



Green Infrastructure and Health

Policy Scan Summary

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New York City Highline, urban garden in Chelsea West Side

1. Introduction

We know green infrastructure in parks holds enormous potential for improving the environment, promoting health, supporting a thriving economy, and weaving stronger community. There are a number of standout projects around the country that have linked green infrastructure in parks for broad community benefit. Brownsville, TX built [Cascade Park](#) that stores floodwater, treats stormwater, and provides a new park and trails system.¹ Prineville, OR restored the Crooked River Wetlands Complex that created 120 acres of natural area with trails and outdoor classroom space that also [saved the City nearly \\$55 million](#) in wastewater treatment plant upgrades.²

Cities across the country are now exploring opportunities to move their approaches to green

infrastructure from a set of projects to citywide systems that really build a community's capacity to thrive. That requires policy at the federal, state, and local levels that provides room for communities to articulate their vision for green infrastructure.

This Policy Scan Summary document provides policy ideas and examples that city parks departments and their partners can use to grow green infrastructure in parks for community benefit. The Summary was intentionally designed and built with an eye toward small and mid-sized cities, and with a lens of how

policy impacts advance the multiple goals of equity, environment, economy, and health.

Parks departments follow a pathway in how they plan, build, and steward parks; so do water utilities as they plan, build, and steward green and gray infrastructure. This Summary recognizes that policy needs to affect each of those stages, and can do so with a range of policy tools (e.g., regulations, funding, community engagement, incentives, authorities, and priorities).

A number of policy areas intersect with the potential for more green infrastructure in parks--climate and disaster response, environment/planning/food, education, health and human services, housing/economic development/public safety, parks and recreation, and trails and transportation. In addition to highlighting the findings of how governments in the US are already using policy to promote green infrastructure, we've also noted areas where federal, state and local governments can begin thinking more broadly about how to incorporate green infrastructure into untapped policy opportunities.

KEY DEFINITIONS

Green Infrastructure (GI): Green Infrastructure encompasses a wide array of stormwater management solutions, such as green roofs, trees, rain gardens and permeable pavement that capture and infiltrate rain where it falls, reducing flooding and enhancing water quality. These projects improve the health of not only local waterways, but by extension, also the individuals and communities who reside nearby.³

Community Benefits: The benefits that flow back to a community from a range of infrastructure, development, nonprofit hospital, or other ongoing activities.⁴

THE CURRENT LANDSCAPE AROUND STORMWATER

Thinking of parks and natural areas as green infrastructure is not new. The Olmstead Brothers' plans often envisioned parks that protected communities from flood or enhanced transportation corridors. But more often, local, state, and federal policy has treated stormwater as a nuisance. As a result, years of assumptions built into stormwater and flood management policy have made it more difficult to include green infrastructure in parks for community benefit. Those framing challenges include:

- *Treating stormwater as a nuisance instead of an asset*—providing legal protections for residents and landowners to move water away from their homes and business as fast as possible;
- *Assuming stormwater management as an afterthought to the built environment*—creating design and building standards that assume stormwater flows into pipes and channels; and
- *Decoupling water management into its pieces instead of the whole*—separating water quality from quantity, and increasing the federal and state role in determining water management standards.

This Summary document is the result of a federal, state, and local-level policy scan (see Appendix: Methodology for complete methods). Our goals with this document are to:

- Create a comprehensive, but not exhaustive, search of existing policies at the federal, state, and local levels; that
- Intentionally sought to check potential “blind spots” based on the NRPA and consultant team’s lived experiences, and the current policy frames used for green infrastructure; and
- Identify the families of policy tools that could have the most impact relative to increasing the quality and quantity of green infrastructure in parks for multiple, community benefits.

This included a search of the peer-reviewed literature on barriers and opportunities for green infrastructure in parks, a Google search of green infrastructure in parks policy, a Westlaw search for state green infrastructure policy, and tapping into the knowledge of NRPA, its members, and the consultant team.



Minto Island Park, Salem, Oregon / Ian Sane, Flickr

2. Summary of Findings

2.1 Federal Findings

Federal policy is set by Congressional action, agency rules and guidance, and how federal programs are operated. The federal policies that have the greatest effect on GSI in parks fall into four main categories:

- **Clean Water Act Implementation:** The regulations and requirements that are administered by the US Environmental Protection Agency (US EPA) and states relative to improving the water quality of the nation's waterways;
- **Funding to tribes, states, and local government for green infrastructure:** The grant programs that are actively providing funds to plan, construct, and/or steward green infrastructure in communities;
- **Federal funding sources that could be used for green infrastructure, but may not be right now:** The health, disaster preparedness, and economic development grant programs that are funding a range of community development and infrastructure actions with authorities that allow for green infrastructure in parks, but need additional casemaking; and
- **Federal authorities that allow for private and other innovative investments** in green infrastructure and parks.

For many federal policies, their potential to support green infrastructure in parks is determined by how states interpret, prioritize, and deliver federal programs.

Clean Water Act Implementation

Regulatory requirements drive a significant share of green infrastructure investment in the United States. These drivers include: Combined Sewer Overflow (CSO) consent decrees (45 cities of the 772 with combined sewers as of 2019), Municipal stormwater permits (MS4) (7,500 communities as of 2016), statewide general stormwater

permits for industry and new construction, and sanitary sewer overflow requirements. Each of these regulatory requirements has the effect of driving local governments to invest more water quality infrastructure.

