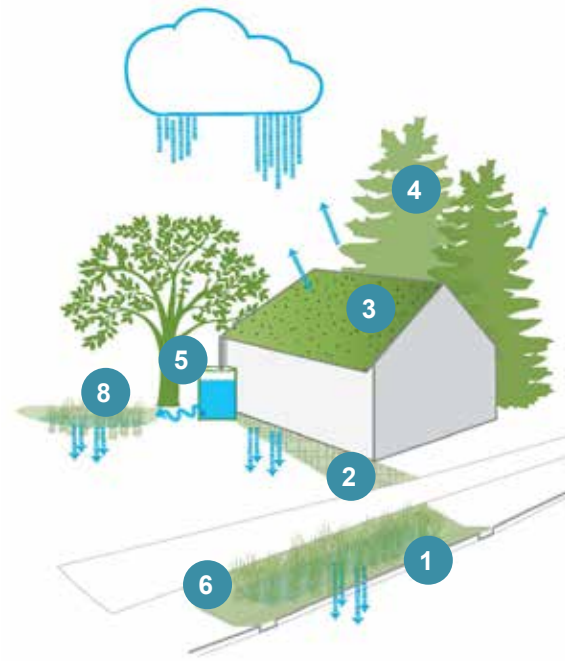


Green Stormwater Infrastructure (GSI)
Overview + Annual Accomplishments Report
2015



What is GSI?

Green Stormwater Infrastructure (GSI) is a set of distributed stormwater best management practices that use or mimic natural processes to slow, infiltrate, evapotranspire, and/or harvest and reuse runoff from hard surfaces, on or near the site where it is generated.



- 1 Roadside Bioretention
- 2 Pervious Concrete
- 3 Vegetated Roof
- 4 Street Trees
- 5 Stormwater Cisterns
- 6 Compost-Amended Soil
- 7 Biofiltration
- 8 Residential Rain garden

What problems does GSI address?

TOO MUCH RUNOFF VOLUME

...that causes flooding, sewer back-ups, & sewer overflows



In the parts of Seattle served by a combined sewer system (stormwater and wastewater are drained by one underground pipe), GSI is designed to reduce the volume of stormwater going to the system, particularly during the peak storm periods. Reducing this "peak flow" of stormwater volume helps prevent flooding, sewer back ups, and combined sewer overflows into water bodies like Puget Sound and Lake Washington. Seattle is under a consent decree to reduce the incidence of combined sewer overflows to one overflow per outfall per year.

TOO MUCH POLLUTION

...that damages our creeks, lakes, and Puget Sound



In other parts of Seattle, polluted stormwater runoff is discharged directly into our urban creeks and lakes and into the Duwamish River. In these areas, GSI is designed to filter and break down pollutants in the stormwater and to slow the water down, so it does not damage stream banks and channels. Healthy creeks, lakes, and rivers provide critical habitat for salmon and other aquatic life.

Why use GSI?

Water System Benefits	Community Livability Benefits
Improves Water Quality	Sequesters Carbon
Decreases Flow/Prevents Flooding	Mitigates Heat Island Effect
Preserves Gray Infrastructure Capacity	Beautifies Neighborhoods
Conserves Potable Water	Improves Pedestrian Safety + Experience
Recharges Groundwater	Supports Biodiversity/Improves Habitat
Saves Energy / Reduces Carbon	Offers Educational Opportunities
Improves Air Quality + Health	Increases Property Value

Where is GSI used?

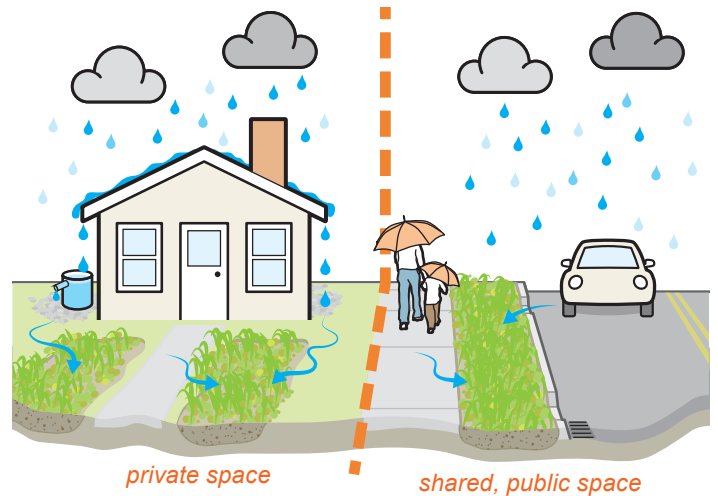
GSI is used across multiple scales and site contexts including residential, commercial, and in the public right-of-way. Seattle's Stormwater Code requires the use of GSI (or "on-site stormwater management") on new development projects. City and County departments and community partners are also implementing GSI retrofit projects on private property and in the public right-of-way to improve habitat and water quality in creeks, lakes and Puget Sound and to prevent combined sewer overflows.

