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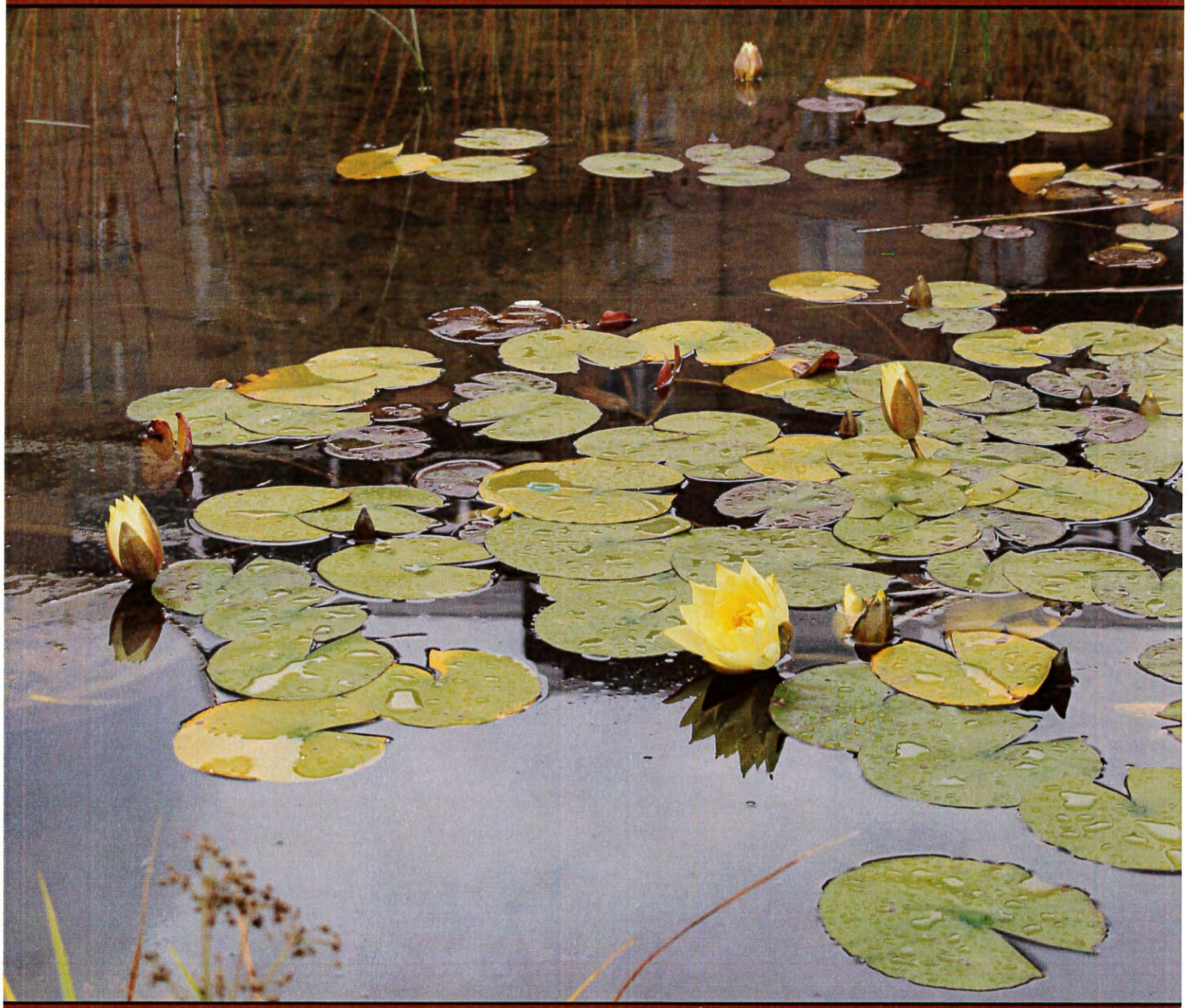
Green Infrastructure in Parks:

A Guide to Collaboration, Funding, and Community Engagement



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INTRODUCTION

This guide is intended to encourage partnerships between park agencies and stormwater agencies aimed at promoting the use of green infrastructure on park lands. Green infrastructure can help to maximize the environmental, economic, and social benefits of parks. By building strong partnerships, agencies can improve park lands and access to parks, better manage stormwater, increase community resiliency to shifting weather patterns, and provide funding to implement and maintain park enhancements that benefit the community.

