GREAT URBAN PARKS CAMPAIGN: GREEN INFRASTRUCTURE IN UNDERSERVED COMMUNITIES

Background Research for March 2016 Convening of Thought Leaders in Atlanta, GA

APA
American Planning Association
Making Great Communities Happen

National Recreation and Park Association

Table of Contents

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Cover image: Visitors arrive at the grand opening of Pacoima Wash Natural Park in Los Angeles, California. © flickr user LA Mountains

Introduction

Project Overview

The goal of the Great Urban Parks Campaign: Green Infrastructure in Underserved Communities project is to improve environmental and social outcomes in underserved communities through green infrastructure projects in local parks and the development of resources and training for park, planning, and allied professionals to improve equity through green infrastructure.

The Great Urban Parks Campaign will equip and inspire communities to leverage their parks to improve social and environmental outcomes while applying green infrastructure principles and practices to manage stormwater in parks. Through this project, we will inform and educate planners and park professionals on strategies and best practices to achieve maximum community benefits through green infrastructure in parks. We will also implement pilot projects to showcase models for how green infrastructure can be leveraged to improve multiple outcomes in underserved communities.

Working with local parks as the focus of such work presents an exciting opportunity to impact communities. Many parks are ideally suited for green infrastructure, as they often are located in communities with proximity to floodplains or in other areas that can measurably contribute to stormwater management. Furthermore, as people visit parks for recreation or relaxation, parks provide an excellent venue for disseminating information to the public on the practices of green infrastructure. The public gains multiple benefits as they see tangible results of both the functional improvements of managing stormwater on site as well as the natural beauty of wetlands, wildlife, and healthy environments.

There is a clear need for this type of project. APA and NRPA aspire to a future where green infrastructure practices like these are considered in the planning of every park, particularly as a matter of environmental justice in underserved communities, for the many benefits they provide to people and wildlife. These include cleaner air and water, reduced heat-island effect, reduced costs relative to gray infrastructure, improved opportunities for public use and recreation, increased habitat for wildlife, plants, and insects, educational opportunities for youth, and improved local economic conditions from increased property values. However, the resources do not exist at this time to guide planners and park professionals in best practices for implementing such projects, and there are few examples of how such work has been successfully implemented.

Convening

We have brought together green infrastructure experts, thought leaders in social equity and policy, as well as influencers in the planning and park and recreation fields, for a deep dive into the current status of green infrastructure in local parks and the potential to realize greater positive social and environmental change in communities through such practices. The convening is designed to bring together stakeholders and leaders to explore creative solutions to challenges in the field of parks and recreation and create innovative strategies to solve problems, reduce costs, and better serve the public.

One outcome of this collaboration between thought leaders and practitioners will be a video to frame the challenges, outline current research, and propose recommendations for further action to advance the practice of green infrastructure in underserved communities. The greatest need is to focus on innovative strategies for utilization of existing parks and public lands, but we intend to provide resources and direction to all public park and recreation agencies to encourage new approaches to creating high-performance public spaces that utilize green infrastructure to stormwater management.

Background Research

To inform and frame issues for the convening, APA reviewed selected literature on green infrastructure, its use in parks, and how it can promote equity. In conjunction with the literature review, an initial scan was conducted to identify 12 relevant case studies representing a range of green infrastructure project types and locations (see Appendix A). Sources consulted in the scan included, among others, the American Society of Landscape Architects' online index of stormwater case studies and the Environmental Protection Agency's National Service Center for Environmental Publications. This information will be used for further research and development of resources on parks, green infrastructure, and equity.

What is Green Infrastructure?

In practice, green infrastructure is commonly defined in one of the following two ways:

- As an **open space network**, defined by Benedict and McMahon (2006) as an interconnected network of natural areas and other open spaces that conserves natural ecosystem values and functions, sustains clean area and water, and provides a wide array of benefits to people and wildlife; or
- As **green stormwater infrastructure**, which is how the U.S. Environmental Protection Agency characterizes systems and practices that use or mimic natural processes to infiltrate, evapotranspirate, or reuse stormwater on the site where it is generated.

