District of Columbia Chapter

State and District of Columbia Analyses

CHESAPEAKE BAY COMPREHENSIVE WATER RESOURCES AND RESTORATION PLAN

STATE CHAPTER

District of Columbia

June 2018

US Army Corps of Engineers®

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Introduction

1.1 Introduction

The goal of the *Chesapeake Bay Comprehensive Water Resources and Restoration Plan* (CBCP) is to provide a single, comprehensive and integrated restoration plan that would assist with implementation of the *2014 Chesapeake Bay Watershed Agreement* (2014 Bay Agreement). The CBCP provides a "roadmap" of implementation actions to protect, restore, and preserve the Chesapeake Bay and actions that adopt and align with what other organizations are doing without duplicating ongoing or planned actions. Additionally, the CBCP maximizes the use of existing information and identifies projects that can be implemented in each jurisdiction in the Chesapeake Bay Watershed.

The CBCP aligns with the vision established in the 2014 Bay Agreement:

"We envision an environmentally and economically sustainable [and resilient] Chesapeake Bay watershed with clean water, abundant life, conserved lands and access to the water, a vibrant cultural heritage, and a diversity of engaged citizens and stakeholders."

To identify implementation actions to protect, restore, and preserve the Chesapeake Bay, geospatial analyses were conducted at a 1) baywide, 2) jurisdiction or state, and 3) watershed scale. The baywide analysis characterized problems, needs, and opportunities at a hydrologic unit code 10 (HUC 10) scale, hereafter referred to as subwatershed. CBCP analyses were based on a core set of questions formulated from the 2014 Bay Agreement goals and outcomes as well as stakeholder input. The baywide analysis resulted in a set of recommended implementation strategies that included locations (subwatersheds), potential management measures, a range of potential costs, benefits, potential project implementation agencies, and any sequencing or dependences that could affect implementation. The full results of the baywide analysis are described in the CBCP Main Report. The CBCP state analyses are the result of the baywide analysis "clipped" per each jurisdiction in the Chesapeake Bay Watershed (New York, Pennsylvania, West Virginia, Virginia, Maryland, Delaware, and the District of Columbia). The results of the District of Columbia Analysis are described in this section of the report.

The CBCP state-selected watershed analysis contains a more detailed investigation in each jurisdiction, with the goal of identifying more site-specific project-scale opportunities (with priorities defined by each jurisdiction) for implementation. The Anacostia River Watershed was identified as the state-selected watershed by the District of Columbia for wetland creation, seawall removal, living shoreline creation, and habitat restoration. A number of agencies have identified the Anacostia River Subwatershed as a priority including The Nature Conservancy (TNC) and the U.S. Fish and Wildlife Service (USFWS). Additionally, the *Anacostia River Watershed Restoration Plan and Report* dated February 2010 (available at https://www.anacostia.net/Restoration_Plan/download/Anacostia-Report-Web-Quality.pdf), is a

strategic plan previously developed for assisting in the restoration of the Anacostia River Watershed.

The following are reference maps displaying the boundaries, name (Figure 1), and number (Figure 2) of each HUC 10 subwatershed (henceforth referred to as subwatersheds) in the District of Columbia. Table 1 (all tables are provided following the report content) provides the number, name, size (acres), and other drainage states of each District of Columbia subwatershed. Hereafter, HUC 10 subwatersheds are referred to simply as subwatersheds.

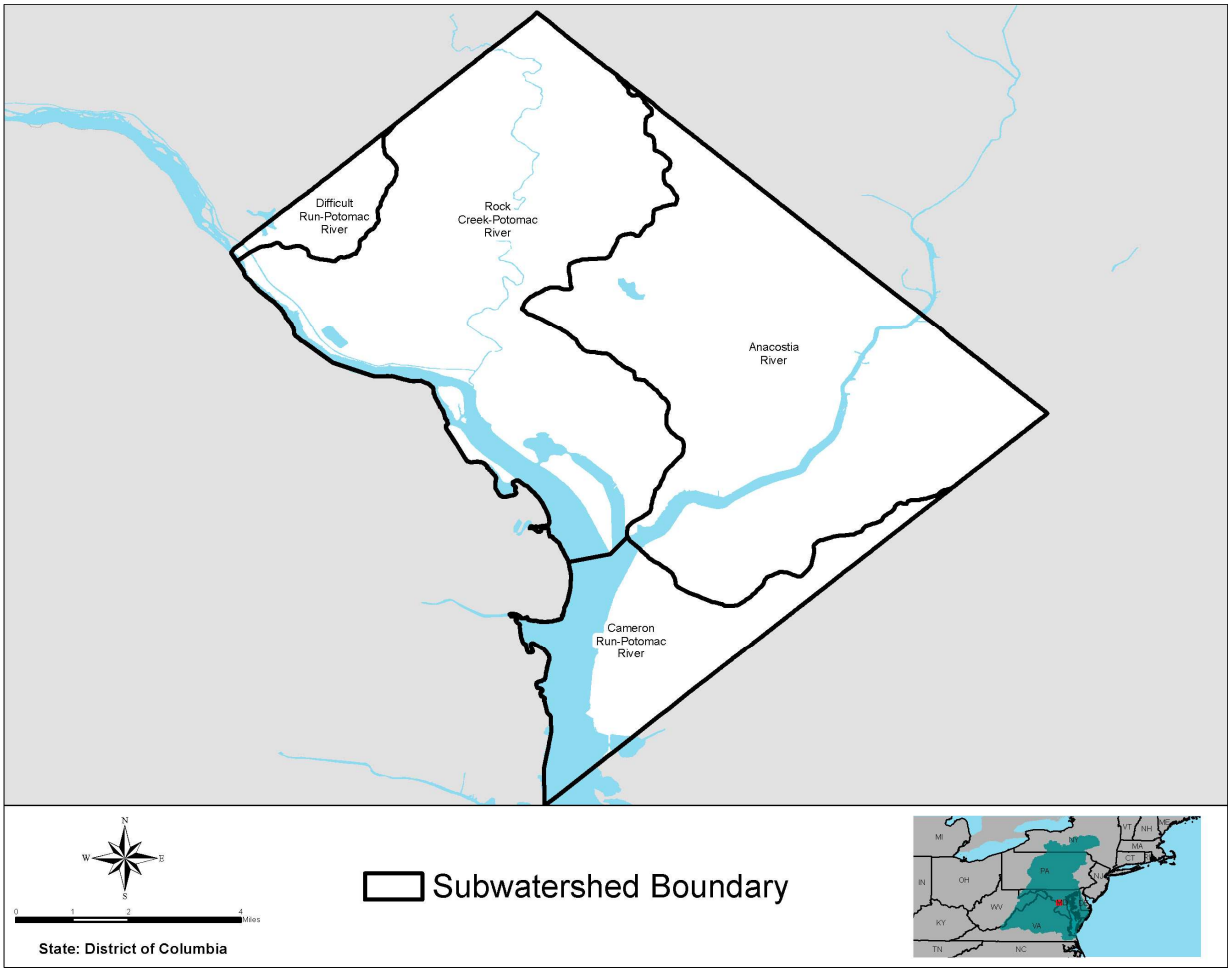

Figure 1. Hydrologic unit code (HUC) 10 subwatershed names for the District of Columbia

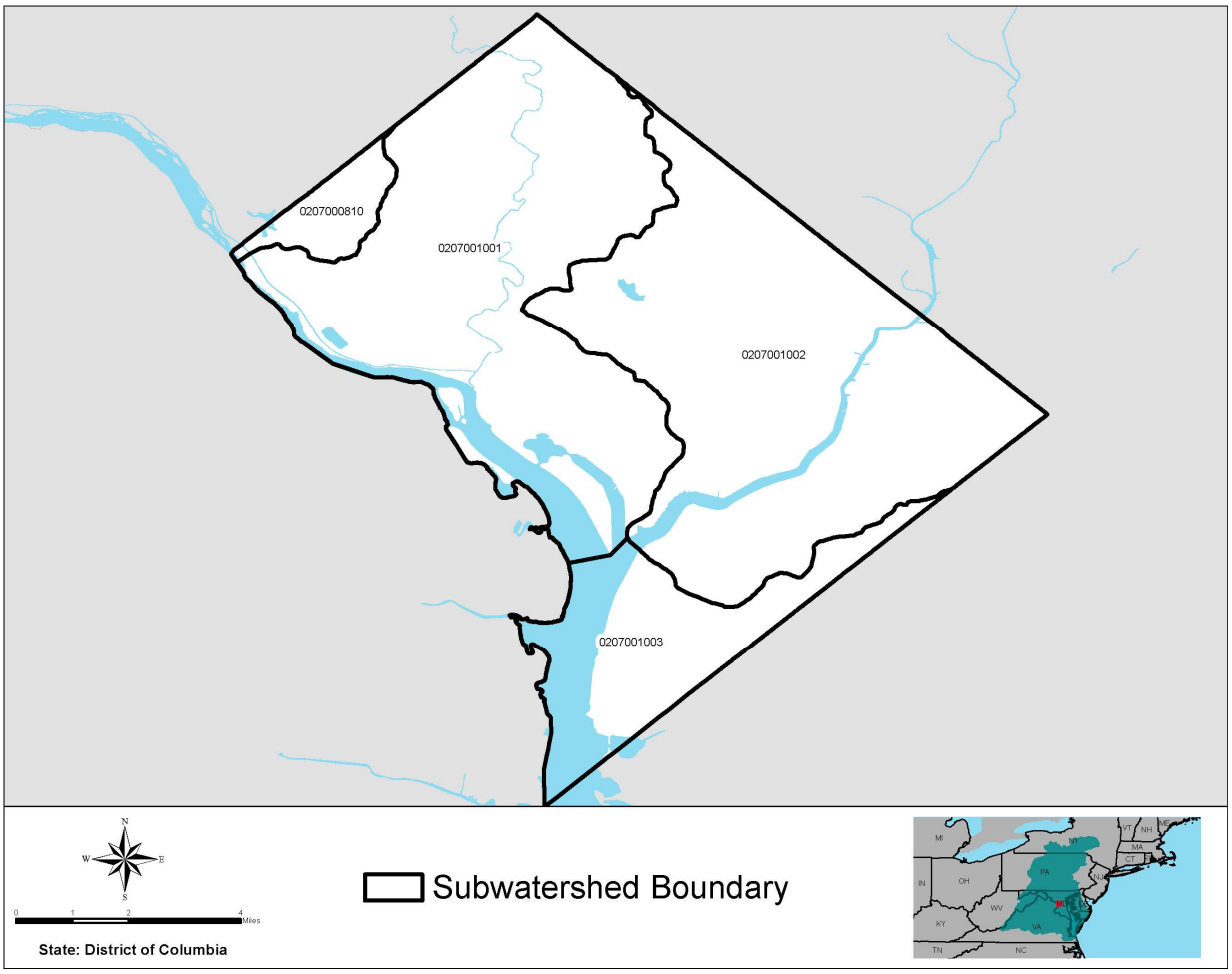

Figure 2. Hydrologic unit code (HUC) 10 subwatershed numbers for the District of Columbia

Table 1. Summary of each hydrologic unit code (HUC) 10 subwatershed in the District of Columbia

HUC 10 Number	Subwatershed Name	Acres*	Drainage States
0207001001	Rock Creek-Potomac River	72,440	DC,MD,VA
0207001002	Anacostia River	111,037	DC,MD
0207001003	Cameron Run-Potomac River	153,721	DC,MD,VA
0207000810	Difficult Run-Potomac River	99,646	DC,MD,VA

*Acreage for the entire subwatershed

1.2 Watershed Stressors

The Watershed Stressors Analysis evaluated the presence of stressors in each subwatershed based on six metrics listed below. See the Planning Analysis Appendix for more details on the data used.

- *Percent impervious cover* (Chesapeake Conservancy 2016)
- *Percent forest cover* (Chesapeake Conservancy 2016)
- *Percent of stream network with forested riparian buffers* (Environmental Protection Agency (EPA) 2010)
- *303(d) impaired waterways list* (EPA)
- *Benthic Index of Biotic Integrity (B-IBI)* (Chesapeake Bay Program (CBP))
- *Nitrogen and phosphorous yields* (as predicted by Spatially Referenced Regressions on Watershed (SPARROW) modeling)

Results of the Watershed Stressors Analysis for each subwatershed in the District of Columbia are shown on Figure 3 and in Table 2. Subwatersheds that contain the least watershed stressors resulted in a high watershed stressor score, and subwatersheds that contain the most watershed stressors resulted in a low watershed stressor score. The healthiest watersheds are areas that, if not already protected, would be good candidates for protection. The areas that are less healthy indicate areas that may benefit from restoration actions aimed at increasing the overall health of the subwatersheds. In general, the pattern of watershed stressors typically follows that of development, with the greater the amount of development and industrial activities in an area, the more stressed the watershed.

Based on the CBCP analysis, all the subwatersheds in the District of Columbia have a low watershed stressor score (0.22 or lower) and are considered in poor health. These subwatersheds are also the most heavily stressed subwatersheds in the Chesapeake Bay Watershed. This is due to the high amount of development in this area.

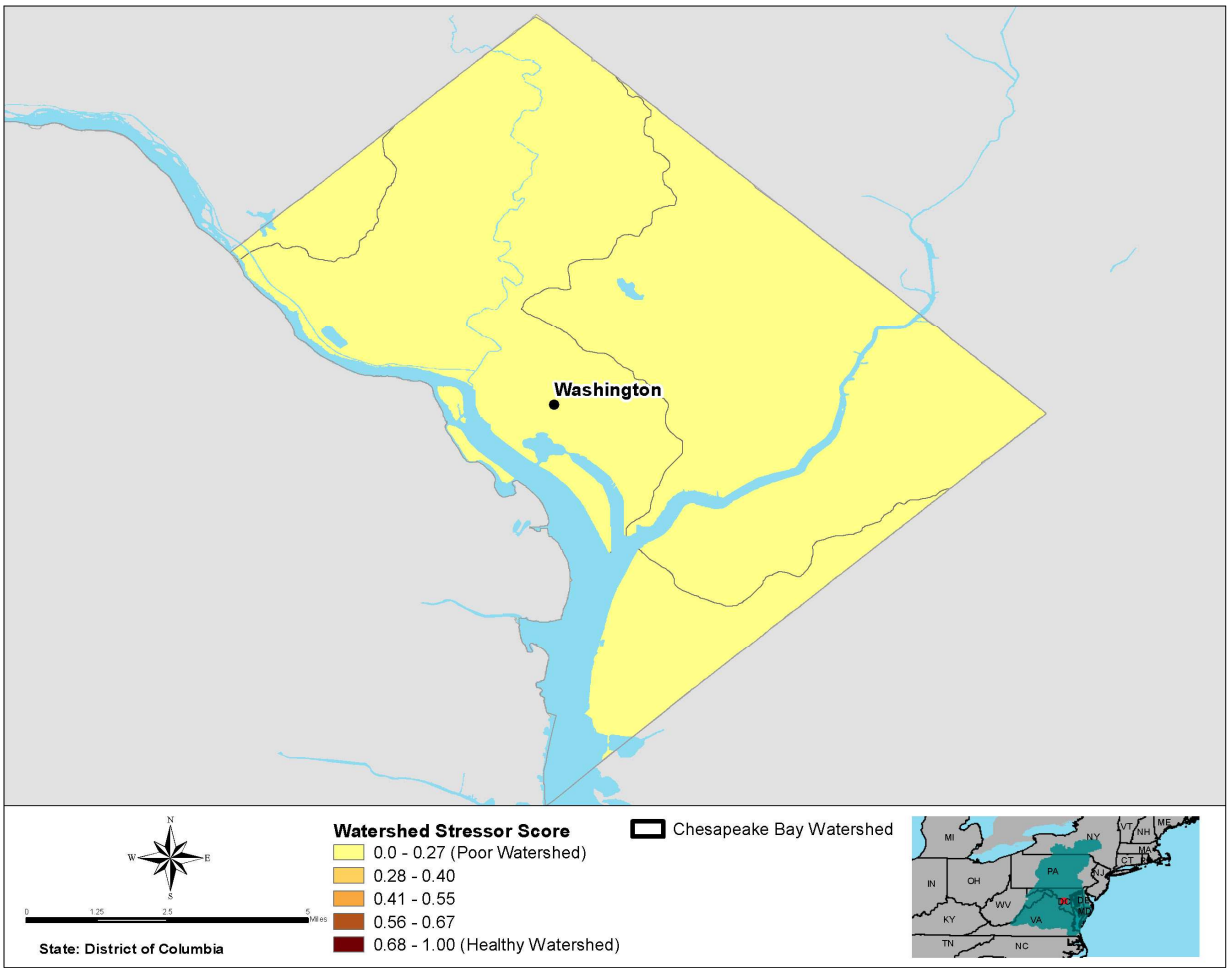

Figure 3. Watershed Stressor Analysis for the District of Columbia

Table 2. Watershed Stressors Analysis for the District of Columbia

HUC 10 Name	Watershed Stressor Score
Difficult Run-Potomac River	0.22
Rock Creek-Potomac River	0.17
Anacostia River	0.17
Cameron Run-Potomac River	0.17

SECTION 2

Restoration Efforts Contributing to Watershed Wide Priorities

Opportunities for action were identified throughout the Chesapeake Bay Watershed by the baywide geospatial analyses. The *Opportunities Assessment* identifies subwatersheds with the greatest potential, need, or impairment, depending on the nature of the evaluation. The following sections discuss the *Opportunities Assessment* findings in Delaware and presents *Opportunity* maps that highlight subwatersheds holding the greatest potential to address the need investigated in each map. Shaded cells in the tables and darker-colored subwatersheds in the figures represent subwatersheds with the highest amount of *Opportunities*.

2.1 Vital Habitats Goal

"Restore, enhance and protect a network of land and water habitats to support fish and wildlife and to afford other public benefits, including water quality, recreation uses and scenic value across the watershed."

2.1.1 Outcome: Black Duck

"By 2025, restore, enhance and preserve wetland habitat to support a wintering population of 100,000 black ducks. Refine population targets through 2025 based on best available science."

The CBP black duck focus areas were overlaid on the wetland restoration and enhancement maps created by the CBCP analysis to identify the subwatersheds that provide wetland restoration and enhancement opportunities with the potential to benefit black duck populations during the nonbreeding, over-wintering season.

Results of this analysis identified subwatersheds in which to focus wetland restoration and enhancement to benefit black duck populations during the nonbreeding, over-wintering season lie within the tidally influenced wetland areas of the Chesapeake Bay Mainstem and near the mouths of bay tributaries as these areas are the most important over-wintering habitats utilized by the black duck.

The analysis identified no priority areas for over-wintering black duck populations in the District of Columbia.

2.1.2 Outcome: Brook Trout

"Restore and sustain naturally reproducing brook trout in the Chesapeake Bay's headwater steams, with an eight percent increase in occupied habitat by 2025."

Geospatial data regarding brook trout have been provided by the CBP and Trout Unlimited and are included in the Fish Passage, Forest Buffer, and Stream Restoration Analyses below.

2.1.3 Outcome: Fish Passage

"*Continually increase habitat to support sustainable migratory fish populations in the Chesapeake Bay watershed's freshwater rivers and streams. By 2025, restore historical fish migration routes by opening 1,000 additional stream miles to fish passage. Restoration success will be indicated by the consistent presence of alewife, blueback herring, American shad, hickory shad, American eel and brook trout, to be monitored in accordance with available agency resources and collaboratively developed methods.*"

Fish passage within the Chesapeake Bay Watershed is limited by a significant number of blockages that range from large hydroelectric power-generating dams to historical mill dams to road culverts and utility pipes that have been exposed by erosion. The intent of the CBCP's Fish Passage Blockages Opportunities Assessment was to build upon the work of the CBP's Fish Passage Workgroup to identify where high prioritized blockages are co-located with *Opportunities* for stream restoration. The following data was used in the Fish Passage Blockages Opportunities Assessment (see the Planning Analysis Appendix for more details on the data used).

- *High prioritized fish passage blockages* (CBP Fish Passage Workgroup)
- *Stream Restoration Analysis results* (CBCP)

Results of the Fish Passage Blockages Opportunities Assessment for the subwatersheds in the District of Columbia are shown on Figure 4. There are opportunities to improve fish passage in only one subwatershed in the District of Columbia. The analysis identified six priority fish passage blockages for anadromous fish in the Cameron Run-Potomac River Subwatershed (HUC 0207001003). The analysis identified no priority fish passage blockages in any other subwatersheds in the District of Columbia.

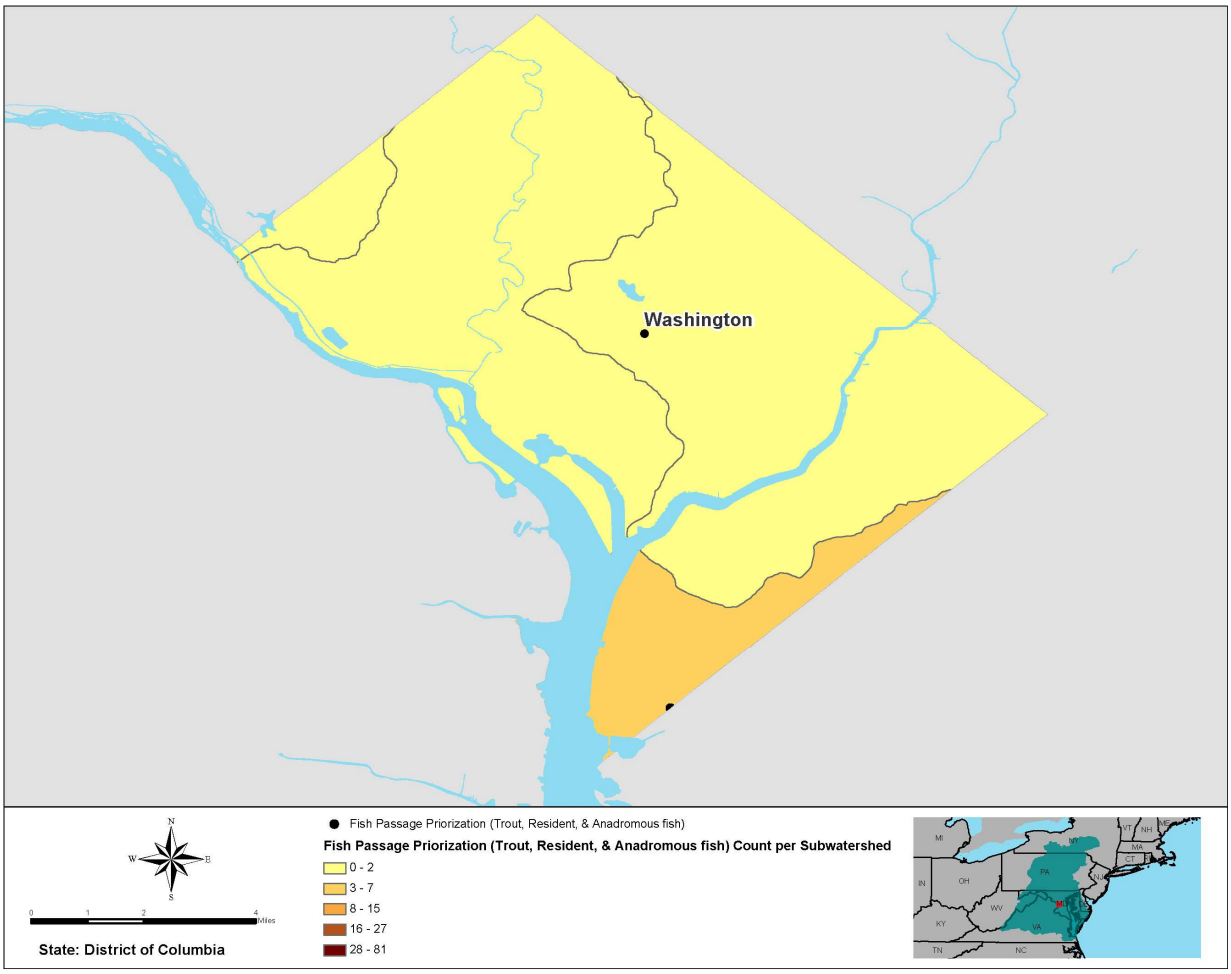

Figure 4. Priority fish passage blockages in the District of Columbia

2.1.4 Outcome: Riparian Forest Buffers

"Continually increase the capacity of forest buffers to provide water quality and habitat benefits throughout the Chesapeake Bay watershed. Restore 900 miles of riparian forest buffers per year and conserve existing buffers until at least 70 percent of riparian areas in the watershed are forested."

The purpose of the Riparian Forest Buffer Opportunities Assessment was to identify subwatersheds to focus riparian buffer restoration. Riparian buffer restoration can provide numerous benefits while targeting various impairments. This analysis identified subwatersheds where riparian buffer restoration opportunities exist to:

- Address watershed stressors (high-yielding nitrogen and phosphorous subwatersheds)
- Improve brook trout habitat
- Support improving stream habitat for resident fish and migratory species

The following data layers were used in the Riparian Forest Buffer Opportunities Assessment (see the Planning Analyses Appendix for more details on the data used):

- *Area of existing riparian buffers* (acres) (forested and non-forested) (CBP from Chesapeake Conservancy 2016)
- *Nitrogen and phosphorous yields* (as predicted by Spatially Referenced Regressions on Watershed (SPARROW) modeling)
- *Brook Trout Watersheds* (U.S. Geological Survey (USGS) National Hydrography Dataset plus catchments identified as potentially supporting brook trout based on the Eastern Brook Trout Joint Venture Salmonid Catchment Assessment and Habitat Patch Layers)
- *National Fish Habitat Assessment* (National Fish Habitat Partnership (NFHAP))
- *Eastern Brook Trout Conservation Portfolio, Range-wide Habitat Integrity and Future Security Assessment, and Focal Area Risk and Opportunity Analysis* (Trout Unlimited, Fessenmeyer et al. 2017)

Results of the Riparian Forest Buffers Analysis for the District of Columbia is shown in Figure 5 and listed in Table 3. In the District of Columbia, the Cameron Run-Potomac River Subwatershed (HUC 0207001003) has approximately 70 percent forest coverage within a 30 meter stream buffer, and the Anacostia River Subwatershed (HUC 0207001002) has approximately 56 percent forest coverage within a 30 meter stream buffer. Additionally, these two subwatersheds are also areas where streams contain resident fish populations. Riparian forest buffer restoration in the Anacostia River Subwatershed may also be utilized to reduce nitrogen and phosphorus loads in that subwatershed.

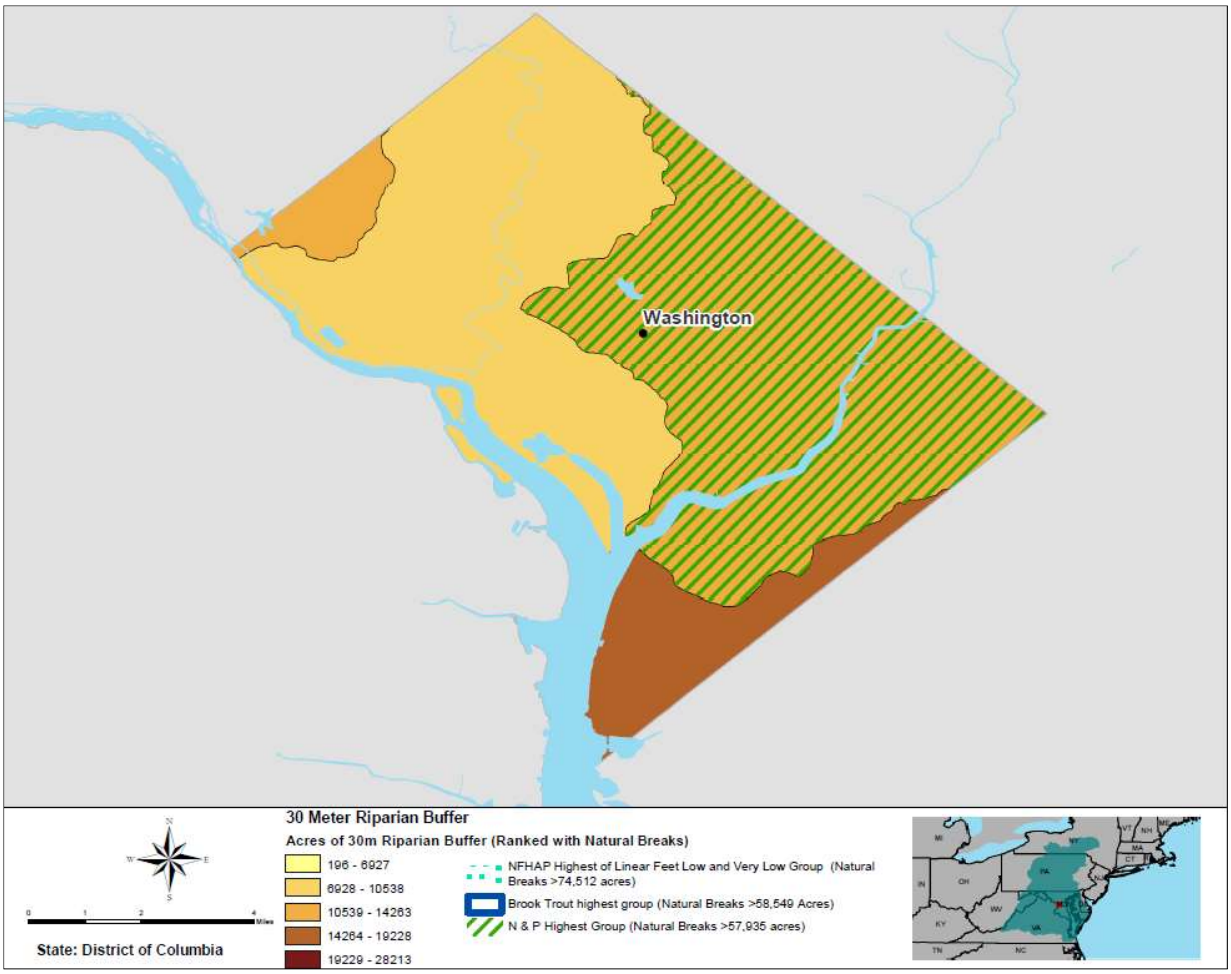

Figure 5. Riparian Forest Buffers Opportunities Assessment for the District of Columbia

Table 3. Riparian Forest Buffer Opportunities Assessment for the District of Columbia

Subwatershed Name	30 Meter Riparian Buffer (Acres)	Resident Fish (Acres)	Brook Trout (Acres)	Nitrogen and Phosphorous (Acres)	Percent Forested Buffer
Cameron Run-Potomac River	16,387	2,935	0	55,498	70.4%
Anacostia River	13,597	2,052	0	60,855	56.2%

2.1.5 Outcome: Stream Health

"Continually improve stream health and function throughout the Chesapeake Bay watershed. Improve the health and function of ten percent of stream miles above the 2008 baseline."

The purpose of this analysis was to identify subwatersheds to focus stream restoration efforts to benefit resident fish, brook trout, and anadromous fish. The following data was used in the Stream Restoration Opportunities Assessment (see the Planning Analyses Appendix for more details on the data used):

- *Watershed Stressor Analysis* (CBCP)
- *National Fish Habitat Assessment* (NFHAP)
- *Brook Trout Watersheds* (USGS)
- *Extent of anadromous fish habitat* (CBP)
- *Conservation Strategies for Brook Trout* (Trout Unlimited)

Results of the Stream Restoration Opportunties Assessment for the District of Columbia is shown in Figure 6 and listed in Table 4. The analysis showed that stream restoration in the Cameron Run-Potomac River Subwatershed (HUC 0207001003) has the potential to benefit anadromous fish. This watershed has a low watershed stressor score (0.17) and is considered in poor health. It is recommended that stressors are addressed prior to or in conjunction with stream restoration efforts in this subwatershed to develop habitat benefits.

Conservation strategies for brook trout were incorporated into the Stream Restoration Opportunities Assessment to propose actions to benefit brook trout. No stream restoration *Opportunities* were identified in the District of Columbia to benefit brook trout based on Trout Unlimited conservation strategies.

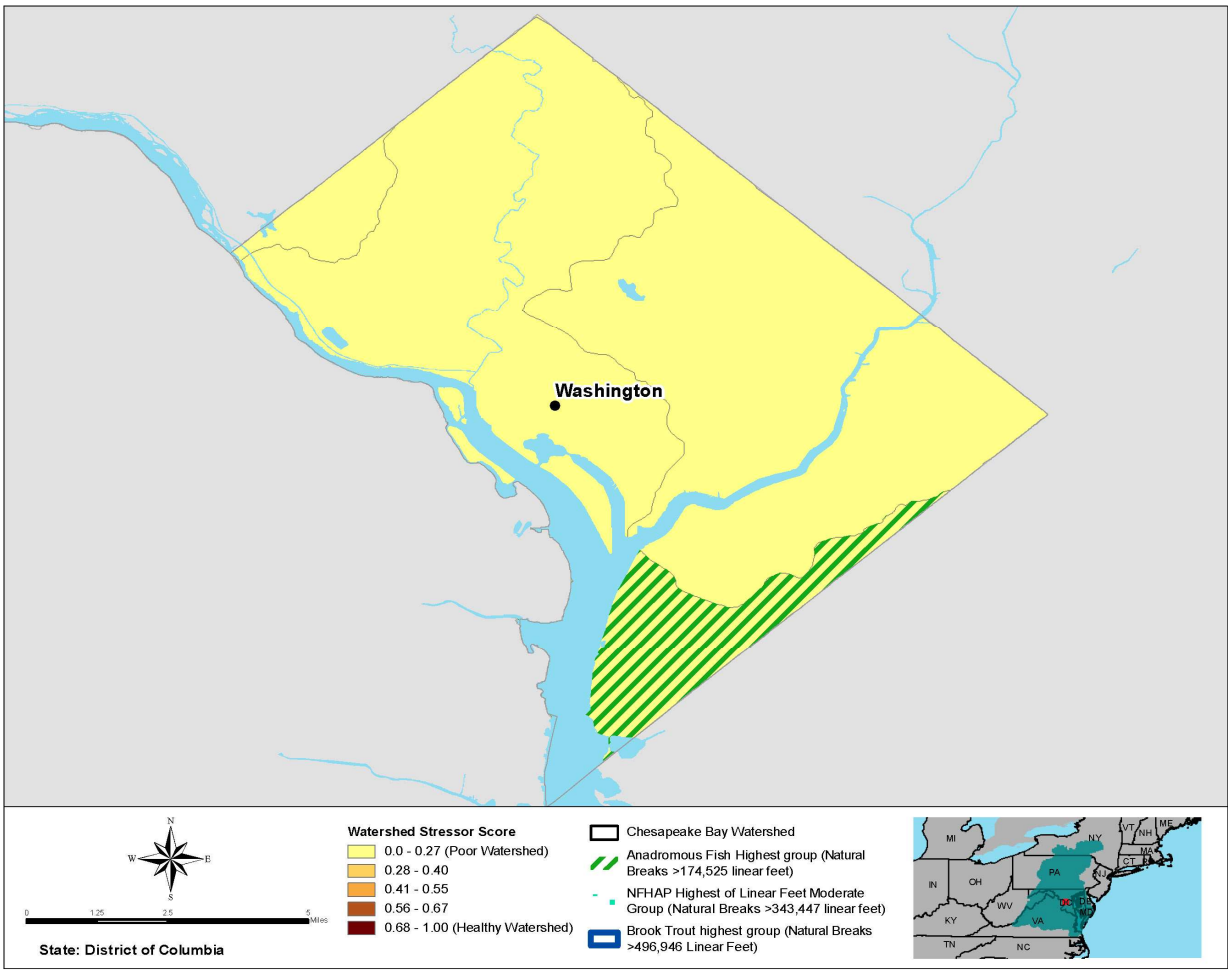

Figure 6. Stream Restoration Opportunities Assessment for the District of Columbia

Table 4. Stream Restoration Opportunities Assessment for the District of Columbia

Hydrologic Unit Code (HUC) 10 Name	Watershed Degradation Score	Eastern Brook Trout (Linear Feet)	National Fish Habitat Assessment (Linear Feet)	Index of Biological Integrity Scores
Cameron Run-Potomac River	0.17	0	200,832	Poor

2.1.6 Outcome: Wetlands

"Continually increase the capacity of wetlands to provide water quality and habitat benefits throughout the Chesapeake Bay watershed. Create or reestablish 85,000 acres of tidal and nontidal wetlands and enhance the function of an additional 150,000 acres of degraded wetlands by 2025. These activities may occur in any land use (including urban), but should primarily occur in agricultural or natural landscapes."

