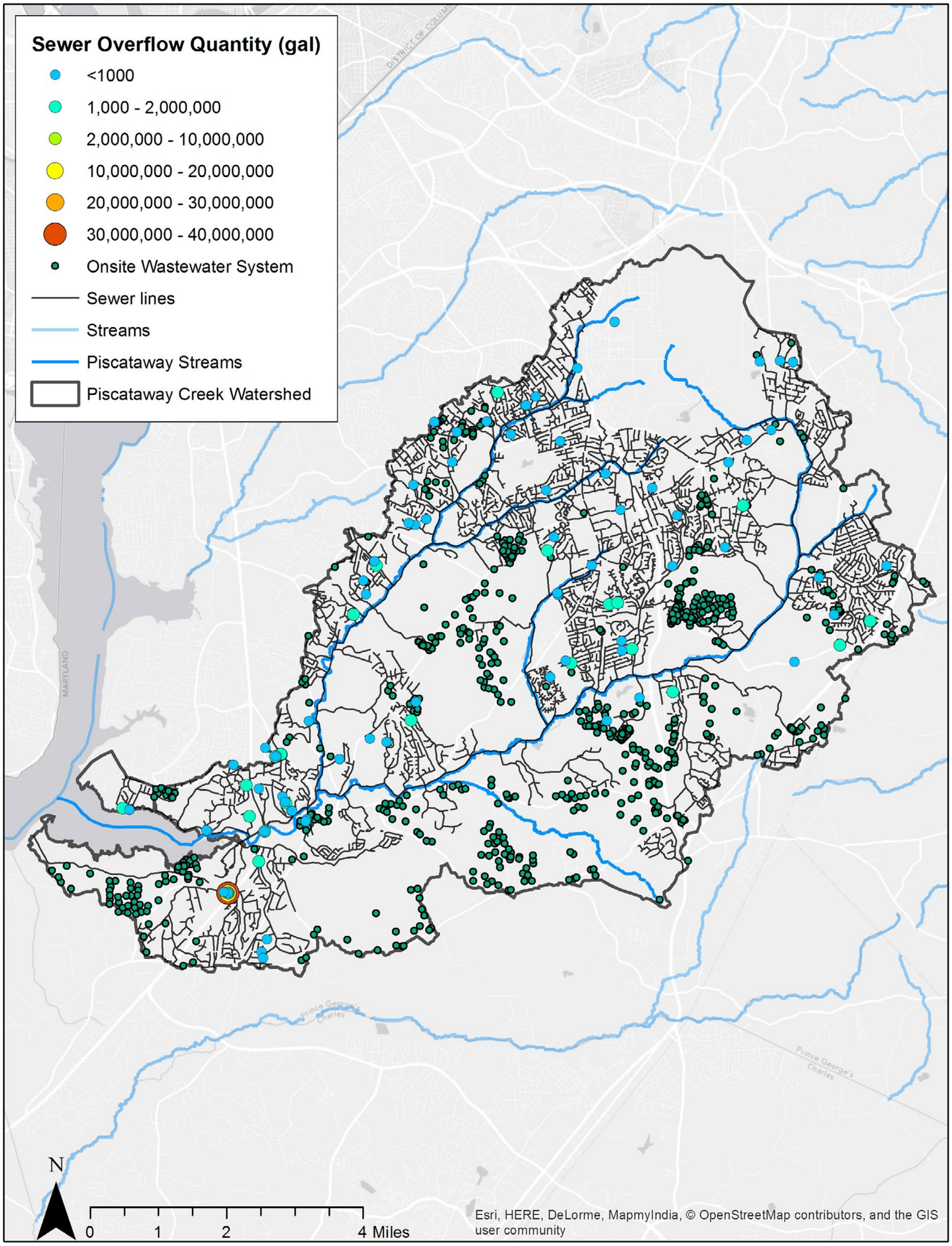
The SSO legend in Figure 4-2 shows that most of the major spills occurred at the Piscataway Wastewater Treatment Plant. Two of the three largest spills occurred because of power failure or third-party damage. As such, these would not be likely to reoccur, assuming better security and backup power. The Cheltenham Boy's Village is the only other wastewater system within the watershed. There have been few reported problems with this facility, aside from two small SSOs (5,000 and 12,000 gallons).

The *High Flow/Precipitation* category was responsible for the second-largest SSO, which was correlated with a major precipitation event. This suggests that lines allow for excess infiltration/inflow. The Washington Suburban Sanity Commission (WSSC) is currently addressing problems that cause SSOs through their Sewer Repair, Replacement and Rehabilitation (SR3) Program.

Table 4-3. Summary SSO overflow (gallons) in the Piscataway Creek watershed by year

Causes	2005	2006	2007	2008	2009	2010	2011	2012	2013
Blockage	11,180	701	1,138	10	30,505	5,055	1,638	20	3,502
Construction Activity					146				
Defective Equipment/ Workmanship				500	755			14,350	
Equipment Failure		1,367		5,300,000					
Equipment Wear	10,320	751		2,183	331		25,146	1,732	
Grease									10
High Flow/ Precipitation		13,000		16,359,000	140,122		152,450	158,000	85,000
Mechanical Failure	200			3,002		5,375	323,144		
Other	6,915	2,336			1,195		801,750		7,000
Power Loss				1,200,000			13,700,000		
Roots		7	245	4,246	895	12,100	274		108
Roots/Grease					129	190			2,258
Stream Erosion		1,470		947				850	
Third Party Damage						32,986,000	2,050	20	10
Unknown			153	97	1,515		102	3,111	5
Total	28,615	19,632	1,536	22,869,985	175,593	33,008,720	15,006,554	178,083	97,893

County data from 2011 indicate that there are 1,810 on-site wastewater systems within the watershed. Although these systems are typically not considered point sources, they are included in this section to provide a complete picture of sanitary wastewater in the watershed. These types of systems can contribute nitrogen loadings to nearby water bodies through their normal operation. Failing on-site systems can increase nitrogen, phosphorus, and bacteria levels. No information is currently available as to the age, maintenance, or level of treatment of the systems. Figure 4-2 shows the locations of on-site wastewater systems.



Source: Storm sewer pipes are from DoE and overflows from MDE, June 2014

Figure 4-2. Sanitary sewer lines, overflow sites, and on-site wastewater systems in the Piscataway Creek watershed.

4.2 Nonpoint and Other Sources

Nonpoint sources can originate from rainfall runoff (in non-urban areas) and landscape-dependent characteristics and processes that contribute sediment, organic matter, and nutrient loads to surface waters. Nonpoint sources include diffuse sources that cannot be identified as entering the water body at a specific location. Because the County is considered a Phase I MS4, for TMDL purposes, all urban areas within the County are considered point sources and allocated loads are considered under the WLA component. Mechanisms under which urban or MS4 loads are generated are the same as other rainfall-driven nonpoint sources. Potential sources vary greatly and include agriculture-related activities, atmospheric deposition, on-site treatment systems, streambank erosion, wildlife, and unknown sources.

Atmospheric deposition occurs by two main methods: wet and dry. Wet deposition occurs through rain, fog, and snow. Dry deposition occurs from gases and particles. Particles and gases from dry deposition can be washed into streams from trees, roofs, and other surfaces by precipitation after it is deposited. Winds blow the particles and gases contributing to atmospheric deposition over far distances, including political boundaries, such as state boundaries.

Streams and rivers can vulnerable to nutrient inputs from wildlife. Wild animals with direct access to streams include deer, raccoons, other small mammals, and avian species. This access to streams contributes bacteria and nitrogen to water bodies.

Development in the watershed has altered the landscape from pre-settlement conditions, which included grassland and forest, to post-settlement conditions, which include cropland, pasture, and urban/suburban areas. This conversion has led to increased runoff and flow into streams versus pre-settlement conditions, as well as streambank erosion and straightening of meandering streams. The increased erosion not only increases sediment loading to water bodies but also increases loadings of nutrients and other pollutants (e.g., PCBs) that are adsorbed to the particles.

4.3 Existing BMPs

BMPs are measures used to control and reduce sources of pollution. They can be structural or nonstructural and are used to address both urban and agricultural sources of pollution. Structural practices include practices that are constructed and installed such as detention ponds, porous pavement, or bioretention systems. Nonstructural BMPs include institutional, educational, or pollution prevention practices that when implemented work to reduce pollutant loadings. Examples of nonstructural BMPs include implementation of strategic disconnection of impervious areas in a municipality, street sweeping, homeowner and landowner education campaigns, and nutrient management. Different types of BMPs remove pollutants at different levels of efficiency. Ponds tend to have lower efficiencies (but can treat larger areas), while bioretention systems and infiltration practices tend to have higher efficiencies (but can only treat smaller areas).

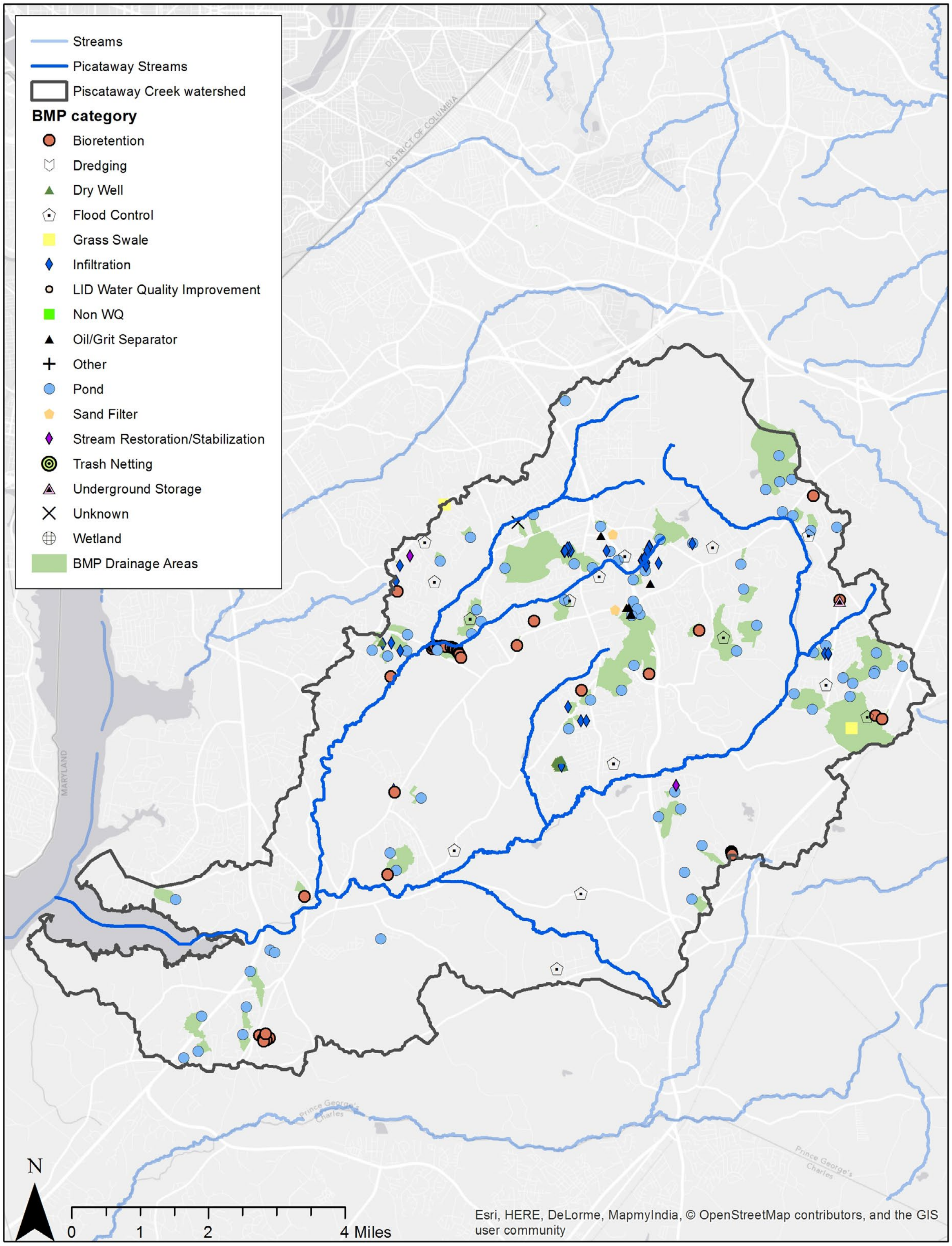
The County has implemented both structural and nonstructural BMPs in furtherance of a variety of programmatic goals and responsibilities including permit compliance, TMDL WLAs, flood mitigation, and others. Table 4-4 presents the list of known public and private structural BMPs in the Piscataway Creek watershed.

