CITY OF
HYATTSVILLE

LOWER WARD 1 RESILIENT STORMWATER SYSTEMS PLANNING STUDY

March 2020

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PREPARED FOR

City of Hyattsville, MD

PREPARED BY

Low Impact Development Center, Inc. and Weston and Sampson

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Introduction

The City of Hyattsville initiated a stormwater infrastructure systems analysis in 2018 with funding from the Maryland Department of Natural Resources (DNR) Community Resiliency Grant Program. The objective was to take a portion of the City where redevelopment is less prevalent, evaluate its existing stormwater infrastructure, and identify potential green and gray stormwater infrastructure improvements to manage flood risks and improve water quality.

Heavy downpours are increasing in frequency and intensity. Some of the largest increases are being observed in the Midwest and Northeast United States. Heavy downpours are expected to intensify as global temperatures rise, increasing the risk of flooding.[1] It is the City's intent to identify sustainable, effective approaches to address current and emerging stormwater-related issues that complement the City's overarching sustainability themes.[2]

Location

This project was conducted in lower Ward 1 (see Figure 1). The study area is 168 acres. It includes the Hyattsville Department of Public Works (DPW), the CSX railroad, and some older neighborhood communities with dead-end roads (see Figure 2). DPW and the surrounding area lie near the confluence of the Northeast and Northwest branches of the Anacostia River. Existing gray stormwater infrastructure is limited, and localized flooding can occur during and after storm events. Excess

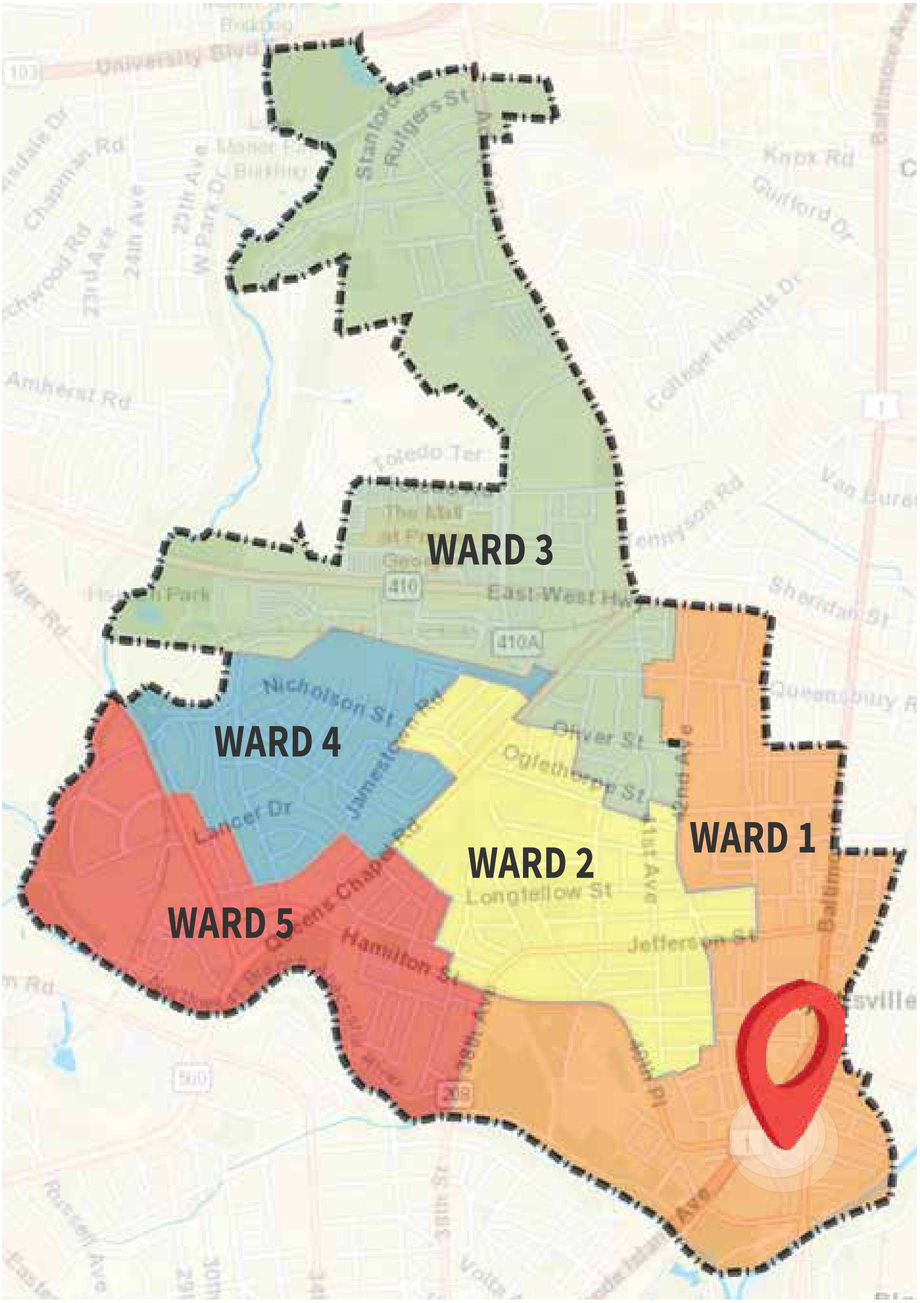


Figure 1. Lower Ward 1 project location

Figure 2. Project area boundaries

stormwater runoff from this area has a direct path to the river, where it enters untreated, without the benefit of water quality management.

Stormwater Management

The study area encompasses a section of Hyattsville that drains toward the existing municipal, County, and State-owned stormwater infrastructure systems in lower Ward 1. This system of inlets, gutters, roadside ditches, drains, and underground pipes compose the City's "gray" infrastructure that is designed to carry water away from the built environment during and after rain events. Any water that does not soak into the ground flows into the stormwater infrastructure system and then into the Anacostia River.

"Green" infrastructure, in contrast to gray infrastructure, is a stormwater management approach that slows down, reduces, and treats stormwater where it falls. Green infrastructure practices mimic natural systems using vegetation, soils and other elements. Examples include rain gardens, permeable pavement, bioswales and submerged gravel wetlands.[3]

In Prince George's County, the Department of the Environment (DoE) has been actively retrofitting developed areas of the County that have little or no stormwater management with green infrastructure to keep harmful pollutants out of waterbodies.[4] Green infrastructure can also be strategically used in areas impacted by localized flooding to help reduce peak flow rates, preventing water from overwhelming pipe networks and pooling in streets. An integrated flood risk management approach includes a combination of gray and green solutions.

GREEN AND GRAY INFRASTRUCTURE OPTIONS

Identified Green Infrastructure Opportunities

Green infrastructure uses native plants, soils, and natural processes to improve water quality. Strategically integrating these practices at multiple locations has the potential to alleviate localized flooding by minimizing runoff volume and peak discharges. Green infrastructure opportunities considered in this evaluation for their applicability and appropriateness at particular locations are summarized below.

Bioretention. Bioretention captures stormwater runoff and allows it to slowly infiltrate through soil media. It provides water quality benefits by removing pollutants as the water flows through the soil and/or is taken up by native plants. Treated water may be routed back to the storm drain system. Bioretention can be integrated into areas like roadway medians, roadsides, or parking lot edges to directly treat runoff from impervious surfaces.

Bioswale. A bioswale is similar to bioretention. The primary difference is that it allows stormwater to flow through it instead of pooling. A bioswale is often linear in shape and is well suited for narrow areas. Native plants provide aesthetic and wildlife value.

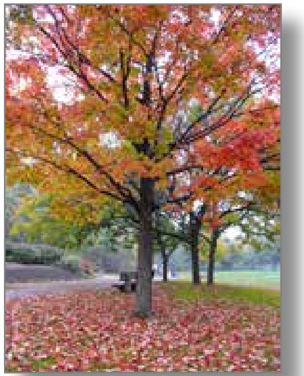
Infiltration Trench. An infiltration trench is a channel filled with layers of gravel, sand, and soil designed to capture and filter stormwater runoff. It helps remove pollutants and allows water to slowly soak into the underlying soil. An infiltration trench can be constructed in a variety of shapes but is often designed to fit into narrow, linear spaces.

Permeable Pavement. Permeable pavement is used to pave bikeways, walkways, and low-traffic parking areas and streets. It allows water to flow through it instead of running off. It can be made of interlocking pavers (pictured at right) specially designed to allow water through gaps, or as porous asphalt or pervious concrete engineered to maintain a strong surface while allowing water to flow through.

Pocket Wetland. A pocket wetland is a shallow, constructed wetland designed to treat stormwater runoff and filter pollutants from a small drainage area. They are suitable for areas where a high water table or groundwater can help replenish a shallow wetland pool during hot, dry weather.

Submerged Gravel Wetland. A submerged gravel wetland is an engineered facility designed to mimic the plant and microbial benefits of a natural wetland. These facilities are suitable for wet areas with poorly draining soils and act as a filter for pollutants before water is discharged into the existing stormwater management system.

Urban Tree Planting. Urban trees help reduce stormwater runoff. Their canopies intercept rainfall before it hits the ground, preventing some stormwater problems before they start. Trees slow rainfall speed, reducing the damage runoff can cause. Their extensive root systems can take up large volumes of water, and trees and vegetation help keep neighborhoods cooler. Trees are not suitable in every situation, as they need space and care to keep healthy.



