Camden **SMART** Initiative

Stormwater Management and Resource Training

# Camden's Struggle with Stormwater

The City of Camden is served by a combined sewer system, which uses the same pipes to carry sewage and stormwater. In dry weather, the combined sewer system brings water to a treatment plant before being discharged into the city's waterways. In wet weather, all of the rain that flows off of roofs, streets, sidewalks, parking lots, and other impermeable surfaces is directed to the same pipes exceeding their capacity.

When the amount of water exceeds the sewers' capacity, the combined sewer system overflows, releasing untreated raw sewage and stormwater into the city's waterways. This creates a backup at inlets causing localized flooding that causes streets to be impassable, damages private property and renders parks and other public spaces unusable. This flooding also attracts mosquitoes adding to the public nuisance. These conditions are further exacerbated because all of Camden city's stormwater is conveyed through Camden's aging combined sewer system.

The flooding and combined sewer overflows caused by inadequate stormwater management have led to degradation of the city's environment and pose a public health and environmental hazard that negatively affect residents' quality of life.

FLOODING

STORMWATER
FROM ROOFS AND STREETS

COMBINED SEWER
TO TREATMENT PLANT

SEWAGE

COMBINED SEWER
OVERFLOWS
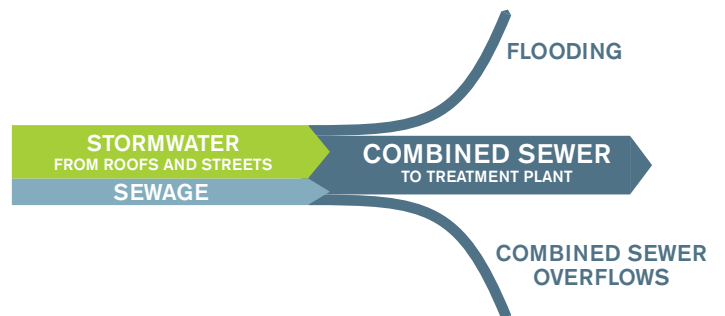
1 Federal Street (Downtown Camden)

2 Corner of Federal St and N. Delaware Ave (Downtown Camden)

3 Home in Cramer Hill neighborhood

4 Von Neida Park fields (Cramer Hill)

Camden **SMART** Initiative

The objective of the Camden SMART (Stormwater Management and Resource Training) Initiative is to develop a comprehensive network of green infrastructure programs and projects for the City of Camden. The Initiative is a partnership to restore and revitalize Camden's neighborhoods. The partners include the City of Camden, Camden County Municipal Utilities Authority, Cooper's Ferry Partnership, Rutgers Cooperative Extension Water Resources Program, New Jersey Tree Foundation, NJ Department of Environmental Protection, public-private partners, community organizations, and, most importantly, Camden residents.

The Camden SMART partnership realizes that something must be done to address the city's stormwater issues because the future of Camden is inextricably tied to its environmental, economic, and social health. An approach to stormwater management that includes both traditional (gray) and green infrastructure has the ability to not only perform stormwater management functions but also to improve the environmental, economic, and social sustainability of the city.

In addition to managing stormwater, green infrastructure provides multi-layered benefits

ENVIRONMENTAL BENEFITS

Cleaner Air and Water

Improved Climate

Increased Habitat

ECONOMIC BENEFITS

Higher Property Values

More Jobs

Reduced Energy Costs

SOCIAL BENEFITS

More Beautiful Neighborhoods

Increased Neighborhood Safety

Improved Health

The Preliminary Opportunities Analysis that follows is just a start in addressing the health and safety issues resulting from flooding. Camden SMART plans to leverage its partnerships and bring more resources in order to implement specific projects and conduct a more in-depth study. This additional study would **identify deficiencies in the existing infrastructure and prioritize gray infrastructure and green infrastructure improvements that can have a lasting impact on the lives of Camden residents while providing environmental, economic and social benefits.**