The guide offers information on why partnerships between stormwater managers and parks managers can be beneficial and how you can create such partnerships. The guide presents an overview of green infrastructure and describes practices that can be used to manage stormwater in parks. In addition, you will find information on factors that influence the selection of appropriate green infrastructure practices, such as maintenance requirements.

The guide is designed to provide you with a stepwise approach for building relationships with potential partners, and includes information on how to identify and engage partners, build relationships, involve the community, leverage funding opportunities, and identify green infrastructure opportunities. It includes recommendations on the types of projects that are most likely to attract positive attention and funding, and which provide a wide range of benefits.

Case studies are included to illustrate the approaches presented in the guide. These real-life examples portray how partnerships between municipal stormwater agencies and parks departments have improved recreational resources in the community, enhanced environmental protection, and reduced risks and burdens.

For those who wish to go deeper into a topic, the guide includes short descriptions and links to external resources that provide more detail on the material presented within.

Improves Drainage

Permeable pavement, soil amendments, enhanced infiltration, and underground stormwater storage systems can be used to mitigate drainage problems or nuisance flooding in parking areas, walkways, and playing fields. Urban soils are often compacted and hard to maintain. Improving the drainage of turf fields can result in fewer field closures after rain storms and reduce the need for seasonal turf maintenance, re-tilling, and aeration. Addressing issues of standing water on pavement or in low-lying areas improves public safety and helps to eliminate mosquito breeding habitat.

Helps to Educate the Public

Placing signs where green infrastructure is used raises public awareness of the importance and type of measures that reduce stormwater pollution. Green infrastructure at parks can demonstrate features easily transferrable to homes and businesses. Green infrastructure demonstrations and signage can help the local municipality meet stormwater program requirements for public education. Maintenance of green infrastructure can also help create green jobs and educate the new green work force.

Improves Water Quality

Stormwater volume and pollutant reductions can be achieved with green infrastructure to help local municipalities meet regulatory requirements. Park spaces offer a wealth of pervious surface that can be used to absorb rainwater and runoff from adjacent developed landscapes that currently drain directly to piped collection systems.

Benefits the Overall Environment

Green infrastructure can be used to reduce urban heat island impacts by incorporating vegetation, especially trees, where pavement or conventional turf landscapes existed before. Vegetated green infrastructure can also sequester carbon via CO_2 uptake during photosynthesis, which traps carbon in the biomass and helps reduce greenhouse gases. Green infrastructure planted with native and locally adapted plants can attract beneficial wildlife such as birds, butterflies, and other pollinators.

Provides Economic Benefits

Green infrastructure can be installed to earn stormwater utility credits in stormwater fee areas, and the parks could receive funds from such programs. Parks with green infrastructure might be able to apply for maintenance funding or have their best management practices (BMPs) maintained by an outside party, depending on the type of BMPs and the types of approaches taken by the local municipality. Where rainwater harvesting has been incorporated, captured water can be used for irrigation or other graywater uses, reducing costs associated with potable or recycled water use. Upgraded stormwater management systems could also reduce maintenance costs or reduce capital costs to upgrade essential stormwater management infrastructure. Destination parks could also stimulate community-level investments due to the desirability of being near the park.

Common Questions About Green Infrastructure

What do I need to know about green infrastructure, and what does the public need to know about green infrastructure and how it relates to parks?

Why choose green over gray infrastructure?

There are a variety of benefits of choosing green infrastructure over traditional gray infrastructure (e.g., concrete pipes), including:

- It's more attractive, effective, and multifunctional.
- It provides habitat for beneficial wildlife.
- It can reduce maintenance and eliminate mosquito breeding habitat.
- It can incorporate existing park features—both natural elements and man-made infrastructure.
- Using it can reduce infrastructure costs compared to gray infrastructure.

Will it attract nuisance wildlife?

Not if you design and maintain it correctly according to local standards and the following guidelines:

- Choose the right mix of plants to attract beneficial wildlife (e.g., birds, pollinators).
- Select green infrastructure elements that eliminate standing water that could serve as mosquito breeding habitat, and design facilities to drain in 72 hours. Ensure permanent pools don't become stagnant.
- Nuisance wildlife can occur in all parks. Good design and attentive management such as eliminating food sources and providing securely covered trash receptacles can reduce or eliminate problems.
- Inspect practices regularly to remedy any problems.

Will the stormwater features be unattractive or create safety hazards?