Identified Gray Infrastructure Opportunities

Gray infrastructure systems play an important role in reducing flood risks to communities in managing stormwater as well as small to large flood events. Several gray infrastructure improvement opportunities were identified through this project to alleviate local urbanized flooding and/or address specific water quality concerns.

Culvert. A culvert allows water to flow underneath roads, bridges, and trails. Clogged and/or undersized culverts can become "pinch points" during rain events, causing channels to overflow their banks. Having adequately sized culverts that are regularly maintained is important for managing large storm events.

Curb and Gutter. Curb and gutter is designed to collect and concentrate water along a street or other paved area before being directed into the storm drain system. Installing and/or raising the height of the visible curb in areas along Rhode Island and Baltimore Avenues will help alleviate localized flooding by directing the water away from adjacent properties and into green infrastructure areas and other stormwater devices.

Outfall Protection. A storm drain outfall is the point where a storm drain pipe or channel discharges stormwater runoff to a waterbody. Damaged outfalls are stabilized or improved through rip-rap, bioengineering techniques and/or vegetation. This reduces the amount of local flooding and of sediment and erosion in downstream channels and wetlands.

Storm Drain Insert. A storm drain insert is a device placed in a storm drain inlet to filter stormwater runoff. Depending on their design, they can capture solid debris and/or smaller pollutants like sediment. With regular maintenance to prevent blockage, they are a relatively simple and cost-effective way to prevent polluted runoff and litter from entering the storm drain system and eventually reaching waterways.

Stormwater Plunge Pool. A plunge pool is an excavated "pool" that can be placed at the end of a storm drain pipe or man-made channel to slow down the speed at which water is flowing. This protects the channel from erosion and allows sediment to settle out of the stormwater. This can simplify regular cleanout operations by encouraging sediment to settle in one place.

STUDY AREA CONTEXT

Lower Ward 1

Hyattsville's population is growing.[5] The lower Ward 1 study area's population was an estimated 864 people in the year 2010, up from 638 in the year 2000.[6] The combination of an increase in heavy rainfall events and population growth means that more people are likely to be affected by flood events. The following summarizes existing conditions that influence the ability to build climate change resilience through improved stormwater management.

Land Uses

The study area includes a mix of properties classified as residential, commercial, mixed use, and industrial. Stormwater runoff from two facilities – the Hyattsville Department of Public Works and Washington Air Compressor Rental – is regulated under the State's industrial general permit. This means that the facilities have operations defined as industrial activities by the State and, as such, require site-specific plans and control measures in place to reduce or eliminate those pollutants being carried into waterways.

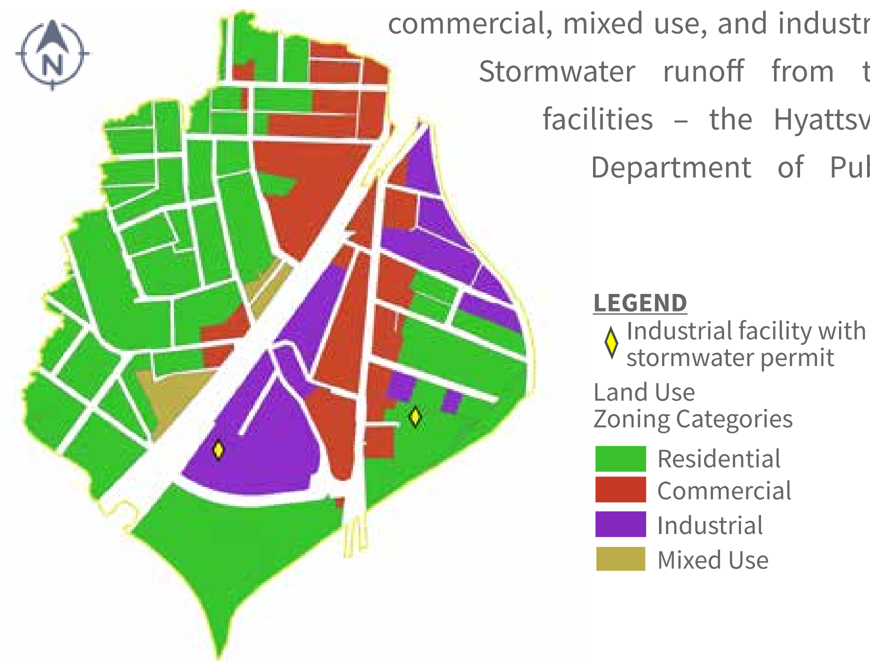


Figure 3. Land use classifications and facilities with industrial stormwater permits

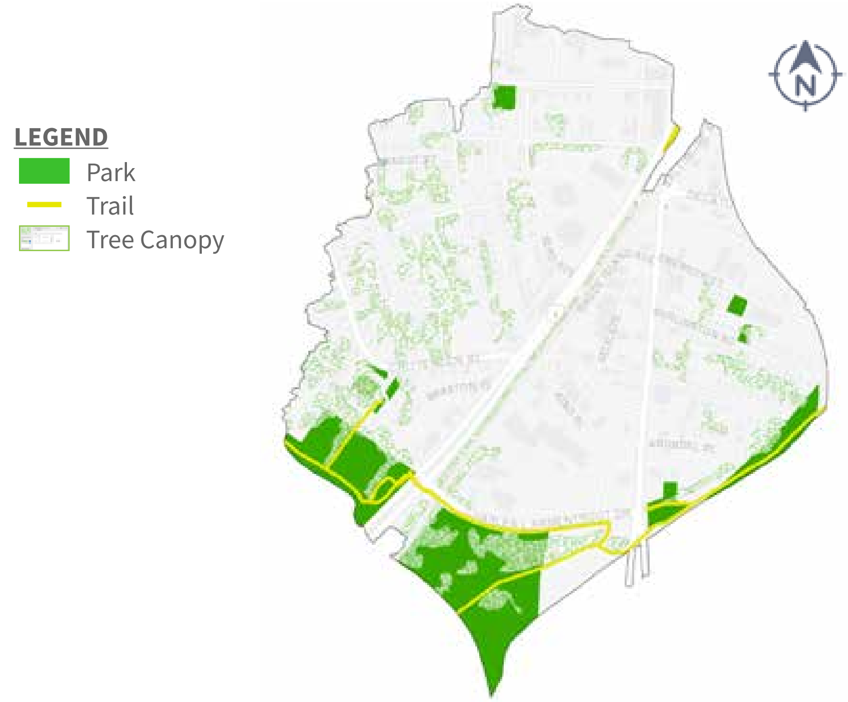


Figure 4. Existing parks, community spaces, trails, and urban tree canopy

Urban Tree Canopy, Green Spaces, and Trails

Trees provide multiple benefits to those who work and live near them. They reduce summer peak temperatures, air pollution, and stormwater runoff and improve social ties and community aesthetics.[7] In Prince George's County, the urban tree canopy is defined as

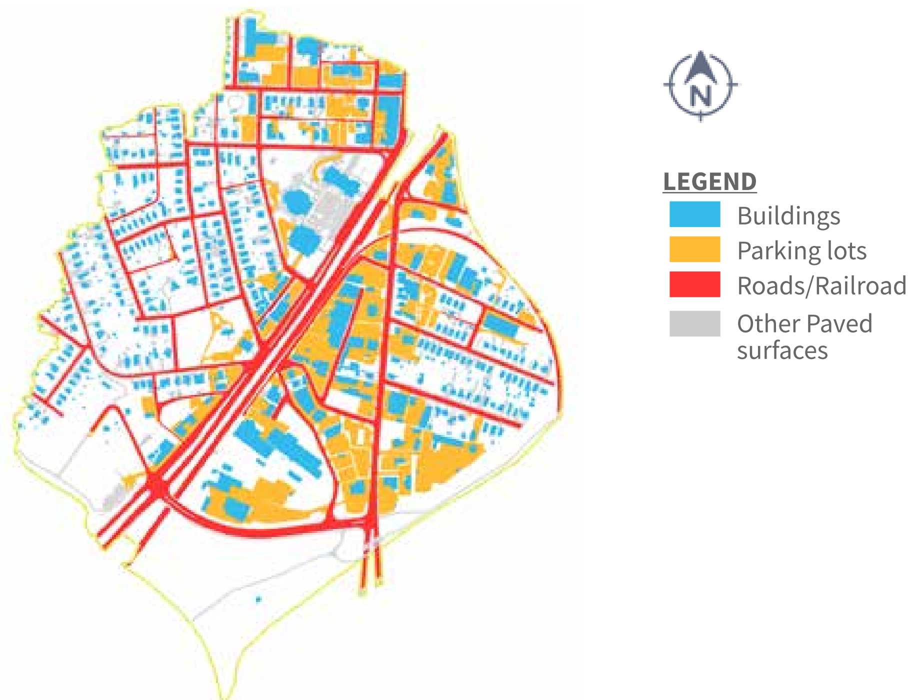


Figure 5. Buildings, parking lots, roads/railroads, and other impervious areas

woodlands greater than 5,000 square feet or one tenth of an acre when viewed from above.[8] About 12% of the study area contained urban tree canopy in 2017 as compared to 20% City-wide.

Several City and County parks and green spaces are located in the study area. These include the Robert J. King Memorial Park located at Gallatin Street at 42nd Place; Burlington Park at 46th Avenue and Burlington Road; the Emerson Street Food Forest located at Emerson Street and 46th Avenue; Melrose Park on Rhode Island at 41st Street; and the Anacostia River Stream Valley Park along the waterfront. A collection of trails run primarily through the Stream Valley Park and a parcel owned by the Washington Suburban Sanitary Commission.

