

GREEN STREETS

2025

This research explores 'Green Streets'—the integration of natural elements into street design to promote sustainability, livability, and economic benefit.

TOOLKIT





Green Streets Introduction

Infrastructure that participates with nature.

The traditional urban street, designed primarily for vehicular transport and rapid stormwater disposal, is undergoing a fundamental transformation. A growing number of municipalities are adopting a new paradigm: the “green street,” a form of green infrastructure that strategically integrates vegetation, soil, sustainable materials, and specialized engineered systems into the public right-of-way. This approach represents a critical shift from a linear “gray” infrastructure model—which relies on pipes and drains to move water away from cities—to a regenerative, nature-based system that manages stormwater at its source.

This toolkit outlines the multifaceted value proposition of Green Streets, demonstrating how they deliver far more than a single environmental benefit. Beyond their primary function of flood mitigation and stormwater management, they enhance community livability, foster urban biodiversity, and create measurable economic advantages. Case studies of leading cities such as Boston, Seattle, New York, Minneapolis, and New Orleans highlight diverse and successful implementation strategies, revealing that the most effective programs are driven by strong policy, secured by diversified funding, and anchored by community engagement.

Analysis concludes that the primary barriers to green infrastructure adoption are not technical, but rather administrative, financial, and institutional. To overcome these challenges, a municipality must pursue a holistic framework that prioritizes regulatory reform, establishes innovative financing mechanisms, and invests in long-term maintenance and community stewardship. This comprehensive approach positions Green Streets not as an optional amenity, but as a foundational investment in a city’s long-term resilience, economic vitality, and social equity.

01

INTRODUCTION

Welcome

Bienvenido

Bienvenue

Bienvenuto

Willkommen



What are Green Streets?

The concept of a “green street” is an infrastructure approach that moves beyond traditional solutions to create [multifunctional public spaces](#) within the rights-of-way. As defined by the **EPA**, a green street is a stormwater management solution that incorporates plants, shrubs, and trees, along with engineered systems to slow, filter, and cleanse stormwater runoff from impervious surfaces. They can also provide supplemental benefits such as reduction of the urban heat island effect and beautification.

Urbanized areas present a persistent hydrologic challenge. As forests and natural areas are replaced with buildings, roads, and other impervious surfaces, the ability of the ground to absorb and filter rainwater diminished significantly. This leads to an increasing volume of polluted stormwater runoff. As precipitation flows over hard surfaces, it collects a cocktail of pollutants, including oil, fertilizers, pesticides, and animal waste, before flowing into local waterways or the city’s drainage and sewer systems.

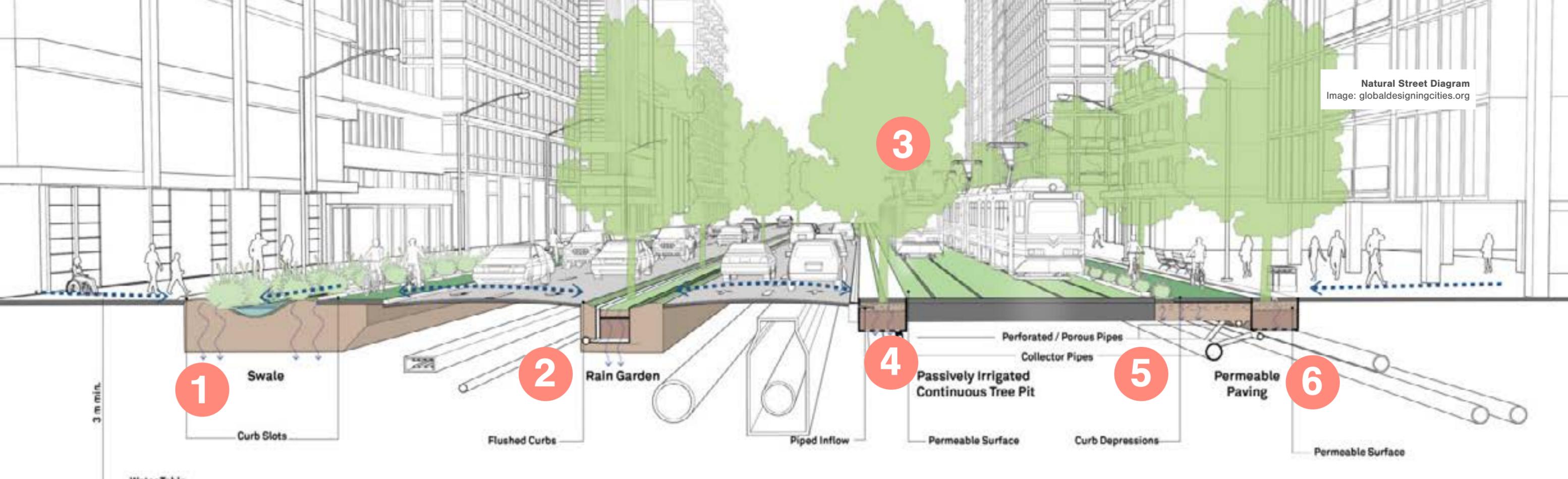


How are Green Streets unique?

Green Streets contrast with traditional street design which channels runoff into storm sewers that often discharge polluted water directly into surface waters. Rather than diverting water through underground “gray” infrastructure, green infrastructure captures, absorbs, and filters rain where it falls—mimicking natural systems. This can help address the growing limitations of aging gray systems, which struggle with increasingly intense rainfall due to climate change.

Green Streets offer economic benefits by helping municipalities meet stormwater management requirements more cost-effectively than traditional infrastructure. Multiple studies demonstrate that green infrastructure [saves money](#) compared to traditional infrastructure by reducing water treatment and stormwater management costs, increasing property values, and creating green jobs.





Green Street Components

Green Streets work alongside traditional stormwater systems by using plants, soil, and natural processes to soak up, filter, or evaporate rainwater before it reaches underground pipes. This approach helps manage flooding and reduces water pollution by treating stormwater at the source. Selecting the right features depends on the specific conditions of the site. [Potential Green Street components](#) are highlighted below.

1 Swale

Swales carry water like pipes and are designed as shallow, open, planted channels to convey runoff and remove pollutants. They are an alternative to a piped drainage system where space and grade is available. Water moves horizontally along the surface or in subsurface layers. Swales slow water flow and trap sediments and pollution to improve water quality.

2 Rain Garden

A Rain Garden is a shallow, planted depression designed to capture stormwater runoff allowing water to soak into the ground rather than flowing into storm drains. Rain gardens have a special soil filter media that can remove pollutants from road runoff. Some are designed to allow water to infiltrate underlying soils while others collect the treated water and convey the clean water downstream.

3 Street Trees & Planting

Street trees and other plantings are a critical part of a city's green infrastructure. The roots soak up water, which slows runoff and reduces the strain on storm drains. The leaves and canopies capture rain and let water evaporate, further mitigating flooding. These plantings also provide shade, improve air quality, and enhance the beauty of a street.