2.1.6.1 Identify Wetland Enhancement Opportunities:

The Wetlands Enhancement Opportunities Assessment (nontidal and tidal) for the District of Columbia identified areas where wetlands exist and may provide enhancement opportunities to increase their ecological value. The following data was used in the Wetlands Enhancement Opportunities Assessment (see the Planning Analyses Appendix for more details on the data used):

- *High Resolution Land Cover Data* (collected in 2016 by the Chesapeake Bay Conservancy and provided by NFWF)
- *Hydric Soils Dataset* (CBP)

Results of the Wetlands Enhancement Opportunities Assessment for the District of Columbia are shown in Figures 7 (nontidal) and 8 (tidal) and listed in Table 5. The analysis showed that nontidal wetlands are concentrated and opportunities for wetland enhancement opportunities exist in the Cameron Run-Potomac River (HUC 0207001003), the Anacostia River (HUC 0207001002), and the Difficult Run-Potomac River (HUC 0207000810) Subwatersheds in the District of Columbia. The analysis showed that opportunities to enhance existing tidal wetlands are limited due to the small amount of existing tidal wetlands in the District of Columbia.

The existing datasets do not evaluate the function and value of the existing wetlands; therefore, additional field analyses would be necessary to determine the existing wetland areas in need of enhancements and to identify the specific type of enhancement necessary.

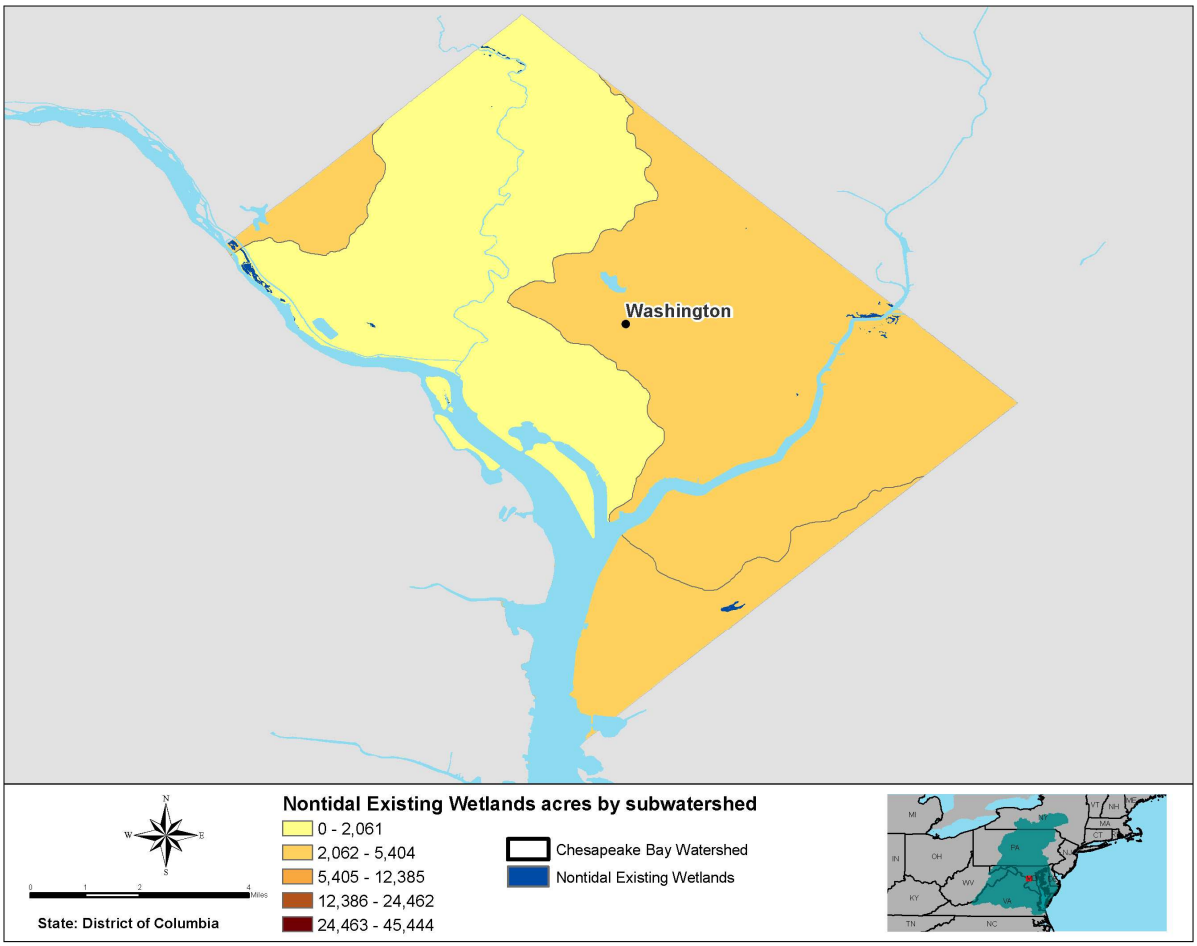

Figure 7. Existing nontidal wetlands in the District of Columbia

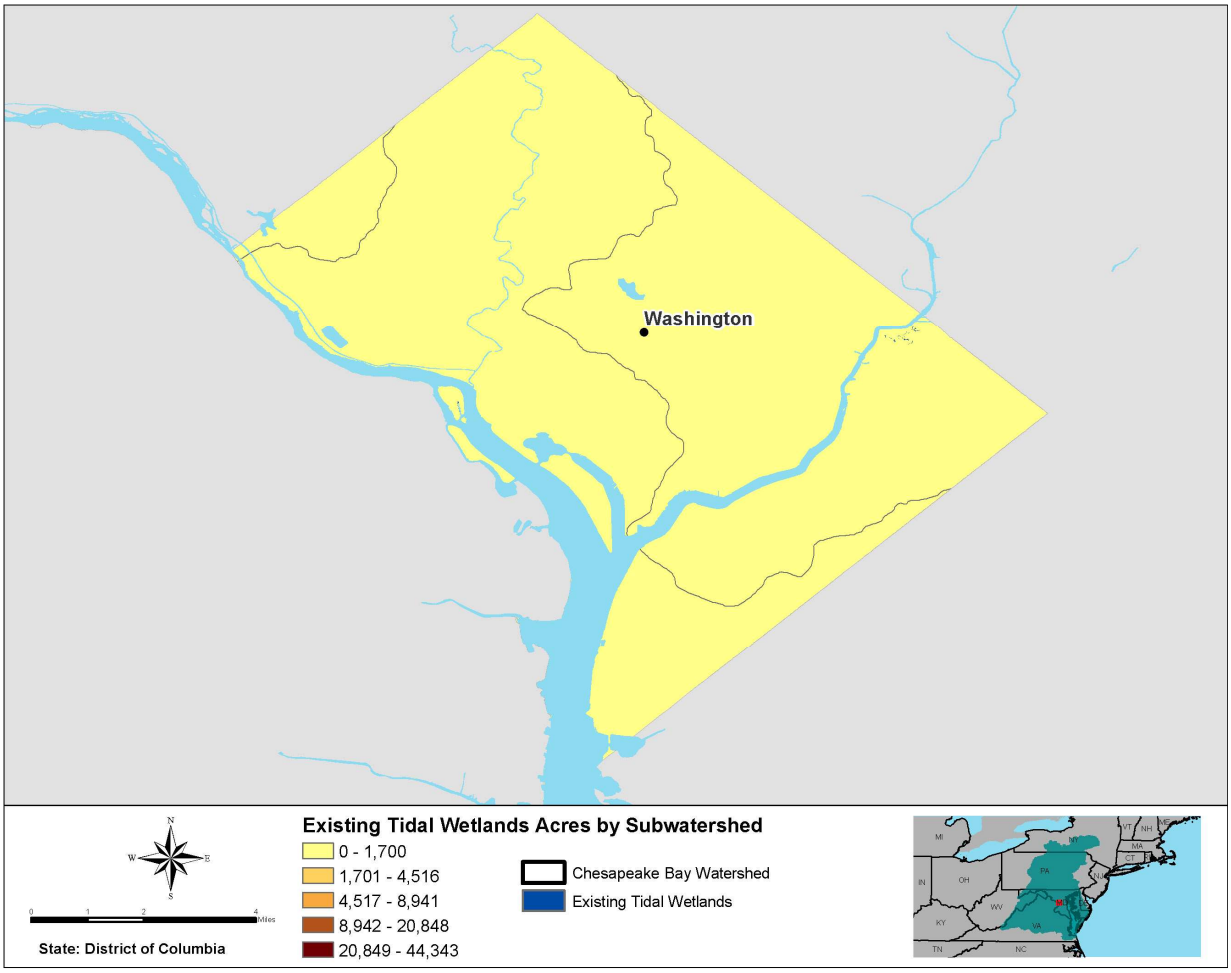

Figure 8. Existing tidal wetlands in the District of Columbia

2.1.6.2 Identify Wetland Restoration Opportunities

The Wetland Restoration Opportunities Assessment identified opportunities for wetland restoration in the District of Columbia. The following data was used in the Wetland Restoration Opportunities Assessment (see the Planning Analysis Appendix for more details on the data used):

- *Wetlands Enhancement Opportunities Assessment Results* (CBCP)
- *Digital Elevation Model* (USGS)

Results of the Wetland Restoration Opportunities Assessment are shown in Figures 9 (nontidal) and 10 (tidal) and listed in Table 5. The analysis showed that there are nontidal restoration opportunities in the Cameron Run-Potomac River (HUC 0207001003), Anacostia River (HUC 0207001003) and the Rock Creek-Potomac River (HUC 0207001001) Subwatersheds in the District of Columbia. The analysis showed that opportunities to restore existing tidal wetlands are limited to less than 10 acres in each subwatershed.

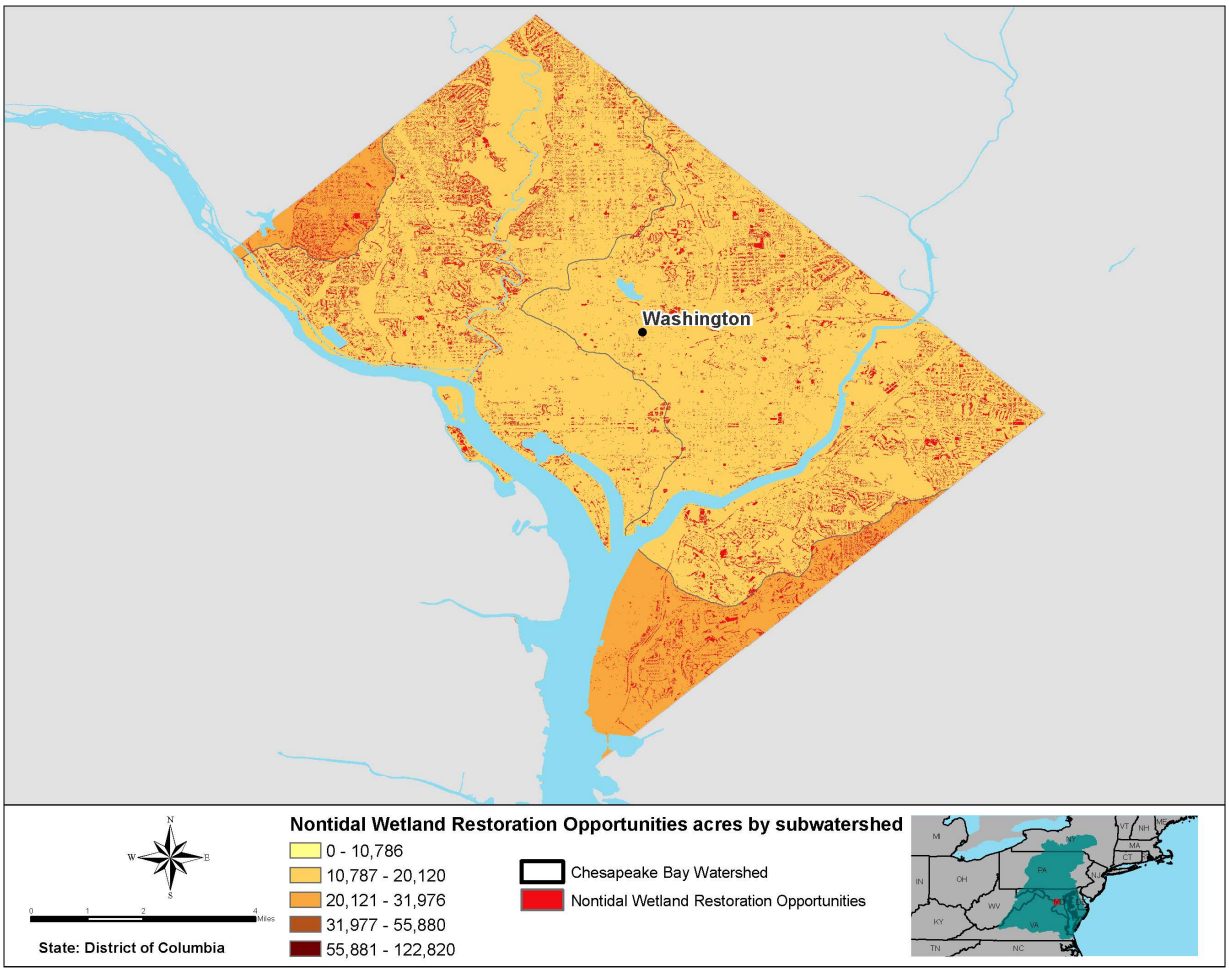

Figure 9. Nontidal wetland restoration opportunities in the District of Columbia

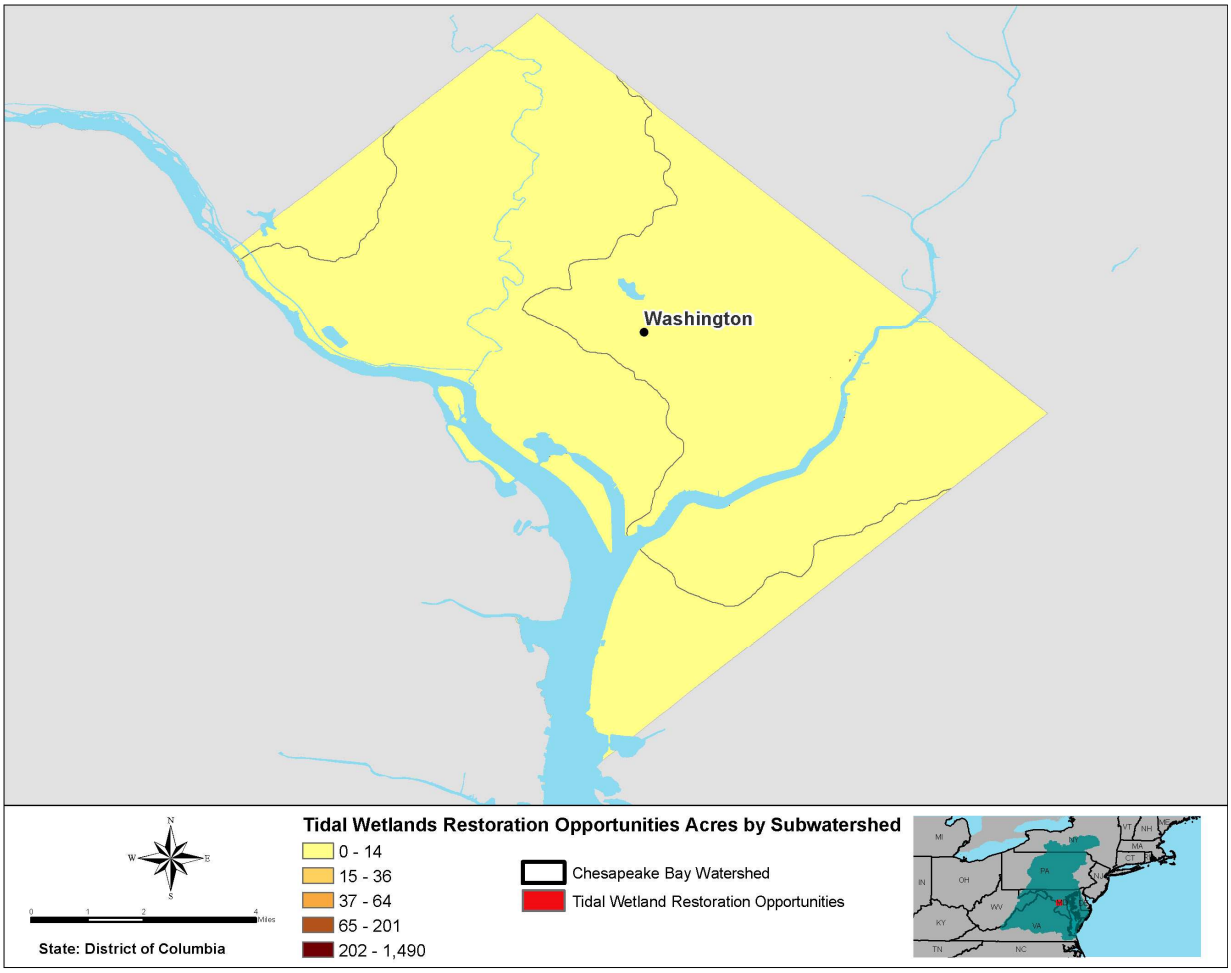

Figure 10. Tidal wetland restoration opportunities in the District of Columbia

Table 5. Acreage of existing tidal and nontidal wetlands and wetland restoration opportunities in the District of Columbia

Subwatershed Name	Existing Nontidal Wetlands (Acres)	Existing Tidal Wetlands (Acres)	Nontidal Wetland Restoration Opportunities (Acres)	Tidal Wetland Restoration Opportunities (Acres)
Rock Creek-Potomac River	593	7	13,187	2
Anacostia River	2,227	10	18,481	4
Cameron Run-Potomac River	4,120	222	22,424	8
Difficult Run-Potomac River	2,143	0	1,056	0

2.1.6.3 Identify Wetland Restoration Opportunities to Benefit Avian Wildlife:

The purpose of this analysis was to identify the wetland restoration *Opportunities* that have the potential to benefit avian wildlife by determining where *Opportunities* overlap with Audubon Important Bird Areas. The following data was used in this analysis (see the Planning Analyses Appendix for more details on the data used):

- *Wetlands Restoration Opportunities Assessment Results* (CBCP)
- *Nesting locations for wading birds and waterbirds* (Center for Conservation Biology)
- *Black Duck Focus Areas* (CBP)
- *Audubon Important Bird Areas*

This analysis showed that there are no subwatersheds in the District of Columbia that contain Audubon Important Bird Areas or identified as CBP black duck focus areas. The Cameron Run-Potomac River Subwatershed (HUC 0207001003) contains nontidal wetland restoration opportunities that may benefit nesting wading birds and waterbirds.

2.1.6.4 Identify Wetland Restoration Opportunities that are Important Habitats for Imperiled Species (Rare, Threatened, and Endangered)

The purpose of this analysis was to identify wetland restoration *Opportunities* that are important habitats for rare, threatened and endangered (RTE) species. The following data was used in this analysis (see the Planning Analyses Appendix for more details on the data used):

- *Wetlands Restoration Opportunities Assessment Results* (CBCP)
- *Nature's Network Imperiled Species Dataset* (identifies important, moderately important, and less important habitat for imperiled species)

The results of this analysis are shown in Figures 11 (nontidal) and 12 (tidal). The results of this analysis shows that core habitat for imperiled species is present in the Rock Creek-Potomac River Subwatershed (HUC 0207001001); however, there is minimal nontidal and tidal wetland restoration opportunities in this subwatershed that could potentially benefit imperiled species.

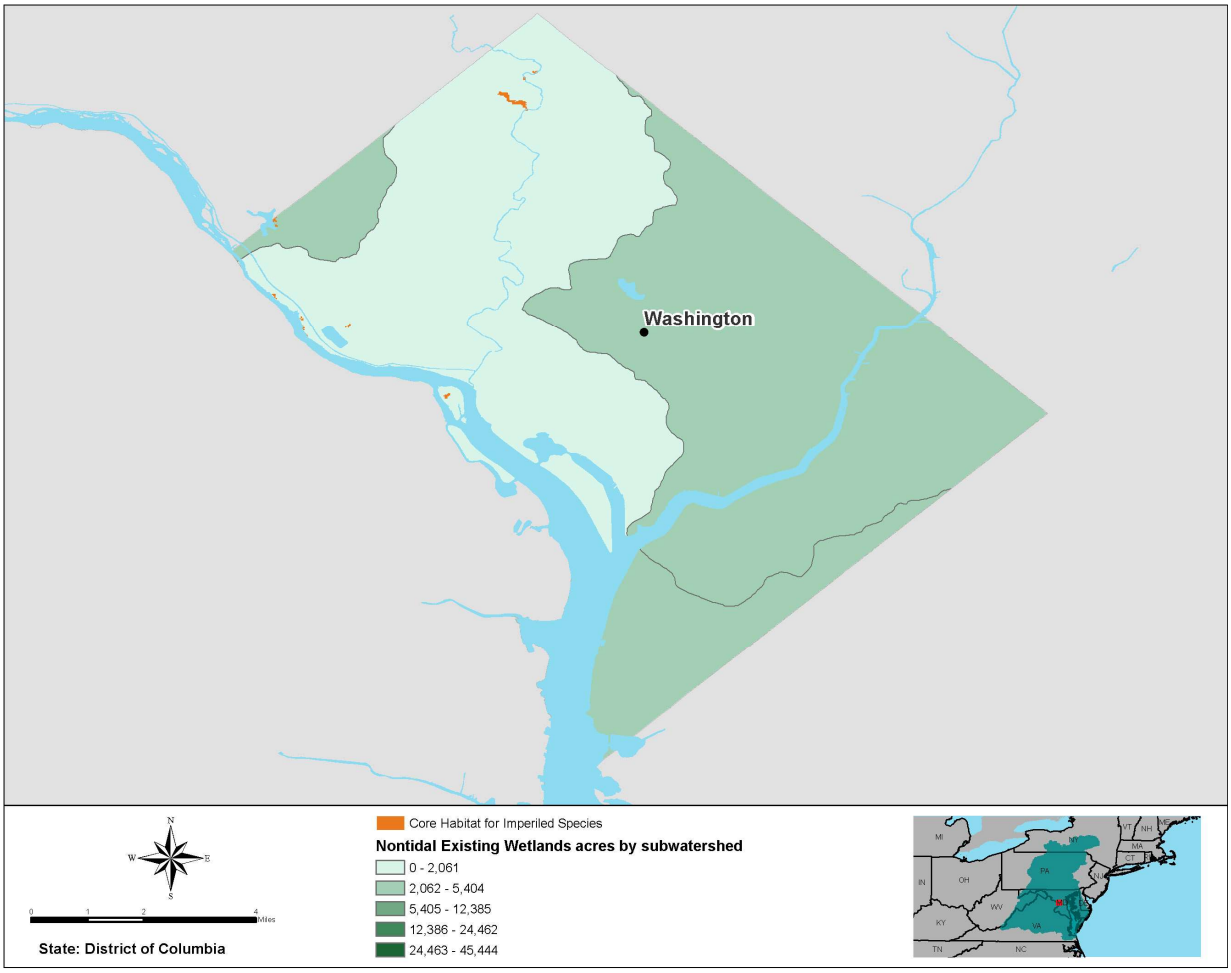

Figure 11. Core habitat for imperiled species in relation to existing nontidal wetland restoration *Opportunities* in the District of Columbia

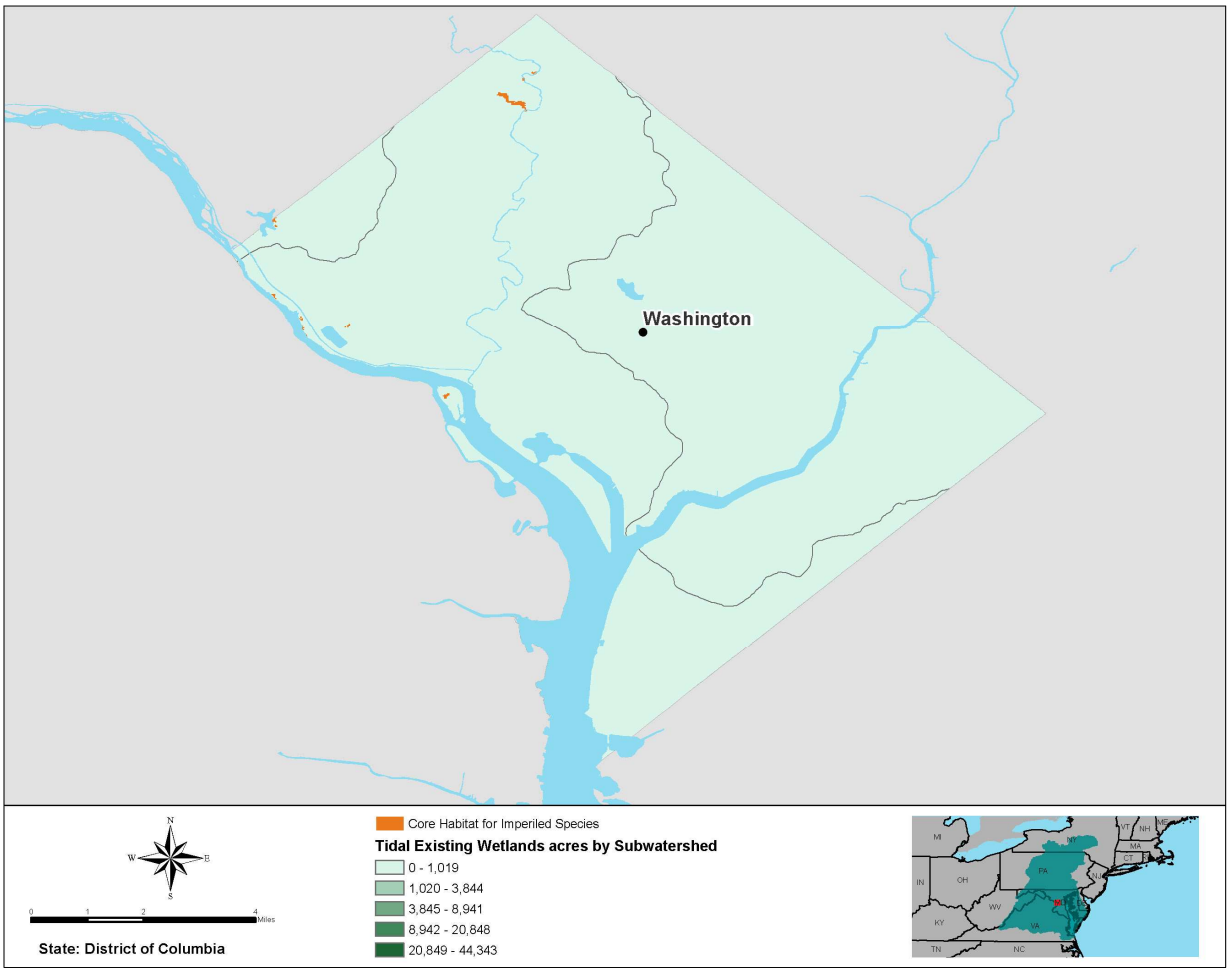

Figure 12. Core habitat for imperiled species in relation to existing tidal wetland restoration *Opportunities* in the District of Columbia

2.1.6.5 Identify Opportunities to beneficially use dredged material for Wetland Enhancement and Restoration

The purpose of this analysis was to identify wetland enhancement and restoration *Opportunities* located within a three-mile buffer of USACE navigation projects to identify potential beneficial use of dredged material for nontidal wetlands enhancement and restoration. The following data was used in this analysis (see the Planning Analyses Appendix for more details on the data used):

- *U.S. Army Corps of Engineers (USACE) navigation projects (dredged channels)*
- *Wetlands Restoration and Enhancement Opportunities Assessment Results* (CBCP)

The results of this analysis are shown on Figures 13 (nontidal) and 14 (tidal) and listed in Table 6. All of the subwatersheds in the District of Columbia have opportunities to beneficially use dredged material for nontidal wetland restoration. There are also opportunities to beneficially use dredged material to enhance existing nontidal wetlands in the District of Columbia. There are limited opportunities to beneficially use dredged material for tidal wetland restoration due to the limited amount of tidal wetland restoration opportunities in the District of Columbia.

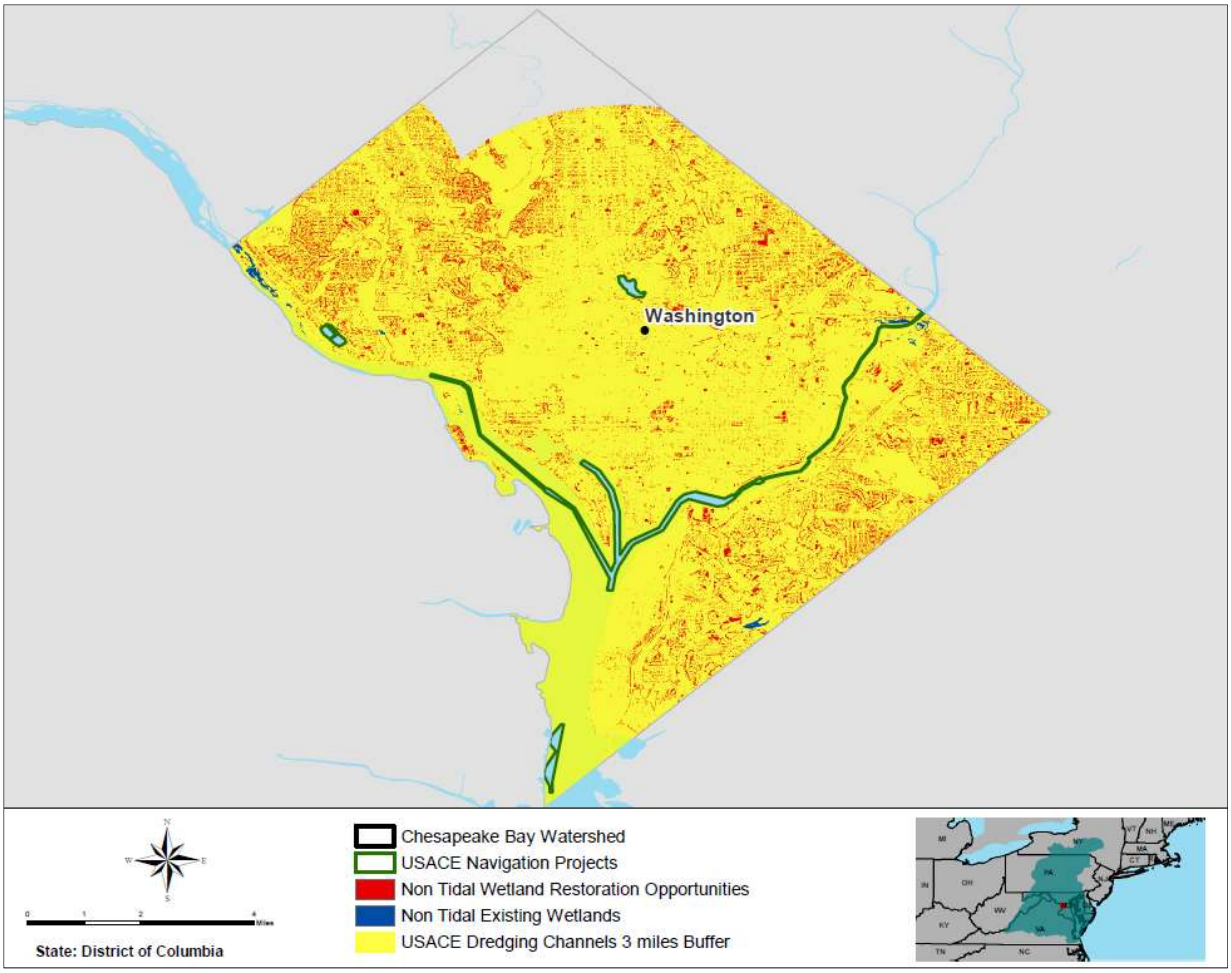

Figure 13. Potential beneficial use of dredged material and nontidal wetland enhancement and restoration opportunities in the District of Columbia

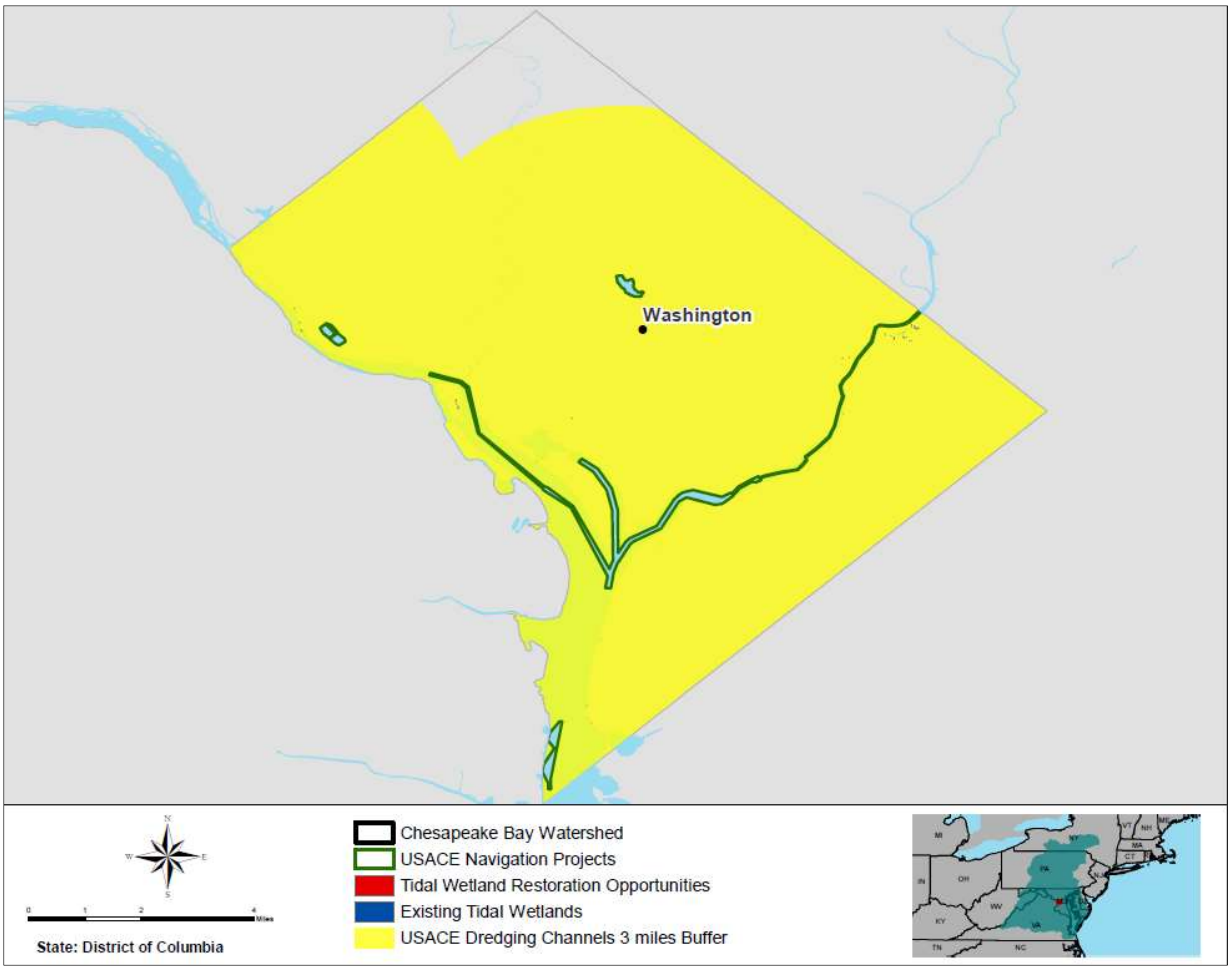

Figure 14. Potential beneficial use of dredged material and tidal wetland enhancement and restoration opportunities in the District of Columbia

Table 6. Potential beneficial use of dredged material and wetland enhancement and restoration opportunities in the District of Columbia

Subwatershed Name	Existing Nontidal Wetlands within 3 Miles of USACE Maintained Channels (Acres)	Existing Tidal Wetlands within 3 Miles of USACE Maintained Channels (Acres)	Nontidal Wetland Restoration Opportunities within 3 Miles of USACE Maintained Channels (Acres)	Tidal Wetland Restoration Opportunities within 3 Miles of USACE Maintained Channels (Acres)
Cameron Run-Potomac River	529	208	6,470	6
Anacostia River	271	10	4,212	4
Rock Creek-Potomac River	57	7	2,991	2
Difficult Run-Potomac River	58	0	1,883	0

2.1.6.6 Wetlands Threats Opportunities Assessment:

The Wetlands Threats Opportunities Assessment investigated whether wetland restoration *Opportunities* are at risk to climate change, anticipated increases in flooding and coastal storms, and projected development in the Chesapeake Bay Watershed. This analysis incorporated the results of the CBCP Threats Analysis with the CBCP Wetlands Restoration Opportunities Assessment and the Wetlands Enhancement Opportunities Assessment to understand habitats that may be lost or impaired by future threats.

The analysis showed that there are no tidal or nontidal threats to wetland restoration opportunities in the District of Columbia. The analysis showed that 99 acres of existing tidal wetlands are threatened in the Cameron Run-Potomac River Subwatershed (HUC 0207001003).

