WATERSHED PROTECTION
Capital Projects

Green Stormwater Infrastructure

Green Stormwater Infrastructure integrates natural systems like vegetation and soil into water treatment devices to control the quality and quantity of urban runoff. Green Stormwater Infrastructure benefits include stormwater control, water conservation, urban heat island cooling, natural habitat, and beautification. This document summarizes the function and benefits of different Green Stormwater Infrastructure systems.

HOW IT WORKS

As rain water flows off parking lots, streets, buildings, and managed landscapes, it collects and carries pollutants such as sediment, fertilizers, toxins, and trash into downstream waterways. If left untreated, this water harms aquatic plants, animal communities, and human activities that depend on them.

Conventional “grey” stormwater controls remove pollutants and handle erosive flows, but do less to ensure that water continues to infiltrate into the soil and return to creeks as baseflow. Green Stormwater Infrastructure controls such as rain gardens, porous pavement, and rainwater harvesting go a step further to help retain water in the soil before it has a chance to runoff into storm drains and creeks. These strategies attempt to restore, to the greatest extent possible, natural hydrologic processes. Instead of managing stormwater as a waste product that must be eliminated immediately, it is seen as a resource that can provide multiple benefits to a watershed. This approach also reduces the need for irrigation and relieves pressure on the water supply in lakes.

GREEN STORMWATER INFRASTRUCTURE

Above Left: Rain garden at JJ Seabrook Greenbelt.

Above Right: Rainwater harvesting at Twin Oaks Branch Library.

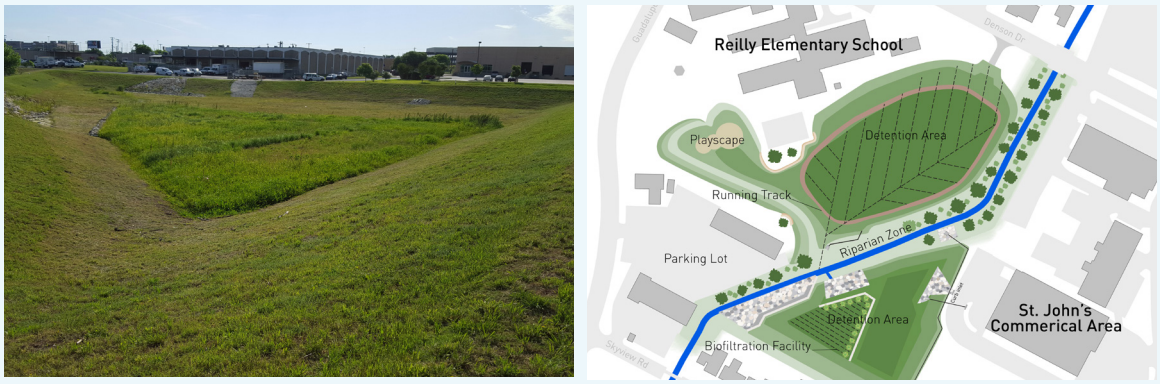
Left: Porous pavement at a private development on South Lamar

GREEN STORMWATER QUALITY CONTROLS

BIOFILTRATION

A biofiltration system is similar to a conventional sand filter with the addition of organic matter and plants to the filter media (material). This enhanced filter media uses living material to capture and degrade pollutants, removing more dissolved pollutants than a traditional sand filter while featuring native plants that help maintain the aesthetics and function of the filter system. As well as enhancing removal of pollutants, the plant community also tends to sustain the permeability of the biofiltration media for longer periods of time without maintenance.

REILLY ELEMENTARY SCHOOL BIOFILTRATION FACILITY



Biofiltration system (left) and diagram of both flood detention and biofiltration facilities (right)

The Reilly Pond System is a multi-mission project that focuses on improving the water quality and flood detention performance of an existing flood control located adjacent to Reilley Elementary School. Improvements to the dam increased protection for local residents, while the new biofiltration system and habitat restoration features along the streambank create a safe and ecologically functional space for students and visitors.