4 Tree Pit & Soil Volume

Tree pits are specially designed areas that house street trees and use engineered soil to filter stormwater runoff. By increasing soil volume and providing a larger root zone, urban trees can grow larger and live longer. This improves their ability to absorb stormwater, enhance air quality, and mitigate the urban heat island effect.

5 Passive Irrigation

Passive irrigation directs stormwater to the surface of landscaped areas and reduces stormwater runoff into local drains and citywide systems. Passive irrigation is one of the simpler and easier ways to incorporate water-sensitive design.

6 Permeable Paving

Permeable paving is a key element of green street infrastructure. It allows stormwater to filter through the pavement's surface into a gravel and soil layer. This reduces runoff and lets water slowly soak into the ground. The system also filters out pollutants, improving water quality.

Green Street Benefits

According to the EPA, Green Streets can remove up to 90% of runoff pollutants

Green spaces boost mental health, build community, and help reduce crime.

Green streets raise property values, attract investment, and create green jobs.

The core advantage of Green Streets is their capacity to deliver a [wide array of benefits](#) with a single investment. A sustainable approach—one that considers social, economic, and environmental benefits—captures the full long-term value. This is a function that traditional “gray” infrastructure cannot replicate, as a stormwater pipe serves one purpose: moving water.

Green Streets help cities become more resilient by capturing and treating stormwater from roads and sidewalks. They’re designed to capture the “first flush” of rainfall, which carries the most pollutants, filtering it on-site.

Green Streets help create healthier, more livable communities by cooling urban areas and improving safety. Trees and vegetation reduce the urban heat island effect through shade and evapotranspiration, lowering surface temperatures and energy use. Features like vegetated curb extensions also calm traffic and protect pedestrians and cyclists.

Green Streets offer strong financial returns, mainly by reducing the need for expensive gray infrastructure upgrades and by uplifting property values.

The following are some of the benefits of Green Streets:

ENVIRONMENTAL

Habitat and Biodiversity.

Green Streets enhance urban biodiversity as native species provide habitats for birds, insects, and other species. The city has already successfully implemented [Pollinator Gardens](#) across the city resulting in broad community support for habitat restoration.

Water Quality.

Green Streets [improve stormwater quality](#) by reducing the load of sediment, unwanted minerals, and other contaminants that are carried with runoff from impermeable surfaces.

Flow Management.

Detaining runoff in landscaped areas and slowing the rate of flow from the catchment area reduces the risk of erosion of the soil bed and reduces stress on stormwater system capacity.

Natural Hydrology.

Where local soils are suitable, rain gardens are used to treat stormwater before it permeates the groundwater - often decreasing soil subsidence.

Air Quality.

Vegetation improves air quality and reduces greenhouse gases by removing many air pollutants from the atmosphere.

SOCIAL

Amenity & Landscape Design.

Landscape design contributes to a city’s character and identity. Planting compliments the built environment, softens appearance of hard surfaces, and provides a visual screen from less desirable elements in the right-of-way.

Urban Cooling.

Green Streets, when supplemented with tree plantings, provide significant reductions in urban temperatures. Large trees with good soil moisture can reduce local temperatures through shading and evapotranspiration. Trees have also been linked to the prevention of unnecessary loss of life during heatwaves.

Encourage Outdoor Activity.

Green Streets encourage outdoor activity, including walking, [cycling](#), and other recreation.

Crime Reduction.

According to the [National Institute of Health](#), good public spaces support desirable behaviors and inappropriate public spaces provide the opportunity for increases in criminal behavior. When designed well, Green Streets can play a major role in [Crime Prevention Through Environmental Design \(CPTED\)](#).

ECONOMIC

Energy.

By reducing local temperatures and shading roadway and building surfaces, Green Streets reduce the cooling demand of buildings, thus cutting energy needs.

Infrastructure Lifespan.

Green Streets complement grey infrastructure such as catch basins and drainage pipes, and lengthens the lifespan of existing grey infrastructure.

Stormwater Systems.

The impacts on drainage systems and the cost of managing erosion in waterways can be significant. Green Streets slow the rate of runoff, reducing the pressure on these systems and lowering maintenance costs.

Property Values and Marketability.

[Studies](#) show that homes located near tree-lined streets or green infrastructure can see property value increases ranging from a few thousand dollars to over 20% depending on proximity and context.

Passive Irrigation.

Directing stormwater to irrigate the planting areas reduces the need for manual watering systems.

GREEN STREETS

02

CASE STUDIES

ARE SAFE,

COMING,

AND BEAUTIFUL



Case Studies

The table below presents a comparative overview of five leading U.S. cities that have successfully implemented green infrastructure programs. Each city’s approach reflects its distinct geography, geology, and organizational structure, resulting in unique strategies for success. Some cities depend heavily on federal or state grants, while others fund projects through service fees. Similarly, implementation varies—ranging from departments of transportation and public works to dedicated sustainability offices. The following pages provide a closer look at each peer city’s programs, funding mechanisms, and implementation strategies. These examples are intended to inform and inspire Charlotte as it develops a green infrastructure approach tailored to its own local context.

Peer City	Program	Funding	Implementation
Boston, MA	Green Infrastructure	Predominantly federal grants	Boston Office of Green Infrastructure leads collaboration with other departments.
Seattle, WA	Green Stormwater Infrastructure	Public dollars from water bills, private development	Reduced stormwater flows by up to 94%, removes over 90% of pollutants, and has saved an estimated \$60 million compared to traditional infrastructure.
New York, NY	Greenstreets Program	Municipal funding, financial incentives for private property owners (grants)	Over 2,500 Green Streets built citywide, helps to meet water quality goals
Minneapolis, MN	Green Infrastructure Program	Capital Project Grants (e.g., MWMO), leveraging existing budgets	Creates community amenities and pollinator habitats, improves water quality
New Orleans, LA	NORA Green	Federal, state, and city funds; community-led grants	Reduces flood risk and water treatment costs, creates workforce development opportunities

Green Streets can help us to enjoy nature in city environments



Boston implements green infrastructure to address safety concerns and climate impacts
Image: mass.streetsblog.org

Boston, MA

The Boston [Green Infrastructure](#) program’s goal is to reduce flooding, improve water quality, and create a more resilient city. The initiative also aims to create benefits to the community, such as safer streets through their Vision Zero and Complete Streets commitments and a reduction in the urban heat island effect. The city is also implementing coastal resilience plans along its waterfront to protect against rising sea levels and intense storms.

Funding

Boston actively pursues competitive grants from outside sources. A \$15 million federal grant for a project on Blue Hill Avenue was formally obligated, securing that funding. Boston’s [Green New Deal Data Dashboard](#) also shows that the city is actively pursuing federal funding from sources like the Bipartisan Infrastructure Law (BIL) and the Inflation Reduction Act (IRA).



Western Avenue Complete Streets Reconstruction
Image: tighebond.com



Program Highlight: Green Infrastructure Program

Boston has implemented a [Streets Green Infrastructure \(GI\) Policy](#) to ensure widespread implementation of green infrastructure within the City of Boston’s public right-of-way (ROW) and parcels operated and maintained by the city. Additionally, the [Boston Green Infrastructure Planning and Design Handbook](#) serves as a guide to implement GI techniques to manage stormwater throughout the city.