Spotlight on West Seattle

When it rains, runoff from roofs and roads can overwhelm the capacity of the combined sewer system in West Seattle and other parts of the city. This can trigger overflows of polluted stormwater mixed with sewage into Puget Sound. GSI installations help prevent these overflows. King County Wastewater Treatment Division manages the combined system in this part of Seattle and is using a two-pronged GSI approach: building roadside bioretention to manage road runoff and offering rebates to manage runoff from roofs and driveways.

GSI systems are proven water quality best management practices and in some contexts (such as in creek watersheds), may be the only cost effective way to improve water quality outcomes.

GSI can also provide many urban livability co-benefits such as traffic calming, street trees, streetscape beautification, and in some areas, sidewalks.



Ninety-one roadside bioretention cells capture runoff from the road in the Sunrise Heights and Westwood neighborhoods



Rain gardens on private property -- like this one at the Fautleroy School -- capture runoff from the roofs, walkways and driveways and add an attractive landscape feature. RainWise rebates from King County Wastewater Treatment Division make these projects possible.

Program Accomplishments 2015

- I. POLICY + PROGRAM DEVELOPMENT
- II. RIGHT-OF-WAY RETROFITS + RAINWISE
- III. PARTNERSHIPS

I. Policy + Program Development

New GSI Website: www.700milliongallons.org

SPU and King County Wastewater Treatment Division continued joint program management in 2015 and integrated multiple web resources into a one-stop shop on the internet.



The site includes helpful information about what GSI is, what funding and other resources are available (including the popular RainWise program), and a dynamic storymap with information on the hundreds of GSI projects that have already been installed all around the city.

GSI Manuals: Options Analysis, Design, Maintenance

The Design and Operations & Maintenance volumes of the City of Seattle-King County joint GSI Manuals were updated in 2015, based on lessons learned from project design teams. The 'Construction' volume was also developed and completed in 2015. The GSI Manual serves as the "go-to" resource for designers and project managers developing or maintaining City or County-led GSI improvements in the public right-of-way.

Low Impact Development (LID) Integration

Seattle updated a broad set of development-related codes and standards with the intent of making LID the preferred and commonly-used approach to site development. The revisions to documents such as Land Use Code and the Right-of-Way Improvement Manual were designed to minimize impervious surfaces, native vegetation loss, and stormwater runoff in all types of development situations.

Natural Drainage Systems (NDS) Partnering Program in Creek Watersheds

In 2015, SPU developed the program framework and decision model for its \$35M capital program to use roadside bioretention to remove pollutants from targeted residential roadway runoff within Seattle creek watersheds. The program is part of SPU's *Plan to Protect Seattle's Waterways*. The NDS Partnering Program will deliver roadside GSI projects in collaboration with developers, sister agencies and community groups and will prioritize project locations that achieve multiple City and community goals. The program will be rolled out in 2016 in the Longfellow Creek watershed, in southwest Seattle.



Stormwater Planters Installed for Code Compliance

2015-2020 GSI Implementation Strategy

SPU worked closely with the City's Office of Sustainability and Environment to finalize Seattle's community-wide framework and 5-year plan for GSI implementation. The Strategy:

- Sets a 2012 baseline of roughly 100M gallons of stormwater managed annually with GSI in Seattle
- Sets an interim (2020) target of managing 400M gallons annually
- Summarizes early progress toward this target
- Lays out core strategies for achieving the interim target and the longer-term goal of managing 700M gallons annually with GSI by the year 2025
- Outlines a 2-year City of Seattle workplan (2015-2016)
- Calls for data tracking and biannual progress reports
- Calls for a follow-up 5-year Strategy in 2021

Stormwater Code Update

The use of on-site stormwater management approaches is required in Seattle's updated (2016) Stormwater Code. These changes were driven by Seattle's NPDES permit with WA Department of Ecology. Specific requirements vary by project type and are detailed in the updated Stormwater Manual:

www.seattle.gov/dpd/codesrules/codes/stormwater.