In reality these definitions form a continuum, from the site and neighborhood scale (green stormwater infrastructure) to the city and regional scale (open space network). The background research for this project focuses on green stormwater infrastructure – particularly in parks – in the context of larger open space systems/networks.

Physically, green infrastructure can take many forms. Some methods such as rain gardens are site-specific, while others (streambank restoration, for example) are best suited for larger landscapes or as part of a larger green infrastructure plan. Types of green infrastructure identified in the case studies are described in Table 1.

Green infrastructure techniques are frequently combined in ways that complement one another. For example, within a green parking lot, stormwater runoff captured by permeable pavement may be directed into a rain garden or bioswale. Numerous examples of projects that incorporate multiple green infrastructure strategies are detailed in the case studies later in this report.

Table 1. Green Infrastructure Examples

Green Infrastructure Type	Description
Bioswales	A bioswale is a vegetated channel that receives stormwater from an area that is graded towards it. The plant materials contained within the bioswale filter the stormwater before it is absorbed into the ground or directed into another stormwater containment system.
Constructed wetlands	Wetland construction and restoration creates a natural resource that holds stormwater runoff, slows runoff, treats nonpoint source pollution, and increases biodiversity.
Daylighting	Daylighting is the process of restoring a natural watercourse for streams that had previously been contained within pipes or other gray infrastructure.
Green parking lots/streets/alleys	Green parking lots, streets, and alleys incorporate features such as depressed curbs, permeable pavement, and plant materials to capture, detain, and/or filter stormwater before it is absorbed into the ground or directed into another stormwater containment system.
Green roofs	Green roofs incorporate plant materials on top of buildings, improving air quality, reducing the amount of stormwater runoff, and providing insulation benefits to the structure below.
Green schoolyards	Green schoolyards involve replacing paved surfaces and/or manicured grass areas with natural play areas, gardens, and outdoor classrooms that connect children with the natural environment.
Permeable pavement	Permeable pavement is used as a replacement for standard concrete, asphalt, or paver blocks in parking lots, driveways, roadways, and other applications. It contains voids that capture stormwater runoff and direct it to drainage channels, as opposed to the sheet drainage that occurs with impervious paving materials.
Rain gardens	Similar to bioswales, a rain garden is a planted area that receives stormwater from an area that is graded towards it. The plant materials contained within the bioswale filter the stormwater before it is absorbed into the ground or directed into another stormwater containment system.
River and streambank restoration	River and streambank restoration involves removing artificial barriers (such as channelization or steep grades) and providing appropriate vegetation along banks.

Why Green Infrastructure?

Communities are increasingly inspired to seek out cost-effective solutions that reduce the impact of society's interconnected health, economic, societal, and environmental challenges. Green infrastructure is one such solution, alleviating the burden on aging stormwater management facilities and improving water quality while addressing other social, economic, public health, and environmental goals.

Communities nationwide face daunting challenges in replacing aging stormwater management facilities to comply with mandated requirements of the Clean Water Act at a cost of billions of dollars. Planners, civil engineers and elected officials seek innovative approaches to reduce the prohibitive costs of replacing crumbling gray infrastructure and highly vulnerable stormwater facilities.

Parks and other public assets present a unique opportunity to utilize lands that are already in long-term protected conservation status in a manner that is consistent with their purpose. In addition, because a significant amount of urban parkland is strategically located in areas which are ideally suited for green infrastructure approaches to stormwater management, parks are even more desirable locations for such projects. However, even though green infrastructure approaches to replacing traditional gray infrastructure may be cost effective and environmentally beneficial, there is often little importance placed on achieving greater benefits than just functionality, benefits that can improve social equity, and environmental quality.

Green infrastructure projects in parks in underserved communities could produce long-lasting environmental and social benefits. Through a variety of techniques including source water protection, infiltration, bioremediation and green structures to manage stormwater and replenish groundwater, green infrastructure improves a community's environmental quality. But, green infrastructure projects in parks also offer a unique opportunity to demonstrate valuable social outcomes. By increasing access to nature, green infrastructure projects can help community members develop a deeper appreciation of the environment. And, by actively engaging community members in the process of planning, developing, and monitoring green infrastructure projects in parks, there is an opportunity for community empowerment and engagement, helping to ensure the long-term success of the projects.