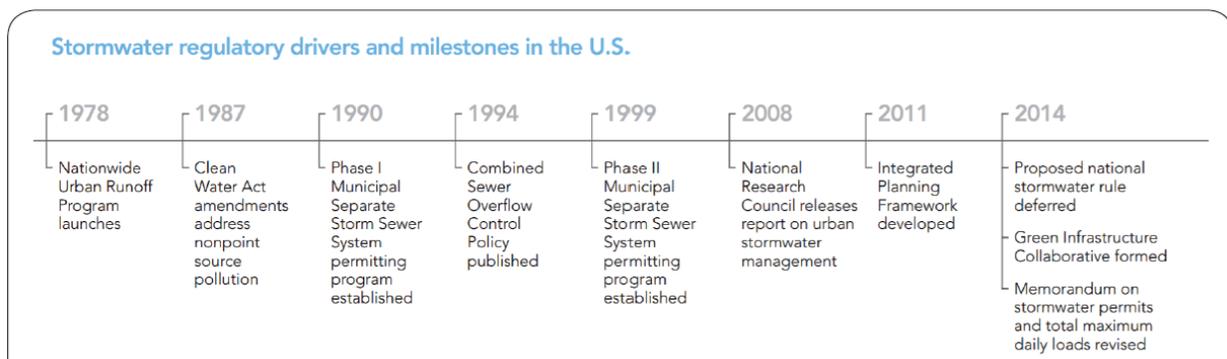


Figure 1. Water Environment Federation, 2015

Recent policies encourage or direct US EPA to prioritize the use of green infrastructure in its regulatory approaches. US EPA generally issues consent decrees, and states with delegated Clean Water Act permit authority issue permits for MS4 (and other National Pollution Discharge Elimination Systems permits) and general permits. The Water Infrastructure Improvement Act (WIIA, 2019) directs US EPA to integrate green infrastructure into its regulatory implementation across a number of programs. WIIA also directs US EPA to coordinate the integration of green infrastructure into state and city actions with other federal agencies (e.g., transportation, fish and wildlife, and housing and urban development), and to provide technical assistance on incorporating green infrastructure.

EXAMPLES

Combined Sewer Overflow (CSO) consent decrees: Several cities are linking their CSO compliance to citywide green infrastructure plans that also include parks (e.g., Youngstown, OH, Philadelphia, PA, Portland, OR, and Chicago, IL).⁵

Statewide general permits: Maryland and Virginia both have statewide general permits that require no net increase of nutrient runoff from new construction. The permits allow a road or other development project to install green infrastructure onsite, or invest offsite in green infrastructure (including in parks) to treat an equivalent volume of nutrient pollution and/or flow runoff. These statewide permits are part of the state’s strategy to meet the federal nutrient reduction goals for the Chesapeake Bay.

Water quality standards and wastewater permits: Montana and Wisconsin have both developed statewide strategies for reducing nutrient runoff that allow wastewater treatment plants to reduce their nutrient discharges via built technology at the plant or to install green infrastructure with partners in the community or with nearby farms and forests.

Current Federal Funding for Green Infrastructure

There are a number of existing federal grant programs that actively fund green infrastructure. These programs are relatively small and tend to support a particular project within a community (e.g., to address flooding in a particular neighborhood, to retrofit a housing complex or park exposed to flooding, etc.).

EXAMPLES

Clean Water Act funding via US Environmental Protection Agency (e.g., Clean Water State Revolving Funds, Section 319 nonpoint source pollution control grants, Environmental justice grants, Urban Waters grants, and other programs);

Community and economic development & Disaster recovery grants via Housing and Urban Development, Economic Development Administration, and Federal Emergency Management Agency (e.g., FEMA Pre-disaster Mitigation Grants, HUD Sustainable Communities Grants, and EDA Economic Development Assistance grants);

Infrastructure funding via US Department of Agriculture, Department of Transportation, FEMA, and EDA (e.g., USDA Rural Development Community Facility Grants, Federal Highway Administration Active Transportation grants, and FEMA Hazard Mitigation grants); and

Open space and natural area funding via Interior, USDA, and US EPA (e.g., Land and Water Conservation Fund grants, USDA Natural Resources Conservation Service grants, and US EPA 5-star restoration grants).

Federal agencies are [doing more to coordinate](#) their funding programs (e.g., across HUD, Transportation, and US EPA).⁶

Much of the current funding can be used by local governments (including parks departments) for capital improvement projects (including the design and construction). There are some grant programs that will support system-wide planning or community engagement. We are not aware of significant federal programs that will provide grants for operations and maintenance, or ongoing stewardship of green infrastructure in parks.

Potential Federal Funding for Green Infrastructure

There are several federal funding programs where green infrastructure is not currently being funded, but there is authority to fund green infrastructure.

EXAMPLES

Medicaid Section 1115 waivers or “eleven-fifteen” waivers are designed to provide flexibility for states to invest their federal and state Medicaid dollars in innovative ways to deliver better healthcare and more preventative measures for low income residents. Medicaid waivers in places such as North Carolina or Oregon are being used to fund housing, early childhood education, and other social determinants of health. Green infrastructure and parks could be a fundable category if A) the state can make a case for how it improves health of individuals, and B) the state asked the federal government to include green infrastructure in a Section 1115 waiver.

In the Bipartisan Budget Act of 2018, Congress provided flexibility for [Medicare Advantage](#) plans to offer supplemental, non-medicinal benefits (e.g., park prescriptions or memberships in community programs).⁷ The benefits need to be based in evidence, but provide wide flexibility for parks programs to link time in green spaces to health. Building from this, groups like [National Recreation and Parks Alliance](#) are exploring how to change the tax code to allow time in greenspaces and parks to be eligible expenses for flexible spending (FSA) and health savings accounts (HSA).⁸

Community Development Block Grants (HUD) and Community Facility Grants (USDA Rural Development) have both been used for green infrastructure and parks in a small number of examples, but could be used more broadly for green infrastructure. Rural development grants are focused on communities with fewer than 20,000 people.

Authorities for innovative investment

There are several policies at the federal level that city parks departments could use to attract different kinds of private and other innovative investment in green infrastructure from new sources.

EXAMPLES

The US tax code (administered by the Internal Revenue Service) provides guidelines for how nonprofit hospitals must meet community benefit spending requirements. Part of those guidelines count environmental improvements as an eligible expense, creating a path for hospital investment in green infrastructure in parks for health benefits. The 2017 Tax Cuts and Jobs Act also created Opportunity Zones authority in the tax code--providing tax benefits for private investments in designated, distressed zip codes across the US. Both authorities create incentives that could include investment in green infrastructure in parks, where there can be a demonstrated improvement in health, social outcomes, or financial return on investment.