Figure 4-3 presents the locations of the BMPs in the watershed. The County also engages in street sweeping, public outreach to promote environmental awareness, green initiatives, and community involvement in protecting natural resources. Past public outreach activities include educational brochures on stormwater pollution awareness, outreach in schools, the *Can the Grease* program to decrease the amount of SSOs, and recycling programs.

Table 4-4. List of BMP types in the Piscataway Creek watershed

BMP Type	Total	Total w/DA	Total Acres Treated	Avg. Acres Treated
Bioretention	42	41	104.25	2.54
Dry Well	41	41	6.12	0.15
Flood Control	15	1	337.27	337.27
Grass Swale	2	1	0.77	0.77
Infiltration	36	28	46.60	1.66
Oil/Grit Separator	6	2	0.78	0.39
Pond	74	67	2,775.89	41.43
Sand Filter	2	1	2.32	2.32
Stream Restoration/Stabilization	2	0	0.00	0
Underground Storage	1	0	0.00	0
Unknown	1	1	9.12	9.12
Wetland	0	0	0.00	0
Total	222	183	3,283.12	17.94

Note: DA = drainage area.



Source: BMPs and storm sewer pipes are from DoE, June 2014

Figure 4-3. BMPs and associated drainage areas in the Piscataway Creek watershed.

4.4 Existing Condition Analysis

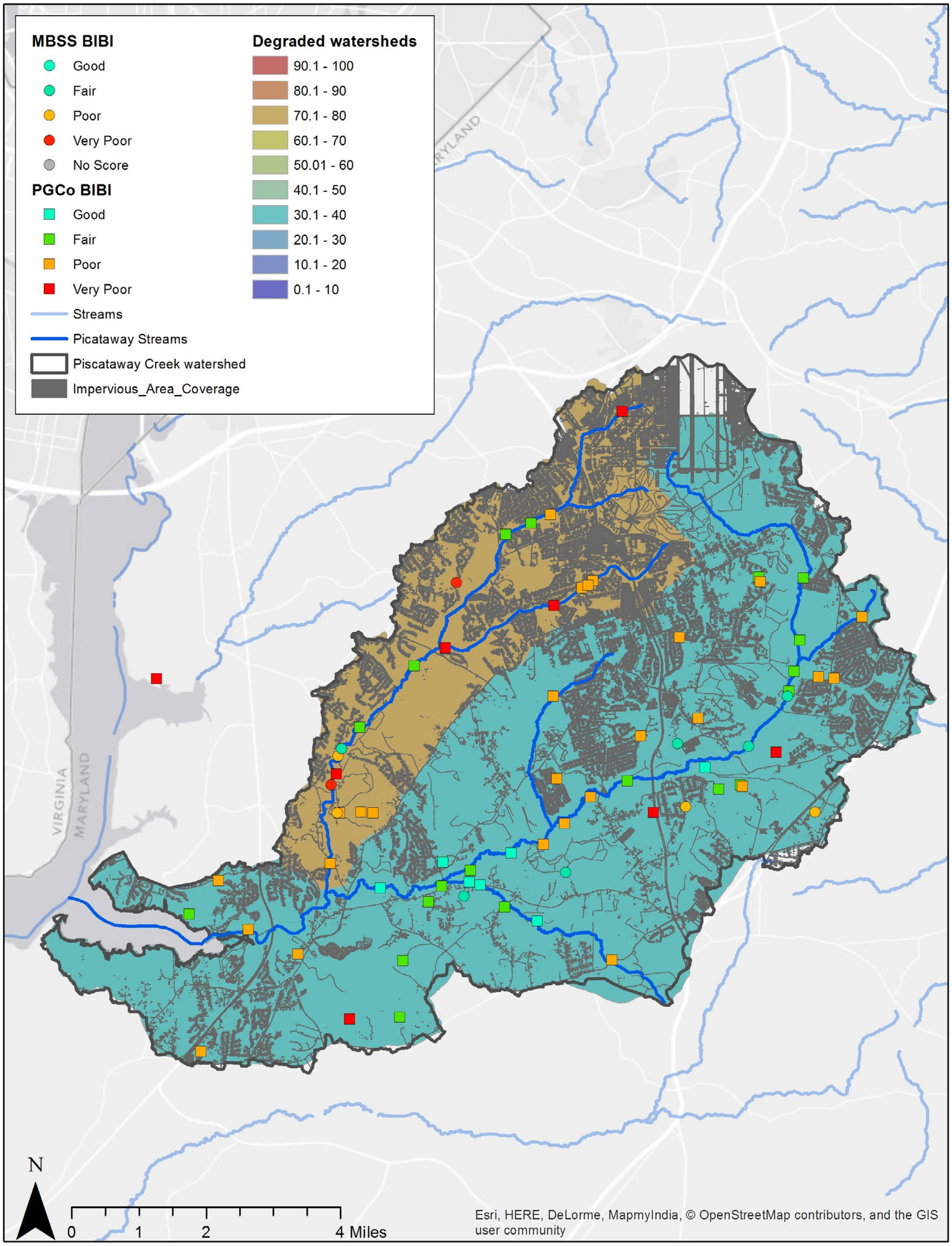
Water quality and the health of biological communities are affected by watershed characteristics such as land use and percentage of impervious cover. Multiple studies have shown that as impervious cover increases, peak runoff volumes and velocities increase, along with streambank erosion (Arnold and Gibbons 1996; Schueler 1994). The purpose of this section is to examine how landscape and physical characteristics in the County might influence conditions in other portions of the County. Available data were reviewed to examine relationships between biological index scores and impervious cover and BMP locations. BMP locations are also examined in relation to current land uses and impervious areas.

- Figure 4-4 compares biological scores to impervious areas.
- Figure 4-5 compares biological scores to BMP locations.
- Figure 4-6 compares BMP locations to the current storm drain network.
- Figure 4-7 compares BMP locations to impervious areas.
- Table 4-5 looks at BMPs, their drainage areas, and what land use(s) they treat.

Overall the watershed has biological integrity values of Poor, Very Poor, and some Fair and Good. The monitoring locations with Poor and Very Poor scores tend to be in the impervious areas. The monitoring locations with scores of Fair and Good are in areas surrounded by areas that have more pervious surfaces, such as turf or forested patches.

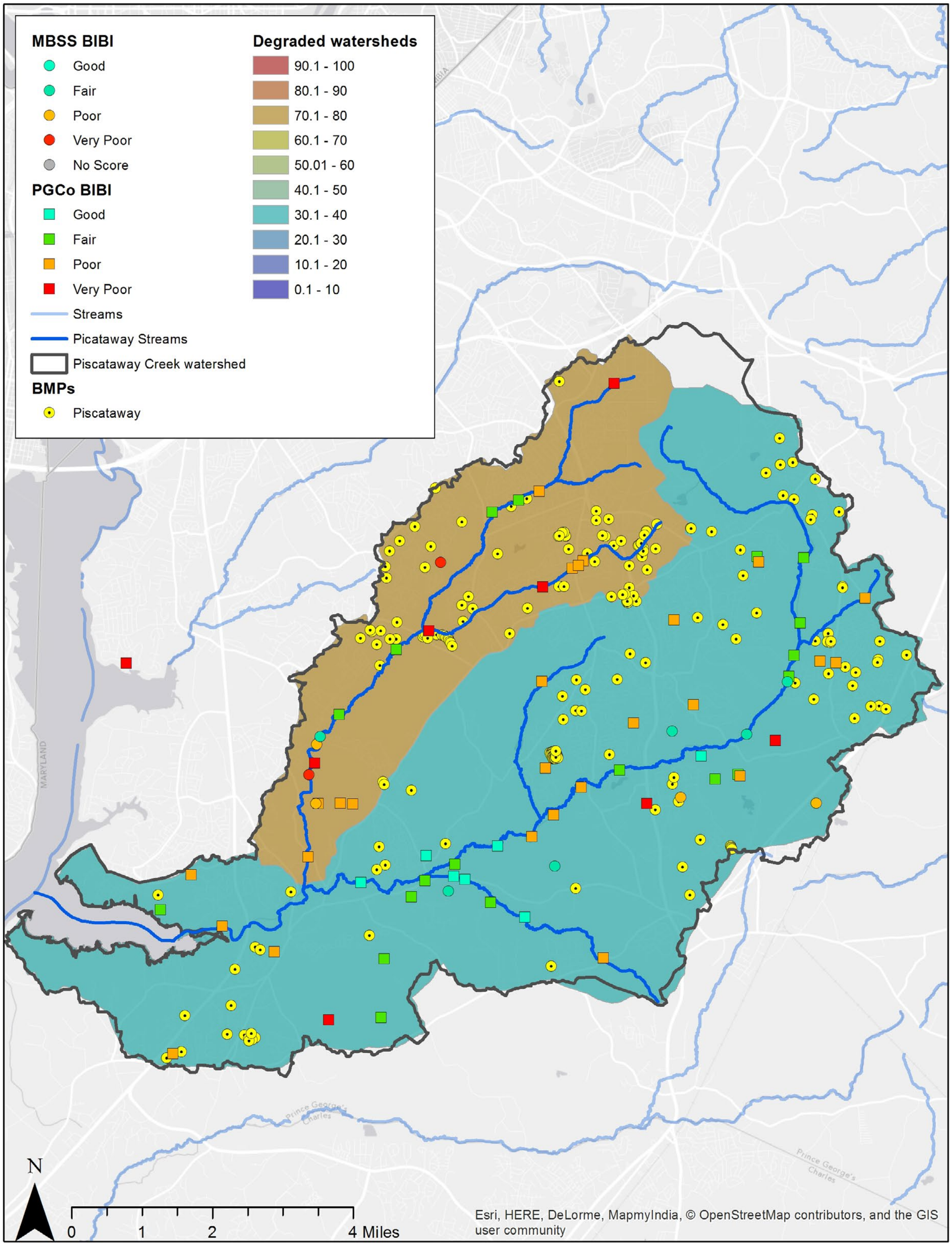
Figure 4-6 and Figure 4-7 show that there are impervious areas that have storm sewers that are not treated by BMPs, for example, in the central portion of the watershed. These areas might be candidate locations for BMP placement during the restoration plan development.

Table 4-5 is a compilation of BMP types in the Piscataway Creek watershed and the land uses they drain. By area treated, stormwater ponds are the most implemented BMP. They usually treat residential and non-urban areas. Flood control basins are the second most implemented practices. These BMPs are fairly ineffective because they are not designed for water quality. Bioretention practices are the most effective BMP, and while they are third in terms of area treated, their overall proportion is quite minor. They tend to treat smaller areas, but with greater pollutant removal efficiency. Dry wells and infiltration practices are the next most implemented BMPs, with the infiltration treating more total area and impervious area.