The updated Code also adds a new GSI (on-site) facility type, rain garden, and lowers the threshold for new and replaced impervious surfaces beyond which the GSI (on-site) requirements are triggered.

Data Tracking + Mapping

In 2015, Seattle launched an effort to map its GSI installations and track metrics such as GSI type and gallons of stormwater managed.



Open House -- Delridge Natural Drainage Project



II. Public Right-of-Way Retrofits

Ballard Natural Drainage for CSO Control

SPU completed design for this project in the summer of 2015. Construction will begin in the spring of 2016 and will be phased so that work adjacent to Loyal Heights Elementary School will begin after the school year ends. The project will infiltrate over 4M gallons of stormwater annually and will reduce the required control volume for the basin by 140,000 gallons.

Venema Natural Drainage for Creek Water Quality

The goal of this project is to improve water quality in Venema Creek and improve stormwater conveyance in the surrounding neighborhood. In 2015, the project team completed the majority of the construction. Plantings will occur in early 2016 for the bioretention facilities.

Delridge Natural Drainage & Neighborhood Greenway

The goal of this project is to reduce overflows of untreated sewage and polluted stormwater into Longfellow Creek and support SDOT efforts to provide people of all ages and abilities with safe and attractive places to walk and ride bicycles. In 2015, the design for the project was completed and construction began.

Barton CSO Control Project with Roadside Rain Gardens

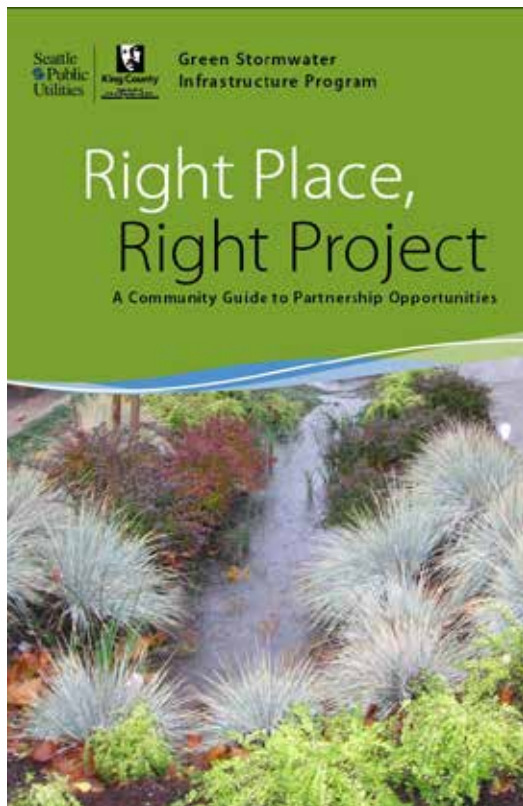
King County Wastewater Treatment Division (WTD) completed construction of this project in 2015, retrofitting 15 streets with 91 roadside bioretention cells. The estimated drainage area to the roadside bioretention facilities is 32 acres.

Swale on Yale (Capitol Hill Water Quality Project)

The first phase of the Swale on Yale project went on line in the fall of 2015, taking dirty stormwater runoff from Capitol Hill and cleansing it through two blocks of biofiltration swales before releasing it into Lake Union. Monitoring also began in the fall 2015, and the data collected will be used to assess overall performance and to inform the design for Phase II.



Barton Basin Natural Drainage for CSO Control



III. Partnerships

Natural Drainage Systems (NDS) Partnering Program

In 2015, SPU and SDOT began design work on a coordinated sidewalk-natural drainage system project in the Thornton Creek watershed of NE Seattle. The project is the first collaboration under SPU's NDS Partnering Program and will include seven blocks of new sidewalk and bioretention swales to manage polluted runoff from the adjacent roadway.

RainWise

In 2015, Seattleites voluntarily installed roughly 270 raingardens and stormwater cisterns as part of the RainWise rebate program. Since the program's inception in 2010, there have been 870 installations across Seattle, and the program has leveraged a cost share of approximately 12%. These installations manage over 13M gallons of stormwater annually!

