



Green Infrastructure, Nature-Based Infrastructure, & Climate Resilience

What Is Green Stormwater Infrastructure?

The SRF programs can fund projects that build the capacity of communities to withstand the impacts of climate change, including water-related crises such as floods, droughts, and snowstorms. To learn more about steps states can take to integrate water efficiency, green infrastructure, and flood reduction measures through SRF projects, check out NRDC's report [Using State Revolving Funds to Build Climate-Resilient Communities](#).

Climate resilient projects funded through SRFs can include adaptation and mitigation planning, [integrated water resource management plans](#), and vulnerability assessments to provide a clearer picture of what type of infrastructure designs are needed in a specific community. The Environmental Finance Center at the University of North Carolina at Chapel Hill offers [free direct technical assistance](#) to communities to get started on using integrated planning.

Aspects of green infrastructure that Clean Water SRF projects can incorporate include infiltration basins, constructed wetlands, permeable pavement, planting trees, installing green roofs and green streets, and protecting and restoring riparian zones and shorelines.



Green Stormwater Infrastructure (GSI): Refers to the practice of using nature-based water management techniques that protect, restore, or mimic the natural water cycle as a means of preventing flooding, improving ecosystem health, and offering many other community benefits, it looks pretty! Examples of green stormwater infrastructure include bioretention techniques such as rain gardens and bioswales (vegetated channel), which use amended soil and native plants to capture, retain, and slowly infiltrate rain drops where they fall.

[The EPA defines GSI](#) as “a wide array of practices at multiple scales that manage wet weather and that maintain and restore natural hydrology by infiltrating, evapotranspiring and harvesting and using stormwater. On a regional scale, green infrastructure is the preservation and restoration of natural landscape features, such as forests, floodplains and wetlands, coupled with policies such as infill and redevelopment that reduce overall imperviousness in a watershed. On the local scale green infrastructure consists of site- and neighborhood-specific practices, such as bioretention, trees, green roofs, permeable pavements and cisterns.”

Natural Infrastructure: Environmental and Energy Study Institute (EESI) defines [natural infrastructure](#) as, “Projects that use existing or rebuilt natural landscapes (i.e., forests, floodplains, and wetlands) to increase resilience to climate impacts, often resulting in environmental, economic, and social co-benefits.”

Resilience: Refers to a community's ability to adapt to changing conditions and recover from a disruptive event.

Green Project Reserve

In 2009 the American Recovery Act required all CWSRF programs to use a portion of federal capitalization grants for green infrastructure, water and energy efficient projects, and “[other environmentally innovative activities](#).” The [Green Project Reserve \(GPR\)](#) directs **at least 10%** of funds from each state’s CWSRF program to be used for planning, design, and/or building activities of eligible GPR projects. BIL general supplemental and emerging contaminants funding also designates 10% to the GPR. States have historically spent [widely varying amounts](#) of GPR funds (and CWSRF funds overall) on green stormwater infrastructure and natural infrastructure projects, and not all GPR projects are “green.”

GREEN PROJECT RESERVE

GPR funds can fund projects in four categories. GPR is required for the CWSRF, and states can decide if they want to promote similar projects through the DWSRF. For more details on these categories, see EPA’s [project eligibility guidance](#).



Green Infrastructure

Includes practices that maintain and restore natural hydrology, maintains floodplains/wetlands, reduces impervious surfaces.

Water Efficiency

Improving technologies and practices for water delivery that use less water, including conservation and reuse efforts. Can include water audit and conservation plans.

Energy Efficiency

Improving technologies and practices that reduce energy consumption and/or produce/use renewable energy. Projects that reduce energy consumption by 20% are categorically eligible.

Environmentally Innovative Activities

Includes new/innovative approaches to delivering services or sustainably managing water resources. Can include adaptation planning, GHG inventorying, and constructing LEED certified buildings.

CASE STUDY GREENVILLE, NORTH CAROLINA’S TOWN CREEK CULVERT PROJECT



An urban stormwater project in Greenville, NC, combined green and gray infrastructure components to create the largest stormwater project funded in the state by the CWSRF (as of 2020). The Environmental Finance Center at the University of North Carolina at Chapel Hill dug into lessons learned and highlighted the successes and challenges of the project in this [case study](#).

In response to chronic flooding problems in the growing city, the Greenville Stormwater Utility increased the city’s flooding resiliency by installing regenerative stormwater conveyance systems, wetlands, bioretention areas, and permeable pavers in addition to gray infrastructure. Regenerative stormwater conveyances consist of a series of riffles and pools that treat stormwater to remove nutrients prior to discharging.



A regenerative stormwater conveyance system in Greenville, NC. Photo courtesy of WK Dickson & Co., Inc.

The following examples demonstrate a handful of ways that communities can use SRF funding to increase climate resiliency, and were developed by the SRF State Advocates Forum.