Not if you use green infrastructure, because:

- Green infrastructure practices are typically integrated into the landscape and rely mainly on soils, vegetation, and infiltration to reduce runoff.
- Traditional stormwater management creates detention basins and wet ponds that are often unsightly and need fences to keep out the public.
- Green infrastructure features can be designed with aesthetics in mind and can even incorporate benches, art, or sculptural designs.

How do you ensure public safety and limit liability?

- If possible, design features to infiltrate runoff.
- Design stormwater elements that minimize the risk potential for park users such as eliminating trip hazards, adding crushed stone paths, or designing boardwalks or viewing platforms.
- Create water areas (e.g., permanent pools, water features) with the public in mind. Careful design, clear sight lines, and natural features such as wetland fringes can reduce or eliminate hazards.
- Limit access to gently sloping bank areas around water features by adding natural screens and barriers, and allow public access where it can be controlled or monitored by park staff.

Mosquito Control

Green infrastructure can be designed to limit mosquito breeding. Green infrastructure design standards allow for standing water for short periods of time—usually 48 to 72 hours—which is much shorter than the time needed for mosquitoes to develop from larvae to adults. When designed to this standard and properly maintained, green infrastructure ensures that water is infiltrated into the ground quickly enough to limit nuisance insects.

Mosquito control via green infrastructure also reduces the need for parks managers to use insecticides for mosquito control—an overall benefit to health, safety, and the environment.

GETTING STARTED

Adding green infrastructure practices in a park is a multi-step process that involves a variety of stakeholders. The first phase of any project involves identifying partners. Engaging with partners from the outset of the project will ensure that the necessary expertise is available to guide the project from an idea through its implementation. The second phase includes relationship building, leveraging funds, identifying which green infrastructure practices to use, and planning for maintenance. Selection of high-visibility pilot projects can draw attention to the work being undertaken and encourage community support.

The following sections walk through the steps in the process. Case studies are provided to highlight examples of successfully projects.

Figure 1. Process for implementing green infrastructure.

- The state or local department of transportation has a project that requires offsite mitigation of stormwater, and the park could be the best and most affordable place in which to locate stormwater management practices. In this case, the department of transportation might be strongly motivated to provide incentives in the form of park enhancements and maintenance concessions so that the parks manager clearly sees reasons to engage in such partnerships.
- The parks manager approaches the local utility regarding potential opportunities for funding to support restoration of stream channels, eroded areas, or areas prone to flooding (e.g., recreational fields that are frequently rendered unusable by floodwaters).

Park agencies can work with local governments and quasi-governmental utility agencies that are responsible for managing stormwater to prevent flooding and meet water quality regulations. This might be a public works, engineering, or planning department; drainage district; or water and sewer authority. Many stormwater agencies have an interest in implementing green infrastructure and might be able to fund or cost-share the design, construction, or maintenance of green infrastructure.

Stormwater agencies will be aware of priority areas that could benefit from green infrastructure, such as those with known water quality problems, undersized or failing drainage infrastructure, and a history of localized flooding or combined sewer overflows. Once these areas are identified, stormwater agencies can work with parks agencies to narrow down potential locations for green infrastructure and provide advice on site suitability, design, and engineering considerations. They can also identify possible green infrastructure funding from stormwater-related revenue or dedicated grant/loan programs.

Environmental Justice

Historically, many cities have had limited park space and recreational amenities in economically disadvantaged neighborhoods. In more recent years, there has been an increase in active community engagement in these underserved areas to improve previously neglected or derelict spaces and to reimagine how these areas can become public park space.

Citizens can benefit from living or working near park spaces by participating more in healthy physical activity, experiencing a positive sense of community, and having more equitable access to environmental resources such as parks and open space. Park spaces offer areas where neighbors can gather for play, exercise, social interaction, or other leisure activities. Studies have shown that having access to parks or green space can contribute to improved psychological health and wellbeing of those who live or work nearby by reducing stress.

When community members come together to correct environmental damage or to rehabilitate and redesign parks, they are able to actively participate in the decision-making process and gain a voice in improving the local environment and community livability.

Stormwater agencies can contact park agencies—either individual park managers or park agency leadership—depending on the scale of desired efforts. They might want to look at a single park for a project or evaluate parks citywide for green infrastructure opportunities. Ultimately, multiple levels of park management will need to be involved in the decision making.

Governmental Agency Partners

Other agencies and departments can have a stake in green infrastructure and park enhancements.