INFILTRATION & DETENTION

Ferry Avenue Rain Garden: This demonstration project was designed on a vacant lot owned by CCMUA to intercept runoff from surrounding roadways. The completed 900 square feet rain garden can capture, treat, and infiltrate over 75,000 gallons of stormwater each year. | Photo courtesy of CCMUA

TRANSPIRATION

The New Jersey Tree Foundation works with communities to empower residents to create positive changes in their own communities. Residents apply for, plant and adopt trees. The trees provide shade, improves the air quality, beautify neighborhoods and perform the critical function of transpiration, a process in which trees absorb water through their roots and transfer it up to the leaves where it evaporates into the atmosphere. | Photo courtesy of New Jersey Tree Foundation

HABITAT CREATION

Rain gardens designed with native plant material provide habitat for insects and birds that are beautiful and low maintenance.. | Photo courtesy of CCMUA

Preliminary Opportunities Analysis

In order to be strategic in its green infrastructure investments, the Camden SMART partners identified areas of the city with the highest opportunity for them to effect change—areas both at risk of flooding and with a high concentration of residents.

Areas at Risk of Flooding

Areas at risk of flooding were identified by combining best available data sources from FEMA and city public works and Camden Redevelopment Agency city mapping. To do this, a grid was overlaid on the city and each square of the grid was given a ranking from highest risk of flooding to lowest risk of flooding. Then, the factors were added together to assign each cell a combined risk of flooding.

Floodplains – FEMA

Highest risk of flooding	100-year floodplain
	500-year floodplain
Lowest risk of flooding	outside the 100- and 500-year floodplains

Identified Flood-Prone Areas – Camden Public Works

Highest risk of flooding	high concentration of Public Works-documented locations of known flooding issues
Lowest risk of flooding	low concentration of Public Works-documented locations of known flooding issues

Community-Identified Flood-Prone Areas – Camden SMART

Highest risk of flooding	high concentration of locations identified by the public to have flooding issues
Lowest risk of flooding	low concentration of locations identified by the public to have flooding issues

Topographic Low Points – Camden Redevelopment Agency

Highest risk of flooding	localized low points with large areas sloped toward them
Lowest risk of flooding	localized high points

Population Density and Risk

Census 2010 data was used to determine population density—where the highest concentrations of population are in Camden. Overlaying the combined risk of flooding with population density produced an overall opportunity map. On this map, the degree of opportunity was divided using natural breaks into 3 categories: areas with the highest opportunity to effect change, areas with moderate opportunity to effect change, and areas with low opportunity to effect change. Areas with the highest opportunity are those with a high risk of flooding and a high population density. Areas with the lowest opportunity are those with a low risk of flooding and a low population density. Areas with moderate opportunity may have a high risk of flooding and a low population density, a low risk of flooding and a high population density, or a moderate risk of flooding and a moderate population density.
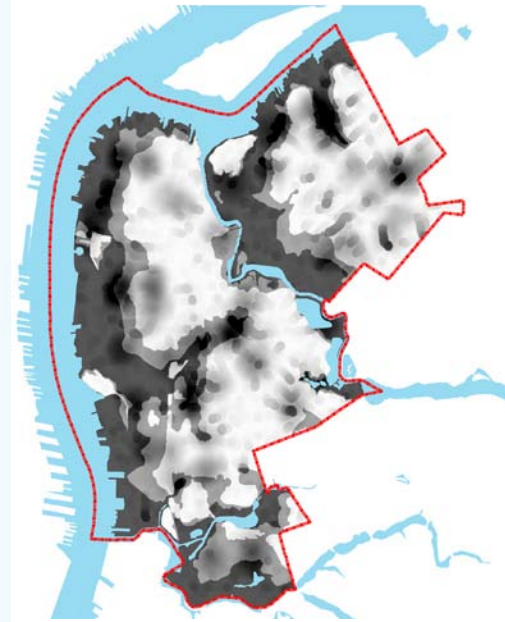
Prioritizing Opportunities

The opportunity map also highlights property ownership types—public properties, school properties, institutional properties, and private properties. Different property types will lend themselves to different strategies—different stakeholders, different partners, and different funding sources. As funding for particular property types becomes available, the Camden SMART Team can quickly identify where the highest opportunities are among those sites.