Seattle Children’s Hospital used some of its community benefits budget to invest in trails and other neighborhood improvements near its hospital.⁹



River Front Park / Nancy Allen, The Wetlands Conservancy

2.2 State Findings

Though all 50 states are unique in their specific policies that govern stormwater management, there are some basic similarities and themes that each addresses. In general, the state policies that have the greatest effect on green infrastructure development concern how the states implement the federal Clean Water Act (including National Pollution Discharge Elimination System permits and post-construction development standards). Two other policy areas, funding opportunities (like from the federal Clean Water State Revolving Fund program) and authority to form surface water management utilities with a fee or tax base, round out four policy categories with significant impacts on the overall, statewide use of green infrastructure across all 50 states.

National Pollution Discharge Elimination System (NPDES) Permits

NPDES permits are authorized in the Clean Water Act (CWA) and required for point source discharges (i.e., municipal and industrial wastewater and municipal stormwater systems) throughout all 50 states. Barring four exceptions that are managed through the federal US EPA (New Mexico, Massachusetts, Idaho, New Hampshire), NPDES permits are issued by states, and along with statewide general permits for new construction and industrial stormwater, are the key mechanism through which stormwater management projects are implemented. While all state-level programs must at least meet the federal minimum standards specified by the Clean Water Act, many states have additional requirements that affect how water is collected, treated, and discharged statewide.

Most state Departments of Environmental Quality (DEQ or analogous agencies) publish state stormwater management manuals, which outline the State's specific standards for NPDES permits. These are also where the State promotes best management practices (BMPs) that align with statewide water quality goals and the "maximum extent practicable" treatment technology requirements in the Clean Water Act. These regulatory documents are a critical opportunity to promote green infrastructure.

EXAMPLES

Many states have begun listing green infrastructure as BMPs in their stormwater management manuals:

Several states require green infrastructure in stormwater management. Illinois requires that green infrastructure be used in NPDES permitted projects “[to the extent practical](#),” and also requires that all developers (not just MS4 level permits) engage and educate their communities on the features being installed.¹⁰ [Rhode Island](#)’s language is even stricter, requiring green infrastructure for all new development in the state and offering practical design guidelines for municipalities to work into their own planning documents.¹¹ Other states (e.g., Wisconsin, Minnesota) have similar policies for NPDES permits that require green infrastructure as part of the stormwater management system.

[New York’s NPDES permitting process](#) goes a step further by requiring developers to submit community-level stormwater management plans along with their permit applications, which must include green infrastructure.¹² This pushes communities to think about stormwater management at a broad level while also promoting green infrastructure.

Other states (e.g., Ohio, South Carolina) encourage green infrastructure as a BMP in their permitting process and management guides, but do not have any sort of requirement for consideration or installation.

Some states barely mention GSI practices, if at all.

Post-Construction Development Standards

Post-construction development standards are state DEQ requirements that address how newly-developed property must handle stormwater runoff. These policies and guidelines vary from state to state, are usually included in state stormwater manuals, and are another prime opportunity for state regulatory agencies to promote green infrastructure.

EXAMPLES

Minnesota has [strict post-construction development standards](#), requiring no net increase in stormwater discharge volume, total suspended solids (TSS), or levels of phosphorous from newly developed properties.¹³ They also require that impervious surface development retain at least the first inch of rainfall on site. Other states (e.g., Virginia, Maryland) have similar “no net discharge” requirements.¹⁴

[New York](#) has similar requirements that post-construction runoff volumes cannot increase. It also requires that ALL stormwater runoff that is not retained on the property must be treated. In megacities like New York City with such high levels of impermeable surface coverage, this leads to a significant amount of water being treated on-site in new development.¹⁵

Similar to NPDES permits, many states at least list GSI as BMPs in their state stormwater management guides for post-construction standards. However, some states ([e.g., Michigan](#)) only have post-construction standards for large cities that qualify for MS4 permits.¹⁶

Funding Opportunities

Green infrastructure projects cost money to implement, and many municipal governments are unable to afford the cost of green infrastructure installation without state assistance. The Clean Water State Revolving Fund (CWSRF) is a federal-state loan and grant program that helps direct federal dollars for state water quality projects, and states can offer a variety of other funding mechanisms that incentivize local-level green infrastructure development.

MAJOR STATEWIDE FUNDING MECHANISMS FOR GSI

Clean Water State Revolving Fund (CWSRF) grants. These are consistent funds delivered to states by US EPA to fund water quality and treatment projects, authorized in the Clean Water Act and managed by states. Many states set up their own programs within the CWSRF authorities to disburse these grants, such as [Wisconsin's Urban Nonpoint Source & Stormwater Management Grant Program](#), or any number of analogous programs in Illinois, Michigan, Massachusetts, etc.¹⁷

General obligation bonds. These are statewide debt sold to investors that are then paid back over time with interest. An example would be [California's Proposition 1 \(The Water Quality, Supply, and Infrastructure Improvement Act\)](#), a \$7.5 billion general obligation bond dedicated to improving water quality throughout the state.¹⁸ The State uses this money to offer \$200 million in grants annually for multi-benefit stormwater management projects around the state. By requiring consideration of multi-benefits, this bill also encourages the proliferation of GSI development.

New taxes. Statewide tax increases can be used to generate revenue for green infrastructure projects. An example would be [Minnesota's Clean Water, Land and Legacy Act](#).¹⁹ A voter-approved sales tax increase, this funding bill explicitly called out parks as part of the State's clean water strategy/resources, making an explicit connection between parks and their green infrastructure function. The bill also created an interagency team of 7 state agencies to work on green infrastructure/clean water projects together.

Tax credits/rebates. These are a way for states to incentivize green infrastructure development through rebates or tax reductions when property owners install green infrastructure on their property. One example would be [New York's A11226](#).²⁰ This bill created a temporary state tax credit program where large cities (only NYC fit the size requirement) could offer one-year tax rebates of up to \$100,000 if at least half of a building's roof was a green roof. Another example is [South Dakota's SB 66](#), which offers substantial property tax rebates for property owners who install riparian buffers on their property.²¹

Authorizing other state funding for green infrastructure use. Though less common, states have the power to allow money from non-utility sources to be shifted toward stormwater management/green infrastructure practices. A recent example is [Texas's SB7 \(2019\)](#).²² After experiencing historic flooding in recent years, Texas wanted to be able to use state funding for flood mitigation instead of reserving it for more costly cleanup efforts. SB7 opened the state's rainy day and emergency funds to be used for flood mitigation efforts, which includes the development of green infrastructure features around the state.

