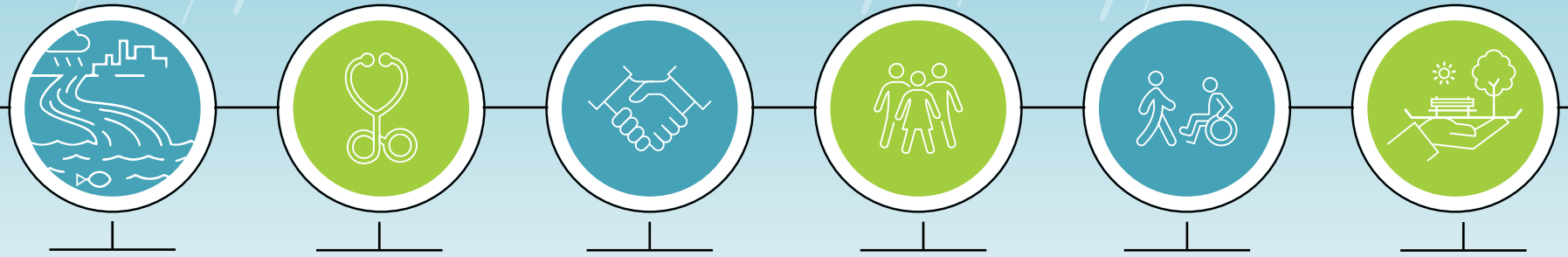
King County

2022

GSI PROGRESS REPORT



STORMWATER MANAGEMENT

PUBLIC HEALTH OUTCOMES

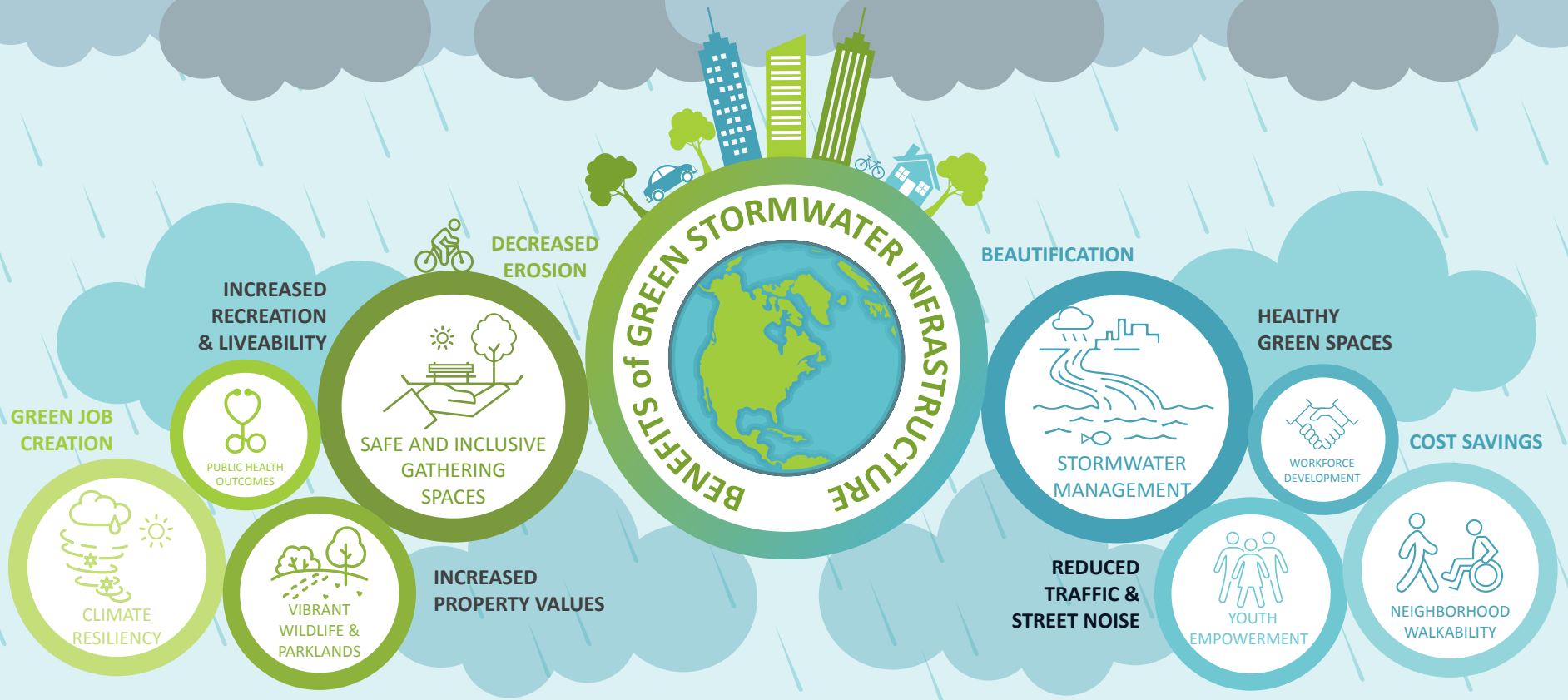
WORKFORCE DEVELOPMENT

YOUTH EMPOWERMENT

NEIGHBORHOOD WALKABILITY

SAFE AND INCLUSIVE GATHERING SPACES

BENEFITS of GREEN STORMWATER INFRASTRUCTURE



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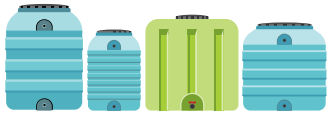


GSI by the NUMBERS

Number of grants awarded: **53**

Amount of money awarded: **$91,000**

64% of capital awarded to limited income or nonprofit applicants

Square footage of contributing area across all projects:

over 82,000 ft²

Stormwater managed annually:

1,800,000 gallons/year

Installations funded by project type:

CISTERNS: **50**

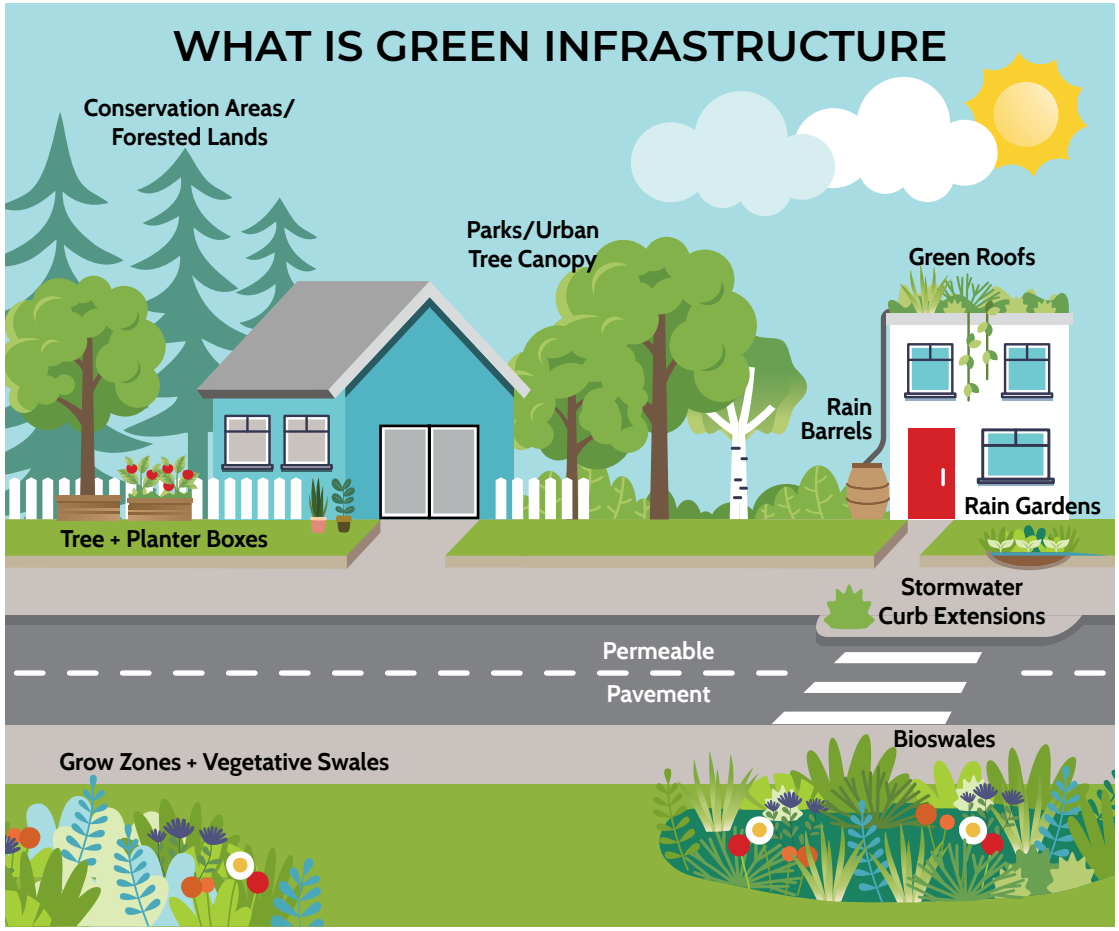
RAIN GARDENS: **9**

DEPAVE: **3**

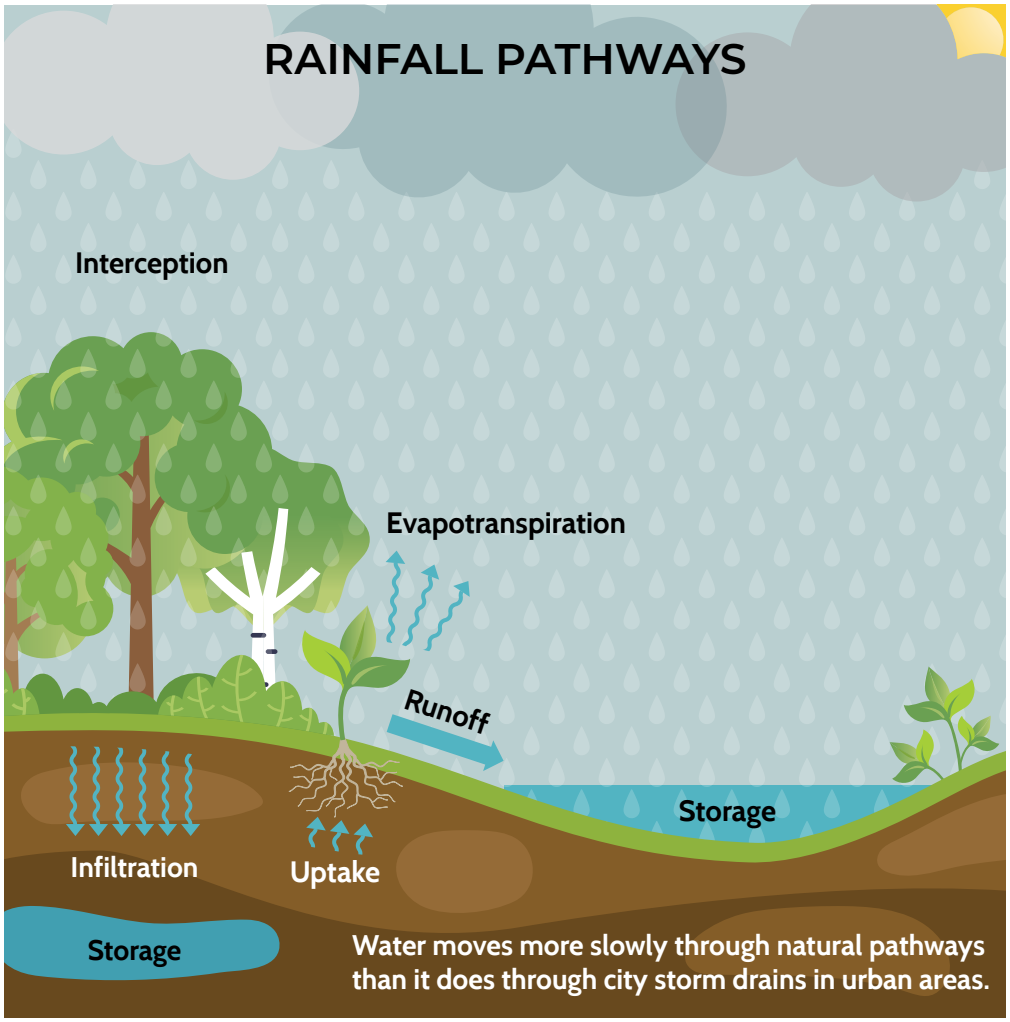
INTRODUCTION

As the population of King County and the Puget Sound region continues to grow, we are losing the plants, soils, and open areas that naturally soak up and filter the rain. The roofs, roadways, and other hard surfaces of our dense, urban environment generate far more polluted runoff than our aging drainage, stormwater, and sewer systems can handle. In fact, runoff to lakes, rivers, and creeks is now one of the leading sources of pollution in the Puget Sound region. That's why we're implementing green stormwater infrastructure solutions to manage our ample rainfall naturally in urban and rural settings throughout King County.

Plants, trees, soils, permeable surfaces, and engineering inspired by natural drainage processes work to capture, slow down, and treat rain where it falls so it doesn't become polluted runoff. Bringing nature back into the built environment helps urban, suburban, and rural areas manage stormwater more like forests and pasture. For the last decade, King County and several of its partners have developed more of these natural solutions to manage stormwater, which are collectively known as "green stormwater infrastructure" (GSI).



Learn more about GSI Tools & Resources at
700milliongallons.org/tools/



GSI helps keep our water clean through a combination of plants, soil, trees, and pipes. GSI is a nature-based engineering approach that slows and treats rain as close to where it falls as possible. That means cleaner stormwater entering our waterways and less of it entering our stormwater and sewer system, which reduces the likelihood of combined sewer overflows (CSOs), flooding, and pollutant discharges.

GSI also fosters healthier communities and supports King County's growing focus on leveraging investments to help support community priorities. GSI can contribute to better public health outcomes, boost workforce development, empower youth, enhance neighborhood walkability, and promote the creation of safe and inclusive gathering spaces. GSI is a key strategy to meet the goals of King County's Municipal Stormwater National Pollutant Discharge Elimination System permit, Clean Water Healthy Habitat Initiative, Strategic Climate Action Plan, 30-Year Forest Plan, and Equity and Social Justice Initiative Plan.

This progress report captures several voluntary and incentive-based GSI programs across King County's Wastewater Treatment Division and Water and Land Resources Division. These programs address CSO reductions, water quality benefits, retrofitting older developments, workforce development, and community engagement. This biennial report highlights several case studies within each program and provides interested property owners and community members with a glimpse of what to expect if they are interested in participating in GSI programs in the future.

King County's Solids Waste Division is also implementing several notable GSI projects. Learn more about Green Tools for green building.

GREEN STORMWATER INFRASTRUCTURE MINI GRANTS

About the Program

Green Stormwater Infrastructure (GSI) Mini Grants provide incentives for private property owners to be part of the stormwater pollution solution. Developed by Stewardship Partners and funded by WTD, the program provides grants of up to $1,500 for landowners within the WTD service area that are not eligible for other incentive programs and up to $4,500 to income-limited landowners and non-profit organizations. Grants may be used for a variety of green features including rain gardens, de-paving projects, cisterns, green roofs, and Grattix Boxes, which are essentially a rain garden in a box.

A total of 107 GSI Mini Grants have been distributed to homeowners, funding projects across WTD's service area since the program's creation in 2015. In 2022 alone, this program has managed 456,621 gallons of stormwater, helping to keep Puget Sound water cleaner and healthier for our community!

Find out more at www.12000raingardens.org/gsi-mini-grants

Before and after photos for the Ha Nguyen cistern installation project.

Detailed Project Description

Mini Grants help private property owners afford improvements to manage rain on-site. GSI helps stop polluted stormwater runoff from going into our local water bodies like the Duwamish River and Puget Sound. As a program partner, ECOSS's stormwater solutions staff provides multicultural outreach to help connect communities to this funding resource.

Numerous beneficial GSI projects were funded by GSI Mini Grants in 2022 using WTD funding. One example was an 858-square-foot de-paving project. The GSI Mini Grants allowed the homeowner to transform a permeable surface where an old garage had been removed into a beautiful yard and garden space.

With a different homeowner, ECOSS assisted homeowner Ha Nguyen with the installation of two 205-gallon cisterns at his home to capture rainfall from his 1,419-square-foot roof. Ha Nguyen was excited to reduce stress on the county's sewer system while also using the collected rainwater to care for his garden. He also appreciated receiving assistance from an ECOSS team member in Vietnamese, his primary language: "It was very convenient since we share the same language, which makes it easier. It was easier for us to converse back and forth. Kevin helped my family do the paperwork. He was very dedicated to helping us navigate."

GSI Mini Grant Stats for 2022

18 Mini Grants awarded

5 projects pre-approved for funding , **4** of these to support income-limited and/or multicultural homeowners

$26,975 awarded in 2022

456,621 gallons of stormwater managed by 2022 projects

I have used the cisterns for about 2 years already. At home, our family uses the cisterns to water plants and flowers. In the backyard, we grow herbs. It's different each year but recently, for example, we grew corn, green beans, and various types of mint. My family really loves flowers. And we love growing summer plants, so that's why I really need the cistern. It helps me to have more to water the plants better. The plants in the front are all flowers which consume a lot of water, so cisterns are great for that. I save a lot of money on water bills, too.