Implementation

Green Infrastructure in Boston is a collaborative effort involving a dedicated [Office of Green Infrastructure \(OGI\)](#) that works across all departments to implement GI. The Boston Water and Sewer Commission (BWSC) undertakes its own GI projects, often in partnership with other city departments such as the Public Works Department, Boston Parks and Recreation, and the Boston Transportation Department.



Boston Green Street Diagram
Image: tighebond.com



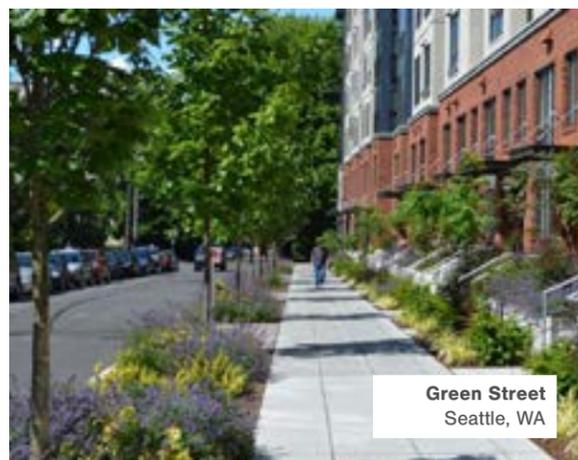
Green Street
Seattle, WA

Seattle, WA

Seattle's [Green Stormwater Infrastructure \(GSI\)](#) program takes a comprehensive, nature-based approach to urban water management through systems that help slow, filter, and absorb stormwater runoff, reducing the burden on the traditional drainage systems, minimizing flooding, and improving the health of local waterways. Beyond environmental benefits, these efforts enhance neighborhood aesthetics, promote walkability, and build resilience to climate change.

Funding

Seattle funds its GSI program through a diverse mix of public and private sources. Core funding comes from Seattle Public Utilities' capital improvement budget, which is supported by utility service fees. The city also leverages significant external funding, including grants from the King County Flood Control District and other state and federal sources.



Green Street
Seattle, WA



Program Highlight: Green Stormwater Infrastructure

A 2013 [City Council Resolution](#) established green stormwater infrastructure (GSI) as a critical aspect of a sustainable drainage system and challenged Seattle to rely on GSI to manage stormwater runoff whenever possible. The Resolution and associated Executive Order also set a community-wide implementation target – to manage [700 million gallons](#) of runoff annually with GSI by the year 2025.

Implementation

Seattle's Green Stormwater Infrastructure (GSI) program is a collaborative, citywide initiative led by Seattle Public Utilities in partnership with King County Wastewater Treatment Division, Seattle Department of Transportation (SDOT), Seattle Parks and Recreation, and the Seattle Department of Construction and Inspections. An internally produced [Implementation Strategy](#) guides their green infrastructure investments.



On-street Rain garden
Seattle, WA



Hillside Avenue Green Infrastructure Median
Queens, NYC

New York, NY

New York City's [Greenstreets Program](#) is a partnership between NYC Parks and the Department of Transportation (DOT). It began with a focus on transforming unused road areas into green spaces. The program evolved into the Green Infrastructure Unit, expanding its focus to active stormwater capture in designated priority watersheds. Locations are strategically determined based on hydraulic analysis and traffic safety standards, with a focus on connecting existing green spaces.

Funding

The program is supported by sources such as the EPA's **Clean Water State Revolving Fund (CWSRF)**, which provides low-interest financing for green infrastructure projects, and the **EPA Environmental Finance Center Grant Program**, which offers technical assistance to help communities access federal funding. [Climate Strong Communities](#), a city program, leverages federal and state funding to support green infrastructure projects.



Green Street Curb Inlet
New York City, NY



Program Highlight: Greenstreets

The NYC Greenstreets Program has transformed [over 2,500 underutilized traffic islands and medians](#) into green spaces that manage stormwater and enhance urban livability. Many of these sites feature bioswales that can capture over 2,000 gallons of stormwater per rain event, significantly reducing pressure on the city's stormwater system.

Implementation

The Greenstreets program operates under an inter-agency model involving NYC Parks and the Department of Transportation (DOT), and its primary funding agency, the [Department of Environmental Protection \(DEP\)](#). NYC Parks maintains its role in the day-to-day operation and long-term care of Greenstreets sites. DOT provides space for these projects inside underutilized rights-of-way.



Greenstreet Detail
New York City, NY



Minneapolis, MN

The City of Minneapolis’ [Green Infrastructure Program](#) helps manage stormwater and increase green spaces across the city. It has woven the program into its “Complete Streets” policy and broader climate goals. With the city’s public right-of-way accounting for 22% of its land area, streets offer significant opportunities for green infrastructure. Minneapolis utilizes a range of practices, including rain gardens, tree trenches, and permeable pavement, in both new construction and street rehabilitation projects.

Funding

Funding of the Green Infrastructure Program is through a [combination of sources](#). Regionally, the Mississippi Watershed Management Organization (MWMO) contributes capital funding for green stormwater infrastructure projects in public rights-of-way. These efforts are supplemented by state and federal grants, as well as partnerships with nonprofits and community-based organizations.



Program Highlight: Green Infrastructure

Minneapolis’ Green Infrastructure efforts have yielded measurable environmental and benefits to the community. According to the city’s [Climate Action Dashboard](#), participation in the Green Cost Share program—which supports permeable pavement and stormwater reuse systems—has grown by over 40% since 2020, helping reduce greenhouse gas emissions and stormwater runoff.

Implementation

The City of Minneapolis Public Works Department manages its own GSI program, focusing specifically on the design and installation of projects within the public right-of-way. Additionally, the city has developed [GSI Design Criteria](#) to guide green infrastructure construction and provide performance criteria for GSI projects.





Stormwater Lot
Image: danabrownassociates.com

New Orleans, LA

In the wake of Hurricane Katrina, New Orleans has been at the forefront of adopting [green infrastructure](#) to reduce the city’s vulnerability to flooding. After the storm, many properties were destroyed leaving a multitude of vacant lots across the city. Subsequently, the city purchased lots in strategic locations, deploying innovative water management solutions that absorb runoff and filter pollution by mimicking the region’s natural wetland ecology.

Funding

Funding is obtained through federal grants, local government bonds, and private investment. A large portion of construction funding comes from a [\\$141 million federal grant from the U.S. Department of Housing and Urban Development \(HUD\)](#). The program also uses funds from the Federal Emergency Management Agency (FEMA), local General Obligation bonds, and private investment.



Stormwater Lot
Image: danabrownassociates.com

Program Highlight: NORA Green

The [New Orleans Redevelopment Authority \(NORA\) Green Program](#) has transformed vacant lots into stormwater management sites that collectively detain up to 200k gallons of water per rain event, reducing strain on the city’s pumps and preventing flooding. Additionally, NORA has planted over 500 native trees across six major urban forests, restoring the tree canopy, improving air quality, and creating peaceful green spaces.