2.1.7 Outcome: Submerged Aquatic Vegetation

The Submerged Aquatic Vegetation (SAV) Restoration Opportunities Assessment compares areas that have experienced significant historical SAV loss and areas where SAV habitat was located as of 2015 to identify potential areas in the Chesapeake Bay Watershed for SAV restoration.

The following data was used in the SAV Restoration Opportunities Assessment (see the Planning Analysis Appendix for more details on the data used):

- *Virginia Institute of Marine Science (VIMS) SAV Survey Data (1971–2015) (compiled layer that represents all locations where SAV have been detected from 1971 through 2015)*
- *VIMS SAV Survey Data (2015) (identifies current location of SAV habitat)*

The results of the SAV Restoration Opportunities Assessment are shown in Figure 15 and listed in Table 7. The analysis showed that there are opportunities for SAV restoration in three of the subwatersheds in the District of Columbia. Moderate SAV loss without subsequent natural recovery has occurred in the Cameron Run-Potomac River (HUC 0207001003), the Rock Creek-Potomac River (HUC 0207001001) and the Anacostia River (HUC 0207001002) Subwatersheds.

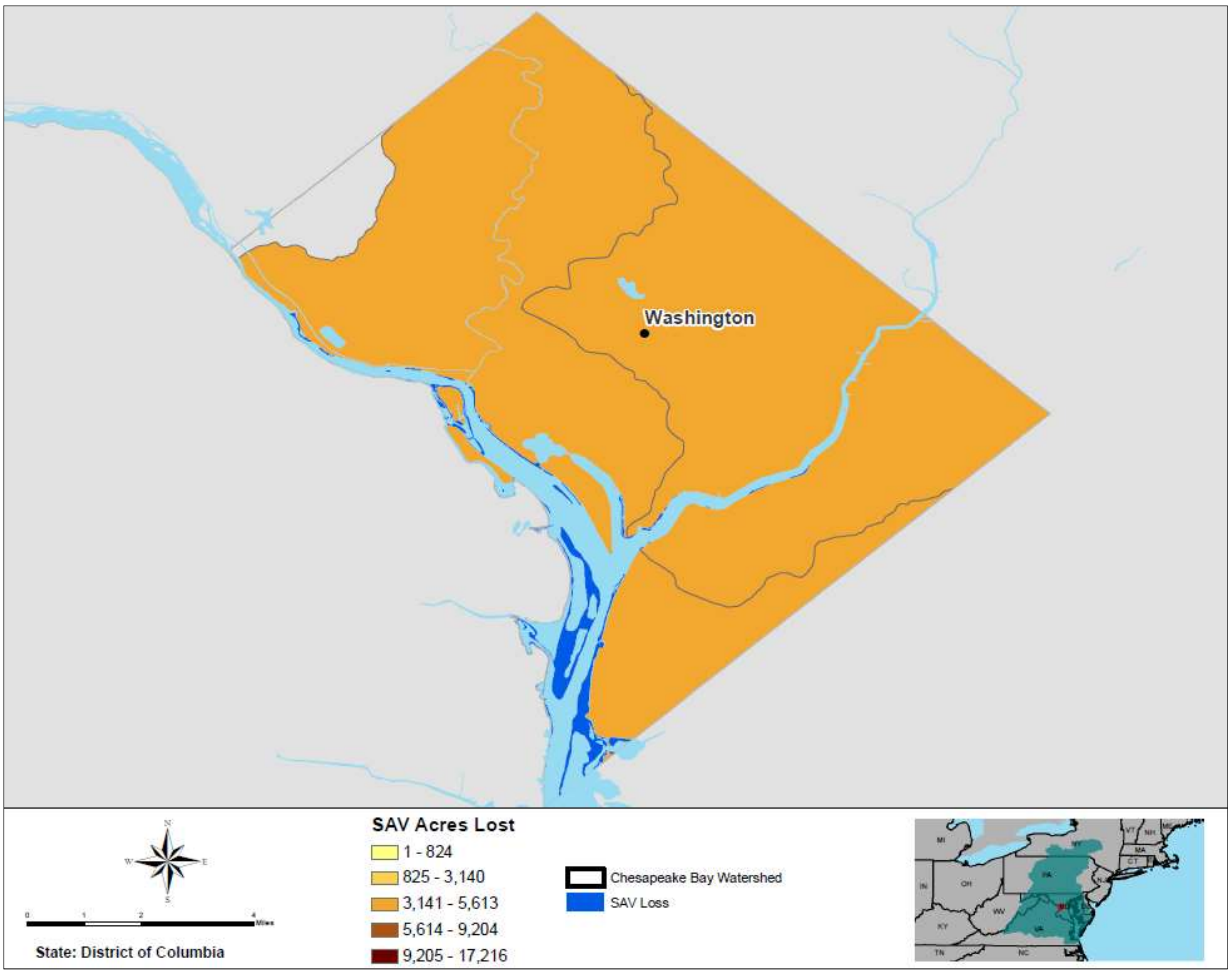

Figure 15. Acreage of submerged aquatic vegetation lost in the District of Columbia

Table 7. Acreage of submerged aquatic vegetation lost in the District of Columbia

Subwatershed Name	Acres of Submerged Aquatic Vegetation Lost
Cameron Run-Potomac River	4877
Rock Creek-Potomac River	3515
Anacostia River	3515
Difficult Run-Potomac River	0

2.2 Toxic Contaminants Goal

"Ensure the Chesapeake Bay and its rivers are free of the effects of toxic contaminants on living resources and human health."

2.2.1 Outcome: Toxic Contaminants Research

"Continually increase our understanding of the impacts and mitigation of toxic contaminants. Develop a research agenda and further characterize the occurrence, concentrations, sources and effects of mercury, polychlorinated biphenyls (PCBs) and other contaminants of emerging and widespread concern. In addition, identify which best management practices might provide the multiple benefits of reducing nutrient and sediment pollution as well as toxic contaminants in waterways."

2.2.2 Outcome: Toxic Contaminants Policy and Prevention

"Continually improve practices and controls that prevent or reduce the effects of toxic contaminants on aquatic systems and humans. Build on existing programs to reduce the amount and effects of polychlorinated biphenyls (PCBs) in the Chesapeake Bay watershed. Use research findings to evaluate the implementation of additional policies, programs and practices for other contaminants that need to be further reduced or eliminated."

The following data was used in the Toxic Contaminants Opportunities Assessment (see the Planning Analyses Appendix for more details on the data used):

- *National Priorities List (NPL) Sites (Superfund Sites) (*downloaded from https://toxmap-classic.nlm.nih.gov/toxmap/superfund/identifyAll.do and cross referenced with EPA for accuracy)

Results of the Toxic Contaminants Opportunities Assessment for the District of Columbia are shown on Figure 16. There are two NPL sites in final status located in the Anacostia River Subwatershed (HUC 0207001002) and one NPL site in final status in the Cameron Run-Potomac River Subwatershed (HUC 0207001003). Final status is defined as:

> *"[a] site determined to pose a real or potential threat to human health and the environment after completion of [Hazard Ranking System] HRS screening and public solicitation of comments about the proposed site" (U.S. Department of Health & Human Services 2017).*

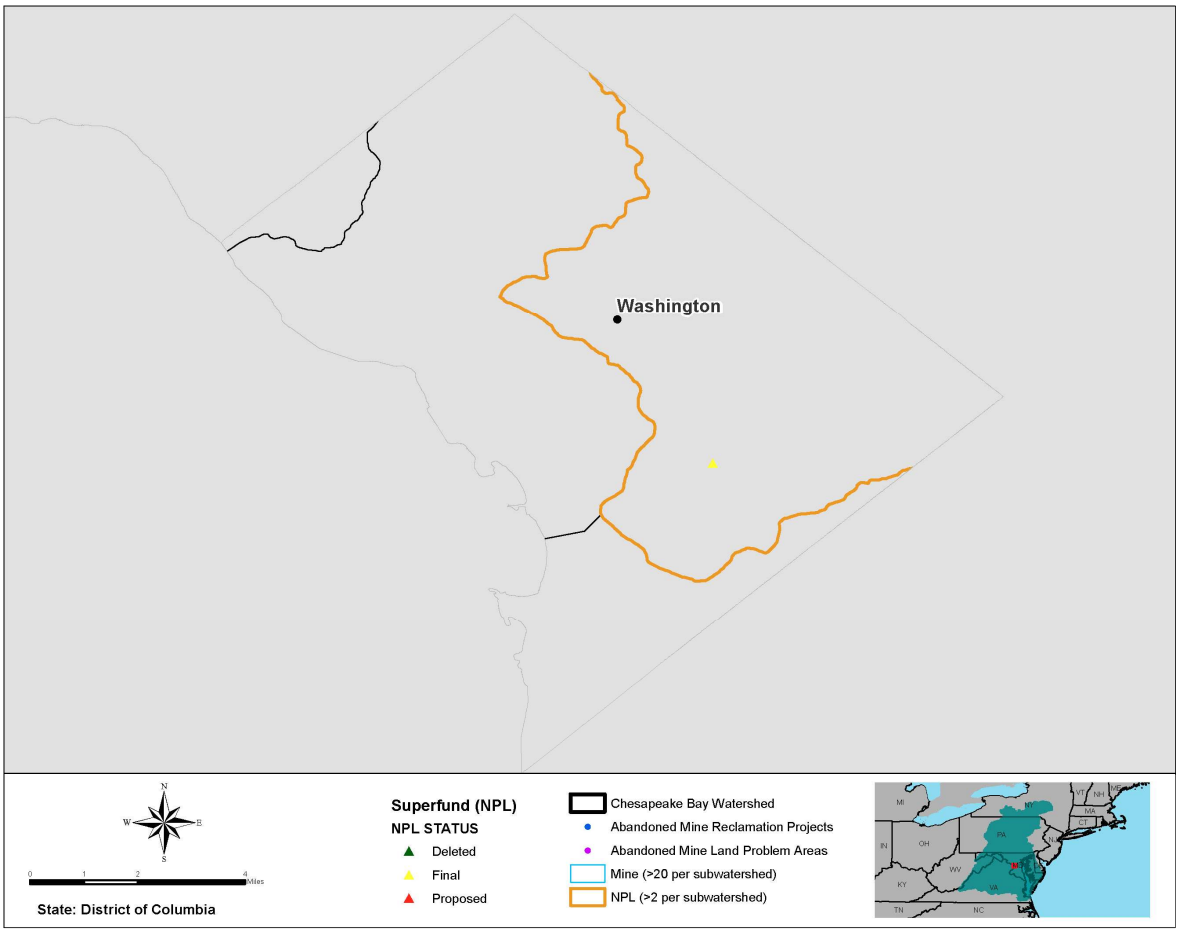

Figure 16. Toxic Contaminants Opportunities Assessment for the District of Columbia

2.3 Healthy Watersheds Goal

"Sustain state-identified healthy waters and watersheds, recognized for their high quality and/or high ecological value."

2.3.1 Outcome: Healthy Watersheds

"Ensure 100 percent of state-identified currently healthy waters and watersheds remain healthy."

The Healthy/High Value Habitats Opportunities Assessment identifies areas in the District of Columbia that have the healthiest habitats. The following data was used in the Healthy/High Value Habitats Opportunities Assessment (see Planning Analyses Appendix for more details on the data used):

- *State-identified Healthy Watersheds* (based on state-derived definitions and classifications of healthy waters and watersheds)
- *Subwatersheds identified as brook trout catchments (*National Hydrography Dataset plus catchments identified as potentially supporting brook trout based on the Eastern Brook Trout Joint Venture Salmonid Catchment Assessment)
- *Black Duck Focus Areas* (CBP)

- *Audubon Important Bird Areas*
- *Index of Ecological Integrity (IEI)*
- *Nature's Network Core and Connector Habitat*

Results of the Healthy/High Value Habitats Opportunities Assessment for the District of Columbia are shown in Figure 17 and listed in Table 8. The analysis showed that there is minimal healthy/high value habitat in the District of Columbia. The only subwatersheds that have healthy/high value habitats are the Cameron Run-Potomac River (HUC 0207001003) and the Anacostia River (HUC 0207001002) Subwatersheds, but both subwatersheds have less than 1 acre of healthy/high value habitat.

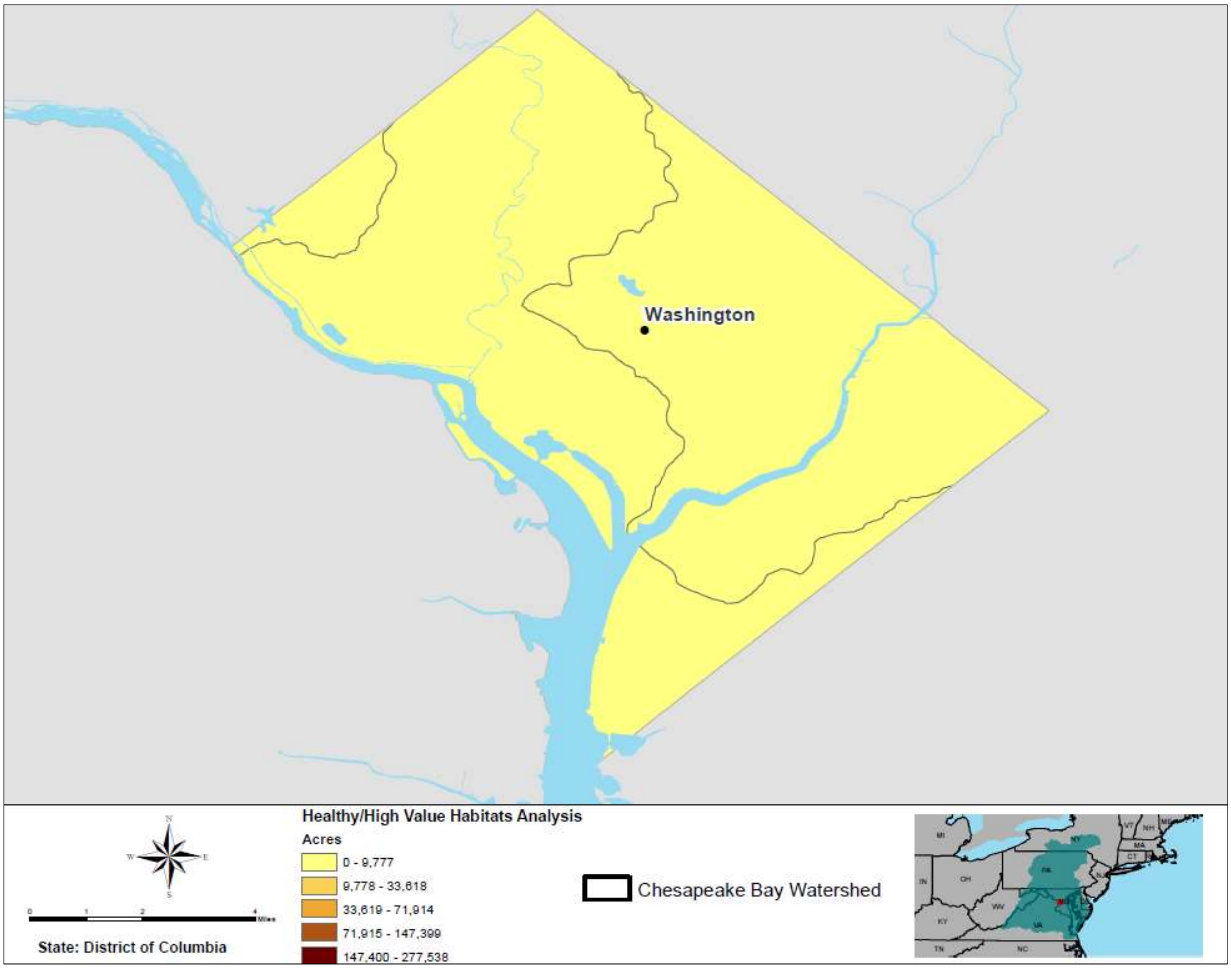

Figure 17. Healthy/high value habitats in the District of Columbia

Table 8. Healthy/high value habitats in the District of Columbia

Subwatershed Name	Healthy/High Value Habitat (Acres)
Cameron Run-Potomac River	0.98
Anacostia River	0.54

2.4 Land Conservation Goal

"Conserve landscapes treasured by citizens in order to maintain water quality and habitat; sustain working forests, farms and maritime communities; and conserve lands of cultural, indigenous and community value."

2.4.1 Outcome: Protected Lands

"By 2025, protect an additional two million acres of lands throughout the watershed – currently identified as high-conservation priorities at the federal, state or local level – including 225,000 acres of wetlands and 695,000 acres of forestland of highest value for maintaining water quality."

The purpose of the Conservation Opportunities Assessment was to identify habitats in need of potential conservation. Areas in potential need of conservation consist of healthy/high value habitats that are currently not conserved and potential habitat enhancement and restoration areas that align with conservation initiatives.

The following data was used in the Conservation Opportunities Assessment (see the Planning Analyses Appendix for more details on the data used):

- *Healthy/High Value Habitats Opportunities Assessment Results* (CBCP)
- *Protected Lands Dataset* (CBP)

According to this analysis, no conservation opportunities were identified in the District of Columbia.

2.5 Public Access Goal

"*Expand public access to the Chesapeake Bay and its tributaries through existing and new local, state, and federal parks, refuges, reserves, trails and partner sites."*

2.5.1 Outcome: Public Access Site Development

"By 2025, add 300 new public access sites to the Chesapeake Bay watershed, with a strong emphasis on providing opportunities for boating, swimming and fishing, where feasible."

The Socioeconomic Analysis synthesizes information that reflects societal use of resources within the District of Columbia. The compilation characterizes the locations in the watershed that are important for recreation and public access, water supply, and source water protection and those areas where underserved populations are located.

The following data was used in the Socioeconomic Analysis (see Planning Analyses Appendix for more details on the data used):

- *Locations of national, state, and local parks*
- *Public access points* (Nationally designated trails, existing and proposed public access sites compiled by the CBP)
- *Underserved populations* (Minority and low-income populations provided by the CBP)
- *National Inventory of Dams* (Congressionally authorized database documenting dams in the U.S. and its territories; maintained and published by the USACE)

Results of the Socioeconomic Analysis for the District of Columbia are shown in Figure 18 and listed in Table 9. This analysis demonstrates that there are areas in the District of Columbia that consist of underserved low-income and minority populations, particularly on the north and east sides of the district in the Cameron Run-Potomac River (HUC 0207001003) and the Anacostia River (HUC 0207001002) Subwatersheds. These subwatersheds also have public access sites and recreational parks adjacent to these low-income and minority communities. The Cameron Run-Potomac River Subwatershed has 27 public access sites, and the Anacostia River Subwatershed has 14 public access sites. Both subwatersheds also have a significant amount of recreation parks acreage. This analysis helps identify areas where stewardship opportunities can aide underserved communities in connecting with the natural environment (i.e., facilitating environmental stewardship by connecting people to the environment).

To determine where conservation may provide societal benefits to the public, the following data were overlaid:

- *Conservation Opportunities Assessment Results* (CBCP)
- *Socioeconomic Analysis Results* (CBCP)

Since there were no conservation opportunities identified for the District of Columbia in the Conservation Opportunities Assessment, there are no opportunities for conservation to provide societal benefits to the public in the District of Columbia.

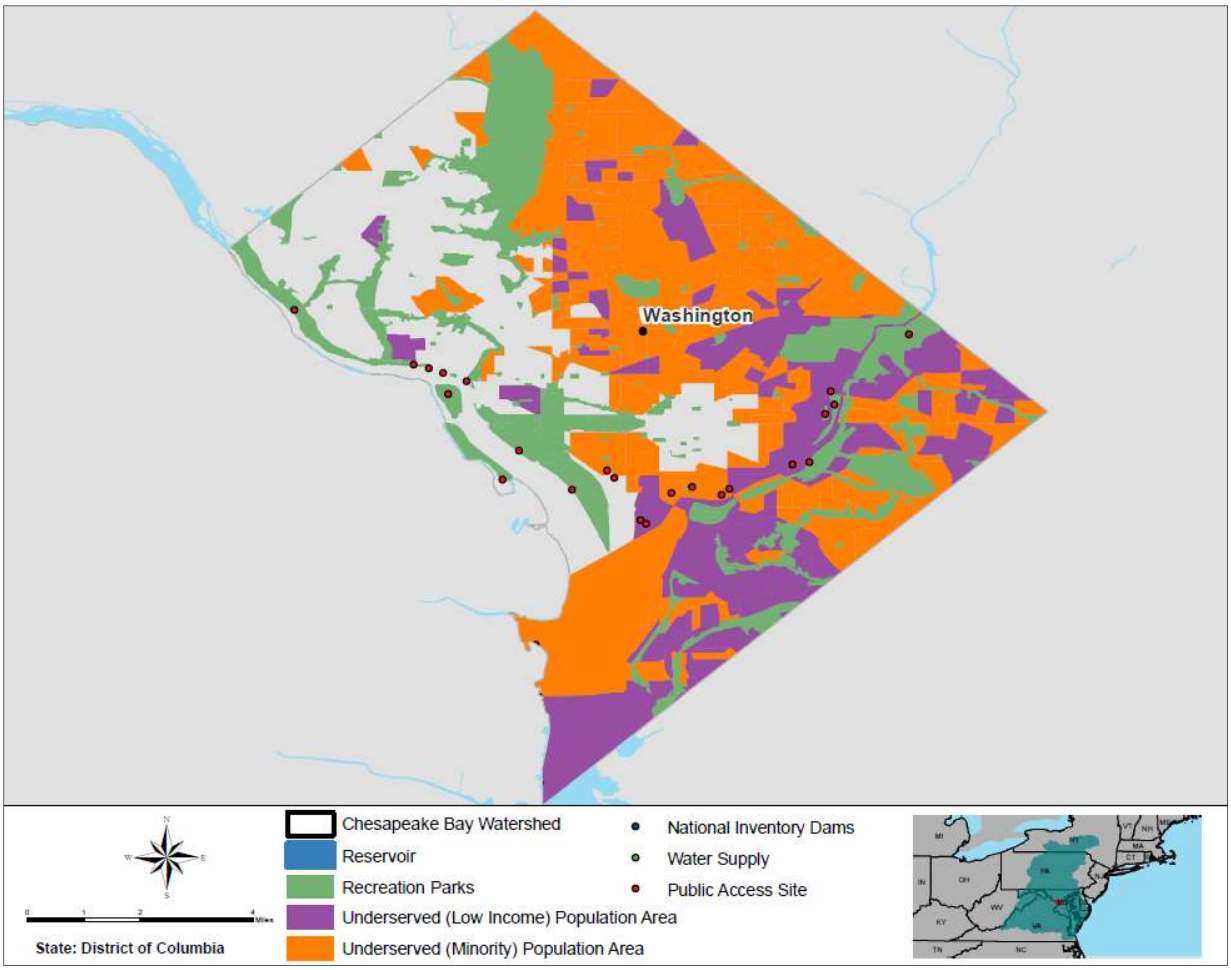

Figure 18. Socioeconomic Analysis for the District of Columbia

Table 9. Socioeconomic Analysis for the District of Columbia

Subwatershed Name	Recreation Parks (Acres)	Underserved (Minority) Population (Acres)	Underserved (Low Income) Population (Acres)	Reservoir (Acres)	Public Access Sites	Water Supply Counts	National Inventory Dams (Counts)
Rock Creek-Potomac River	11,702	33,559	1,491	0	16	4	3
Anacostia River	12,967	102,982	13,609	0	14	0	14
Cameron Run-Potomac River	13,038	116,534	5,666	0	27	20	18
Difficult Run-Potomac River	12,169	30,870	51	0	6	15	40

2.6 Climate Resiliency Goal

"*Increase the resiliency of the Chesapeake Bay watershed, including its living resources, habitats, public infrastructure and communities, to withstand the adverse impacts from changing environmental and climate conditions.*"

2.6.1 Outcome: Climate Adaptation

"Continually pursue, design and construct restoration and protection projects to enhance the resiliency of the Chesapeake Bay and its aquatic ecosystems against the impacts of coastal storm erosion, coastal flooding, more intense and more frequent storms, and sea level rise."

The Threats Analysis identifies areas within Delaware that are threatened by urbanization and climate change, as well as areas prone to increased/persistent future flooding.

The following data was used in the Nontidal Threats Analysis (see Planning Analyses Appendix for more details on the data used):

- *Nontidal flooding* (USGS)
- *Future projected development* (USACE North Atlantic Coast Comprehensive Study (NACCS))
- National Fish Habitat Assessment (NFHAP)

The following data was used in the Tidal Threats Analysis (see the Planning Analysis Appendix for more details on the data used):

- *Areas projected to have more frequent 'normal' flooding* (NACCS and USGS 30-meter Digital Elevation Model)
- *Future projected development* (NACCS)
- *Sea level rise curves* (Projected using the USACE Sea Level Rise High Scenario in year 2100 based on USGS Sea Level Rise Calculator)
- *Resources at risk to coastal storms* (NACCS)
- *Coastal Vulnerability Index* (USGS)

This Watershed Threats Analysis identified no tidal or nontidal threats in the District of Columbia.

SECTION 3

Watershed Planning Considerations outside the 2014 Bay Agreement

3.1 Rare, Threatened, and Endangered Species and USFWS Species of Concern

The following maps (Figures 19 through 22) display areas in the District of Columbia that have federally listed threatened and endangered species as well as species identified as critical by the USFWS. The species have been placed into the following categories based on their primary habitat needs —aquatic, beach, stream, and wetland dependent. The following maps display the number of species per subwatershed that fall into the aquatic, beach, stream, or wetland categories and whether they are federally listed, critical, or both.

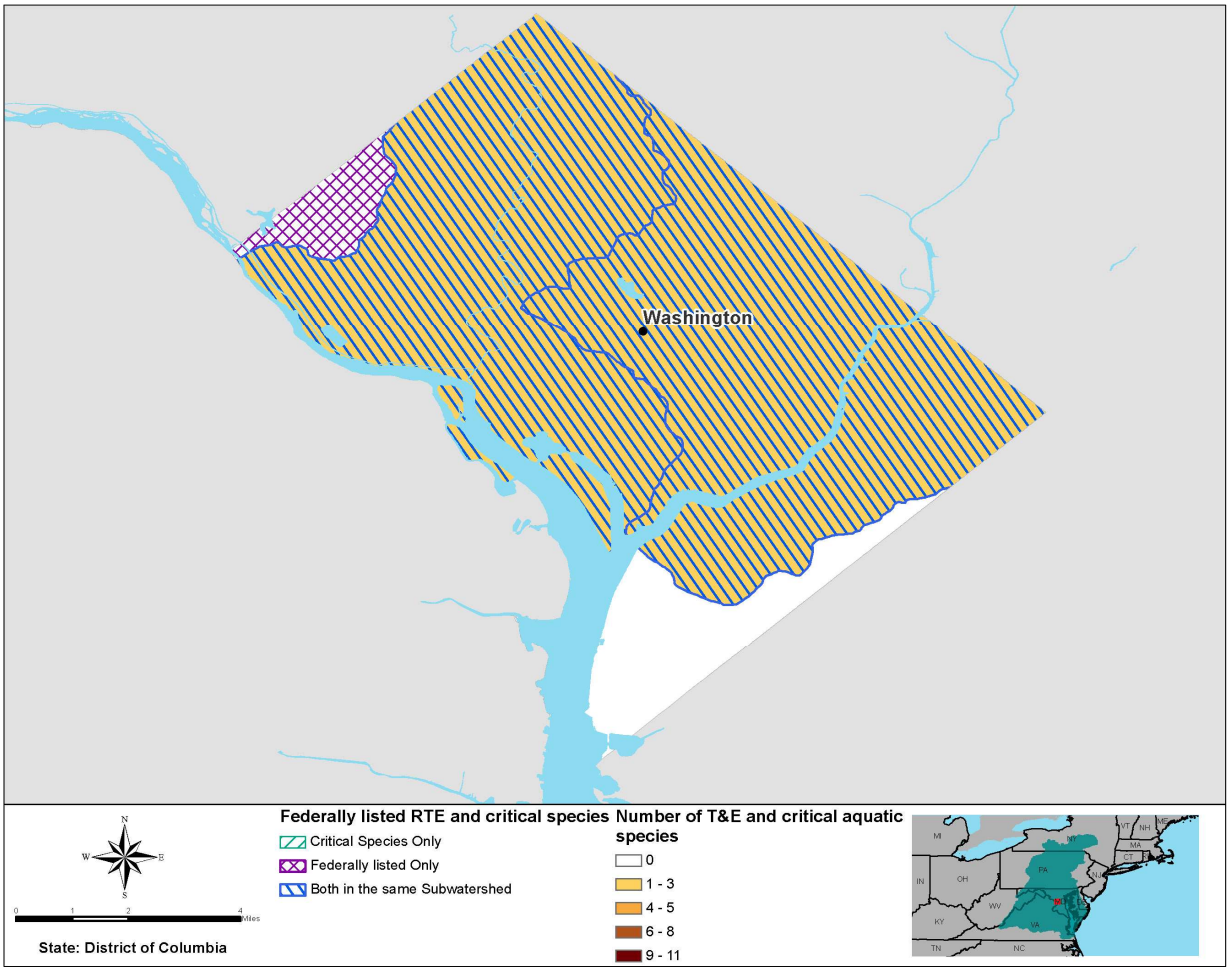

Figure 19. Occurrence of rare, threatened, and endangered and U.S. Fish and Wildlife Service critical aquatic species in the District of Columbia

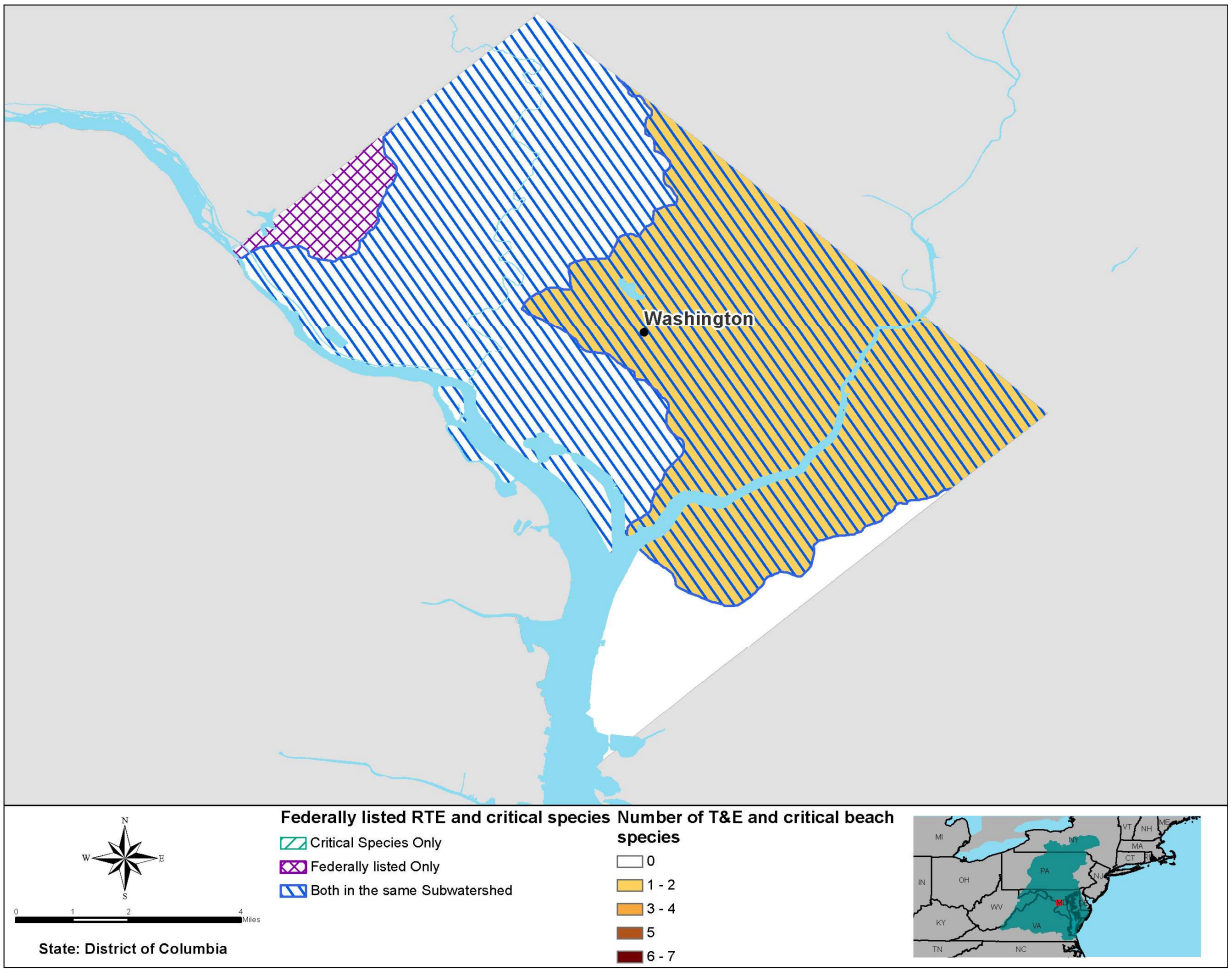

Figure 20. Occurrence of rare, threatened, and endangered and U.S. Fish and Wildlife Service critical beach species in the District of Columbia

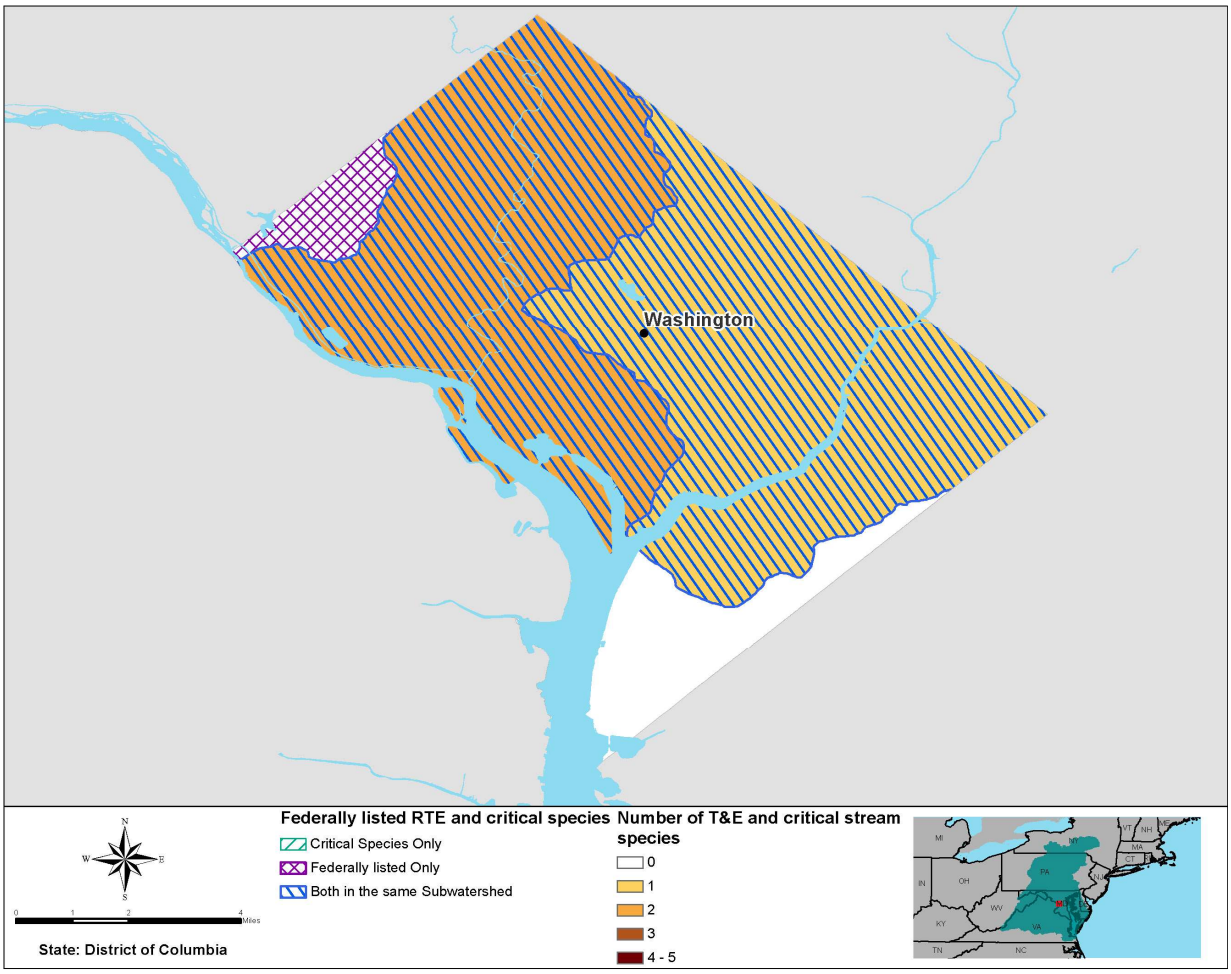

Figure 21. Occurrence of rare, threatened, and endangered and U.S. Fish and Wildlife Service critical stream species in the District of Columbia

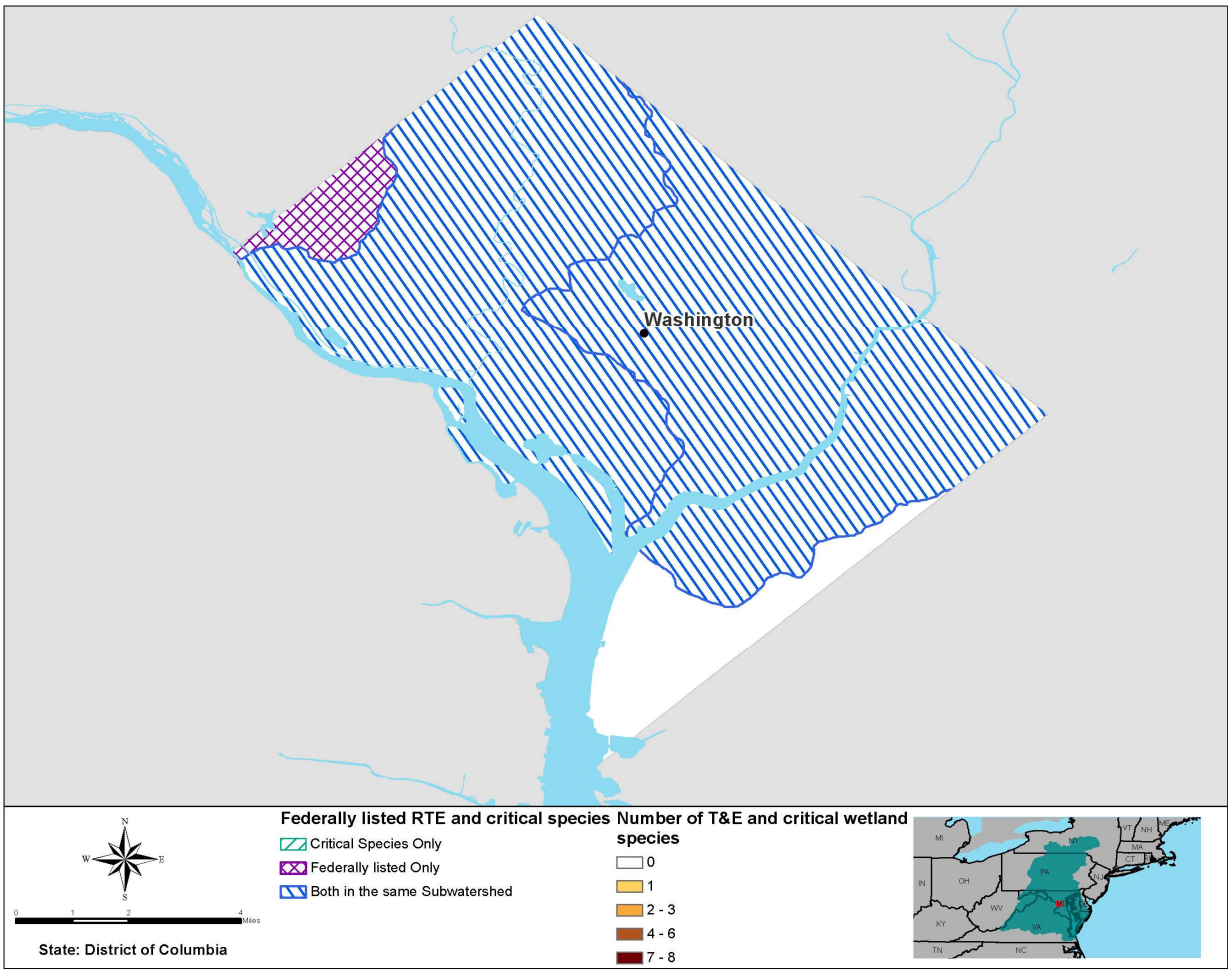

Figure 22. Occurrence of rare, threatened, and endangered and U.S. Fish and Wildlife Service critical wetland species in the District of Columbia

3.2 Marsh Migration

As sea levels rise, the ability of a marsh to migrate inland will be an important factor to determine the future location of tidal wetlands. In 2015, the National Oceanic and Atmospheric Administration (NOAA) (2015) developed a model based on previous work by The Nature Conservancy that evaluates the potential for tidal wetlands to migrate inland. A cost distance approach was taken that considers elevation and land use adjacent to existing wetlands to estimate the inland migration potential. The results of NOAA's modeling were incorporated with the CBCP analyses as described below. The intent was to identify where wetland restoration opportunities should consider inland migration corridors.