- Ha Nguyen

The Latinx families I have helped are deeply grateful and excited that the County is providing the attention and handholding required to bring resources to our community. The efforts will be multiplied as community members talk to their friends and families. For example, one Latinx homeowner in South Park has referred two neighbors and her church leadership to the program. This effort speaks to the commitment of King County to serve BIPOC communities and provide them the tools and resources to protect their environment and their health.

- ECOSS staff member

RAINSCAPES

About the Program

The RainScapes program is revisiting older, developed areas in unincorporated King County, adding updated stormwater controls and green stormwater features that can offer flood and pollution prevention and environmental and community benefits.

The RainScapes program provides property owners with tools and resources to restore their own land, bringing back some of the natural processes lost; address flooding issues from development; and enhance the remaining open space.

RainScapes program staff welcome project suggestions from the community. If you think your property would benefit from a green infrastructure retrofit, contact: GreenStormwaterInfrastructure@kingcounty.gov. For more information, go to www.kingcounty.gov/rainscapes

Green Start Crew installing a residential cistern.

CASE STUDY 1: WONG CISTERN

Project Description

The King County Green Start program provides job training to people currently experiencing homelessness as a gateway to a career in green jobs. During the summer of 2022, the Green Start crew installed two 480-gallon above ground cisterns at a residential property in White Center.

> *It was great to work with you and your crew. Everyone was really easy to work with, and putting together the maintenance video for my cisterns was very helpful! We love having these in our yard.*

Wong Cistern Stats for 2022

4 members of DIRT Corps' Green Start crew performed the installation

Two 480-gallon cisterns were installed to capture the roof water from the home on the property

875 square feet of roof area served

3,500 gallons of stormwater managed annually

- The property owner uses the cistern water for garden and yard watering, saving money on potable water
- The Green Start crew learned how to properly install and maintain cisterns and developed a maintenance video for the property owners

Detailed Project Description

The property owner heard about RainScapes during a presentation by program staff to the North Highline Unincorporated Area Council. The Wong family was interested in doing more on their property to make it more sustainable and self-sufficient and to add beautification elements to the community. They were excited about being the first White Center property owners to be added to the RainScapes list and were hopeful they could begin a trend of GSI installations throughout the White Center area. They were open to all forms of GSI that would work on their property, and it was ultimately determined that cisterns would be the best option given the slopes on their property and limited space.

Four members of the Green Start crew, led by DIRT Corps, installed two 480-gallon cisterns to capture stormwater form the home's roof. This installation provided real life training to people experiencing homelessness so that they could increase their skillsets to break into the green jobs market more easily. The Green Start crew also developed a maintenance video for the Wong family that RainScapes is using to help all property owners better understand cistern maintenance.

CASE STUDY 2: FAIRWOOD CHURCH RAIN GARDEN

BEFORE: Existing planter island in the parking lot at the front of the Fairwood Church property.

AFTER: Planter island converted into a rain garden.

Project Description

RainScapes retrofitted an existing parking lot planter island into a rain garden that captures about 20,000 square feet of roof water from two church buildings. The project was completed in February 2021 and was the first pilot project of the RainScapes program. GLY and DIRT Corps were hired as the contractors to complete the work, and two trees, hundreds of pollinator-friendly shrubs, and native plants were added to the rain garden.

Fairwood Church Rain Garden Stats for 2022

17,420 square feet of roof served and redirected to a new parking lot rain garden

125,000 gallons of roof water. The rain garden captures and filters this yearly average and slowly releasing it to the soil and groundwater

2 trees added, as well as hundreds of pollinator-friendly shrubs, groundcovers, and native plants

- Beautifies and updates the church's mature front planting area
- Protects Madsen Creek, the Cedar River, and Lake Washington from polluted runoff and erosion from storm events
- Reduces the property owner's King County commercial surface water management fees

> *The scope, scale, and out-of-pocket costs of this project would have been beyond the capabilities of church staff or volunteers, and so the leadership team appreciated King County taking the lead on the design and construction process with their hired contractor.*
>
> *The RainScapes program provides property owners with the tools and resources to restore their own land, bringing back some of the natural processes lost during development, and enhance the remaining open space.*
>
> *King County engineering staff went to great lengths to explore the as-builts of the current building and property and this diligence helped make the final design really work with the landscape.*

Detailed Project Description

Located in the Cedar River watershed in Renton, the Fairwood Community United Methodist Church struggled with seasonal flooding in their parking lot. The retrofit project is engineered and designed to soak up rainwater runoff from approximately 20,000 square feet of roof area, prevent parking lot flooding, and reduce flooding and pollution to Madsen Creek. GSI projects mimic natural systems and allow rain to soak into the ground. GSI also offers green space to the community, habitat for small critters, shade, beautification, and so much more!

Church volunteers were using natural yard care practices such as vinegar spot spraying for weeds and saving water in the summer by letting the lawn go golden. The leadership council discovered the RainScapes program when they were seeking a solution to reroute water and fix the parking lot drain system. King County RainScapes staff worked with church volunteers and learned that water from the roof could be diverted into a rain garden. King County engineering staff reviewed the building and property as-builts and helped create a final design that works with the landscape to benefit the environment and the church.

The rain garden collects rainfall from the rerouted roof downspouts, with an overflow feature to ensure that the building will not flood during heavy storms. The engineering uses natural systems such as plants, soils, and sand that filter out heavy metals, oil, and other car fluids, leaving water cleaner as it enters Madsen Creek. The DIRT Corps program includes teaching the church community ongoing maintenance to prevent weeds, clear inlets, and prune the landscape plantings.

This project continued the church's dedication to natural yard care and low maintenance plants and is part of their commitment to stewardship of the earth and restoring natural processes. The scope, scale, and out-of-pocket costs of this project would have been beyond the capabilities of church staff or volunteers, and the leadership team appreciated King County taking the lead on the design and construction process with their hired contractor.

CASE STUDY 3: WHITE CENTER RAIN GARDEN WITH SNOHOMISH CONSERVATION DISTRICT

Rain garden installed on White Center property.

Rain garden installed on White Center property.

Project Description

The Snohomish Conservation District installed several rain gardens on private property in White Center as part of a grant with RainScapes. Two rain gardens were installed on one property to capture roof water from the home, diverting it to the two rain gardens that were 110- and 170-square-feet in size.

White Center Rain Garden Stats for 2022

2 rain gardens were installed on the property

- Capturing roof water from the home

110 - and **170** -square-feet in size

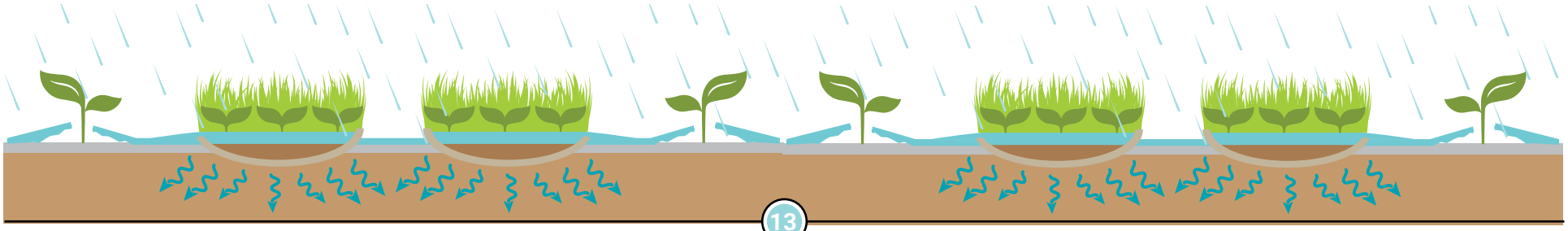
- Native plants were used in both rain gardens

Detailed Project Description

King County's RainScapes program partnered with the Snohomish Conservation District (SCD) on a National Estuary Program (NEP) grant. The grant was intended to build rain gardens on private residential properties in White Center. The goal was for RainScapes to learn from SCD's rain garden program, with a goal to implement lessons learned into the RainScapes program. White Center was chosen as a focus area because RainScapes completed a community-led GSI strategy in the White Center area and had several residential property owners interested in rain gardens as part of the strategy.

Eight residential properties received rain gardens as part of the grant program. All rain gardens were designed and installed by SCD, with RainScapes engineers approving the design and working alongside SCD to learn more about their rain garden program and processes.

This property received two rain gardens to infiltrate as much of the home's roof water as possible. The property owner was interested in rain gardens to ensure their home's roof water did not cause flooding on the property or neighboring properties and to be a better environmental steward.