- **The local executive office** (mayor, commissioner, etc.) might want to promote clean water, sustainability, and green jobs to maintain green infrastructure.
- **Transportation departments** can partner with parks to achieve better drainage along problematic roads or intersections. Underutilized open space at interchanges can be used for both stormwater management and recreation. Transportation departments might have funds to mitigate the impacts of transportation projects on sensitive areas such as wetlands and wildlife habitat. These funds might be used to create constructed wetlands, stormwater/habitat ponds, or other green infrastructure elements in parks.
- **School districts** can partner with parks departments to create living laboratories and green infrastructure park projects that are part of an environmental curriculum. These features can also promote physical education and interaction with nature.

MOVING FORWARD

2. Build Relationships

Once you have identified potential partners, these partners can be engaged by working with them to identify common mutually beneficial goals. Parks supervisors and other potential partners can also explore creative funding arrangements to secure adequate funding to implement park projects that meet the goals of the respective partners.

Case Study: Partnering to Create Herron Park — Philadelphia, Pennsylvania

In 2009, the city of Philadelphia proposed a 20-year plan to improve stormwater management and water quality in local streams and rivers. This approach focused on using green infrastructure to change the city's drainage and provide other benefits to the local community. The Philadelphia Recreation Department and the Philadelphia Water Department collaborated on the redevelopment of Herron Park in Philadelphia, a 1.12-acre park that was largely covered in concrete. The departments worked together to blend new recreational and aesthetic amenities with stormwater management elements. The park features:

- A playground.
- A porous surface basketball court.
- A push-button activated "sprayground" that only runs when people are present.
- More than 80 native and adapted trees, shrubs, grasses, and a rain garden with more than 3,000 water-tolerant native plants.
- A vegetated swale.
- An infiltration trench.

Figure 3. Top: east entrance of the park in 2011 after new green infrastructure elements were installed. Bottom: conditions in 2009, before renovation. (Source: Langan Engineering)

Both the basketball court and playground meet multiple goals. The porous asphalt surface on the basketball court allows water to pass through to the soil below, including water from an adjacent street that is redirected to the court. The pervious safety surface of the playground is made from recycled tires to meet playground safety requirements and infiltrate water. Other green design elements include a vegetated swale that serves as a passive lawn area and slows stormwater before it enters the drainage system. A new infiltration trench with a perforated pipe laid in gravel replaced a traditional concrete drain, allowing stormwater to soak into the soil beneath the porous play surface while ensuring proper drainage. The green infrastructure elements help retain the first inch of rainfall from the site itself as well as runoff from 1.17 acres of adjacent, impervious land. The park reconstruction, which cost $1.1 million, helps the Philadelphia Water Department meet its legal obligation under a 2011 consent decree with the U.S. Environmental Protection Agency to reduce combined sewer overflows into the Delaware River by 85 percent.

4. Identify Green Infrastructure Opportunities

Where should green infrastructure be installed in parks? Below are some ideas to get the most benefit from green infrastructure at your site.

Capture Runoff

Look for opportunities where runoff from park land and adjacent rights-of-way can be directed to pervious park spaces or other green features designed to retain stormwater. For example:

- Use curb cuts to direct water from roadways to landscaping or other pervious areas.
- Create a vegetated swale along the perimeter of the property with ornamental shrubs, grasses, and other landscaping elements to collect and infiltrate offsite run-on or runoff.
- Build a rain garden to capture runoff and feature plants that attract butterflies or birds.

Case Study: Treating Offsite Runoff at Hunter Point South Waterfront Park **Long Island City, New York**

Hunter Point South Waterfront Park, in Queens, New York, is a 5.5-acre park located directly on the waterfront in a former industrial area of Long Island City. The park provides a multi-use open space that incorporates an array of design features to encourage recreational activities, manage stormwater, and conserve water and power.

Figure 5. Hunter Point South Waterfront Park. (Source: ESTO)

Hunter Point South Waterfront Park includes a multi-use, grassy oval framed by a continuous path and a pleated steel roof shade pavilion. The oval field serves as a landscaped play area for most of the year, but it can also handle storm surges on the flood-prone site. Adjacent to the oval, a canopied pavilion houses Parks Department offices, restrooms, and a café. The structure is designed to withstand uplift in case of flooding, and its roof directs rainwater into bioswales that manage stormwater onsite. The park also features a play area, basketball courts, adult fitness facilities, a children's playground, and a dog run.

At the park's perimeter, a bioretention area filters stormwater from the new Center Boulevard and surrounding streets, minimizing impacts on the city's drainage infrastructure. Photovoltaic panels located on the pleated roof of the pavilion generate 37,000 kWh per year, powering more than half of the park's energy needs.