Impervious Areas

Fifty-three percent of the study area is covered by hard (impervious) surfaces such as roads, buildings, parking lots, and sidewalks that don't allow water to soak into the ground (Figure 5). Instead, the water rapidly accumulates in the form of stormwater runoff. Increased impervious cover is associated with increased stream bank erosion, increased flooding, and decreased water quality.

Based on 2017 data,[9] buildings make up 28% of all impervious areas; parking lots 29%; roads/railroads 29%; and other paved surfaces such as sidewalks, driveways, and plazas make up the remaining 14%.

Transportation Network

The study area is bisected by two State roads: Rhode Island Avenue (Route 1) and Baltimore Avenue (Alt-Route 1). Charles Armentrout Road and Decatur Street are County roadways. The remainder of the streets are owned and operated by the City of Hyattsville. Public transportation includes WMATA bus routes and two County "The Bus" routes. Recreational trails include the Northwest Branch Stream Valley Trail and the planned Rhode Island Avenue Trolley Trail.

Storm Drain System

Much of Hyattsville was built before stormwater management was required or modern drainage criteria were established. The storm drain infrastructure that does exist is aging. Many of the storm drain pipes and culverts that were installed between 1960 and 1990 are between 30 and 60 years old. The storm drain infrastructure along Rhode Island Avenue (Route 1) and Baltimore Avenue (Alt-Route 1)

– shown in red in Figure 6 – is owned and operated by the State. The infrastructure shown in orange was primarily installed by the Washington Suburban Sanitary Commission between 1960 and 1990. Its ownership has since transferred over to the County. Some additional storm drain infrastructure that exists within the study area has not been inventoried and is not shown. Recommended stormwater improvements outlined in this study that impact the storm drain infrastructure operated and maintained by the State or County require their cooperation, as the City lacks the authority to modify these systems. Efforts to complete the inventory are in progress.

Stormwater Runoff and Hydrology

Stormwater from rain events typically flows over streets and through an underground network of pipes. During heavy downpours the underground network can become overwhelmed, resulting in more water flowing over land. Figure 6 uses a 10-foot contour interval to represent areas of equal elevation. The red dashed arrows represent the general direction of water flow. Not all stormwater is directed to the storm drain system; in many parts of the study area, water flows directly into the Anacostia tributary.

Floodplain and Flood Prone Areas

Parts of the study area are more susceptible to riverine flooding. Figure 7 identifies areas that are most threatened with flooding during periods of heavy rain. The 100-year floodplain (colored aqua) is defined as areas with a 1% chance of a flood occurring in any year. Put differently, over the course of a 30-year mortgage, a home in this area has a 26% chance of being flooded at least once.[10] The 500-year floodplain (light blue) is the area where there is a 1 in 500 chance of a flood occurring in any given year.[11] The yellow represents areas

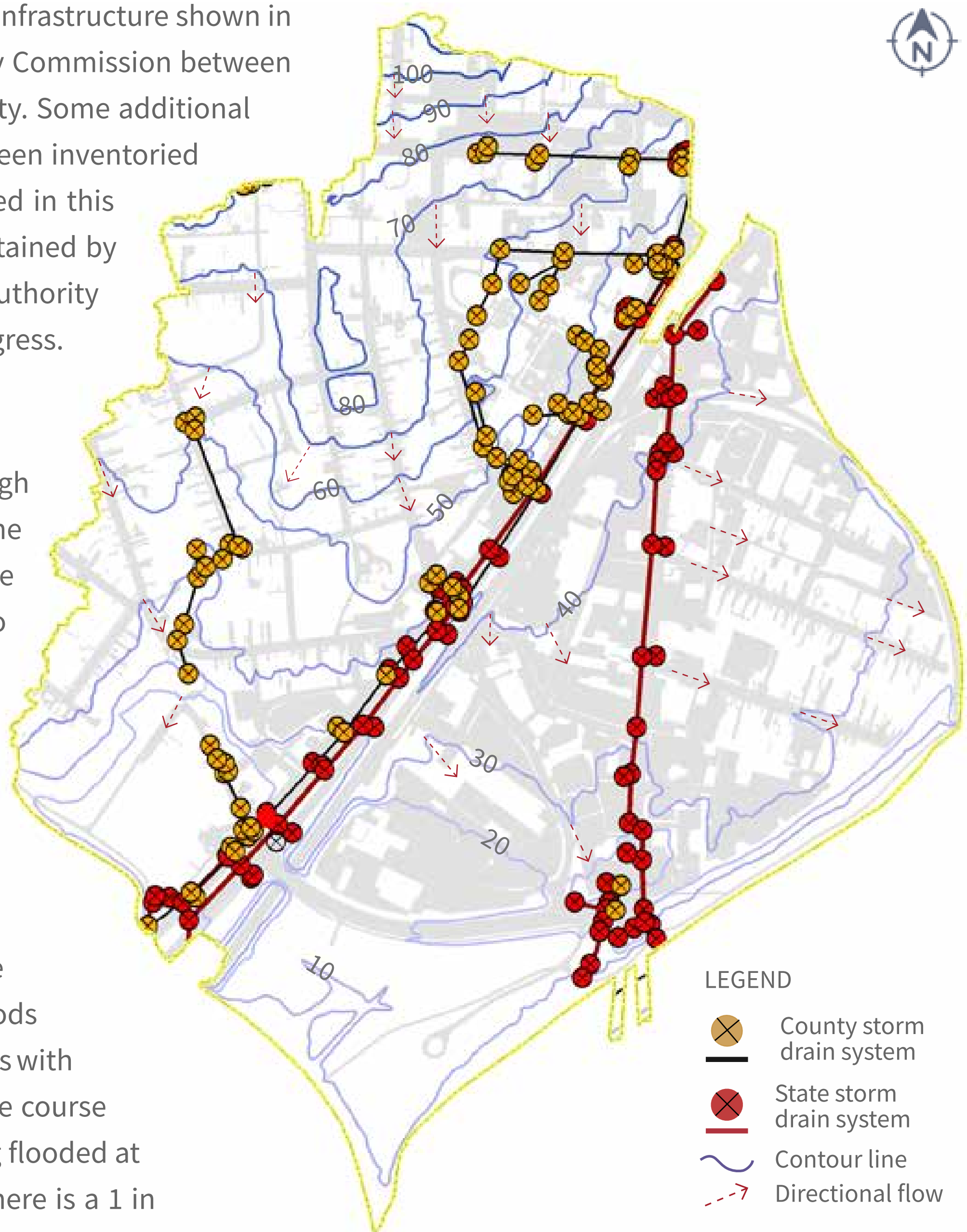


Figure 6. Stormwater runoff and surface hydrology

Figure 7. Existing floodplain and Hyattsville DPW-identified drainage issues

protected against a 100-year flood by the Hyattsville-Riverdale levee system. The Federal Emergency Management Agency (FEMA) projects that areas at risk of riverine flooding will increase 45% nationwide by 2100, largely due to climate change.[12]

Areas not located near a body of water can also be at risk of flooding. The red areas in Figure 7 represent areas identified by Hyattsville DPW as susceptible to standing water or localized flooding during heavy rainfalls. The trend towards heavier, more frequent downpours is expected to increase due to climate change,[13] also increasing the likelihood of localized flooding events due to overwhelming the capacity of the existing storm drain system.

Climate

There has been a marked increase in heavy, short downpours in recent years. According to the 2014 National Climate Assessment, heavy downpours have increased nationally. The Midwest and Northeast in particular are experiencing heavier, more frequent rain events.[14] Last year (2018) was the wettest on record for the Washington, DC area, with a record 23 days seeing one or more inches accumulate. These frequent downpours spurred multiple flood events.[15]

The chart below (Figure 8) shows observed annual precipitation averages in Prince George's County from 1950-2013 (dark gray bars); climate model simulations (hindcasts) from 1950-2005 (light gray band); and climate model projections for two possible futures out to 2100. The blue band shows the range of projections for a possible

AVERAGE ANNUAL RAINFALL FOR PRINCE GEORGE'S COUNTY, MD (IN INCHES) - OBSERVED, SIMULATED, AND PROJECTED: 1950 - 2100

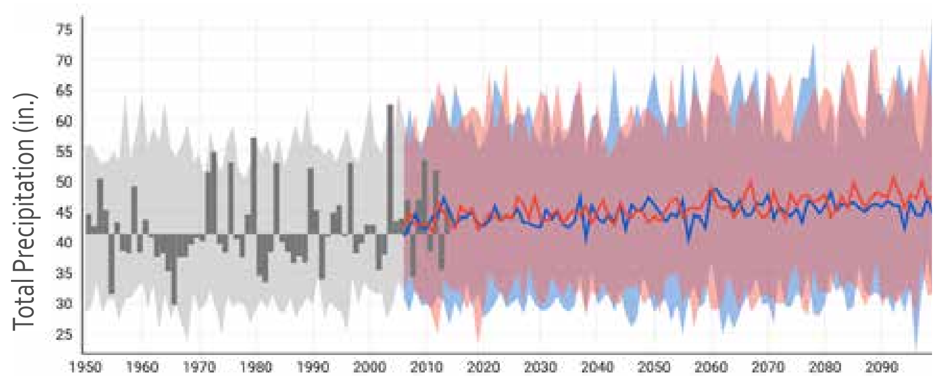


Figure 8. Annual precipitation trends

future in which global emissions of heat-trapping gases peak around 2040 and then decline. This scenario is called RCP 4.5. The red band shows the range of projections in which global emissions of heat-trapping gases continue to increase through the 21st century. This scenario is called RCP 8.5. People with a low tolerance for risk often focus on this latter scenario for planning.[16] Data on individual storm events used for modeling purposes were obtained from the National Oceanic & Atmospheric Administration (NOAA) National Centers for Environmental Information (NCEI) Storm Events Database.[17]

