

# Green Stormwater Infrastructure (GSI)

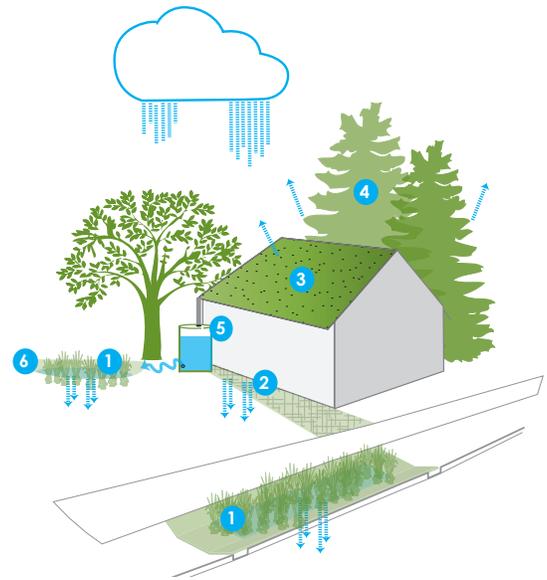
Program Overview and  
Annual Report 2013



## What is GSI?

Green stormwater infrastructure (GSI) mimics natural ecological function by cleaning, slowing, and/or reducing runoff close to where it falls as rain. GSI uses infiltration, evaporation, filtration or rainwater harvesting and reuse. When used in the public right-of-way (street and planting strip), GSI may be referred to as “natural drainage systems.”

GSI projects are designed to fit within a broader, integrated network of drainage systems that function at the block scale, neighborhood scale and city/regional scale. GSI elements may be paired with conventional “gray” infrastructure, like underground pipes, tanks, and pumps, and can be designed to support urban livability goals like pedestrian safety. GSI also helps ensure our urban drainage systems can adapt to climate changes, like more severe or more frequent storms.



## Where is GSI used?

Seattle’s Stormwater Code requires developers to use GSI “to the maximum extent feasible” to manage stormwater runoff. The Code defines right-of-way and parcel thresholds and also outlines which types of projects to use. Some GSI technologies, such as rain gardens, cannot be used in places with steep slopes, contaminated soil or soils that do not drain. In these places, underdrains, green roofs, tree planting/retention and rainwater harvesting and reuse may be used instead. City departments and community partners are also building GSI retrofit projects on private property and in the public right-of-way to improve habitat and water quality in our creeks, lakes, and Puget Sound.

- 1 bioretention (like rain gardens)
- 2 permeable/porous pavement
- 3 green roofs
- 4 urban canopy cover
- 5 rainwater harvesting (like cisterns)
- 6 soil building (like mulch + compost)
- 7 biofiltration

## What problems does GSI address?

### TOO MUCH RUNOFF VOLUME

...that causes flooding, sewer backups, & sewage overflows



In the parts of Seattle where stormwater and wastewater combine in one underground pipe, GSI is designed to reduce the volume of stormwater getting into the system, particularly during the peak of the storm. Reducing this “peak flow” of stormwater volume helps prevent flooding, sewer backups, and sewage overflows into waterways. Seattle is under a consent decree with the EPA to reduce the number of sewage overflows to no more than 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 discharges directly into our city creeks (like Thornton Creek, Pipers Creek and Longfellow Creek) and lakes (like Lake Union and Lake Washington). 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 waterways provide critical habitat for salmon and other aquatic life.

# Why use GSI?

GSI systems are proven drainage and water quality technologies designed to achieve the specific goals of a drainage area.

GSI also provides many community benefits. When budgets are tight and space in the urban environment is limited, multi-benefit infrastructure is a high-value investment.