Developing Preliminary Metrics

Many factors should be considered when deciding whether to pursue investment in a green infrastructure project. The map of opportunity areas provides one such factor, indicating **where the biggest impacts are likely to be**. Other factors that may be considered include:

- Possession of site control
- Proximity to a neighborhood anchor (school, library, community center)
- Stewardship / community support
- Coordination with other work being done in the same location
- Cost and timeframe feasibility (or funding sources are in place)
- Maintenance requirements (or maintenance agreement is in place)

Areas at risk of flooding
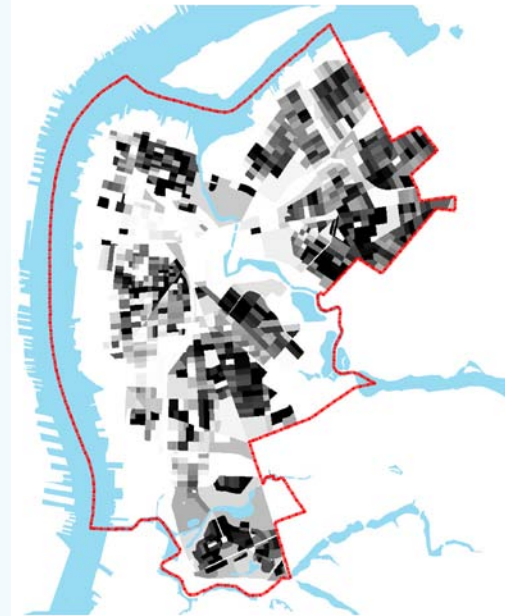
Population Density at Risk