Stormwater Utilities

Of the 7,500 communities regulated by stormwater permits, [only about 1,500 have established stormwater or surface water management utilities](#).²³ If states explicitly authorize the creation of local stormwater utilities, it opens up the possibility for local and regional governments to enact stormwater management plans at a regional level and introduce additional funding mechanisms to pay for green infrastructure. Without authorization, local governments are generally limited in the funding they are able to generate independently for stormwater management and green infrastructure.

EXAMPLES

Most states that offer this explicit authorization do so through state statute. An example would be [MN State Statute 444.075](#), which authorizes the creation of stormwater utilities throughout the state and also explicitly authorizes them to set their own rates for service.²⁴ Other states (like New York and Pennsylvania) allow for the creation of utilities, but the [process to create them is burdensome and therefore limits the number of utilities](#) throughout the state.²⁵

Some state statutes restrict the formation of stormwater utilities, limiting the ability of local governments to raise funds for green infrastructure. The Missouri State Supreme Court [decided that St. Louis' stormwater fees were a tax](#) and needed to be referred to a vote for approval.²⁶

Other Unique Policies of Note

While there are significant similarities between state-level policy drivers that affect green infrastructure, we identified several unique policies that exist outside of these four main areas. In each of these instances, states created legislation with the express purpose of affecting green infrastructure implementation through less

traditional channels.

Water Rights

All states have some form of law that governs the ownership and use of water. This is true whether in Vermont, Nebraska, or Idaho. Most water right systems were set in the 1800s or early 1900s, and may apply restrictions on the holding or harvesting of stormwater on-site illegal without a water right, a huge impediment to the development of certain types of green infrastructure that store or infiltrate water. Specifically, water rights can restrict: stormwater storage, rainwater harvesting, and groundwater infiltration of surface water flows.

EXAMPLES

States have dealt with this in different ways. In Colorado, the [Residential Precipitation Collection Act](#) passed in 2016 authorized private citizens to store up to 110 gallons of stormwater on their property in rain barrels, a practice that was previously illegal.²⁷ [California's Rainwater Capture Act of 2012](#) similarly authorized the capture and storage of stormwater on-site, overriding downstream rights to the runoff.²⁸

During the failure of the Lake Oroville Dam in 2017, former California Governor Jerry Brown issued an [executive order](#) that declared a State of Emergency to allow for expedited emergency permits for water storage.²⁹ This authorized local and state agencies to capture water in their jurisdictions instead of going through the more rigorous water rights permitting process, and helped reduce runoff to the failing dam.

Explicit Green Infrastructure Directives

Some states have used policy to direct state agencies to encourage green infrastructure use. In 2013, the governor of Delaware signed an [executive order that directed all state agency heads to prioritize green infrastructure](#) in their work for the explicit purpose of mitigating the effects of climate change.³⁰ [Maryland's Stormwater Management Act of 2007](#) not only required the adoption of green infrastructure at the State level, but also mandated that local governments adopt ordinances to remove barriers toward the development and implementation of green infrastructure.³¹

State Policies that Impede Green Infrastructure

In 2016, [Tennessee passed SB1830](#), which prohibits local governments from enacting stormwater quality or management standards more strict than federal standards from the CWA.³² Not only did this completely remove the ability for municipalities to set their own water management standards, it also neutered the State's existing NPDES requirements, simply returning them to the federal CWA standards. Laws similar to this would greatly impair a state's ability to incentivize the proliferation of green infrastructure from a water quality standpoint, and likely lead to reduced water quality throughout the state.



Crooked River Wetlands in Prineville, OR

2.3 Local Findings

While most green infrastructure projects are developed, installed and maintained at the local level, a local government’s ability to promote green infrastructure in its community is hugely dependent upon state-level policies (e.g., NPDES permitting requirements) and funding streams (e.g., legislated grant opportunities), similar to the ways that state-level policy is [preempted and influenced by federal policies](#).³³

The policy toolkit for local governments looks different than it does at the state or federal level. Part of this has to do with the different approach to rules and regulations (ordinances vs. legislation), but a broader difference is the role that local governments play as entities. Federal and State governments play a large regulatory role with regards to stormwater management, broadly enacting and enforcing policies consistently across the state. A city’s role is much more broadly oriented toward local planning, vision, building regulations, infrastructure construction, and public service delivery.

To really champion green infrastructure and promote its development, local governments can focus on those major local government functions—citywide planning, building ordinances, infrastructure construction, and public service delivery—to pull the levers that have the most effect at the local level. While there are some regulatory policies (particularly in large cities that qualify for MS4 permits) available to local governments, other contextual policies may have significant effect on making green infrastructure a community priority.

We have developed a list of “10 Contextual & Policy Needs for Successful Green Infrastructure Implementation in Local Parks” to highlight what we see as the most important tools local governments can use to make green infrastructure a part of the fabric of their community. We used a sample of 14 small and mid-sized municipalities from across the country as case studies. We show examples of how these local levers can make a difference in getting green infrastructure woven into the fabric of a city.

POLICIES THAT HINDER LOCAL GREEN INFRASTRUCTURE DEVELOPMENT IN PARKS

While this section highlights policies that help local governments develop green infrastructure, it is also important to point out local policies that hinder green infrastructure development in parks.

Conflicting Local Ordinances

Local governments may be responsible for zoning ordinances, building standards and comprehensive plans, but it is unlikely that all of these are coordinated to promote or even allow green infrastructure. There are guides cities can use to audit current ordinances to see if there are conflicts that impede the use of green infrastructure (e.g., road development guidelines that prohibit bioswales or street trees). The US EPA has a guide on [overcoming municipal barriers to green infrastructure](#) that walks cities through this process.³⁴ The [New Jersey Green Infrastructure Municipal Toolkit](#) has examples of ordinance language cities can use to update code and make their cities more green infrastructure-friendly.³⁵

Protective Acts for Parks

In 1997, Seattle passed [Initiative 42](#).³⁶ Considered a huge win for parks at the time, Initiative 42 protected parks and designated parkland from being developed for any purpose outside of traditional parks services (conservation, recreation). Unfortunately, this also prevents parks from being able to install green infrastructure, which does not fit the policy's definition of a traditional park use. Local policies that exclude multi-benefit use of space might also need to be updated to allow for green infrastructure development in spaces like parks.