- To better improve water quality, the biofiltration component treats runoff for 4.6 acres of commercial development that did not previously have water quality controls.
- The biofiltration facility was planted with Emory sedge and Celebration Bermuda grasses. Emory sedge is a native sedge that, when paired with the appropriate media, removes more nitrogen and phosphorus from stormwater than typical sand filters. Both plantings were selected for their tolerance to ponding and dry soil conditions.
- To restore aquatic habitat, there was also extensive invasive species control of Giant Cane near Denson Drive. Native grasses and understory trees were also planted along the creek embankment to improve the health of the riparian zone.

POROUS PAVEMENT

Porous pavement is a permeable hardscape with underlying layers of gravel or rock that store stormwater and allow it to percolate into the ground, reducing runoff from rainfall. This infiltration also serves to reduce pollutants in stormwater runoff and sustain nearby vegetation. On sites with limited space, porous pavement can allow for more effective land use by serving as paved surface that also reduces the need for additional water quality treatment devices.

GREEN ALLEY DEMONSTRATION PROJECT – POROUS PAVEMENT

Green Alley porous pavement (left) and rain garden (right)

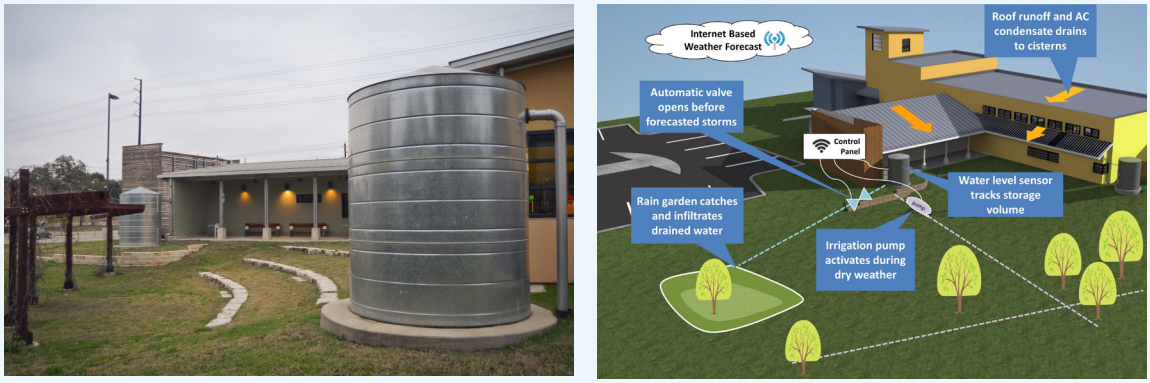
The Green Alley Demonstration Project is located in the Guadalupe neighborhood between 8th and 9th Streets, bounded by Lydia and Waller Streets. Under the joint leadership of the City of Austin, the University of Texas, and the Guadalupe Neighborhood Development Corporation, this pilot project incorporates “Alley Flat” housing, porous pavement, rain gardens, native and edible landscaping, wildlife habitat, public art, and recycled materials. The porous pavement allows stormwater runoff to infiltrate into the underlying subsoil to sustain vegetation and filter pollutants before they run off into Waller Creek.

The project was designed with significant resident input and used green infrastructure elements to transform alleys into useful, attractive, and usable public places.

RAINWATER HARVESTING

Rooftops can generate large volumes of runoff which, when discharged to paved surfaces and landscaped areas, can generate large pollutant loads. Rainwater harvesting systems capture this runoff in cisterns or tanks, thus preventing pollution while also putting the captured water to beneficial use. The captured water can be used for landscape irrigation, air conditioning chillers, or flushing toilets. Rainwater harvesting systems can also be used to control the smaller and more frequent flows, which degrade nearby streams and creeks.