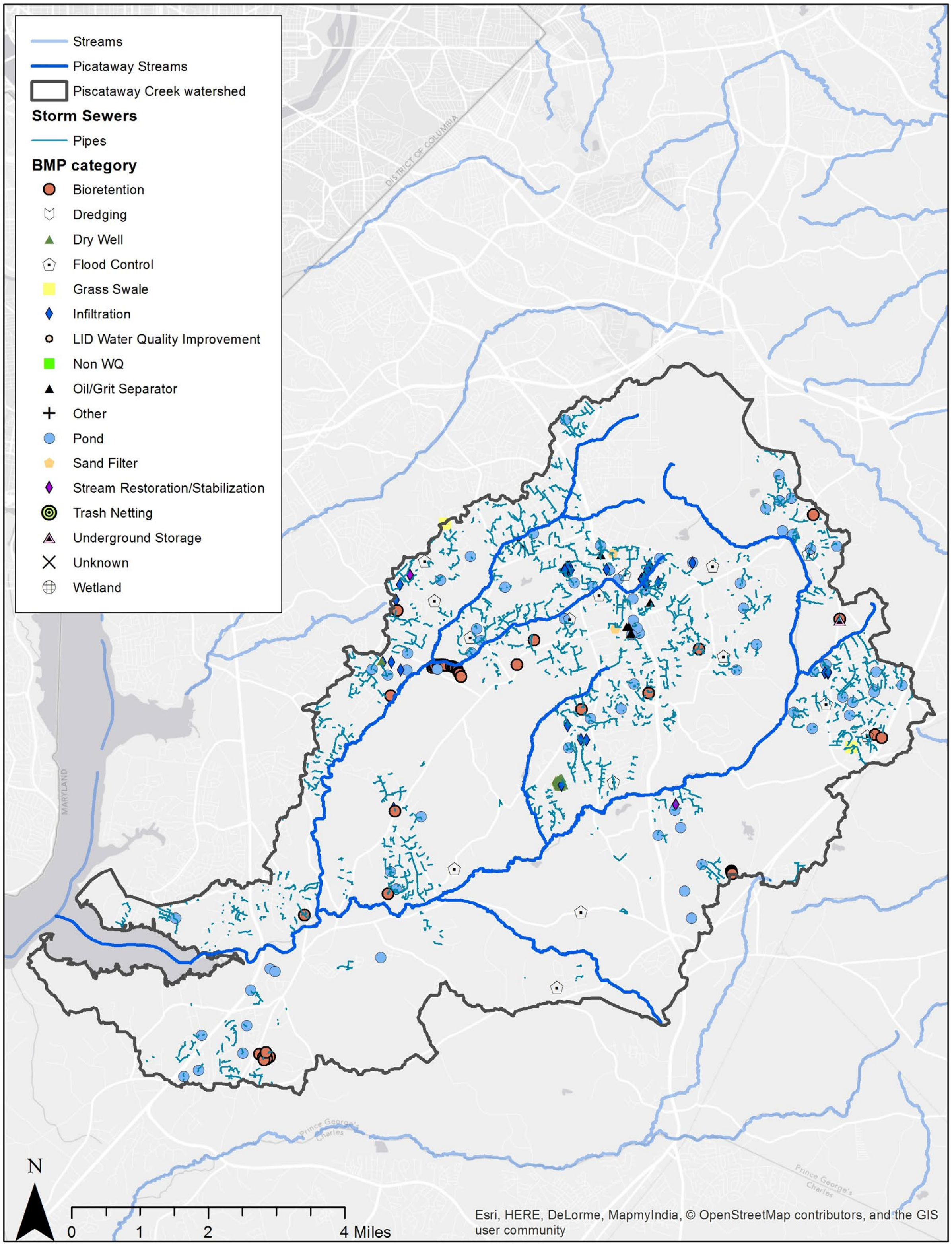
Source: Biotic Integrity from MD DNR, degraded watersheds from Tetra Tech, 2009 impervious area from M-NCPPC 2014

Figure 4-4. Comparison of biological conditions and impervious areas in the Piscataway Creek watershed.



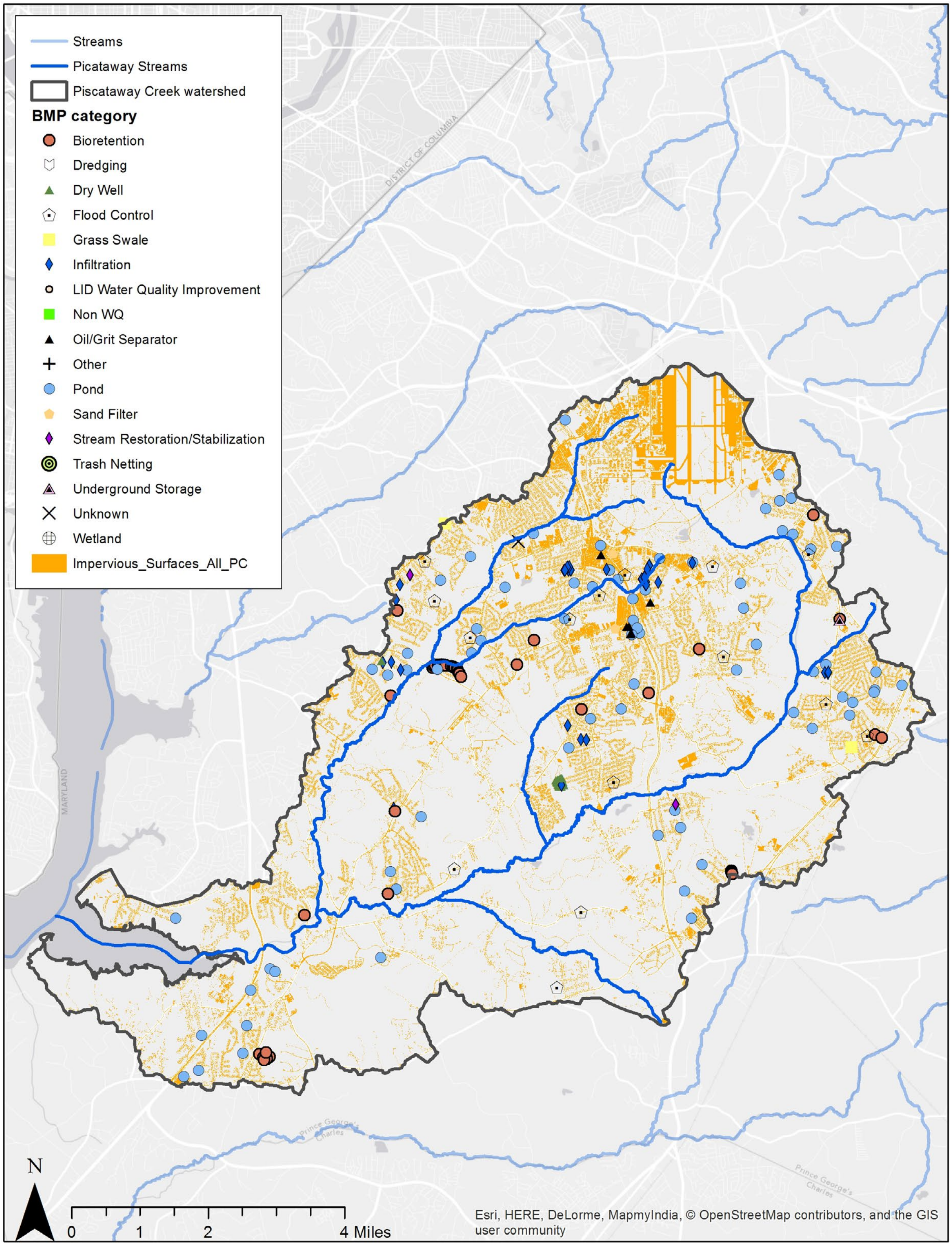
Source: BMPs are from DoE, June 2014, Biotic Integrity from MD DNR, degraded watersheds from Tetra Tech

Figure 4-5. Comparison of biological conditions and BMP locations in the Piscataway Creek watershed.



Source: BMPs and storm sewer pipes are from DoE, June 2014

Figure 4-6. Comparison of BMP locations and storm drain network in the Piscataway Creek watershed.



Source: 2009 impervious area from M-NCPPC 2014, BMPs are from DoE, June 2014

Figure 4-7. Comparison of BMP locations and impervious areas in the Piscataway Creek watershed.

Table 4-5. Summary of known BMP drainage areas, land uses, and impervious areas

BMP Type	Statistic	Com-mercial	Indus-trial	Institut-ional	Non-urban	Open urban	Resi-dential	Trans-portation
Bioretention	Count	1	0	5	5	0	36	0
	DA (acres)	1.81	0.00	5.15	3.48	0.00	87.00	0.00
	Imp DA (acres)	0.99	0.00	3.04	1.48	0.00	24.10	0
Dry Well	Count	0	0	0	3	0	41	0
	DA (acres)	0.00	0.00	0.00	0.70	0.00	5.12	0.00
	Imp DA (acres)	0.00	0.00	0.00	0.05	0.00	1.47	0
Grass Swale	Count	0	0	0	0	0	1	0
	DA (acres)	0.00	0.00	0.00	0.00	0.00	0.77	0.00
	Imp DA (acres)	0.00	0.00	0.00	0.00	0.00	0.07	0
Infiltration	Count	2	0	1	0	0	28	0
	DA (acres)	1.85	0.00	0.01	0.00	0.00	136.09	0.00
	Imp DA (acres)	0.91	0.00	0.00	0.00	0.00	48.59	0
Oil/Grit Separator	Count	1	0	0	0	0	1	0
	DA (acres)	1.27	0.00	0.00	0.00	0.00	1.86	0.00
	Imp DA (acres)	1.13	0.00	0.00	0.00	0.00	1.28	0
Pond	Count	14	4	15	40	6	62	6
	DA (acres)	751.56	382.06	276.93	2,671.63	506.85	9,119.72	129.73
	Imp DA (acres)	582.81	122.96	102.04	157.50	54.27	2,566.72	0
Sand Filter	Count	1	0	0	0	0	0	0
	DA (acres)	1.37	0.00	0.00	0.00	0.00	0.00	0.00
	Imp DA (acres)	0.72	0.00	0.00	0.00	0.00	0.00	0
Unknown	Count	0	0	0	1	0	1	0
	DA (acres)	0.00	0.00	0.00	0.27	0.00	17.98	0.00
	Imp DA (acres)	0.00	0.00	0.00	0.00	0.00	7.20	0
Bioretention	Count	1	0	5	5	0	36	0
	DA (acres)	1.81	0.00	5.15	3.48	0.00	87.00	0.00
	Imp DA (acres)	0.99	0.00	3.04	1.48	0.00	24.10	0
Dry Well	Count	0	0	0	3	0	41	0
	DA (acres)	0.00	0.00	0.00	0.70	0.00	5.12	0.00
	Imp DA (acres)	0.00	0.00	0.00	0.05	0.00	1.47	0

Note: This table only includes information for BMPs with geospatial drainage area (DA) information.

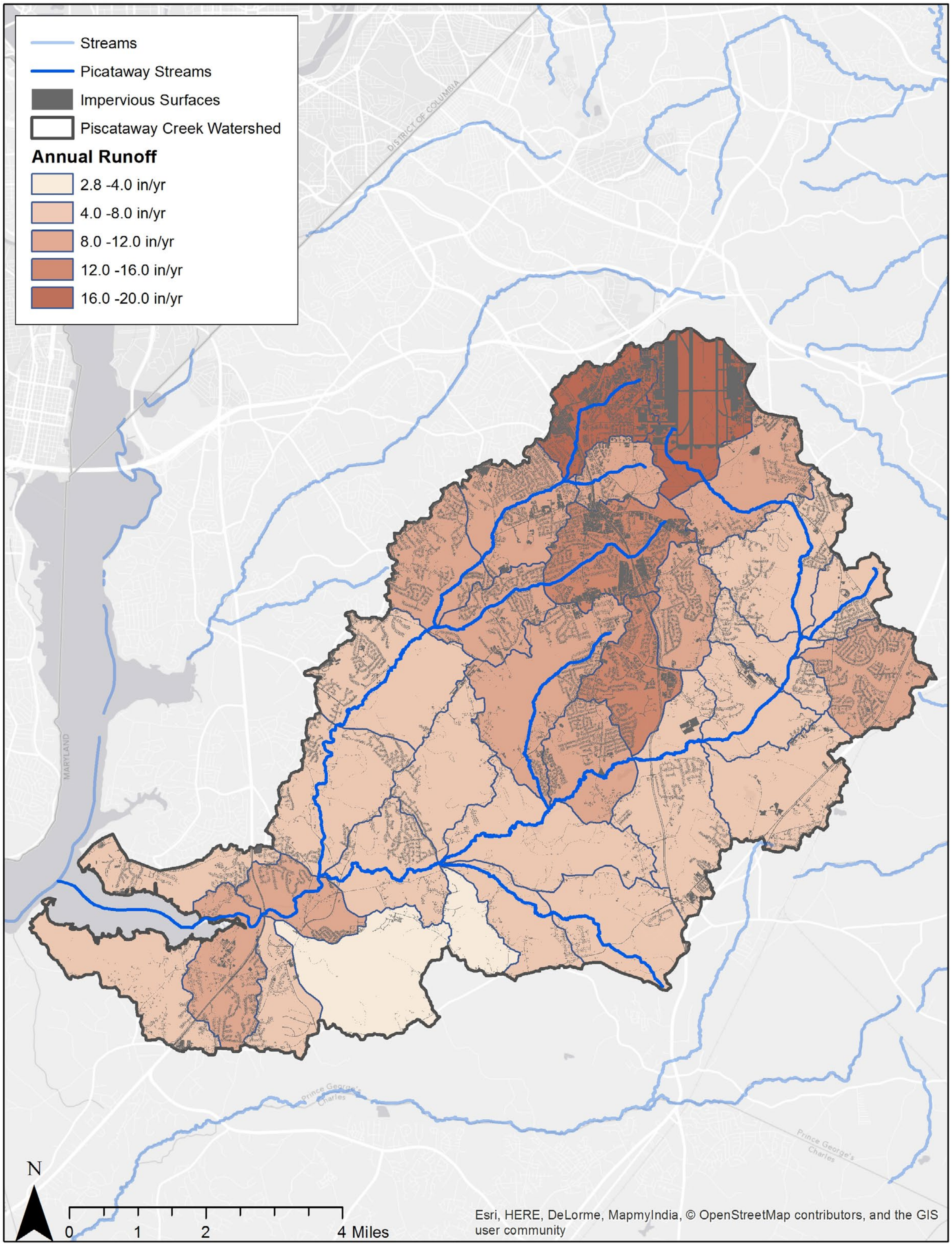
4.5 Stressor Loading Analysis

As described above, water quality and the health of biological communities are affected by watershed characteristics such as land use and percentage of impervious cover. On the basis of land cover characteristics, there is substantial literature on annual median concentrations for connected impervious, disconnected impervious, and pervious areas. Multiplied by annual runoff volumes from each of these land covers, this develops the projected runoff loads of the various stressors. These stressors are total nitrogen, total phosphorus, TSS, BOD, and fecal coliforms. The first four parameters are measured in pounds per acre per year, while the latter is measured by billion counts (MPN) per acre per year.