Implementation

New Orleans has established a coordinated system for managing federal, state, and local funds and grants, with the [Office of Resilience & Sustainability](#) overseeing and collaborating with the Project Delivery Unit for projects involving HUD, FEMA, or other capital investments. Through a cooperative agreement, Capital Projects, Public Works, and the Sewerage and Water Board have unified project management efforts, including co-located staff.



Detail of curb inlet
Image: danabrownassociates.com

NORA Green Stormwater Lot

How they work



03

CURRENT CONDITIONS

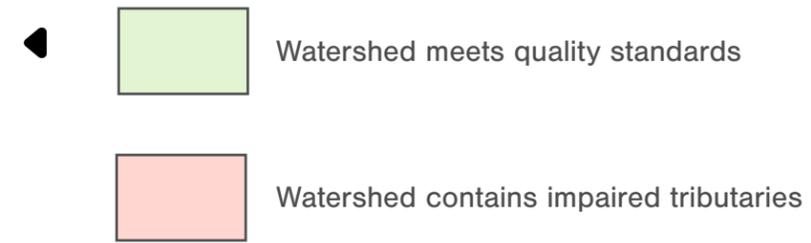
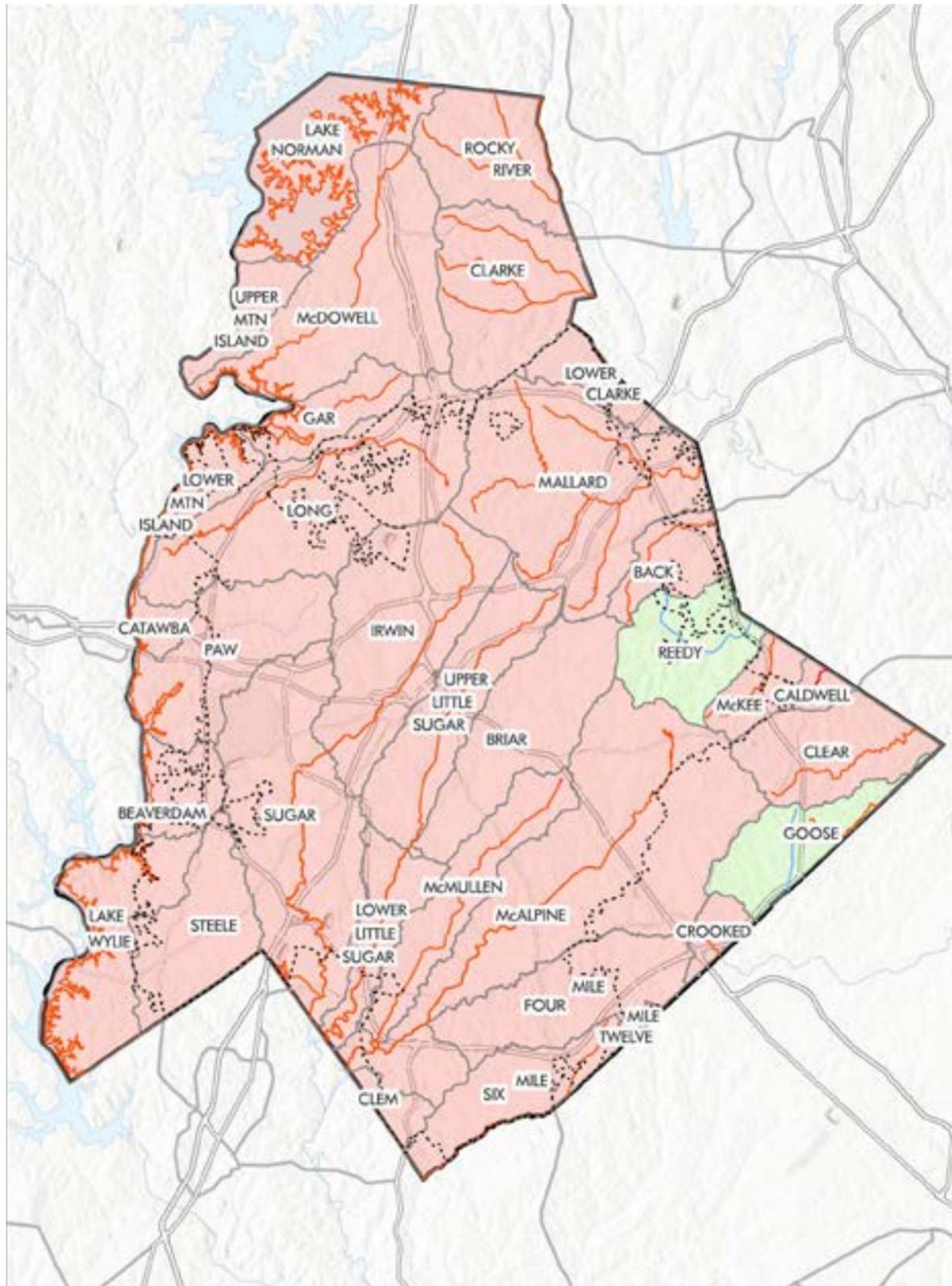
GREEN

STREETS ARE

NATURAL AND

ACCESSIBLE

Charlotte Area Catchment Health Rating Map



25 of 27 watershed basins in Charlotte are impaired.

Watershed Quality

The [CharMeck NPDES MS4 TMDL Watershed Plan for FY2021](#) is a regulatory and planning document developed by the City of Charlotte and Mecklenburg County to comply with the National Pollutant Discharge Elimination System (NPDES) permit requirements. Specifically, it addresses Total Maximum Daily Load (TMDL) obligations for impaired waterways affected by stormwater runoff from the Municipal Separate Storm Sewer System (MS4). The plan is part of a broader effort to improve water quality in urban streams and creeks by reducing pollutants such as bacteria, nutrients, and sediment.

This plan lays out a strategy to improve water quality using Stormwater Control Measures (SCM), infrastructure upgrades, and monitoring—all united through public outreach. It targets key Charlotte-Mecklenburg watersheds—Long Creek, Sugar Creek, Little Sugar Creek, and

McAlpine Creek—by identifying pollution sources, prioritizing areas for action, and setting implementation timelines. The approach is adaptive, evolving based on monitoring data and scientific insights.

The FY2021 plan reports progress in BMP implementation and improved monitoring, with some signs of better water quality. However, many streams remain impaired, highlighting the challenges of urban watershed restoration. The plan reaffirms commitment to infrastructure investment, public engagement, and agency collaboration, serving as both a compliance guide and a long-term environmental strategy.



Flash Flooding
Charlotte, NC

Flooding

Charlotte experiences [frequent and costly flooding](#) due to its location and topography. The city’s low-lying areas, especially those near creeks, are particularly vulnerable. Charlotte has a history of severe flooding events, often from heavy rainfall associated with tropical storms and hurricanes that make their way inland. The economic impact of these events is significant, making flooding one of the most expensive natural disasters for the city.