1. Overlay the existing wetlands layer to show the connectivity of migration corridors to existing wetlands. The results are presented in Figure 23 and Table 10.

2. Determine which subwatershed have the greatest opportunity for marsh migration. Tally the acres of greens and blues in each subwatershed. Provide the results in the standard color ramp determined by the Jenks method. The results are presented in Figure 24.

3. Overlay the migration/cost corridor data on top of the tidal wetland restoration opportunity results. The results are presented in Figure 25.

4. Overlay the migration/cost corridor data on top of the threats to existing tidal wetlands opportunity results.

The following data was used in the Marsh Migration Opportunities Assessment (see the Planning Analyses Appendix for more details on the data used):

- *Marsh Migration Model* (NOAA 2015)
- *Tidal Wetlands Enhancement and Restoration Opportunities Assessment* (CBCP)

In the District of Columbia, the subwatersheds with the lowest cost for marsh migration include the Rock Creek-Potomac River Subwatershed (HUC 0207001001) along the Potomac River, the Anacostia River Subwatershed (HUC 0207001001) along the Anacostia River, and in the Cameron Run-Potomac River Subwatershed (HUC 0207001003).

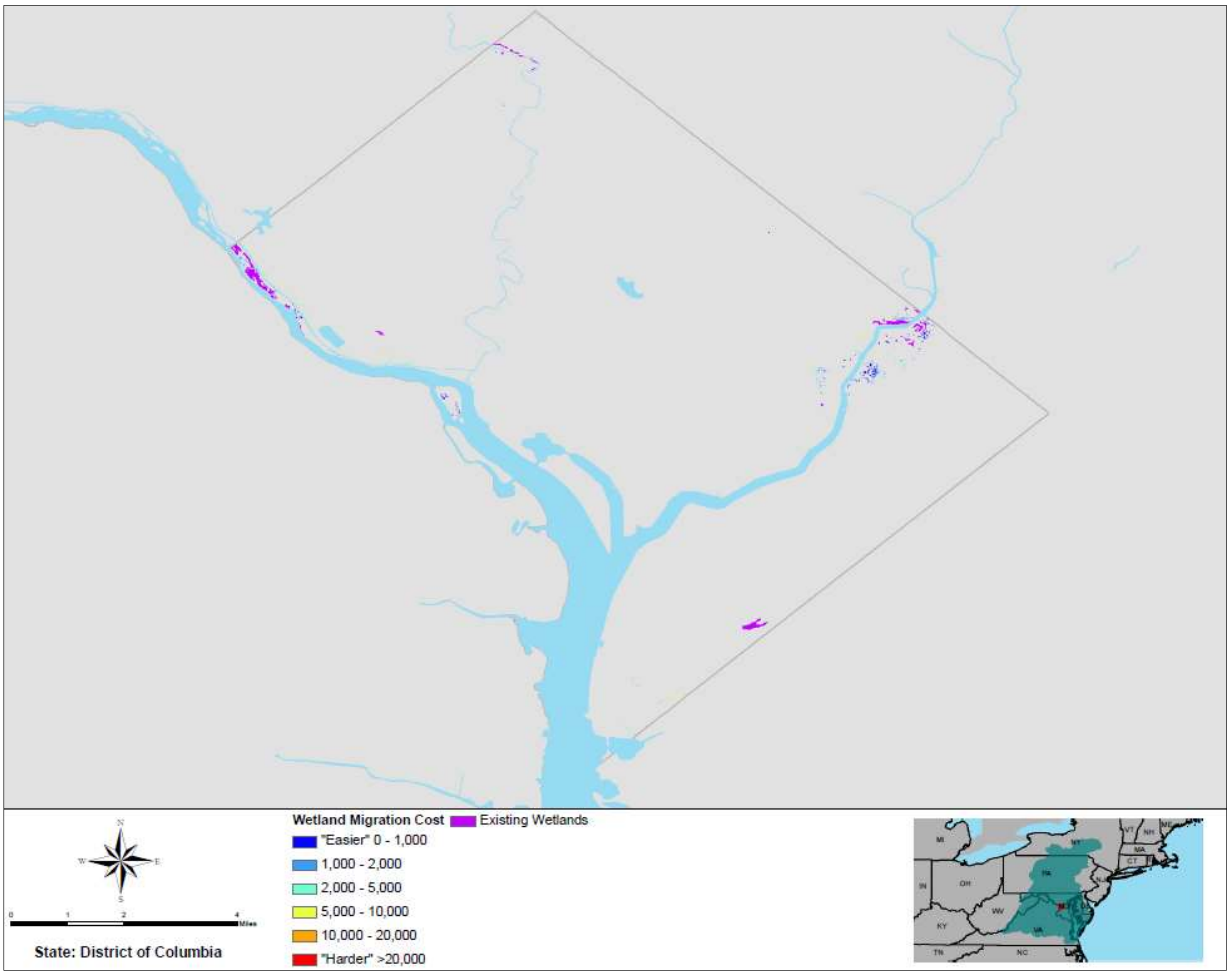

Figure 23. Connectivity of migration corridors to existing wetlands in the District of Columbia

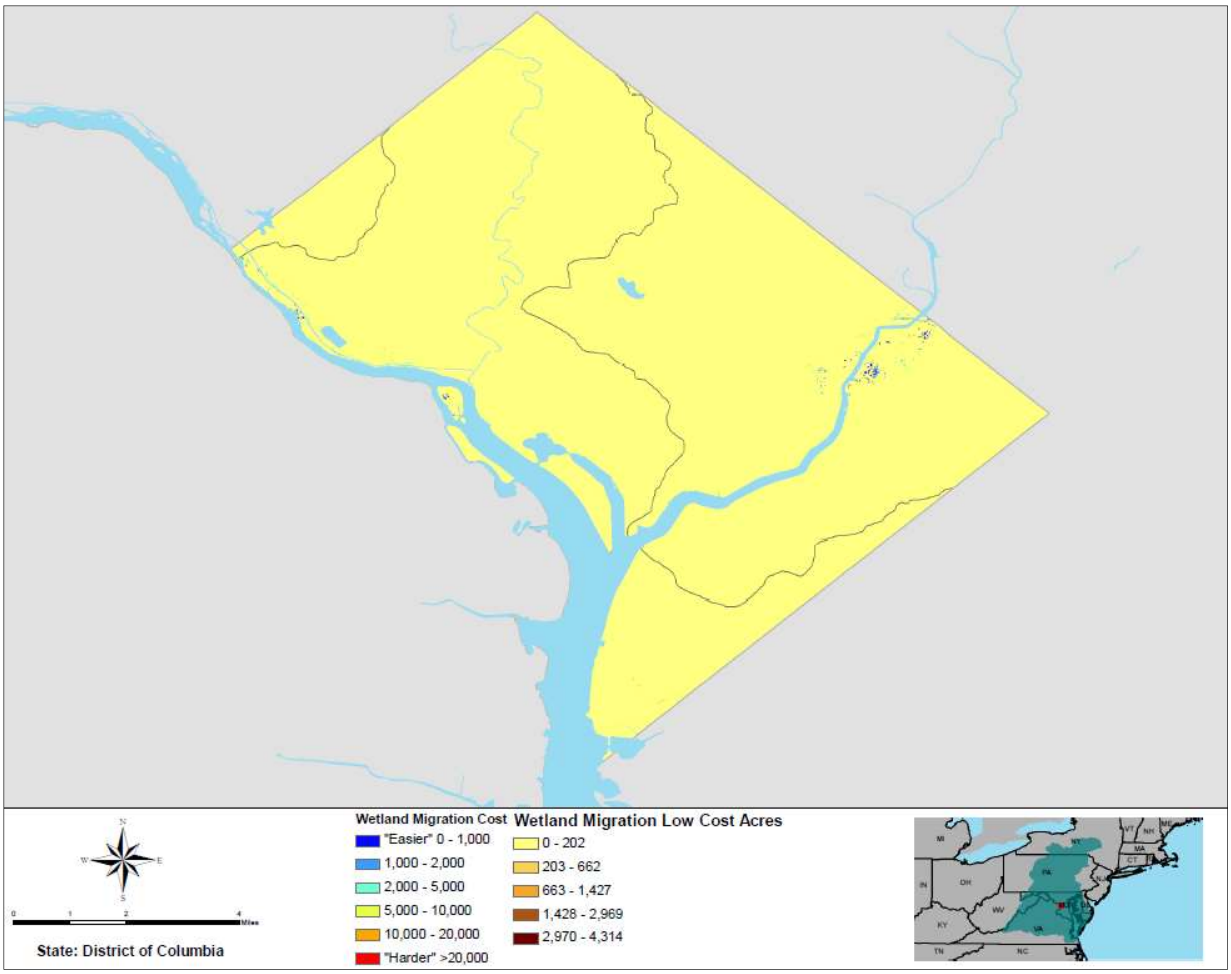

Figure 24. Subwatersheds with the greatest opportunity for marsh migration in the District of Columbia

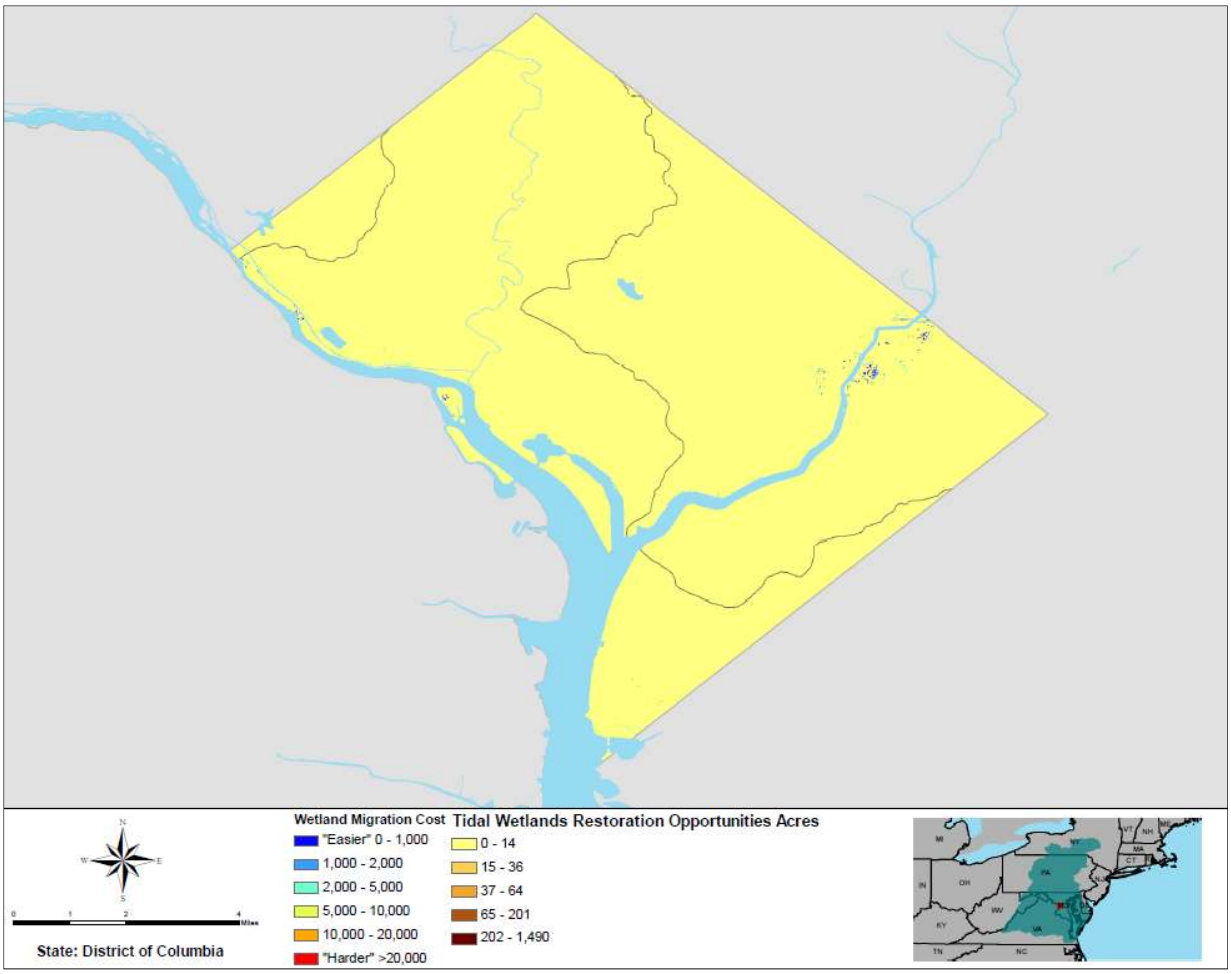

Figure 25. Wetland migration cost and tidal restoration opportunities in the District of Columbia

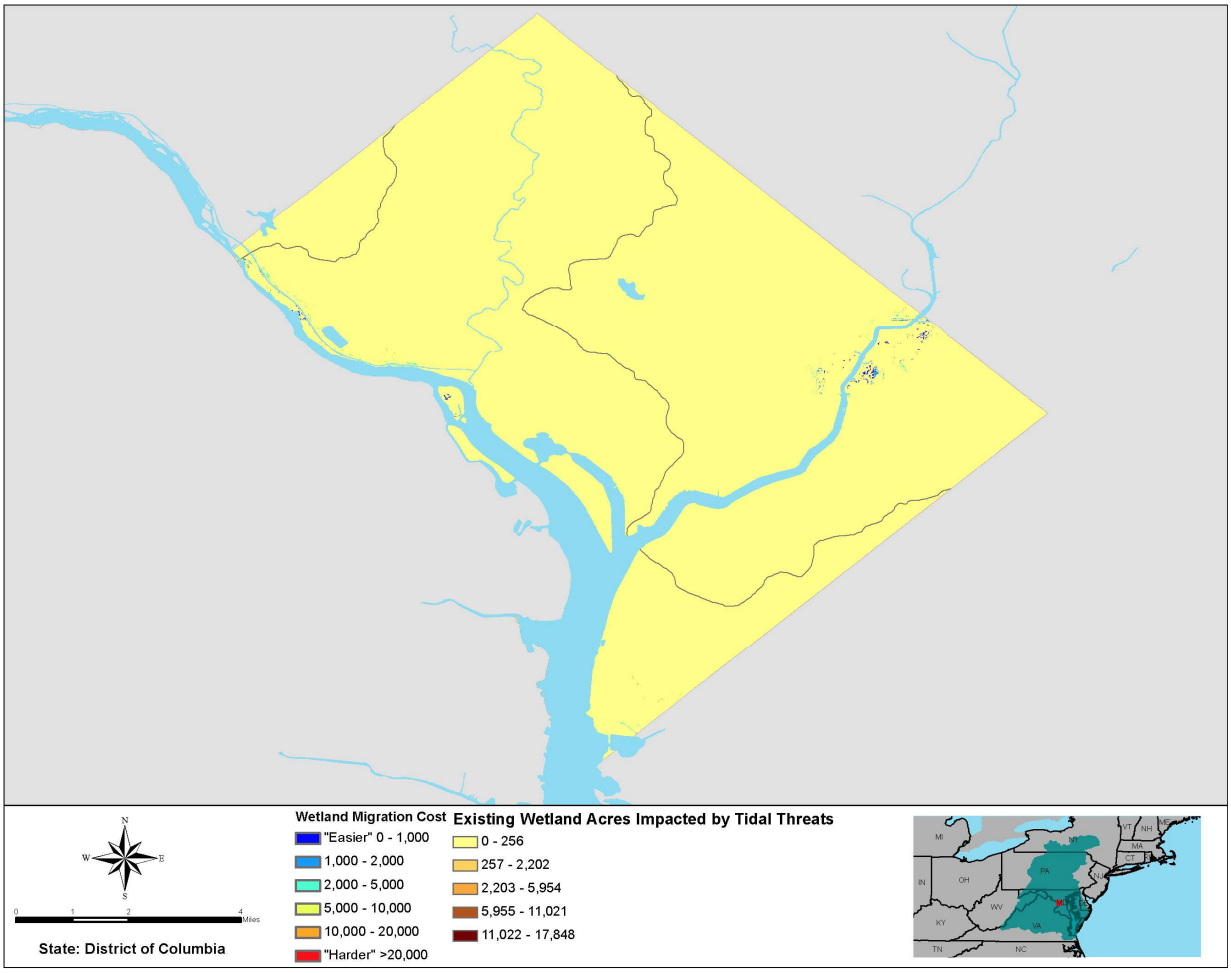

Figure 26. Marsh migration cost and wetland threats in the District of Columbia

Table 10. Marsh Migration Opportunities Assessment in the District of Columbia

Subwatershed Name	Wetland Migration Low Cost (Acres)
Cameron Run-Potomac River	140
Anacostia River	41
Rock Creek-Potomac River	15
Difficult Run-Potomac River	0

3.3 Regional Flow and Connectivity

Nature's Network developed data that characterizes the ability of flora and fauna to move across the landscape. This regional flow data characterizes areas within a range of constrained flow to high diffuse flow (Figure 27 and Table 11) (see the Planning Analyses Appendix for definitions of each category.) The purpose of this analysis is to discern where there are important areas of regional flow, as determined by the Nature Conservancy (2016), which could benefit from tidal

and/or nontidal wetland restoration. By aligning areas for potential wetland restoration with regional flow, opportunities to improve connectivity and ease of passage are identified. To investigate this concept, the CBCP overlaid the combined wetland restoration opportunities with the regional flow data. The acreage that is identified by Nature's Network as being a regional flow corridor of any degree was summed within each subwatershed. The total acreage of restoration opportunity was classified into 5 groups utilizing the Jenks (Natural Breaks) method in ArcGIS. The top 2 groups of watersheds based on acreage of opportunity are identified as *Opportunity* subwatersheds. Those subwatersheds with the greatest overlap between wetland restoration opportunity (acres) and regional flow data in the District of Columbia include the Difficult Run-Potomac River (HUC 0207000810) and the Cameron Run-Potomac River (HUC 0207001003) Subwatersheds.

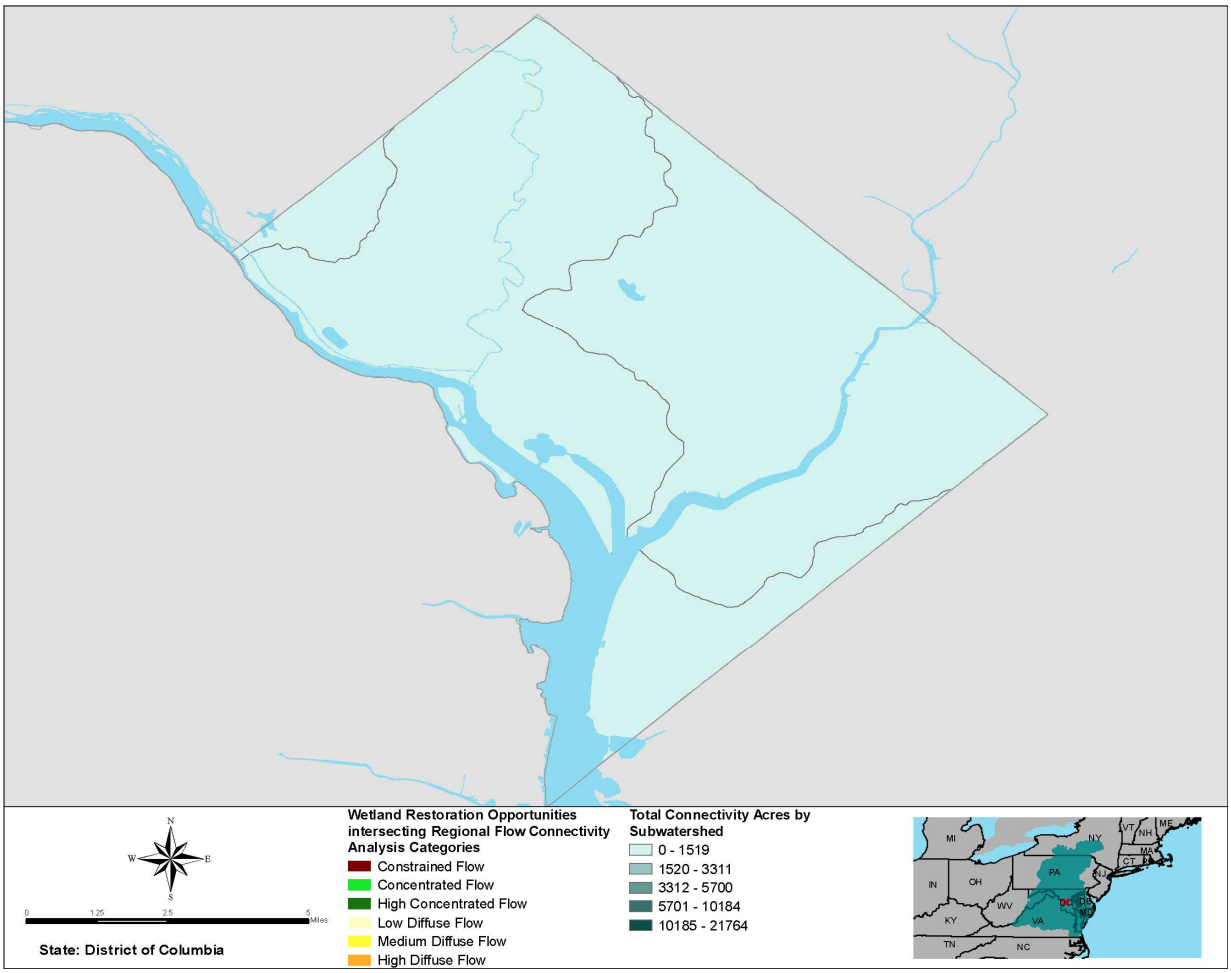

Figure 27. Acres of wetland restoration opportunities that could beneficially impact regional flow in the District of Columbia

Table 11. Acres of wetland restoration opportunities that could beneficially impact regional flow in the District of Columbia

Subwatershed Name	Wetland Restoration Opportunities Intersecting Regional Flow (Acres)
Difficult Run-Potomac River	1,133
Cameron Run-Potomac River	883
Anacostia River	9
Rock Creek-Potomac River	0

3.4 Road-Stream Crossings

A number of human activities can disrupt the continuity of river and stream ecosystems. The most familiar human-caused barriers are dams. Fish passage projects and dam removals have been a focus of the Chesapeake Bay Fish Passage Workgroup (FPWG) since 1989, and many dams and fish passage structures have been installed, opening thousands of miles of potential fish habitat. In recent years, there is growing concern about the role of road-stream crossings, especially culverts, in altering habitats, disrupting river and stream continuity, and blocking fish passage. Over 160,000 road-stream crossings exist in the Chesapeake Bay Watershed. In the District of Columbia there are 248 road-stream crossings. However, few culverts in the Chesapeake Bay Watershed have been assessed for fish passage. Of those in the District of Columbia, no culverts have been surveyed.

SECTION 4
Integration Analysis

The *Opportunity* maps can guide various stakeholders and focus efforts. The purpose of the Integration Analysis was to evaluate the results of the individual Opportunity Assessments to identify where multiple 2014 Bay Agreement goals and outcomes or co-benefits that could be achieved. The resulting *Restoration Roadmap* is a compilation of the *Opportunity Assessments* which highlights co-benefits and the potential to address multiple problems with an integrated water resources management approach.

In the District of Columbia, the following *Opportunities Assessments* identified subwatersheds with opportunities aligning with the 2014 Bay Agreement goals and outcomes:

- Wetlands restoration to benefit avian wildlife
- Riparian forest buffers
- Stream restoration
- Toxic contaminants
- Watershed stressors (water quality improvements)
- Fish passage

Due to the fact that there are a number of analyses that occur only in estuarine or tidal areas (oyster restoration, SAV, etc.), these data were separated and included in scoring only in those subwatersheds where 2014 Bay Agreement goals and outcomes have the potential to occur, eliminating bias towards tidal/estuarine areas at the mouth of the watershed when compared to the basin states further from the mainstem of the Chesapeake Bay. This allows for consistency between all analyses where subwatersheds were placed in disparate categories.

The subwatershed in the District of Columbia with the highest potential to achieve the most 2014 Bay Agreement goals is the Cameron Run-Potomac River Subwatershed (HUC 0207001003). The Anacostia River (HUC 0207001001), the Rock Creek-Potomac River (HUC 0207001001) and the Difficult Run-Potomac River (HUC 0207000810) Subwatersheds also had opportunities to achieve 2014 Bay Agreement goals.

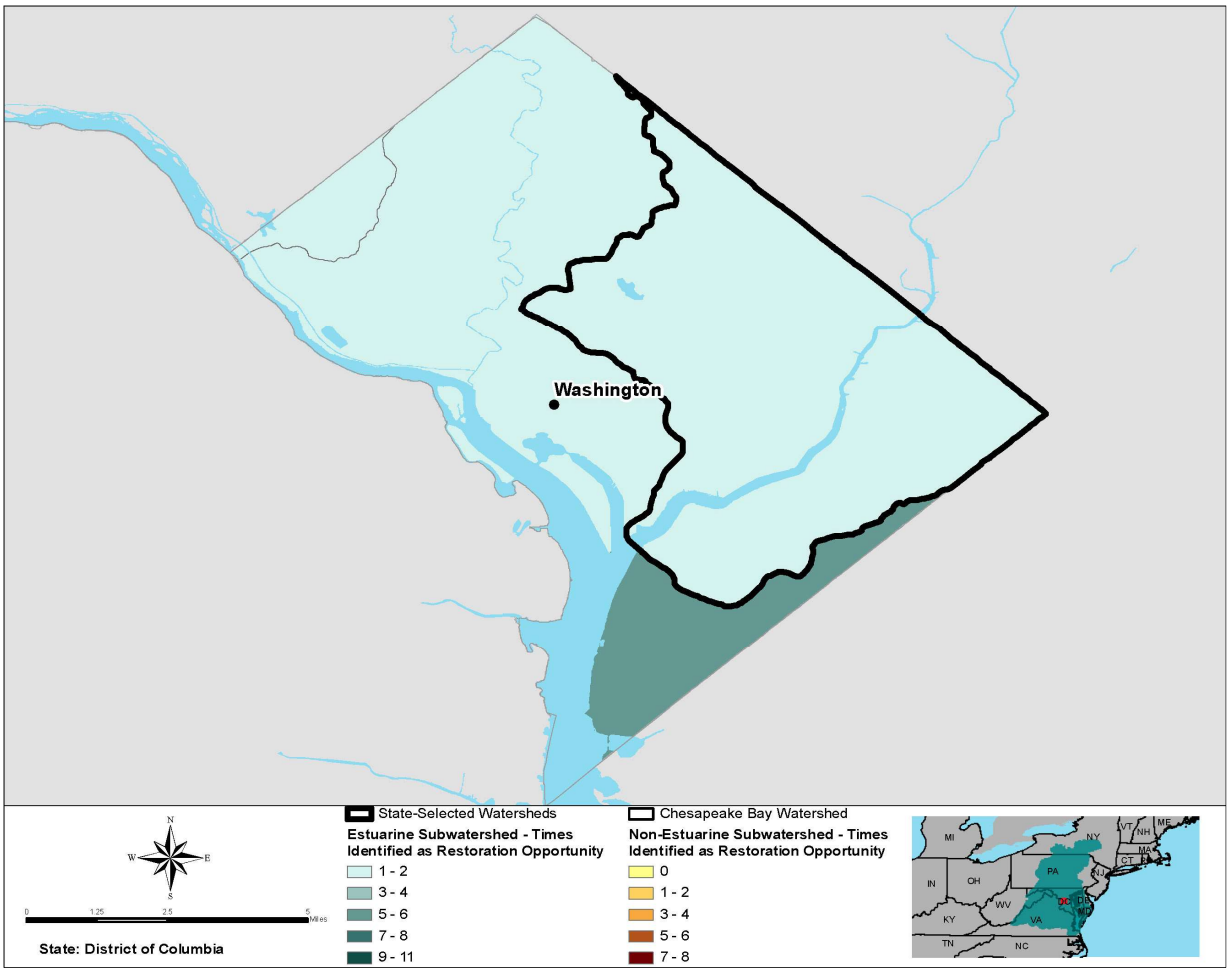

Figure 28. *Restoration Roadmap* for the District of Columbia

Table 12. *Restoration Roadmap* for the District of Columbia*:* Compilation of Opportunity Assessments (1 = yes; 0 = no)

Drainage States	HUC 10 Number	Subwatershed Name	Wetlands Restoration Opportunity to Benefit Avian Wildlife	Riparian Forest Buffers Opportunity	Stream Restoration Opportunity	Toxic Contaminants Opportunity	Water Stressor Analysis Opportunity	Times Identified as *Opportunity*	Times Identified as *Opportunity* including Fish Passage
MD,VA, DC	0207000810	Difficult Run-Potomac River	0	0	0	0	1	1	1
DC,MD,VA	0207001001	Rock Creek-Potomac River	0	0	0	0	1	4	1
DC,MD	0207001002	Anacostia River	0	0	0	1	1	2	2
DC,MD,VA	0207001003	Cameron Run-Potomac River	1	1	1	0	1	4	5

SECTION 5

State-Selected Watershed Action Plan Summary

The State-Selected Watershed Action Plans undertook a detailed analysis for each jurisdiction with the goal of identifying site-specific, project-scale for implementation. The watershed being evaluated in detail for the District of Columbia is the Anacostia River Watershed. The full action plan for the Anacostia River Watershed is appended to this chapter. Figure 29 depicts the results of the action plan investigation. Utilizing the results of the CBCP baywide analyses, local data, and candidate restoration projects submitted by stakeholders, 4 areas are identified as focal points for developing projects that could address multiple CBA goals and outcomes. Table 13 summarizes the potential opportunities identified in each polygon.

Table 13. Summary of activities in proposed focus areas for project identification in the Anacostia River Watershed

Anacostia Watershed Project Focus Areas				
Activity	A	B	C	D
Conservation				
Oyster Restoration				
Stream Restoration			X	
Riparian Buffer Restoration / Reforestation		X	X	X
SAV Restoration	X	X		
Wetland Creation / Restoration		X	X	X
Living Shoreline	X	X		
Removal of Fish Blockages		X		X
Stakeholder-Submitted Candidate Project		X		
Trash Reduction		X		
Armored Shoreline Structure Removal		X		X
Stormwater Retrofit		X	X	X

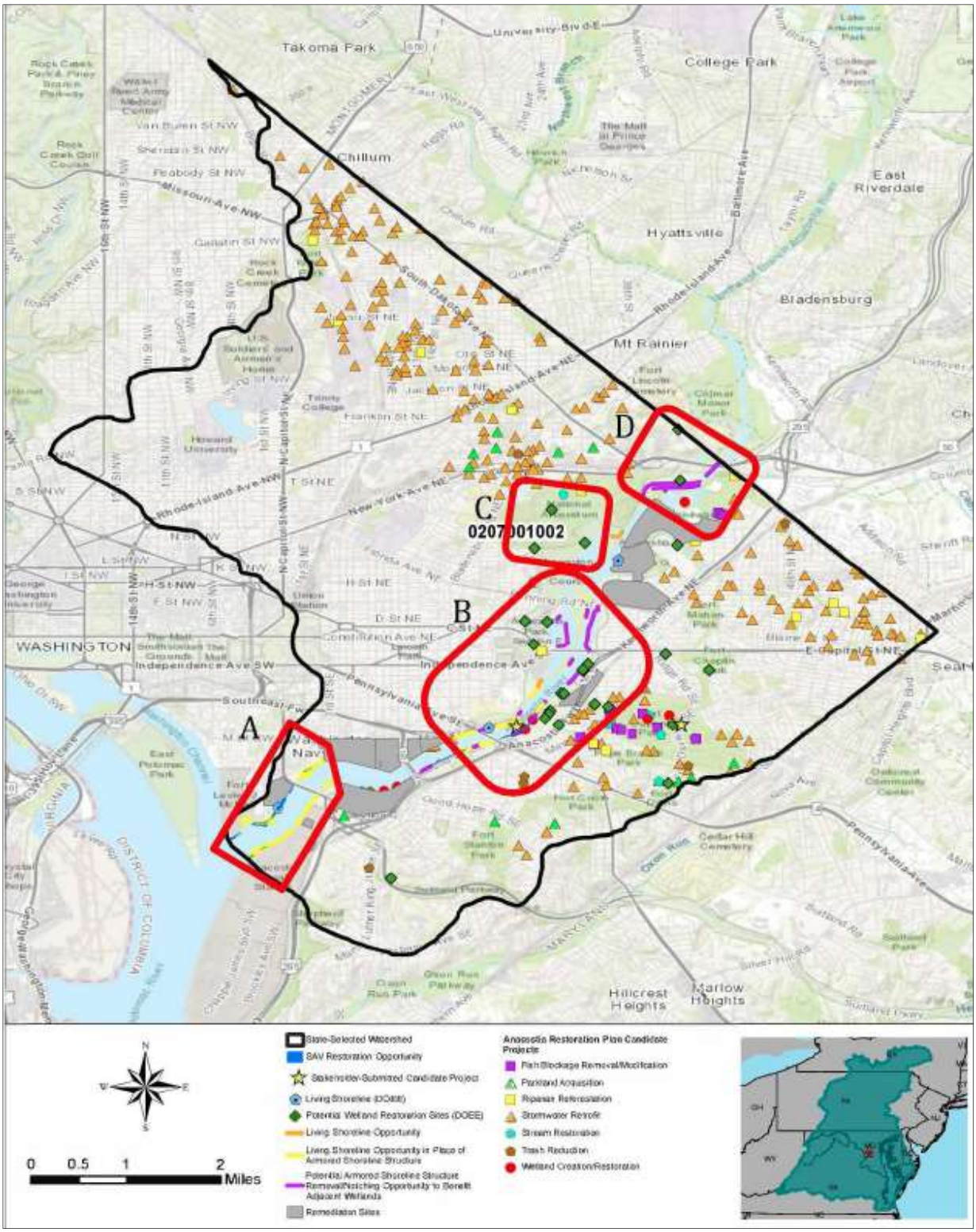

Figure 29. Proposed focus areas for project identification in the Anacostia River Watershed

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SECTION 6

Funding and Implementation Strategy

The Federal Leadership Committee for the Chesapeake Bay, including EPA and the Departments of Agriculture, Commerce, Defense, and the Interior, invested more than $536 million in watershed restoration in fiscal year 2016. Funding is directed to state and local governments, educational institutions, nonprofit organizations, and territorial and tribal agencies. These groups often provide additional funding—cash or in-kind—to further facilitate restoration efforts.