The purpose of this section is to examine how these landscape and physical characteristics in the watershed might influence conditions in their local watershed. Given their individual characteristics, this analysis highlights subwatersheds where runoff loads are elevated. The most elevated subwatersheds are candidates for Capital Improvement Plan retrofit projects to restore watershed functions. The least elevated watersheds are candidates for preservation measures. The following figures relate how impervious surfaces are closely correlated to the extent of stressor loading.

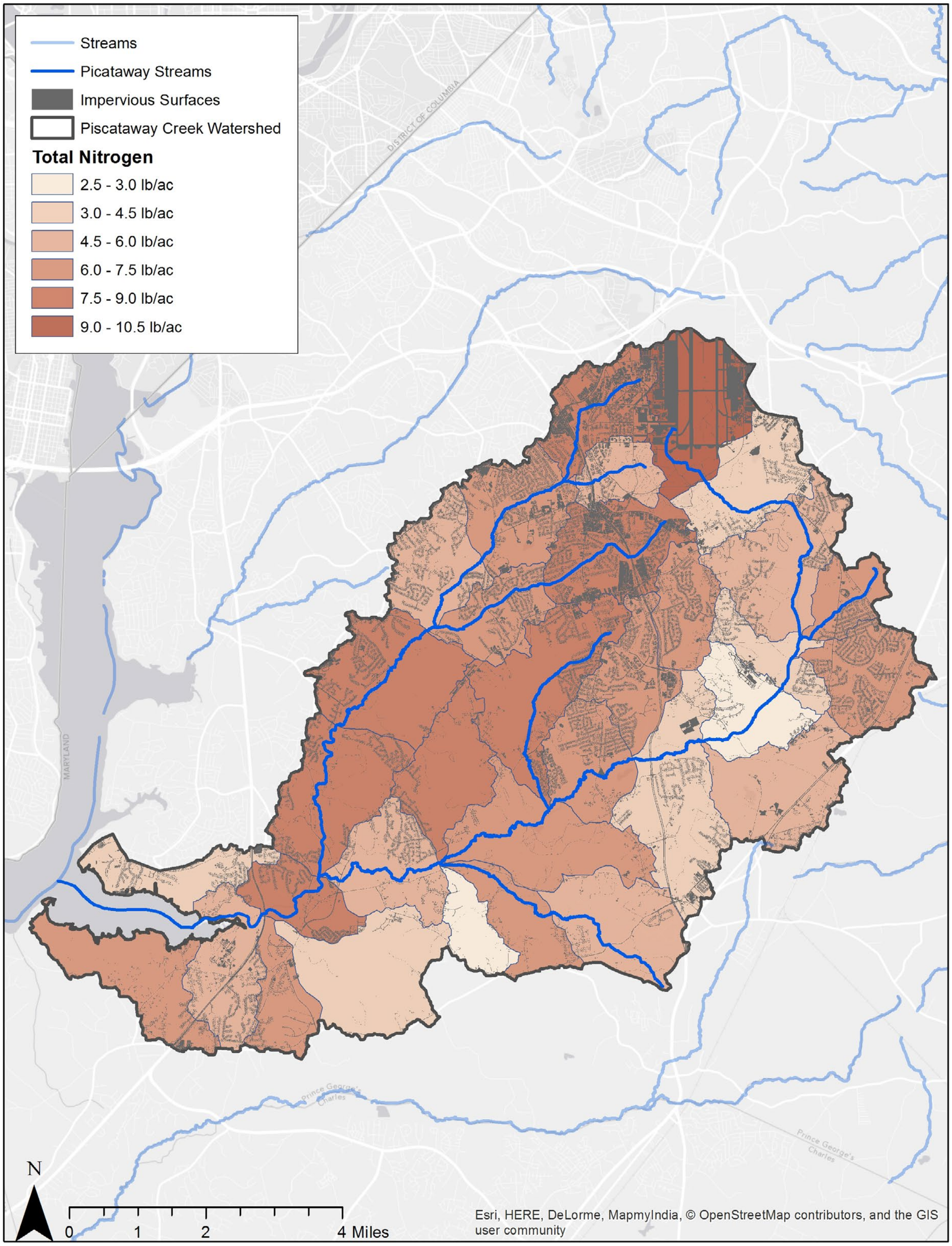
- Figure 4-8 presents the variation in total phosphorus loads throughout the watershed.
- Figure 4-9 presents the variation in total nitrogen loads throughout the watershed.
- Figure 4-10 presents the variation in total phosphorus loads throughout the watershed.
- Figure 4-11 presents the variation in TSS loads throughout the watershed.
- Figure 4-12 presents the variation in BOD loads throughout the watershed.
- Figure 4-13 presents the variation in fecal coliform loads throughout the watershed.

Figure 4-8 illustrates how runoff is affected by both the extent of impervious cover. The headwaters of the Piscataway watershed at JBA have similar runoff to the adjacent headwaters of Tinkers Creek. The pervious cover in this subarea is mowed fields instead of maintained turf; therefore, loading rates of total phosphorus are lower. Being largely due to atmospheric deposition, total nitrogen loading rates are slightly higher. TSS loading is reduced because runways are relatively sediment free, and such fields are effective in retaining sediments. In contrast, agricultural areas in the southwest portion have similar TSS loading rates. Following similar loading trends allocated to total phosphorus, BOD is projected to be lower. Because wildlife and pets are actively managed in airport operations, fecal coliform bacteria loading rates are expected to be considerably lower.



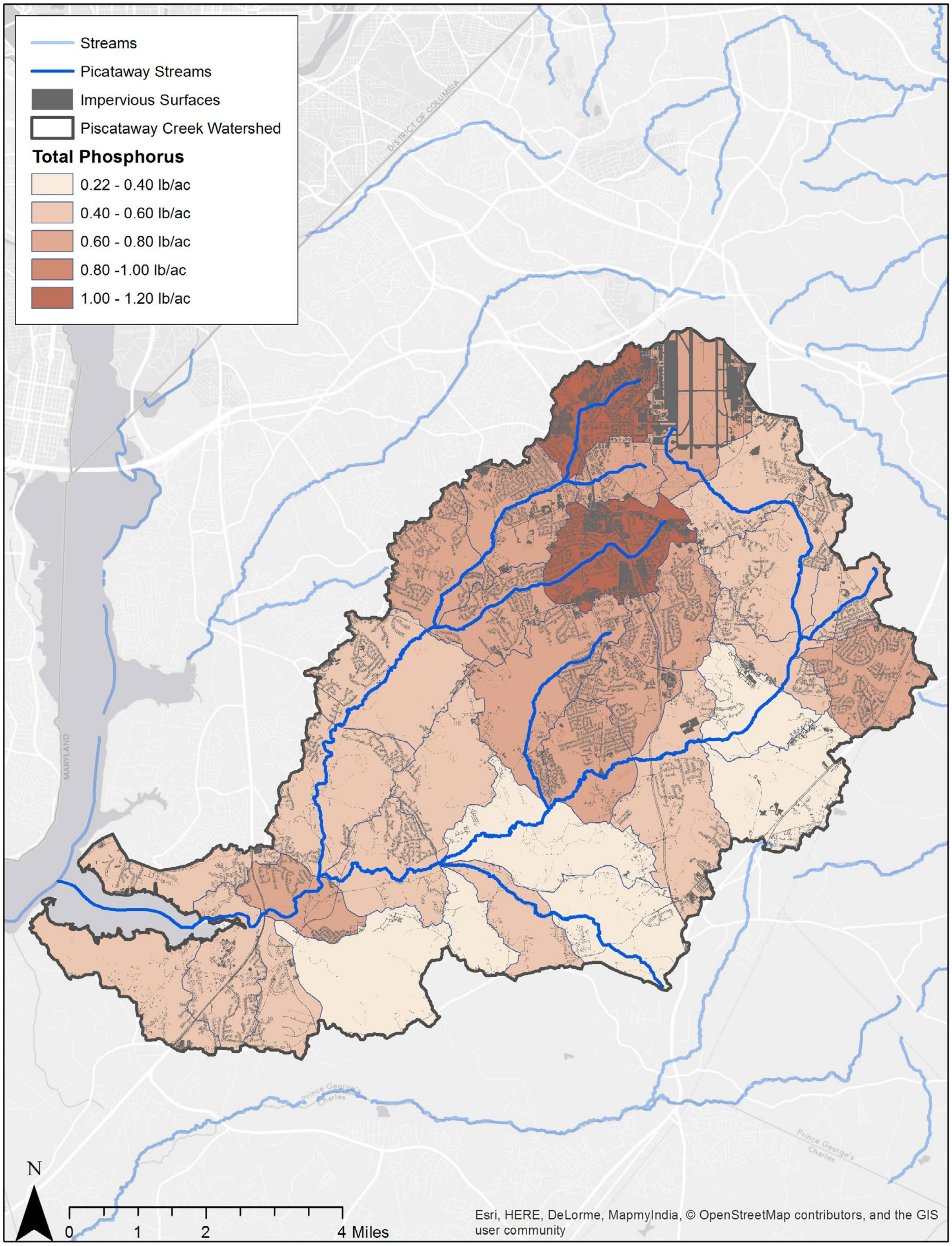
Source: 2009 impervious area from M-NCPPC 2014.

Figure 4-8. Comparison of runoff and impervious areas in the Piscataway Creek watershed.