Flood-Prone Areas

Heavy rainfall can cause significant street flooding and traffic delays. There has been street flooding on major roads like Wilkinson Boulevard in west Charlotte and a section of North Tryon Street. These and many other areas have been known to flood during heavy downpours.



Flash Flooding at N Tryon and 16th Streets
Charlotte, NC

Significant Impact: Street Flooding

Flood events have a wide range of economic impacts. They can destroy homes, damage infrastructure like roads and bridges, and disrupt essential services. Businesses suffer from closures, leading to long-term economic setbacks. Many homeowners in inland areas do not have flood insurance, which further increases the financial burden.

Flood Management

Charlotte-Mecklenburg Storm Water Services is a joint utility that works to reduce flood risk. They manage storm drainage systems, enforce floodplain regulations, and have programs to help property owners. These programs include a floodplain buyout program and grants for flood-proofing homes.



Batch House Underwater 2020
Charlotte, NC

GREEN STREETS

ARE DESIGNED

04

WITH ALL

IN MIND

NEXT STEPS



Focus Areas

Implementing a successful green streets program requires a comprehensive and coordinated approach that addresses multiple facets of urban planning and infrastructure. There are five key focus areas that form the foundation for effective implementation: **policy and planning**, which sets the vision and regulatory framework; **partnerships and community support**, which ensure stakeholder engagement and long-term buy-in; **funding and financing**, which provide the necessary resources for both capital and operational needs; **maintenance and stewardship**, which sustain the functionality and appearance of green infrastructure over time; and **design and engineering standards**, which guide the execution and ensure consistency, safety, and performance. Together, these elements create a holistic strategy for implementing green infrastructure.

1 Policy & Planning

2 Partnerships & Community Support

3 Funding & Financing

4 Maintenance & Stewardship

5 Design & Engineering Standards

1 Policy & Planning

A strategic, integrated approach is essential—starting with embedding green infrastructure goals into comprehensive plans and transportation strategies. Clear definitions, updated codes, and supportive frameworks are key to shifting from traditional “gray” infrastructure to sustainable, green alternatives. Charlotte is equipped with numerous policy and plan goals that support a Green Streets initiative.

Comprehensive Plan

The **Charlotte Future: 2040 Comprehensive Plan** provides clear policy direction for integrating natural and built environments through [Goal 7: Integrated Natural and Built Environments](#). This goal emphasizes the protection and enhancement of the city’s natural assets—such as surface water, tree canopy, and open spaces—while promoting sustainable urban development. Key policy directions include:

- Expanding green infrastructure like swales, rain gardens, and green roofs to manage stormwater and reduce flooding.
- Preserving and enhancing tree canopy through updated development regulations and flexible mitigation strategies.
- Encouraging green building practices to reduce carbon emissions and promote environmental resilience.
- Improving water quality so that all city streams meet surface water standards.

SEAP+

Charlotte’s [Strategic Energy Action Plan Plus](#) (SEAP+) is the city’s bold roadmap to achieve net-zero greenhouse gas emissions by 2050 through clean energy, climate resilience, and equitable community transformation. The plan links sustainable infrastructure with efforts to reduce the urban heat island (UHI) effect—identified as the city’s top climate risk. The plan promotes green building and climate-resilient design to cut emissions and reduce heat retention from materials like asphalt and concrete. It also targets underserved neighborhoods with limited vegetation and high impervious surfaces, which face higher temperatures. The SEAP+ also aligns with the Tree Canopy Action Plan to expand green spaces, cool these areas, improve air quality, and lower residents’ energy costs.

Strategic Mobility Plan

[Charlotte’s Strategic Mobility Plan \(SMP\)](#) is a long-term transportation strategy designed to support the city’s climate and sustainability goals. The SMP discusses the use of green infrastructure to address negative environmental impacts:

Sustainable Policy 3 | Minimize Environmental Impact

As the center of a growing region, Charlotte and its regional partners can work together to ensure our transportation system minimizes its impact on the environment. Charlotte supports mobility planning and infrastructure design that strengthens the environmental quality of our infrastructure.

Sustainable Strategy 3.2 | Implement Sustainable Street Design

Charlotte will treat streets as an environmental asset by using them strategically for effective and innovative storm water management and continuing to plan for, design, and build streets and a street network that provide for meaningful street tree canopy.

SMP Actions

Green Streets and Storm Water — Explore street designs that detain and filter storm water runoff (i.e., green streets) to manage runoff, protect water quality and stream health, and increase natural landscape design in the urban environment.

Street Design — Investigate and implement design standards and new street design manuals and materials to reduce urban heat island effects and storm water runoff.

Tree Canopy — Increase the canopy of our right-of-way for safety, health, and aesthetic value through standards that ensure the viability of street trees, prioritize street trees in the design of capital projects, and coordinate to accommodate street trees on state-maintained roads.

1 Policy & Planning (cont'd)

Vision Zero

[Charlotte's Vision Zero initiative](#) focuses on eliminating traffic-related deaths and serious injuries through speed management, safer street design, and data-driven infrastructure investments. While the program does not currently incorporate green infrastructure as a defined strategy, several design approaches commonly used in safety projects, such as narrower lanes, curb extensions, and modified intersections, could support future Green Streets concepts if coordinated with stormwater and sustainability partners. This represents a possible area for future alignment, especially within place-based planning efforts like the Strategic Investment Areas.

SHIP

The City of Charlotte is committed to designing, building, and operating all municipal projects responsibly and sustainably. Horizontal infrastructure, comprising roads, sidewalks, bridges, transit systems, water, waste, and electricity distribution networks, and recreational areas, forms the backbone of Charlotte's development. The **Sustainable Horizontal Infrastructure Policy (SHIP)** is intended to direct City departments to design, construct, and operate horizontal infrastructure in a manner aligned with existing policies and ordinances and to create energy-efficient, climate-resilient, and socially equitable systems. This policy further aims to enhance resilience to climate change through the incorporation of heat island reduction strategies while ensuring that sustainability is considered in materials selection.

Greenprints

A [GreenPrint](#) is a community-driven environmental action plan that addresses climate and environmental injustices in historically underserved areas. These plans focus on health and well-being, align with the City's Corridors of Opportunity program, and build on existing partnerships to integrate climate action with economic growth and community empowerment.



2 Partnerships & Community Support

Without public awareness and support, projects can face resistance from community members and stakeholders. To include the community in green infrastructure projects, cities must engage in participatory planning processes by involving local communities in project design and implementation from the outset. It is essential to prioritize projects in underserved communities that have been disproportionately impacted by flooding and climate change, ensuring the balanced distribution of green spaces and their inherent benefits. Consistent and transparent communication through public outreach and education builds trust and shares the full range of benefits of green infrastructure.