Preemptive State Policies

Local government policies are [preempted by state-level policies](#), which means that a state's laws can restrict how local governments are able to fund and implement green infrastructure.³⁷ Bills like [Tennessee's SB1830](#) make it more difficult, though not impossible, for local governments within the state to encourage the proliferation of green infrastructure.³⁸



Bikeway in Portland, OR / Clean Water Services

3. Ten Elements for Citywide Green Infrastructure Implementation in Parks

This section highlights 10 elements that can promote citywide, large-scale investment in green infrastructure in parks for community benefit.

1. Develop a local Green Infrastructure Plan

A citywide green infrastructure plan helps tie green infrastructure to broader citywide and community goals. The plan can set guiding principles, areas of the city to prioritize different kinds of green infrastructure, and articulate the community's vision for green infrastructure. A green infrastructure plan could be woven into a citywide parks master plan, or a water utility's 20-year facilities plan.

What kinds of broader policies need to be in place for this to happen?

State DEQs (or analogous entity) may have statewide green infrastructure plans that can include design guidelines, best management practices, and environmental requirements at the state level to help shape your community's green infrastructure plan. There may also be local climate assessments (with projections for precipitation volume, frequency, and duration), community health needs assessments (with census-tract information on ethnicity, income, health disparities, and health priorities), and population projections (with projections on growing and shrinking parts of the city).

CASE STUDY: MILWAUKIE, WI

Milwaukee published their [Green Infrastructure Plan](#) in June 2019.³⁹ The Plan helps the city meet multiple goals around climate and flood resilience, Clean Water Act compliance, and building a reputation as a green and livable city. The City has made it a requirement for developers to prioritize green infrastructure when submitting the mandated stormwater management plans.

Seeing that this policy is so new, we can only speculate what the potential impacts can have on the economic, environmental, health, and social outcomes. However, in this Stormwater Management Manual, the City explicitly shares how local actions (e.g., the prioritizing of green infrastructure) can impact cities that depend on Lake Michigan to survive. They go even further putting their work into context to the 1.1 million people who rely on the health of Lake Michigan and its watershed.

CASE STUDY: YOUNGSTOWN, OH

With 60% population loss, high concentrations of poverty, and increases in vacant properties, Youngstown, OH faces intense economic and social pressures. Youngstown must invest in a large scale stormwater solution, and is seeking the most cost-effective, benefit rich option. In 2017, [Youngstown contracted with a consulting firm, Greenprint Partners, to help them develop a community green infrastructure plan](#).⁴⁰ Through their partnership with Greenprint Partners, Youngstown undertook a holistic approach to citywide green infrastructure planning that centered equity.

Greenprint Partners is working with the City of Youngstown and dozens of local partners to develop a green infrastructure master plan to guide the city in using green infrastructure to reduce its combined sewer overflows while also proactively driving improved health, crime, and economic outcomes for communities. This benefits-driven planning process will ensure that Youngstown gets the most good out of its green infrastructure for years to come.

Other Resources:

[MassAudubon has put together some short, simple graphic resources](#) to help guide communities toward developing master green infrastructure plans.⁴¹

2. Green infrastructure included in city/utility/water authority budget

One of the primary challenges to green infrastructure development/installation/maintenance is funding. While the upfront capital costs can be expensive for certain green infrastructure features, several programs offer assistance for communities through grants or low-interest loans to be able to install green infrastructure projects. But to be successful long-term, the local authority who will be managing the project post-development needs to have a line item in the budget specifically dedicated to green infrastructure maintenance and upkeep.

What kinds of policies need to be in place for this to happen?

Most public works departments/stormwater utilities will have the broad authority in their statutes to fund green infrastructure, but may lack dedicated funding sources or programs for green infrastructure. Some utilities may need explicit changes in their authorities to fund green infrastructure (e.g., the [Multnomah County Drainage District in Oregon](#)).⁴² Other utilities may need board or council-adopted resolutions prioritizing green infrastructure investments. Ideally, policies can identify secure, sustainable, adequate funding sources for green infrastructure with clear authority to invest those funds in parks for community benefits.

CASE STUDY: LENEXA, KS

The [Rain to Recreation](#) program prioritizes green infrastructure that improves water quality and flood control, but also provides opportunities for education and recreation.⁴³ The program uses voter-approved tax dollars and other utility fees to invest in [green infrastructure-related projects](#) like [rain gardens, bioswales, wetlands, and pervious pavement](#), along with community engagement and [education workshops](#) designed to increase community support for green infrastructure.⁴⁴ “Initially, Rain to Recreation received some funding from the city’s general fund account and a now-expired one-eighth cent sales tax. Currently, the program is funded through two ways: a stormwater utility fee established in 2000 that is collected as a special assessment on Johnson County property tax bills; and a systems capital development charge, so that as new developments are built, growth pays for growth.”⁴⁵

Having varied sources of funding for green infrastructure projects, adequately funding both capital projects and ongoing maintenance, is important for the longevity of green infrastructure in a community. Through direct investments in stormwater management and utilities, these funds may also support local green jobs and help transfer knowledge at the local level as to why green infrastructure is important to the health of the community and environment.

CASE STUDY: SEATTLE, WA

Seattle Public Utilities and King County Wastewater Treatment Division have set an ambitious goal to manage 700 million gallons of stormwater a year in the greater Seattle area through green infrastructure, expressly funded in each agency. Through its utility-funded “[700 Million Gallons](#)”⁴⁶ program (along with additional grants and funding sources), the city/county utility partnership has [already made significant progress](#), installing over 1,000 rain gardens, 800 cisterns, and 1,600 “RainWise” projects around the metro area.⁴⁷

3. Long-term control plan that specifically mentions green infrastructure

Combined sewer overflows (CSOs) are triggered when a combined wastewater treatment system (that treats wastewater as well as stormwater) is overloaded and unable to treat the volume of water passing through. In these instances, the excess water is discharged untreated into nearby bodies of water. This raises risks related to human and environmental health, and is a violation of the Clean Water Act. Forty-five communities with combined sewage systems have consent decrees that mandate they design and implement long-term control plans (Control Plans). Control Plans are planning documents that guide the steps a community will take to reduce the number of

CSO events in a given year, and can include any number of mitigation strategies. Including green infrastructure in a city's Control Plan is a way to tie green infrastructure into the main stormwater management plan.