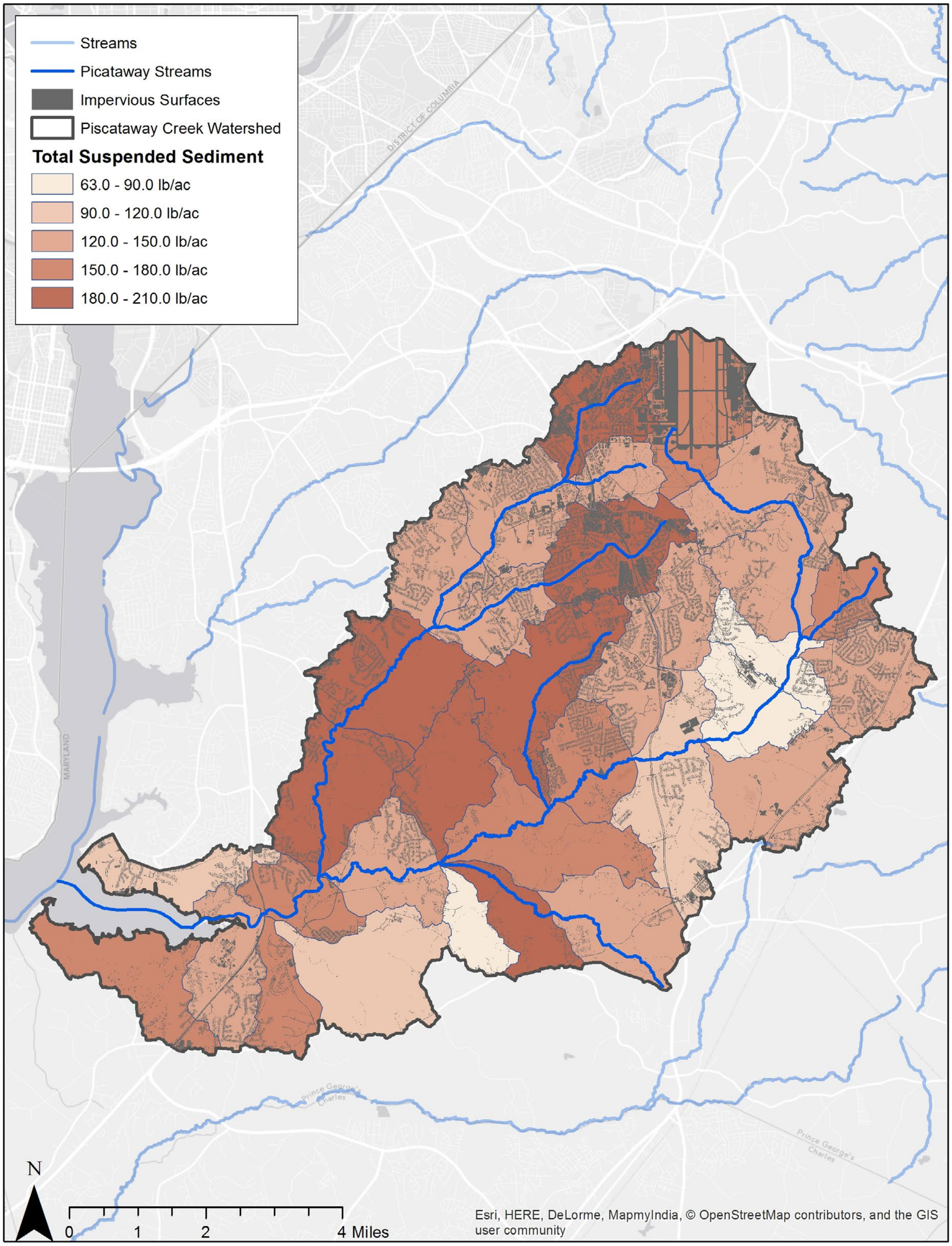
Source: 2009 impervious area from M-NCPPC 2014.

Figure 4-9. Comparison of total nitrogen and impervious areas in the Piscataway Creek watershed.



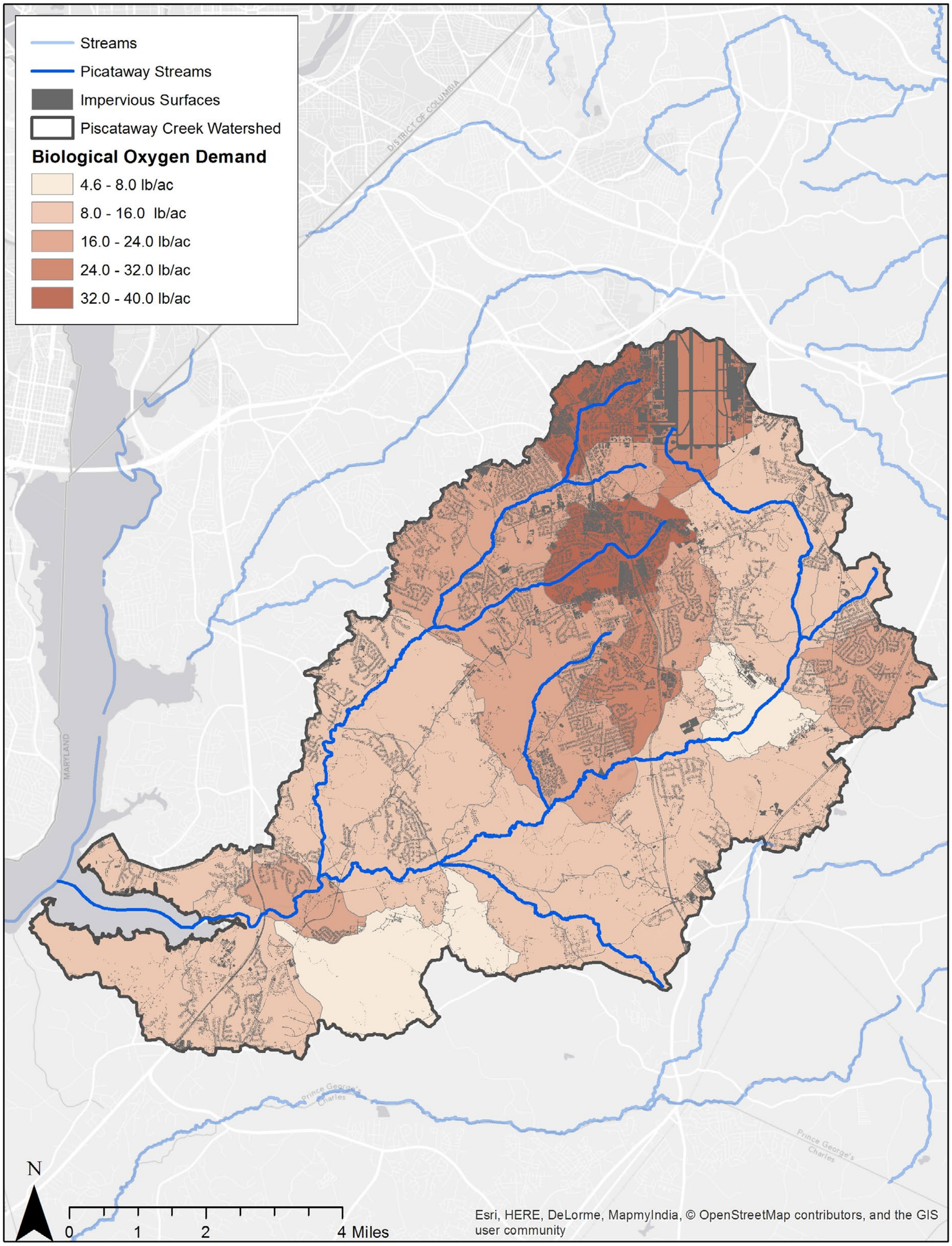
Source: 2009 impervious area from M-NCPPC 2014.

Figure 4-10. Comparison of total phosphorus and impervious areas in the Piscataway Creek watershed.



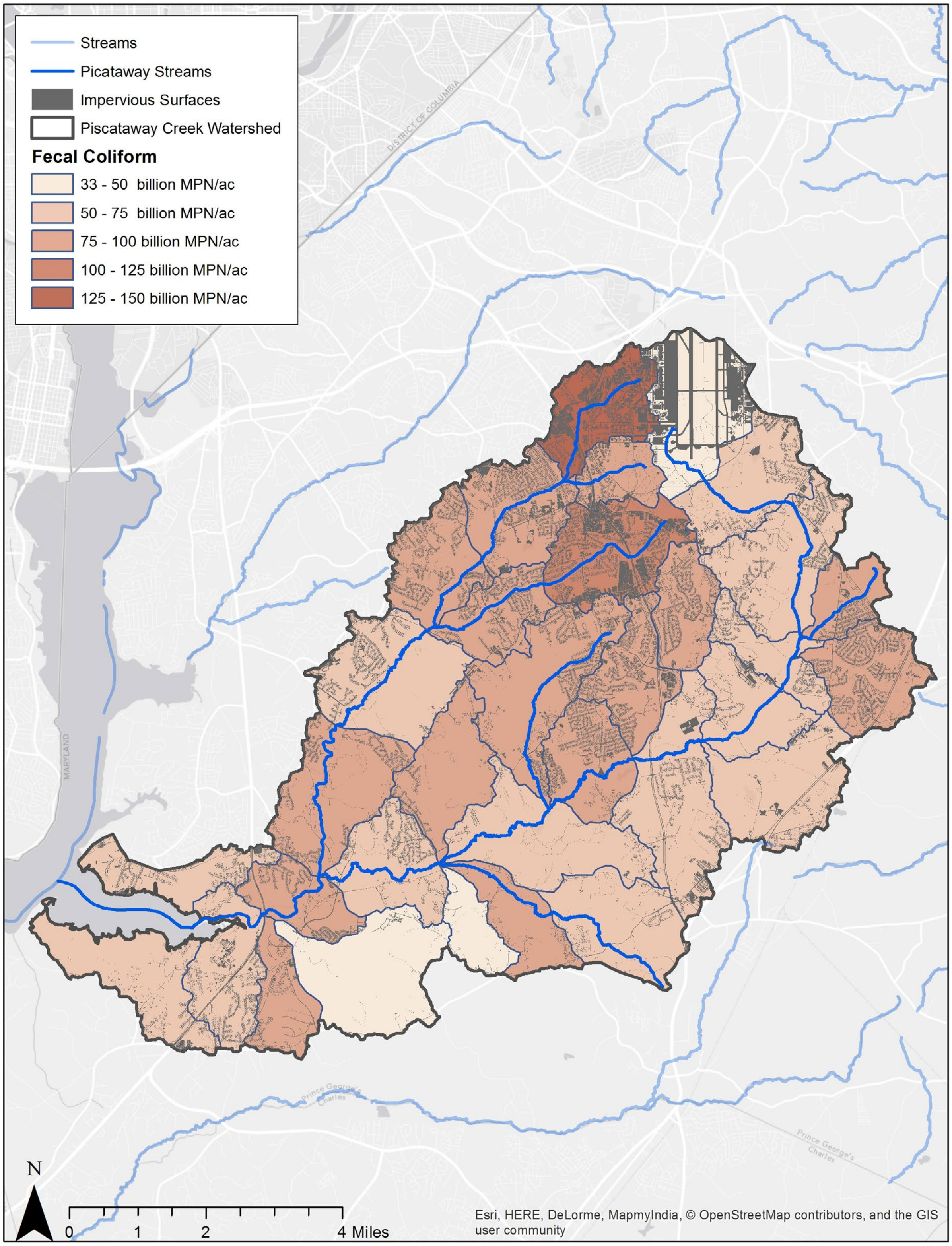
Source: 2009 impervious area from M-NCPPC 2014.

Figure 4-11. Comparison of TSS and impervious areas in the Piscataway Creek watershed.



Source: 2009 impervious area from M-NCPPC 2014.

Figure 4-12. Comparison of BOD and impervious areas in the Piscataway Creek watershed.



Source: 2009 impervious area from M-NCPPC 2014.

Figure 4-13. Comparison of fecal coliform bacteria and impervious areas in the Piscataway Creek watershed.

5 Next Steps

As previously discussed, the County is in the beginning phases of developing restoration plans for the EPA-approved TMDLs in the County. This is a multistep process and this report represents the initial phase of the plan development process by collecting the necessary data and beginning to process the information. Additional phases will be completed through the remainder of 2014, culminating in final plans submitted to MDE by January 2, 2015. Future phases include analyses to (1) look at the amount of pollutant loads that need to be reduced; (2) estimate reductions from the current and past County restoration activities; (3) determine the current load reduction gap; and (4) estimate the remaining amount of restoration activities that are still required to meet TMDL goals. The restoration plans will be developed once these analyses are complete.

Restoration plans typically:

- Identify causes and sources of pollution.
- Estimate pollutant load reductions.
- Describe management options and identify critical areas.
- Estimate technical and financial assistance needed.
- Develop education component.
- Develop project schedule.
- Describe interim, measurable milestones.
- Identify indicators to measure progress.
- Develop a monitoring component.

The restoration plans will be developed over the summer and early fall and expected to be available for public comment in November. For more information concerning the restoration plans or the public meeting, please visit the County's Department of the Environment website at www.princegeorgescountymd.gov/sites/stormwatermanagement or contact Lilantha Tennekoon at 301-883-6198 or ltennekoon@co.pg.md.us.

Once finalized, the restoration plans will lead to additional BMP implementation, public outreach, and opportunities for the public to help in the watershed restoration process. The County is already conducting many of the activities that will be described in the plans, but the rate of implementation activities will increase. BMPs will be installed through the County's Public-Private Partnership Program, capital improvement projects, and grants. Additional BMPs are expected to be implemented from Rain Check Rebates and the Alternative Compliance program through the County's recently implemented Clean Water Act Fee. There will also be an increase in pollutant-focused public outreach initiatives. The public will also be encouraged to take small steps that will add up to be part of the restoration solution.