Partnerships

- **EPA Environmental Finance Centers (EFCs)**
[EFCs](#) are a network of university-based organizations funded by the U.S. Environmental Protection Agency to help communities access federal funding for environmental infrastructure projects, technical assistance, training, and guidance to local governments.
- **Mecklenberg Soil & Water Conservation District**
The [District](#) can provide education on soil and water conservation. They can also assist with plant selection, sharing the ecological benefits of green infrastructure, and assisting with community design sessions.
- **North Carolina Wetlands Restoration Program (NCWRP)**
[This program](#) can share best practices from other municipalities in NC. They can also offer valuable insight into restoring natural systems. This partnership would strengthen the project's credibility and ecological goals.
- **Smart Surfaces Coalition**
Charlotte is a member city of the [Smart Surfaces Coalition](#) a non-profit committed to the rapid, cost-effective global adoption of Smart Surfaces to enable cities to decrease urban heat, save money, reduce flooding, and increase resilience.
- **Private Specialists**
Collaborating with private green infrastructure specialists through [public-private collaboration](#), can significantly enhance the effectiveness and innovation of a city's green streets program and open opportunities for shared funding, pilot projects, and solutions that align with both municipal goals and private sector innovation.



Community Support

The public outreach strategy should focus on education, collaboration, and building trust. The goal is to inform the public about the benefits of green streets and involve them in the planning process. This will help reduce resistance and ensure projects meet community needs.

- **Educational Workshops**
Host workshops for the community. These workshops will explain what green streets are and how it helps with flooding and climate change. Use simple language and clear visuals. Show examples of successful projects from other cities.
- **Community Design Sessions**
Hold participatory planning meetings. Invite community members to help with project design. This includes choosing locations, types of plants, and other features. This approach gives the community ownership of the project. This also ensures the final design reflects the community's desires.
- **Pilot Projects and Demonstrations**
Implement small-scale green infrastructure projects in visible public spaces. These can be rain gardens or swales. These projects can serve as living examples of the technology. They show how the infrastructure works and its benefits in a tangible way.

3 Funding & Financing

Federal Funding

[Federal funding](#) can support local green infrastructure through competitive grants or formula-based programs. While grants can help launch projects, they're often competitive, may require matching funds, and usually don't cover long-term maintenance. Local governments should plan for ongoing funding beyond the initial grant. The following highlights four key federal funding areas:

Water Quality

Programs like the EPA's [Section 319](#) and [Urban Waters Small Grants](#) support projects that reduce stormwater pollution. These funds can be used for green infrastructure like rain gardens and bioswales.

Economic & Community Development

Green infrastructure can boost local economies by creating jobs and raising property values. [HUD's Community Development Block Grants \(CDBG\)](#) can fund projects like urban tree planting and flood mitigation. Additionally,

Disaster Recovery

After federally declared disasters, programs like [FEMA's Hazard Mitigation Assistance Grant Program](#) and [HUD's CDBG-Disaster Recovery Grant Program](#) can fund green infrastructure to reduce future risks, such as flood-prone property buyouts or vegetative buffers.

Transportation

Green infrastructure can be funded through transportation programs like the FHWA's [Transportation Alternatives Program \(TAP\)](#), [Congestion Mitigation and Air Quality Improvement Program](#), and the DOT's [BUILD Discretionary Grant Program](#) (RAISE was renamed BUILD, first known as TIGER). These support projects that reduce flooding and improve air quality, such as permeable sidewalks and swales along trails.

North Carolina State Funding

North Carolina offers several state-level funding programs that support green infrastructure, including stormwater management, tree planting, and land conservation. The following is a list of key programs:

NC Land and Water Fund (NCLWF):

[Offers grants for innovative stormwater projects](#) that improve water quality, restore natural areas, and create greenways. Projects must show environmental benefits and may include design, construction, and monitoring.

NC DEQ Stormwater Funding (LASII Program):

[Offers competitive grants for planning and building stormwater infrastructure.](#) Eligible applicants include cities, counties, and nonprofits. Funding supports both water quality and flood control efforts.

NC DEQ Environmental Grants:

Includes a [wide range of programs](#) for water quality, stream restoration, and coastal resilience. Some grants also support planning, land acquisition, and infrastructure improvements.

Transportation & Infrastructure Grants (NC Commerce):

State programs like the [Rail Industrial Access Program](#) and [Community Development Block Grants \(CDBG\)](#) can support green infrastructure when tied to transportation or economic development projects.

Legacy Tree Fund (NC Urban Forest Council):

Provides grants (typically around \$5,000) for [community tree planting projects](#). Prioritizes projects with public engagement and education, especially in neighborhoods, schools, and storm recovery areas.

3 Funding & Financing (cont'd)

Municipal Financing

Charlotte has several public financing tools at its disposal to support green infrastructure and stormwater projects:

Clean Water State Revolving Fund (CWSRF)

Charlotte can apply for low-interest loans through [North Carolina's CWSRF](#), which supports stormwater, stream restoration, and green infrastructure projects. Loans can be up to \$35 million, with 0% interest available for green projects. These funds help the city invest upfront in infrastructure while spreading out repayment over time.

Municipal & Green Bonds

Municipal Bonds

Charlotte regularly issues [General Obligation \(GO\) Bonds and Revenue Bonds](#) to fund infrastructure, including stormwater improvements. GO Bonds are backed by the city's credit and require voter approval, while Revenue Bonds are repaid through fees like stormwater utility charges.

The city's Capital Investment Plan (CIP) includes bond-funded projects for greenways, stormwater, and transportation. Bonds allow Charlotte to finance large-scale projects and repay the debt over time at lower interest rates.

Green Bonds

While Charlotte has not yet issued [dedicated green bonds](#), these instruments are gaining traction nationwide as a way to finance environmentally beneficial projects—and could represent a promising option for the city in the future.

Tax Increment Financing (TIF)

[TIF](#) is not widely used in Charlotte for green infrastructure, but it's a potential tool. It uses future increases in property tax revenue from a development area to pay for improvements like parks or stormwater upgrades.



Private Financing

Charlotte is exploring ways to partner with the private sector to support green infrastructure projects, especially in areas with limited public funding.

Public-Private Partnerships (P3s)

Charlotte has used [public-private partnerships](#) for infrastructure projects by combining city resources with private investment. These partnerships help deliver projects more efficiently and can include green infrastructure like parks, stormwater systems, and greenways.

For example, the GreenPrints initiative is a collaboration between the City of Charlotte and CleanAIRE NC. It focuses on bringing green infrastructure—like rain gardens, tree planting, and green roofs—to underserved neighborhoods as part of the city's "Corridors of Opportunity" strategy.

Future Opportunities

While Charlotte hasn't yet used [social impact bonds](#) or pay-for-performance models for green infrastructure, these tools could be explored in the future to attract private capital for projects that deliver measurable environmental and community benefits.