This section details a summary of federal, state, and nongovernmental programs and organizations that could be pursued for assistance in implementation efforts.

6.1 Federal Funding

The *Catalog of Federal Funding Sources for Watershed Protection* is a searchable online database of financial assistance sources (grants, loans, and cost-sharing) available to fund a variety of projects. The database may be searched by:

- Key word (e.g., wetlands, infrastructure, education, forestry);
- Type of organization (e.g., nonprofit groups, state, tribal, educational institution);
- Match requirement (yes or no); and
- Federal agency.

A search of all criteria provided programmatic information by agency that may be useful for different needs and opportunities identified in the CBCP. This information is available in the CBCP Existing Watershed Conditions and Threats Report in Table 39 of Section 12.3. Each program is linked to a web page that details the most current information regarding the funding source, including program overview, current and past funding levels, lowest/median/highest awards, match requirements, contact information, and eligible organizations.

6.2 Non-Government Resources

Outreach and public engagement, advocacy, volunteer and community support, monitoring, and research are examples of activities that many nongovernmental and nonprofit groups do as part of their mission. These groups often are more nimble than larger governmental agencies. They are on the ground and aware of opportunities and constraints at the parcel scale. Networking with community groups can bring much needed resources to the aid of communities with the capacity to facilitate restoration efforts. Tables 40 and 41 in Sections 12.4 and 12.5 of the CBCP Existing Watershed Conditions and Threats Report catalogs a list of groups that support habitat

conservation, management, and restoration efforts that are complementary to Chesapeake Bay goals.

6.3 Public-Private-Partnerships

A public-private partnership is typically a contractual agreement between a state or locality and a private organization or nongovernmental organization that commits them to provide an environmental or recreational service. Public/Private partnerships will be an essential component for implementation of various CBCP measures, including those associated with restoration, water quality, recreation, stewardship, and conservation. For example, public-private partnerships have become a popular and effective method to achieve stringent water quality standards required to meet stormwater initiatives in the Chesapeake Bay Watershed. Another successful and viable example of a public-private partnership approach is the execution of voluntary, long-term real estate protections by local citizens in the Chesapeake Bay Watershed. Other successful partnerships that have been implemented in the watershed are citizen water quality monitoring programs and programs where students grow oyster spat for reef restoration projects. Other public-private partnerships exist in which schools grow vegetation that they then plant at local restoration sites, providing a viable function for the school and promoting stewardship and interpretation throughout the watershed. Overall, the implementation of public-private partnerships will be an essential component to ensure successful implementation of the CBCP.

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Section 7
References

Source information for all geospatial data is provided in Annex 3 of the Planning Analyses Appendix.

U.S. Department of Health & Human Services. 2017. *What are the Superfund "NPL" statuses?* Available: https://toxmap.nlm.nih.gov/toxmap/faq/2009/08/what-are-the-superfund-site-npl-statuses.html

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District of Columbia State-Selected Watershed Action Plan

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Section 1
Introduction

As part of the Chesapeake Bay Comprehensive Water Resources and Restoration Plan (CBCP) watershed assessment, a multi-scalar geospatial analysis approach was completed. As part of the scoping effort to develop this approach, each state initially identified a watershed in which geospatial analyses would be completed at the local watershed scale to further define ecological problems, needs, and opportunities. For the District of Columbia, the state-selected watershed for the smaller scale analyses was the Anacostia River watershed. The purpose of this refined, smaller scale geospatial analysis was to evaluate the unique problems and opportunities within the Anacostia River watershed and ultimately guide the implementation of future projects at a smaller scale.

This report builds upon the CBCP baywide and statewide analyses, which corroborated the Anacostia River watershed for selection as part of the CBCP smaller scale watershed analyses. The analysis findings are rooted in the geospatial analysis conducted with available data as well as feedback and collaboration from local, state, and federal agencies and NGOs. Feedback was solicited through interactive webinars and stakeholder reviews of draft deliverable products. Additionally, the summary of the analysis findings presents potential projects to pursue within the Anacostia River watershed at a conceptual level of detail, and does not present detailed designs, detailed costs, or National Environmental Policy Act documentation. Projects selected for advancement are recommended to be evaluated further with follow-on studies to develop additional details and confirm feasibility as well as to avoid duplication of ongoing or planned actions by other federal, state, and local agencies and nongovernmental organizations (NGOs). Although this analysis aims to identify projects that may be implemented by the U.S. Army Corps of Engineers (USACE), maximizing value added by USACE expertise and resources, it also identifies actions or projects that may be generated by other agencies.

Previous restoration and conservation efforts in the Anacostia River watershed have focused on stream restoration, stormwater retrofit, low impact development, trash reduction, parkland acquisition, fish blockage removal, riparian buffer creation, and wetland restoration. To avoid repeating previous efforts, the priority restoration focus areas discussed herein were identified in coordination with local agencies and stakeholders. These priority focus areas for this analysis include wetland restoration, seawall removal, living shoreline creation, and habitat creation on the mainstem Anacostia River.

The Anacostia River watershed encompasses 173 square miles in central Maryland and the District of Columbia (**Figure 1**). The study area for this analysis includes the 29 square miles of the Anacostia River watershed that lie within the District of Columbia (**Figure 2**). The hydrologic unit code (HUC) 10 (subwatershed) designation for this portion of the Anacostia River watershed is 0207001002. The Anacostia River watershed includes a total of 12.5 stream miles, including approximately 6.4 miles of the mainstem Anacostia River (U.S. Geological Survey [USGS] n.d.). The Anacostia River watershed also includes the entirety of several smaller watersheds, including the Hickey Run, Tidal River, Ft. Davis, Pope Branch, Ft. Dupont, and Ft. Chaplin watersheds, and

portions of the Piney Run, Watts Branch, Nash Run, Dueling Creek, and Sligo Creek watersheds. The portions of the Anacostia River watershed that fall within Maryland were not captured in this analysis. Further coordination across states should be considered as efforts progress toward project implementation.

The watershed is within the jurisdiction of the Baltimore District of USACE. This analysis works to identify and address the problems in the Anacostia River watershed and improve the overall ecological health of the watershed by identifying restoration opportunities.

The District of Columbia has experienced development since the early 17th century, and today the Anacostia River watershed is highly urbanized (Anacostia River watershed Restoration Partnership [AWRP] 2010). Land cover within the Anacostia River watershed is dominated by development (i.e., roads and other impervious surfaces), which comprises 49% of the watershed area. An additional 19.5% is cultivated or landscaped open area, whereas 27.5% of the landscape is characterized by trees, shrubs, and other natural vegetative cover. **Figures 3** and **4** show the breakdown of land cover by area within the watershed based on high resolution land cover data from the Chesapeake Conservancy (2016) that were developed for the Chesapeake Bay Program (CBP).

Population density is illustrated on **Figure 5**. Areas with the highest population density align with the most heavily developed areas. Critical infrastructure in the Anacostia River watershed, including hospitals, power plants, fire stations, law enforcement offices, rail lines, wastewater treatment plants, and highways are highlighted on **Figure 6**. Median incomes vary geographically across the watershed as shown on **Figure 7**. Racial and age demographics are presented on **Figures 8** and **9**.

Figure 10 shows the topography within the Anacostia River watershed, illustrating the lower-lying areas along the Anacostia River. Soils adjacent to the Anacostia River are predominantly Entisols as typical of floodplains and sediment depositional areas. Ultisols are common elsewhere in the watershed (**Figure 11**).

This plan addresses the problems and risks to the Anacostia River watershed and seeks to improve the overall ecological health of the watershed by identifying restoration opportunities for consideration. Additional feasibility studies will be required to investigate the application of the restoration and conservation measures within the Anacostia River watershed identified in this plan. The opportunities identified in this plan are not exhaustive, and there may be other opportunities that should be considered for future funding and feasibility study that are not outlined in this study.

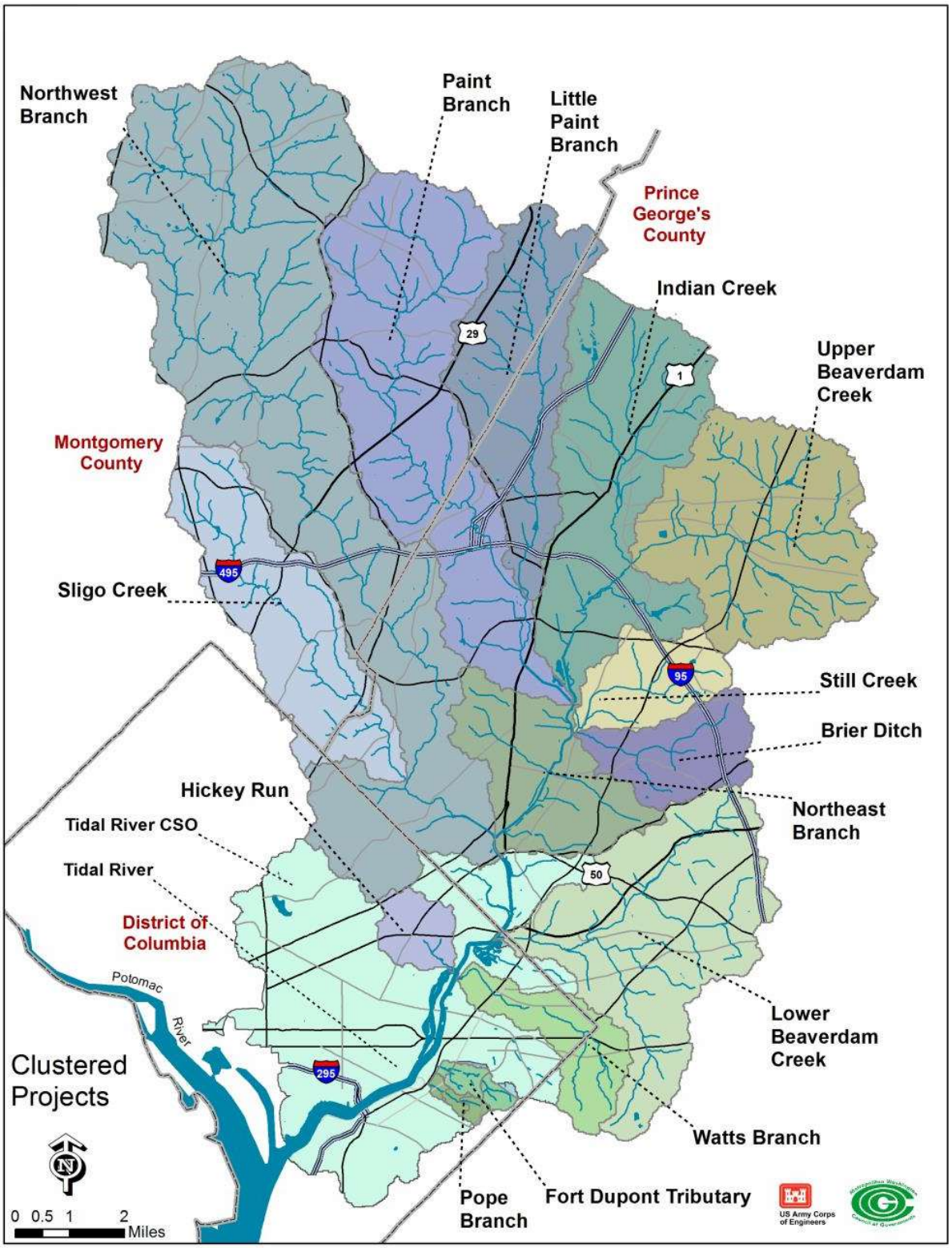

Figure 1. The Anacostia River watershed (AWRP 2010)

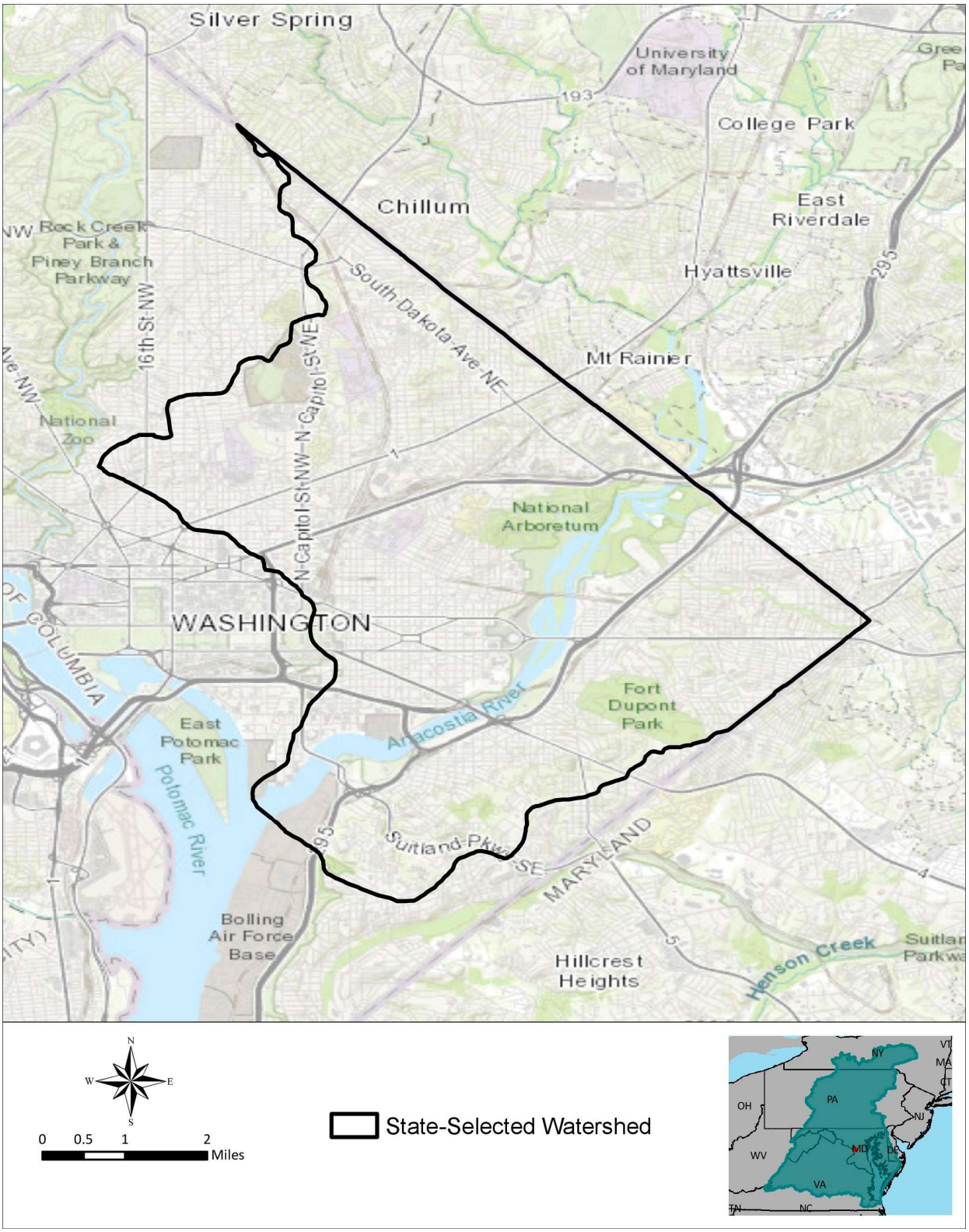

Figure 2. District of Columbia priority watershed – Anacostia River watershed

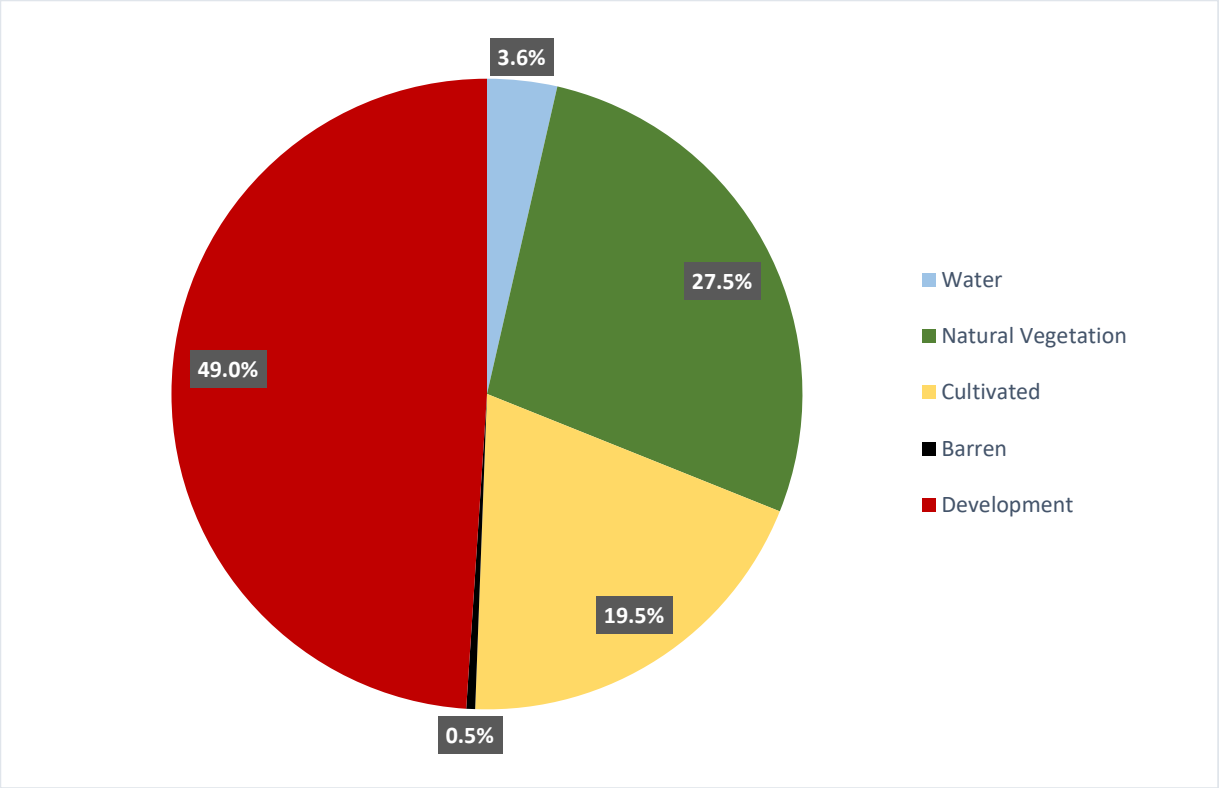

Figure 3. Anacostia River watershed land cover breakdown (Chesapeake Conservancy 2016a)

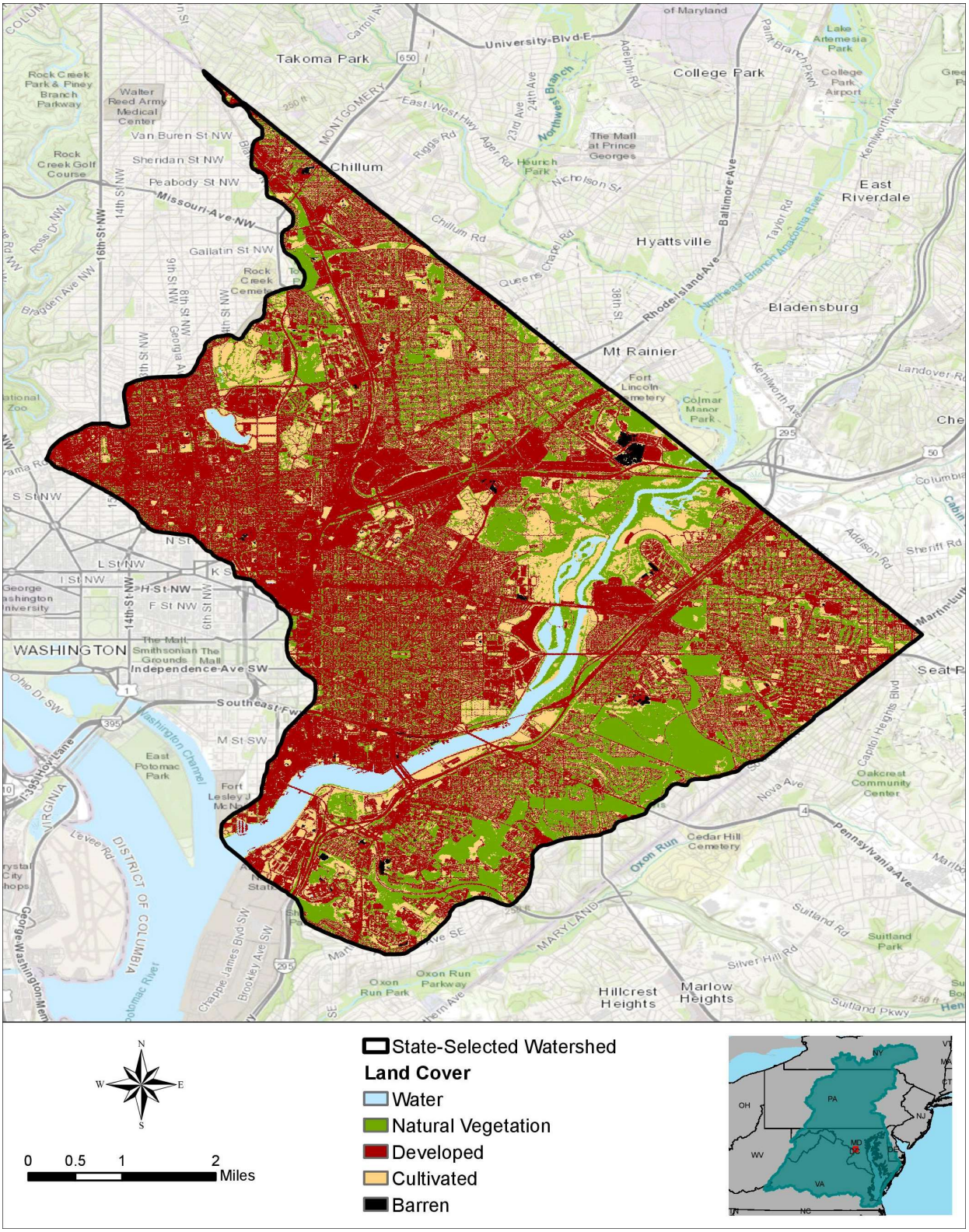

Figure 4. High resolution land cover data in the Anacostia River watershed (Chesapeake Conservancy 2016a)

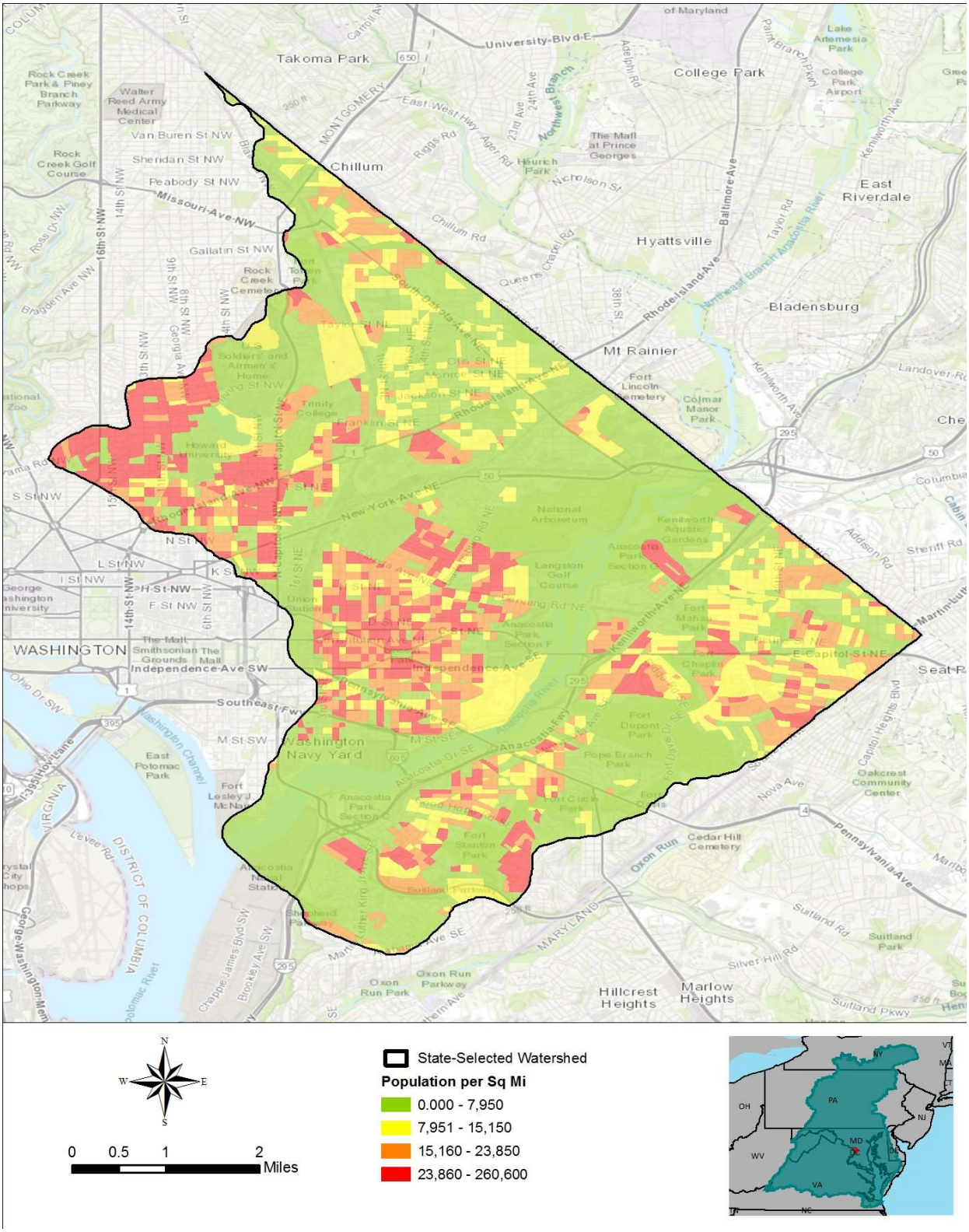

Figure 5. Population density in the Anacostia River watershed (U.S. Census Bureau 2010)

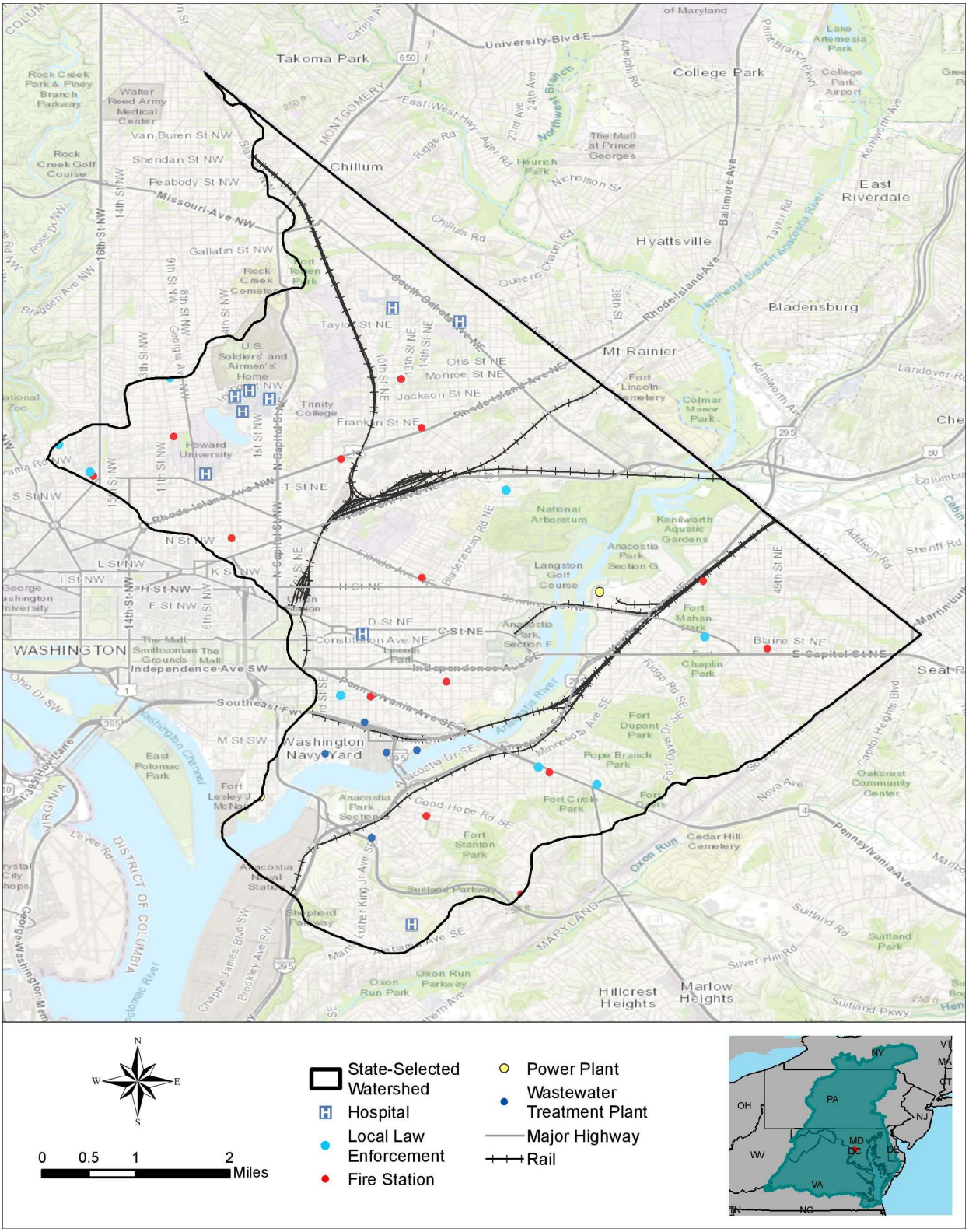

Figure 6. Critical infrastructure in the Anacostia River watershed (U.S. Department of Homeland Security 2016)

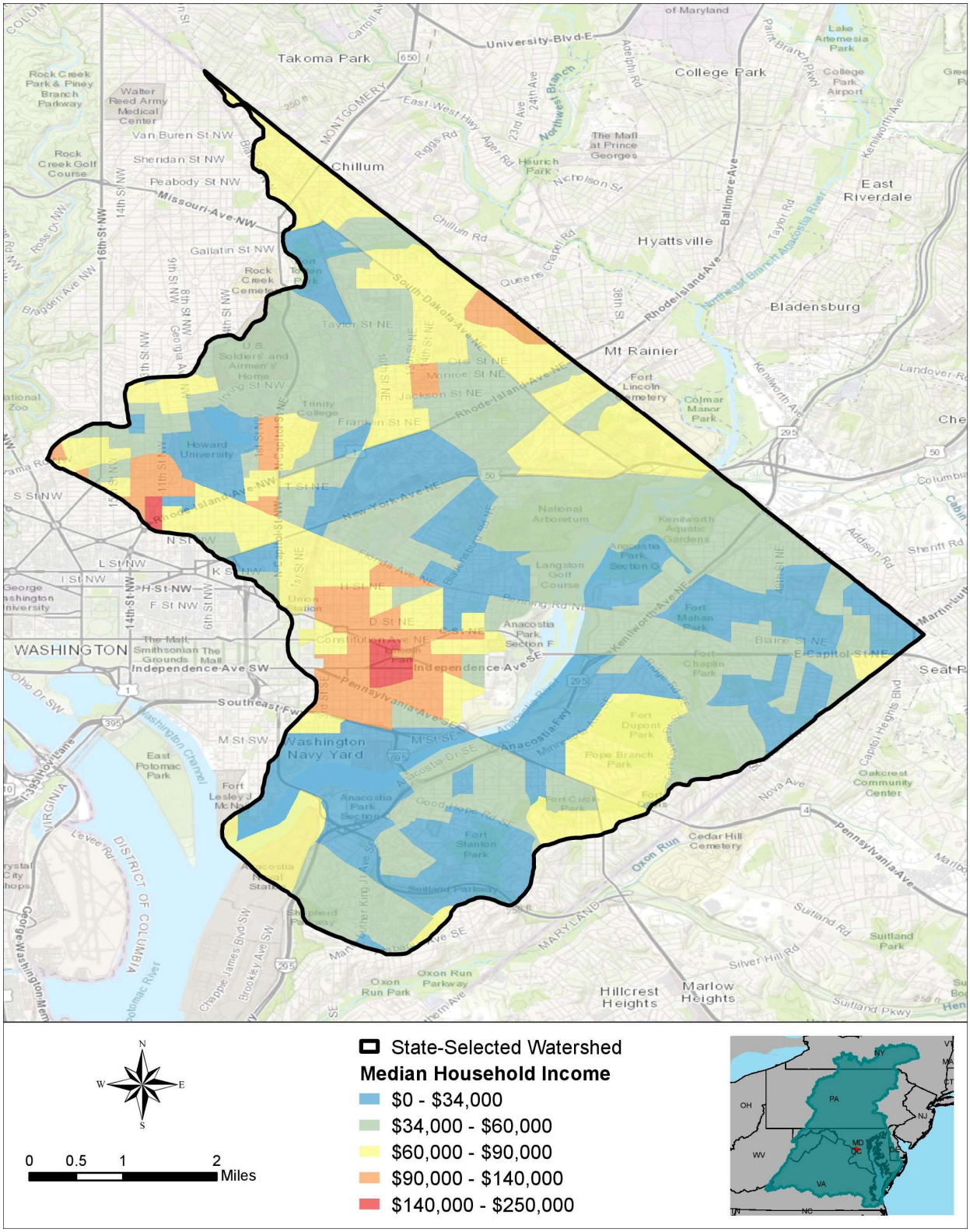

Figure 7. Median household income in the Anacostia River watershed (U.S. Census Bureau 2010)

