Daylighting streams and restoring wetlands in the District

DRAFT 12 March 29, 2022

Parks & Environment and Planning Subcommittees

Introduction

Most of the historic surface streams and wetlands in the District have been lost to urbanization. Uncovering the History of the District's Buried Streams | Open Data DC Figure 1. These water features offered, and can again offer, important environmental and recreational benefits. In 2021 DOEE issued final regulations to preserve streams and wetlands, new Chapters 25 (Critical Area – General Rules) and 26 (Critical Area – Wetlands and Streams) to Title 21 of the District of Columbia Municipal Regulations (DCMR).
Streams and wetlands, (as defined in 21 DCMR 2599) are critical areas.

> Chapters 25 and 26 establish the process for a project that proposes to impact wetlands and streams in the District. These rules outline the permit application and review process for regulated activities that require either a District wetland and stream permit or a Clean Water Act Section 401 (33 U.S.C. § 1341) water quality certification. These rules establish the criteria to determine if a proposed project is water-dependent, or if the proposed project is not water-dependent and has no practicable alternative. The regulations detail the planning process that requires avoidance and minimization of wetland and stream impacts to the maximum extent practicable. These regulations also describe the mitigation requirements for impacts to wetlands and streams that are necessary to ensure lost wetland and stream functions are replaced and to ensure no net loss of wetland and stream acreage.

Critical Areas –- means the following areas and ecosystems:
(a) Areas containing species of local importance;
(b) Critical aquifer recharge areas;
(c) Fish and wildlife habitat conservation areas;
(d) Frequently-flooded areas;
(e) Wetlands; and
(f) Areas the Department designates, by rule, as critical areas

DOEE is carrying out the *Chesapeake Watershed Implementation Plan Phase III* (2019) to improve water quality in the Chesapeake Bay. To further that plan DOEE reviews and regulates water-dependent projects that may impact streams and wetlands.[i1] DOEE is also working to enhance fish and wildlife habitat and recreational space, and improve water quality through several initiatives, including:
(1) "daylighting" streams[2]: restoring to the surface streams which had been buried underground.

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[1] This paper includes information from *Uncovering the History of the District's Buried Streams,* with presenters Joe Arrowsmith, Ecological Engineer, Straughan Environmental, Josh Burch, D.C. Department of Energy and Environment, and David Ramos, American University, February 15, 2022. chrs.org/buried-streams-pc/
21 DCMR 2500, 2600.

[2] **Stream –** a channel or conveyance of surface water with perennial, intermittent, or ephemeral flow and having defined bed and banks, whether natural or artificial." 21 DCMR 2699.1.

(2) restoring wetlands and creating new wetlands.[3]

To better understand the underlying policy, the program, and to measure program results, this paper outlines DOEE's program to daylight streams and restore wetlands and suggests follow-on questions to ask DOEE. It is recommended that everyone read this draft white paper in Word (i.e., not just printing and reading). -- The DOEE documents are voluminous and are easier to view from the hotlinks.

I. Daylighting streams

Of the streams that flowed through the District of Columbia at the start of the 19th century, only about 30% remain today. The other 70% have been filled in, diverted into pipes, or have disappeared as a natural response to widespread construction reducing infiltration of rainfall. Streams, including ephemeral streams that do not have water year round, mitigate damage from floods, and provide habitat and food for aquatic species, semi-aquatic species, waterfowl, and other wildlife. Headwater streams are a source of water, nitrogen, organic carbon, and sediment to downstream waters. Despite their small individual size and distance from downstream waters, headwater streams, including ephemeral streams, cumulatively supply most of the water in rivers. Downstream waters are the time-integrated result of all waters contributing to them. " Uncovering the History of the District's Buried Streams | Open Data DC

In 2014 DOEE started a project to" daylight" buried streams. Stream and Habitat Restoration | ddoe (dc.gov) See Figure 1 showing historic and current surface streams, and targeted subwatersheds, Figure 2. DOEE began by studying 500 stream outfalls, and then focused on 100 of these outfalls for further study. Evaluation criteria included:

- Proximity to historic streams

Stream bank – the side slopes of an active channel between which the streamflow is normally confined. 21 DCMR 2699.1.

Intermittent stream – a stream that does not have flowing surface water during dry periods of the year, but has flowing water during certain times of the year resulting from the flow of groundwater, although runoff from rainfall can serve as a supplemental source of water for stream flow. 21 DCMR 2699.1.

Perennial stream – a stream that has flowing water year-round during a typical year, for which groundwater is the primary source of stream flow, and runoff from rainfall may be a supplemental source of stream flow. The water table is located above the stream bed for most of the year. 21 DCMR 2699.1.

Ephemeral stream – flowing water in stream beds present during, and for a short duration after, precipitation events in a typical year, but not including streams for which groundwater is a source of the water. 21 DCMR 2699.1.

Daylighting a stream "is the act of restoring to the open air some or all of the flow of a previously covered creek, or stormwater drainage." District Begins Restoration of Piped Stream | ddoe (dc.gov) Project Description_Broad Branch Restoration_0.pdf (dc.gov)

[3] **Wetland** - "an area that is inundated by tides or saturated by surface water at a frequency and duration sufficient to support, and that under normal circumstances, does support, a prevalence of vegetation typically adapted for life in saturated soil condition; and included a marsh, swamp, pond, or vernal pool." 21 DCMR 2599. DOEE, *Wetland Conservation Plan* (2020), p. 4.

- Watershed size
- Geology
- Land use
- Property ownership

Wetlands and streams flowing on the surface benefit the environment:
• Water quality improvement
• Wildlife habitat enhancement
• Groundwater recharge
• Shoreline erosion protection
• Floodwater storage
• Retention, assimilation, and transformation of nutrients and pollutants
• Riparian buffers
• Stream baseflow
• Carbon storage
DOEE, *Wetland Conservation Plan* (2020).

> DOEE's Stream and Habitat Restoration Program oversees the design and construction of stream restoration, low impact development (LID) stormwater retrofits, and outfall repair at various locations around the District including: federal parkland, District parkland and in the public right of way. The goal of these projects is to improve water quality, provide high quality outdoor recreational space, restore natural stream flow, reduce erosion and stormwater pollution, enhance wildlife habitat, and ensure long-term protection of stormwater and sanitary sewer infrastructure.
> Stream & Habitat Restoration — Anacostia River Sediment Project (restoretheanacostiariver.com)

DOEE has completed several daylighting projects. Number of feet of streams restored and date completed are shown below.

TABLE 6-10: STREAM RESTORATIONS

Sheila's Tributary	500	Pre-2010
Watts Branch - Upper	8,976	2011
Bingham Run	850	2012
Milkhouse Ford	1,075	2012
Pope Branch RSCs (2)	325	2012
Linnean Park	1,000	2014
Linnean Gully (Soapstone)	200	2014
Park Drive 1	325	2014
Broad Branch	1,900	2014
Broad Branch RSCs (2)	775	2014
Nash Run	1,400	2016
Pope Branch	4,200	2016
Texas Ave/Alger Park	1,500	2017
Springhouse Run	1,900	2017
Spring Valley	1,100	Expected 2019
Stickfoot	800	Expected 2021
Park Drive 2	1,300	Expected 2021

Fort Dupont	17,000	Expected 2022
Pinehurst Branch	7,900	Expected 2022
Oxon Run**	16,000	Expected 2028
Outfall Restoration Projects**	1,500	Expected 2022

Notes:

** DOEE included all streams to be restored by 2025 in DOEE, *Chesapeake Watershed Implementation Plan Phase III* (2019), Table 6-10. DOEE did not include Oxon Run, as that will be completed after 2025, or outfall restoration, as it is not a Best Management Practice currently fully credited by the Chesapeake Bay Program.

Questions on daylighting streams

1. Have all buried streams been identified and mapped?

2. Will DOEE study any of the 400 remaining stream outfalls potentially eligible for daylighting?

3. How much water flow is needed for daylighting a stream to be successful? See e.g., Broad Branch, where additional streams added needed water flow. What is the hydrology research on this?

4. What are the effects from daylighting on public health, property values?

5. Has there been a baseline testing and then follow-up testing of water to see if water quality improved in daylighted streams?

6. Has each completed daylighting project been a success? What is the performance measure?

7. Daylighting streams can help prevent flooding (limited capacity of pipes vs. stream with banks, e.g., Broad Branch. Has the difference been measured in floods? Is there a control?