The two definitions of green infrastructure noted previously have in common the ecological services and benefits provided by green infrastructure. Rouse and Bunster-Ossa (2013) provide a useful framework for characterizing those benefits, as illustrated in Table 2.

While the background research focuses on environmental benefits associated with green stormwater infrastructure, it also identifies opportunities to leverage co-benefits. The ways in which co-benefits are realized vary. Coutts and Hahn (2015) note that the mere presence of green infrastructure leads to health benefits due to its effects on the environment (such as improved air quality, which can reduce the incidence of asthma and other respiratory illnesses). Access to green infrastructure also encourages physical activity that leads to a host of positive health outcomes, and exposure to green infrastructure can result in stress reduction.

Table 2. Green Infrastructure Benefits (Source: Rouse and Bunster-Ossa 2013, pp. 12-13)

Green infrastructure can…	
absorb stormwater, reducing runoff and associated impacts such as flooding and erosion.	…to benefit the **environment**
improve environmental quality by removing harmful pollutants from the air and water.	
moderate the local climate and lessens the urban heat island effect, contributing to energy conservation.	
preserve and restore natural ecosystems and provide habitats for native fauna and flora.	
mitigate climate change by reducing fossil fuel emissions from vehicles, lessening energy consumption by buildings, and sequestering and storing carbon.	
create job and business opportunities in fields such as landscape management, recreation, and tourism.	…to benefit the **economy**
stimulate retail sales and other economic activity in local business districts (Wolf 1998 and 1999).	
increase property values (Neelay 1988; Economy League of Greater Philadelphia 2010).	
attract visitors, residents, and businesses to a community (Campos 2009).	
reduce energy, healthcare, and gray infrastructure costs, making more funds available for other purposes (Heisler 1986; Simpson and McPherson 1996; Economy League of Greater Philadelphia 2010).	
promote healthy lifestyles by providing outdoor recreation opportunities and enabling people to walk or bike as part of their daily routines.	…to benefit the **community**
improve environmental conditions (e.g., air and water quality) and their effects on public health.	
promote environmental justice, equity, and access for underserved populations.	
provide places for people to socialize, and build community spirit.	
improve the aesthetic quality of urban and suburban development.	
provide opportunities for public art and expression of cultural values.	
connect people to nature. Studies have shown that better health outcomes, improved educational performance, and reduced violence can be among the resulting benefits (Ulrich 1984; Kaplan 1995; Berman et al. 2008; Kuo and Sullivan 1996, 2001a, and 2001b).	
yield locally produced resources (food, fiber, and water).	

Green Infrastructure, Parks, and Equity

Parks are a primary component of urban green infrastructure networks (the first definition referenced above). As such, they provide logical locations for green stormwater infrastructure. In places such as Atlanta (Historic Fourth Ward Park) and Philadelphia (Saylor Grove Park), green infrastructure is being deployed in parks to manage stormwater and reduce flooding.

Green stormwater infrastructure in parks can provide environmental and social co-benefits when designed to be multi-functional, integrated into the park, and to connect with the surrounding community, for example:

- providing opportunities for physical activity, contact with nature, etc. through facilities and programs such as trails, fitness installations, community gardens, nature education, etc.; and
- improving environmental quality through features such as tree plantings that improve air quality and reduce the urban heat island effect.

As noted in the previous section, these benefits can be particularly significant for poor and underserved communities that typically have less access to green infrastructure than more affluent populations. Studies have shown that poor and underserved neighborhoods typically have less access to green infrastructure resources such as parks and tree canopy than more affluent communities. For example, a study in Oakland, CA found that tree canopy coverage ranged from 47.4% in a high-income council district to 12.0% in a low-income council district (Horn, 2016). They also demonstrate significantly worse health outcomes (morbidity and mortality) than more affluent ones within the same metropolitan region. As part of an examination of inequities in Cuyahoga County, OH, CommonHealth Action (2010) documented a 24.5-year difference in life expectancy between an affluent suburban neighborhood (Lyndhurst) and a high-poverty inner-city neighborhood (Hough) that are located only 8.5 miles from one another. While there are many causes of these types of disparities (referred to as the social determinants of health by public health professionals), the level of access to green infrastructure can be a contributing factor.