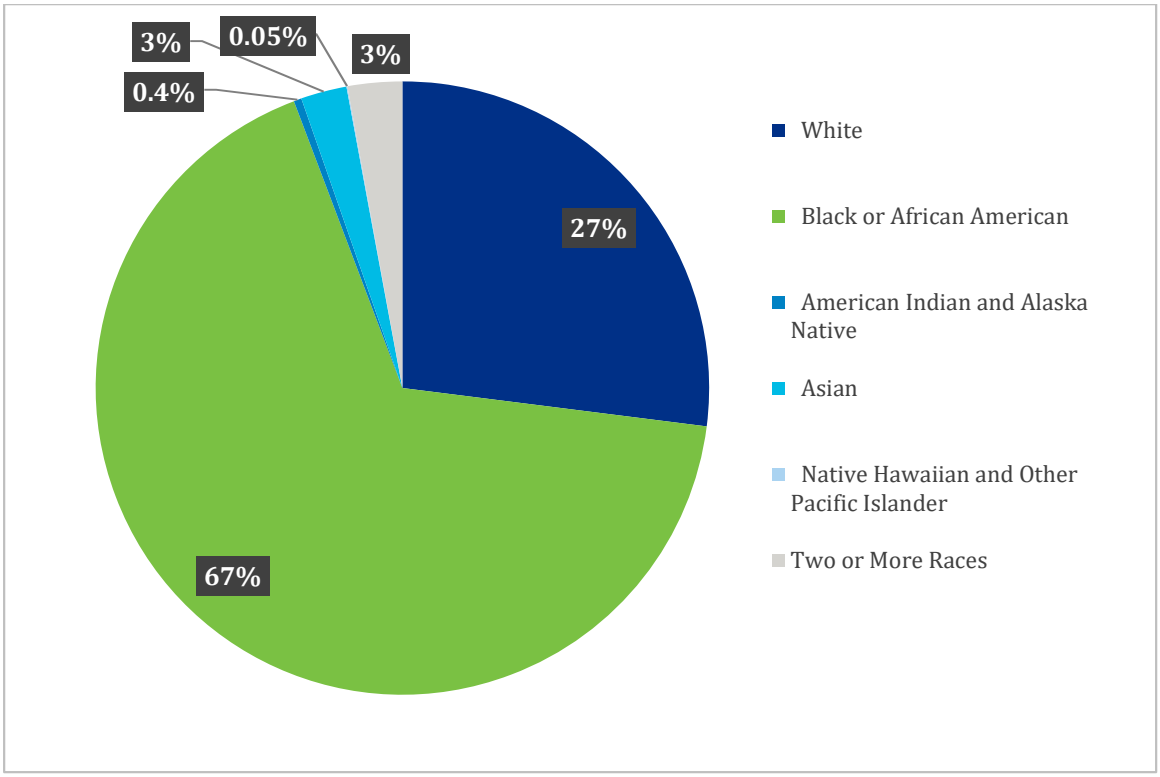

Figure 8. Racial demographics in the Anacostia River watershed (U.S. Census Bureau 2010)

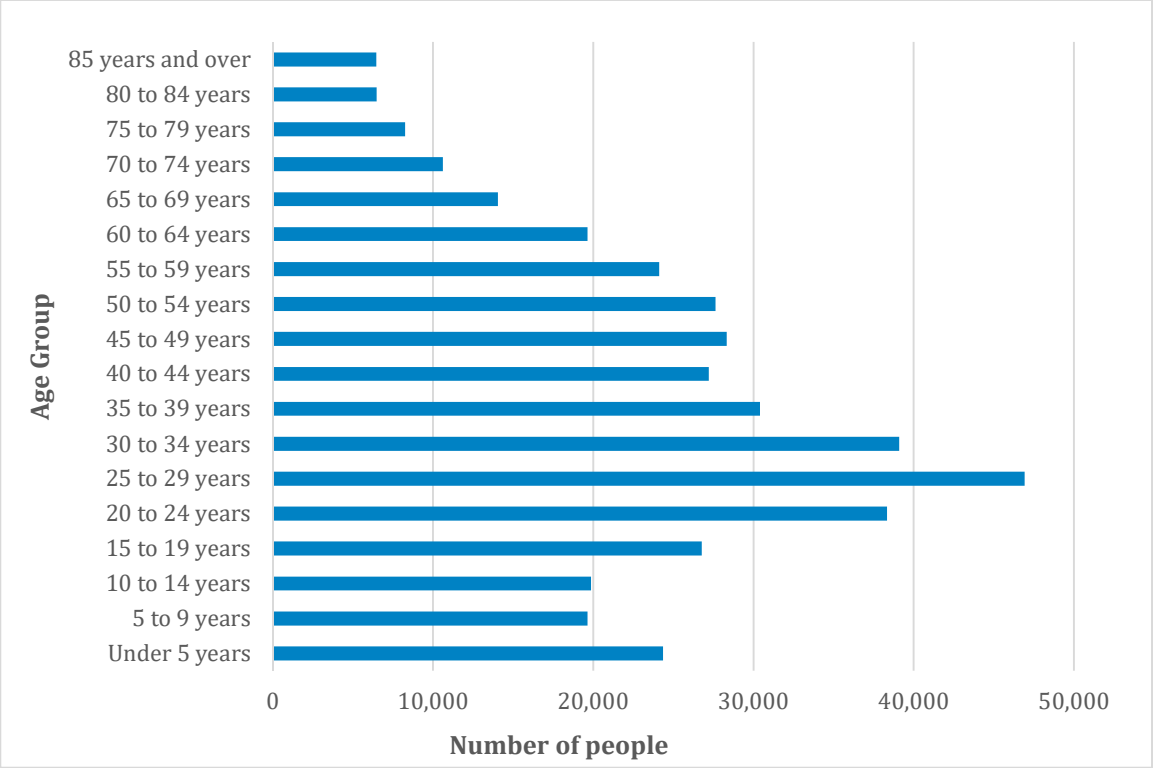

Figure 9. Age demographics in the Anacostia River watershed (U.S. Census Bureau 2010)

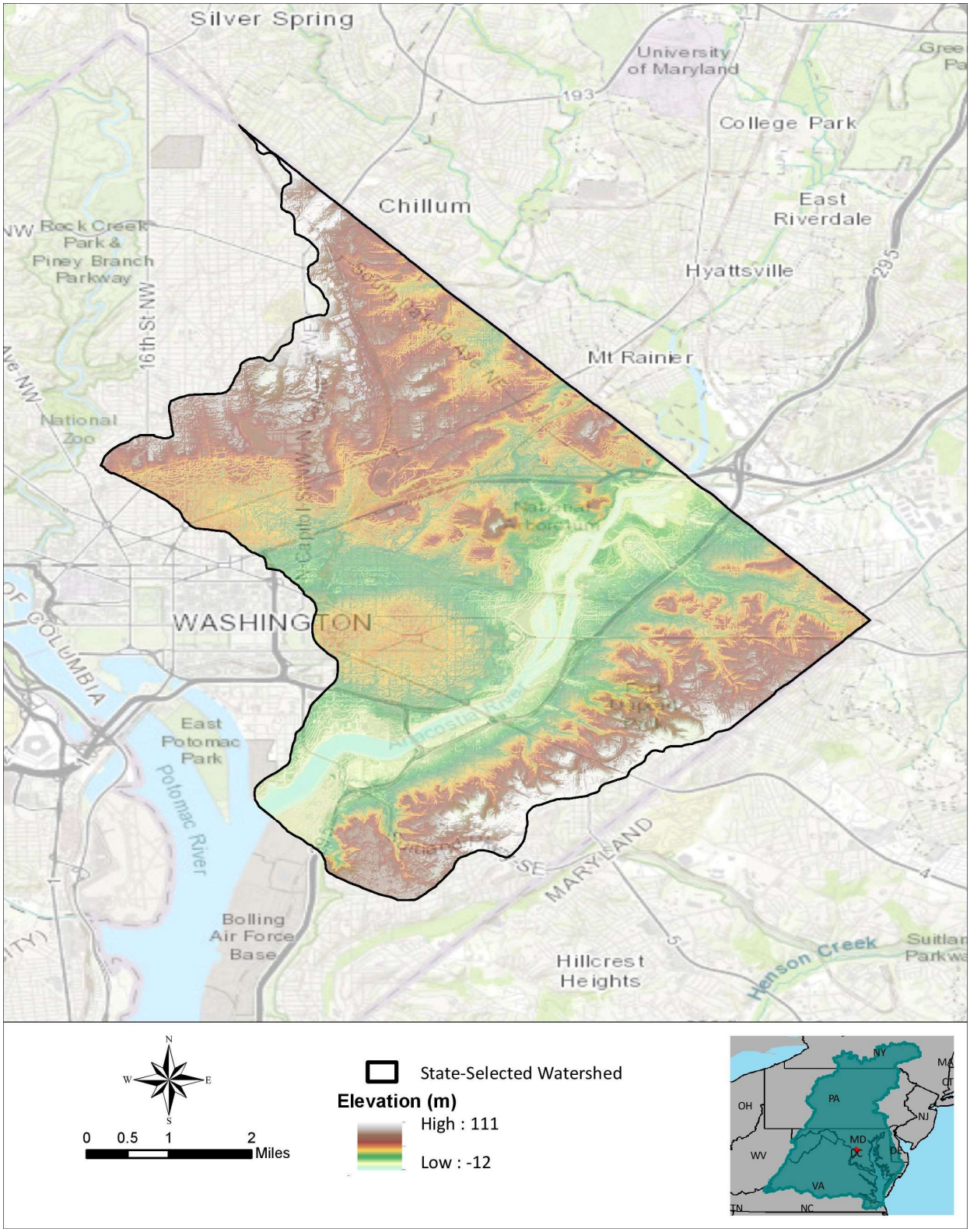

Figure 10. Topography of the Anacostia River watershed (Advanced Spaceborne Thermal Emission and Reflection Radiometer 2009)

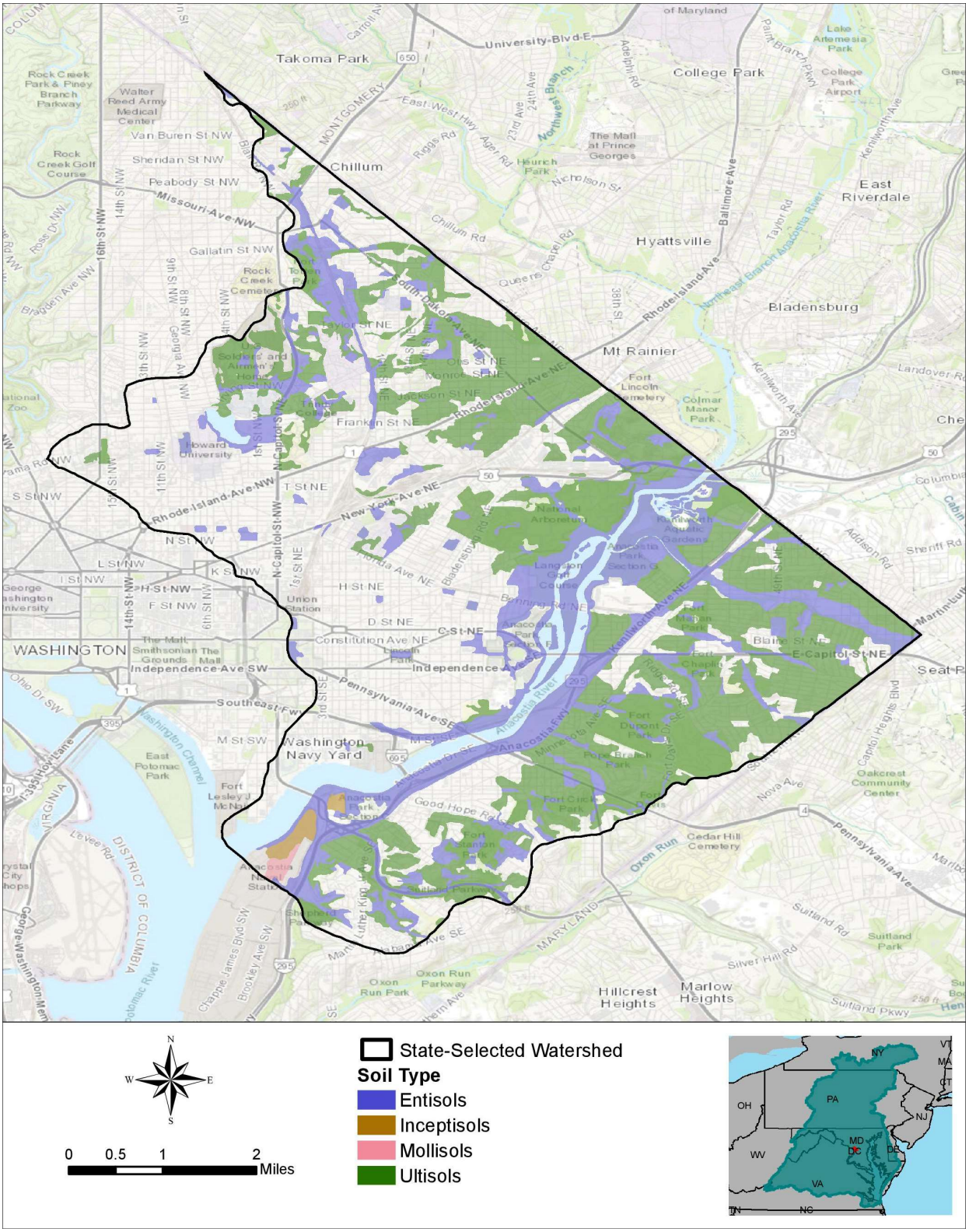

Figure 11. Anacostia River watershed soil types (U.S. Department of Agriculture Natural Resources Conservation Service no date [n.d.]).

Section 2

Baywide and Statewide Analyses Results Summary for the Anacostia River Watershed

2.1 Problems and Needs

In cooperation with stakeholders, the Chesapeake Bay baywide analysis was conducted to evaluate problems, needs, and opportunities in the Chesapeake Bay Watershed through geospatial analysis. The problems identified in the baywide and statewide analyses were refined and confirmed at the watershed scale, which are discussed further in Section 3. This section summarizes the problems and needs identified for the Anacostia area based on the baywide analysis. For more information on the baywide analysis, see Chesapeake Bay Comprehensive Water Resources and Restoration Plan Main Report and Planning Analyses Appendix**.**

The baywide analysis provided insight into several problems and needs within the Anacostia River watershed. **Figure 3** in the District of Columbia State Chapter highlights the areas of relative watershed stress throughout the Chesapeake Bay on a hydrologic unit code subwatershed scale. The Anacostia River watershed was identified as one of the most highly stressed areas in the Chesapeake Bay Watershed based on its watershed stressor score. The watershed stressor score was determined based on the low percentage of forest cover, high modeled nitrogen and phosphorous loadings, limited riparian buffer areas, high degree of imperviousness, impaired stream sections based on the 303(d) impaired waterways list, and low scoring based on the index of biotic integrity (CBP 2012).

Healthy/high value habitats are limited in the Anacostia River watershed (D.C. State Chapter **Figure 20**). Healthy/high value habitats were identified based on index of ecological integrity data and Nature's Network core and connector habitat data as well as data regarding state-identified healthy watersheds, the availability of Brook Trout catchments, CBP Black Duck Focus Areas, and Audubon Important Bird Areas (Audubon n.d., Chesapeake Conservancy 2016b, North Atlantic Landscape Conservation Cooperative 2016). Similarly, D.C. State Chapter **Figures 14** and **15** indicate a lack of habitat for imperiled species within the watershed's nontidal and tidal wetlands.

Additionally, submerged aquatic vegetation (SAV) habitat is limited in the Anacostia River. D.C. State Chapter **Figure 18** compares areas of SAV habitat between 1971 and 2015, with the blue highlighted areas representing areas where SAV habitat has been lost. The lack of SAV is detrimental to water quality and to the aquatic ecosystem. SAV plays a vital role in improving water quality, stabilizing sediment, removing pollutants such as excess nitrogen, absorbing wave energy, producing oxygen, providing habitat for spawning fish and crustaceans, and providing food for waterfowl (National Oceanic and Atmospheric Administration [NOAA] n.d.).

Water quality impairments are also a major concern in the Anacostia River watershed. As noted in the baywide analysis, according to Spatially Referenced Regression on Watershed (SPARROW)

modeling, the Anacostia River watershed is in the top 20% for nitrogen and phosphorus loadings for the entire Chesapeake Bay Watershed. In addition to nutrients, sediment and toxic contaminants are primary water quality concerns. The D.C. area contains several military and industrial areas, including one Superfund site (the Washington Navy Yard; D.C. State Chapter **Figure 19**), which—in combination with runoff from urban areas—act as sources for a variety of toxic contaminants. As a result of water quality impairments originating from urban and industrial sources, the District of Columbia Department of Energy and Environment (DOEE) has total maximum daily loads in place for trash, sediment, oils and grease, low dissolved oxygen, pathogens (E. coli), and various metals and organic contaminants. Additionally, elevated pH and high turbidity are primary concerns (DOEE 2016a).

Further discussion of the problems and needs within the Anacostia River watershed, explored through more localized datasets, can be found in Section 3 of this report.

2.2 Opportunities

Several restoration opportunities were identified in the baywide analysis to address the problems and needs identified in Section 2.1. The baywide analysis assessed the current level of interest and engagement in restoration and conservation activities in the Anacostia on the part of several government agencies and NGOs (Chesapeake Bay Comprehensive Water Resources and Restoration Plan Planning Analyses Appendix **Figure 8)**. The figure provides a relative measure of the priority level given to this watershed by different groups or agencies compared to the rest of the Chesapeake Bay Watershed. Based on stated priorities from U.S. Fish and Wildlife Service, NOAA, National Fish and Wildlife Foundation, Ducks Unlimited, the Conservation Fund, and The Nature Conservancy, the Anacostia River watershed is a low to moderate priority for conservation and restoration. Though the Anacostia River watershed is a lower priority than other areas, the moderate priority level indicates the presence of restoration and conservation opportunities.

The baywide analysis also assessed potential opportunities for nontidal and tidal wetland restoration (D.C. State Chapter **Figures 10** and **11**). In these figures, darker colors indicate greater opportunities for wetland restoration. For nontidal wetland restoration, the Anacostia River watershed is in the low to moderate range for restoration opportunities (D.C. State Chapter **Figure 10**). D.C. State Chapter **Figure 10** also depicts specific wetland restoration opportunities (shown in red). Each red dot indicates undeveloped land area that is not currently wetland; some of this area could represent potential wetland restoration sites. The baywide analysis indicated the presence of few opportunities for tidal wetland restoration or enhancement (D.C. State Chapter **Figure 11**). Additionally, due to the ongoing USACE dredging activities in the Anacostia River and adjacent waterways (D.C. State Chapter **Figure 16**), there are opportunities for using dredged materials in nearby wetland creation, restoration, or enhancement projects.

The implementation of wetland restoration and enhancement projects in the Anacostia River watershed has high opportunity to provide socioeconomic benefits, which are illustrated on D.C. State Chapter **Figure 21**. Socioeconomic resources were defined as public access points and parklands (i.e., recreational, cultural, aesthetic value), underserved populations (i.e., low-income or minority populations), and locations of water supply infrastructure (e.g., reservoirs). The

proximity to parks, underserved populations, and other socioeconomic resources suggests that wetland projects or improvements in this area could have high marginal socioeconomic benefits.

The Anacostia River watershed was identified as a potential hotspot for riparian buffer restoration to help mitigate nutrient loading (D.C. State Chapter **Figure 6**). Based on the acreage of buffer potentially available for restoration, the Anacostia River watershed is in the moderate range for riparian buffer restoration opportunities. Riparian buffers can help mitigate water quality problems and provide habitat along the mainstem river. Opportunities were also identified for the restoration of SAV within the Anacostia River watershed. The areas of historical SAV loss noted on D.C. State Chapter **Figure 18** represent potential SAV restoration locations.

The baywide analysis provided insight into various potential project opportunities, some of which have already been explored in-depth by previous and/or ongoing restoration and conservation efforts within the Anacostia River watershed. Efforts to address habitat health and water quality via stormwater retrofitting, low impact development, trash reduction, riparian reforestation, and stream restoration have been widely investigated and implemented (DOEE 2008, 2012, 2016b; AWRP 2010).

In consideration of these previous efforts, this overview focuses on the findings of the baywide analysis that generally relate to the following priority restoration focus areas: wetland restoration, seawall removal, living shoreline creation, and habitat creation in the mainstem Anacostia River. Although not exhaustive, these restoration opportunities address important and understudied problems identified in stakeholder discussions and the baywide analysis. Restoration opportunities for the Anacostia River watershed are further explored and discussed in Section 3.

2.3 Summary of Baywide Analysis Results in the Anacostia River Watershed

In summary, the Chesapeake Bay baywide analysis identified the following problems and needs within the Anacostia River watershed:

- The Anacostia River watershed is one of the most highly stressed watersheds in the Chesapeake Bay
- There is limited availability of healthy and high value habitat within the Anacostia River watershed
- There is limited availability of connective habitat within the Anacostia River watershed
- There is limited availability of SAV habitat within the Anacostia River
- Significant water quality impairments include nitrogen, phosphorus, sediment, pathogens, metals, oil and grease, trash, low dissolved oxygen, turbidity, elevated pH, organic contaminants, and other toxic contaminants

Opportunities to address the problems and needs identified in the Chesapeake Bay baywide analysis include:

- Limited level of opportunities for nontidal wetland restoration
- Few to no opportunities for tidal wetland restoration
- Opportunities to reuse dredged materials in wetland projects
- Opportunities to increase connective habitat
- High opportunities for socioeconomic benefits through wetland restoration and enhancement
- Moderate level of opportunities for SAV restoration
- Opportunities to implement riparian buffers to reduce nitrogen and phosphorous loading to the Anacostia River
- Opportunities for conservation and enhancement of existing wetlands and aquatic habitats

The problems, needs, and opportunities identified in the Chesapeake Bay baywide analysis are discussed further in Section 3. Section 3 also includes a more detailed, watershed-specific discussion of problems, needs, and opportunities within the Anacostia River watershed.

Section 3

Anacostia, D.C. Watershed Analysis

3.1 Anacostia River Watershed Problems and Needs

Building upon the findings of the Chesapeake Bay baywide and statewide analyses, this section utilizes localized geospatial datasets, where available, to execute a refined analysis to identify problems, needs, and opportunities within the Anacostia River watershed. This section also considers existing reports, studies, projects, and stakeholder information specific to the Anacostia River watershed to inform the findings and analysis.

Stakeholders were engaged to help define the known problems, needs, and opportunities within this watershed. In addition, collaborators working to connect various agencies working in the Chesapeake Bay were engaged to ensure consistency and information sharing. **Attachment A** to this report includes a list of the stakeholders contacted to support the development of this analysis.

The Anacostia River watershed is considered an important cultural and ecological resource and has been the focus of several previous restoration and conservation efforts. The full Anacostia River watershed, including the areas outside of D.C., was the focus of a USACE-led multi-agency effort to evaluate and identify restoration needs and project opportunities. In 2010, the multi-agency group, known as the Anacostia River watershed Restoration Partnership (AWRP), published the *Anacostia River Watershed Restoration Plan and Report*, in which over 3,000 candidate restoration projects were identified. The project opportunities identified by the AWRP primarily included the following project types: stream restoration, stormwater retrofit, low impact development, trash reduction, parkland acquisition, fish blockage removal, riparian buffer creation, wetland restoration (AWRP 2010). A goal of this analysis was to focus on restoration strategies that to date have not been as widely implemented, relative to the opportunities identified by the AWRP. Based on the baywide analysis and in coordination with the DOEE and other D.C. stakeholders, the following were identified as the priority restoration focus areas for this analysis, focusing on the mainstem Anacostia River:

- Wetland restoration
- Seawall removal
- Living shoreline creation
- Habitat creation on the mainstem Anacostia

Urban and industrial development in the watershed have contributed to water quality issues in the Anacostia River and neighboring waters. Stormwater runoff, combined and sanitary sewer overflows, municipal separate storm system (MS4) discharges, and altered hydrologic conditions associated with development (e.g., stream channelization) have contributed to increased suspended sediment/turbidity, trash, oils, grease, pathogens, and nutrients (e.g. nitrogen,

phosphorus) loadings within streams and the mainstem river (AWRP 2010). Low dissolved oxygen and elevated pH levels are also significant concerns (DOEE 2016a). Locations of combined sewer system outfalls and MS4 outfalls are shown on **Figure 12**.

Toxic contaminants, such as metals and organic compounds, are of concern in the Anacostia River watershed due to various urban sources and historical and ongoing industrial sources. The Washington Navy Yard, which lies on the north side of the Lower Anacostia River, is the sole National Priorities List or Superfund site in D.C. (United States Department of Environmental Protection 2018). Several other sites have been subjected to remedial investigations (i.e., efforts to characterize the presence, nature, and extent of possible contamination) as part of DOEE's Anacostia Sediment Remediation Project (DOEE 2016c). The Kenilworth Landfill site, Washington Gas site, and Poplar Point are also being investigated and considered for possible cleanup actions by the National Park Service (NPS) (NPS 2015). **Figure 12** depicts the locations of sites that were investigated for possible contamination during DOEE's 2016 Phase I remedial investigation. This figure was obtained directly from the DOEE Phase I remedial report and depicts potential cleanup sites both on land and in the river (DOEE 2016c). Any potential restoration projects at these locations on land or in the adjacent river channel should take into consideration ongoing or future remediation activities associated with the Anacostia Sediment Remediation Project, National Park Service Environmental Cleanup projects, and any other future remedial programs.

Anthropogenic influences, water quality impairments and coastal development, have resulted in considerable declines in habitat availability in the Anacostia River watershed. An estimated 2,600 acres of wetland and tidal habitat was lost in the 20th century across the entire Anacostia River watershed, due mainly to development (National Capital Planning Commission [NCPC] 2008). **Figure 13** shows the approximate extent of historical wetlands in the watershed and locations of current wetlands, which primarily lie along the Anacostia River. Historical wetland data were obtained from DOEE correspondence, and approximate current wetland locations were obtained from DOEE based on their recent efforts to catalog wetlands in D.C. (DOEE 2018).

Given its poor water quality, the Anacostia River primarily supports populations of hardy fish species such as catfish, as well as the invasive northern snakehead (DOEE 2015). Based on NOAA Environmental Sensitivity Index data, other fish species known to inhabit the Anacostia River include Atlantic sturgeon, shortnose sturgeon, white perch, American shad, alewife, blueback herring, and hickory shad (NOAA 2016). Wetlands and riparian habitats in the Anacostia River are utilized for nesting by waterfowl such as the American black duck, mallard, wood duck, and the Canada goose (NOAA 2016). Other waterfowl use the lower Anacostia river for wintering, including bufflehead, common goldeneye, mergansers, and redhead duck (NOAA 2016).

SAV habitats, which are particularly sensitive to high turbidity, are limited in the Anacostia River watershed. **Figure 14** displays the varying extent of SAV habitat within the Anacostia River watershed since 1971. SAV habitat in the Anacostia River watershed totaled 3.32 hectares (8.20 acres) in 2016, less than the peak value observed in 1995 (6.27 hectares; 15.49 acres) and likely considerably less than pre-development values (data were not available prior to 1971). Historical SAV acreage data were obtained from the Virginia Institute of Marine Science (VIMS) SAV database (VIMS 2017).

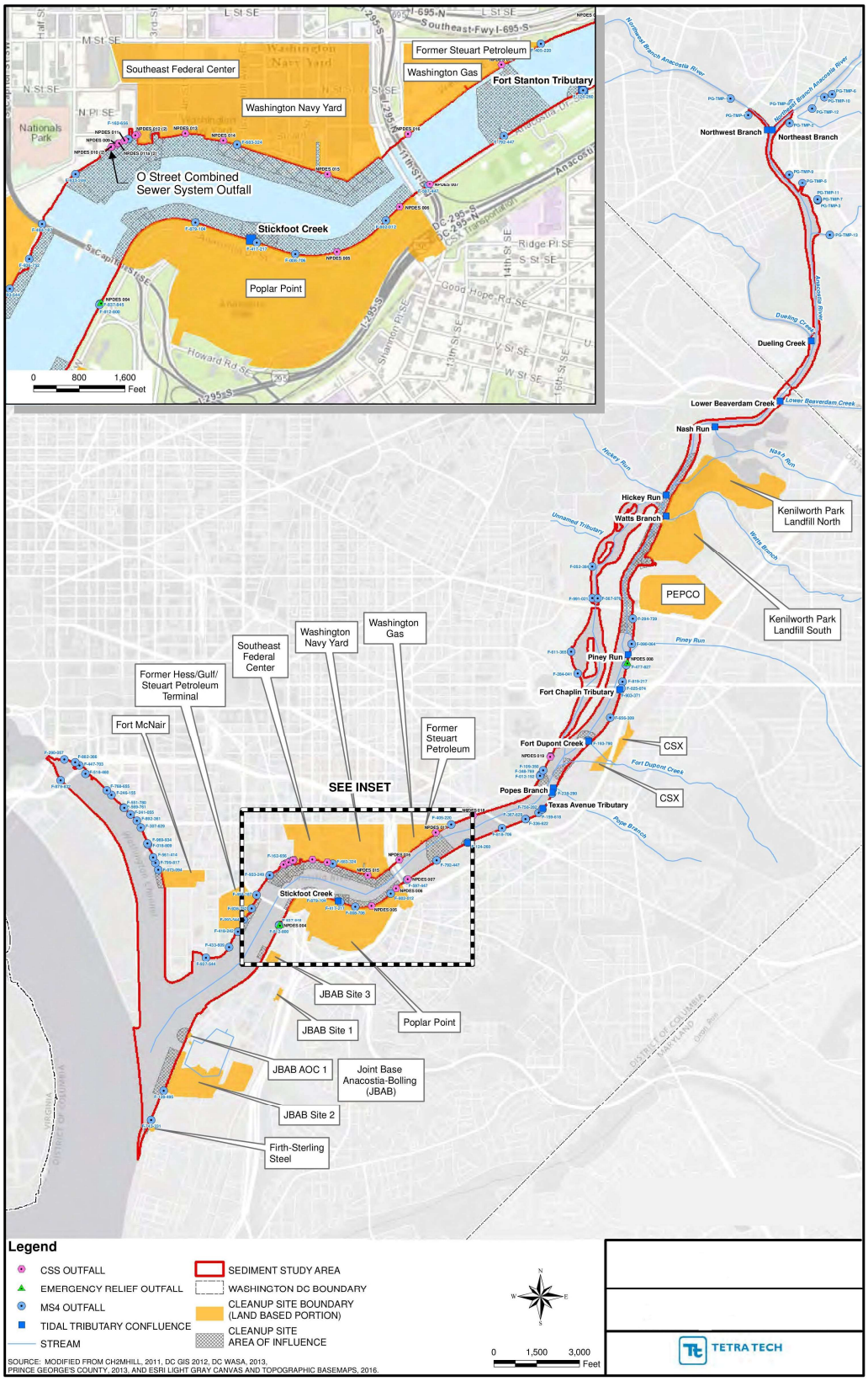

Figure 12. Remedial investigation sites from DOEE's 2016 Anacostia Sediment Remediation Project Phase I Remedial Investigation Report (DOEE 2016c)

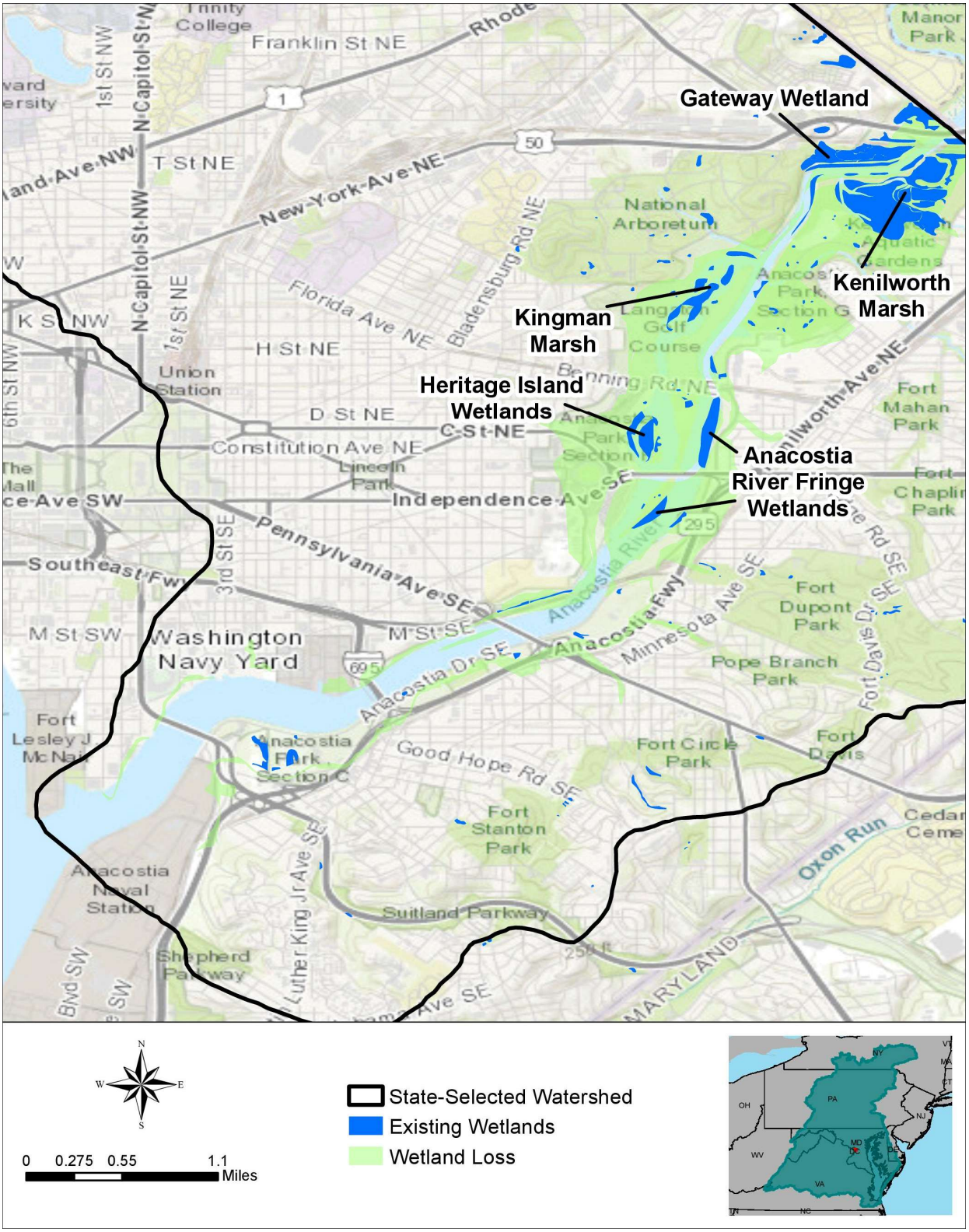

Figure 13. Historical and current wetland habitat in the Anacostia River watershed

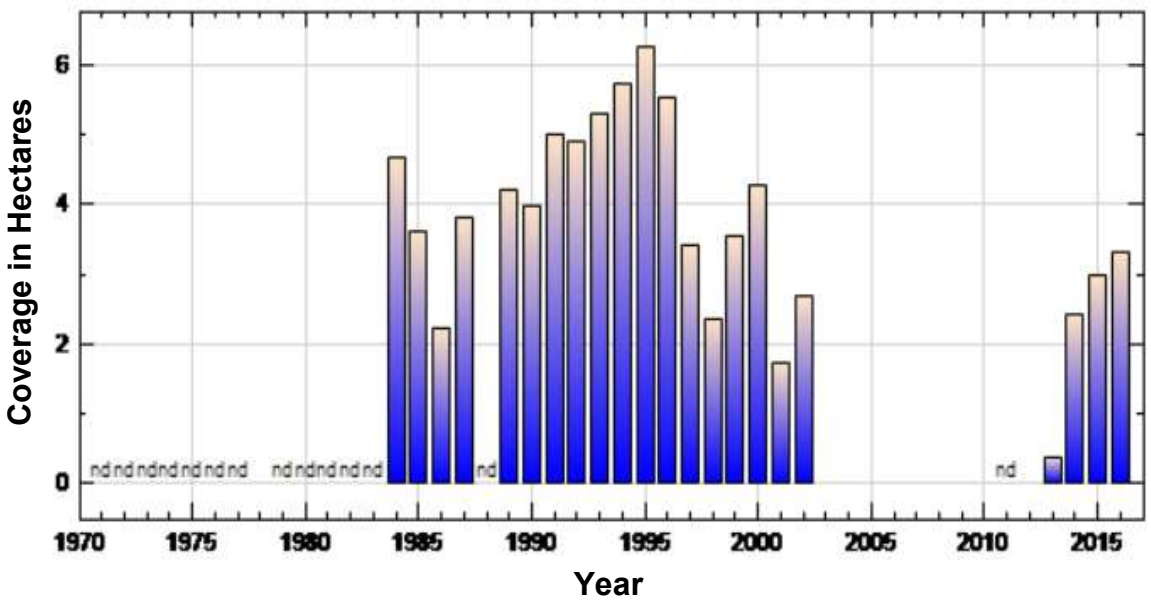

Figure 14. SAV coverage in the Anacostia River hectares by year (VIMS 2017)

In summary, as identified in the Chesapeake Bay baywide analysis (Section 2.1) and the Anacostia-specific discussion (Section 3.1), there are several problems and needs in the Anacostia River watershed, including:

- Limited availability of healthy/high-value habitat and connective habitat
- Limited wetland habitat availability on the mainstem Anacostia River
- Limited availability of SAV habitat within the mainstem Anacostia River
- High levels of development resulting in high stormwater management needs
- Significant water quality impairments including: nitrogen, phosphorus, sediment, pathogens, metals, fats, oils, grease, trash, low dissolved oxygen, turbidity, elevated pH, organic contaminants, and other toxic contaminants
- Presence of several areas where environmental remediation may be required to mitigate contamination

District of Columbia stakeholders (**Attachment A**) have identified wetland restoration, seawall removal, living shoreline creation, and mainstem Anacostia habitat creation as priority focus areas to address some of these problems and needs. A number of projects have been completed to address these and other problems and needs within the watershed. **Figure 15** shows several completed and ongoing projects within the Anacostia River watershed. Several of these projects were identified in the AWRP's *Anacostia River Watershed Restoration Plan and Report* (AWRP 2010). The AWRP includes various local, state, and federal governmental groups, community groups, and private groups focused on environmental resources in the D.C. area. **Figure 15** also shows the areas where remedial investigations related to chemical contamination have recently occurred or are ongoing. As discussed above (**Figure 12**), these areas should be avoided pending the results of remedial investigations or cleanup activities. Several wetland restoration projects

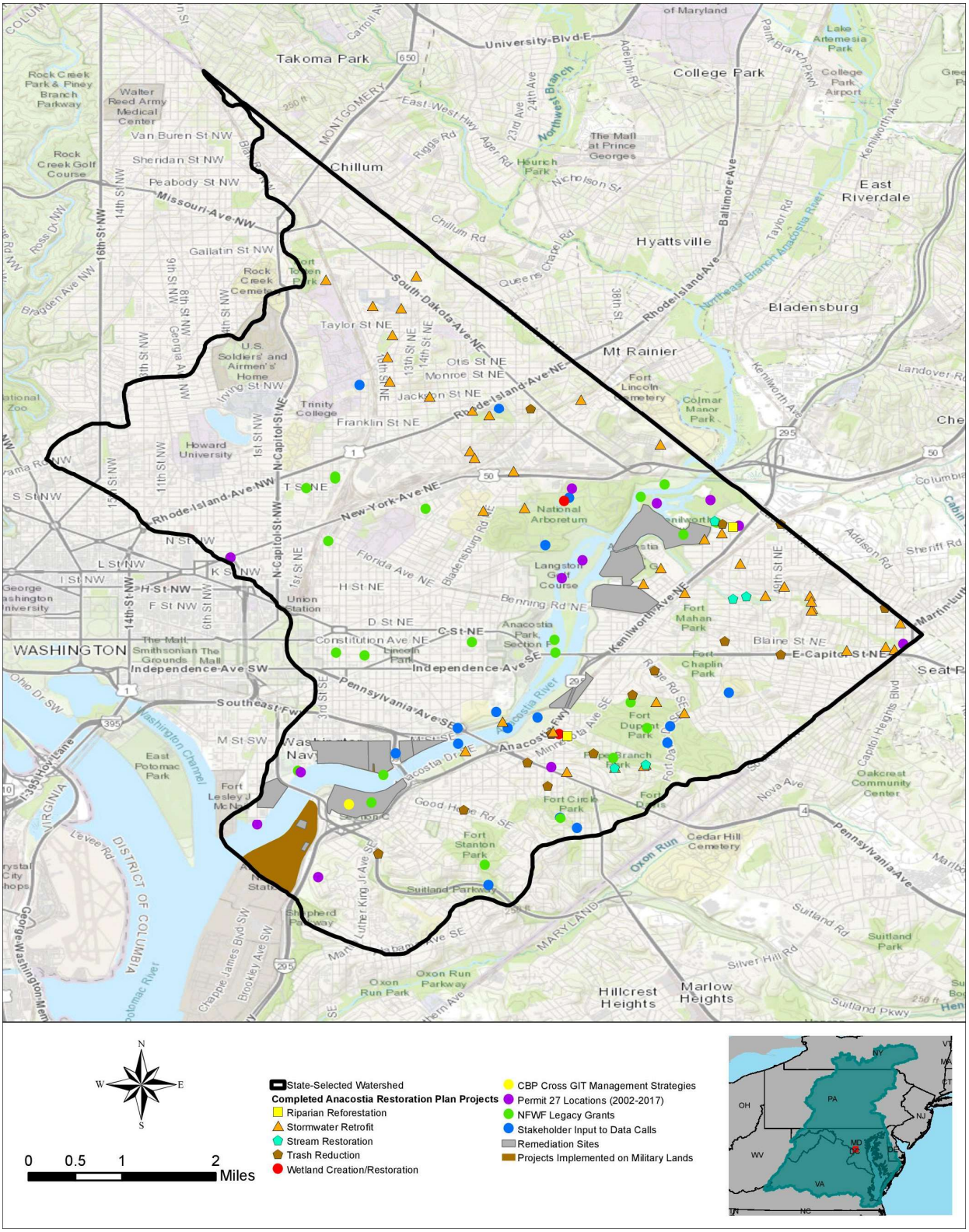

Figure 15. Summary of existing and ongoing projects in the Anacostia River watershed

have also been implemented over the past 25 years, including restoration efforts at Kenilworth Marsh, Kingman Marsh, the Anacostia Fringe Wetlands, and the Heritage Island Wetlands. The locations of these wetlands are shown on Figure 13. This analysis of the Anacostia River watershed will seek to avoid the duplication of past and ongoing efforts within the watershed.