● YES ● MAYBE

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

## Program History // 2000-2012

### 1 2000 // SEA Street

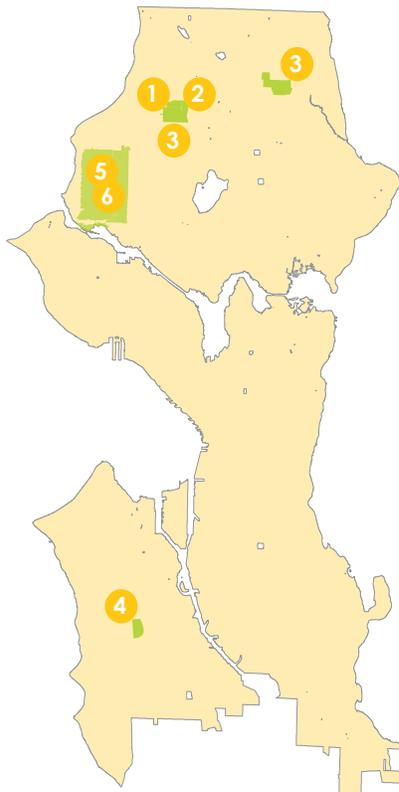
This "Street Edge Alternatives" project collected stormwater from across 2.3 acres and showed a 99 percent reduction in runoff volume. SEA Street became an international model for natural drainage projects and was the first GSI project implemented in the public right-of-way in the U.S.

### 2 2003 // Carkeek Cascade

The Cascade collects runoff from across 28 acres and reduced runoff volume by up to 74 percent. Post-construction monitoring showed that levels of water pollutants like lead, copper, and zinc were reduced by up to 90 percent.

### 3 2004 // Neighborhood Green Grids

The Broadview and Pinehurst Green Grids demonstrated how GSI could be applied at a large scale across a neighborhood. The Pinehurst Green Grid reduced annual runoff volume by 82 percent, managing 9.7 million gallons of stormwater annually, across 49 acres.



### 4 2005-2009 // Highpoint

Seattle built neighborhood-scale GSI into the 129-acre High Point Housing Redevelopment Project by partnering with SHA and WA Department of Ecology. A traditional piped street drainage system would have required a detention pond with five times the volume to achieve the same result.

### 5 2010 // RainWise Pilot

Seattle introduced the RainWise program to provide rebates to property owners who construct a rain garden or stormwater cistern on their property. On average, rebates cover 88 percent of project costs. The first phase was focused in Ballard to help reduce sewage overflows.

### 6 2010 // Ballard CSO Pilot

Seattle completed its first roadside GSI project designed to reduce sewage overflows in 2011. Information gathered through this pilot is informing every aspect of future roadside GSI work.



# Program Accomplishments 2013

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

## I. Policy + Program Development

### Pre-vetted Concept Designs for Right-of-Way

SPU, SDOT, DPD and King County planning, design, construction, and maintenance staff developed a set of standard GSI concept designs and details to use on residential street projects, resolving policy questions for future public projects.

### 2025 Implementation Target

In July 2013, City Council unanimously passed Resolution 31549, which defines GSI as a critical aspect of a sustainable drainage system and states it should be used to manage runoff whenever possible. It also sets a new implementation target to manage 700 million gallons of runoff annually with GSI by 2025 and directs departments to collaborate on an Implementation Strategy. Currently, GSI manages 100 million gallons annually.

### GSI Manuals: Options Analysis + Design

The first two volumes of a City of Seattle-King County joint GSI Manual were drafted in 2013. The manual will serve as the “go-to” resource for designers and project managers developing GSI for City of Seattle right-of-ways. The first two volumes cover topics related to determining project location and developing designs.

### Integrated Plan - Natural Drainage Systems (NDS) Partnering

A proposal to use GSI to remove pollutants from residential roadway runoff within Seattle creek watersheds is part of SPU’s Integrated Plan submittal to EPA. The option, called “NDS Partnering,” outlines an approach for working with community groups and agencies to prioritize project locations to achieve multiple City and community goals. The submittal included a desktop-GIS analysis to establish Citywide technical feasibility maps for GSI facilities on private property and in the public right-of-way. This approach will be further developed in 2014.