- **Constructing resilience-related infrastructure improvements.** This can include backup generators, physical flood barriers, redundant equipment and infrastructure, telemetry systems for remote operation, and saltwater-resistant equipment. It also includes green infrastructure that uses natural mechanisms to help reduce flood risks, like rain gardens, permeable pavement, and rainwater harvesting. Natural infrastructure, such as wetlands and forests, can also improve a community's resilience against changing climate. The conservation or restoration of these natural areas can be financed by CWSRF programs.
- **Modifying or relocating facilities.** Water treatment plants can be moved out of the floodplain and existing wells can be deepened. Equipment can also be physically hardened against hazards by waterproofing electrical components, sealing structures to prevent flood water penetration, and adding wind-resistant features.
- **Assisting water systems with developing assessments and emergency response plans (ERPs).** The Safe Drinking Water Act requires community water systems serving more than 3,300 persons to conduct a risk and resilience assessment of their water systems. Following the completion of the assessment, water systems must develop or update their emergency response plans (ERPs). Eligible infrastructure improvements identified by the assessments may be funded through the loan fund.
- **Providing technical assistance and training for water utilities to bolster their resilience.** Assistance could be provided to plan and adapt to extreme weather, prepare for emergencies and disasters, set up Water/Wastewater Agency Response Networks (WARNs), and prepare for and participate in tabletop or field exercises.

Advocacy opportunities related to green infrastructure and climate resilience

In [EPA's guidance memo to states](#), the agency suggests that "States should consider how to incorporate climate resilience criteria into their prioritization of SRF funding under the BIL." Just as you should look at how your state establishes and ranks other project priorities in the IUP, you can also look at any parameters that are in place promoting investment in climate resilient projects and make suggestions if they are lacking.

These types of projects can be promoted through priority-setting systems and additional subsidization. Ranking criteria primarily focus on public health and water quality but can also address other concerns, such as infrastructure resiliency. States can encourage more projects that promote system resiliency through targeted ranking criteria (e.g., offering priority points) and funding incentives (e.g., reduced interest rates and/or waiving fees). Additional subsidies can be used to encourage resiliency projects. CWSRF projects in eligibility categories such as nonpoint source pollution control and land conservation can also help deliver more climate resiliency co-benefits.

States must give *at least* 10% to Green Project Reserve activities, but that doesn't mean they can't increase that percentage. In addition to the GPR, states can direct overall CWSRF funds to an array of green infrastructure, nonpoint source, and conservation projects. Recommending changes to project prioritization criteria can help direct more funds to climate resilient projects.



ADVOCACY EXAMPLES:

New Hampshire's [wastewater](#) ranking criteria and [stormwater](#) ranking criteria promote planning and infrastructure projects to make systems more resilient to climate change by using climate change vulnerability assessments and adaptation measures.

[California's 2020 CWSRF draft IUP comments](#) from WaterNow included recommendations to increase the amount of funding dedicated to the GPR to meet demand. WaterNow's three recommendations were:

- “Increase the GPR to 15% and prioritize qualifying localized infrastructure projects for funding available from this increase in the green reserve;
- Specifically list consumer incentive or direct installation programs designed to achieve improved conservation, efficiency, or onsite stormwater management as eligible for CWSRF funds; and
- Solicit distributed infrastructure projects and incentive programs, including green stormwater strategies, water use efficiency measures, onsite reuse, and watershed restoration for [State Fiscal Year] 2020–21.”

[Pennsylvania's 2022 CWSRF draft IUP comments](#) from Pennsylvania Environmental Council suggested that the 10% allocation should serve as a *minimum* target for green infrastructure projects.

[North Carolina Conservation Network](#) recommended in 2020 that “North Carolina **set a threshold requirement for moving or elevating all new or repaired infrastructure beyond or above the 500 year floodplain, and then award additional points to incentivize further steps towards resilience on the part of water utilities...**

As proposed, the priority rating systems for clean water and drinking water projects offer a modest number of points for a project that relocates out of a floodplain (5 [points]), fortifies or elevates within a floodplain (4), hardens against disruption by floods (4), or downsizes infrastructure after a floodplain buyout (4). The latter is new; we support its addition. However, the offer of modest points for

reducing flood risk misses the mark: that should be a threshold requirement for funding, not a minor incentive to improve a project design. Under Presidential EO 11988 and federal regulations, the level of flood resilience incentivized here—getting out of or above the mapped 100-year floodplain—is already a baseline requirement for facilities built with federal funding. Moreover, as noted by the Nature Conservancy paper discussed above, merely staying out of the mapped 100-year floodplain is not adequate to protect infrastructure from flooding...

From an equity perspective, funding non-resilience investments through the state revolving funds hurts low-wealth communities, because their residents are already more likely to be paying water rates over 2.5% of median household income, which the US EPA deems unaffordable. As of 2018, the UNC Center for Environmental Finance estimated that 57% of utilities in North Carolina charged more than 2.5% of median household income for 5,000 gallons/month of combined water and sewer service.¹¹ Every additional tranche of nonproductive debt carried by utilities makes this problem worse.” [Read the full IUP comments here.](#)



CLIMATE RESILIENCY RESOURCES

WaterNow Alliance's [Tap into Resilience Toolkit](#)

WaterNow Alliance presentation: [Meeting Water Challenges with Equitable Distributed Infrastructure](#)

EPA's [Creating Resilient Water Utilities](#) initiative