CASE STUDY 4: SHARP CISTERNS

Cistern number one installed on the side of the garage/shop.

Cistern number two installed behind the garage/shop.

Project Description

RainScapes contractor, DIRT Corps, installed cisterns to capture the roof water of the garage/shop building. The gutter system was modified to capture the roof water more effectively. The cistern water is used for watering gardens and trees on the property, which lies within a wildfire-prone area.

Sharp Cisterns Stats for 2022

2 cisterns installed to a residential property

2,860 square feet of roof served

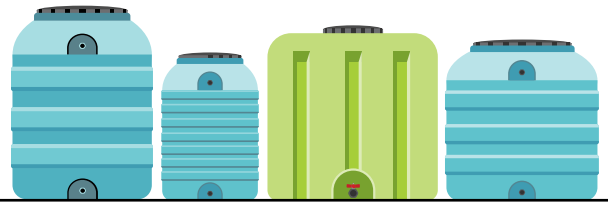
- Property owner also has solar panels and composting, and is looking to be as self-sustaining as possible
- Cistern water is being used for wildfire safety and suppression on the property
- Cistern water is saving the property owner money on potable water for fire suppression and gardening needs

Detailed Project Description

This was the first RainScapes cistern installation pilot project. DIRT Corps installed two 1,550-gallon cisterns to capture the roof water from the garage/shop. The property owners were looking to further their sustainability efforts and address wildfire safety concerns for their property. They have already used the cistern water to spray down old trees during wildfire season and have been excited about the money it has saved them.

> *Cisterns are doing great. We're getting ready to hook up two more in parallel with the originals. That'll give us approximately 6000 max gallons of water storage! I'm pretty excited about that. And thank you again for making all of this happen!*
>
> *– Tristan Sharp*

> *Overall, we are loving the whole system! You and your team did such a great job!*
>
> *– Tristan Sharp*



CASE STUDY 5, WHITE CENTER TREE GIVEAWAY

Property owner after receiving two free trees.

Property owners after receiving two free trees.

Project Description

RainScapes provided 50 free trees and watering bags to private residential homeowners as part of a tree giveaway pilot program under the King County 30-Year Forest Plan, with a goal to increase canopy in low canopy areas of unincorporated King County. Twenty trees were given away to 10 property owners in a focused area of White Center. The trees will assist with adding canopy to the area, which has a high level of impervious surface, and will help slow and absorb rainwater, reducing flooding and pollutants from entering local waterways.

White Center Tree Giveaway Stats for 2022

20 trees planted on 10 residential properties

30 remaining trees planted in local parks

650 flyers mailed to White Center residents

- Free trees provided by Seattle City Light as a partnership for the pilot
- Tree species offered: Galaxy Magnolia, Vine Maple, Mountain Hemlock, Autumn Brilliance

Detailed Project Description

Trees are another important GSI feature that can improve water quality and decrease flooding. To expand tree planting on private property to achieve these benefits, RainScapes is piloting a tree giveaway program in partnership with Seattle City Light. The program began in February 2022, with plans for delivery and planting of trees in the fall of 2022. The pilot program will involve analysis of target properties using American Forests' Tree Equity map to identify low canopy census blocks; developing and sending out a mailer to targeted properties; and delivery of trees in coordination with DIRT Corps. In addition to the mailer, relationships have been developed with organizations in White Center to aid in getting the word out about the tree giveaway program.

Project Goals and Outcomes

- Evaluate the feasibility of a tree giveaway program as a tool to improve water quality
  - Outcome: Feasibility assessment and guidance for developing a longer-term tree giveaway program
- Create an additional landscape option for landowners interested in participating in GSI
  - Outcome: Expanded tree canopy and associated water quality benefits

Sites/Locations

The focus is on communities in unincorporated King County with low canopy and high levels of impervious surface.

- Seattle City Light: White Center and Skyway are part of their service area, but they have less of a presence there, leading to the partnership with King County. They need to plant replacement trees for ones they cut down and can provide trees as part of that mitigation.
- White Center: Tree canopy cover is among the lowest in the county at 21%. It is highly urban with flooding and water quality issues, providing an opportunity to implement GSI projects with multiple benefits for the community. According to community outreach in White Center, trees and native plants ranked highly among possible GSI projects; homeowners also supported potential GSI projects on their properties, with tree planting seen as one of the top several project types.

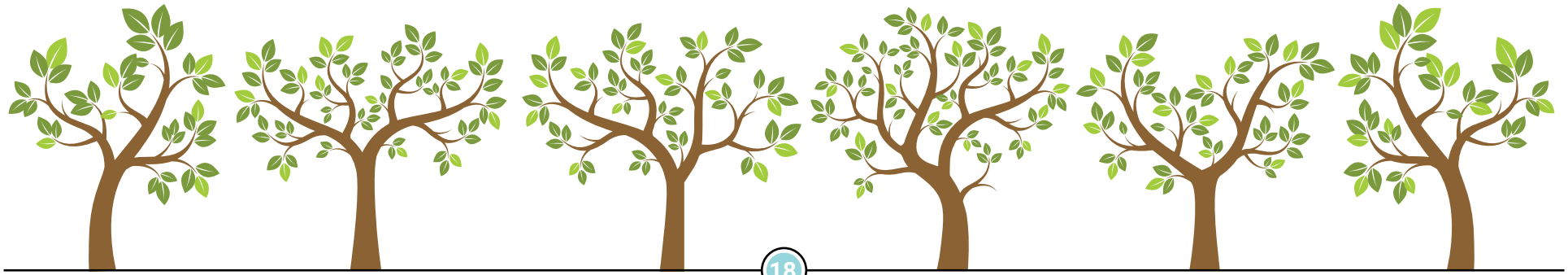
King County partnered with Seattle City Light (SCL) on the tree giveaway. SCL provided 50 trees and watering bags to give away to private property owners and were interested in distributing trees in service areas where tree removal mitigation is a priority. White Center fit the criteria for SCL goals. King County chose an area in White Center with high imperviousness and low canopy cover.

We partnered with SCL on the flyer development and included the list of species people could choose from, which includes Galaxy Magnolia, Vine Maple, Mountain Hemlock, and Autumn Brilliance Serviceberry. Six hundred and fifty flyers were mailed to addresses within the area between 4th Avenue SW and Myers Way S and north of SW 108.

Fifteen property owners responded with interest. We ended up giving away 20 trees to 10 property owners (two trees per property). DIRT Corps is the existing RainScapes GSI contractor and provided tree delivery to each of the private property owners participating in the giveaway. King County provided a liability waiver for each property owner to sign as well as educational materials on where to place your tree, how to safely dig for your tree planting, and how to do utility locates. Property owners planted their trees on their own with no assistance from King County or SCL.

The remaining 30 trees were planted in City of Seattle parks as close to White Center as possible.

It is possible to give away the full 50 trees if flyer outreach is expanded to a larger footprint as well as connecting with King County's Department of Local Services on other outreach opportunities. Both options were available in this pilot but there was hesitation to expand outreach too far if we received more interest than we could accommodate.



RAINWISE

About the Program

The RainWise program, a partnership between Seattle Public Utilities and King County Wastewater Treatment Division (WTD), is nationally recognized as a leader in providing incentives for private property owners to install small-scale GSI (rain gardens and cisterns) to help manage the rain that falls on their roofs. Private properties are an important part of the solution to pollution, especially as the region experiences heavier rains due to climate change.

RainWise rebates are offered to private properties within eligible Seattle neighborhoods that are part of the combined sewer system. In these neighborhoods, stormwater and wastewater drain into the same pipes on its way to the treatment plant. During large storms, stormwater can overwhelm our system, causing overflows into our local bodies of water. By capturing the rain that falls on roofs and rerouting it into rain gardens or cisterns, RainWise installations are helping to reduce the number of these overflow events. Additionally, these installations can add attractive landscaping, provide water for summer irrigation, and may help prevent or reduce flooding.

To find out if you qualify for rebates, see examples of rain gardens and cisterns, and learn more about how to get RainWise, check out 700milliongallons.org/rainwise.

To learn more about how WTD is working to protect our waters and using multiple strategies to manage combined sewer overflows, visit https://kingcounty.gov/services/environment/wastewater/cso/about.aspx

The RainWise program gives rebates for rain gardens and cisterns that capture the rain that falls on the roofs of homes and other buildings. Managing rainwater on-site keeps it from becoming polluted runoff or causing sewer overflows–a very good thing!

Several West Seattle neighborhoods are eligible for RainWise again! With heavier rains, more RainWise installations on private properties will help stop overflows near the ferry terminal.