For example, research into the role of greenspaces in the social ecology of the urban poor in public housing has shown that green infrastructure can improve social capital, defined by Harvard social scientist Robert D. Putnam (as cited in Coutts and Hahn, 2015) as "features of social organization such as networks, norms, and social trust that facilitate coordination and cooperation for mutual benefit." These types of interpersonal relationships generate positive health outcomes (both physical and mental). In her study on the role of

GREEN INFRASTRUCTURE, HEALTH, AND EQUITY IN ACTION:
The beaches at Indiana Dunes State Park are a valuable and free recreational resource for the surrounding population, a significant percentage of which was below the 2012 U.S. median income and/or in a high unemployment area. As documented by Trice (2014), beaches at the park were frequently closed due to the presence of E. coli *bacteria that was deposited in Lake Michigan by Dunes Creek, a stream that had been contained within a pipe. Daylighting the stream eliminated the closed environment that had encouraged the growth of* E. coli*, resulting in improved water quality and improved access to and utilization of the public beaches.*

urban forestry in a healthy social ecology, researcher Frances E. Kuo (as cited in Coutts and Hahn, 2015) states that disadvantaged urban neighborhoods are

> …precisely the context where social ecosystem health is at greatest risk and where urban trees are least present. While poverty is not synonymous with alienation and risk of crime, too many poor urban neighborhoods are characterized by high levels of mistrust, isolation, graffiti, property crime, and violent crime. It may be that the greatest benefits of urban forestry accrue to some of its historically most underserved constituencies.

Alexandra Dapolito Dunn (2010) similarly argues that

> green infrastructure has additional and exceptional benefits for the urban poor which are not frequently highlighted or discussed. When green infrastructure is concentrated in distressed neighborhoods – where it frequently is not – it can improve urban water quality, reduce urban air pollution, improve public health, enhance urban aesthetics and safety, generate green collar jobs, and facilitate urban food security. (p. 41)

To maximize the benefits for underserved communities, it is important to consider how green infrastructure in parks can connect to surrounding neighborhoods. As Harnick (2003) observed, although the distribution of unspoiled natural areas is not equitable, park agencies can level the playing field by siting their facilities in a manner that is accessible to people of all incomes and abilities. Green streets are a way to provide connectivity between parks and their surrounding neighborhoods. Boulevards and arterial roadways that link park users with their homes and schools can incorporate green street design elements (pedestrian scale, shade trees, diverse parkway plantings, etc.) to encourage park usage while also bringing the benefits of green infrastructure into the surrounding community.

In addition, the economic co-benefits of green infrastructure should not be overlooked. Edward McMahon (2000) notes that, often, conventional gray infrastructure such as dikes, levees, and water treatment plants are far more expensive than purchasing or otherwise protecting land within flood plains. The cost savings associated with green infrastructure are a valuable benefit, especially for those communities that struggle with obtaining adequate financial resources.

Summary of Case Study Findings

In his study of the intersection of sustainability and environmental justice, Agyeman (2005) found that small-scale, local projects and cooperative endeavors were the most successful implementers of what he terms “just sustainability.” Our review of 36 case studies supported this conclusion, as 11 of those featured environmental justice and equity as goals or reasons for their respective projects. Six of the 12 case studies highlighted in Appendix A had an equity focus: Lynwood, CA, Charlottesville, VA, Providence, RI, Philadelphia, and two in Los Angeles.

Successful green infrastructure projects within parks have extensive community engagement processes to determine the community’s wants and needs as well as keep residents informed throughout the course of a project. Nonprofit organizations typically were the bridges between the community and the public agencies responsible for designing, constructing, and maintaining the projects.