8. Is there additional information on the educational and recreation benefits?

9. What are DOEE's 2025 Implementation targets for stream restoration? District of Columbia 2020-2021 Programmatic Milestones - FINAL COVID-19 UPDATES.pdf (dc.gov)

10. Which agency/agencies pays to daylight streams? NPS, DOEE, DCWASA, DPR? Is there an MOU? Are there other stakeholders? Does this decision depend on the property owner?
11. Who recommends and approves which streams to daylight?

12. What has been the experience with the In-Lieu Fee Program/Mitigation Bank? DOEE, *Wetland Conservation Plan* (2020) p. 241.

13. FY 2020 grant program – What are the results? How did this inform next steps? FY 2020 Mapping Underground and Piped Streams (Short name: Mapping Underground and Piped Streams) RFA # 2019-1926-WP

14. What is the District of Columbia Clean Water Construction-State Revolving Fund (CWC-SRF) and how does it work? Project Description Broad Branch Restoration_0.pdf (dc.gov) Is there a list of potential sites?

Restoration of existing surface streams:
In addition to daylighting buried streams, DOEE has restored existing surface streams in Branch Avenue Park, Stickfoot Branch, and Pinehurst Branch:

Questions on surface streams

1. What is the status of the Branch Avenue Park Stream Restoration (a surface stream at the park at Branch Avenue/Erie Street/Southern Avenue, SE, 3360 Erie Street, SE) restoration of natural stream flow and erosion reduction)? Branch Ave Stream Restoration Project | ddoe (dc.gov)

2. What is the status of the Stickfoot Branch Stream Restoration Project (erosion reduction and habitat improvement in NPS wooded parkland west of 22nd Street, SE, near Hartford Place, SE)? Stickfoot Branch Stream Restoration Project | ddoe (dc.gov)

3. Pinehurst Branch Stream Restoration Project. What is the status of this project for to restore approximately 7,900 feet of degraded stream reaches; to create conditions suitable for wildlife habitat; and to improve the condition of existing wetlands. in Pinehurst Branch originating at the District/Maryland state line in Chevy Chase Manor, Maryland and flowing approximately 1.3 miles east-southeast to its confluence with Rock Creek.) ? Pinehurst Stream Restoration Project | ddoe (dc.gov)

II. Wetlands

Once a major feature of the landscape, wetlands within the District are now scattered in fragmented patches along the banks of the Anacostia River, Potomac River, and within isolated stream valleys. For more, see History of Wetlands in the District | ddoe (dc.gov)

DOEE has mapped 286[4] acres of wetlands, believed to be 92% of existing wetlands. Figures 5, 6. (DOEE has not mapped the original wetlands.) The city once had a far greater acreage of wetlands than today, including hundreds of acres of wild rice on the Anacostia River. Wetlands were lost to colonial agriculture practices, dumpsites, filling, draining, dredging (e.g., for the Tidal Basin), land reclamation, and seawalls (eliminating 90% of wetlands on the Anacostia River). Ongoing threats to existing wetlands include runoff from impervious surfaces like concrete and asphalt, industrial and municipal wastewater discharge, urbanization, fragmentation, invasive species, point source pollutant discharges (e.g. combined sewer overflows), non-point source pollution (e.g., runoff), increased sedimentation, and filling of

[4] DOEE sources sometimes refer to differing numbers of acres of mapped wetlands.

wetlands. History of Wetlands in the District | ddoe (dc.gov) DOEE, *Wetland Conservation Plan* (2020), p. 37.

Wetlands are beneficial:

> Wetlands are among the most productive ecosystems in the world and vital to the ecology of healthy watersheds. They provide a wealth of benefits to humans, water quality, and wildlife through functions including storage of floodwater; shoreline erosion protection; recharge of groundwater that sustains river and stream baseflow; and retention, assimilation, or transformation of nutrients and pollutants that can degrade downstream water quality. In addition, wetlands are integral components of food webs, providing nursery habitat for breeding fish, amphibians and birds, habitat for wildlife, and export of organisms to downstream waters. Wetlands also act as buffers to protect downstream waters from pollution. Wetlands and streams provide critical habitat for one hundred thirty-eight (138) out of two hundred and three (203) species of greatest conservation need identified in the District Wildlife Action Plan. DOEE, *Wetland Conservation Plan* (2020).

There are four types of wetlands:

Types of wetlands: Table 2.3 2017 Mapped Wetlands by Cowardin Classification [5]	**Total Acreage**
1.Palustrine Forested Wetland (PFO) [6]	114.6 acres
2.Palustrine Scrub Shrub Wetland (PSS)	7.6 acres
3.Palustrine Emergent Wetland (PEM) [7]	144.6 acres
4.Palustrine Unconsolidated Bottom Wetlands (PUB) (i.e., ponds)	22.2 acres

See Figure 5 for illustrations.

DOEE has mapped wetlands:

- 76% <0.5 acre in size and 66% <0.25 acre in size
- 169 acres tidal, [8]
- 120 acres non-tidal [9]
- 114 acres forested,

7.6 acres scrub shrub,

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[5] The Cowardin System of Wetland Classification (1979) developed by the US Fish & Wildlife Service is the waters classification system in Classification of Wetlands and Deepwater Habitats of the United States (Cowardin, Lewis M. II, et al., U.S. Fish and Wildlife Service, December 1979, Reprinted 1982), located here: ttps://www.fws.gov/wetlands/Documents/Classification-of-Wetlands-and-Deepwater-Habitats-of-the-United-States.pdf.

[6] **Forested wetland** – a class of wetland dominated by woody vegetation that is twenty (20) feet tall or taller and three (3) inches or larger in diameter at breast height. These areas typically possess an overstory of trees, an understory of trees or shrubs, and an herbaceous layer. 21 DCMR 2699.1

[7] **Emergent wetland** – a wetland dominated by erect, rooted, herbaceous vegetation. 21 DCMR 2699.1.

[8] **Tidal wetland** – a wetland that is inundated by tidal waters, e.g., on the Anacostia River. 21 DCMR 2699.1

[9] **Non-tidal wetland** – a wetland that is not subject to the ebb and flow of tidal waters. 21 DCMR 2699.1

144.6 acres emergent,
22.8 acres unconsolidated bottom
• 74% on NPS land
DOEE, *Wetland Conservation Plan* (2020). See Figures 9, 10 for land ownership.

Over 92% of the District's potential wetlands (areas determined to have wetland characteristics via a desktop analysis) are located within 500 feet or less of urban development. These urban wetlands face constant challenges such as habitat loss from development, fragmentation, and altered hydrology as well as degraded water quality from stormwater runoff, scour from heavy rain events, and invasive plant colonization. Conservation of these important natural resources is vital to the ecology and health of the District's residents, watersheds, wildlife, and economy. DOEE Wetland Registry (arcgis.com)

DOEE has identified wetlands of concern and plans to recreate 150 acres of wetlands in "targeted conservation opportunity areas" which will reduce threats to 75 aquatic species of greatest conservation need (as defined in DOEE's *Wildlife Action Plan* (2015)). *Sustainable DC 2.0 Plan* (2019). *Wetland Conservation Plan* (2020). Wetland Conservation Plan | ddoe, C100 Appendix D_Wetland Guidance Documents.pdf. See Figures 7, 8, and 9.

Key indicators for new potential wetlands:

- Low-lying or concave landscape position near a source of hydrology [water source];
- Possessed one or two of the three criteria that define a wetland: hydrology, indicators of hydric soil, and/or wetland vegetation; and
- Areas known to be wetlands in the past (i.e., historic wetlands), but no longer meeting the criteria to be considered a wetland.

DOEE, Wetlands and Potential Wetlands, *Wetland Conservation Plan*, 2020. 2.2.4. Figures 8, 9.

Additional general criteria to evaluate a site for a new wetland include:

Promising sites for wetlands: contiguous or connected to other aquatic features such as wetlands, streams, or ponds[10], or adjacent to other natural areas such as forests, unmaintained fields, and natural parks, (allowing for greater connectivity for fauna between natural areas): acreage sufficient to support desired new wetland; sufficient water source to saturate the site for 5% of the growing season (12% under USACE rules), hydric soils,[11] to pond water/establish wetland hydrology, removing impervious areas.