Take Advantage of Areas with Infiltration Potential

Are there areas of your park with great drainage, such as those with sandy soils? These spots can infiltrate a large amount of stormwater and are preferred locations for green drainage practices. Locating these features in a well-drained area saves money because the native soil can be used, and temporary standing water after storms is minimal.

Case Study: Recharging Water Supplies with Treated Stormwater

Los Angeles, California

Sun Valley Park in Los Angeles County, California, was converted to a multi-use site that reduces flooding, treats stormwater, and conserves water while continuing to provide recreational benefits. The park collects runoff from a 21-acre drainage area. The stormwater is piped into a treatment system to remove pollutants. Treated water then flows to infiltration basins located underground beneath the soccer and baseball fields to recharge the groundwater aquifer. The project also includes enhancements to recreational amenities, including new sport fields, seating, lighting, and signage. Project benefits include:

- Reduced flooding
- Water conservation (30 acre-feet/year)
- Native plant landscaping
- Recreational ballfields, lighting, bleachers

The project was completed in 2006 for approximately $7 million. It was funded by a Department of Water Resources Local Groundwater Assistance Grant, a Proposition 12 Grant through TreePeople, and the Los Angeles County Flood Control District.

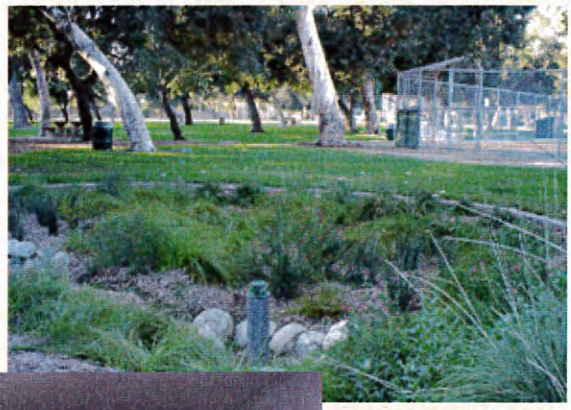

Figure 7. Top: Sun Valley Park vegetated swales. Bottom: underground infiltration gallery. (Source: Los Angeles County Flood Control District)

Protect Riparian Areas and Floodplains

In some locales, riparian areas have been replaced, destroyed, or negatively impacted by development and redevelopment projects. Green infrastructure practices such vegetated buffers and living shorelines can be used to protect and restore riparian areas and floodplains.

Case Study: Restoring Natural Drainage in Gene Green Beltway 8 Park — Houston, Texas

Gene Green Beltway 8 Park, 230 acres of park land in Houston, was created in 1997 by Harris County Precinct Two and the Harris County Flood Control District in an area that was previously underserved by parks. Phase I construction included the core of the park, which was completed in August 2008 at a cost of $5.5 million.

The park serves dual functions of flood control and recreation and is a buffer between Liberty Lake subdivision and Carpenter's Bayou. Approximately two-thirds of the park is a detention basin that can withstand periodic flooding.

Other features include:

- An amphitheater stage and seating
- A BMX track
- Trails
- Sports fields
- Wetland plantings that filter stormwater
- A meandering stream

Figure 9. Gene Green Beltway 8 Park. (Source: Landscape Online)

The park design includes stormwater filtering with native prairie grass, recycled concrete riprap berms, a meandering stream with native vegetation, and bioswales in the parking lot. The stream runs through the park and detention basin to Carpenter's Bayou and filters and dissipates stormwater from the adjacent Liberty Lakes subdivision and the park facilities.

The detention basin area has flooded several times—including during Hurricane Ike in 2008—but the features within the basin have survived intact, despite the assault by the "costliest hurricane in Texas history." Future master plan activities include excavating a lake/wetland for additional stormwater filtration within the detention basin, and preserving a pristine stand of old-growth cypress within the Carpenter's Bayou oxbow.

Capitalize on the Potential for Green Jobs

Green infrastructure maintenance lends itself well to workforce training, because the work typically does not require advanced training or education beyond high school. Green infrastructure maintenance jobs can be filled with young, seasonal workers through a summer hiring program for teens and college students. Park and stormwater agencies can partner with workforce development agencies to provide access to operation and maintenance jobs with long-term career potential for disadvantaged community members. In addition to maintenance, there is long-term, career-oriented green job potential because landscaping, landscape design, engineering, and construction-related skills can be taught and learned through the construction of green infrastructure in parks.