The restoration plan will explore different ways the County can monitor, track, and report restoration progress towards meeting the TMDL reduction goals. There are several different options for monitoring and tracking progress. The County expects to use a combination of monitoring activities. The County will report annual progress as part of its NPDES MS4 permit reporting requirements. In addition, the restoration plans describe adaptive approaches that will reevaluate current strategies on the basis of the progress that has occurred and possibly suggest new implementation strategies.

The County's NPDES MS4 permit also requires the County to develop detailed watershed assessments for each County watershed by January 2019. These assessments will be larger studies that will build off of the initial watershed characterization reports and restoration plans. The assessments will include the current water quality conditions, identification and ranking of water quality problems, prioritized water quality improvement projects, and load reduction benchmarks for meeting applicable TMDL reduction goals.

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APPENDIX A: TMDL FACTSHEETS

Chesapeake Bay Watershed Nutrient and Sediment TMDL

Piscataway Creek Basin Fecal Coliform Bacteria TMDL

Chesapeake Bay Watershed Nutrient and Sediment TMDL

Source Document:	U.S. Environmental Protection Agency, Region 3, Water Protection Division and Region 3, Chesapeake Bay Program Office and Region 2 Division of Environmental Planning and Protection. 2008. Chesapeake Bay Total Maximum Daily Load for Nitrogen, Phosphorus and Sediment. December 29, 2010.
Water Body Type:	Chesapeake Bay tidal and non-tidal watershed and contributing subwatersheds.
Pollutant:	Total nitrogen (TN), total phosphorus (TP) and total suspended solids (TSS)
Designated Uses:	Migratory fish spawning and nursery, open water fish and shellfish, and shallow water Bay grasses.
Size of Watershed:	64,000 square miles
Water Quality Standards:	**Dissolved oxygen (DO)**: See Table 3-4 of report. **Chlorophyll *a***: Concentrations of chlorophyll *a* in free-floating microscopic aquatic plants (algae) shall not exceed levels that result in ecologically undesirable consequences—such as reduced water clarity, low DO, food supply imbalances, proliferation of species deemed potentially harmful to aquatic life or humans or aesthetically objectionable conditions—or otherwise render tidal waters unsuitable for designated uses **Secchi depth:** See Table 3-5 of report.
Analytical Approach:	Chesapeake Bay Airshed Model (wet deposition regression, and Community Multiscale Air Quality Model); SPARROW; Phase 5.3 Chesapeake Bay Watershed Model (HSPF)
Date Approved:	Approved December 29, 2010

Introduction

The Total Maximum Daily Load (TMDL) analysis for the Chesapeake Bay watershed (Figure 1) addresses TN, TP, and sediment loads on an annual average basis. Reductions in these pollutants will address DO, chlorophyll *a*, and clarity impairments in the Chesapeake Bay.

This fact sheet provides summary data related to the TMDL and includes specific information related to allocations made for Prince George’s County, Maryland.

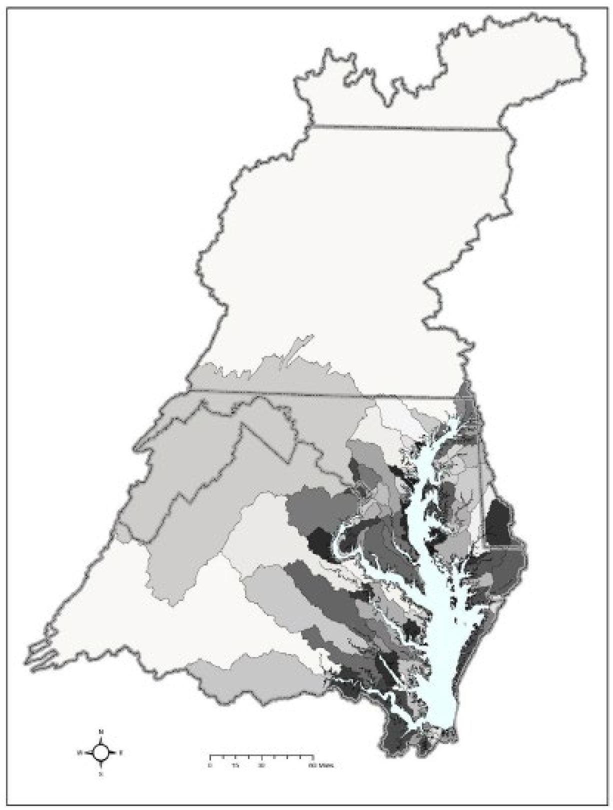

Figure 1. Overall Chesapeake Bay watershed and segment subwatersheds.
Source: USEPA 2010.

Problem Identification and Basis for Listing

Water quality impacts from excessive nutrients and sediment throughout the Chesapeake Bay watershed cause excessive algal growth, low DO, and reduced water clarity in the Chesapeake Bay. Suspended sediment reduces light availability, impacting underwater Bay grass communities. In addition, sediment can transport other pollutants, such as bacterial and phosphorus. Most of the Chesapeake Bay tidal segments were listed as impaired or threatened water that requires a TMDL. Factors for their listing included low DO, insufficient submerged aquatic vegetation, excess chlorophyll *a*, biological/nutrient indicators, TN, TP, TSS, biological oxygen demand, and pH. Many of the impaired segments are addressed by either consent decree or memoranda of understanding with the states.

Applicable Data

The Chesapeake Bay tidal monitoring program was established in 1984 to collect water quality data monthly at more than 150 stations throughout the 92 Chesapeake Bay tidal segments in Delaware, the District of Columbia, Maryland, and Virginia. Twenty-six parameters are monitored, and various other data are also collected, including shallow water monitoring benthic infaunal communities, Bay grass surveys, phytoplankton and zooplankton monitoring, and fisheries population monitoring. The monitoring is designed to support the bay states' 303(d) listing decision-making. In addition to tidal monitoring, there is a network of streamflow gauges and water quality sampling sites throughout the Chesapeake Bay watershed. These data were used to calibrate and verify the Phase 5.3 Chesapeake Bay Watershed Model.

Sources

Point sources of nutrients and sediment include municipal wastewater facilities, industrial wastewater facilities, combined sewer overflow systems, sanitary sewer overflow systems, National Pollution Discharge Elimination System (NPDES) permitted stormwater, and Concentrated Animal Feeding Operations. Nonpoint sources of nutrients and sediment include agricultural runoff, atmospheric deposition, on-site treatment system (septics), stormwater runoff, runoff from forested areas, streambank and tidal shoreline erosion, and wildlife and natural background.

Technical Approach

The two primary models used in the development of the TMDL were the Phase 5.3 Chesapeake Bay Watershed Model and the Chesapeake Bay Water Quality and Sediment Transport Model. The models are designed to simulate the 10-year hydrologic period from 1991 through 2000. The Watershed Model is responsible for simulating the loading and transport of nutrients and sediment from pollutant sources in the watershed and can provide loading estimates for management scenarios. The Water Quality Model simulates estuarine hydrodynamics, water quality, sediment transport, and living resources in the Chesapeake Bay. The model predicts water quality that results from management scenarios, and ensures that the allocated loads developed in the TMDL will meet water quality standards.

The Phase 5.3 Chesapeake Bay Watershed Model was calibrated for 1985–2005, using streamflow and water quality data from this time period. The segment outlets were intentionally designed to be in proximity to in-stream flow gauges and water quality monitoring stations. The model considers inputs from manure, fertilizers, atmospheric deposition, land use-based nonpoint sources, septic systems, regulated stormwater runoff, and wastewater treatment and discharge facilities.

The Chesapeake Bay Water Quality Model is based on a three-dimensional hydrologic transport model (CH3D) with a eutrophication model (CE-QUAL-ICM) to allow prediction of water quality in the Chesapeake Bay, based on the changes in the loading from the watershed. The hydrodynamic model was calibrated for 1991–2000. The Water Quality Model receives loads from nonpoint sources entering the tidal system at tributary fall lines from each of the Chesapeake Bay segments, based on inputs from the Watershed Model, and directly as runoff below the fall lines. Point sources are also incorporated based on their location in the tidal waters. The model incorporates atmospheric deposition of nutrients directly on the Chesapeake Bay tidal surface waters. Shoreline erosional loads are also included.

Allocations

The baseline scenario represents modeled loads for 2009. Wasteload and load allocations were made at the Chesapeake Bay segment level. Several of the bay segments are partially within Prince George's County. The Maryland Department of the Environment then allocated to the county level. The TMDL scenario represents the maximum nutrients and sediment loads to meet water quality standards. Reductions to each of the sectors is based on a limit of technology upgrades to wastewater treatment plants, no reductions to forest lands, and equal percent reductions from the nonpoint source sectors (MDE 2012). These factors are also modified by credit for existing nutrient and sediment reduction practices that are already in place and consideration for geographic proximity and relative impacts of the local load on Chesapeake Bay water quality. See Table 1 for TMDL allocations and reductions from baseline. Overall, there is a 9.32 percent reduction from baseline to the TMDL TN target, and a 3.61 percent reduction from baseline to the TMDL TP target. Table 2 provides annual allocations to urban loading sources for the County. County-level sediment allocations were not provided.

Table 1. Baseline and annual allocations to Prince George's County (delivered loads)

Sector	TN		
	2009 Load (lbs/year)	TMDL (lbs/year)	% Reduction
Agriculture	198,439	150,520	24.15%
Urban	832,131	628,709	24.45%
Septic	93,098	62,562	32.80%
Forest	200,386	198,993	0.70%
Point sources	1,670,919	1,674,936	-0.24%b
Total	2,994,973	2,715,720	9.32%
Sector	**TP**		
	2009 Load (lbs/year)	**TMDL (lbs/year)**	**% Reduction**
Agriculture	37,275	31,017	16.79%
Urban	106,306	68,923	35.17%
Septic	--[a]	--	--
Forest	6,850	6,744	1.55%
Point sources	61,786	97,880	-58.42%[b]
Total	212,217	204,564	3.61%

Source: DER 2012.

Notes:

[a] Septics are not considered a source of phosphorus in the Chesapeake Bay Model.

[b] Negative reductions account for growth in wastewater treatment plants.

Table 2. Annual allocations to urban loading sources in Prince George's County and percent reductions from 2009

Sector	TN (lbs/year)	% Reduction	TP (lbs/year)	% Reduction
County Phase I/II MS4	360,740	22.56%	29,394	38.58%
Municipal Phase II MS4	101,202	20.21%	8,796	34.65%
Bowie	36,746	18.26%	3,136	30.70%
Other Municipal	64,456	21.28%	5,660	36.65%
Nonregulated	18,807	24.86%	1,122	44.54%
Construction	83,805	37.22%	22,253	30.14%
SHA Phase I/II MS4	41,414	21.18%	3,880	36.02%
State Phase II MS4	10,168	21.57%	877	37.58%
Regulated Industrial	5,027	21.89%	502	36.38%
Extractive	7,546	16.16%	2,099	26.45%
Total	**628,709**	**24.45%**	**68,923**	**35.17%**

Source: DER 2012.

References

MDE (Maryland Department of the Environment). 2012. Maryland's Phase II Watershed Implementation Plan for the Chesapeake Bay TMDL. Developed by the University of Maryland, Maryland Department of Planning, Maryland Department of Agriculture, Maryland Department of the Environment and Maryland Department of Natural Resources.

Prince George's County Maryland, Department of Environmental Resources (DER). 2012. Revised Draft, Prince George's County, Maryland – Phase II Watershed Implementation Plan, For Inclusion in the Maryland Final Phase II Watershed Implementation Plan.

Piscataway Creek Basin Fecal Coliform Bacteria TMDL

Source Document:	MDE (Maryland Department of the Environment). 2006. Total Maximum Daily Loads of Fecal Bacteria for the Non-Tidal Piscataway Creek Basin in Prince George's County, Maryland FINAL. Document Version May 10, 2006.
Water Body Type:	Non-tidal stream reaches of the Piscataway Creek Basin in Maryland
Pollutant:	Fecal coliform bacteria
Designated Uses:	Use I-P – Water Contact Recreation, and Protection of Aquatic Life and Water Supply
Size of Watershed:	69 square miles
Water Quality Standards:	*E. coli*: 126 MPN / 100 mL Steady state geometric mean Enterococci: 33 MPN / 100 mL
Indicators:	*E. coli*
Analytical Approach:	Flow duration curve with bacterial source tracking used to determine proportional contributions from sources.
Date Approved:	Approved September 20, 2007

Introduction

This Total Maximum Daily Load (TMDL) was developed to address the fecal coliform impairment in non-tidal Piscataway Creek basin. It is entirely within Prince George's County and large portions of Andrews Air Force Base lie within it (Figure 1).