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[10] **Pond –** a still body of water, whether formed naturally or created artificially, that:
(a) Lacks wave action on the shoreline;
(b) Allows light to penetrate to the bottom; and
(c) Is shallow enough for rooted water plants to grow. 21 DCMR 2599.
See DOEE, *Stormwater Management Guidebook* (2013), p. 187 et seq. for pond design and maintenance. FinalGuidebook_changes accepted_Chapters 1-7_07_29_2013_compressed.pdf (dc.gov)

[11] Hydric soil: "Soil that formed under conditions of saturation, flooding or ponding long enough during the growing season to develop anaerobic conditions in the upper part." Hydric soil, hyrophytic plants and wetland hydrology form the elements of a wetland. USDA Natural Resources Conservation Service. Hydric Soils - Introduction | NRCS Soils (usda.gov)

Sites to avoid: where future land disturbance is likely; presence of hazardous waste (e.g., nutrients, heavy metals, i.e., grease, de-icing salts); forested sites (unless to remove invasive species, e.g., *Alanthus altissima*), likely to attract birds that might pose a danger to aircraft; historic or archeological sites; existing utilities.
DOEE, *Wetland Conservation Plan* (2020), Appendix C, Appendix O. Wetland Conservation Plan

DOEE encourages creating living shorelines:

> Throughout the District's development, seawalls have been constructed along the shorelines of the Anacostia and Potomac Rivers. Prior to the construction of seawalls, the Anacostia River meandered through a broad floodplain that contained large marshes. Seawalls provide little habitat for aquatic and terrestrial species, remove the ability of the river to connect with its floodplain, and do little to reduce wave energy. Sea walls may also prevent the predicted landward migration of wetlands resulting from climate change (Hughes 2004), thereby reducing the District's climate change resiliency. DOEE should encourage stakeholders to consider the establishment of living shorelines, where appropriate, as options for best management practices for future development projects and restoration projects along the river. Living shorelines are a bank-stabilization technique that utilizes materials similar to natural shorelines and may include wetland plants, submerged aquatic vegetation, and a variety of structural material such as fiber logs, sand, rock and stone. Living shorelines provide shoreline stabilization, create habitat for aquatic and terrestrial wildlife, and improve water quality by filtering stormwater runoff. Living shorelines may be a preferred approach for adapting to sea level rise where there is space for landward migration of wetlands … . Some living shoreline designs involve incorporating wetland plants and creating wetlands, which would help increase the number of District wetlands. Coordination between DOEE, USACE, NPS, and other stakeholders, as well as public outreach and public acceptance, will be necessary to encourage living shorelines within the District.
> DOEE, *Wetland Conservation Plan* (2020), p. 241:
>
> Some living shoreline designs involve incorporating wetland plants and creating wetlands, which would help increase the number of District wetlands. Coordination between DOEE, USACE, NPS, and other stakeholders, as well as public outreach and public acceptance, will be necessary to encourage living shorelines within the District.
> Living shorelines/wetland, DOEE, *Wetland Conservation Plan* (2020*)*, p. 240. Stream & Habitat Restoration — Anacostia River Sediment Project (restoretheanacostiariver.com)

DOEE has completed several wetlands restoration projects:
Kingman Island
Heritage Island
River fringe. See Figure 7.

Questions on wetlands:

1. Several funding sources are listed in DOEE**,** *Chesapeake Watershed Implementation Plan Phase III* (2019), pp. 90-92, 104. Are all of these sources listed below still available? Are they sufficient for the 150 acres of new wetlands that DOEE plans?
    - EPA's Section 319 Nonpoint Source and Chesapeake Bay Implementation grants.
    - EPA's Clean Water State Revolving Fund; Innovative Nutrient and Sediment Reduction,
    - EPA's Section 117 Chesapeake Bay Regulatory Accountability Program and Implementation grants
    - Small Watershed grants administered by the National Fish and Wildlife Foundation (NFWF) under EPA's Chesapeake Stewardship Fund.
    - NFWF's Coastal Resiliency Fund (supported by NOAA and private funding).
    - Potential source: US Army Corps of Engineers Section 510 grant.
    - Local revenue sources: Anacostia River Cleanup and Protection Fund ($2.5 million in annual disposable bag fees) and Stormwater Enterprise Fund generated by Municipal Separate Storm Sewer System (MS4) impervious surface fees.
    - Funds approved by DC Council.

Questions on mosquitos:
Mosquitos: Are wetlands a mosquito breeding area? What data is available? DOEE's response:

> Mosquito Risk. Mosquito control can be a concern for stormwater wetlands if they are under-sized or have a small contributing drainage area. Deepwater zones serve to keep mosquito populations in check by providing habitat for fish and other pond life that prey on mosquito larvae. Few mosquito problems are reported for well designed, properly sized and frequently maintained constructed wetlands; however, no design can eliminate them completely. Simple precautions can be taken to minimize mosquito breeding habitat within constructed wetlands (e.g., constant inflows, benches that create habitat for natural predators, and constant pool elevations—MSSC, 2005)[12]
> DOEE, *Stormwater Management Guidebook* (2013) section 3.11Section 3.11 Wetlands.pdf (dc.gov)

Does DOEE test wetlands for mosquitos? If so, which wetlands, what intervals, and what are the results? If mosquitos are detected, what steps are taken?

Additional questions:

1. Are Canada geese still a threat to wetlands? If yes what mitigation measures are in effect now or planned?

2. What enforcement actions has DOEE taken in connection with wetlands and streams?

3. Question about "living shorelines." What are the effects of barriers proposed for the Navy Yard, Washington Harbour? Is a DOEE permit required for these projects?

[12] A bench, e.g., in a pond, is "a shallow area just inside the perimeter of the normal pool that promotes growth of aquatic and wetland plants. The bench also serves as a safety feature, reduces shoreline erosion, and conceals floatable trash. Incorporate an aquatic bench that generally extends up to 10 feet inward from the normal shoreline, has an irregular configuration, and extends a maximum depth of 18 inches below the normal pool water surface elevation." DOEE *Stormwater Guidebook*, Ch. 3.

Figure 1. Streams in the past no longer flowing on the surface, are in red. Streams continuing to flow on the surface are in blue. DOEE, Streams from our past. Uncovering the History of the District's Buried Streams (arcgis.com)

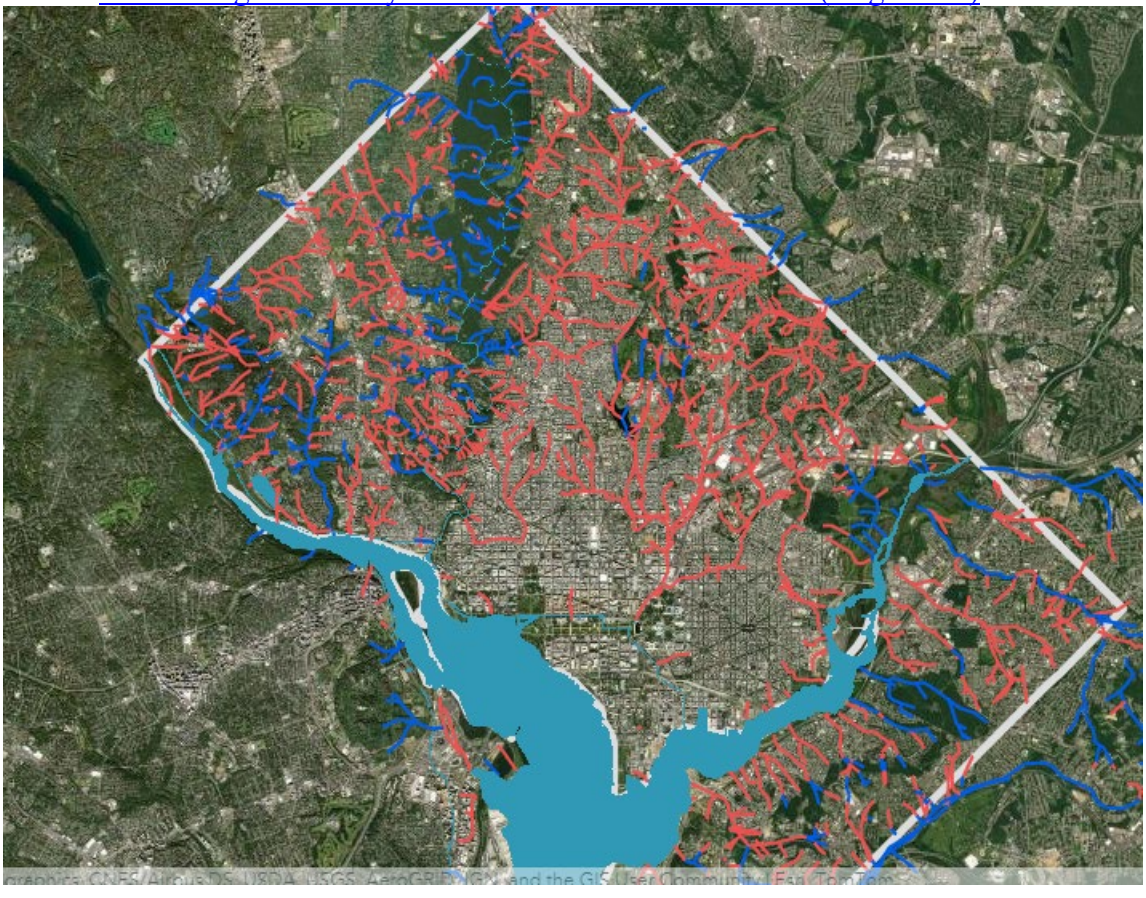


Figure 2. Targeted subwatersheds. DOEE, *Chesapeake Watershed Implementation Plan Phase III* (2019).