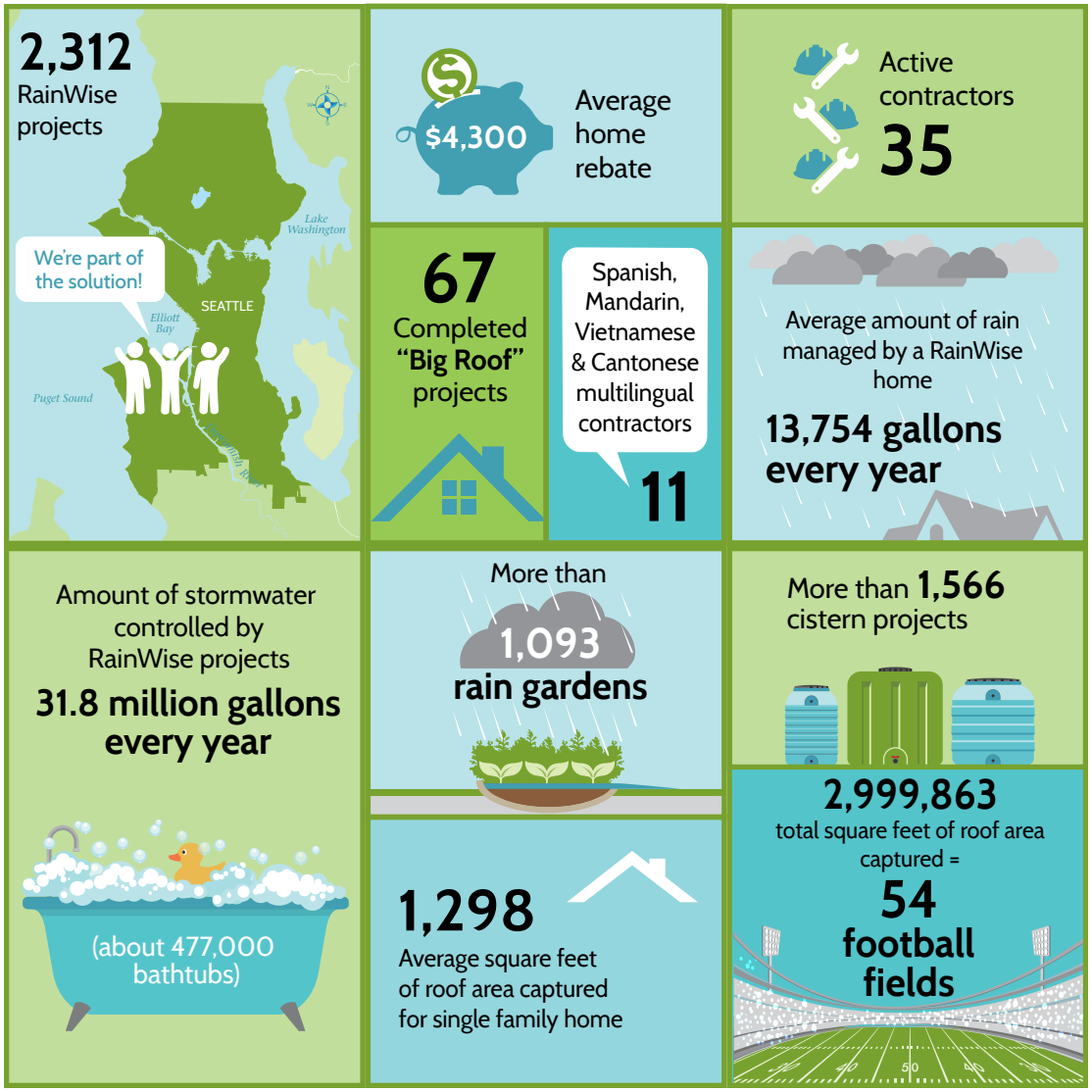
The first thing I talked to my new neighbor about was my RainWise garden. It is a conversation starter. It raises awareness in the community of things we can do to protect Puget Sound. My rain garden captures 922 square feet of my roof area. I love it because the design follows the original flow of the landscape. The garden fits perfectly into the surrounding elements and complements existing plants. It also uses lots of native plants. It is beautiful and low maintenance.

- Merica, RainWise homeowner

I think the local community is becoming more attuned to the sewer problems after heavy rains. I see more and more RainWise signs in my neighborhood. I got RainWise because I am concerned about stormwater runoff. My house collects a lot of water–so it was a natural fit! I got a 205-gallon cistern that is in the back of my house and is close to my lush garden where I use the water for summer irrigation. My cistern is worry-free and only took a day to install. I encourage others to go through the program!

- Nancy, RainWise homeowner

RainWise Stats for 2022



There are five basic steps to becoming RainWise:

1. Check your eligibility: https://700milliongallons.org/rainwise/eligibility/.
2. Find a contractor you want to work with: https://700milliongallons.org/rainwise/find-a-contractor/ or contact rainwise@seattle.gov and ask for help with contractor matchmaking.
3. Create a plan with your contractor and schedule a free pre-inspection for approval to build and install your system.
4. When it's done, your contractor will schedule a final inspection to confirm your installation was done properly.
5. Submit your rebate package and get your rebate within 6 to 8 weeks.

CASE STUDY 1: UNIVERSITY OF WASHINGTON GREEN GREEKS

In 2022, Delta Gamma became another trailblazer for sustainability in the Greek community on campus by saving water and reducing pollution.

Alumni and students celebrate their RainWise installation at a ribbon cutting during the fall of 2022.

Project Description

RainWise is working with sustainability student leaders from the Green Greeks Chapter at the University of Washington to install RainWise projects at fraternity and sorority houses. By deepening our knowledge of Greek governance structures and working with student leaders who are champions for these types of projects, we support students in encouraging their decision-makers to allow RainWise installations at the fraternities and sororities on the University of Washington campus.

University of Washington Green Greeks Stats for 2022

The University of Washington has **22** houses in the Greek system eligible for the RainWise rebate program

3 houses have completed RainWise projects – Alpha Gamma Delta, Chi Omega, Alpha Omega Pi/Alpha Omicron Pi

74,700 gallons of stormwater is kept out of our combined sewer system by the University of Washington Green Greeks collectively.

Tech details for the three installations

- **AOPII:** Four **865**-gallon cisterns collect rainwater from **4,937** square feet of roof area, managing nearly **20,000** gallons of stormwater
- **Chi Omega:** Two **625**-gallon, one **785**-gallon, and one **480**-gallon cisterns along with one rain garden collect rainwater from **7,837** square feet of roof area, managing **51,400** gallons of stormwater
- **Delta Gamma:** One **625**-gallon cistern flowing into one rain garden collect rainwater from **830** square feet of roof area, managing **3,300** gallons of stormwater

Detailed Project Description

The University of Washington has 22 houses in their Greek system that are eligible for the RainWise rebate program. Through educational presentations at Green Greek meetings, water conservation team meetings, and ongoing communication with sustainability coordinators and new student leaders, RainWise outreach staff have supported three houses in completing installations to date.

Over the years, RainWise contractors have installed rain gardens and/or cisterns at AOPII, Chi Omega, and Delta Gamma houses. In 2022, construction of was completed of a new cistern at Delta Gamma and a subsequent ribbon-cutting celebration was attended by over 100 alumni and students in the Green Greek system. At the event, RainWise outreach staff were on hand to answer technical questions and talk about RainWise possibilities at neighboring residential homes and other Greek houses. RainWise continues to facilitate Greek system students and House Board members in conversation about possibilities for projects at additional sorority and fraternity houses.

> *The members of AOPII are excited to have these four cisterns as tangible evidence of our willingness to walk the talk about caring for our environment. We talk about environmental justice and climate change and are pleased to be taking this step to mitigate stormwater runoff in our community. The people in the RainWise program and our contractor were all wonderful to work with and made this process easy. We hope the RainWise program will continue to be able to serve Seattle in this way for as long as is needed. We encourage the other Greek Organizations on campus and other members of the community to join in the RainWise program to continue the process of sustainability on campus and in the Seattle area.*
>
> *- Marisa Alison, former AOPII Collegiate Member, Sustainability Chair for the Upsilon Chapter, and tireless advocate for the first RainWise installation on campus*

> *Participating in the RainWise program allows my chapter to protect local waterways and reduce our environmental impact. I am proud that my chapter is part of a collective management solution that expands past the Greek community.*
>
> *- Jaden Keatts, Delta Gamma's Director of Sustainability*

CASE STUDY 2, SEATTLE HOUSING AUTHORITY

Project Description

Seattle Housing Authority (SHA) owns and operates more than 8,000 apartments and single-family homes at nearly 400 sites throughout the city, and administers a number of programs such asincluding the Low-Income Public Housing Program and the Seattle Senior Housing Program to help provide long-term, low-income rental and assistance to the community. Additionally, SHA incorporates environmental stewardship into daily practices and is working with RainWise staff to install rain gardens and cisterns at multiple properties across their organization.