Regional Standards for Permeable Pavement

SPU is participating in a coordinated regional effort to develop standardized specifications for pervious concrete and porous asphalt. This work will improve performance consistency across projects and jurisdictions will streamline implementation for the development community.

GSI Maintenance and Seattle Conservation Corps

SPU partners with Seattle Conservation Corps (SCC) to maintain its GSI in the public right-of way. SCC provides homeless adults opportunities to train and work in a structured program that provides job skills and carries out projects that directly benefit our neighborhoods and our environment.

Partnership Guide

Right Place, Right Project outlines the types of GSI funding and technical assistance partnerships available from SPU, King County WTD, and a variety of grant sources. The guide is available on the 700milliongallons.org website.



Workplan Highlights 2016

- I. POLICY + PROGRAM DEVELOPMENT
- II. PUBLIC RIGHT-OF-WAY RETROFITS
- III. PARTNERSHIPS

I. Policy + Program Development

GSI Strategy Progress Report

Seattle's GSI Implementation Strategy calls for biannual progress reports. The first update will cover 2013-2015 and be released in the summer of 2016. It will include updates on gallons managed with GSI built by SPU and WTD, other agencies, private developers, residents and business owners, and community organizations.

Potential RainWise Expansion

In 2016, the RainWise program will complete its evaluation for possible expansion of the program into Seattle's major creek watersheds. The program will also evaluate the business case for including green roofs and permeable pavement retrofits as eligible for rebates.

Voluntary Roadside Raingarden CAM

This client assistance memo will provide guidance to neighborhood groups and others interested in developing voluntary GSI retrofits in the public right-of-way.

Pre-vetted Concept Designs for Streets without Curbs

In 2016, SPU and SDOT will also develop standardized and pre-vetted concepts and details for roadside bioretention in areas of the city that lack curb and gutter. These areas have significant overlap with areas lacking sidewalks, so the effort will also facilitate the integration of GSI and sidewalks.

II. Public Right-of-Way Retrofits

Ballard Natural Drainage for CSO Control

Construction for this project will begin in the spring of 2016. There will be on-going opportunities for community input and engagement throughout construction.

Delridge Natural Drainage & Neighborhood Greenway

Construction of the natural drainage elements of this collaborative SPU-SDOT project will also begin in 2016.

Natural Drainage and Localized Flooding

In 2016, SPU will evaluate the potential for natural drainage systems to resolve localized flooding issues in creek watersheds. This is part of SPU's GSI Strategy commitment to evaluate GSI opportunities on all major capital improvement projects and programs. Feasible locations will be referred to the NDS Partnering Program.

King County WTD: South Park, Highland Park, Ravenna, Greenlake

Predesign is slated to begin in the Lower Duwamish Valley, in the South Park and Highland Park neighborhoods in 2016. Options analysis will also continue in the east Ravenna and south Green Lake areas. And options analysis for the Madison and Garfield areas will begin in 2016.

III. Partnerships

Natural Drainage Systems (NDS) Partnering

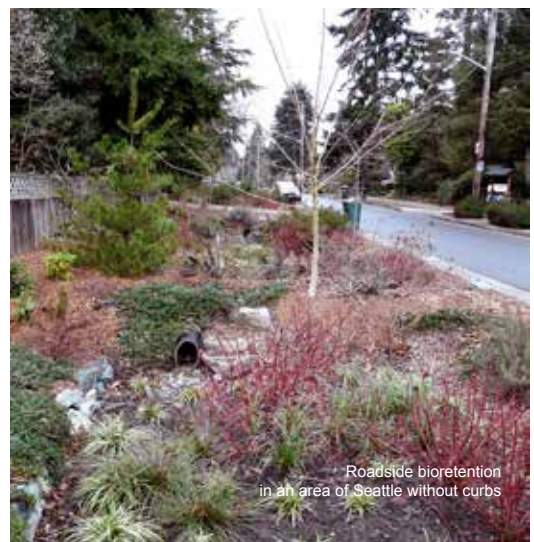
The NDS Partnering program will kickoff in the Longfellow Creek watershed in West Seattle in 2016. The program will identify 7-13 blocks in the watershed for natural drainage systems improvements. The program will prioritize partnerships with Seattle Department of Transportation Move Seattle projects.



RainWise installation at New Hope Mosque & Academy



Roadside bioretention installed for Stormwater Code Compliance



Roadside bioretention in an area of Seattle without curbs