What kinds of policies need to be in place for this to happen?

Control Plans only apply to cities with combined sewer systems. There are some cities with requirements to eliminate Sanitary Sewer Overflows, but there are fewer regulatory pressures to act for municipalities that have separate sewer systems for stormwater and wastewater.

CASE STUDY: LANCASTER, PA

Lancaster is under a [consent decree](#) to reduce CSOs into the Conestoga River.⁴⁸ In 2011, Lancaster developed a [community green infrastructure plan](#) that specifically integrated green infrastructure practices into its Control Plan, with the express purpose of reducing the amount of CSOs and, in the event of a CSO, reducing the pollutant levels in untreated runoff.⁴⁹

4. Incentive programs with funds for properties like parks to design and build green infrastructure

As previously mentioned, several states offer grants and low-interest loans to help fund green infrastructure projects around the states. Where authorized, local governments can consider their own incentive programs to encourage private developers to install green infrastructure on their property. Things like property tax credits, local sales taxes, stormwater treatment rebates, etc. can encourage the development of green infrastructure while also bringing money in to fund green infrastructure projects in public spaces.

What kinds of policies need to be in place for this to happen?

The kinds of incentives available to local governments will largely depend on what state-level policies are in place that affect how local governments collect money from their constituents.

CASE STUDY: CHATTANOOGA, TN

Though the State of Tennessee has passed legislation that [discourages communities from developing green infrastructure](#),⁵⁰ Chattanooga has found a way to incentivize its residents and businesses to install green infrastructure at the local level. The city enacted a [Water Quality Fee](#) to help offset the costs of treating runoff, but offers a variety of “credits” in the form of tax rebates for property owners who install green infrastructure features that help reduce the volume of runoff from their properties.⁵¹ These credits can reduce the fee up to 85 percent, and could be used to incentivize landowners to install green infrastructure features/reduce impermeable surfaces on their property.

CASE STUDY: WASHINGTON, DC

The District requires new construction to retain and treat all of its stormwater onsite or purchase stormwater retention credits from other green infrastructure projects offsite. These [stormwater retention credits](#) can be used for projects on public or private land.⁵²

CASE STUDY: DAVENPORT, IA

Similar to Chattanooga, Davenport charges residents a Stormwater Utility Fee and [offers credits/rebates for installing green infrastructure features](#) that help mitigate stormwater runoff.⁵³ What's particularly cool about Davenport's crediting program is that they offer credits for educational programs, including training employees on the benefits of green infrastructure in stormwater management, or sharing green infrastructure benefit information in community forums.

CASE STUDY: TACOMA, WA

Tacoma has set up a local granting program called "[Make a Splash](#)", which offers residents and businesses up to \$4,000 in reimbursements to install stormwater management/green infrastructure features on their property.⁵⁴ These projects can include any number of green infrastructure features, may be educational in nature, and are specifically targeted at small-scale projects geared toward increasing community engagement with/investment in green infrastructure.

Other Resources:

The New Jersey Green Infrastructure Municipal Toolkit includes several helpful sections for communities looking to expand green infrastructure within their communities, including [one specifically about incentive ideas](#).⁵⁵

5. Green infrastructure information resources (e.g., local design manuals, maintenance standards, etc.)

While it is not uncommon for state Stormwater Management Manuals to include green infrastructure designs and maintenance standards, local governments have the opportunity to be more responsive to their specific communities and design resources that truly reflect the local people and environment. Offering workshops, design courses, DIY-building days, or even just hosting accessible information on the city's website can be an important tool in building community support for green infrastructural development.

What kinds of policies need to be in place for this to happen?

Cities that qualify for MS4 permits are required to offer some sort of community education as part of the permitting process, but smaller cities can take advantage of this cheap, easy way to show communities why green infrastructure is so important.

CASE STUDY: TUCSON, AZ

Tucson's approach to [stormwater management](#) includes attention to both water harvesting (e.g., retaining and reusing rainwater to reduce potable water use for irrigation) and reducing the impact of flash floods.⁵⁶ The city website encourages water harvesting and offers plenty of resources for residents to learn more about stormwater management best practices and green infrastructure design guidelines. Tucson published its own [Water Harvesting Guidance Manual](#)⁵⁷ in 2005 to encourage citizens to capture and recycle stormwater on their own property, and they offer additional [educational resources](#) from books to school presentations about stormwater management.⁵⁸

CASE STUDY: DOUGLAS COUNTY, NE

Douglas County has a robust online presence geared toward providing community-specific educational resources to residents about green infrastructure. In addition to [resources about stormwater standards](#)⁵⁹ and specific technical/design criteria for storm drainage, they provide [feature-type specific resources](#) with facts and clear design guidelines for things like bioswales, rain gardens, green roofs, etc.⁶⁰

Douglas County also hosts regular [Stormwater Webcast](#) events to get community members further engaged in stormwater management across the county.⁶¹ They also engage the community through [Public Outreach and Education](#) pages, which link to local groups who can provide additional education materials and workshops to interested community members.⁶²

CASE STUDY: TARPON SPRINGS, FL

As a coastal city at high risk for flooding, Tarpon Springs has emphasized educating its residents about stormwater management practices. The city website has several resources related to [stormwater and green infrastructure](#),⁶³ with publications like “[Homeowner's Runoff](#)”⁶⁴ and “[Watershed Health](#)”⁶⁵ to help residents understand the benefits of green infrastructure and on-site treatment, which includes reducing community flooding events. The city also makes its policies and plans surrounding green infrastructure and stormwater management accessible and understandable for the layperson, with clear explanations about their [stormwater utility fee](#),⁶⁶ [county-wide fertilizer ban](#)⁶⁷ (which helps reduce pollution in stormwater runoff), and their [stormwater capital improvement projects](#).⁶⁸

6. Presence of regional governmental agencies with demonstrated interest in funding green infrastructure (e.g., counties, regional sewer districts, etc.)