2019 Seattle Housing Authority RainWise educational event.

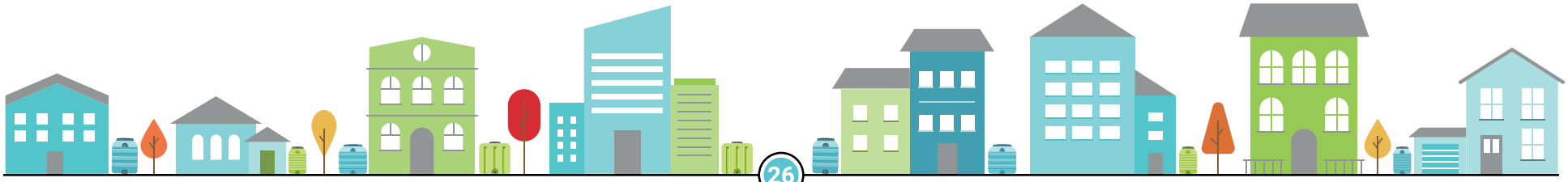
> *Seattle Housing Authority is responsible for many facilities in Seattle, housing thousands of low-income people. In partnership with the RainWise Program, we strive to implement stormwater solutions that improve water quality in our region. The Environmental Stewardship and Sustainability team works closely with property management, asset management, maintenance, and various staff across the agency to identify potential properties to install cisterns and rain gardens that offer creative and beautiful stormwater solutions.*
>
> *We hope that other organizations will see Seattle Housing Authority as a role model, expanding the number of agencies willing to take a stand in addressing our city's aging infrastructure by utilizing green stormwater infrastructure to protect our waterways.*
>
> *- Jennifer Pritchard, Environmental Stewardship and Sustainability Team, Seattle Housing Authority*

Seattle Housing Authority Stats for 2022

8,000 apartments and single-family homes at nearly **400** sites throughout the city are owned and operated by Seattle Housing Authority through the Low-Income Public Housing Program.

Three RainWise Big Roof projects have been completed and have greatly helped to improve the health of our local waterways.

- **Willis House:** Completed in 2019, **10** cisterns capture rainwater from **7,600** square feet of roof area, managing **30,000** gallons of stormwater annually
- **SHA Cloverdale Apartments:** Completed in 2022, **4** cisterns capture rainwater from **2,780** square feet of roof area, managing **11,000** gallons of stormwater annually
- **Montridge Arms Apartments:** Completed in 2022, **9** cisterns capture rainwater from **10,160** square feet of roof area, managing **40,100** gallons of stormwater annually



Detailed Project Description

Seattle Housing Authority has been working with the RainWise Big Roof program to help reduce combined sewer overflows. To date, three RainWise projects have been completed, with other projects in progress. SHA's engagement in the RainWise program supports shared goals to manage stormwater and reduce overflows while providing learning opportunities for their residents to connect with GSI.

The SHA Environmental Stewardship and Sustainability Committee championed the first SHA RainWise installation at Willis House, located in the Green Lake neighborhood, in 2019. That installation alone is capturing runoff from 7,600 square feet of roof area with 10 cisterns, significantly improving the health of our local waterways by managing 30,000 gallons of stormwater every year.

RainWise outreach staff work with SHA interns, SHA sustainability staff, and various other departments to clarify processes and communicate goals and options. They are already pursuing future project opportunities to continue expansion of this successful partnership.

Seattle Housing Authority RainWise Big Roof program at High Point.

EQUINOX STUDIOS INDUSTRIAL GSI

About the Program

Co-owned by 125 local artists and artisans, Equinox Studios partnered with ECOSS to develop a large-scale GSI demonstration site featuring a self-guided tour of multiple solutions to stormwater runoff. Located in the industrial heart of Georgetown, Equinox Studios consists of five old industrial buildings located on "Lake Fifth Avenue", a street that once was the banks of the Duwamish River and suffers severe flooding when it rains.

By combining artistic creativity with technical ingenuity, Equinox has created a demonstration site that showcases cost-effective solutions that can be replicated by business and industry wanting to control polluted runoff.

Equinox Studios Industrial GSI Stats for 2022

Collects the rain that falls on more than **62,000** square feet of roof

Filters **1.3** million gallons of stormwater every year

Lake Fifth Avenue – you can see the need for stormwater management!

Self-guided tour featuring:

- **3** Grattix Systems (rain gardens in a box) that collect and filter runoff from the roof
- **3** kinds of permeable paving (concrete, asphalt, and pavers) that allows rain to soak into the ground
- A living wall (also called a vegetated wall or green wall) named "Garden of Gusto" with LOTS of plants and vines
- **2** oyster barrels attached to downspout filters that remove zinc and other contaminants

We have a range of different interventions we have created here known as green stormwater infrastructure. We are collecting roof water and keeping it out of the storm and sewer systems...and we are doing it creatively. It doesn't have to be some ginormous effort. You can do little bits and be creative about it. When the guys across the street see what we are doing, they might be interested. When other folks around the city, the Port, Boeing see what is possible we hope they say, "Oh, we could do that."

Sam Farrazaino, Founder, Equinox Studios

Equinox Studios features almost 100,000 square feet of workspace for artists and artisans. We get a lot of rainwater, and a lot of toxic pollutants from the air. We are trying to figure out ways to mitigate these issues and help with things like "Lake Fifth Avenue." We have a storm sewer down the middle of our complex. When it is high tide and rains a lot, you can canoe across the street. We started partnering with ECOSS to figure out ways to help with this. We have ended up doing everything from oyster barrels to pervious concrete, pervious asphalt, capturing roof water and filtering it through Grattix boxes and then storing the water in a giant cistern for irrigating our planter gardens. We are a place where other industry can come and see what is possible in a lot of different interventions, from do-it-yourself to bigger infrastructure.

Sam Farrazaino, Founder, Equinox Studios

WATER QUALITY CAPITAL PROGRAM

About the Program

The Water Quality Capital Program is housed in King County's Stormwater Services Section and works to improve water quality across King County. The Program focuses on unincorporated King County, but also partners with local jurisdictions (such as the City of Burien) to implement projects within incorporated areas.

In King County, over two-thirds of the developed land was built before adequate stormwater controls were required. As a result, the water quality and health of streams in these areas are degraded. The Puget Sound Partnership 2014 Action Agenda for Puget Sound identified the lack of stormwater controls in older, developed areas as one of the most significant problems preventing Puget Sound recovery. To add these stormwater controls retroactively (known as "stormwater retrofitting") will be expensive and logistically challenging. This will likely take decades to plan, site, design, fund, acquire the necessary land, and implement. Progress needs to begin immediately because a large number of the County's streams and lakes are in a degraded condition.

The Water Quality Capital Program identifies, plans, prioritizes, designs, and constructs public capital projects within King County to manage stormwater runoff, with a focus on improving water quality and stream health across the County and adjacent jurisdictions with shared watersheds. The program implements best management practices defined in King County's Surface Water Design Manual, including GSI, to maximize multi-benefit outcomes of Clean Water Healthy Habitat goals by mitigating downstream flooding, erosion, and water quality, while also improving salmon habitat, climate change resiliency, and community health with an equity and social justice lens.

Burien, Washington

BEFORE: Looking south toward the project site and existing detention facility from SW 148th Street.

CONSTRUCTION: Looking north from the center of the project site – clearing and grading.

AFTER: Looking north from the center of the project site – sedimentation pond and northern bioretention cell filling with stormwater runoff.

CASE STUDY 1: BURIEN COURTHOUSE RAIN GARDEN

Project Description

The Burien Courthouse GSI Retrofit project improves water quality in Miller Creek by expanding and converting an existing detention pond to a bioretention facility. This GSI retrofit treats runoff from pollution-generating impervious surfaces like roads and parking lots before it flows to salmon-bearing habitats downstream. The new sedimentation pond and two bioretention cells provide improved treatment of total suspended solids, oil, dissolved copper, and dissolved zinc while also managing stormwater through increased detention volume and infiltration area.