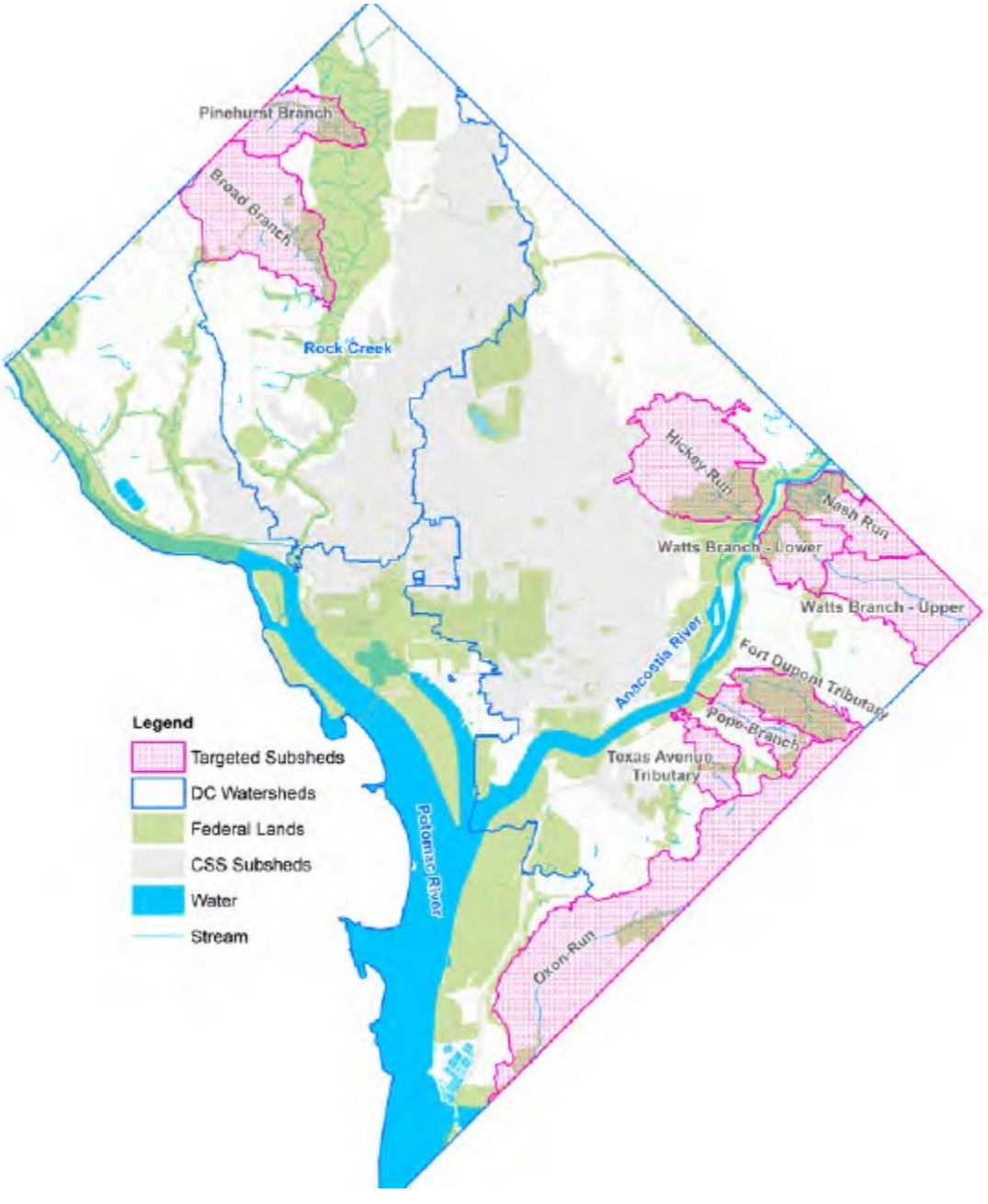


Figure 3. Stream daylighting projects.

I. Completed projects. Quotes from DOEE documents.

Foundry Branch
With the expansion of treatment capacity at Blue Plains, [opened in 1937] the District began efforts to connect more sewers to the wastewater plant to minimize direct discharge of untreated sewage to surface waters.
Along Foundry Branch, the District installed a new "separate" sewer system in parallel to the piped stream. The purpose of this separation was to split off stormwater from wastewater and re-direct wastewater to the plant at Blue Plains. The large, now "separate" storm sewer tunnel still remains to this day holding flowing water from Foundry Branch.
The stream has now been piped for a full century, running through present day Glover Archbold and Foundry Branch Valley Parks. Evidence of the tunnel is clearly visible throughout the park.

Oxon Run
Oxon Run escaped burial, but was instead set in concrete as part of flood and erosion control efforts in the mid-20th century. Oxon Run's vast network of tributaries were piped during this project. While this effort intended to allow development closer to the concrete banks of Oxon Run, the floodplain of this stream remains largely undeveloped and is currently preserved as parkland.

Broad Branch
While Broad Branch still exists as a surface stream near its confluence with Rock Creek, nearly a mile of Broad Branch is conveyed through a large tunnel built in the mid-20th century running under Broad Branch Road and Nevada Avenue NW to the Maryland border. This tunnel collects drainage from a pipe network that replaced nearly all of the former feeder streams and springs.
In 2014, DOEE sought to return a portion of Broad Branch to the surface. Project Description_Broad Branch Restoration_0.pdf (dc.gov)

Bingham Run and Milkhouse Ford Regenerative Stormwater Conveyance Projects:

doee.dc.gov › service › habitat-restoration-stream-restoration-projects
The purpose of these two restoration projects is to demonstrate the effectiveness of regenerative stormwater conveyances by installing a series of them along Oregon Avenue in Northwest D.C. A regenerative stormwater conveyance (RSC), also known as a coastal plain outfall, is a specialized type of low impact development technique that uses stream restoration techniques to create a dependable open channel conveyance with pools and riffle-weir grade controls to create a system of physical features, chemical processes, and biological mechanisms that greatly reduce erosive forces and positively impact the ecology of a drainage area. The RSC installations will reduce erosion and decrease pollutants reaching Rock Creek by slowing down and infiltrating

stormwater runoff from Oregon Avenue. These projects are a unique partnership between the District and the National Park Service (NPS) to control stormwater from District lands while restoring intermittent streams on NPS land.
See Uncovering the History of the District's Buried Streams (arcgis.com)

Nash Run Upland LIDs
Green Infrastructure Right of Way Retrofit

Objective
Install stormwater volume reduction and water quality best management practices in the subwatershed's right-of-way to protect and improve Nash Run, a DOEE priority watershed.

Outputs
- Designs and permits
- Permeable pavement and alleys
- Bioretention basins
- Tree plantings
- Other impervious surface removal

Stream and Habitat Restoration | ddoe (dc.gov)

Pope Branch Stream Restoration Project | ddoe (dc.gov)
Pope Branch Regenerative Stormwater Conveyances:
At three different locations DDOE installed regenerative stormwater conveyances to help catch and filter stormwater run-off from the streets that drain into the Pope Branch tributary of the Anacostia River. A regenerative stormwater conveyance (RSC), also known as a coastal plain outfall, is a specialized type of low impact development technique that uses stream restoration techniques to create a dependable open channel conveyance with pools and riffle-weir grade controls to create a system of physical features, chemical processes, and biological mechanisms that greatly reduce erosive forces and positively impact the ecology of a drainage area. The RSC installations will reduce erosion and decrease pollutants reaching Pope Branch and the Anacostia River by slowing down and infiltrating stormwater runoff from streets along Pope Branch. This project was implemented using American Recovery and Reinvestment Act (ARRA) funding and was a partnership between DDOE and the District Department of Parks and Recreation (DPR).