NUMBER OF DAYS PER YEAR WITH MORE THAN 1 INCH OF RAINFALL - OBSERVED, SIMULATED, AND PROJECTED (IN INCHES)

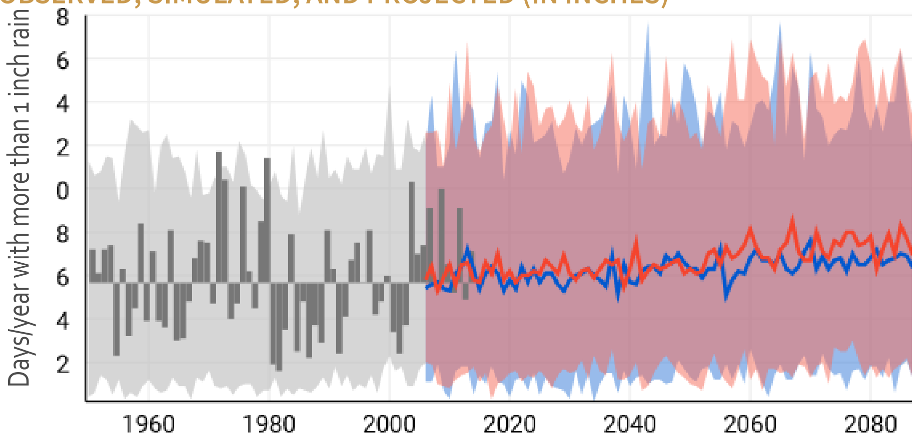


Figure 9. Days with precipitation above 1 inch

The chart above shows the number of days per year that the County has been observed to or is projected to receive more than 1 inch of precipitation. The number of days with an inch or more is increasing over time. This is an indicator of how often very heavy precipitation events occur, and shows a trend of increasing flood risks.[18]

AVERAGE DAILY MAXIMUM TEMPERATURE (°F) - OBSERVED, SIMULATED, AND PROJECTED FOR PRINCE GEORGE'S COUNTY

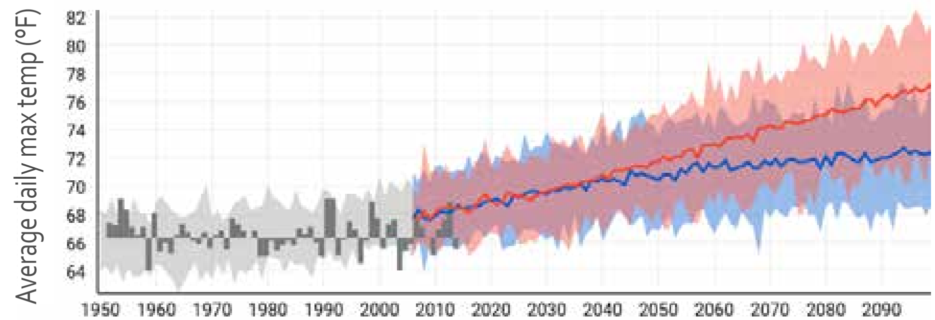


Figure 10. Average daily maximum temperature (°F)

Average area temperatures have also risen over time. Data from the U.S. Climate Resilience Toolkit show that heat waves are becoming more intense and longer lasting (Figure 10).[19] This directly impacts human health and also the placement and makeup of green infrastructure features. Higher temperatures also means a higher demand for energy to cool buildings. Figure 11 shows the trend towards amount of energy people use to cool a building when it is warm outside.[20]

NUMBER OF COOLING DEGREE DAYS - OBSERVED, SIMULATED, AND PROJECTED FOR PRINCE GEORGE'S COUNTY

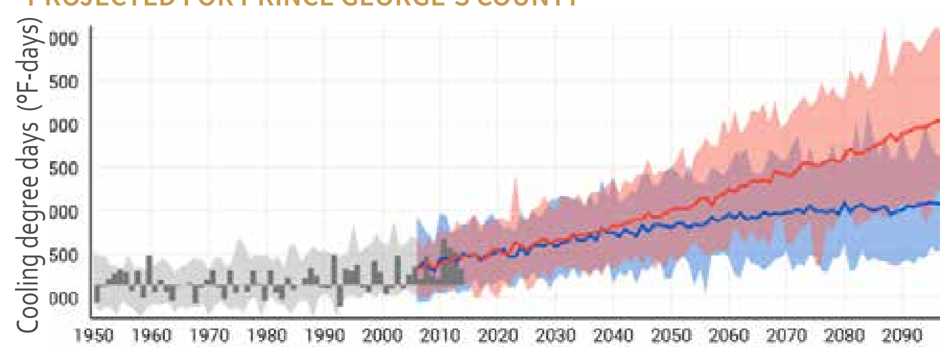


Figure 11. Number of cooling degree days

STORMWATER SYSTEMS ANALYSIS

Approach

Hyattsville currently lacks a comprehensive analysis of the existing storm drain infrastructure's overall capacity and deficiencies. This makes it difficult to prioritize green projects and initiatives for implementation based on their ability to address existing problems. The City needs a more holistic understanding of what is at risk (built and natural infrastructure) to stormwater flooding to better prioritize future investments of City dollars and to engage the County and others when directing or coordinating improvements. This project analyzed the current conditions that are causing drainage issues within lower Ward 1 to determine what might change in the future based on climate impacts and to identify green and gray infrastructure measures that can reduce localized flooding risks while also improving water quality.

A vulnerability assessment of lower Ward 1's storm drain infrastructure was conducted to evaluate the capacity of existing infrastructure to handle the regulated design storm, which is an estimate of rainfall intensity in inches per hour based on local rainfall data. Hydrologic models were then employed to assess how this capacity would change based on future land use conditions and future rainfall patterns due to climate change projections. Of particular concern was the impact that short-duration, high-intensity precipitation events have on the existing system's ability to manage targeted goals. Green and gray storm drain improvements were identified to help alleviate demands on the existing storm drain infrastructure and provide lower Ward 1 with greater protection from localized flooding events.

Figure 12. Entrance to neighborhood park in lower Ward 1

Modeled Rainfall Events

Design storms are applied in a hydrologic model to estimate rates and volumes of runoff. Storms are generally analyzed for a couple of durations and frequencies. Duration refers to how long a rain event lasts. Frequency refers to whether the rain event is classified as a one-, two-, ten-, 50- or 100-year storm, or somewhere in between. The design storms for current conditions was based on current precipitation frequency estimates for Hyattsville from the National Oceanic and Atmospheric Administration (NOAA). However, observed trends in measures of extreme precipitation are expected to continue to increase over time. Future conditions were evaluated by assuming a 25% increase in the design storm in the next 20 years. This increase was estimated from downscaled climate projections conducted for Washington, DC.[21]

CURRENT

Frequency	Duration	Depth
10-year	6 hour	3.35 inches

FUTURE

Frequency	Duration	Depth
10-year	6 hour	4.19 inches

Table 1. Modeled rainfall events

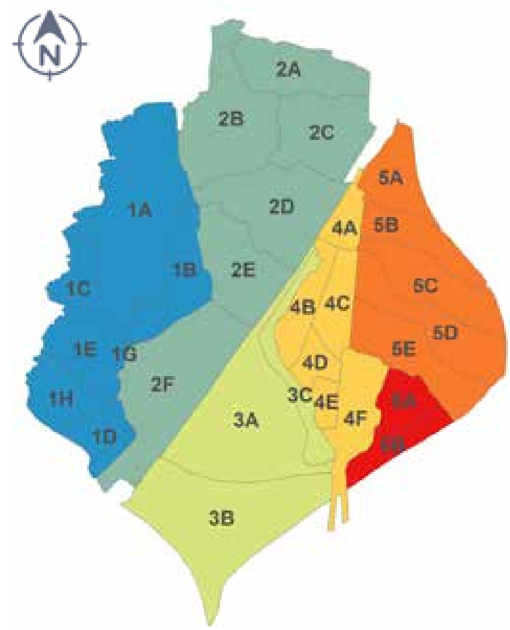
Analyzing storms of several durations for a given frequency provides an understanding of "critical" (maximum) flow. The results of the hydrologic model are used to size stormwater facilities.[22]

Catchment Areas

Lower Ward 1 was divided into six catchment or drainage areas to evaluate changes in the amount of stormwater runoff from different modeled rainfall events. Six catchments were defined by using available geospatial data on topography and the existing storm drain infrastructure. Each was further divided into smaller subcatchments so that catchment areas with different percentages of impervious could be more accurately modeled (Figure 13).