Closely related to community engagement, education features prominently in many of the case studies at a range of scales, from dedicated outdoor classrooms to informational signage explaining the purpose and benefits of green infrastructure components.

Funding typically combines a variety of sources: local tax dollars, grants from federal, state, and nonprofit agencies, and donations from private businesses, community organizations, and residents. Benedict and McMahon (2006) document this patchwork approach to funding green infrastructure as necessary since there is not adequate government funding to fully implement green infrastructure solutions. However, there are many potential grant funding sources for green infrastructure due to the overlapping categories of interest that such projects may fall into (such as wetland protection, pollution control, stormwater mitigation, etc.).

Further Research and Development

Additional investigative work is needed to further explore the implementation (and barriers thereto) of green infrastructure in parks, especially though the lens of equity. Key questions include:

- How can a formal emphasis on green infrastructure and equity be incorporated in the park planning and community planning process?
- What public-private partnership financing models lend themselves to these types of projects?
- Are there examples of policies to ensure equity in the siting of green infrastructure in parks?
- How can the private sector be brought into these projects?
- What barriers (regulations, technical knowledge, maintenance considerations, etc.) can impede the implementation of green infrastructure?

The project team will aim to address the above questions, among others, in a set of resources that will be produced in a later phase of the project.

Acknowledgements

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Appendix A. Case Studies

Location	Type of Green Infrastructure	Description
Ricardo Lara Linear Park – City of Lynwood, California	Bioswales	Ricardo Lara Linear Park in Lynwood, CA was funded by a grant under Proposition 84, which provides grants for disadvantaged communities to create parks. Lynwood built a 5.25 acre linear park in the buffer zone along I-105, which includes a 4.5 foot deep bioswale that runs the length of the park. Lynwood's residents, who are predominantly low and moderate-income and Hispanic, have 0.6 acres of parkland per 1,000 residents, compared to a national median of 12.5. The city worked with a community engagement group called From Lot to Spot to identify what residents wanted in the new five-block park, and the amenities identified through the engagement process included a fitness park with workout machines, a dog park, a community garden and pavilion, and an ecological section.
Saw Mill River – Saw Mill River Coalition and Groundwork Hudson Valley, Yonkers, New York	Daylighting	In Yonkers, New York, a project started by Groundwork Hudson Valley, an environmental justice non-profit, led to the Saw Mill River Coalition, engaging a wide range of public and private sector stakeholders and beginning the process of daylighting the river, which was buried by the Army Corp of Engineers in the 1920s. The coalition obtained grant funding from the State of New York along with funding from federal agencies and private foundations to undertake the $19 million daylighting of the Saw Mill River, which runs through downtown Yonkers, creating 13,775 square feet of aquatic habitat and spurring revitalization of the surrounding downtown. A Community Benefits Agreement was put in place, and community stakeholders were engaged through public charrettes and roundtables funded by the Hudson River Foundation. The river now provides an overflow channel that protects the community from flooding, offers aquatic habitat, and includes a public park complete with an education center.
Avalon Green Alley Network – City of Los Angeles and The Trust for Public Land, South Los Angeles, California	Green Alley	The Avalon Project will retrofit a mile of alleyways in a park-poor neighborhood in South Los Angeles, where there are only 0.42 acres of park space per 1,000 residents, creating a network of green space that will provide increased access to public open space, as well as green stormwater BMPs. This partnership between the City of Los Angeles and the Trust for Public Land is the first alley revitalization project in South Los Angeles and the first comprehensive alley retrofit in Los Angeles to incorporate both green stormwater BMPs and vehicles use. It will also be the City's first network of green alleys, retrofitting six alley segments to create connections between residences and community services and amenities. Active community engagement around the project led to the formation of the Avalon Green Alley Green Team, which has organized alley cleanups, tree plantings, community art projects, and a neighborhood watch in cooperation with the local police division. The project, which broke ground in 2015, foresees a combination of community-led and city provided maintenance and stewardship of the green alleys going forward, including the Avalon Green Alley Green Team, the Los Angeles Conservation Corps, and the Coalition for Responsible Community Development.