3.2 Anacostia River Watershed Opportunities

There are several measures that can be implemented to restore ecosystems and address problems and needs within the watershed. Several activities are also underway by state and federal agencies to improve ecosystem health within the Anacostia River watershed. This section will discuss select restoration activities to consider for future investigation and planning. Information is provided for each restoration measure based on available data, including existing projects, ongoing studies, or completed projects within the watershed.

This analysis will focus on the project types that have been identified by stakeholders as priorities: wetland restoration, seawall removal, living shoreline creation, and habitat creation on the mainstem Anacostia. Implementation of wetland restoration, seawall removal, and living shoreline projects will necessarily include the creation of habitat on the mainstem Anacostia River.

3.2.1 Wetland Restoration

3.2.1.1 Summary of Wetland Restoration Needs

Wetlands provide water quality and habitat benefits within a watershed (USACE 2015a). The 2014 Chesapeake Bay Watershed Agreement Goals highlight reestablishing 85,000 acres of tidal and nontidal wetlands and enhancing the function of an additional 150,000 acres of degraded wetlands by 2025 (USACE 2015a). As part of the bay agreement goals, wetlands were areas targeted for additional land conservation by 2025 (USACE 2015a).

An estimated 2,600 acres of tidal emergent wetlands have been destroyed along the mainstem Anacostia River during decades of development (NCPC 2008). The loss of wetlands has resulted in the loss of critical wetland functions, such as flood risk reduction benefits, soil and sediment retention, and nutrient uptake and storage. Creation of new wetlands and restoration of existing wetlands are critical to increasing the amount of habitat on the mainstem Anacostia River for fish, mammals, invertebrates, and birds. Wetland restoration in areas adjacent to shoreline offer opportunities to benefit shoreline restoration efforts, such as living shoreline.

3.2.1.2 Existing and Ongoing Wetland Restoration Projects

Several wetland restoration projects have taken place in the Anacostia River watershed in the past several decades. These projects include the Kenilworth Marsh restoration project, a 32 acre restoration project completed in 1993; the Kingman Marsh restoration project, a 40 acre restoration project completed in 2000; the Anacostia Fringe Wetlands project, a 17 acre restoration project completed in 2003; and the Heritage Island wetland restoration, a 6 acre restoration project completed in 2006. The approximate locations of these projects and other existing wetlands are shown on **Figure 13** (DOEE 2018).

There are several wetland restoration projects currently under preliminary investigation or in planning as shown on **Figure 16.** Seven wetland restoration projects were identified in the *Anacostia River Watershed Restoration Plan and Report* (AWRP 2010). DOEE has also preliminarily identified 21 potential wetland restoration opportunities throughout the watershed as part of their 2017 efforts to update the registry of D.C. wetlands. Additional geospatial data or feasibility studies related to these potential opportunities were not available for this analysis.

Potential wetland restoration projects have been identified as part of the ongoing DOEE Anacostia River Living Shoreline and Wetland Enhancement program (DOEE 2018). These opportunities include three wetland restoration opportunities near Kingman Marsh. The Anacostia Watershed Society's (AWS) Anacostia Gateway Wetlands Restoration Project is currently in the planning phases (DOEE 2018). This restoration effort is targeting restoration of 10 acres of tidal wetlands along the east side of the Anacostia River near the D.C. border, south of U.S. Route 50 and west of the National Arboretum.

NPS is planning various wetland restoration activities as outlined in the Anacostia Park Wetlands and Resident Canada Goose Management Plan and Environmental Impact Statement (NPS 2014, 2016). The planned restoration activities include implementation of extensive revegetation and shoreline stabilization measures in wetlands throughout Anacostia Park, including those in and around Kenilworth Marsh, Kingman Marsh, and the Anacostia River Fringe wetlands. This plan includes measures to reduce populations of nonmigratory Canada geese, which can severely damage wetland vegetation year-round through overgrazing. This project does not involve creation of new wetland acreage. Geospatial data related to these efforts were not available for this analysis.

A variety of groups are also engaged in wetland improvement activities such as trash cleanups and invasive plant species removals. Numerous government agencies, NGOs, and community groups, including AWS, DOEE, NPS, and others are members of the D.C. Cooperative Weed Management Area, which focuses on invasive plant management in the District (DOEE 2015).

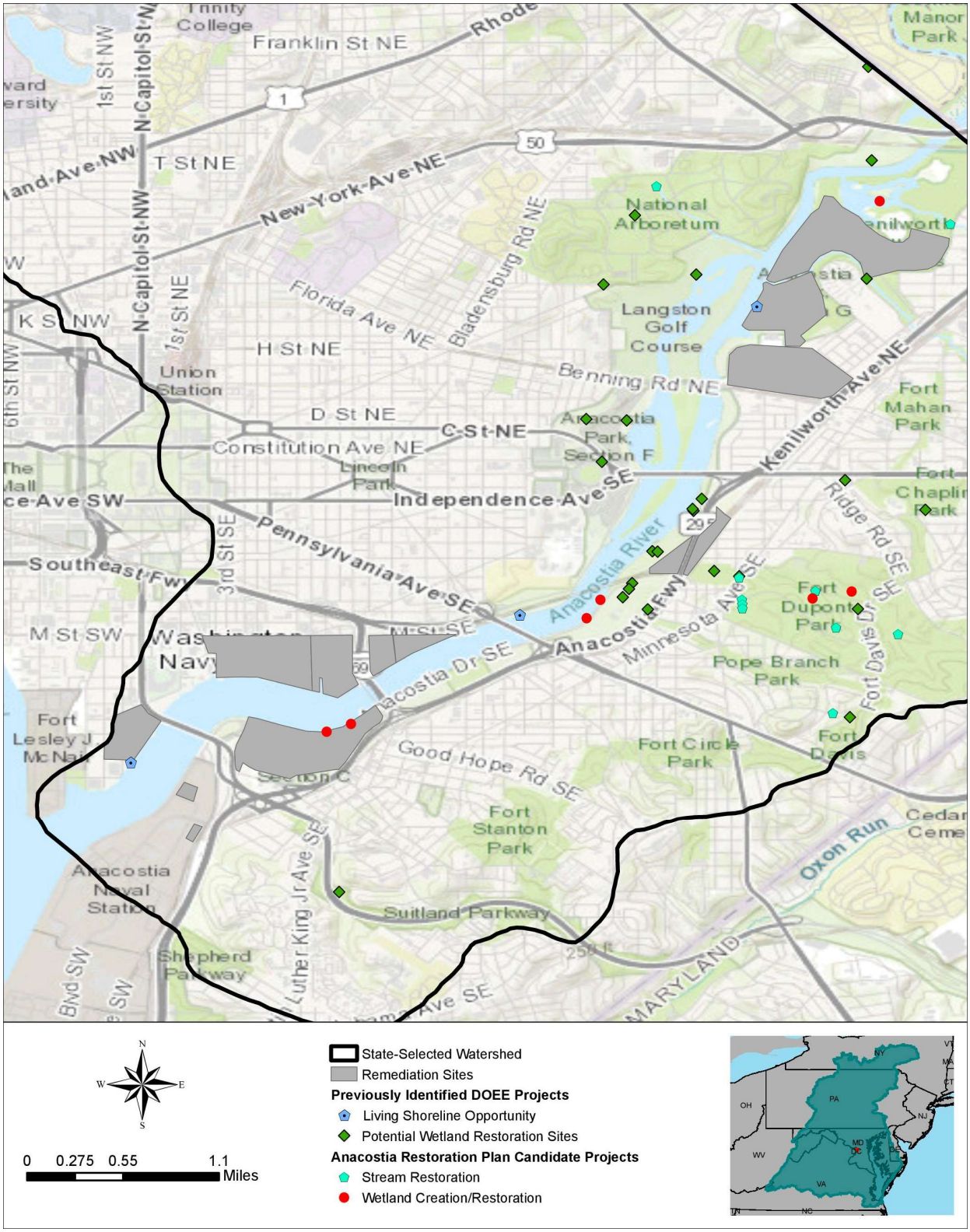

Figure 16. Previously identified wetland project opportunities in the Anacostia River watershed

3.2.1.3 Wetland Restoration Opportunities

As noted on **Figure 16**, DOEE has identified 21 potential wetland restoration opportunities within the Anacostia River watershed. Wetland restoration opportunities also identified as part of the DOEE's Anacostia River Living Shoreline and Wetland Enhancement project (two of these locations overlap with the 21 wetland project sites). To prioritize these opportunities, location-specific geospatial data should be collected and analyzed. Geospatial data regarding these specific opportunities were not available at the time of this analysis.

Priority may be given to wetland restoration projects along the mainstem Anacostia River in areas where historical wetlands were located. Wetlands along the mainstem Anacostia River may provide benefits to wildlife, water quality, and flood mitigation. Consideration should be given to potential environmental remediation activities in or near any potential wetland project. Use of dredged fill materials should be considered, as identified in the baywide analysis.

Another means of creating or restoring wetlands is to reconnect existing wetlands to the tidal floodplain via seawall removal. That analysis is discussed in Section 3.2.2.

3.2.1.4 Wetland Restoration Costs

The potential costs for wetland restoration may vary widely. Wetland restoration costs can range from approximately $1,280 to $133,000 per acre in U.S. 2017 dollars. To produce a reasonable cost estimate, additional analysis and feasibility studies would be required to better define the scope of wetland restoration opportunities in the Anacostia River watershed, considering implementation barriers.

3.2.1.5 Wetland Restoration Implementation Barriers

Invasive species present long-term maintenance issues for wetland restoration projects. Problematic native species, namely whitetail deer and Canada geese, can be particularly destructive to wetland vegetation through overgrazing. NPS has formulated a plan to reduce impacts from resident Canada Goose populations through controlled kills and extensive revegetation efforts (NPS 2014).

Water quality impairments and soil and sediment contamination also present a significant barrier to the establishment of healthy wetland habitats. As noted, **Figure 12** depicts potential environmental remediation sites, where remedial investigations are underway to determine the nature and extent of possible hazardous contamination in those areas. Any wetland restoration projects at these locations on land or in the adjacent river channel should be delayed until contamination has been characterized. Areas where environmental remediation is deemed necessary should be avoided for wetland projects until remedial action is complete.

Funding is another limitation for wetland restoration projects. Other implementation barriers include land ownership and accessibility. Accessibility becomes important for monitoring and maintenance as well as restoration implementation. This includes roadways and tidal impacts on boat access for dredging activities. When reusing dredged sediment, spray distances are a limitation. This was a lesson learned from the Blackwater wetland restoration effort (The Conservation Fund et al. 2012). Similarly, the Blackwater wetland restoration effort highlighted limitations based on the quality of the dredged material and content of organic matter versus

clays, silts, or sand. Water depths may limit the locations where dredging and beneficial reuse of the material will be successful.

3.2.2 Seawall Removal and Living Shoreline Creation

3.2.2.1 Summary of Seawall Removal and Living Shoreline Creation Needs

Seawalls were installed by USACE along the Anacostia River in the early- to mid-20th century to mitigate flooding in the District (NCPC 2008). Seawalls, riprap, and other hardened shoreline structures offer protection from storm surges but may negatively impact the local environment by accelerating shoreline erosion, preventing wildlife from accessing tidal areas, altering tidal processes, and increasing wave energy in nearby waters (NOAA 2017). The locations of seawalls and other shoreline characteristics along the Anacostia River are shown on **Figure 17.** This figure was generated based on NOAA's Environmental Sensitivity Index: Chesapeake Bay and the Outer Coasts of Maryland and Virginia dataset (NOAA 2016).

As noted earlier, coastal development has contributed to the loss of significant habitat along the mainstem Anacostia River, highlighting the need for restoration of natural shoreline and aquatic vegetation. Living shorelines use plants or other natural elements, sometimes combined with hardened shoreline features, to stabilize shorelines of estuarine coasts, bays, and tributaries (NOAA 2017). This type of shoreline restoration approach can provide multiple benefits, including minimizing tidal erosion and maintaining tidal processes to restore and enhance natural shoreline habitat. Living shorelines provide shallow water habitat and provide shoreline access for wildlife and recreation. Tidal storm risks are reduced through the absorption of wave energy, storm surge, and flood waters, and they can improve water quality by settling sediments and filtering pollutants (Maryland Department of Natural Resources [DNR] 2011).

Removal of seawalls may provide several benefits. Removing or notching seawalls in areas adjacent to wetlands can improve wetland condition by increasing connection to the natural floodplain. In addition, replacing seawalls with living shorelines may serve to provide mainstem habitat for aquatic and terrestrial wildlife, improve water quality, and restore natural tidal processes (Maryland DNR 2011). Implementation of a living shoreline also provides an opportunity to more sustainably mitigate flood risks, thereby improving the resiliency of D.C.'s flood mitigation strategy. To generate the most ecosystem value, seawall removal/notching should be accompanied by living shoreline creation.

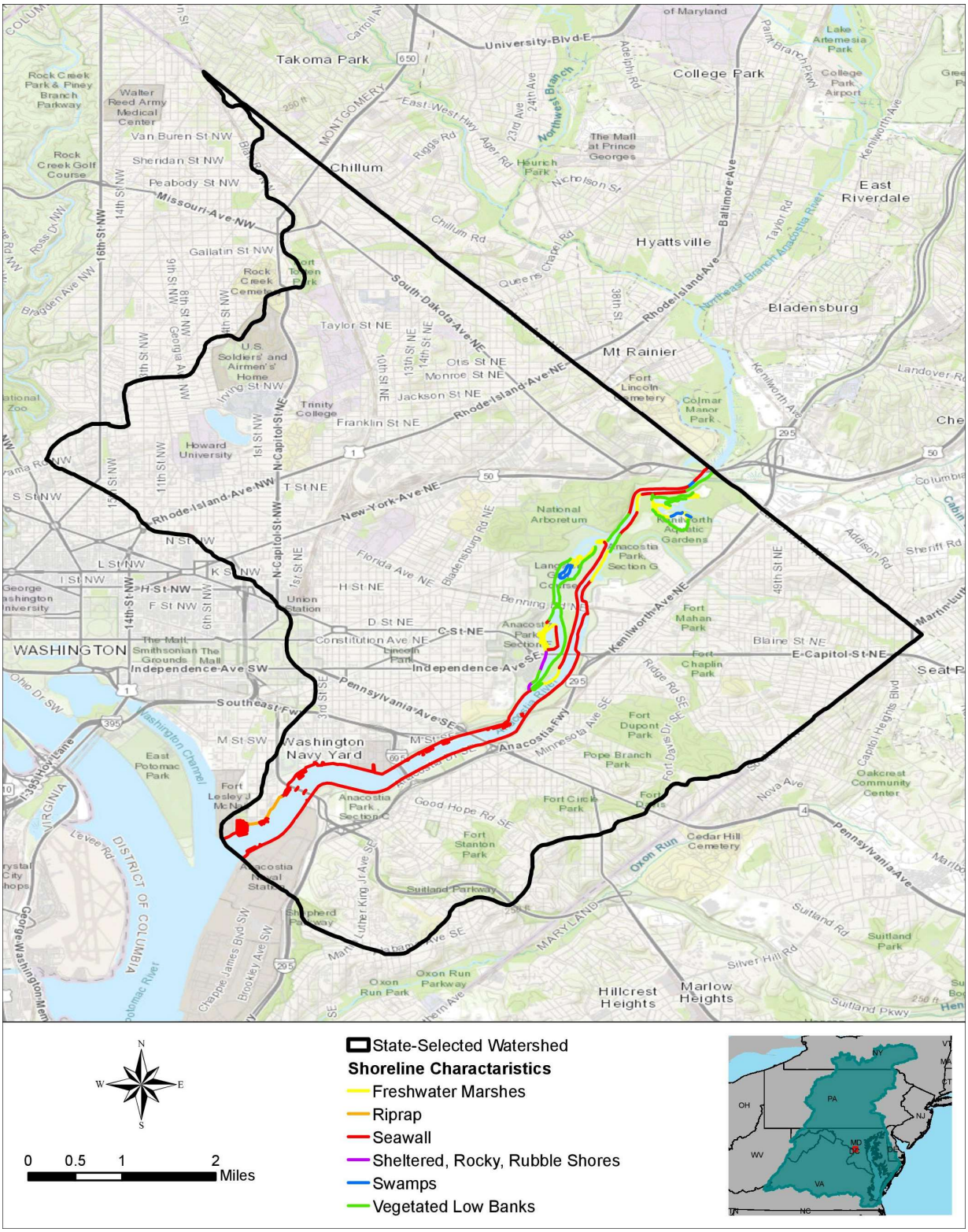

Figure 17. Shoreline characteristics along the mainstem Anacostia River (NOAA 2016)

3.2.2.2 Existing and Ongoing Seawall Removal and Living Shoreline Creation Projects

At the time of this study, the planning phases of DOEE's Anacostia River Living Shoreline and Wetland Enhancement project are currently underway. This project includes three potential seawall removal/living shoreline creation project areas as shown on **Figure 16**. Though DOEE cannot regulate development on private shorelines, they are coordinating developers and other government agencies to identify opportunities for seawall removal and living shoreline implementation. For example, DOEE is coordinating with developers at Buzzard Point on the lower Anacostia River to evaluate living shoreline as a component of planned coastal development (Ramboll Group 2018).

The AWS's Anacostia Gateway Wetlands Restoration Project has identified seawall adjacent to the Gateway wetlands (see **Figure 13**) as a target for removal (AWS n.d.). This project is in the planning phases. A feasibility study evaluating the potential restoration of the Gateway wetlands also identified seawall removal as a potential component of those restoration effort (Coastal Resources Inc. 2015).

NPS has outlined plans to modify seawall adjacent to the Gateway wetlands as part of their wetland restoration efforts. NPS is also considering modification of seawall across from the lower portion of the Anacostia Fringe wetlands along the eastern shore of the river (NPS 2014).

3.2.2.3 Seawall Removal and Living Shoreline Creation Opportunities

Sections of seawall that are adjacent to existing wetlands were identified as potentially suitable targets for removal or partial removal (i.e., notching). Seawall removal or notching at these locations would increase wetland connectivity to the tidal floodplain, improving wildlife access to wetland habitat and providing potential flood mitigation and water quality benefits. Seawall removal/notching activities likely would be coupled with shoreline revegetation (i.e., living shoreline creation).

Seawalls located within 300 meters of existing wetland or potential DOEE wetland restoration sites were highlighted as potential candidates for removal or notching as shown in red on **Figure 18**. Seawalls directly adjacent to areas considered for environmental remediation (per the DOEE's Anacostia Sediment Remediation Project; **Figure 12**) were excluded from this analysis. In these areas, any potential remedial actions will take precedence over environmental restoration projects. Approximately 3.59 miles of seawall were identified in this analysis as potentially suitable for removal/notching. Further investigations should consider local conditions that may influence the efficacy of seawall removal at each site (e.g., elevation, soil characteristics, nearby infrastructure) and should involve coordination with groups and agencies that are considering wetland projects in these areas, including USACE, NPS, AWS, and DOEE.

Seawall removal and living shoreline implementation opportunities were also identified as a measure to improve flood mitigation and resiliency. Buildings within the Federal Emergency Management Agency (FEMA) 100-year floodplain were located by overlaying building location data from District of Columbia Open Data with the FEMA 100-year floodplain boundaries obtained from FEMA. Shoreline within 300 meters of buildings within the 100-year FEMA floodplain were identified as areas where opportunities for resilient flood mitigation projects (e.g., living shoreline) may exist. The yellow areas on **Figure 19** signify sections of seawall that

should be evaluated for replacement with living shoreline, and the purple areas denote shoreline without seawall where living shoreline creation could provide flood mitigation functions for nearby infrastructure. Potential remediation areas were again excluded from this analysis. This analysis identified approximately 3.87 miles of living shoreline implementation opportunity based on providing resilient flood hazard mitigation to nearby infrastructure. However, it should be noted that some of the seawalls may be protected by NPS as historic areas. Correspondence with DOEE suggests that seawalls north of the Benning Rd. bridge should be the primary targets for removal to avoid historic areas. Any seawall removal/notching should take into consideration the presence of historic structures.

Based on the analysis of seawall removal/notching to benefit wetlands (**Figure 18**) and the flood mitigation analysis (**Figure 19**), the combined total amount of shoreline where living shoreline creation and/or seawall removal opportunities were identified is approximately 7.14 miles. This value accounts for overlap between the analyses in **Figure 18** and **Figure 19**. The combined opportunities are shown together on **Figure 23**.

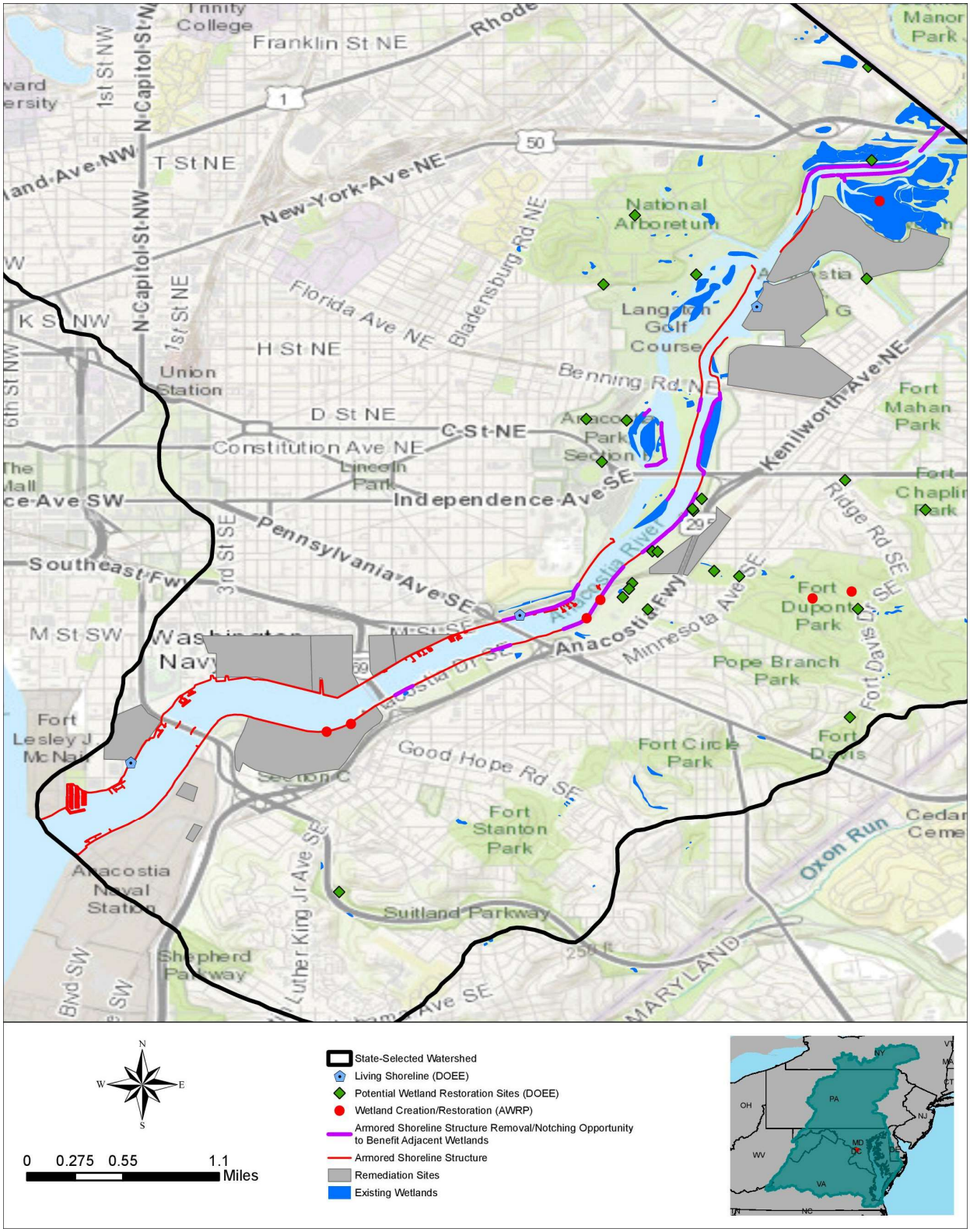

Figure 18. Opportunities to notch or remove seawall to reconnect nearby wetlands to floodplain

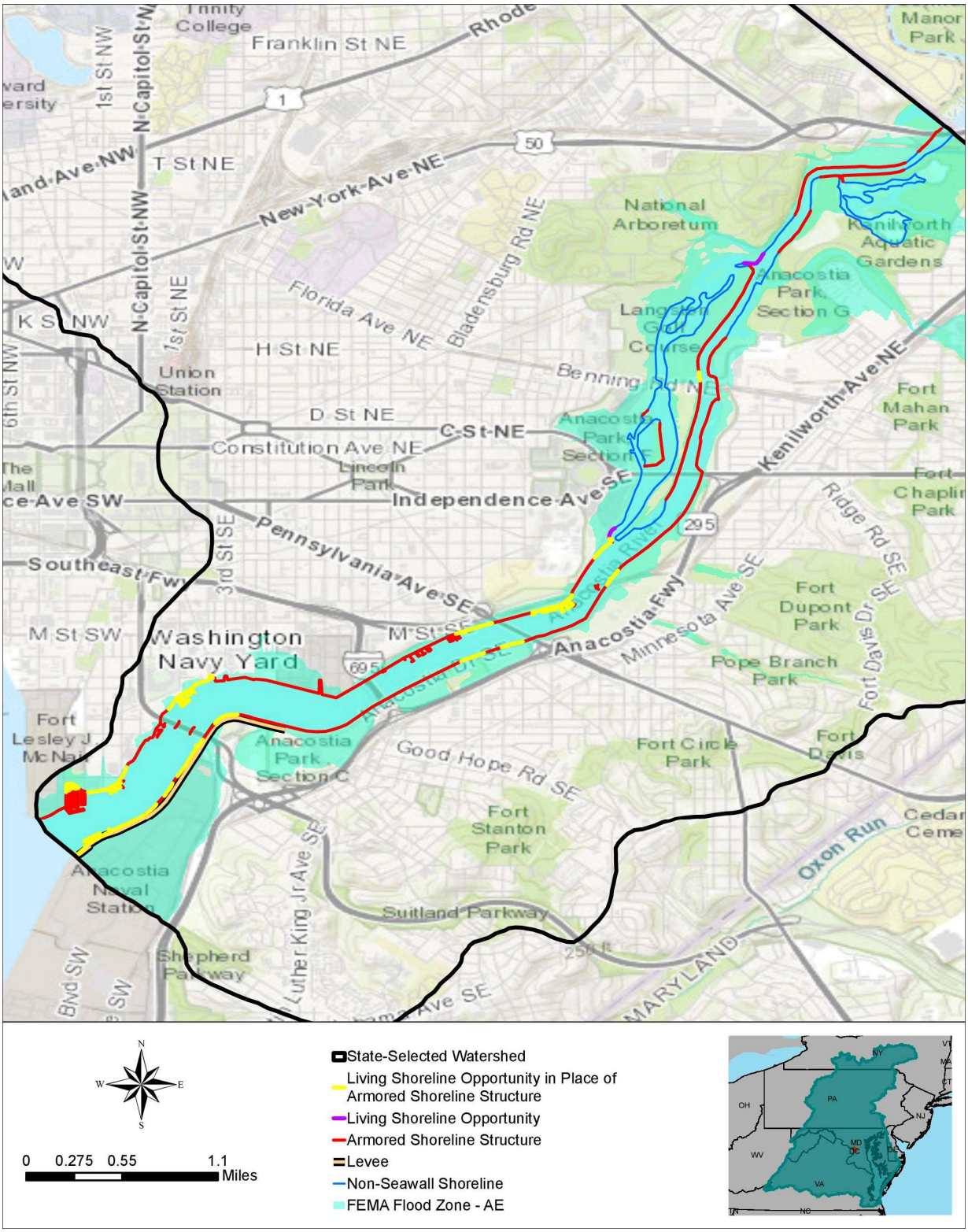

Figure 19. Living shoreline creation opportunities based on flood mitigation and resiliency needs (District of Columbia Open Data 2017; FEMA 2017)

3.2.2.4 Seawall Removal and Living Shoreline Creation Costs

Planning level costs to develop living shorelines are estimated at $1,280 per linear foot. The seawall notching/removal analysis identified 3.59 miles of seawall for which removal/notching could benefit adjacent wetlands. These efforts also will involve revegetation activities similar to living shoreline creation. Based on the cost of living shoreline creation, the planning level cost for this effort is approximately $24.3 million in 2017 U.S. dollars. It should be noted that additional expenditure would be required to remove or modify seawall.

The flood mitigation analysis identified 3.87 miles of seawall that could be replaced to provide resilient flood mitigation along the river. At the estimated cost per linear foot, the planning level cost is approximately $26.2 million in 2017 U.S. dollars, with additional expenditure to remove existing hardened shoreline structures.

Combining the opportunities identified in the seawall notching/removal analysis (**Figure 18**) and the flood mitigation analysis (**Figure 18**), and accounting for overlap between the two analyses, a total of 7.14 miles were identified for potential living shoreline creation and/or seawall removal opportunities. At the estimated cost per linear foot ($1,280), the planning level cost is approximately $48.3 million in 2017 U.S. dollars. Again, it should be noted that additional expenditure would be required to remove or modify seawall.

3.2.2.5 Seawall Removal and Living Shoreline Creation Implementation Barriers

Funding is a major barrier to implementing seawall removal and living shoreline creation projects. Land access and acquisition may be necessary in some instances to remove/modify seawall and develop living shorelines projects. Coordination with land owners is necessary and may become an implementation barrier if land owners are unwilling to approve seawall removal or living shoreline projects.

Additionally, in tidal areas, relative sea level change, coastal storms, and wave action may be implementation barriers to developing and maintaining successful living shorelines. Poor water quality and sediment contamination may also be an implementation barrier to establishment of healthy living shoreline habitats. Contaminated areas should be avoided, pending the conclusion of remedial investigations and cleanup activities.

Some sections of seawall are designated as historic areas under the jurisdiction of NPS. For example, the seawall adjacent to historic areas at Ft. Lesley J. McNair and the Thomas Jefferson Memorial (both outside of the Anacostia River watershed) have been subject to recent restoration and preservation efforts (USACE 2011; NPS 2009). As noted earlier, correspondence with stakeholders indicates that seawall north of the Benning Rd. bridge should be the primary targets for removal to avoid historic areas.

3.2.3 Submerged Aquatic Vegetation Restoration

3.2.3.1 Summary of Submerged Aquatic Vegetation Restoration Needs

Historical trends in Chesapeake Bay have shown a decline in SAV habitats (USACE 2015). The 2014 Chesapeake Bay Watershed Agreement goals target sustaining 185,00 acres of SAV habitat in the Chesapeake Bay with 90,000 acres by 2017 and 130,000 acres by 2050 (USACE 2015).

The baywide analysis identified the Anacostia River watershed as a potential area of interest for SAV restoration because considerable mainstem habitat has been lost in the Anacostia River due to water quality impairments and development in tidal areas. The extent of SAV habitat in the Anacostia River watershed is limited as was illustrated on **Figure 14**. SAV occurs in shallow waters with good clarity and sandy bottoms. The high levels of turbidity in the Anacostia River reduce sunlight penetration, which inhibits SAV growth. Restoration of SAV is beneficial because SAV provides important habitat to fish and other aquatic wildlife and helps to re-oxygenate water, improve water quality, stabilize sediment, and absorb wave energy (NOAA n.d.).

3.2.3.2 Existing and Ongoing Submerged Aquatic Vegetation Restoration Projects

Existing SAV restoration efforts are limited to small scale replanting efforts by NGOs and community groups. AWS has engaged in aquatic vegetation replanting efforts throughout the Anacostia River.

As noted, for SAV restoration to be successful, water quality must be improved. Many of the ongoing activities within the Anacostia River watershed are working to improve water quality, which will provide habitat where SAV can thrive.