Capacity Assessment

The NRCS Unit Hydrograph method was used to assess the capacity of the existing infrastructure to handle the regulated design storm and



Catchment	Percent Impervious
1	31%
2	62%
3	35%
4	83%
5	52%
6	46%

Table 2. % Impervious by catchment

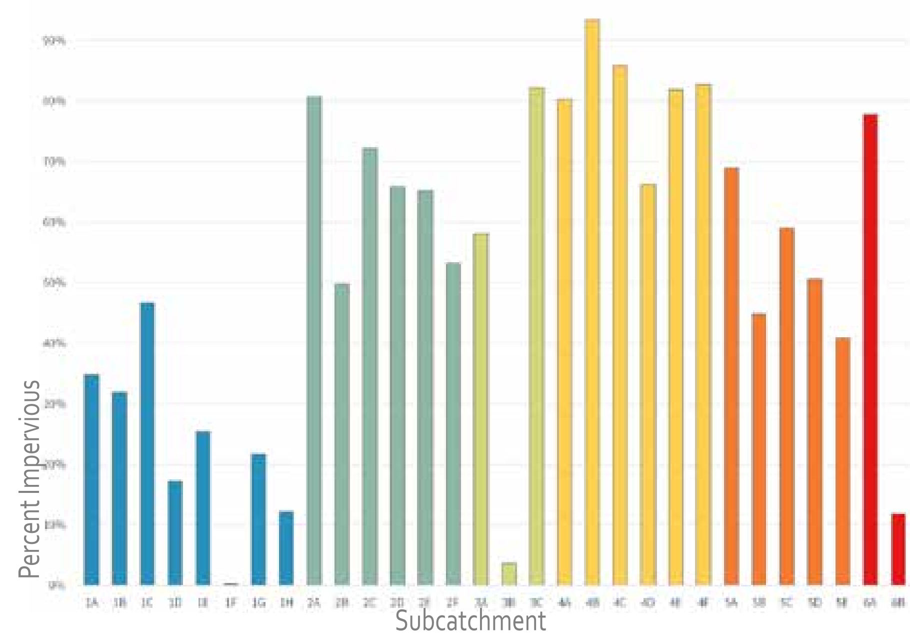


Figure 13. Identified catchment and subcatchment areas and percents impervious

how this capacity would change based on future land use conditions. Doing so helps provide a better understanding of the local flooding impacts in terms of extent and depth of flooding and determine how they can be mitigated. The model was calibrated using information available for two high-intensity, short-duration rainfall events (Table 3) to predict ponding levels and volumes of flow that would occur in the lower Ward 1 area for various storm frequencies and with various green and gray stormwater infrastructure alternatives. Results were compared to information obtained on known flood-prone areas and anecdotal evidence.

CALIBRATION EVENTS

Date	Description
August 12, 2014	2.96 inches over 5.5 hours
July 28, 2017	4.21 inches over 15 hours

Table 3. Representative high-intensity, short-duration rainfall events

Results

A variety of causes were identified that impact drainage issues and contribute to localized flooding in the lower Ward 1 area:

- Undersized storm drain culverts and/or piping
- Insufficient catch basins and/or storm drain capacity
- Neighborhoods with no stormwater infrastructure
- Broken or low curbs
- Isolated low spots

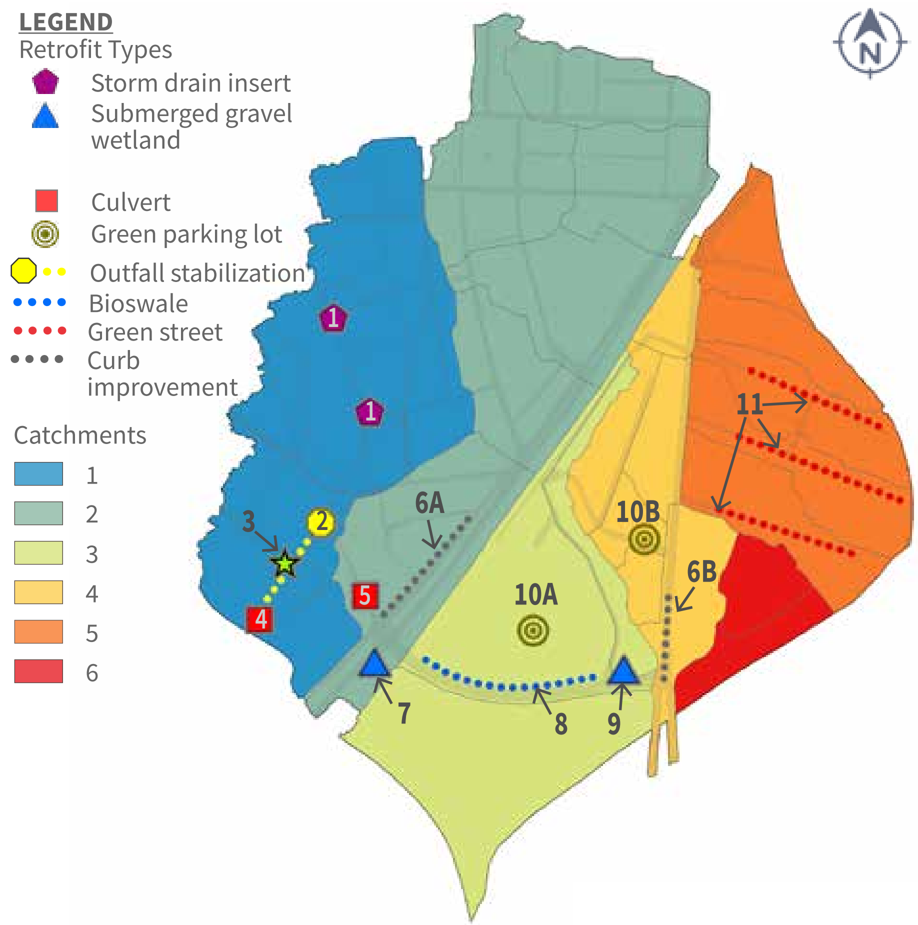


Figure 14. Locations of identified retrofit opportunities in lower Ward 1

Eleven retrofit projects or activities were identified to reduce localized flooding potential and improve water quality under current and future conditions (Figure 14). Two additional area-wide actions were also identified. Potential retrofit projects and their expected impacts are identified in Table 3. It was not possible to model the results of all retrofit opportunities due to limited storm drain system information.

IDENTIFIED RETROFIT OPPORTUNITIES

ID	Project name	Location	Localized Flood Reduction Benefit	Water Quality Benefit	Priority	Time frame	COST ESTIMATE design + install
1	41st Place storm drain inserts	41st Pl. at Emerson; 41st Pl. at Decatur St.	Minimal	Medium	Low	Mid- to Long-term	$10,000 - $12,0000
2	41st Street outfall protection	41st St. from 41st Pl. to Northwest Branch Trail	High	Medium	Medium	Short- to Mid-term	$150,000-$250,000
3	41st Street pocket wetland	41st St. trail, near Northwest Branch Trail	Low	Medium	Medium	Short- to Mid-term	$75,000-$150,000
4	41st Street trail culvert	41st St. trail, adjacent to the Northwest Branch Trail	High	Low	Medium	Short- to Mid-term	$40,000-$60,000
5	41st Place stream crossing	41st Pl., near Melrose Park	Low	Minimal	High	Short- to Mid-term	$30,000-$50,000
6A 6B	Rhode Island Avenue | Baltimore Avenue curb improvements	Rt. 1 southbound, Braxton Pl. to 41st Pl. | Alt-Rt. 1 near Charles Armentrout Dr.	Medium	Minimal	Medium	Mid-term	SHA Project | Not Estimated
7	Rhode Island Avenue submerged gravel wetland	Rt. 1 northbound, southeast of Charles Armentrout Dr. intersection	Low	High	Medium	Mid-term	SHA Project | Not Estimated
8	Charles Armentrout bioswale	Charles Armentrout Dr. (westbound), west of 42nd Pl.	Low	Medium	Low	Long-term	$200,000-$400,000
9	Charles Armentrout submerged gravel wetland	Charles Armentrout Dr. at 42nd Pl.	Medium	High	High	Short-term	$350,000 - $380,000
10A 10B	"Green" parking lot improvements	Baltimore Ave/Alt-Rt. 1 | Area between R1. 1, Charles Armentrout Dr., and 42nd Pl.	Minimal	High	High	Short- to Mid-term	Not estimated
11	Lower Ward 1-East residential green streets	Emerson St., Burlington Rd., & Buchanan St.	Medium	High	Medium	Long-term	Not estimated
12	Development and redevelopment stormwater requirements	Study area-wide recommendation	Medium	Medium	Medium	Short-term	Not estimated
13	Storm drain inventory assessment	Study area-wide recommendation	High	Low	Medium	Short-term, Ongoing	Not estimated

Table 4. Identified retrofit opportunities

1 Storm Drain Inserts | 41st Place

FLOOD REDUCTION BENEFIT	Minimal
WATER QUALITY BENEFIT	Medium
PRIORITY	Low
TIME FRAME	Mid to Long

Location: 41st Pl - near Emerson and Decatur St.

Figure 16. Example of a curb inlet storm drain insert

Description: A storm drain insert is a collection basket, tray, or bag placed under a storm drain inlet to filter out sediments and debris such as trash, leaves, and twigs. Some have more than one collection device and an underlying tray with a media filter to collect finer sediments or oils. Stormwater runoff enters and passes through the collection device before discharging into the storm drain pipe. Space is provided between the storm drain and the insert to allow larger volumes of water to bypass the system during high rains.

Figure 15. Existing storm drain inlet along 41st Place

When considering inserts, it is important to ensure that the storm drain is in good repair and has room to accommodate an insert with adequate storage capacity. One that is too shallow as compared to the drainage area may lead to flooding.[23] Inserts must be regularly maintained by hand or with a small-scale vacuum truck.