Location	**Type of Green Infrastructure**	**Description**
NYC Parks Five Borough Complex – City of New York, Randall's Island, New York	Green Roofs	In 2007, the Five Borough Technical Services Division of the New York City Department of Parks and Recreation installed its first green roof system on its headquarters, located on Randall's Island. The project, in partnership with GreenApple Corps, is recognized for a range of benefits, including reducing stormwater runoff, mitigating the urban heat island effect, conserving energy, creating green space and wildlife habitat, and reducing noise transmission in the urban environment. It also provides an education and research venue for the public, park staff, and park patrons. The first installation was an extensive green roof with nine species of plants native to the New York City metropolitan area. The roof was expanded with four extensive and five intensive green roof systems in 2008. It has since been expanded to include over 30 unique systems covering 30,000 square feet, making it the fifth largest green roof in New York City. Components include the intensive and extensive systems, green walls, a vegetable/herb farm, a vertical farm system, honey bee hives, and a hydroponic growing system.
William Dick Elementary Schoolyard – City of Philadelphia and The Trust for Public Land, Philadelphia, Pennsylvania	Green Schoolyards	As part of Philadelphia's Green 2015 initiative, The Trust for Public Land's Parks for People program undertook a participatory design process with students in grades 6-8 at William Dick Elementary School. Students were engaged in all phases of the greening and redesign of their school's asphalt playground, which had issues with runoff and standing water and was an inhospitable play environment. The design process started in 2012 and the new playground opened in June 2014, reflecting the students' vision and including new play equipment, an artificial turf field, and a running track, as well as shade trees, and the largest rain garden of any Philadelphia schoolyard.
The Steel Yard – The Steel Yard (local nonprofit), Providence, Rhode Island	Permeable Pavement Bioswales	After Providence Steel and Iron closed in 2001, a local non-profit purchased the space, located in a poor and underserved neighborhood, remediated it and redeveloped it as a park and community space for arts education, workforce training, and small-scale manufacturing. The Steel Yard Park retains the character of the original industrial site while also incorporating permeable pavement and bioswales that store and filter rainfall on site, helping to protect the Narragansett Bay watershed.
Rain Garden Reserve – City of Cuyahoga Falls, Ohio	Rain Gardens	Having been declared a federal disaster zone twice in a two-year period due to repeated flooding, the City of Cuyahoga Falls worked with FEMA and the Ohio Emergency Management Agency to develop a plan to reduce flooding in a neighborhood that experienced chronic flooding. Using FEMA funds, the City acquired four flood-damaged properties and demolished the houses to preserve the lots and as open space and create the mid-block 24,000 square foot Rain Garden Reserve. The park has three rain gardens and an overflow pipe for peak rain events, which drains 3.17 acres at the lowest point on the block. The cost for the project was $107,000 in FEMA funds and $50,000 in donated materials, and the project was supported by community organizations, residents, and local businesses. Ongoing maintenance is performed by the City.