Two large LID [low impact development] retrofits on M Place in Southeast DC treat stormwater runoff from the street prior to it entering nearby Pope Branch.
Habitat Restoration - Stream Restoration Projects | ddoe (dc.gov)

Watts Branch Stream Restoration:
The District Department of the Environment, the U.S. Fish and Wildlife Service and the Natural Resources Conservation Service of USDA completed a restoration project for the Watts Branch tributary of the Anacostia River in Washington, DC from Southern Avenue to Minnesota Ave. NE. The stream restoration project used Natural Channel Stream Design (NCD) practices over a 1.7 mile stretch of stream on District property. Through the natural channel design method a series of in-stream structures were installed (cross vanes, j-hooks, and vane arms) to keep the high velocity flows in the center of the stream channel thus minimizing erosive forces on the stream banks. NCD also creates a series of pools and riffles that both create areas for fish habitat and offer grade control on the stream. In addition to the in-stream work the project also entailed the creation of bankfull benches for energy dissipation during high flow events further reducing bank erosion. The final component of the project was to plant thousands of trees and shrubs along the stream corridor to increase the riparian area along the stream.

Habitat Restoration - Stream Restoration Projects | ddoe (dc.gov)

The project will reduce stream bank erosion, improve water quality, and restore aquatic habitat. Estimates show that this stream project will help reduce total suspended solids (TSS) in Watts Branch by 51,000lbs/yr, nitrogen (N) by 400lbs/yr, and phosphorous (P) by 70lbs/yr. Through the aforementioned water quality improvements coupled with in-stream structures and an improved riparian corridor DDOE anticipates an improvement in aquatic species over the

ensuing years. In the years to come DDOE will be actively monitoring the stream to look for an increase in macro-invertebrates, improvements in water quality, and changes in geomorphology.

Stream restoration is one part of a multi-agency, collaborative effort to improve water quality of the Watts Branch watershed and the Anacostia River. Other projects include rehabilitating sanitary sewers, constructing stormwater management facilities, and reducing the amount of stormwater runoff from impervious areas.

Broad Branch Stream Restoration:
This project began in February 2014 and was completed in October of 2014. The goal of the effort was to daylight a 1,600 foot portion of Broad Branch, a tributary to Rock Creek in Northwest DC. … Daylighting this section of the Rock Creek watershed will improve water quality at the location and downstream water quality by exposing water to sunlight, air, soil, and vegetation, all of which help process and remove pollutants. Furthermore its restoration reduces nutrient and sediment pollution from erosion caused by fast flowing stormwater by creating meanders and floodplain wetlands which will have wider cross-section and a greater channel depth than the pipe it will replace. Additional surface flow from adjacent streets and rooftops was directed to the area by creating curb cuts and redirecting storm sewers to area further slowing, cooling, and filtering stormwater in the subwatershed.

There were four governmental agencies involved in this project, the Department of the Environment (DDOE), the Department of Transportation (DDOT), the District of Columbia Water and Sewer Authority (DC WASA), and the National Park Service (NPS).

The old channel can be still be seen even though the source of the stream was diverted in the 1930s.

Celebration of the Completion of the Broad Branch and Linnean Park Stream Restoration Projects | ddoe (dc.gov)

Nash Run:
Nash Run is located in northeast Washington, DC, and is a first-order tributary of the Anacostia River. The headwaters of the stream are located in Prince George's County, Maryland, but 75% of the watershed is within the borders of the District. The stream is piped beginning in Prince George's County and outfalls east of Kenilworth Avenue in northeast DC. The Nash Run sewershed encompasses a 229-acre area in the District, 112 acres (49%) of which is impervious. The stream has an estimated normal flow of two cubic feet per second.

The heavily urbanized character of the Nash Run watershed, and its consequent imperviousness, result in flashy and intense stream flows, even during the most moderate of storms. Considerable amounts of trash and debris wash out of the storm sewer system during rain events, choking portions of the stream and causing areas for ponding and mosquito breeding. The resulting hydrologic alterations have deteriorated the water quality of Nash Run and degraded natural habitat downstream of the outfall. A study on trash in the Anacostia River estimated that Nash Run produces approximately 3% of the total trash from the District that washes into the Anacostia River. Beginning in 2011, DDOE funded the design of a system to capture trash and sediment at the end of the storm sewer system as well as the restoration designs for an 800-foot section of the stream valley using natural channel stream design techniques. DDOE planned to implement these designs in 2013.

Installing the end of pipe BMP coupled with stream restoration at Nash Run will improve water quality in the stream, improve the general appearance of the stream, reduce sediment and floatable pollution, and will improve conditions for terrestrial and aquatic life along the stream corridor. Once work is finally complete the stream will not only be an environmental improvement but will also be an aesthetic asset for the community that surrounds Nash Run.

NASH RUN STREAM CONDITION PRIOR TO RESTORATION
PHOTO SOURCE: DOEE

NASH RUN STREAM CONDITION POST-RESTORATION
PHOTO SOURCE: DOEE

FIGURE 6-6: STREAM RESTORATION PRE AND POST CONSTRUCTION PHOTOS

Project Description_Nash Run Restoration_0.pdf (dc.gov)

Figure 4. Stream Daylighting Projects in Design:

Pope Branch Stream Restoration and Sewer Line Replacement:

Located in southeast Washington, DC, Pope Branch is a 1.6-mile first-order tributary of the Anacostia River. The entire stream lies within DC city boundaries. The primary land uses of the 250-acre watershed are parkland and residential lands. Pope Branch is listed on the 303-D List for bacteria, organics, and metals.[13] The primary sources of pollutants are stormwater runoff from yards, streets, and

[13] Section 303(d) of the federal Clean Water Act and regulations developed by US EPA require states to prepare a list of waterbodies or waterbody segments that do not meet water quality standards even after all the pollution controls required by law are in place.

parking lots as well as an aging sanitary sewer that runs along the stream. This project has multiple components, all of which will work toward improving the water quality of Pope Branch. DDOE, DCWASA, and the District Department of Parks and Recreation have partnered on a stream restoration and sewer replacement project in the Pope Branch tributary of the Anacostia River. Located in Southeast, Pope Branch parallels Massachusetts Ave. and Pennsylvania Ave. SE and lies in a watershed that is predominantly single family homes. Due to high volume and velocity stormwater flow that enter the stream substantial back erosion has compromised the stream banks and has exposed the sewer line in several areas. Additionally, DDOE has funded the construction of several LID storm water retrofits to begin addressing the issue of untreated storm water runoff in this subwatershed. DDOE has worked with a small citizens group, the Pope Branch Alliance, to help organize of neighborhood activities such as trash clean ups.
Flowing sewer line work which will bury the sewer line deeper under the existing stream the stream itself will be restored using base flow channel design. After years of the stream incising and becoming disconnected from its natural floodplain, [it] will be reconnected to its floodplain which will help dissipate the energy of water in the stream by allowing it to spread out into the floodplain. A series of weirs and step pools will also help reduce the in-stream erosive forces while also creating areas for increased habitat. The project will create a healthy floodplain forest.

The Penn Branch community lies within the Pope Branch watershed and was the pilot community for DDOE's RiverSmart Homes program. As the pilot neighborhood, trees, rain barrels, and rain gardens were installed at homes throughout the Penn Branch community to help catch, slow, and filter the stormwater that runs-off of residential properties ending up in the Pope Branch stream.

Habitat Restoration - Stream Restoration Projects | ddoe (dc.gov)

Springhouse Run Stream Restoration:
Springhouse Run is a remnant of one of the original tributaries to Hickey Run, a tributary of the Anacostia River, with a drainage area of approximately 100 acres. The majority of the tributary is stable, although it is highly altered and armored in most areas. The armoring has resulted in a stream with poor habitat value and very limited ability to trap sediment and uptake nutrients.

The Watershed Protection Division is coordinating the design of a stream and habitat restoration for Springhouse Run. The stream will be reconnected to its historic floodplain and its sinuosity will be restored. This project reach measures approximately 1,600 feet in length and lies entirely within the U.S. National Arboretum. DDOE is partnering with the U.S. Department of Agriculture, Agricultural Research Service, which owns Arboretum, to complete this project.

An additional component of this project is to construct a bioretention facility in the circular drive at the entrance to the Arboretum Visitor Center and additional bioretention facilities in the Visitor Center parking lot at the R Street entrance to the Arboretum.

Park Drive Gullies & Stream Restoration Project | ddoe (dc.gov)

Project work will happen in the forested area north of Park Drive which is owned by the National Park Service.

Project Status: The Park Drive Gully Restoration Project is presently in the Design Phase.