Recommendation: Install curb inlet storm drain inserts along 41st Place to reduce the amount of solids and other pollutants that reach the Anacostia. Coordinate with DoE and the County's Department of Public Works and Transportation (DPW&T) to install inserts in the four storm drains along 41st Place near Emerson St. and Decatur St.

COST ESTIMATES

- Design + Install: ~$10,000 to ~$12,000[a]

COORDINATING AGENCIES

- DPW&T, DoE

[a] Estimate is for 4 inserts. Assumes existing storm drain is in good condition.

2 Outfall Protection | 41st Street

FLOOD REDUCTION BENEFIT	Low
WATER QUALITY BENEFIT	High
PRIORITY	Medium
TIME FRAME	Short to Mid

Location: 41st St - btwn. 41st Pl and the Northwest Branch Trail

Figure 18. Outfall stabilization project in Suitland, MD

Description: 41st Street experiences issues with standing water during and after intense rain events. This has led to problems for adjacent homeowners and Melrose Park users. Information obtained from the Melrose Trail construction project and County GIS information was used to model stormwater flows. Two major causes of this problem were identified. First, the drainage ditch along 41st Street and the Melrose Park entrance is undersized and has not been maintained. It is clogged with sediment and debris and is overgrown with plants, giving water no place to go. Second, the culvert under the trail at the park's southwest corner is undersized (see opportunity #3).

Figure 17. Existing swale along 41st Street

The ditch was designed to be 15 or more feet wide with a mowed grass surface. Years of sediment and overgrowth have reduced its width to 6 feet. Its depth has also been reduced. This has greatly reduced the ability of the channel to quickly convey water to the Northwest Branch of the Anacostia River.

Recommendation: Widen the channel to 15-20 feet and maintain the grass in a mowed condition or provide a cobbled bottom. Add a plunge pool near the outfall to slow down incoming runoff and improve overall stability. This will also simplify maintenance by allowing the sediment to settle out in a relatively restricted area, making it easier to scoop out.

COST ESTIMATES

- Design + Install: ~$150,000 to ~$250,000

COORDINATING AGENCIES

- M-NCPPC, DPW&T, DoE

Figure 19. Rendered overlay of 41st Street outfall restoration project. A plunge pool is installed directly below the outfall.

Figure 20. Existing grass channel along 41st Street. The channel is built up with sediment and debris and filled with overgrown plant material.

Figure 21.Rendered overlay of cobble bottom swale. It extends towards intersection with Northwest Branch Trail.

Figure 22. Existing conditions within Melrose Park along 41st Street trail

3 Pocket Wetland | 41st Street Trail

FLOOD REDUCTION BENEFIT	Low
WATER QUALITY BENEFIT	Medium
PRIORITY	Medium
TIME FRAME	Short to Mid

Location: 41st St - nearing Northwest Branch Trail

Figure 24. Rendered overlay of pocket wetlands. Area is in Melrose Park along 41st Street trail.

Description: Pocket wetlands are small, shallow wetlands that help treat stormwater runoff and filter pollutants. They are suitable for areas where a high water table or groundwater can help replenish a shallow wetland pool during hot, dry weather.

A series of pocket wetlands may be suitable along the western side of the channel that runs along the 41st Street trail leading into Melrose Park. Water from the channel would be allowed to overflow into these areas during rain events to further filter excess nutrients from the stormwater and provide habitat for amphibians and wetland plants. Combining the practices would be an excellent way to leverage green and gray stormwater infrastructure together.

Figure 23. Current conditions of channel along trail. The area is overgrown with water tolerant plants.

Recommendation: Evaluate the opportunity to incorporate pocket wetlands with the outfall protection project (see project #2). Coordinate with DoE and M-NCPPC.

COST ESTIMATES

- Design + Install: ~$75,000 to ~$150,000[a]

COORDINATING AGENCIES

- M-NCPPC, DPW&T, DoE

[a] It is recommended that the pocket wetland and the outfall protection project be designed and installed concurrently.

4 Culvert | 41st Street Trail

FLOOD REDUCTION BENEFIT	High
WATER QUALITY BENEFIT	Low
PRIORITY	Medium
TIME FRAME	Short to Mid

Location: 41st Street trail, adjacent to the Northwest Branch Trail

Description: The existing culvert at the intersection of the 41st Street trail and the Northwest Branch Trail is 18 inches in diameter. While the culvert was adequately size for small events, the increased amount of precipitation falling in heavy events means that it is now prone to flooding and failure. During heavy rains, huge volumes of water quickly fill the drainage system and overwhelm the culvert. This causes water to back up on the upstream side and overflow across 41st Street, resulting in concerns with localized flooding and increased erosion. Undersized and/ or poorly maintained culverts can become clogged by debris, making them even more vulnerable to being overwhelmed during intense rain events. The 41st Street trail culvert was observed to be obstructed with sediment and debris during multiple site visits.

Figure 25. Existing culvert under 41st Street trail. Areas is near Northwest Branch trail intersection.

Figure 26: Culvert replacement project under a park trail

Modeling results were evaluated to determine the benefit of increasing the culvert size by 5 to 10 times its current dimensions. This, in combination with the outfall protection project, was determined to greatly reduce or eliminate localized flooding concerns for current and future storm events.

Recommendation: Coordinate with M-NCPPC and DPW&T to replace the existing culvert with one adequately sized to pass the current and future 10-year 6-hour storm event.

COST ESTIMATES

- Design + Install: ~$40,000 to ~$60,000[a]

COORDINATING AGENCIES

- M-NCPPC, DPW&T

[a] Actual culvert size will be determined during design after a survey is completed.

5 Stream Crossing | 41st Place

FLOOD REDUCTION BENEFIT	Low
WATER QUALITY BENEFIT	Minimal
PRIORITY	High
TIME FRAME	Short to Mid

Location: 41st Pl - near Melrose Park

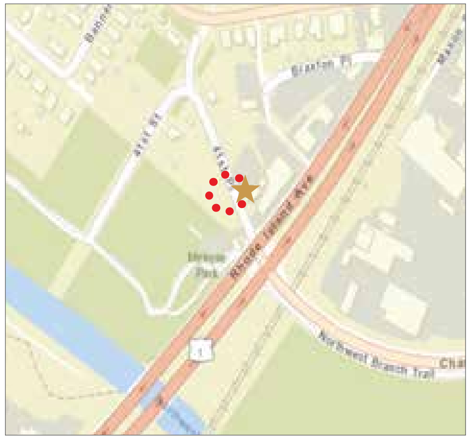


Figure 28: Example of a water crossing

Description: A paved ford or dip was previously installed on 41st Place as a low water stream crossing. Such crossings can be a low-cost alternative to culverts for roads with light traffic, but the wear and tear of traffic going over the 41st Place crossing has caused it to erode. This has led to safety and water quality concerns.

An alternative is to redesign the crossing to allow water to pass under the road instead of over it. 41st Place is municipally-owned, and the City would be responsible for the costs to redesign and install an improved low water crossing. However, the City should engage Prince George's County's Office of Highway Maintenance (OHM) for advice on road-stream crossing alternatives.

Figure 27. Current conditions along 41st Place

Recommendation: Design and install an improved small waterway crossing on 41st Place that supports the appropriate load rating and allows water to pass unobstructed under the roadway.

COST ESTIMATES

- Design + Install: ~$30,000 to ~$50,000[a]

COORDINATING AGENCIES

- OHM

[a] Estimate based on the cost to design, permit, and install a culvert. The cost of other options may vary.

6 Curb Improvements | Rhode Island and Baltimore Avenues

FLOOD REDUCTION BENEFIT	Medium
WATER QUALITY BENEFIT	Minimal
PRIORITY	Medium
TIME FRAME	Mid

Location: Rt. 1 and Alt-Rt. 1 southbound

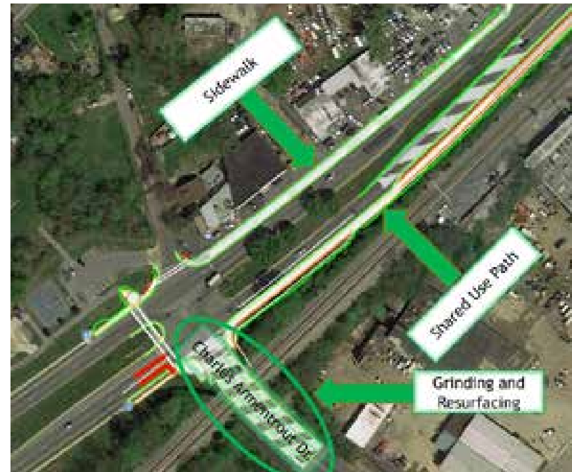


Figure 30. SHA-proposed improvements. Part of Rhode Island Ave Trolley Trail extension.

Description: The current curb and gutter system along the southbound sides of Rhode Island and Baltimore Avenues does not sufficiently prevent stormwater runoff carried in the roadway from overflowing into business properties located directly along the street. During more intense rain events, stormwater runoff in the roadway can exceed the height of the mountable curbs. The Maryland State Highway Administration's (SHA) proposed Rhode Island Avenue Trolley Trail extension includes replacing the southbound shoulder with an ADA-compliant sidewalk. This should provide better protection from flooding to businesses along this route. Similar improvements should be made to the southbound portion of Baltimore Ave. Improved curb and gutter will restrict stormwater runoff from running onto properties and help direct the stormwater toward areas where it can be properly managed.

Figures 29. Existing curb-and-gutter along Rhode Island Ave southbound

Recommendation: Support SHA's efforts to incorporate ADA-compliant sidewalk and improved curb and gutter on Rhode Island Avenue between 41st Place and Braxton Place. Coordinate with SHA to similarly improve curbing along Baltimore Ave in accordance with SHA standards.