4

Maintenance and Stewardship

Green Streets require **consistent, long-term maintenance** to remain effective. A strategic solution is to create a dedicated operational framework for maintenance, possibly by adapting existing asset management systems to include green infrastructure. Green Streets projects should be designed with maintenance as a core consideration. Ensuring these systems effectively capture and infiltrate stormwater over time requires thoughtful planning before implementation. [Key maintenance factors to address](#) include:

- Type of maintenance required for each component
- Frequency of maintenance and availability of trained personnel
- Cost of replacing components, such as vegetation, soil media, or permeable surfaces
- Availability of dedicated funding for ongoing operations, maintenance, and replacement needs

Plan for Maintenance

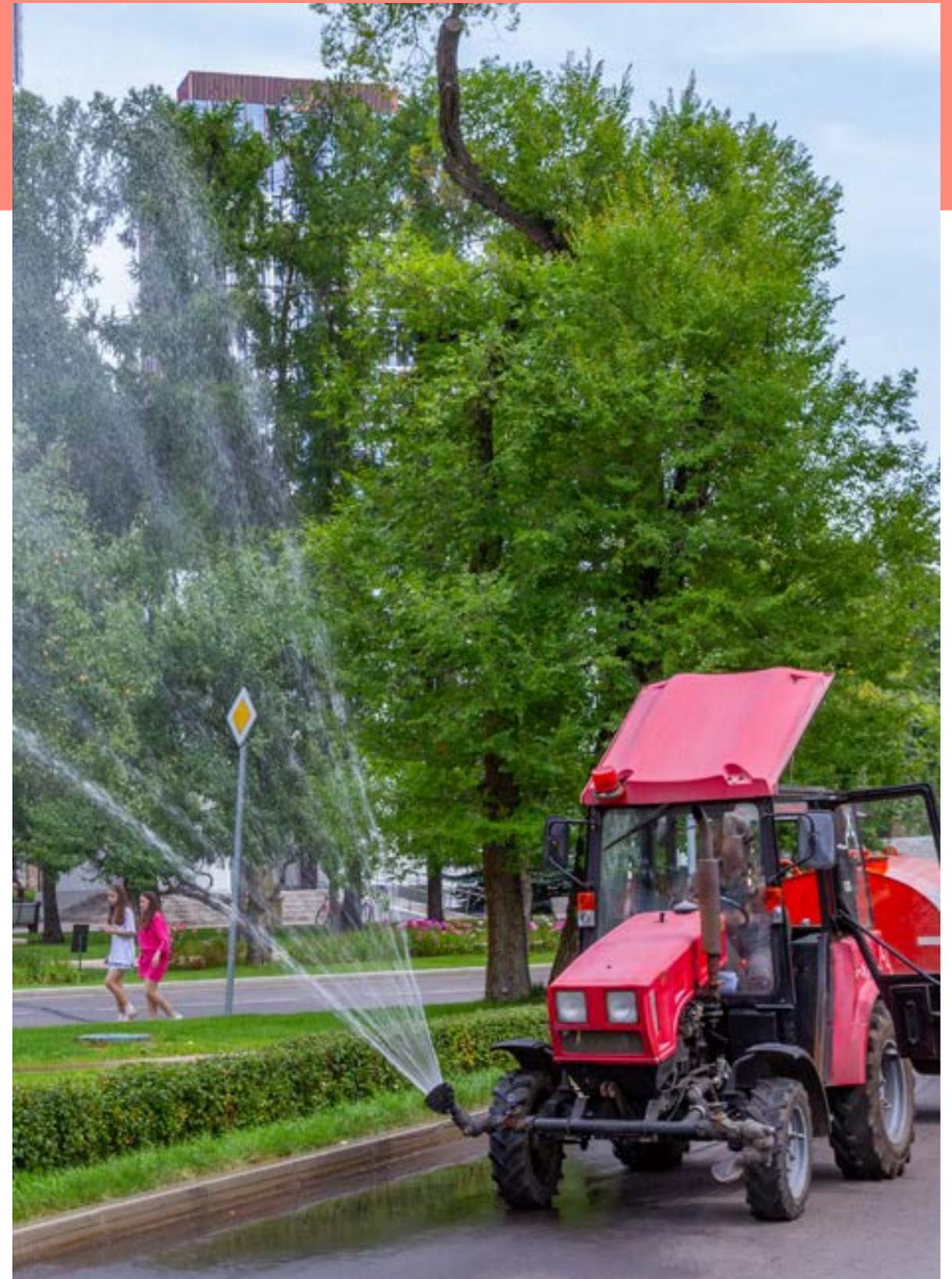
Maintenance plans and strategies will vary depending on the green infrastructure project. Proper maintenance is essential to maximizing the environmental, social, and economic benefits of green infrastructure, as well as ensuring that projects perform as expected. Establishing written plans and procedures ensure proper long-term maintenance and are critical components to the success of any green infrastructure project.

Dedicated Funding

To cover the costs of operation and maintenance, some communities have established user fees for stormwater infrastructure (e.g., stormwater utility fee), similar to those for traditional wastewater infrastructure (i.e., sanitary sewer fee). In communities that do not have a stormwater utility, options for covering the cost of green infrastructure operation and maintenance include the use of municipal or district funds, the establishment of landowner fee assessments, and partnerships.

Education and Training

Effective operation and maintenance training should be provided in an easy-to-understand format, occur at regular intervals, and target the activities employees, residents, or volunteers are expected to perform. Education and training can also provide information on the water quality and environmental benefits that green infrastructure can yield when properly maintained.



Green Street Resources

Introduction:

[Learn About Green Streets](#)

epa.gov/G3/learn-about-green-streets

[Economic Benefits of Green Infrastructure](#)

epa.gov/green-infrastructure/economic-benefits-green-infrastructure

[Green Infrastructure and Stormwater Management](#)

globaldesigningcities.org/publication/global-street-design-guide/utilities-and-infrastructure/green-infrastructure-stormwater-management

[Benefits of a Green Street](#)

epa.gov/G3/benefits-green-street

[Charlotte Pollinator Gardens](#)

charlottenc.gov/City-Government/Departments/General-Services/Landscape-Management/Pollinator-Gardening

[Green Infrastructure: Soak up the rain](#)

epa.gov/green-infrastructure

[The influence of green streets on cycling behavior in European cities](#)

sciencedirect.com/science/article/abs/pii/S0169204618313732

[The Impact of Green Space on Violent Crime in Urban Environments: An Evidence Synthesis](#)

pmc.ncbi.nlm.nih.gov/articles/PMC6950486

[Built Environment Strategies to Deter Crime](#)

transportation.gov/mission/health/built-environment-strategies-to-deter-crime

[The price of shade: New study finds the location of trees affects home values](#)

news.vt.edu/articles/2025/08/pamplin-urban-tree-coverage-real-estate.html

Case Studies:

Boston

[Boston Green Infrastructure](#)

bostonplans.org/planning-zoning/boston-smart-utilities/green-infrastructure

[Green New Deal Data Dashboard](#)

boston.gov/departments/mayors-office/green-new-deal-data-dashboard#resilience-and-nature

[Streets Green Infrastructure Policy](#)

drive.google.com/file/d/1YN4dnU_qlh7T2zg7nMigr-Au9baraebN/view

[Boston Green Infrastructure Planning and Design Handbook](#)

bwsc.org/sites/default/files/2024-05/Green%20Infrastructure%20Design%20Handbook.pdf