Burien Courthouse Rain Garden Stats for 2022

- **Funding:** This partnership project is delivered through shared multi-agency funding:
  - Stormwater Financial Assistance Program Grant awarded by the Washington State Department of Ecology
  - Contributions from the City of Burien
  - Donation of land for the project site from the King County Facilities Management Division
  - Surface Water Management Fee and staff time from King County Stormwater Services Section
- **Salmon Habitat:** Miller Creek is located downstream of the project site and has documented high pre-spawn mortality rates of returning coho salmon, ranging between 50 and 90%. This project directly reduces the volume and improves the quality of stormwater runoff draining to the salmon habitat.
  - 90% Salmon Pre-Spawn mortality rate (9 out of 10 returning Salmon die before they can lay eggs to sustain the next generation). This project cleans water before it enters downstream salmon habitat, helping reduce this Salmon Pre-Spawn Mortality Rate
- **Area treated:** The project treats runoff from 3.07 acres of land within the City of Burien and King County Courthouse.
  - Planting: The project includes several trees and hundreds of drought-tolerant native plants selected to maximize stormwater treatment while also reducing maintenance and providing habitat.
  - Education: The project includes an educational sign in English and Spanish located near the courthouse crosswalk to maximize public engagement explaining how GSI like rain gardens and bioretention benefit community and salmon health through improved stormwater management.
  - Beautification: The improved landscaping enhances the public space while the water features provide a point of interest for the community to engage with and observe urban stormwater firsthand.

Detailed Project Description

The multi-agency capital project is delivered in partnership with the Washington State Department of Ecology, King County, and City of Burien. This GSI retrofit project sustainably provides flow control and water quality treatment in a highly urbanized watershed. These improvements advance multi-benefit Clean Water Healthy Habitat goals by mitigating downstream flooding and erosion while also improving salmon habitat, climate change Resiliency, and community health.

The Miller Creek Basin was substantially developed without adequate stormwater controls. Due to the large amount of untreated stormwater runoff draining from the basin, the health of the creek has become severely degraded. WLRD and volunteer neighborhood creek stewards have observed and documented high pre-spawn mortality rates of the returning coho salmon, ranging between 50 and 90 percent. Miller Creek is currently listed as a 303 (d) waterbody for dissolved oxygen, temperature, and bacteria. Miller Creek has also been observed exceeding criteria for pH, zinc, and copper.

This project was designed by King County staff in the Capital Services Unit of the Stormwater Services Section and improves water quality in the Miller Creek Basin by retrofitting an existing detention pond to a sedimentation pond and two bioretention cells, increasing both the volume of stormwater managed and the quality of water that flows through it. The old detention pond had been designed to previous standards that focused on controlling stormwater volumes to reduce flooding. Because of this, water would only flow into the detention pond during large rain events. The project changed existing stormwater conveyance pipes to ensure that water would enter the new GSI system more frequently compared to the old detention pond, increasing how often stormwater was cleaned.

The SW 148th Street arterial is located immediately north of the project site and receives relatively high average daily traffic because many vehicles use the arterial to access state routes 509 and 518 to travel from downtown Burien to various points of interest, like SeaTac airport. The high volume of traffic results in increased pollution as the stormwater encounters gas, tire crumbs, and other contaminants accumulated on the road from heavy vehicle use. Recent studies have shown that tire crumbs (also known as "6PPD-Quinone") are directly contributing to salmon pre-spawn mortality and can be mitigated through GSI, like this project.

The sedimentation pond toward the north of the site serves as a first step of treatment to remove highly concentrated pollutants arriving from the SW 148th Street arterial before flowing into the bioretention cells. Capturing most of the pollution in the sedimentation cell simplifies maintenance by reducing how frequently the bioretention cells downstream need to be serviced. The bioretention cells include infiltration, which allows stormwater to seep back into the groundwater to alleviate flooding while also providing filtration through the soil that captures pollutants. Like a drinking water filter, the bioretention cells will become clogged over time if not properly maintained, reducing the amount of water that infiltrates through them. The sedimentation cell captures most pollutants before water flows to the bioretention cells, so that the cells can infiltrate for longer periods of time before becoming clogged and requiring service.

The bioretention cells also include native drought-tolerant planting to further improve water quality while reducing maintenance. Native plants are better adapted to the local climate and survive better than non-native plants, reducing maintenance while also providing habitat amenities. The plants also further clean the water through evapotranspiration and phytoremediation. Stormwater that evaporates returns to the environment without carrying pollutants downstream. Thirsty plants suck up water and it evaporates through their leaves, resulting in less flooding and pollutants flowing to the Puget Sound.

WATERWORKS GRANT PROGRAM

About the Program

King County's WaterWorks Grant Program funds innovative projects that improve water quality and engage communities. Managed through WTD, the program provides $5 million in funding every two years to organizations carrying out a variety of projects, such as GSI, community engagement, research, water quality monitoring, education, and more. Nonprofits, schools and educational institutions, cities, counties, tribes, and special purpose districts are eligible to apply and partnerships are encouraged.

For more information, visit www.kingcounty.gov/waterworks-grants or contact WaterWorks grant manager Elizabeth Loudon at water.grants@kingcounty.gov or (206) 477-4297, or WaterWorks coordinator Kai Gregersen at water.grants@kingcounty.gov or (206) 477-3968.

CASE STUDY 1: KENT MERIDIAN HIGH SCHOOL

Project Description

Students from Kent Meridian High School led the effort to transform an unused garden on the school's campus and got grant funding for design and installation of a rain garden and cistern. The rain garden features an internal overflow while the 2,500 gallon cistern collects water from half of the school roof and directs overflow to the garden.

BEFORE: The small plot between the parking lot and school contained grass and shrubs.

AFTER: This student-initiated project includes two rain gardens connected by a bridge and a cistern. The contractor, Stone Soup Gardens, oversaw the project and involved students and teachers in design and final planting.

Kent Meridian High School Rain Garden and Cistern Project Stats for 2022

A **2,500**-gallon cistern collects water from **3,300** square feet of school roof–that's half of the roof!

The cistern uses **2,500** gallons of stored water from winter/spring rainfall to water the garden during the summer months, rather than using city water.

A **450**-square-foot rain garden cleans stormwater on the Kent Meridian High School campus.

80 plants were installed in the rain garden.

250 volunteer hours of planning and planting.

As of July 31, 2022, the Kent Meridian Rain Garden & Cistern website (KM Rain Garden & Cistern) had over **1,000** visitors.

Detailed Project Description

This project began when former KMHS student Risa Suho learned about green ways to manage stormwater. She wanted to expand these practices to her school and submitted grant proposals to the WaterWorks Grant Program for the KMHS rain garden and cistern in 2019. After Risa graduated, former student Elisha Gill took the lead, including grant reporting.

With guidance from teachers at Kent Meridian and Stone Soup Gardens, the students of the KMHS Environmental Science Club helped designed and plant two rain gardens connected by a bridge, for a total of 450 square feet. Stone Soup Gardens oversaw the design, obtained permits and managed the installation of the raingardens and a cistern. The 2,500-gallon cistern collects water from 1,650 square feet of roof, while another 1,650 square feet of roof drains directly into the rain gardens. Eighty plants were installed in the rain gardens on April 30, 2022. A website was created to explain the project that contains an excellent description of which plants were placed where (KM Rain Garden & Cistern). The KMHS Environmental Science Club will conduct upkeep for the project, and the site will remain an inspiration to the KMHS community.

Projects seem impossible, but when you have the genuine support of communities, of mentors, and people who are willing to collaborate with you, it almost feels like you can accomplish anything.

– Risa Suho, KMHS class of 2019

The WaterWorks program was a great support in how to write the grants and what we needed to do for the rain garden and the cistern. We also met with RainWise who taught us what a rain garden was.

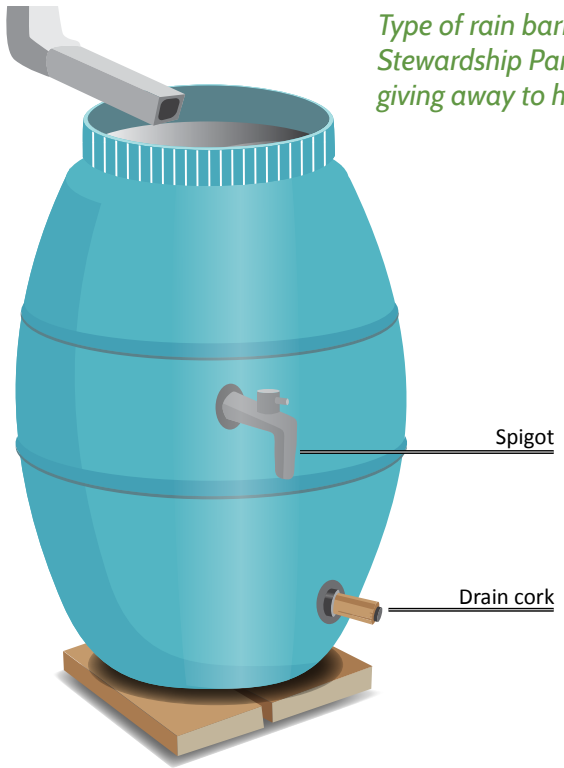
– Elisha Gill, KMHS class of 2021

CASE STUDY 2: GREEN INFRASTRUCTURE EXPANSION IN CARNATION

Project Description

Stewardship Partners is working with the City of Carnation and other local partners to identify existing GSI projects (rain gardens, de-pave, cisterns, permeable pavement, green roofs) and priority sites for future projects in Carnation to install a demonstration project at Carnation City Hall, host a rain barrel giveaway, and build public awareness and capacity around GSI.