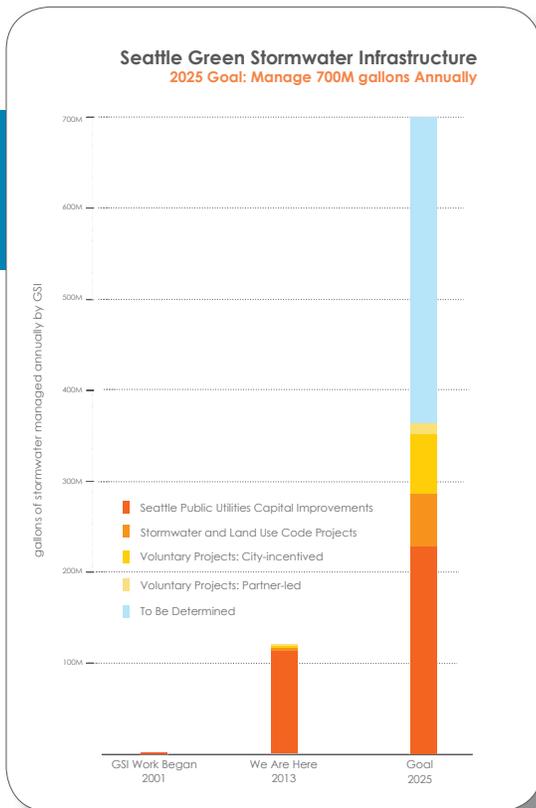
### Responsive Community Engagement

IN DELRIDGE, project outreach engaged a diverse community with the help of neighborhood-based organizations:

- Multi-lingual “Project Ambassadors” went door-to-door to introduce the project and answer questions
- A survey, additional door-to-door outreach, and an open house gathered residents’ input on location
- A “Walk and Talk” event and an additional open house were held to get input on proposed locations and early designs.

IN BALLARD, project outreach responded to concerns about the 2010 Ballard Pilot Project:

- A survey was sent to all residents in the neighborhood to collect local knowledge about drainage issues and to understand community questions
- Two open houses were held to keep the community engaged in the process to select project blocks
- A community liaison reached out to neighbors door-to-door and a “Walk and Talk” event gathered residents’ input on proposed locations and early designs.



July 2013 Open House -- Delridge Natural Drainage Project



## II. Public Right-of-Way Retrofits

### Swale on Yale (Capitol Hill Water Quality Project)

This project will improve water quality in Lake Union by removing about 65 percent of total suspended solids (TSS). In 2013, the project completed construction of GSI systems on two blocks: Yale Ave. N. and Pontious Ave. N. The two swales will manage about 36 million gallons of stormwater annually.

### Ballard Natural Drainage for CSO Control

This project will help to reduce sewage overflows into Salmon Bay in Ballard. In 2013, the project team identified 22 blocks for roadside raingardens. This phase involved geotechnical evaluation to find soils that drain well and significant outreach and engagement with residents in the project area.

### Venema Natural Drainage for Creek Water Quality

This project will improve water quality in Venema Creek and improve stormwater conveyance in the surrounding neighborhood. In 2013, the project team determined specific locations and reached 60 percent design.

### Delridge Natural Drainage & Neighborhood Greenway

This project will reduce sewage overflows into Longfellow Creek and support SDOT efforts to provide people of all ages and abilities with safe and inviting places to walk and ride bicycles. In 2013, the joint SPU-SDOT project team identified the route for a Neighborhood Greenway on 21st and 17th Ave. SW and identified blocks for natural drainage systems along 17th Ave. SW.

### King County // Barton Natural Drainage for CSO Control

This King County Wastewater Treatment Division (WTD) project to construct natural drainage systems along 15 blocks in the Westwood/Sunrise Heights neighborhood will reduce sewage overflows into Puget Sound. The project completed design in 2013.