Developing a green jobs workforce can have a positive impact on the environment and local communities. As the use of green infrastructure increases, so does the demand for a skilled green workforce. When parks managers implement green infrastructure in park areas, employment opportunities arise for individuals to install and maintain features. Green jobs can range from entry-level (e.g., landscape maintenance) to highly skilled positions (e.g., installation of pervious concrete and green roofs); plus, programs exist to provide training so workers can ensure proper functionality of green infrastructure elements.

Many programs target the underemployed urban workforce to provide job skills and instill a sense of community ownership. Programs can offer classroom-based learning, hands-on training, and certifications, as well as assist in job placement. For instance, State University of New York, College of Environmental Science and Forestry (SUNY ESF), and its partners have

6. Undertake High-Visibility Pilot Projects

Think about selecting one or more high-visibility sites for a pilot project. Successful pilot projects in areas with high foot traffic can help to garner support from the community for more green practices. Partner with the media to explain the purpose and benefits of the projects, and highlight the community partnerships, donors, and volunteers involved in making the projects happen.

Case Study: Creating a Waterfront Green Showcase at Ferrous Site Park **Lawrence, Massachusetts**

In 2015, Groundwork Lawrence (GWL) completed the redevelopment of Ferrous Site Park, a former foundry constructed in 1845. Since the early 2000s, GWL has partnered with the city of Lawrence, the Commonwealth of Massachusetts, and community partners to establish a park at the site. During that time, GWL has used the site as a laboratory for youth education programs that explore the ecology of the urban area.

Redevelopment addressed brownfield concerns and met the city's overall goals of transforming the entire North Canal mill district into a thriving mixed-use, transit-oriented development. Funding for the $2.75 million project came from the city of Lawrence, the National Park Service, Groundwork USA, and the Commonwealth of Massachusetts. Over a period of 24 months, the site was redeveloped to include recreation areas and green features, including:

Figure 11. Top: Ferrous Site Park area before redevelopment. Bottom: park conditions after redevelopment. (Source: Groundwork Lawrence)

- Ferrous Terrace: This overlook at the historic canal spillway has a pavilion providing shelter for summertime education programs and community gatherings.
- Wild Arboretum: Rows of trees that thrive in urban conditions and provide food for a range of animals. The tree species will be labelled to teach about urban forestry and ecology.
- Ferrous Hill: The sand castings from the former industrial foundry adjacent to the park have been reshaped as a meadow mound with panoramic views.
- Wild Woodland: A remnant woodland habitat representative of the species that grew on the site before park development.
- River Edge Forest: Preserved and restored riparian habitat along the Spicket and Merrimack rivers.
- Pathways: Central to the park's design is a new looping pathway network that provides safe and universal access to excellent views of the rivers and the waterfall at the end of the North Canal.
- Rain Garden: This feature will intercept and infiltrate stormwater from a 50-year storm event from the adjacent industrial property. Previously the water was discharged directly into the Merrimack River via asphalt swales.

PARKS GREEN INFRASTRUCTURE ACTIONS CHECKLIST

Consider the following actions at your park to implement green infrastructure:

	Action	Benefit to Parks
☐	Convert turf areas with high maintenance requirements to bioretention areas or other naturalized areas	Reduces maintenance and other costs associated with the management of turf
☐	Install cisterns or rain barrels to collect roof runoff for irrigation	Reduces potable or recycled water use
☐	Install permeable pavement or pavers	Reduces runoff, pavement maintenance, and use of deicers
☐	Amend soils to improve infiltration	Eliminates standing water and mosquito breeding habitat
☐	Install bioretention in underutilized perimeter areas	Reduces runoff and flooding and beautifies low-use landscaped areas
☐	Include educational signage describing BMPs and stormwater impacts	Creates opportunities for environmental education
☐	Install green roofs	Increases lifespan of roof, lowers energy cost, and manages stormwater
☐	Remove unnecessary impervious surfaces	Reduces runoff and decreases erosion

These green infrastructure actions can help park agencies meet one or more of the following goals and priorities, including:

- Enhancing park aesthetics with natural drainage.
- Providing recreational opportunities in underserved communities.
- Meeting the demand for better park features.
- Reducing landscape and facility maintenance.
- Improving drainage in low-lying areas.
- Eliminating mosquito breeding habitat.
- Improving the quality of compacted urban soils.
- Providing habitat for ecological diversity.
- Sharing costs among agencies.
- Providing ideal locations for green stormwater management.