> *Stewardship Partners gave away three rain barrels to community members this quarter [Q4 2022]. These were special requests from people who had attended the Carnation Farmers Markets. We view this as a huge success in our outreach efforts... it shows that community members are invested in green infrastructure and still interested in receiving the rain barrels!*
>
> *– Todd Albertson, project lead*



Type of rain barrel Stewardship Parters is giving away to homeowners.

Green Infrastructure Expansion in Carnation project (before).

Green Infrastructure Expansion in Carnation project (after).

Green Infrastructure Expansion in Carnation Stats for 2022

15 rain barrels given away and installed by homeowners in 2022

825 gallons is the total capacity of the **15** rain barrels; each barrel is **55** gallons.

1 rain garden was completed in 2022, for a total of **200** square feet.

> *The Carnation Library Rain Garden is a testament to our work with public and private landowners to educate, empower, and implement GSI features within this city. This particular rain garden has benefits beyond its stormwater management services. Library staff will use the rain garden as an education piece in their ongoing programs about the environment and associated literature for their youth programming.*
>
> *- Chris LaPointe, Stewardship Partner's Director of Ecological Restoration*

Detailed Project Description

Increasing GSI has been identified by Stewardship Partners as a priority in the Snoqualmie Valley. This project aims to address the valley's deficit by installing GSI projects in the City of Carnation.

In partnership with the City of Carnation and other local partners, funding is being used to identify existing GSI projects and priority sites for future projects. This research has led to several GSI projects. One rain garden was completed at the Carnation Library, and several rain gardens are in progress at Full Circle Farm and Carnation Elementary School.

Another goal of this project is to install GSI features at Carnation's City Hall. Potential projects include a demonstration rain garden, a green parking lot, a cistern, and informational signage.

Finally, Stewardship Partners staff members have been attending the Carnation Farmers Market and other public events throughout the grant period to give away a goal of 20-plus rain barrels/cisterns to residents. All this work has a larger goal of building public awareness and capacity around GSI.

CASE STUDY 3: TILTH ALLIANCE

Project Description

This project takes place at the Rainier Beach Urban Farm and Wetlands in Seattle's Rainier Beach neighborhood and other locations. The work includes (a) restoration by community volunteers, (b) student and community education events, and (c) environmental educator training for teachers and other community leaders. One of the trainings, Soil and Water Stewardship, included installing 12 GSI projects throughout King County.

Participants in Tilth's Soil & Water Stewardship training install a box rain garden at Emerson High School in Kirkland.

Participants in the Soil and Water Stewardship training install a cistern at the Rainier Beach Urban Farm.

Tilth Alliance Project Stats for 2022

Two **500**-gallon cisterns were installed for a total cistern capacity of **1,000** gallons

1,000 gallons of potable water saved

The box rain garden installed at Emerson High School measured **36** square feet

3,675 square feet of stormwater area managed by GSI

658 volunteers contributed **2,149** hours of work in 2022

Detailed Project Description

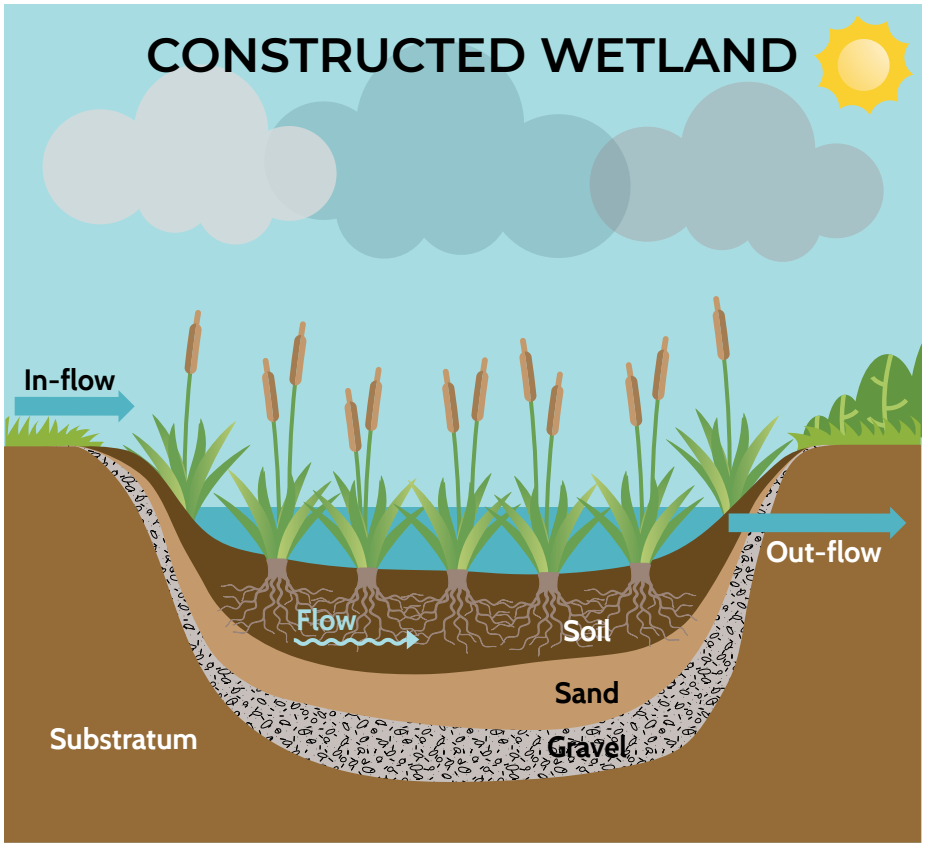
The Rainier Beach Urban Wetlands and Water Quality Initiative takes place at the Rainier Beach Urban Farm and Wetlands in Seattle's Rainier Beach neighborhood, with other projects taking place in additional locations. The project includes three broad areas of work, centered on community-based water quality education:

1. wetlands restoration by community volunteers as well as by a local teen employment and senior wellness program;
2. student and community education through water quality service learning, field trips, after-school programs, and community events; and
3. professional development training for teachers on ethical and culturally based outdoor science education.

The project aims to engage thousands of volunteers in these three areas of work. In 2022 alone, 658 volunteers contributed 2,149 hours of work, restoring, planting, learning, and improving water quality in the Rainier Beach neighborhood.

One of the professional development trainings, called Soil and Water Stewardship, includes 12 GSI projects located throughout the county. Two cisterns and a box rain garden were installed through this program in 2022. These trainings magnify the impacts of the grant; educators will be able to use their GSI experience and instruction to reach additional community members and inspire water quality improvements for years to come.

> *[This project] improves local conditions for Rainier Beach residents who experience significant environmental disparities. As an environmental education center, project participants will be able to see on-site examples of water quality actions they can take in their own lives, including cisterns, rain gardens, and natural land care practices.*
>
> *- Chris Hoffer, Tilth Alliance Program Manager*



With support from Soil and Water Stewards, we were able to repair and add to the rainwater storage collection systems at our learning garden in Wallingford. These home-scale projects are highly visible to the public, as the garden is adjacent to the Wallingford Farmers Market, and inspire visitors about what they might try in their own homes, which is important since the site is near Green Lake and a very large RainWise-eligible basin in North Seattle.

– Chris Hoffer, Tilth Alliance Program Manager

This course taught me more about practical practices related to water and soil management than I received in all of graduate school. It was thorough, but also rooted in community and place in a way that theoretical teaching so often lacks.

– A review of the Soil and Water Stewardship training from a past participant

CONCLUSION

When it rains in King County, much of that water falls on roads, roofs, and other hard surfaces instead of soaking into the ground. It picks up pollutants like car oil and dog poop, and sometimes floods homes and neighborhoods before it finally flows into our streams, rivers, and coastal waters.

With Green Stormwater Infrastructure (GSI) landscaping like those mentioned in this report, we can help filter and slow down rainwater so it's clean and safe for us, our children, and fish and wildlife. GSI features can be installed anywhere- parking lots, sidewalks, or even your own backyard. The King County and partner programs featured here are making it easy, accessible, and affordable to install GSI and provide a host of co-benefits such as green job creation, green spaces, wildlife habitat, beautification, and cost savings.