Swale on Yale Under Construction



Areas eligible for RainWise rebates (2013)

## III. Partnerships

### City-County Joint Management of GSI Program

Seattle and King County WTD entered into a joint program management contract to streamline delivery of GSI projects in Seattle's right-of-way.

### RainWise Partnerships

In 2013, Seattle and King County signed an agreement to share delivery of the RainWise program, which offers rebates to property owners who install a rain garden or stormwater cistern. Together, the City and County now offer RainWise to more than 40,000 eligible households in Seattle. SPU also signed an agreement with Seattle Public Schools to foster more participation on school properties.

In 2013, 135 new rain gardens and cisterns were installed via RainWise. Since the program began in 2010, there have been over 300 installations, and the program has leveraged a cost share of roughly 12 percent. Collectively, the installations manage nearly 5 million gallons of stormwater annually.

### Development Incentives

SPU provided technical assistance to the Seattle 2030 District as they developed a draft stormwater management target for members. SPU also collaborated with DPD to develop draft incentives for "beyond-code" GSI achievements in different new development and redevelopment contexts.



Residential RainWise Installations

# Program Workplan 2014-2015

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

## I. Policy + Program Development

### 2025 GSI Implementation Strategy

The 2025 GSI Implementation Strategy initiated by Resolution 31549 is slated for delivery in June 2014. Strategy implementation will continue throughout 2014-2015.

### Pre-vetted Concept Designs for Private Development

Building on the 2013 interdepartmental effort, GSI concepts and details developed for public projects will be considered for pre-approval for private development projects and inclusion in the Right-of-Way Improvement Manual.

### RainWise

In 2014, RainWise will expand to include green roofs and permeable pavement. To improve access and equity, the program will evaluate options for citywide eligibility. Currently only property owners in sewage overflow areas are eligible. Options to eliminate up-front homeowner costs are being explored to reduce the barriers to participation in lower income neighborhoods. The program will also pilot methods for more effective outreach to historically underserved communities.

### Code Updates

A two-year city-wide process to review and revise land-use codes to 1) minimize impervious surfaces 2) reduce stormwater runoff and 3) preserve native vegetation was initiated in 2013 and will be completed by June 2015.

The Stormwater Code updates for on-site stormwater management will build on the current "GSI to the maximum extent feasible" requirement and will align Seattle regulations with State requirements. This update will also be adopted in 2015.

### Third Party Inspections

In 2014, third-party inspection requirements for GSI installations in the public right-of-way will begin. This will ensure minimum standards of quality and will support cost-effective operations and maintenance of the facility over time.

### GSI Manuals

Construction and Operations & Maintenance volumes will be written in 2014.

## II. Public Right-of-Way Projects

### Ballard, Delridge & Venema Natural Drainage Projects

The Ballard and Delridge projects will be designed during 2014 and are slated for construction in 2015. There will be on-going opportunities for community input and engagement throughout the design process. The Venema Natural Drainage Project will begin construction in 2014.

### King County Natural Drainage Projects

Construction of the Barton Project begins in early 2014 will continue through 2015. The County will also complete planning and begin design for South Park and Highland Park GSI projects in 2014 and will begin early scoping for projects in the University Basin (Greenlake area) and Montlake Basin (Madison Park/Garfield area).

## III. Partnerships

### Natural Drainage Systems (NDS) Partnering

In 2014, the GSI Program will develop a system to accept requests for GSI projects on residential streets, in areas where it is technically possible. The approach will focus on community partnerships to achieve critical water quality goals as well as community goals such as improved pedestrian mobility and tree canopy recovery.

### Voluntary Raingarden Client Assistance Memo

The Voluntary Roadside Rain Garden CAM (client assistance memo) was revised and finalized to support community groups' efforts to build neighborhood-driven GSI projects in the public right-of-way.