Philadelphia

Petty Island

Pennsauken

Delaware River

Delaware River

Cooper River

Collingswood

Woodlynne

Oaklyn

	HIGH
	MEDIUM	Population Density / Flooding Risk
	LOW

Gloucester City

Haddon Township
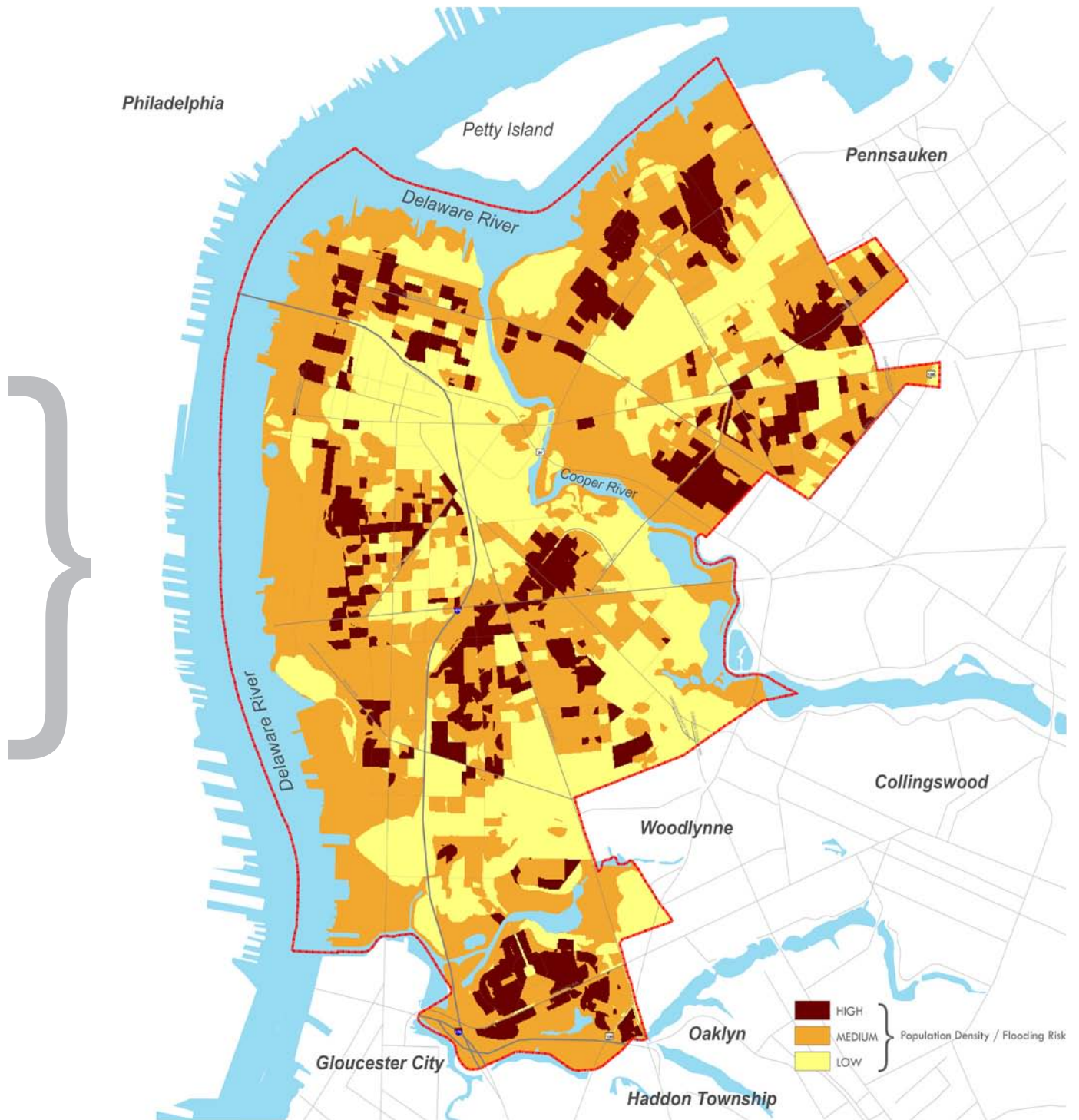
Population at Risk

Camden SMART partners with local community-based organizations and residents to implement green infrastructure projects. | Photos courtesy of Cooper's Ferry Partnership (left and right) and New Jersey Tree Foundation (center)

Menu of Best Practices for Stormwater Management

St. James Church and School
Great Swamp, NJ

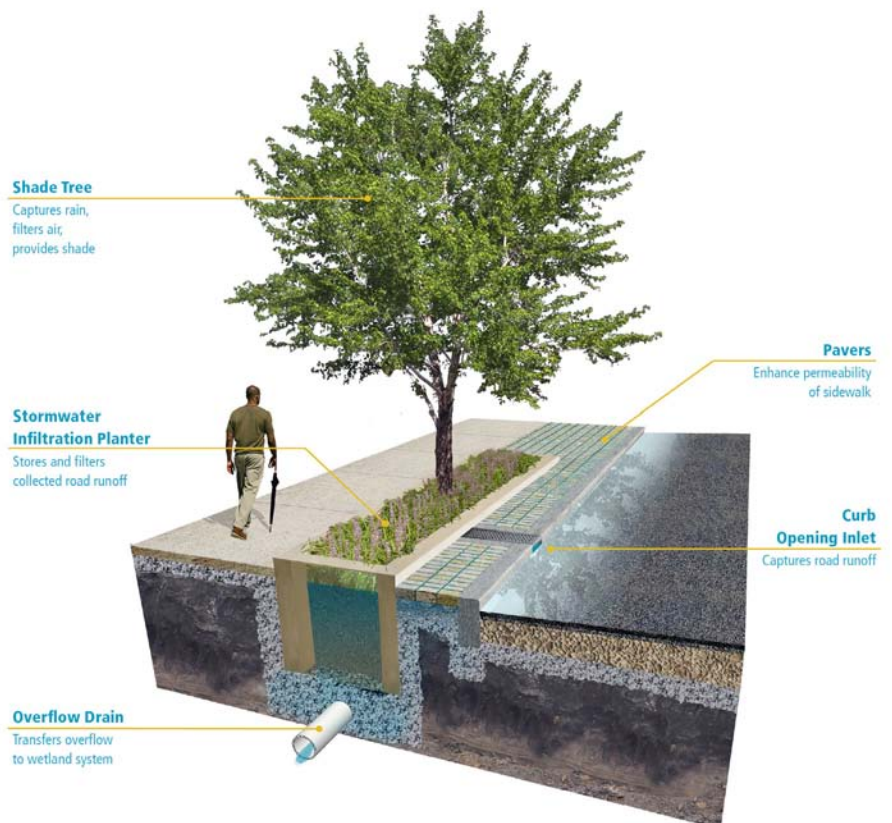Stormwater wetlands are manmade marshy depressions. They store excess stormwater, and the vegetation planted in the wetlands filters pollutants from stormwater. By creating stormwater wetlands in areas that are currently underutilized lawn areas in parks, maintenance costs can be reduced.