Project Overview: DOEE recently awarded a design-build contract to Biohabitats, Inc., to design and build a stream restoration project along Park Drive in SE D.C. There are two severely eroded gullies at the site (Site 1: off of Park Drive between 32nd Pl. SE & Branch Ave. SE; Site 2: off of Park Drive near the intersection with 30th St. SE) that will be restored so that they are stable, minimize erosion, and improve the environmental health of the project area. Project work will also help improve water quality conditions in the Anacostia River, the Potomac River, and the Chesapeake Bay.

Project Objectives:

1. Reduce streambank erosion and channel bed incision to provide long-term stream stability and downstream water quality benefits;
2. Avoid or minimize impacts to natural resources in the Project Area;
3. Stabilize 5 stormwater outfalls;
4. Reduce stormwater velocities that enter the stream channels; and
5. Improve in-stream and riparian habitat conditions

Figure 5. Wetlands. **There are four wetland subtypes**:

1. Palustrine forested wetland (PFO), non-tidal wetland dominated by trees, e.g., in Fort Stanton Park.

Fort Stanton Park Wetland-BJ

DOEE, *Wetland Conservation Plan* (2020) pp. 8-10. District Wetland Conservation Plan 2020.pdf

2. Palustrine scrub shrub wetland (PSS), 2% of all wetlands.[14] No photograph available.
3. Palustrine unconsolidated bottom (PUB) wetland (e.g., ponds) (non-tidal wetlands characterized by a lack of large stable surfaces for plant and animal attachment). E.g.,

[14] **Scrub-shrub wetland** – a class of wetlands dominated by woody vegetation three (3) feet to twenty (20) feet tall, including tree shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions, but excluding woody vines. 21 DCMR 2699.1

Anacostia River Gateway, Rock Creek.

Anacostia River Gateway wetland IH is a palustrine unconsolidated bottom wetland. (Defined as non-tidal wetlands characterized by a lack of large stable surfaces for plant and animal attachment.)

DOEE, *Wetland Conservation Plan* (2020) pp. 8-10. District Wetland Conservation Plan 2020.pdf

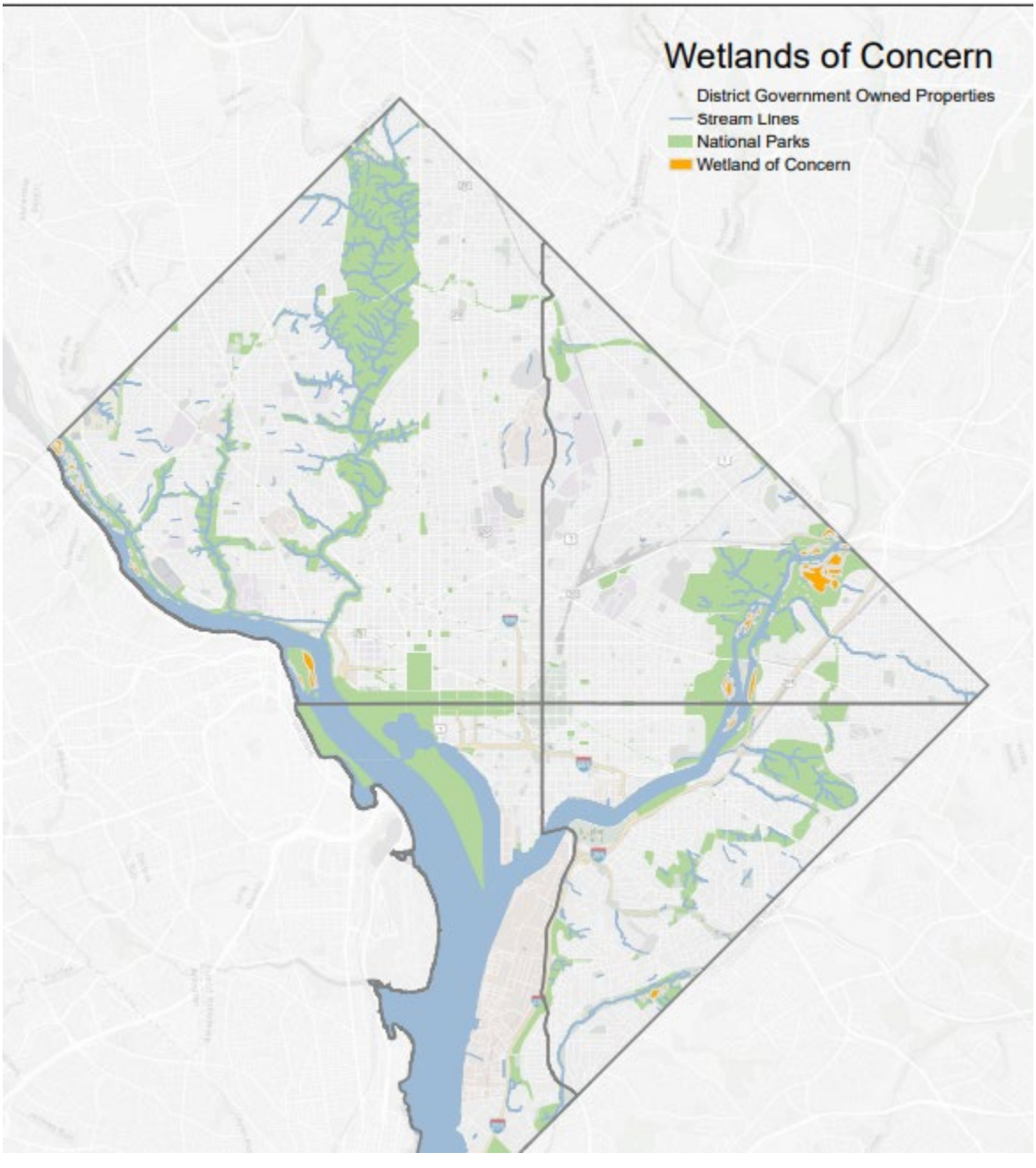
4. Palustrine emergent wetland (PEM), (non-tidal wetlands dominated by emergent plants.) e.g., Oxon Run, wetland O, Rock Creek wetland KF.

Oxon Hill wetland O is a palustrine emergent wetland. (Defined as non-tidal wetlands dominated by emergent plants.)

PFO, PSS, and PEM classifications include all nontidal wetlands dominated by trees, shrubs, persistent emergent plants, emergent mosses, or lichens. PUB wetlands are characterized by a lack of large stable surfaces for plant and animal attachment**.**

DOEE, *Wetland Conservation Plan* (2020) pp. 8-10. District Wetland Conservation Plan 2020.pdf

Figure 6. Wetlands of concern. DOEE, *Wetland Conservation Plan* (2020), p. 242.



Wetlands are irreplaceable features of the District's natural landscape. Given the District's history of extensive wetland loss by filling, dredging, seawall construction, and urbanization, preservation of the remaining natural wetlands for present and future generations is encouraged to preserve biodiversity. ... Wetlands that provide exceptional ecological functions and values such as habitat for species of greatest conservation need, spring-fed wetlands, or wetlands that are unique to the District (e.g., magnolia bogs), could be designated for special protection under the District's future wetland regulations.

Figure 7. Wetland restoration projects. Completed and planned projects.

Direct quotes from DOEE, *Wetland Conservation Plan* (2020).

I. Completed Wetland Projects:

Kingman Lake Wetland Restoration:
Habitat Restoration - Wetland Restoration Projects | ddoe (dc.gov)

This project was completed in 2000 in partnership with the US Army Corps of Engineers (USACE). The goal of this project was to restore over 40 acres of freshwater tidal wetlands in the Kingman Lake area in order to increase plant and animal diversity and improve the filtering capacity of the Anacostia. Monitoring was conducted by the United States Geological Survey (USGS) for five years and was analyzed in the context of other wetlands that have been restored in Kenilworth Park. Funding for this project was cost shared by the USACE and DDOE.

Habitat Restoration - Wetland Restoration Projects | ddoe (dc.gov)

River Fringe Wetland Restoration:
Fringe Report for the 2003-07 Monitoring Program [PDF]
The goal of this project was to restore 17 acres of freshwater tidal wetlands along the shores of the Anacostia River adjacent to Kingman Island. As with the Kingman Lake wetlands, these wetlands will increase the number of beneficial plants and fish in the river and will improve water quality of the Anacostia River. Construction was completed in the fall of 2003. Monitoring is being conducted by DDOE and USGS and will continue for a total of five years. The funding for this project was cost shared by the USACE and DDOE.

This picture of the river fringe project was taken from the Benning Road Bridge. The yellow flower is the prolific Bidens laevis.