3.2.3.3 Submerged Aquatic Vegetation Restoration Opportunities

Figure 20 shows the spatial distribution of SAV habitat in 2015 (green areas) and the areas in which SAV habitat has been lost since SAV data collection began in 1971 (blue areas) (VIMS 2017). The red areas, totaling 13.5 acres of SAV loss, are opportunities to restore SAV habitat once water quality is supportive. Beyond these 13.5 acres, restoration opportunity areas could be identified in areas that are fewer than 6 feet deep (USACE 2015a). However, as stated previously, SAV restoration is sensitive to water quality, particularly turbidity. Therefore, completion of other restoration efforts that improve water quality will be important prior to completion of these restoration projects.

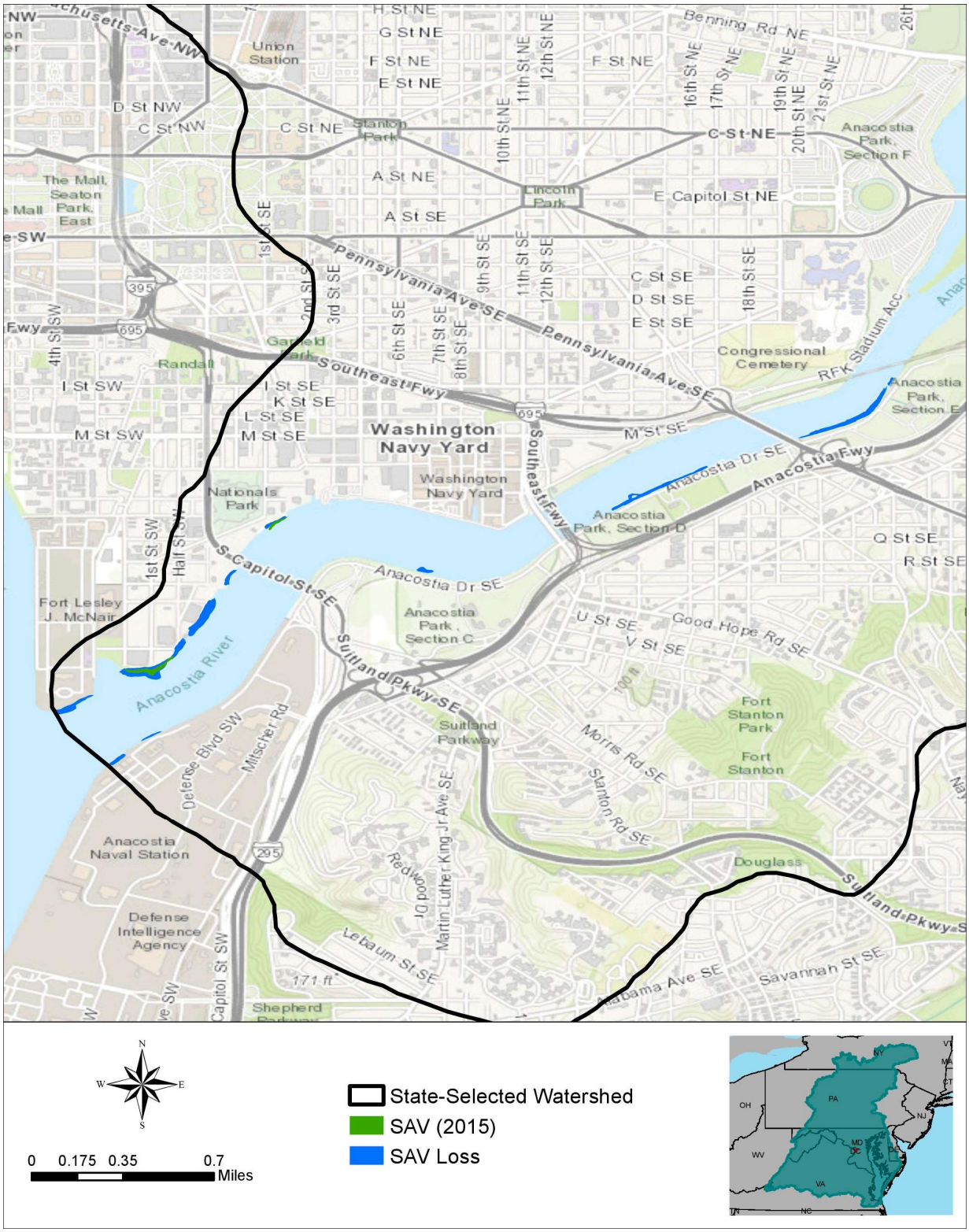

Figure 20. Submerged aquatic vegetation restoration opportunities (VIMS 2015)

3.2.3.4 Submerged Aquatic Vegetation Restoration Costs

SAV habitat restorations can vary in cost between $41,000 to $314,000 per acre in 2017 U.S. dollars. To restore the 13.5 acres of SAV habitat, costs may vary between $553,000 to $4.2 million.

3.2.3.5 Seawall Removal and Living Shoreline Creation Implementation Barriers

As previously mentioned, poor water quality is a major implementation barrier to SAV restoration. Therefore, completion of other restoration activities to improve water quality will be an essential effort prior to expending effort on SAV restoration. SAV restoration efforts should be coordinated to avoid in-river sediment remediation activities. Securing funding to support these activities is another implementation barrier.

3.2.4 Conservation Opportunities

One approach to conservation is to focus on habitats of particular importance to ecosystem functions. An analysis conducted by the CBP focused on identifying habitats of greatest importance to protecting water quality. The blue areas on **Figure 21** illustrate habitats that are particularly valuable to water quality in the watershed as determined based on physical and biological functions such as precipitation storage, nutrient retention, runoff mitigation, and soil preservation. Specifically, data considered in the CBP analysis included data describing soil erodibility, wetland functions, ecosystem productivity, habitat fragmentation, local hydrology, floodplain functions, and landscape characteristics (CBP n.d.). Based on this analysis, the Kenilworth Marsh areas and Kingman Marsh areas may be primary conservation targets to benefit water quality.

Because of the limited extent of habitat in the Anacostia River watershed, conservation of existing wetlands and vegetated areas is critical, particularly along the Anacostia River. Conservation of wetlands, shoreline habitats, and forests will benefit many of the 205 bird, mammal, reptile, amphibian, fish, and invertebrate species identified by DOEE in 2015 as Species of Greatest Conservation Need in D.C. (DOEE 2015).

Management of problematic native species, such as whitetail deer (*Odocoileus virginianus*) and Canada geese (*Branta canadensis*), is also necessary for conserving habitat as high populations of these species can be destructive to vegetation through overgrazing (DOEE 2015). Additionally, management of invasive plant species is an important conservation strategy; numerous agencies, NGOs, and community groups are currently engaged in invasive plant management.

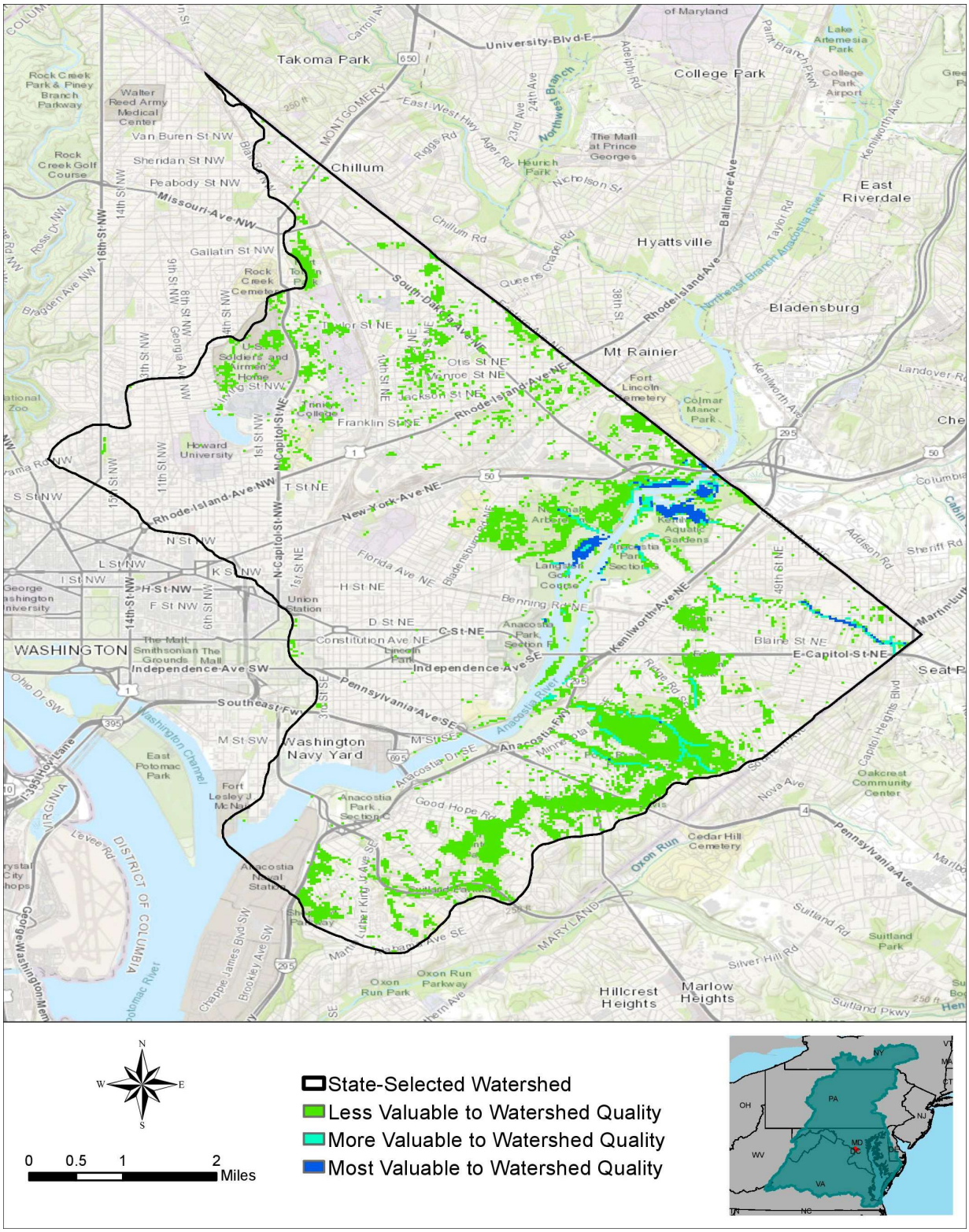

Figure 21. Priority conservation and restoration areas for protecting water quality in the Anacostia River watershed (CBP n.d.)

3.2.5 Other Opportunities

The Anacostia River watershed is susceptible to current and future threats, including coastal storm risks, sea level change, climate change, riverine and localized flooding, heat waves, and several other natural and manmade hazards. To manage these short- and long-term risks, it is important that resiliency be considered in project planning. Resilience is defined as the ability to adapt to changing conditions and withstand and rapidly recover from disruptions due to emergencies (NOAA and USACE 2013).

Several existing studies and plans that incorporate resiliency have covered the Anacostia River watershed. One example is the USACE North Atlantic Coast Comprehensive Study (NACCS) (USACE 2015b). The NACCS provided a risk management framework, which was conducted at three levels of analysis (with refined spatial scale with each analysis), to help support resilient coastal communities. The study included analysis of the District of Columbia. The NACCS study considered vulnerabilities and modeled flooding extents to evaluate areas of highest risk to coastal flooding. **Figure 22** illustrates the areas of relative risk based on the study.

DOEE also developed a climate change adaptation plan, *Climate Read DC: The District of Columbia's Plan to Adapt to a Changing Climate* (n.d.). The adaptation plan considered changes in temperature, rainfall, and sea level rise to assess the risks that the changes would have on the District of Columbia's infrastructure, facilities, and community. The outcome of the plan was a list of action items to improve resilience, with timeframes, lead agencies, and partners identified to implement these action items.

Many of the restoration activities that have been identified in this Anacostia River watershed analysis will help improve resiliency of the watershed. For example, in addition to restoring habitat, living shorelines reduce coastal flood risks, reduce shoreline erosion, and sequester carbon. Resiliency considerations and any impacts to flood risks should be incorporated in feasibility studies and planning for any restoration activity.

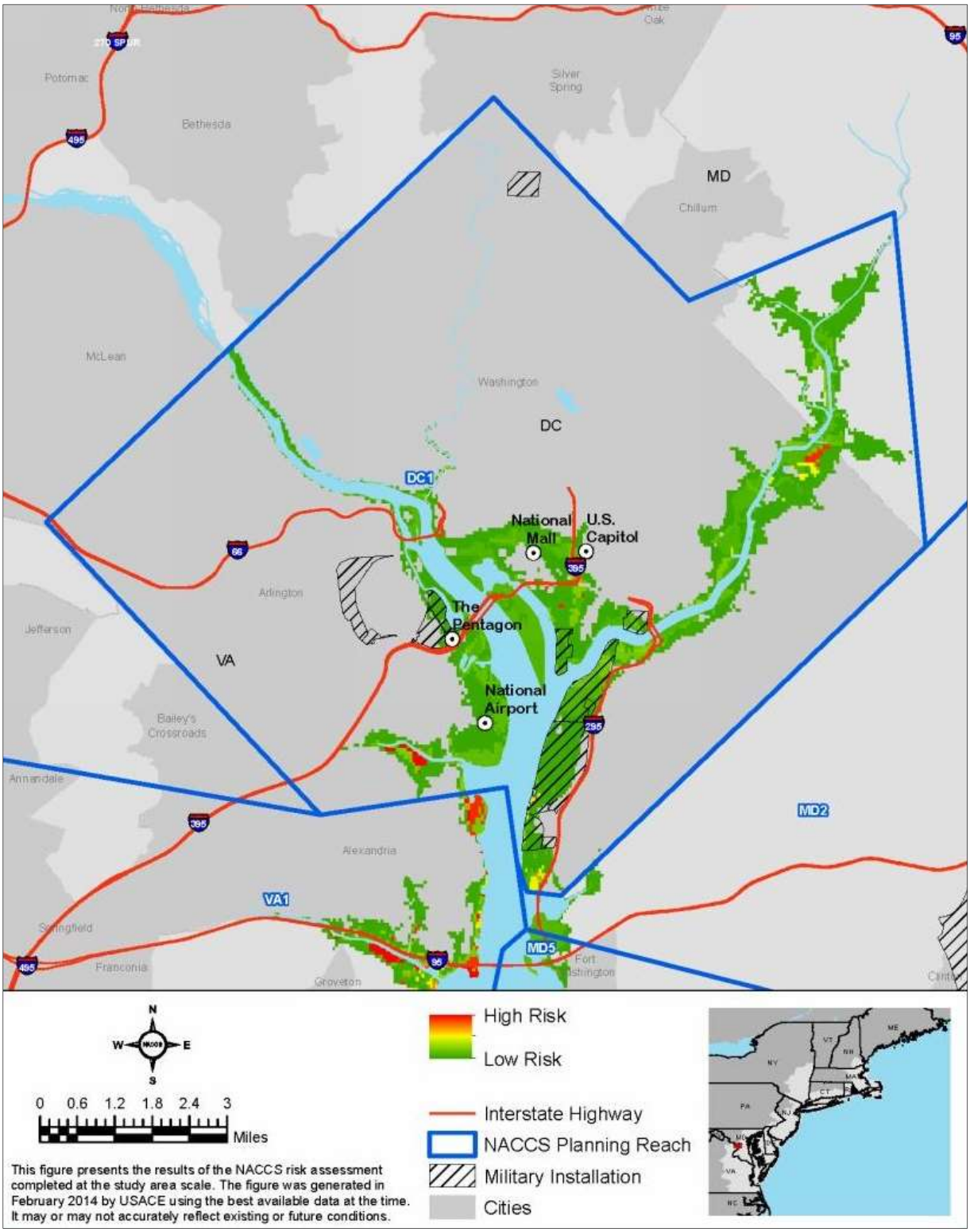

Figure 22. Areas of relative risk for flooding in the District of Columbia (USACE 2015b)

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Section 4
Summary

The Anacostia River watershed covers 173 square miles across central Maryland and the District of Columbia. This study focused on the portions of the Anacostia River watershed (29 square miles) within the District of Columbia, which include the highly urbanized eastern part of the District of Columbia and the Anacostia River. The entirety of this area falls within the subwatershed designated 0207001002. Land use in the watershed is dominated by development.

Because of decades of development and anthropogenic pressures, the watershed has experienced various water quality impairments and significant loss of habitat, particularly in and along the Anacostia River. The high level of development contributes to major water quality impairments, including high suspended sediment/turbidity, trash, oils, grease, pathogens, nutrients (e.g. nitrogen, phosphorus), low dissolved oxygen, elevated pH, metals and other toxic contaminants. The extent of wetlands and SAV habitats have been greatly reduced because of development and poor water quality.

Several measures have been identified to help restore function to the Anacostia River watershed and contribute to 2014 Chesapeake Bay A goals and outcomes, with many efforts currently underway. Efforts such as stormwater runoff mitigation, stream restoration, and low impact development have received attention. **Figure 15** summarizes many of the restoration activities that have been completed or are ongoing within the watershed. With consideration of these previous and ongoing efforts, stakeholders identified wetland restoration, seawall removal, living shoreline creation, and mainstem Anacostia River habitat creation as priorities to investigate in this analysis. In addition, SAV restoration was identified as a potential opportunity. This list of measures is not exhaustive, and additional restoration and conservation opportunities likely exist within the watershed. Beyond the restoration activities discussed herein, ongoing work to conserve and restore existing habitats and implementation of measures to improve water quality should continue throughout the Anacostia River watershed.

The identified priorities involve restoration measures that provide multiple benefits to the watershed, particularly the Anacostia River ecosystem. Wetland restoration and living shoreline creation along the mainstem river may provide habitat, water quality benefits, and resilient flood mitigation benefits. Seawall removal can be targeted to benefit wetland ecosystems by improving connection to the tidal floodplain and can be coupled with living shoreline creation to improve shoreline habitats. In addition to these restoration activities, conservation of existing wetland habitats is critical. **Figure 23** summarizes the restoration and conservation opportunities identified within the Anacostia River watershed, including opportunities related to the aforementioned stakeholder priorities as well as opportunities identified in previous studies (e.g., AWRP studies). **Figure 23** also includes candidate projects identified by stakeholders, which included projects in the mainstem Anacostia River and the Fort Dupont tributary. **Table 1** lists the identified restoration and conservation activities and their recommended prioritization that are depicted in **Figure 23**, highlighting key limitations or conditions required to improve chances for success.

Wetland restoration efforts should focus on those sites previously identified by DOEE and in the *Anacostia River Watershed Restoration Plan and Report* (AWRP 2010). Collection and analysis of geospatial data are critical to assessing these opportunities. Feasibility studies based on such data are necessary to characterize and prioritize potential project sites. Seawall removal/notching, coupled with living shoreline creation, should target seawall adjacent to the Kingman Marsh and Gateway wetlands as these areas contain the longest sections of seawall that neighbor existing wetlands. Living shoreline creation to provide resilient flood mitigation may also be targeted in the areas of the lower portion of the Anacostia River as identified on **Figure 19**, though these projects should involve coordination with NPS to avoid historic shoreline structures. SAV restoration should target historical areas of SAV habitat in the lower portion of the Anacostia River, but this is dependent on efforts preceding restoration to improve water quality. Opportunities for stormwater retrofits, low-impact development, green infrastructure, or other stormwater management projects are also present throughout the watershed, as identified by the AWRP. All restoration projects should avoid ongoing environmental remediation sites.

Focus areas were identified that contain concentrations of co-located opportunities. These focus areas were identified to assist with identifying a project to pursue for implementation and are bounded by the red polygons in **Figure 24**. **Table 2** summarizes the activities proposed in the focus areas. Following public input, at least one project will be developed further for presentation in the final report.

The majority of the opportunities to address the stakeholder-identified priorities exist within the Gateway wetlands area, the Kingman Marsh area, and the area between the John Philip Sousa Bridge and the Benning Rd. bridge, as highlighted in the focus areas on **Figure 24**. These areas contain several co-located opportunities for wetland restoration (including beneficial reuse of dredged material), seawall notching/removal and living shoreline creation to address shoreline erosion issues and provide additional habitat, and eventually, SAV restoration (once water stressors are reduced). Each of these project types contributes to the stakeholder goal of increasing habitat in the mainstem Anacostia River.

The sequencing of restoration and conservation activities is also important. Some wetland stressors may need to be addressed and mitigated prior to implementation of restoration activities. For example, achieving reductions in stormwater runoff through stormwater best management practices (low impact development, green infrastructure, etc.) is critical to improving water quality in the Anacostia River. SAV restoration can only be implemented successfully once adequate water quality is obtained in the watershed. Wetland restoration should be delayed until any nearby environmental remediation activities have been completed and until Canada geese populations have been controlled.

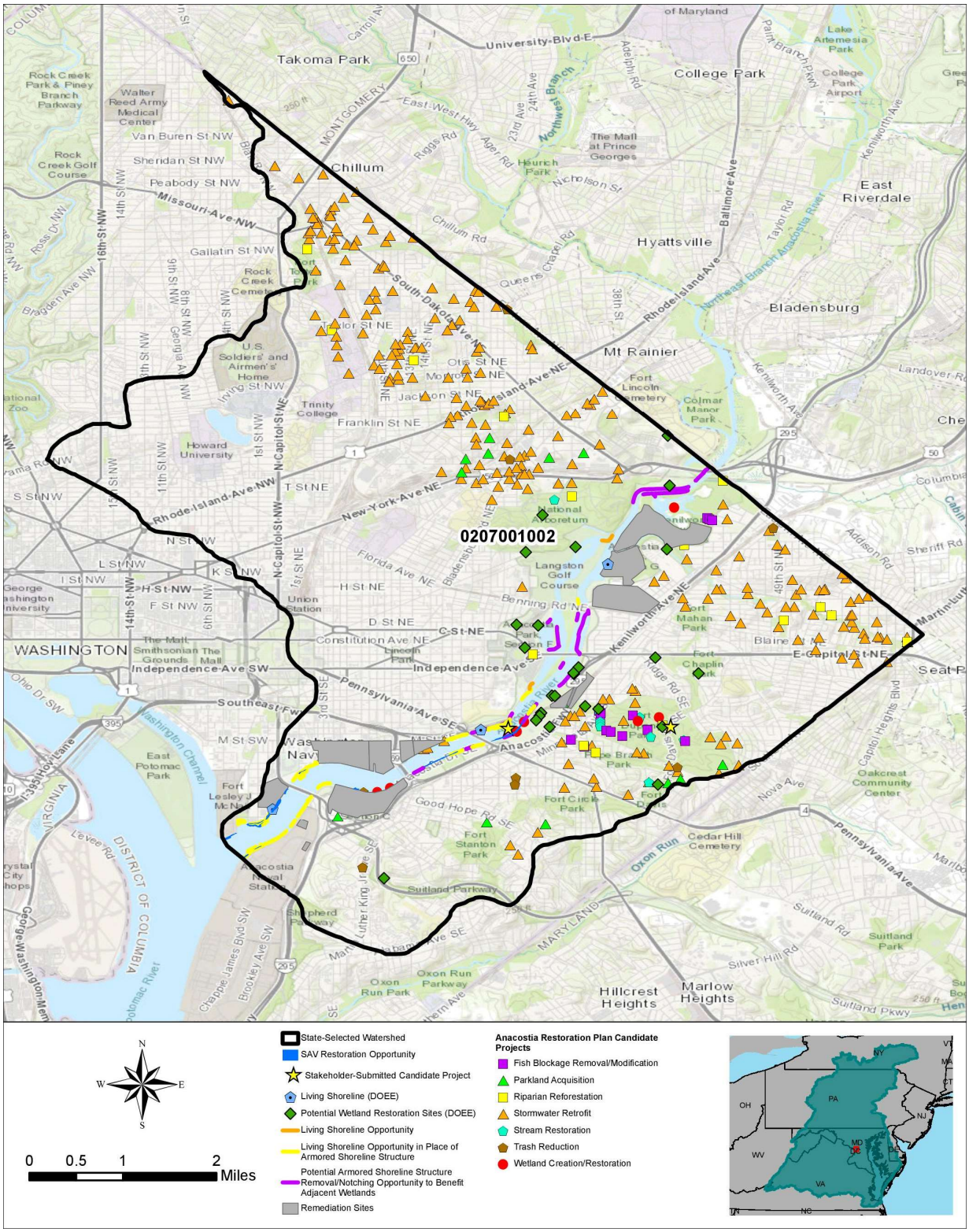

Figure 23. Restoration and conservation opportunities in the Anacostia River watershed

Table 1. Summary of Anacostia River watershed restoration and conservation activities

Suggested Prioritization	Activity	Quantity	Details
1	Stormwater Management/ Runoff Mitigation	Area not available	Improving water quality is critical to the success of environmental restoration projects in the Anacostia River watershed. Mitigation of point and nonpoint pollution sources via stormwater retrofits, sewer system upgrades, green infrastructure and stream restoration should be prioritized. Efforts to improve water quality have been the subject of much investigation as outlined in the *Anacostia River Watershed Restoration Plan and Report* (AWRP 2010) and other documents referenced in this report.
2	Seawall Removal and Living Shoreline Creation	3.59 miles identified for seawall removal/notching to benefit wetlands; additional 3.87 miles identified for flood mitigation via seawall removal and/or living shoreline creation. Combined total of 7.14 miles of shoreline identified for seawall removal/notching and/or living shoreline creation.	Areas of seawall adjacent to wetlands in the upper portion of the Anacostia River were identified for potential seawall removal/notching projects. These projects may serve to reconnect wetlands to the tidal floodplain and should be coupled with living shoreline creation. Areas of seawall in the lower portion of the Anacostia River were identified for possible replacement with living shoreline to provide more resilient flood mitigation. These activities will provide mainstem habitat, water quality benefits, and flood mitigation functions.
3	Wetland Restoration	25 sites (Area not available)	Several areas were previously identified by DOEE as potential wetland restoration project sites. These sites should be subject to geospatial data analyses and feasibility studies, which were not available at the time of this study. Conservation of existing wetlands is critical to maintaining the limited extent of habitat in the Anacostia River watershed.
4	SAV Restoration	13.5 acres	Once water quality is improved within the Anacostia River watershed, SAV restoration can proceed more effectively. Areas of historic SAV habitat are prioritized for this restoration.

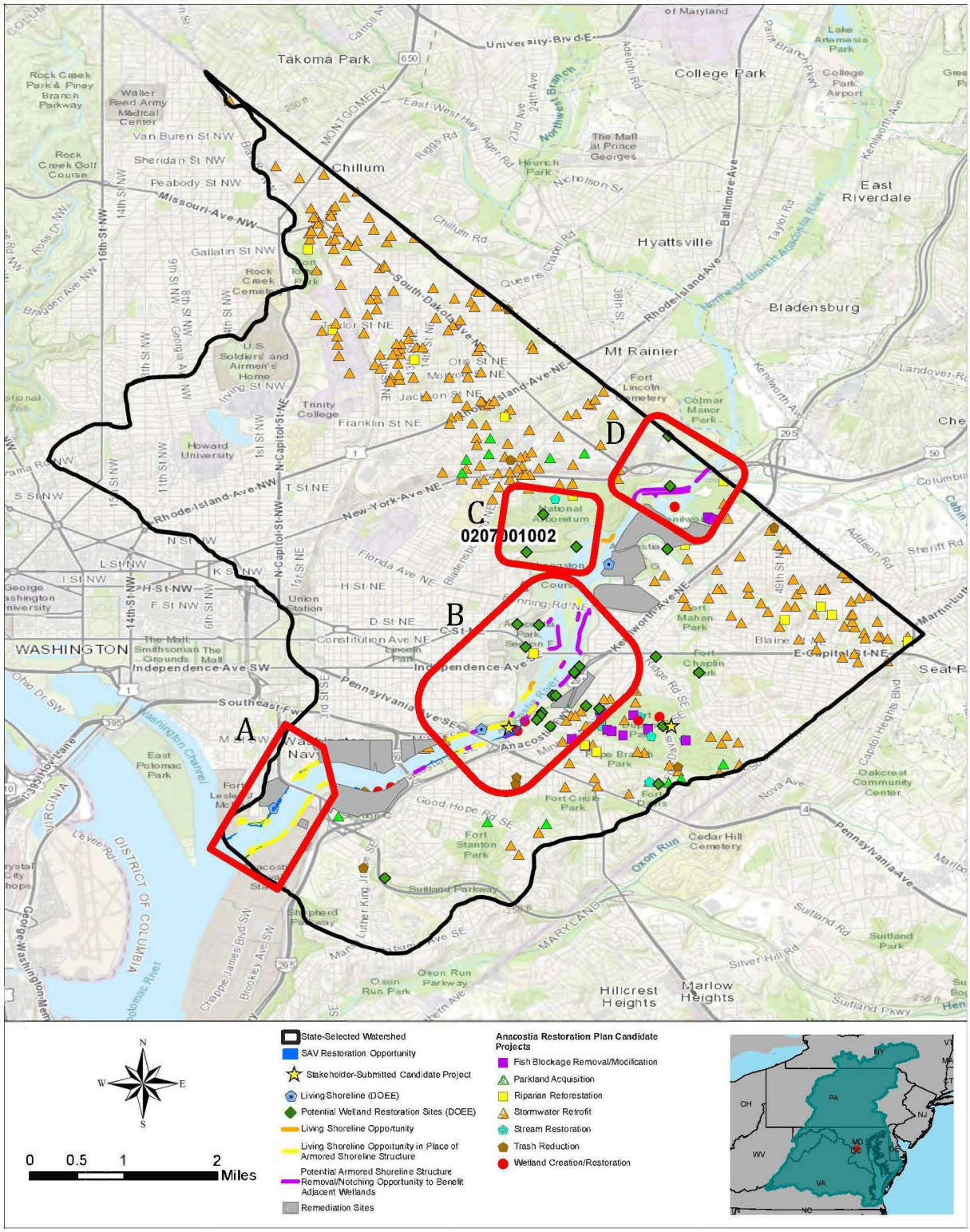

Figure 24. Focus areas identified for potential projects in the Anacostia River watershed

Table 2. Summary of Activities Proposed in Focused Project Areas in the Anacostia River watershed

Anacostia River Watershed Project Focus Areas				
Activity	A	B	C	D
Conservation				
Oyster Restoration				
Stream Restoration			X	
Riparian Buffer Restoration / Reforestation		X	X	X
SAV Restoration	X	X		
Wetland Creation / Restoration		X	X	X
Living Shoreline	X	X		
Removal of Fish Blockages		X		X
Stakeholder-Submitted Candidate Project		X		
Trash Reduction		X		
Armored Shoreline Structure Removal		X		X
Stormwater Retrofit		X	X	X
Parkland Acquisition				

To continue progress toward a restored Anacostia River watershed, further analysis and collaboration should be conducted to understand applicability of these restoration measures at a project-level scale. Once confirmed, these projects should be implemented. The sequencing of these measures should be carefully considered to ensure their success. Watershed stressors will need to be addressed before restoration can take place.

USACE has several authorities to support the implementation of these projects. **Table 3** provides a summary of some of the USACE authorities that could support implementation of these identified project opportunities.

Within the area highlighted in **Figure 24** and elsewhere in the Anacostia River watershed, opportunities may exist for partnership with USACE and non-federal sponsors to utilize the CAP Authority to implement beneficial reuse of dredged material to support wetland restoration, and development of living shorelines to mitigate erosion damages and provide flood risk management. Section 510 funding may be available to support design and construction of living shorelines.

These opportunities were identified based on the information available at the time of study. This analysis is not an exhaustive identification of potential projects or opportunities. To continue progress toward a restored Anacostia River watershed, further feasibility studies should be conducted to understand applicability of these restoration measures at a finer scale. The feasibility studies also should consider the sequencing of these measures to ensure their success. Collaboration will be a key component of progressing restoration efforts. As discussed, implementation barriers also exist for the restoration activities outlined in this report. Collaboration across agencies and state boundaries will help minimize these barriers. Additional opportunities will likely present themselves as more studies are conducted, data are collected,

and collaboration continues. These additional opportunities should be considered in the support of a restored Anacostia River watershed and Chesapeake Bay.

Table 3. Summary of USACE Program Support

Program Support	Brief Description
Continuing Authorities Program (CAP)	Under this authority, USACE can plan, design, and implement certain types of water resources projects without additional project specific congressional authorization. CAP authorities cover a range of mission areas from ecosystem restoration to navigation to improvements to past USACE projects. A feasibility study must be performed prior to implementation. Implementation is conducted with a 50/50 cost share between USACE and non-federal sponsor. The Continuing Authorities Programs are: • Section 14: Flood Control Act of 1946 amended for emergency streambank and shoreline erosion protection for public facilities and services • Section 103: River and Harbor Act of 1962 authorizes participation in the cost of protecting the shores of publicly owned property from hurricane and storm damage • Section 107: River and Harbor Act of 1960 amended for navigation • Section 111: River and Harbor Act of 1968 amended for mitigation of shoreline erosion damage caused by Federal navigation projects • Section 145: Water Resources Development Act of 1976 amended for placement of dredged material on beaches • Section 204: Water Resources Development Act of 1992 amended for Beneficial Uses of Dredged Material • Section 205: Flood Control Act of 1948 amended for flood control • Section 206: Water Resources Development Act of 1996 amended for Aquatic Ecosystem Restoration • Section 208: Flood Control Act of 1954 amended for snagging and clearing for flood control • Section 1135: Water Resources Development Act of 1986 amended for project modifications for Improvement of the Environment.
General Investigation Studies	Projects under this authority address flood risk management, navigation, water supply, recreation, and other needs and opportunities, which, as authorized by Congress, anticipate a greater federal commitment than CAP studies. These projects must be in federal interest and of major need to be economically justified and must be environmentally acceptable.
Section 510	This program provides design and/or construction assistance to non-federal interests for environmental projects that support the restoration and protection of the Chesapeake Bay estuary. Design and construction costs are cost-shared at 75 percent federal and 25 percent non-federal. Implementation of projects under this authority is dependent only on the extent that funds are separately budgeted or specifically appropriated for such work.
USACE Technical Services	This is the primary authorization and technical services program that USACE has available to states and local communities. It contains both the Planning Assistance for States Program (PAS) and the Floodplain Management Services (FPMS). • PAS – gives USACE authorization to use technical expertise in water and related land resources management to provide states, public entities within states, and Native American tribes planning assistance with water resources problems and needs. Types of projects may include all flood-related studies, GIS mapping, stormwater assessments, sanitary sewer studies, water supply and demand, water system vulnerability assessments, surface and groundwater quality, environmental restoration, wetland delineations, and watershed planning. There are two types of Planning Assistance offered through PAS:

Program Support	Brief Description
	○ Comprehensive Plans – including planning for the development, utilization, and conservation of the water and related resources of drainage basins, watersheds, or ecosystems located within the boundaries of the state or across states if both agree. Typical water resource problems included in a comprehensive water resource plan include flood risk management, water supply, water conservation, environmental restoration, water quality, hydropower, erosion, navigation, fish and wildlife, cultural resources, and environmental resources. However, design and implementation are not covered under this authority. ○ Technical Assistance Supporting State Water Resources Management Plans – support of planning efforts to manage state water resources including provision and analysis of hydrologic, economic, or environmental data and analysis for water resource management and land resource development plans. This authority may not be used for design or construction. • Floodplain Management Services (FPMS) authorizes USACE to conduct technical studies using either all federal funding or in combination with a voluntary contribution from a non-federal sponsor. The FPMS authority provides for technical assistance and does not have a provision for construction. Detailed plans, specifications, and construction would have to be accomplished under other civil works authorities or by non-federal sponsors.
Section 729	This is a watershed planning authority to assess the water resource needs of river basis and watersheds within the U.S. relating to: • Ecosystem protection and restoration • Navigation and ports • Flood risk management • Watershed protection • Water supply • Drought Preparedness. These studies require an initial federally funded (<$100,000) watershed assessment (reconnaissance phase). These projects must be implemented with a 75% federal and 25% non-federal cost share agreement.

Section 5
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Attachment A – Anacostia Watershed Stakeholders

The following stakeholders were engaged in the development of the Anacostia watershed analysis:

- Kristin Saunders – Cross Program Coordinator, Chesapeake Bay Program and University of Maryland Center for Environmental Science, Chesapeake Bay Program Office
- Jennifer Dietzen – Environmental Protection Specialist, Regulatory Review Division, District of Columbia Department of Energy and Environment
- Steve Saari – Restoration Branch Chief, Watershed Protection Division, District of Columbia Department of Energy and Environment
- Brian Van Wye – Associate Director, Regulatory Review Division, District of Columbia Department of Energy and Environment
- James (Jim) Foster – President and Chief Executive Officer, Anacostia Watershed Society
- Julienne Bautista – Stormwater Review Engineer, Regulatory Review Division, District of Columbia Department of Energy and Environment
- Phong Trieu – Senior Planner, Metropolitan Washington Council of Governments, Department of Environmental Programs

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