This fact sheet provides summary data related to the TMDL and includes specific information related to allocations made for Prince George's County, Maryland, regulated stormwater sources. Monitoring was conducted at two stations (PIS0045 and TIN0006) and allocations were made at this scale.

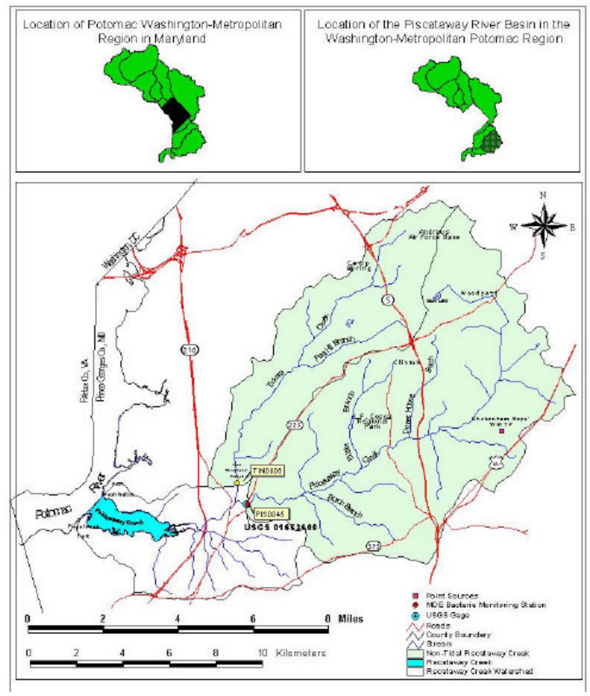

Figure 1. Piscataway Creek watershed
Source: MDE 2006.

Problem Identification and Basis for Listing

The watershed was originally assessed using fecal coliform bacteria. The Maryland Department of the Environment (MDE) conducted twice monthly monitoring at two stations in the watershed from November 2002 to October 2003; Ranges were typically between 10 and 2,010 MPN/100 mL.

In Maryland, determination of impairment due to fecal bacteria is done by calculating the steady state geometric mean using data collected during the previous 2–5 years. Samples must be from steady state, dry-weather conditions and during the beach season (May 31–Labor Day) to be representative of critical conditions. Data collected for each of the two stations resulted in steady state geometric means exceeding 126 MPN/100 mL for the seasonal period.

Applicable Data

TMDL analysis was performed using the data collected from November 2002 to October 2003, specifically for the TMDL (Table 1).

Table 1. Summary of *E. coli* data

Station	*E. coli* (MPN/100 mL)			
	Minimum	Maximum	Geo Mean	Criteria
Annual; 25 samples				
Piscataway Creek / PIS0045	10	1,350	123	126
Tinkers Creek / TIN0006	10	2,010	108	126
Seasonal; 12 samples				
Piscataway Creek / PIS0045	110	1,350	232	126
Tinkers Creek / TIN0006	10	2,010	183	126

Source: MDE 2006.

Sources

Typical sources contribute bacteria in this watershed including wildlife and domestic animals via nonpoint loading from land surfaces, and humans via septic and sewer systems. Sanitary sewer overflows have also been experienced in the watershed. A total of 25 sanitary sewer overflows were reported between July 27, 2001, and September 14, 2004, in the County's portion of Piscataway Creek watershed. The watershed also contains the Cheltenham Boy's Village wastewater treatment plant.

In addition, the watershed includes regulated stormwater. The regulated stormwater sources include industrial stormwater and federal (Andrews Air Force Base) municipal separate storm sewer systems (MS4s); however, the TMDL only identified an aggregate-regulated stormwater load allocation.

Technical Approach

The TMDL used a flow duration curve approach coupled with bacteria source tracking at each monitoring station to identify baseline loads and the proportion of source contributions. Baseline loads are estimated first for each subwatershed by using bacteria monitoring data and long-term flow data. These baseline loads were divided into four bacteria source categories, using the results of bacteria source tracking analysis. Next, the percent reduction required to meet the water quality criterion in each subwatershed is estimated from the observed bacteria concentrations after accounting for critical condition and seasonality. Finally, TMDLs for each subwatershed were estimated by applying these percent reductions.

Allocations

Practicable Reduction Targets

After bacteria source distributions and baseline loads were determined for each of the three monitoring stations, MDE applied a process to identify practicable reduction targets. The process is based on a review of the available literature and best professional judgment to identify reduction percentages to each source and subwatershed that is what MDE considers the maximum practicable reduction (MPR). Table 2 presents the MPR targets.

Table 2. MPR target reductions by source category

MPR per source	Human	Domestic (pets)	Livestock	Wildlife
Target percent reduction	95	75	75	0

Source: MDE 2006.

In the analysis of the MPR scenario, it was not possible to meet water quality criteria; therefore, additional reductions, as presented in Table 3, were required to meet criteria.

Table 3. Required percent reduction by source category

Subbasin	Applied Reductions %				Total Reduction Percent
	Pets	Human	Live-stock	Wild	
PIS0045	82.3	95	79.3	20.7	61.2
TIN0006	81.6	95	76.2	12.4	53.8

Source: MDE 2006.

Baseline Loads, Allocations, and Reductions

The TMDL report lists the TMDL, load allocation (LA) and wasteload allocation (WLA) portions of the analysis (Table 4). The margin of safety is implicit.

Table 4. TMDL summary by water quality station

Station	TMDL Load	LA Load	WLA-PS Load	WLA-MS4 Load
	Billion MPN/day			
PIS0045	136.5	90.4	0.09	46
TIN0006	64.1	27.3	0	36.8
Total	200.6	117.7	0.1	82.8

Source: MDE 2006.
Note: PS = point source.

The MS4 load is analogous to the more generic term *regulated stormwater* and includes other regulated stormwater sources in addition to the County's MS4 (e.g., industrial stormwater). The TMDL report provides no additional listing or accounting of separate stormwater sources, such as a list of affected permits, nor does it provide a baseline load for the MS4s.

APPENDIX B: NPDES PERMITTED DISCHARGERS

Table B-1. Active NPDES permits in the Piscataway Creek watershed in Prince George's County

NPDES ID	Facility Name	Permit Type	Facility Type	Date Issued	Effective Date	Expiration Date
MD0021539	Piscataway WWTP	NPDES Individual Permit	WWTP	04/13/10	05/01/10	04/30/15
MD0023931	Cheltenham Boy's Village WWTP & WTP	NPDES Individual Permit	WWTP	05/10/10	06/01/10	05/31/15
MD08S0058	Repair of High-Voltage Lighting System	NPDES Individual Permit	Electrical Equipment & Supplies	06/04/09	06/04/09	06/03/14
MD08S0358	Replace Primary Feeders 4 & 5, on the West Side of the Base	NPDES Individual Permit	Regulation, Administration Of Utilities	06/04/09	06/04/09	06/03/14
MD09I0213	Tall Cedars	NPDES Individual Permit	Residential Construction	06/30/09	06/30/09	06/29/14
MD09S0099	JBA-Conversion of Gravel Camp Pads to Concrete Camp Pads	NPDES Individual Permit	National Security	07/29/09	07/29/09	07/28/14
MD09S0297	JBA Strategic Planning and Development Facility	NPDES Individual Permit	National Security	05/27/09	05/27/09	05/26/14
MD09S0298	Demolish Building 1508 Off Arkansas Rd, and Spokane Lane	NPDES Individual Permit	Not Reported	06/04/09	06/04/09	06/03/14
MD10S0103	JBA West Runway (1l-19r)	NPDES Individual Permit	Airports, Flying Fields, & Services	07/20/10	07/20/10	07/19/15
MDG344351	P & W Lubricants Inc.	General Permit	Petroleum Bulk Stations & Terminals	01/25/08	01/25/08	12/12/12
MDG490511	Bardon, Inc. - Kirby Road Sand and Gravel	General Permit	Mineral Mine	12/01/11	12/01/11	04/30/15
MDG491036	Aggregate Industries - Kirby Road Asphalt Plant	General Permit	Mineral Mine	n/a	n/a	n/a
MDG679452	Cheltenham Boy's Village WWTP & WTP	General Permit	Hydrostatic Testing	06/13/12	06/13/12	02/28/17
MDG679475	JBA Water Supply System	General Permit	Water Supply/Hydrostatic Testing	04/15/13	04/15/13	02/28/17

NPDES ID	Facility Name	Permit Type	Facility Type	Date Issued	Effective Date	Expiration Date
MDG766265	Fort Washington Pool Association	General Permit	Swimming Pool	03/07/13	03/07/13	09/30/17
MDG767071	the Preserve at Piscataway Recreation Center	General Permit	Swimming Pool	07/29/13	07/29/13	09/30/17
MDG767141	Forest Hills Apts	General Permit	Swimming Pool	03/29/13	03/29/13	09/30/17
MDG999119	Fort Washington Marina	General Permit	Marina	n/a	n/a	n/a
MDL021539	Piscataway WWTP	Associated Permit Record	Sewerage Systems	01/01/94	01/01/94	12/31/99
MDR000119	Piscataway WWTP	General Permit	Stormwater Discharge	04/07/03	04/07/03	11/30/07
MDR000161	Potomac Airfield	General Permit-Stormwater	Stormwater Discharge	n/a	n/a	n/a
MDR000631	JBA	General Permit	Stormwater Discharge	03/25/03	03/25/03	11/30/07
MDR000840	Brandywine Two, Inc.	General Permit	Stormwater Discharge	03/21/03	03/21/03	11/30/07
MDR000843	Ransom Motors, Inc	General Permit	Stormwater Discharge	03/21/03	03/21/03	11/30/07
MDR000958	Capital Quikrete	General Permit-Stormwater	No Exposure Certification	n/a	n/a	n/a
MDR000981	B & M and King George Auto Parts Inc	General Permit	Stormwater Discharge	01/29/03	01/29/03	11/30/07
MDR001036	Aggregate Industries - Kirby Road Asphalt Plant	General Permit-Stormwater	Stormwater Discharge	n/a	n/a	n/a
MDR001599	Tantallon Printers	General Permit-Stormwater	No Exposure Certification	n/a	n/a	n/a
MDR001740	WSSC - Temple Hills Garage	General Permit	Stormwater Discharge	04/29/03	04/29/03	11/30/07
MDR001961	ABC Distribution LLC	General Permit	Stormwater Discharge	07/03/06	07/03/06	11/30/07
MDR002037	Silver Hill Materials Ii, LLC - Hyde Field Sand and Gravel	General Permit-Stormwater	Stormwater Discharge	n/a	n/a	n/a
MDU000168	Cherry Tree Estates	Unpermitted Facility	Not Reported	--	--	--

Note: JBA = Joint Base Andrews; n/a = not applicable; WWTP = wastewater treatment plant, WTP = water treatment plant.