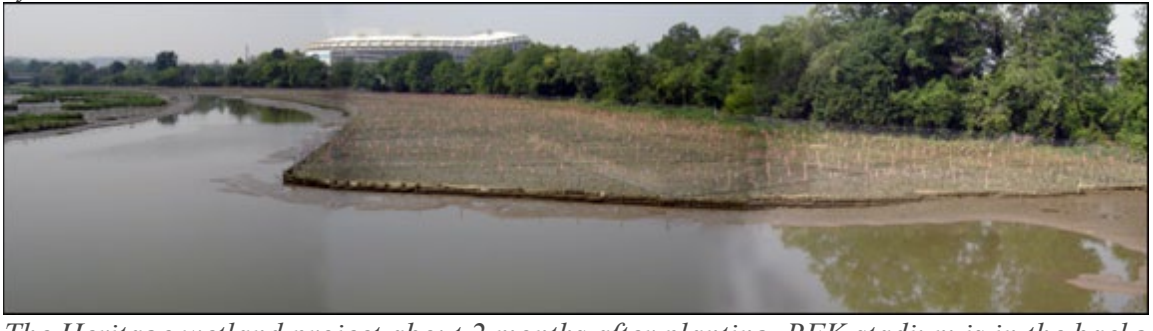
These pictures of the River Fringe wetlands shortly after planting.
Turtles and wading birds are already using the wetlands for habitat.
Habitat Restoration - Wetland Restoration Projects | ddoe (dc.gov)

Heritage Wetland Restoration Project:

Left: Newly planted shrubs in the summer of 06. Right: DDOE staff monitoring the vegetation twice a year.
Stream and Habitat Restoration | ddoe (dc.gov)

The goal of this project was to create six acres of high to mid freshwater marsh in Kingman Lake. The species of plants planted included a high percentage of shrubs such as Button Bush (Cephalanthus occidentalis), Swamp rose (Rosa palustris), Marsh mallow (Hibiscus moscheutos) and other mid marsh species that are generally non palatable to the high number of exotic, non-native resident Canada geese that reside in the area. An additional goal of this project was to create tidal guts adjacent to the wetland cells for fish and non-motorized water craft passage. This project was completed in 2006 and funding was shared by DDOE and USACE. Monitoring is being conducted by DDOE and USGS.

Native hibiscus shrubs bring color to the Heritage wetland. The Pepco power facility is very close by.



The Heritage wetland project about 2 months after planting. RFK stadium is in the background.

Habitat Restoration - Wetland Restoration Projects | ddoe (dc.gov)

II. Planned wetland projects in design

Park Drive Gullies & Stream Restoration Project
This project will restore 2 severely eroded gullies so that they are stable, minimize long term erosion, and improve the environmental health of the project area and surrounding waterbodies.

Pope Branch Stream Restoration and Sewer Line Replacement:
Located in southeast Washington, DC, Pope Branch is a 1.6-mile first-order tributary of the Anacostia River. The entire stream lies within DC city boundaries.

Nash Run:
Nash Run is a first-order tributary of the Anacostia River. The headwaters of the stream are located in Prince George's County, Maryland, but 75% of the watershed is within the borders of the District.

Springhouse Run Stream Restoration:
Springhouse Run is a remnant of one of the original tributaries to Hickey Run, a tributary of the Anacostia River, with a drainage area of approximately 100 acres. Read more>>

Figure 8. Wetlands and potential wetland sites.
Five potential creation sites were located on public land (14%; four on Federal government land and one on District government land) and four were located on private land (11%). NPS owns the majority (75%) of the land where potential creation sites were identified, of which 19 are located within the National Capital Parks-East National Park and 8 are located within the Rock Creek Parkway National Park. DOEE, *Wetland Conservation* Plan (2020), 2.2.4 Potential Wetland Creation Sites within the District.

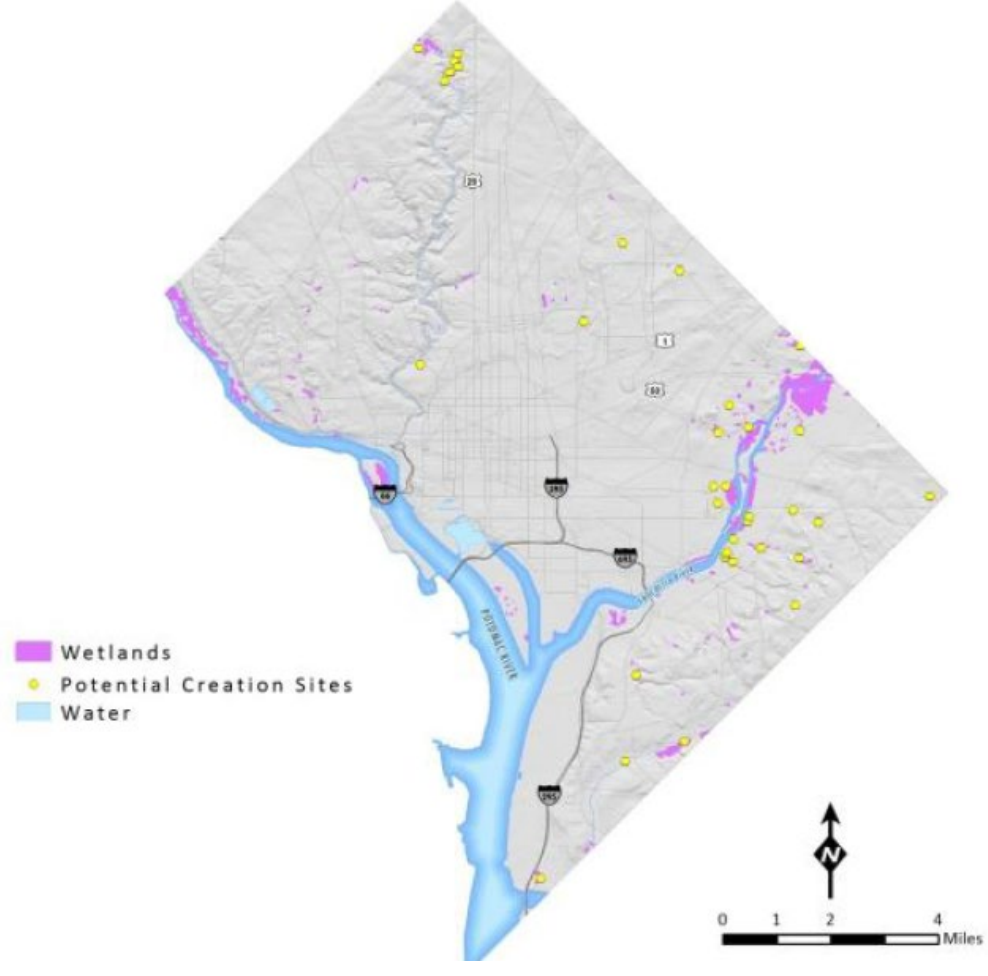


Figure 9. Potential wetland sites by ownership. Five potential creation sites were located on public land (14%; four on Federal government land and one on District government land) and four were located on private land (11%). NPS owns the majority (75%) of the land where potential creation sites were identified, of which 19 are located within the National Capital Parks-East National Park and 8 are located within the Rock Creek Parkway National Park. DOEE, *Wetland Conservation* Plan (2020), Figure 2-24 2017 potential wetland creation sites by ownership type.