Location	Type of Green Infrastructure	Description
Meadow Creek Stream – City of Charlottesville, Virginia	Riverbank/ Stream Restoration	Located in Charlottesville, Virginia, the Meadow Creek stream restoration used "natural channel design" principles to restore 7,372 linear feet of stream and reconnect the stream, which is designated as impaired, to its floodplain. The adjacent trail includes interpretive signage that showcases the project as an urban stream restoration demonstration site. In addition to the restored stream, the project protects 72 acres of land along the creek through permanent conservation easements, including an existing park and 40 acres of new parkland. The new parkland is adjacent to public and low-income housing. The city engaged the community throughout the design process and stream restoration through a variety of channels including public meetings, neighborhood meetings, media engagement, and site tours.
Magnuson Park – City of Seattle, Washington	Constructed Wetlands	Magnuson Park in Seattle, located on the site of a former Naval Air Station, is considered a model for urban ecology. Through the development of the park, 10 acres of impervious surface cover were removed, and five distinct wetland systems were created through the construction of 10 acres of new wetlands and the rehabilitation of four acres of existing, low-functioning wetlands. The wetland systems can hold 5 million gallons of stormwater runoff, reducing non-point source pollution in Lake Washington. The park design also protected 8 groves of mature trees and incorporated 30 species of native plants. The park design incorporates both the ecological function of the wetlands and active recreation, but limits trails and recreation access in priority habitat areas while concentrating it in other areas of the park. The park also includes the Magnuson Outdoor Learning Lab, which offers a hands-on science and service learning.
Pacoima Wash Natural Park – City of Los Angeles, California	Bioswales	The Pacoima Wash Initiative is a collaborative between community residents, the Pacoima Beautiful environmental justice nonprofit, and local governments to create park space and ecological restoration from a makeshift dump site on a vacant lot along the Pacoima Wash (a tributary of Tujunga Wash, which is a tributary of the Los Angeles River). The Pacoima neighborhood of Los Angeles lies at the nexus of freeways and industrial buildings and suffers from a lack of green space; its residents have some of the highest heart disease and obesity levels in the county. Funded by the Mountains Recreation and Conservation Authority with funds from Proposition 50 and an Integrated Regional Watershed Management Plan grant from the California Department of Water Resources, the Pacoima Wash Natural Park is 4.7-acres and features native plantings, walking trails, play areas, and integrated landscape stormwater facilities designed to capture up to 371,000 gallons of runoff.

Location	Type of Green Infrastructure	Description
West Riverfront Park – City of Nashville, Tennessee	Multiple (bioswales, green roofs, permeable pavement)	Following flooding on the Cumberland River in 2010, an area of riverfront property near Nashville's downtown that had previously been discussed as the site of a future baseball stadium was dedicated as a park. The West Riverfront Park, which opened in July 2015, incorporates green infrastructure measures for flood control, including a bioswale, bioretention areas, and a 400,000 gallon harvesting tank located below that park's amphitheater. The park also includes a 4,000 square foot green roof, and 12,500 square feet of permeable pavers, along with a limestone floodwall that was built two feet above the 2010 flood levels. The park was designed with a "park first" ethos, meaning all features were looked at within the park's functional purpose.
Green Streets, Clean Waters – City of Philadelphia, Pennsylvania	Multiple (bioswales, rain gardens, permeable pavement, green schoolyards)	The Philadelphia Water Department (PWD) is investing in green stormwater infrastructure (GSI) to address combined sewer overflows. Through the Green City, Clean Waters program, the City plans to spend $2.4 billion on capital construction, operating and maintenance costs over a 25-year period. PWD is working in partnership with the Philadelphia Parks and Recreation Department (PPR) as well as other city agencies to implement this project throughout the city. PPR's Green2015 Initiative has the goal of adding 500-acres of new, publicly accessible green space to the city through the transformation of vacant or underutilized land into parks. New park sites focus on publicly-owned land such as vacant lots, schoolyards, and recreation centers in park-poor neighborhoods. Incorporating GSI on these sites provides benefits to both agencies related to acquisition of use, cost-share opportunities, as well as to the community. Since the program started in 2011, over 1,100 green stormwater tools have been added around the City by the PWD and private developers. A number of these features are in Philadelphia's parks. The Shissler Recreation Center was redeveloped from a vacant grass field into a recreation facility and spraypark with stormwater tree trenches and biofiltration basins through a partnership with the PWD, PPR, the Mural Arts Program, the Pennsylvania Horticultural Society and the New Kensington Community Development Corporation. Herron Park and Playground sets a new standard for revitalizing and redeveloping neighborhood parks and playgrounds in aging cities. It integrates sustainable stormwater management practices – bioretention facility, rain garden, bioswale, porous pavement, native planting areas – with a vibrant and engaging recreation experience. Both the site design and material selection reinforce play spaces in the park while serving to manage stormwater. Many of these design solutions are being used in other city park redevelopments. At Cliveden Park, a stormwater demonstration project uses the park's natural topography to detain and infiltrate stormwater in small upland depressions and an existing wetland and in Fairmount Park, a constructed one-acre stormwater wetland treats an estimated 70 million gallons of urban stormwater per year.