Table B-2. Available permit limits for NPDES permits in the Piscataway Creek watershed in Prince George's County

NPDES ID	Outfall	Parameter	Minimum	Maximum	Unit	Statistical Base
MD0021539	001	Ammonia	1	1	mg/L	30-Day Average
MD0021539	001	Ammonia	1.5	1.5	mg/L	7-Day Average
MD0021539	001	Ammonia	250	250	lb/d	30-Day Average
MD0021539	001	Ammonia	450	450	lb/d	7-Day Average
MD0021539	001	BOD	10	30	mg/L	30-Day Average
MD0021539	001	BOD	15	45	mg/L	7-Day Average
MD0021539	001	BOD	30	30	mg/L	Maximum Monthly Average
MD0021539	001	BOD	45	45	mg/L	Maximum Weekly Average
MD0021539	001	BOD	2,500	2,500	lb/d	30-Day Average
MD0021539	001	BOD	3,750	11,270	lb/d	7-Day Average
MD0021539	001	BOD	7,510	7,510	lb/d	Maximum Monthly Average
MD0021539	001	BOD	11,270	11,270	lb/d	Maximum Weekly Average
MD0021539	001	BOD	7,510	7,510	lb/d	Monthly Loading
MD0021539	001	*E. coli*	126	126	MPN/100mL	Maximum Monthly Geometric Mean
MD0021539	001	Fecal Coliform	200	200	MPN/100mL	Logrithmic Monthly Median
MD0021539	001	Fecal Coliform	200	200	MPN/100mL	30-Day Geometric
MD0021539	001	Flow	23.6	23.6	Mgpd	Monthly Average
MD0021539	001	Total Nitrogen	365,467	365,467	lb/yr	Cumulative Total
MD0021539	001	Total Phosphorus	0.18	0.18	mg/L	30-Day Average
MD0021539	001	Total Phosphorus	0.18	0.18	mg/L	Maximum Monthly Average
MD0021539	001	Total Phosphorus	0.18	0.18	mg/L	Monthly Average
MD0021539	001	Total Phosphorus	45	45	lb/d	30-Day Average
MD0021539	001	Total Phosphorus	45	45	lb/d	Maximum Monthly Average
MD0021539	001	Total Phosphorus	45	45	lb/d	Monthly Loading
MD0021539	001	Total Phosphorus	16,446	16,446	lb/yr	Cumulative Total
MD0023931	001	Ammonia	8.4	12.7	mg/L	Maximum Daily Average
MD0023931	001	Ammonia	1	2.9	mg/L	Maximum Monthly Average
MD0023931	001	Ammonia	1	2.9	mg/L	Monthly Average
MD0023931	001	Ammonia	8.4	12.7	mg/L	Weekly Average
MD0023931	001	Ammonia	4.9	7.4	lb/d	Maximum Daily Average
MD0023931	001	Ammonia	0.6	1.7	lb/d	Maximum Monthly Average
MD0023931	001	Ammonia	0.6	1.7	lb/d	Monthly Average

NPDES ID	Outfall	Parameter	Minimum	Maximum	Unit	Statistical Base
MD0023931	001	Ammonia	4.9	7.4	lb/d	Weekly Average
MD0023931	001	BOD	10	30	mg/L	30-Day Average
MD0023931	001	BOD	15	45	mg/L	7-Day Average
MD0023931	001	BOD	10	30	mg/L	Maximum Monthly Average
MD0023931	001	BOD	15	45	mg/L	Maximum Weekly Average
MD0023931	001	BOD	6	18	lb/d	30-Day Average
MD0023931	001	BOD	9	26	lb/d	7-Day Average
MD0023931	001	BOD	6	18	lb/d	Maximum Monthly Average
MD0023931	001	BOD	9	26	lb/d	Maximum Weekly Average
MD0023931	001	*E. coli*	126	126	MPN/100mL	Monthly Geometric Mean
MD0023931	001	Fecal Coliform	200	200	MPN/100mL	30-Day Geometric
MD0023931	001	Fecal Coliform	200	200	MPN/100mL	Logrithmic Monthly Median
MD0023931	001	Flow	0.07	0.7	Mgpd	Annual Average
MD0023931	001	TKN	4	4	mg/L	30-Day Average
MD0023931	001	TKN	6	6	mg/L	7-Day Average
MD0023931	001	TKN	2.3	2.3	lb/d	30-Day Average
MD0023931	001	TKN	3.5	3.5	lb/d	7-Day Average

Note: mg/L= milligrams per liter; lb/d = pounds per day; lb/yr = pounds per year; MPN/100mL= most probable number (MPN) per 100 milliliters; gpd = gallons per day; Mgpd = million gallons per day; TKN = total Kjeldhal nitrogen.

Table B-3. Summary of available discharge information for NPDES permits in the Piscataway Creek watershed in Prince George's County

NPDES ID	Outfall	Parameter	Minimum	Average	Maximum	Unit	Statistical Base
MD0021539	001	Ammonia	0.1	0.505	3.6	mg/L	30-Day Average
MD0021539	001	Ammonia	0	0.217	1.2	mg/L	7-Day Average
MD0021539	001	Ammonia	0.05	0.179	0.84	mg/L	Monthly Average
MD0021539	001	Ammonia	1.00	37.42	234.00	lb/d	30-Day Average
MD0021539	001	Ammonia	2.00	19.17	114.00	lb/d	7-Day Average
MD0021539	001	Ammonia	8.00	38.33	222.00	lb/d	Monthly Average
MD0021539	001	BOD	1.00	1.86	11.00	mg/L	30-Day Average
MD0021539	001	BOD	1.00	2.84	15.00	mg/L	7-Day Average
MD0021539	001	BOD	1.00	2.11	4.00	mg/L	Maximum Monthly Average
MD0021539	001	BOD	1.00	2.58	9.00	mg/L	Maximum Weekly Average
MD0021539	001	BOD	29.0	140.5	377.0	lb/d	30-Day Average
MD0021539	001	BOD	15.0	262.1	3,195	lb/d	7-Day Average
MD0021539	001	BOD	279.0	401.2	1,069	lb/d	Maximum Monthly Average
MD0021539	001	BOD	213.0	539.7	2,253	lb/d	Maximum Weekly Average
MD0021539	001	BOD	11.0	164.0	1,152	lb/d	Monthly Loading
MD0021539	001	DO	6.40	7.96	9.70	mg/L	Instantaneous Minimum
MD0021539	001	DO	6.30	8.15	10.10	mg/L	Minimum
MD0021539	001	DO	8.20	9.49	10.50	mg/L	Minimum Weekly Average
MD0021539	001	DO	8.10	9.02	10.80	mg/L	Monthly Average Minimum
MD0021539	001	*E. coli*	1.00	9.38	84.00	MPN/100mL	Maximum Monthly Geometric Mean
MD0021539	001	Fecal Coliform	2.00	26.54	197.00	MPN/100mL	Logarithmic Monthly Median
MD0021539	001	Fecal Coliform	2.00	17.40	78.00	MPN/100mL	30-Day Geometric
MD0021539	001	Flow	15.40	21.99	34.33	Mgpd	Annual Average
MD0021539	001	Flow	18.53	31.17	75.18	Mgpd	Daily Maximum
MD0021539	001	Flow	15.51	20.96	31.29	Mgpd	Monthly Average
MD0021539	001	Flow	8,032	8,032	8,032	MgpY	Annual Total
MD0021539	001	Nitrite + Nitrate	0.15	5.05	11.80	mg/L	30-Day Average
MD0021539	001	Nitrite + Nitrate	0.50	2.10	4.80	mg/L	Monthly Average
MD0021539	001	Nitrite + Nitrate	73.0	278.2	956.0	lb/d	Monthly Average
MD0021539	001	Org Nitrogen	0.08	0.760	1.8	mg/L	30-Day Average
MD0021539	001	Org Nitrogen	0.4	0.671	1	mg/L	Monthly Average
MD0021539	001	Org Nitrogen	15.00	55.33	162.00	lb/d	30-Day Average
MD0021539	001	Org Nitrogen	73.0	121.4	230.0	lb/d	Monthly Average
MD0021539	001	OrthoPhosphate	0.02	0.091	0.19	mg/L	30-Day Average
MD0021539	001	OrthoPhosphate	0.01	0.057	0.15	mg/L	Monthly Average

NPDES ID	Outfall	Parameter	Minimum	Average	Maximum	Unit	Statistical Base
MD0021539	001	OrthoPhosphate	2.00	7.65	25.00	lb/d	Monthly Average
MD0021539	001	PCBs	131.2	686.1	3,164	pg/L	Monthly Average
MD0021539	001	PCBs	0.00002	0.00012	0.00049	lb/d	Monthly Average
MD0021539	001	PCBs	0.00009	0.00356	0.01500	lb/m	Monthly Average
MD0021539	001	PCBs	0.023677	0.044	0.071353	lb/yr	Annual Maximum
MD0021539	001	Total Nitrogen	1.10	2.92	5.60	mg/L	Monthly Average
MD0021539	001	Total Nitrogen	109.0	387.2	1,126	lb/d	Monthly Average
MD0021539	001	Total Nitrogen	6,023	15,793	33,731	lb/m	Monthly Loading
MD0021539	001	Total Nitrogen	100,028	100,028	100,028	lb/yr	Annual Total
MD0021539	001	Total Nitrogen	7,508	117,092	289,774	lb/yr	Cumulative Total
MD0021539	001	Total Phosphorus	0.04	0.102	0.17	mg/L	30-Day Average
MD0021539	001	Total Phosphorus	0.02	0.068	0.19	mg/L	Maximum Monthly Average
MD0021539	001	Total Phosphorus	0.02	0.085	0.2	mg/L	Monthly Average
MD0021539	001	Total Phosphorus	4.00	7.88	13.00	lb/d	30-Day Average
MD0021539	001	Total Phosphorus	4.00	12.58	41.00	lb/d	Maximum Monthly Average
MD0021539	001	Total Phosphorus	3.00	8.04	21.00	lb/d	Monthly Loading
MD0021539	001	Total Phosphorus	100.0	359.7	1,041	lb/m	Monthly Loading
MD0021539	001	Total Phosphorus	2,900	2,900	2,900	lb/yr	Annual Total
MD0021539	001	Total Phosphorus	100	2,176	5,808	lb/yr	Cumulative Total
MD0023931	001	Ammonia	0.00	1.02	7.00	mg/L	Maximum Daily Average
MD0023931	001	Ammonia	0	0.285	2.3	mg/L	Maximum Monthly Average
MD0023931	001	Ammonia	0	0.240	2.6	mg/L	Monthly Average
MD0023931	001	Ammonia	0	0.786	10.4	mg/L	Weekly Average
MD0023931	001	Ammonia	0	0.096	0.9	lb/d	Maximum Daily Average
MD0023931	001	Ammonia	0	0.026	0.3	lb/d	Maximum Monthly Average
MD0023931	001	Ammonia	0	0.049	0.8	lb/d	Monthly Average
MD0023931	001	Ammonia	0	0.185	3.2	lb/d	Weekly Average
MD0023931	001	BOD	0.00	2.91	9.00	mg/L	30-Day Average
MD0023931	001	BOD	0.00	5.43	32.00	mg/L	7-Day Average
MD0023931	001	BOD	0.00	3.26	7.00	mg/L	Maximum Monthly Average
MD0023931	001	BOD	0.00	6.23	19.00	mg/L	Maximum Weekly Average
MD0023931	001	BOD	0	0.548	3	lb/d	30-Day Average
MD0023931	001	BOD	0.00	1.27	7.00	lb/d	7-Day Average
MD0023931	001	BOD	0	0.421	2	lb/d	Maximum Monthly Average
MD0023931	001	BOD	0	0.809	3	lb/d	Maximum Weekly Average
MD0023931	001	DO	5.00	6.10	8.10	mg/L	Instantaneous Minimum
MD0023931	001	DO	5.00	6.14	10.00	mg/L	Minimum

NPDES ID	Outfall	Parameter	Minimum	Average	Maximum	Unit	Statistical Base
MD0023931	001	*E. coli*	1.00	2.31	12.00	MPN/100mL	Monthly Geometric Mean
MD0023931	001	Fecal Coliform	1.00	13.88	114.00	MPN/100mL	30-Day Geometric
MD0023931	001	Fecal Coliform	1.00	18.99	256.00	MPN/100mL	Logarithmic Monthly Median
MD0023931	001	Flow	0.006	0.026	0.1	Mgpd	Annual Average
MD0023931	001	Flow	0.008	0.039	0.104	Mgpd	Daily Maximum
MD0023931	001	Flow	0.006	0.017	0.035	Mgpd	Monthly Average
MD0023931	001	TKN	0	0.497	1.9	mg/L	30-Day Average
MD0023931	001	TKN	0	0.877	3.9	mg/L	7-Day Average
MD0023931	001	TKN	0	0.120	0.6	lb/d	30-Day Average
MD0023931	001	TKN	0	0.213	0.9	lb/d	7-Day Average
MDG344351	001	Flow	31.0	468.8	1,500	gpd	Daily Maximum
MDG344351	001	Flow	28.0	130.4	1,500	gpd	Quarterly Average
MDG490511	001	Flow	275	381,071	2,711,520	gpd	Daily Maximum
MDG490511	001	Flow	1,440	163,811	712,800	gpd	Monthly Average
MDG490511	001	Flow	10	125,359	1,213,640	gpd	Quarterly Average
MDG766265	001	Flow	33,750	33,750	33,750	gpd	Daily Maximum
MDG999119	001	Flow	350.0	350.0	350.0	gpd	Maximum

Note: mg/L= milligrams per liter; pg/L= picograms per liter; lb/d = pounds per day; lb/m = pounds per month; lb/yr = pounds per year; MPN/100mL= most probable number (MPN) per 100 milliliters; gpd = gallons per day; Mgpd = million gallons per day; MgpY = million gallons per year.