Regional governments can help cities broaden their view of stormwater management by creating plans at the watershed or regional level. Because of their larger geographic scope and specific directives, many regional governments play an important role in stormwater management and can be important allies in funding green infrastructure at the local level. Regional bodies can include county governments (e.g., Johnson County, Kansas), special districts (e.g., Northeast Ohio Sewer District), or interstate commissions (e.g., Great Lakes Commission). With a regional body championing green infrastructure development in the region, cities have an intergovernmental partner supporting their work and another potential avenue toward funding green infrastructure projects.

What kinds of policies need to be in place for this to happen?

Counties can be great regional partners for cities looking for intergovernmental support in developing green infrastructure. The creation of special regional governmental agencies (like drainage districts) often needs to be authorized by the State and/or local voters. If they do not already exist in an area, cities have formed other ways to cooperate regional (e.g., regional parks plans, regional transportation plans, etc.).

CASE STUDY: WORCESTER, MA

Massachusetts has ten regional stormwater management coalitions throughout the state, each of which focus on stormwater management at a watershed (or larger) level. These smaller regional groups are united through [Think Blue Massachusetts](#), a statewide group run by the Massachusetts Statewide Municipal Stormwater Coalition.⁶⁹ This statewide educational campaign focuses on educating communities, businesses, and industrial site managers about the benefits of green infrastructure to reduce runoff volume, and also works with towns and cities to develop local-level plans to help them meet stormwater permitting requirements. This larger body represents more than 130 communities around the state, and therefore has incredible regional reach to promote green infrastructure development on a broad scale.

Worcester is the second largest city in Massachusetts, and represented in the Think Blue program. This regional effort has helped pave the way for Worcester to develop its own green infrastructure plan and [secure state funding](#) to install several green infrastructure features throughout the community.⁷⁰ This is just [one of many ways](#) the city is leading in sustainability efforts, including the creation of a large urban gardening network and focusing on LEED-certified development that promotes efficient water use.⁷¹

CASE STUDY: MICHIGAN'S COUNTY DRAIN COMMISSIONERS

Michigan's 1956 Drain Code established [commissioners](#) to manage floods, stormwater, and lake levels across the state.⁷² The Commissioners oversee drainage districts and can review construction plans, invest in drainage projects, and provide other support for stormwater management.

Other Resources:

[Cleveland, OH](#)⁷³ and [Portland, OR](#)⁷⁴ each also have regional governing bodies that include parks management as part of their authority, each of which champion green infrastructure at a [regional level](#).⁷⁵

The [Northeast Ohio Sewer District](#), a regional special district near Cleveland, is also a regional champion of green infrastructure, and offers grants to communities within its boundaries to develop green infrastructure features.⁷⁶

7. Available workforce and GSI workforce development programs

New green infrastructure projects create jobs in the community, but constructing and maintaining green infrastructure requires specialized skills and training. When planning a new green infrastructure project, cities need to think through who will be doing the construction and maintenance, how they will be trained, and whether or not a local workforce is actually available to maintain the system.

What kinds of policies need to be in place for this to happen?

There are some [national training programs](#) for green infrastructure professionals, and some cities (e.g., San Antonio, TX) have green infrastructure maintenance crews as part of their city staff.⁷⁷ For smaller cities with limited maintenance crews, it is important to ensure not only that staff have the necessary skills, but also the budget to work with community partners for green infrastructure and/or hire additional staff.

CASE STUDY: PEORIA, IL

Peoria has taken advantage of the national AmeriCorps program by creating AmeriCorps positions specifically for green infrastructure maintenance throughout the community. [PeoriaCorps focuses on maintaining community green infrastructure](#) while providing program participants with training and industry-recognized credentials through the NGICP (National Green Infrastructure Certification Program).⁷⁸ Graduates of the program have valuable skills that can transfer to jobs across the country within the green infrastructure field.

CASE STUDY: SEATTLE, WA

The City of Seattle has two training programs for green infrastructure projects throughout the city. The [Duwamish Infrastructure Restoration Training Corps](#) is a training program for young adults with a special focus on underrepresented groups in the green infrastructure profession, including people of color, women, and LGBTQ+ communities.⁷⁹ This paid leadership/job training program gives community members the skills they need to work on green infrastructure projects around the community, and graduates are regularly hired by water treatment utilities, conservation districts, and other green infrastructure-related agencies. A similar program, the [Duwamish Valley Youth Corps](#), is run through a local nonprofit and provides many of the same benefits to youth.⁸⁰

CASE STUDY: SALINAS, CA

Salinas is home to [Monterey Bay Friendly Landscaping](#), a landscaping business funded in part by California's State Water Resources Control Board. It aims to "encourage behavior changes that lessen the impact of conventional landscape practices."⁸¹ Types of landscaping they advocate include green infrastructure. They even provide a bilingual [Green Gardener Certification Program](#) to help generate local jobs and change conventional landscaping.⁸²

8. Visionary leadership with strong political will around green infrastructure development

One strong leader with a passion for green infrastructure can help drum up support across a community to make green infrastructure a priority at the local level. If this person has the authority to affect local policy, and the political will to move several local agencies into action, visionary leadership can really be *the* catalyst for widespread community adoption of green infrastructure.

What kinds of policies need to be in place for this to happen?

Of course, this visionary leadership needs to exist within a political and policy context that encourages, rather than hinders, green infrastructure adoption.

CASE STUDY: GARY, IN

Gary, Indiana is in the midst of a city-wide push for green infrastructure proliferation. In 2012, the city took an environmental justice/equitable development focus in pursuit of green infrastructure and received financial support from the US [EPA Sustainable Communities](#) program.⁸³ Through this program, the city installed more than 20 green infrastructure features to address urban blight and mitigate the effects of flooding and CSOs. Following the success of this program, Gary started the [Vacant to Vibrant \(V2V\) program](#) in 2014.⁸⁴

Two key community leaders helped drive these programs to success: Mayor Karen Freeman-Wilson, and the Director of Environmental Affairs and Green Urbanism, Brenda Scott-Henry. Both were fierce advocates of green infrastructure in their positions, and with their combined political power were able to make serious headway in pursuing green infrastructure at a regional level. Of particular note is their motivation behind aggressive green infrastructure development: a multi-benefit approach to tackling community equity, urban blight, flooding, and community health.