[Boston Office of Green Infrastructure](#)

boston.gov/departments/green-infrastructure

Seattle

[Green Stormwater Infrastructure](#)

seattle.gov/utilities/your-services/sewer-and-drainage/for-our-waters/green-stormwater-infrastructure

[Green Stormwater Goal Adopted by Council](#)

council.seattle.gov/2013/07/23/green-stormwater-goal-adopted-by-council/700-Million-Gallons

700milliongallons.org/the-goal

[Green Stormwater Infrastructure in Seattle: Implementation Strategy](#)

seattle.gov/documents/departments/ose/gsi_strategy_nov_2015.pdf

New York

[Greenstreets Program](#)

portal.311.nyc.gov/article/?kanumber=KA-01554

[Climate Strong Communities](#)

nyc.gov/content/climate/pages/initiatives/climate-strong-communities

[NYC Green Infrastructure](#)

nyc.gov/site/dep/water/green-infrastructure.page

[NYC Department of Environmental Protection](#)

nyc.gov/site/dep/index.page

Minneapolis

[Green Infrastructure Program](#)

www2.minneapolismn.gov/government/departments/public-works/surface-water-sewers/programs-policy/green-infrastructure/

[List of Funding Opportunities for Green Infrastructure](#)

stormwater.pca.state.mn.us/index.php?title=List_of_current_funding_opportunities_for_green_stormwater_infrastructure

[Minneapolis Climate Action Dashboard](#)

minneapolismn.gov/government/government-data/datasource/mayor-dashboard/

[GSI Design Criteria](#)

sdg.minneapolismn.gov/design-guidance/boulevards-and-furnishings/green-stormwater-infrastructure

New Orleans

[Green infrastructure](#)

nola.gov/next/resilience-sustainability/unused-content/green-infrastructure-en/

[National Disaster Resilience](#)

nola.gov/nola/media/Community-Development/2025-05-08_Substantial-Amendment-2_FINAL.pdf

[NORA Green](#)

noraworks.org/programs/strengthenneighborhoods/nora-green

[Office of Resilience & Sustainability](#)

nola.gov/next/resilience-sustainability/home

Current Conditions:

Watershed Quality

[Charlotte Area Local Watershed Plan](#)

files.nc.gov/ncdeq/Mitigation%20Services/Watershed_Planning/Catawba_River_Basin/Charlotte_LWP/Charlotte_LWP_CH2MHill.pdf

Flooding

[Mecklenberg County Recives FEMA Disaster Declaration for Hurricanr Helene](#)

news.mecknc.gov/mecklenburg-county-receives-fema-disaster-declaration-hurricane-helene

Next Steps:

1. Policy & Planning

[Charlotte Future: 2040 Comprehensive Plan Goal 7: Integrated Natural and Built Environments](#)

cltfuture2040plan.com/policy-framework/goal-7-integrated-natural-and-built-environments

[Charlotte Vision Zero](#)

charlottenc.gov/City-Government/Initiatives-and-Involvement/Vision-Zero

[Charlotte Strategic Energy Action Plan Plus](#)

charlottenc.gov/City-Government/Initiatives-and-Involvement/The-Office-of-Sustainability-and-Resilience/SEAP

2. Partnerships & Community Support

[Mecklenberg Soil & Water Conservation District](#)

conserve.mecknc.gov/About

[NC DEQ North Carolina Wetlands Preservation Program](#)

deq.nc.gov/about/divisions/coastal-management/estuarine-shorelines/wetlands/restoration

[Public-Private Partnerships Beneficial for Implementing Green Infrastructure](#)

epa.gov/G3/public-private-partnerships-beneficial-implementing-green-infrastructure

[Smart Surfaces Coalition](#)

smartsurfacescoalition.org

3. Funding & Financing

[Green Infrastructure Funding and Technical Assistance Opportunities](#)

epa.gov/green-infrastructure/green-infrastructure-funding-and-technical-assistance-opportunities

Federal Funding

[319 Grant Program for States and Territories](#)

epa.gov/nps/319-grant-program-states-and-territories

[Urban Waters Small Grants](#)

epa.gov/urbanwaterspartners/urban-waters-small-grants

[HUD Community Development Block Grant Program](#)

hud.gov/hud-partners/community-cdbg

[FEMA Hazard Mitigation Assistance Grant Program](#)

fema.gov/grants/mitigation

[HUD Community Development Block Grant Disaster Recovery Grant Funds](#)

hud.gov/hud-partners/community-cdbg-dr

[FHWA Transportation Alternatives \(TA\) Set-Aside](#)

fhwa.dot.gov/environment/transportation_alternatives

[Congestion Mitigation and Air Quality Improvement Program](#)

fhwa.dot.gov/infrastructure-investment-and-jobs-act/cmaq.cfm

[DOT's BUILD Discretionary Grant Program](#)

ops.fhwa.dot.gov/freight/infrastructure/tiger

[Environmental Finance Centers](#)

epa.gov/waterfinancecenter/efcn

North Carolina State Funding

[North Carolina Land & Water Fund: Apply for a Grant](#)

nclwf.nc.gov/apply

[NC DEQ Stormwater Funding Program](#)

deq.nc.gov/about/divisions/water-infrastructure/stormwater-funding-program

[NC DEQ Environmental Grants](#)

deq.nc.gov/news/grants#WaterQualityInfrastructure-11802

[Rail Industrial Access Program](#)

commerce.nc.gov/grants-incentives/public-infrastructure-funds/rail-industrial-access-program

[NC DEQ Community Development Block Grants](#)

deq.nc.gov/about/divisions/water-infrastructure/i-need-funding/community-development-block-grant-infrastructure

[Legacy Tree Fund](#)

ncufc.org/legacy-tree-fund.php

Municipal Financing

[NC DEQ Clean Water State Revolving Fund](#)

deq.nc.gov/about/divisions/water-infrastructure/i-need-funding/clean-water-state-revolving-fund

[General Obligation & Revenue Bonds](#)

charlottenc.gov/Growth-and-Development/Charlotte-Future/CIP/Bond-FAQs

[Municipal & Green Bonds](#)

epa.gov/statelocalenergy/municipal-bonds-and-green-bonds

[Tax Increment Financing](#)

lincolnst.edu/publications/articles/tax-increment-financing/

Private Financing

[What is a P3?](#)

ncchamber.com/leveraging-public-private-partnerships/what-is-a-p3

[Social Impact Bonds](#)

socialfinance.org/social-impact-bonds/

4. Maintenance & Stewardship

[Operation and Maintenance Considerations for Green Infrastructure](#)

epa.gov/G3/operation-and-maintenance-considerations-green-infrastructure

5. Design & Engineering Standards

[Charlotte Land Development Standards Manual \(CLSDM\)](#)

<https://www.charlottenc.gov/Growth-and-Development/Getting-Started-on-Your-Project/cldsm>

[Charlotte Stormwater Control Measure Design Manual \(SCM\)](#)

charlottenc.gov/Services/Stormwater/Stormwater-Regulations/SCM-Design-Manual

[NACTO Urban Street Stormwater Guide](#)

nacto.org/publication/urban-street-stormwater-guide