COST ESTIMATES

- SHA project; not estimated

COORDINATING AGENCIES

- SHA

7 Submerged Gravel Wetland | Rhode Island Avenue

FLOOD REDUCTION BENEFIT	Low
WATER QUALITY BENEFIT	High
PRIORITY	Medium
TIME FRAME	Mid

Location: Southeast intersection of Rt. 1 and Charles Armentrout Dr.

Figure 32. Conceptual overlay of submerged gravel wetland

Description: Modeling results indicate that surcharging of a portion of the Route 1 stormwater system occur at the corner of Route 1 and 41st Place near Shortcake Bakery. Impacts associated with this surcharging are exacerbated by the natural grades, which direct runoff towards the buildings at that corner and by the lack of significant curbing to ensure runoff is directed to existing catch basins. The one double catch basin that serves the southbound side of Route 1 at that corner may also be overwhelmed during some high-intensity rainfall events.

Figure 31. Example of a submerged gravel wetland

The proposed Rhode Island Avenue Trolley Trail extension includes installing a submerged gravel wetland on CSX property along Route 1 northbound, southeast of Charles Armentrout Drive intersection. Stormwater runoff would be redirected to the submerged gravel wetland where the water will be filtered and cleaned to maximize water quality benefits. The wetland is also expected to provide some water quantity control benefits.

Recommendation: Support SHA's efforts to engage CSX and install a submerged gravel wetland near the intersection of Route 1 and Charles Armentrout Drive.

COST ESTIMATES

- SHA project; not estimated

COORDINATING AGENCIES

- SHA, CSX

8 Bioswale | Charles Armentrout Drive

FLOOD REDUCTION BENEFIT	Low
WATER QUALITY BENEFIT	Medium
PRIORITY	Low
TIME FRAME	Long

Location: Charles Armentrout Dr. (westbound), west of 42nd Pl.

Figure 34. Conceptual overlay of bioswale along Charles Armentrout Drive

Description: The low-lying parking areas and truck yards associated with the Washington Compressor Rental Company, Parts Depot, and other businesses located between Route 1, Charles Armentrout Drive and 42nd Place (subcatchment #3A) are expected to experience flooding under a variety of high-intensity events. A swale currently exists along the north side of Charles Armentrout Drive. Two culverts have also been installed to direct water beneath Charles Armentrout Drive to address runoff in that area. The grades of the existing low-lying areas, however, make it difficult for runoff generated there to access the swale. Future opportunities to reduce the amount of impervious, regrade the lot and otherwise improve drainage to the existing culverts, and convert the swale to a bioswale would reduce the pooling of water in low spots and improve water quality.

Figure 33. Bioswale along edge of hospital parking lot in East Norriton, Pennsylvania

Recommendation: Seek opportunities to improve drainage to the existing culverts and improve water quality by reducing impervious area and adding a bioswale along the property's southern edge.

COST ESTIMATES

- Design + Install: ~$200,000 to ~$400,000[a]

COORDINATING AGENCIES

- DPW&T, DoE

[a] Estimate is for bioswales.

9 Submerged Gravel Wetland | Charles Armentrout Drive

FLOOD REDUCTION BENEFIT	Medium
WATER QUALITY BENEFIT	High
PRIORITY	High
TIME FRAME	Short

Location: 42nd Pl. and Charles Armentrout Dr.

Figure 36. Existing conditions along 42nd Place and Charles Armentrout Drive

Description: The right-of-way along 42nd Place just north of Charles Armentrout Drive is owned by the City of Hyattsville. This area was identified by the City as one that often experiences standing water during and after heavy rain events. Model simulations of existing conditions provided similar results. The subcatchment area (#3C) is more than 80% impervious and includes a mix of commercial and light industrial businesses (e.g., vehicle service centers, car dealerships). Pollutant runoff from these properties is assumed to be higher than in residential areas.

Figure 35. Plants growing in a submerged gravel wetland

A submerged gravel wetland was identified as an appropriate stormwater treatment practice because of its ability to maximize the removal of pollutants and to address concerns with localized flooding and standing water. It has also been identified by City staff as a good candidate for outreach to nearby business owners to demonstrate how green infrastructure can be incorporated on commercial properties.

Recommendation: Design and install a submerged gravel wetland or similar stormwater practice to reduce issues with standing water along 42nd Place and reduce and filter stormwater from upstream pollution-generating activities.

COST ESTIMATES

- Design + Install: ~$350,000 to ~$380,000

COORDINATING AGENCIES

- DPW&T, DoE

Figure 37. Existing conditions along 42nd Place and Charles Armentrout Drive

Figure 38. Rendered overlay of submerged gravel wetland project along 42nd Place and Charles Armentrout Drive

10 "Green" Parking Lot Improvements | Rhode Island and Baltimore Avenues

FLOOD REDUCTION BENEFIT	Minimal
WATER QUALITY BENEFIT	High
PRIORITY	High
TIME FRAME	Short to Mid

Location: Commercial and light industrial areas

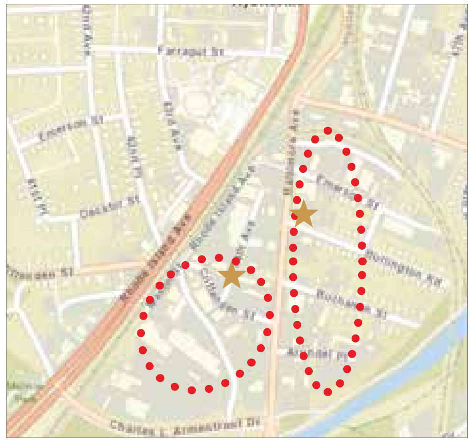


Figure 40. First United Methodist Church (after). The lot was redesigned to incorporate permeable parking pads and bioretention.

Description: A large amount of the study area is impervious (53%). Impervious coverage rises above 80% in the subcatchment areas with commercial and/or light industrial uses and tops out at 94%. Parking lots constitute a substantial portion of the impervious area in the commercial and light industrial areas. These provide an opportunity to retrofit with green infrastructure to capture and treat runoff before it leaves the site.

Incorporating trees and green infrastructure into parking lots can improve a company's bottom line,[24] but it can be an expensive investment for a small business to undertake. The County's Rain Check Rebate Program offers up to $20,000 for commercial, institutional, and other large property owners (and $4,000 for residential owners) to make improvements to existing properties to reduce the amount of impervious area and mitigate stormwater.[25] The City should seek ways to combine this with other incentive programs to encourage participation. In the short-term, the City should also seek opportunities to green City-owned parking lots.

Figure 39. Parking lot of First United Methodist Church in Hyattsville (before). This was previously prone to flooding.

Recommendation: Explore incentives to accelerate investments in green infrastructure on commercial properties. Engage and provide outreach to the business community to identify early adopters.

COST ESTIMATES

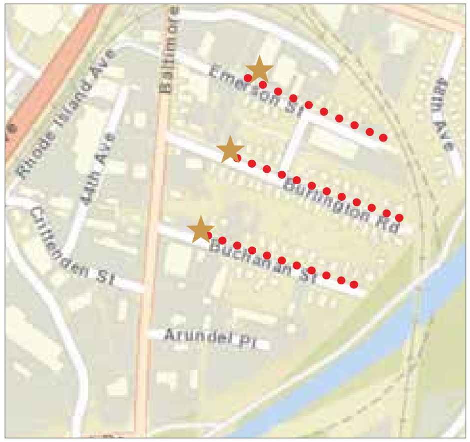
- Not estimated

COORDINATING AGENCIES

- DoE, DPW&T, County Office of Finance, SHA, business community

11 Green Streets | Lower Ward 1 - East Residential

FLOOD REDUCTION BENEFIT	Medium
WATER QUALITY BENEFIT	High
PRIORITY	Medium
TIME FRAME	Mid to Long



Location: Emerson St., Burlington Rd., & Buchanan St.

Description: The neighborhoods east of Baltimore Avenue lack a storm drain system. Runoff generated in this area runs along the roadways before flowing down to the Northeast Branch of the Anacostia River. The neighborhood streets are small with narrow roadbeds that accommodate a travel lane and on-street parking. Low-volume roads also mean that less sediment and debris is produced, making the right-of-way appealing for bioretention facilities and/or permeable pavement.

Figure 41. Existing right-of-way conditions

Figure 42. Rendering of a residential green street

Opportunities exist to incorporate green infrastructure into the right-of-way of the residential sections along Emerson Road, Burlington Street, and Buchanan Street. Green infrastructure practices such as bioretention, infiltration, and permeable pavement may be employed within the road rights-of-way to reduce runoff and minimize pollution.

Recommendation: Explore green infrastructure opportunities within the neighborhood east of Baltimore Avenue. Engage the public to obtain community input and prepare designs using detailed field survey and geotechnical information.

COST ESTIMATES

- Not estimated

COORDINATING AGENCIES

- DoE, Residential property owners

12 Development & Redevelopment Standards | Areawide

FLOOD REDUCTION BENEFIT	Medium
WATER QUALITY BENEFIT	Medium
PRIORITY	Medium
TIME FRAME	Short

Location: Area-wide

Description: Development and redevelopment activities in Prince George's County are required to treat stormwater runoff to the maximum extent practical with green infrastructure controls (otherwise known as environmental site design, or ESD). Additional requirements state that the developer must control peak flow to a meadow condition for the one-year storm. Some non-green infrastructure practices may be allowed for this channel protection volume (CPv).[26]

In addition, the County's Tree Canopy Coverage Ordinance requires development projects that need a building and/or grading permit and exceed a specific amount of gross floor area or disturbance to meet tree canopy requirements of 10% to 20%, depending on the zoning category, unless a full or partial waiver is received.[27] Strengthening this requirement and/or limiting the ability to receive waivers would help increase the City's urban tree canopy over time.