9. Community capacity and support (e.g., nonprofits and volunteer groups rallied around green infrastructure)

Communities that succeed in widespread adoption of green infrastructure need community groups and leaders to rally around the projects from design through maintenance and stewardship. Nonprofits, volunteer groups (like Friends of Parks), and other local organizations can play an important role in ensuring the success of green infrastructure projects long-term.

What kinds of policies need to be in place for this to happen?

Some communities may not have existing organizational support for these efforts, so building capacity by starting volunteer groups may be necessary.

CASE STUDY: LANCASTER, PA

Lancaster puts on an annual [Lancaster Water Week](#) event, during which local groups and volunteers provide a week full of activities to educate the public about stormwater and green infrastructure.⁸⁵ This is not only a great opportunity to engage the existing volunteer community in green infrastructure projects, but also helps attract wider community attention to support these projects, and potentially expand the community volunteer pool.

CASE STUDY: YOUNGSTOWN, OH & PEORIA, IL

In communities where there is not already existing support for green infrastructure, engaging the community during the planning and development process can be an excellent way to build future capacity for volunteers. Youngstown and Peoria both worked with [Greenprint Partners](#), a green infrastructure consulting firm, to develop community-wide green infrastructure plans.⁸⁶ In both instances, community groups were engaged early on in the process, which helped lead to the success of the projects. In Peoria, Greenprint worked with a local nonprofit to train apprentices on green infrastructure management through an innovative stormwater farm model. In Youngstown, they worked with local organizations to create an educational campaign team to help educate the broader community about the benefits of green infrastructure.

10. Interagency agreements/interdepartmental alignment/cooperation around green infrastructure

Unlike traditional gray infrastructure, green infrastructure projects often require the cooperation of more than one agency/department to design, install, and maintain. This could include water departments, parks, public health, planning, sustainability, grounds crews, engineering, etc. all working together on a single feature. Having a shared vision and commitment to green infrastructure across agencies is essential to make community-wide implementation happen.

What kinds of policies need to be in place for this to happen?

While interagency cooperation serves an important function, having formalized intergovernmental agreements between departments is a stronger and more impactful means of establishing collaborative approaches regarding green infrastructure.

CASE STUDY: SALINAS, CA

Salinas recently completed an [Urban Greening Manual](#) with some ambitious goals for improving green space throughout the city, including the installation of several green infrastructure features.⁸⁷ Of particular importance in achieving the city's goals are partnerships (p. 194), which include not only internal city departments (parks, planning, etc.), but other public agencies (local school districts and the County Health Department), NGOs (hospitals, business districts, and community-based organizations), and private partners (private landowners and businesses).

CASE STUDY: MEMPHIS/SHELBY COUNTY, TN

In 2016, Shelby County (regional to Memphis) received a \$60 million grant from HUD to increase community resilience, primarily with regard to regional flooding. To monitor and manage the grant, the county created the [Shelby County Resilience Council](#), an interagency cooperative group including representatives from the Departments of Public Works, Sustainability, Housing, Engineering, and Preparedness.⁸⁸ This is an excellent example of formal interagency cooperation.



Residential building in park

Appendix: Methodology

This Policy Scan Summary document summarizes the information the consulting team found during the policy scan. All the policies mentioned are listed in that spreadsheet.

Because federal, state and local policies differ in significant ways, we completed the scan with three separate methodologies for each level of government. The methodologies were as follows:

Federal Policies

Federal policies were identified doing a Google search and a peer-reviewed literature review (using Web of Science) of “federal policy and green infrastructure”.

Policies identified in that search were supplemented with expert knowledge in the consulting team (Willamette Partnership, Sean Watts, Greenprint Partners, and the NRPA government affairs team). Finally, some of the more recent policies (passed in 2019) were identified in conversations with the National Association of Clean Water Agencies.

State Policies

To find state-level policies that affect green infrastructure development and implementation, we performed combined word searches in Google to find what information the state, community groups, and the media share online regarding green infrastructure. The first word in each search was the name of the state. The second word groupings were “green stormwater infrastructure policies”, “green infrastructure policies”, and “low impact development policies”. From these searches, we prioritized information produced by the state, while using academic articles, news articles, and community-based pages to help guide our search toward identifying state-level information.

Specifically, we looked for two separate things at the state level: 1) Does the state provide any sort of overview document about its existing policy approaches toward green infrastructure, and 2) What specific policies exist to promote (or in some cases, impede) the development of green infrastructure?

Few states explicitly list out their own exhaustive statewide policies regarding green infrastructure, but several universities, nonprofits, and other community groups have done policy analyses at the state and regional level. These were an invaluable resource as we worked to determine how each state approaches green infrastructure to meet its own unique challenges.

Local Policies

With more than 89,000 local governments across the United States, we developed a list of “target municipalities” to help set a boundary around our search. The selected municipalities were medium-sized cities with previously identified green infrastructure implementation in the community, and the list was compiled in cooperation with NRPA. The chosen municipalities were:

1. Gary, IN
2. Youngstown, OH
3. Lenexa, KS
4. Milwaukee, WI
5. Davenport, IA
6. Douglas County, NE
7. Peoria, IL
8. Lancaster, PA
9. Worcester, MA
10. Tacoma, WA
11. Memphis, TN
12. Tarpon Springs, FL
13. Tucson, AZ
14. Salinas, CA

To find local-level policies that affect green infrastructure development and implementation, we performed combined word searches in Google to find what information the local city, community groups, and the media share online regarding green infrastructure. The first word in each search was the name of the city. The second word groupings were “green stormwater infrastructure policies”, “green infrastructure policies”, “stormwater infrastructure policies”, “stormwater management manuals”, “low impact development policies”, and “flooding”. From these searches, we prioritized information produced by the city, while using academic articles, news articles, and community-based pages to help guide our search toward identifying state-level information.

A few other outstanding local policies from non-selected municipalities were included in our list because of their innovative nature, which could provide a useful blueprint for other communities looking to develop green infrastructure projects.

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