Street Trees
Capture rain, filter air, provide shade

Curb Opening Inlet
Transfers road runoff to continuous stormwater planter

Constructed Wetlands
Store and filter excess stormwater, protect the stream from floods, permit infiltration, enhance biodiversity

Overflow Drain
Disperses overflow from green streets and green roofs into constructed wetlands

Continuous Trenches
Store and filter excess stormwater, permit infiltration, provide more space for street tree roots

Columbus Square Stormwater Planters
South Philadelphia, PA

Stormwater planters are located between the sidewalk and the street and are designed to capture and infiltrate street and sidewalk runoff. Water enters at a curb inlet and is absorbed by plants and soil and stored in a layer of gravel until it percolates into the ground below.

Shade Tree
Captures rain, filters air, provides shade

Stormwater Infiltration Planter
Stores and filters collected road runoff

Pavers
Enhance permeability of sidewalk

Curb Opening Inlet
Captures road runoff

Overflow Drain
Transfers overflow to wetland system

Illustrations by WRT for the US EPA document "From Grey to Green: Sustainable Practices for Redeveloping a Vacant Shopping Center"

With the economic constraints that the City of Camden faces, it is imperative to identify solutions to stormwater management that can have multiple benefits- health, social, environmental, and economic. In order to have the most impact with limited funding, the Camden SMART partnership is looking for a targeted, cost-effective approach to green and gray stormwater management.

Shade Trees
Capture rain, filter air, provide shade

Lawn and Planted Areas
Capture rain; recharge groundwater levels through detention and infiltration; store overflow from cistern

Roof Overflow Drain
Transfers overflow from adjacent green roof to underground cistern

Underground Cistern
Collects stormwater runoff from plaza and adjacent building; irrigates plaza plants

Drainage Trench
Collects stormwater runoff from impermeable areas of plaza, drains to cistern

Street Trees
Capture rain, filter air, provide shade

Woodland Buffer
Captures and filters rainfall, protects stream channel, enhances plant and animal biodiversity

Flood Prevention
Topographic depressions retain excessive runoff, protect the stream from floods

Large Permeable Spaces
Permit infiltration and maintain groundwater levels and consistent stream base flow