Figure 43. A tree-lined public space in Hyattsville, Maryland

Figure 44. Street trees in Hyattsville, MD

Recommendations:

- Increase the channel protection volume (CPv) requirement for projects within the City of Hyattsville by 10% to provide increased resiliency for both current and future storms.
- Strengthen the tree canopy coverage requirements in the City of Hyattsville to increase tree canopy over time.

COST ESTIMATES

- Not estimated

COORDINATING AGENCIES

- DoE, M-NCPPC

13 Storm Drain Inventory Assessment | Areawide

FLOOD REDUCTION BENEFIT	High
WATER QUALITY BENEFIT	Low
PRIORITY	Medium
TIME FRAME	Ongoing

Location: Area-wide

Description: Much of the of the public storm drain infrastructure in the City of Hyattsville was installed by the Washington Suburban Sanitary Commission between 1960 and 1990. Its ownership and maintenance was transferred over to the County in the early 1990s. Some public storm drains within Hyattsville were not transferred over to the County. This includes public storm drains determined not to be maintainable due to a lack of access or where reconstruction or cleaning may be necessary to bring the system to a satisfactory level of function or maintainability. The DoE Sustainability Division oversees the County's Municipal Storm Drain Acceptance Program. Efforts by the City of Hyattsville's Department of Public Works to complete a storm drain inventory are in progress.

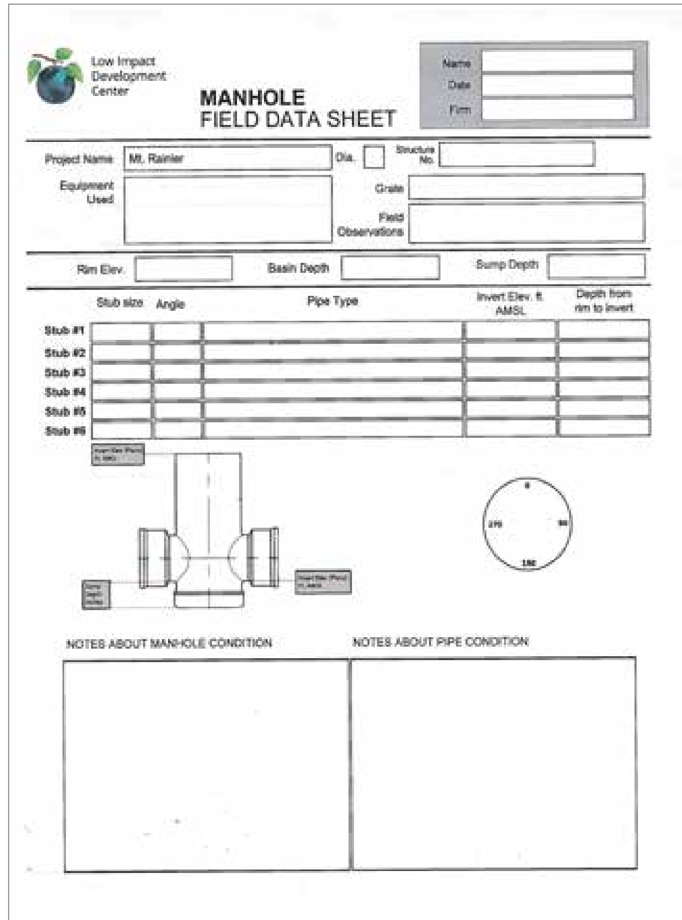
Recommendation: Continue to support the City of Hyattsville's Department of Public Works efforts to inventory and update the existing storm drain system to transfer maintenance to the County. Seek reimbursement wherever possible from the County for storm drain upgrades.

COST ESTIMATES

- Not estimated

COORDINATING AGENCIES

- DoE, DPW&T


Low Impact Development Center

MANHOLE
FIELD DATA SHEET

Name
Date
Firm

Project Name: Mt. Rainier
Dia.
Structure No.
Equipment Used
Grate
Field Observations

Rim Elev.
Basin Depth
Sump Depth

	Stub size	Angle	Pipe Type	Invert Elev. ft. AMSL	Depth from rim to invert
Stub #1					
Stub #2					
Stub #3					
Stub #4					
Stub #5					
Stub #6					

NOTES ABOUT MANHOLE CONDITION

NOTES ABOUT PIPE CONDITION

Figure 45. Sample storm drain assessment field data sheet

PHOTO/IMAGE CREDITS

PAGE #	LOCATION	SOURCE
1, 2	All	Low Impact Development Center, Inc., with GIS data from Prince George's County
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3	Top (right)	Stormwater Maintenance, LLC
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4	Top (left)	Geosyntec
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5	Bottom (left)	Elgin Sweeper
5	Top (right)	Prince George's County Department of the Environment
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9	Top (left)	Low Impact Development Center, Inc., with GIS data from Prince George's County
9	Bottom (right)	U.S. Climate Resilience Toolkit
10	All	U.S. Climate Resilience Toolkit

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11	Top (right)	Low Impact Development Center, Inc.
12, 13	All	Low Impact Development Center, Inc., with GIS data from Prince George's County
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19	Top (right)	Johnson Creek Watershed Council
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26	All	Anacostia Watershed Society
27, 28	Bottom (left)	Low Impact Development Center, Inc.
28	Top (right)	American Rivers
29	Top (right)	Low Impact Development Center, Inc.

ENDNOTES

1 Melillo, Jerry M., Terese (T.C.) Richmond, and Gary W. Yohe, Eds. 2014. Climate Change Impacts in the United States: The Third National Climate Assessment. U.S. Global Change Research Program. www.globalchange.gov.

2 City of Hyattsville. 2017. Speak Up HVL: The 2017 - 2021 Community Sustainability Plan. www.hyattsville.org .

3 For more information on green infrastructure and common techniques, visit the US Environmental Protection Agency's website on "What is Green Infrastructure." https://www.epa.gov/green-infrastructure/what-green-infrastructure.

4 Prince George's Department of the Environment. 2016. The Clean Water Program Guidebook Series for Prince George's County's Municipalities: Understanding Roles and Responsibilities. www.princegeorgescountymd.gov/DocumentCenter/View/16454/PG-Guidebook1_Final_100416_sm.

5 See Endnote 2

6 Population estimates for 2010 and 2000 US Census blocks, clipped to study area boundary. www.census.gov.

7 See USDA Forest Service Urban Natural Resources Stewardship Urban Tree Canopy Assessment webpage for more information. https://www.nrs.fs.fed.us/urban/utc.

8 Definition obtained from the Planning Department of Prince George's County, Maryland. http://gisdata.pgplanning.org.

9 Based on 2017 impervious surface data from the Planning Department of Prince George's County. http://gisdata.pgplanning.org.

10 Holmes, Robert R. Jr and Karen Dinicola. 2010. 100-Year Flood–It's All About Chance: Haven't we already had one this century? USGS General Information Product 106. https://pubs.usgs.gov/gip/106/pdf/100-year-flood-handout-042610.pdf.

11 See Endnote 10.

12 AECOM. 2013. The Impact of Climate Change and Population Growth on the National Flood Insurance Program. Prepared for the Federal Insurance and Mitigation Administration, Federal Emergency Management Agency, Arlington, VA. June 2013..

13 See Endnote 1.

14 See Endnote 1.

15 Samenow, Jason and Ian Livingston. 2018. Drenched city: 2018 is now Washington's wettest year ever recorded. The Washington Post. December 15, 2018.

16 Climate information was obtained from the U.S. Climate Resilience Toolkit which is managed by NOAA's Climate Program Office and hosted by NOAA's National Centers for Environmental Information (NCEI-Asheville). https://toolkit.climate.gov.

17 NOAA National Centers for Environmental Information. https://www.ngdc.noaa.gov.

18 Climate informat was obtained from the U.S. Climate Resilience Toolkit. which managed by NOAA's Climate Program Office and hosted by NOAA's National Centers for Environmental Information (NCEI-Asheville). https://toolkit.climate.gov.

19 See Endnote 16.

20 See Endnote 16.

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22 Hahn, Michael and Annette Humpal. No Date. Implementation of the New NOAA Precipitation-Frequency Atlas for Wisconsin. Presentation #223619.

23 Santa Clara Valley. 2007. Catch Basin Inserts. www.scvurppp-w2k.com/trash_bmp_toolbox_2007/Catch_Basin_Inserts.pdf.

24 See University of Washington College of the Environment "Green Cities, Good Health" webpage for a summary of facts and studies related to the economic value of green infrastructure: https://depts.washington.edu/hhwb/Thm_Economics.html.

25 See https://cbtrust.org/grants/prince-georges-county-rain-check-rebate/.

26 See Prince George's County Code, Section 32-170 through Section 32-176.

27 See Prince George's County Code, Section 25-125 through Section 25-130. Properties zoned R-O-S, O-S, and R-A are exempt. Any permit pertaining to an existing single-family detached home, an existing townhouse, one family semi-detached, two-family or three family dwelling or other similar unit type, except multifamily are also exempt.