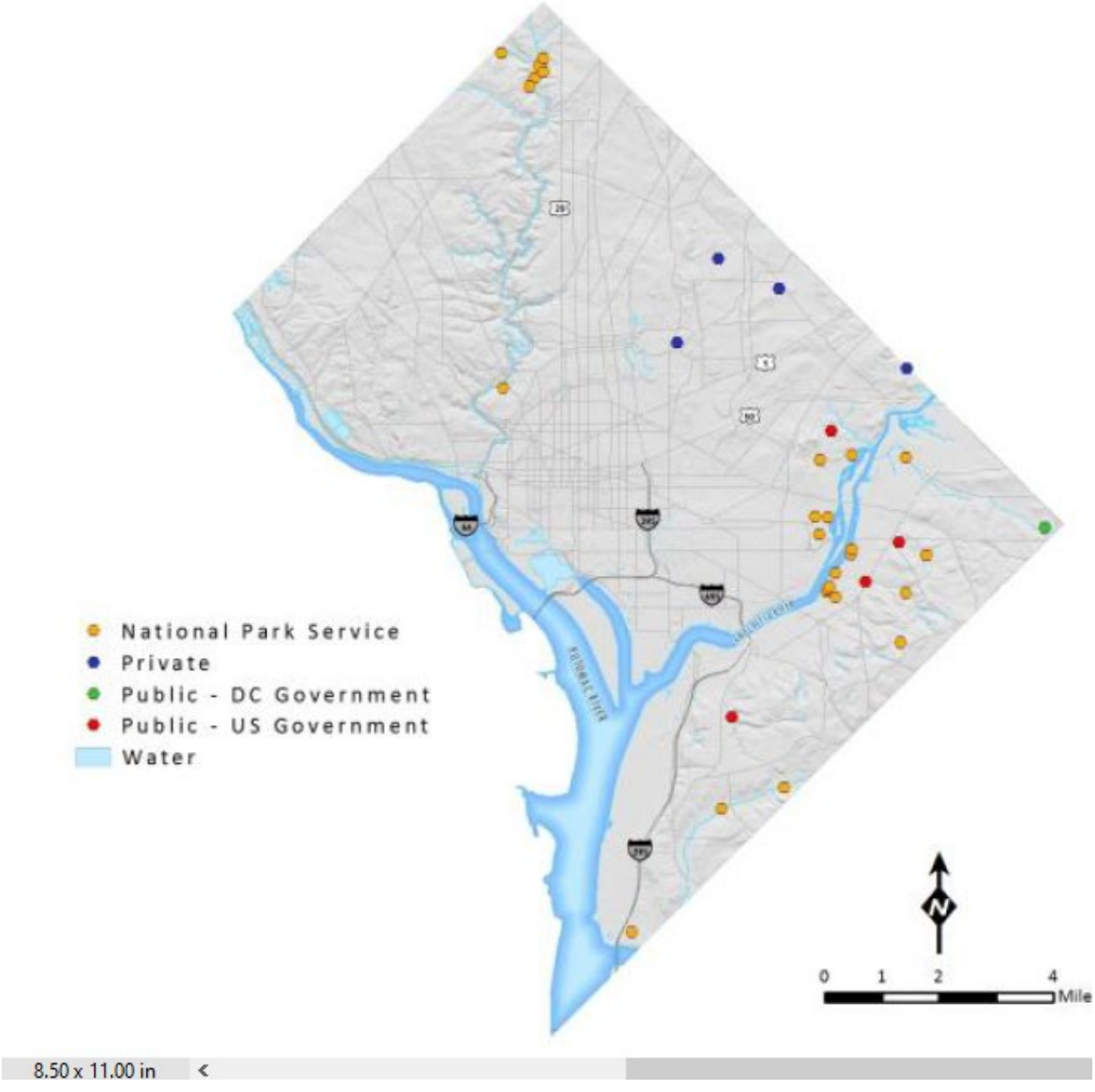


Figure 10. DOEE, *Chesapeake Watershed Implementation Plan Phase III* (2019), figure 4.1

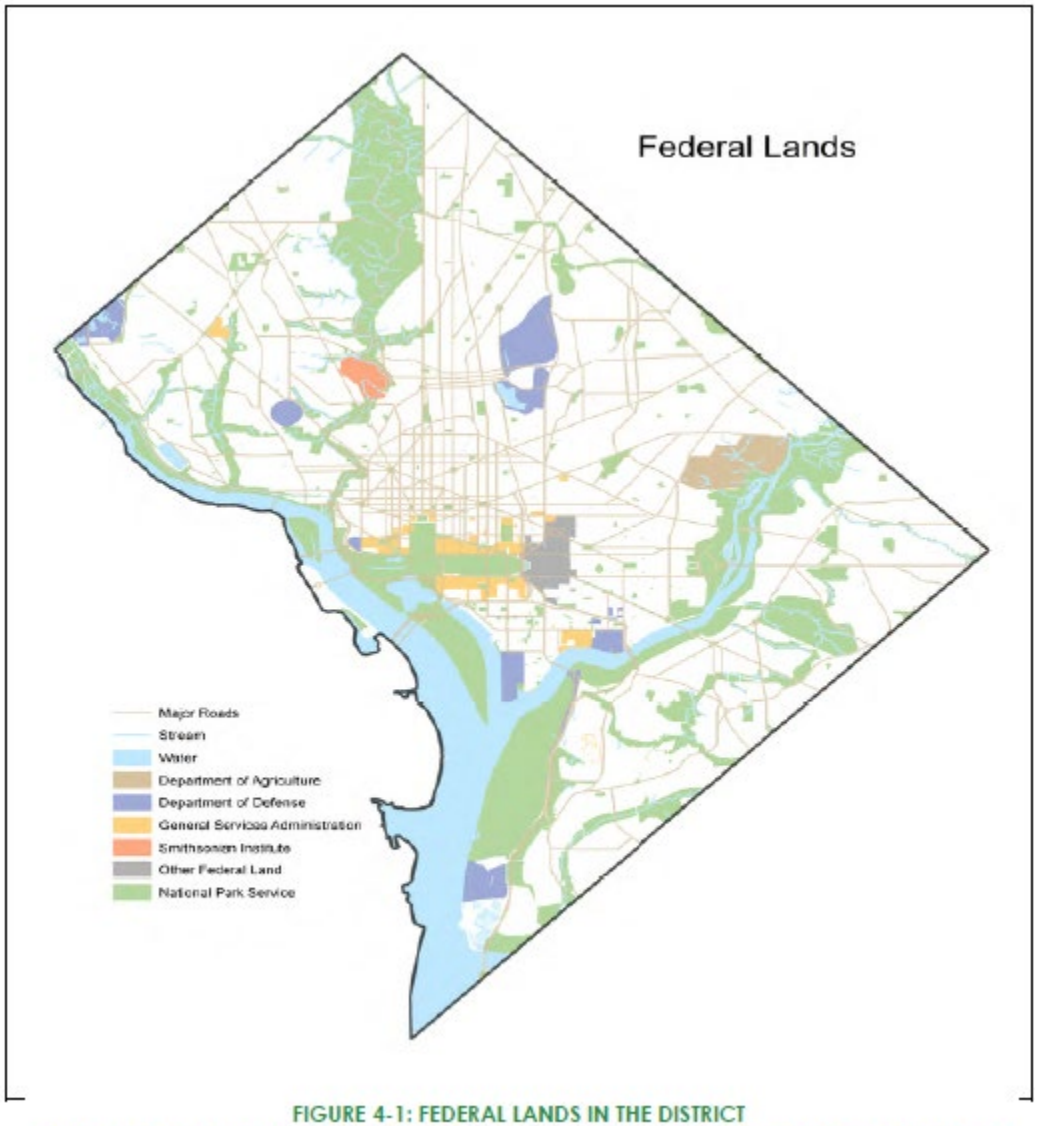


FIGURE 4-1: FEDERAL LANDS IN THE DISTRICT
SOURCE: FEDERAL LAND OWNERSHIP DATA USED IN THE PHASE 6 CHESAPEAKE BAY PROGRAM WATERSHED MODEL

Table F-4.1: NPS Land and Acreage in DC

Chesapeake and Ohio Canal NHP	Chesapeake and Ohio Canal NHP	315
George Washington Memorial Parkway	George Washington Memorial Parkway	118
George Washington Memorial Parkway	Lyndon Baines Johnson Memorial Grove	18
George Washington Memorial Parkway	Theodore Roosevelt Island National Memorial	100
National Capital Parks - East	Anacostia Park	756
National Capital Parks - East	Carter G. Woodson NHS	0.2
National Capital Parks - East	Fort Dupont Park	343
National Capital Parks - East	Frederick Douglass NHS	8.4
National Capital Parks - East	Mary McLeod Bethune Council House National Historic Site	0.1
National Capital Parks - East	National Capital Parks - East	1,031
National Mall and Memorial Parks	Ford's Theater NHS	0.3
National Mall and Memorial Parks	National Mall and Memorial Parks	803
National Mall and Memorial Parks	National Mall	143
National Mall and Memorial Parks	Washington Monument National Memorial	104
National Mall and Memorial Parks	Pennsylvania Avenue NHS	20
National Mall and Memorial Parks	Belmont-Paul Women's Equality National Monument	0.4
Rock Creek Park	Rock Creek Park	2,820
President's Park (White House)	President's Park (White House)	77
Total NPS Lands in DC		**6,657**

The following Department of Defense (DoD) installations are located within the jurisdictional boundaries of Washington D.C.

- Army Reserve National Guard (DC)
- Joint Base Myer-McNair (Fort McNair)
- Joint Base Anacostia – Bolling
- Marine Barracks Washington
- Naval Research Laboratory (HQ)
- Naval Support Activity Washington - Naval Observatory
- Naval Support Activity Washington - Washington Navy Yard
- US Soldiers' and Airmen's Home National Cemetery

US Department of Agriculture

U.S. National Arboretum

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