Greenfield School schoolyard
Center City Philadelphia

Schoolyards present a unique opportunity to pair stormwater management with education. Replacing hardscaped play areas with pervious paving and rain gardens, green schoolyards can serve as stormwater storage, encourage infiltration, and provide opportunities to educate students about stormwater management issues.
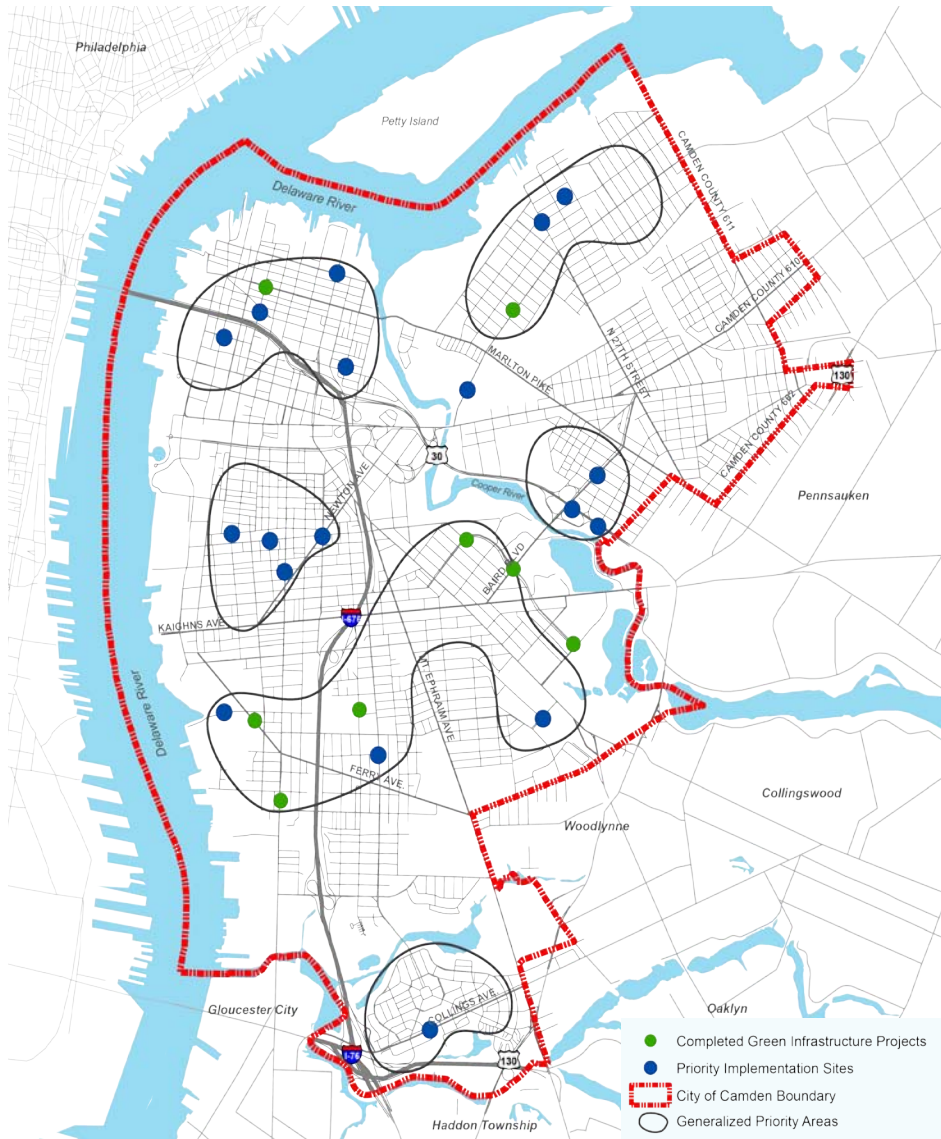

Cliveden Park stormwater management
Mount Airy, Philadelphia

Using natural topography to an advantage, runoff from surrounding streets can be brought into a park and directed to stormwater management features, such as rain gardens and wetlands.

EARLY SUCCESSES

The Camden SMART partnership has already completed twelve rain gardens and green infrastructure projects in the City of Camden. Priority sites in twelve neighborhoods have already been identified for implementation in 2012.

Legend:
- ● Completed Green Infrastructure Projects
- ● Priority Implementation Sites
- ▦ City of Camden Boundary
- ◯ Generalized Priority Areas

The completed rain gardens capture over 800,000 gallons of stormwater per year.

BEFORE

AFTER

Waterfront South Rain Garden: The extensive site remediation of this former fueling station consisted of the removal of twelve underground storage tanks and 1,850 tons of contaminated soil from the site. The final plan integrates four rain gardens to reduce stormwater flow to the combined sewer system and alleviate flooding in nearby intersections and properties. In addition to managing storm water, this new park space provides a recreational amenity for the Waterfront South neighborhood.

Camden SMART is seeking funding to develop a more detailed Green Infrastructure Plan and to implement priority stormwater improvement projects. If you would like to be part of this effort to revitalize Camden's neighborhoods please contact Meishka Mitchell of Cooper's Ferry Partnership or Andy Kricunof the Camden County Municipal Utilities Authority.

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