TWIN OAKS LIBRARY



Twin Oaks 2,500 gallon cisterns (left) and a diagram of the system (right; diagram via Geosyntec)

The retrofit of the rainwater harvesting system at the Twin Oaks Library demonstrates the benefits of using innovative rainwater harvesting technology for water conservation, stormwater treatment, and stormwater runoff reduction.

The green infrastructure at this site includes two 2,500 gallon cisterns, a tree irrigation system, and a rain garden. Real-time water level sensing equipment and weather forecasts are integrated with smart pumps and valves to optimize both water conservation and stormwater treatment goals. During dry weather, harvested rainwater stored in the cisterns is used to irrigate the trees to enhance our urban forest and reduce urban heat island effects. In advance of forecasted storms, the cisterns are drained as needed to make room for more storage. This enables the cisterns to fully capture polluted runoff from the storm, which is then directed to an onsite rain garden for infiltration and treatment by water-loving plants.

Using this innovative technology, the rainwater harvesting system's functionality is maximized for both water conservation and water quality treatment. In 2015, it is estimated that the system delivered a total of 29,000 gallons of harvested rainwater and air conditioning condensate, of which 10,000 gallons were used for regularly scheduled irrigation and 19,000 gallons were released to the irrigation system and rain garden in advance of forecasted storms as part of the system's programming. This project was a collaborative effort by the Watershed Protection Department, Library Department, the Water Environment Research Foundation, and Geosyntec to pilot this technology to more sustainably manage water resources in Austin.

RAIN GARDENS

A rain garden is a shallow, vegetated depression designed to absorb and filter runoff from impervious surfaces like roofs, sidewalks and driveways. Unlike conventional centralized systems, this approach can be flexibly dispersed and integrated into a development as a landscape amenity.

ONE TEXAS CENTER RAIN GARDENS RETROFIT

Located within the East Bouldin Creek watershed, One Texas Center's rain garden system provides water treatment to a highly urbanized area in Austin, removing more than 1,000 pounds of total suspended solids from stormwater runoff annually. The treatment system captures and treats pollutants from approximately 1.5 acres of impervious surfaces.

Due to its highly developed drainage area, stormwater runoff enters East Bouldin Creek with degraded water quality. A portion of the One Texas Center site also drains to Lady Bird Lake, a highly valued recreational amenity. For this reason, this project was identified as a high priority by the Watershed Protection Master Plan.

In 2012, City staff recognized that the highly impervious One Texas Center site could be an opportunity to demonstrate innovative green infrastructure approaches. The One Texas Center rain gardens now capture and treat pollutants from the surface parking lot and entrance driveway, pollutants that previously travelled untreated into East Bouldin Creek. By monitoring the performance of the rain gardens, the project is also able to provide useful data for future practice designs. One Texas Center's rain gardens exemplify stormwater treatment options that are both aesthetic and provide multiple benefits, including:

- Reduced pollutant loads
- Reduced carbon footprint
- Improved landscaping aesthetics
- Improved site hydrology
- Conserves water by reusing stormwater

VEGETATIVE FILTER STRIPS

Vegetative Filter Strips rely primarily on infiltrating stormwater into the ground. Additionally, vegetative filter strips use the filtration properties of plants and soils to remove pollutants from runoff. Filter strips are usually designed by grading the site to promote overland flow of runoff to an area vegetated with grasses, forbs, shrubs, and trees. They are typically used in relatively low-density developments as a passive, low maintenance water quality control.

WEST BOULDIN CREEK VEGETATED FILTER STRIP

Over two-thirds of West Bouldin Creek watershed was developed prior to water quality regulations, meaning that West Bouldin Creek receives stormwater runoff with little to no treatment. The West Bouldin vegetated filter strip treats runoff from over 200 acres of previously untreated urban development. This treated runoff eventually re-enters West Bouldin Creek to drain into Lady Bird Lake, a highly valued recreational amenity. For this reason, this project was identified as a high priority by the Watershed Protection Master Plan.

The project, which was completed in 2009, consists of an isolation/diversion structure that diverts runoff from West Bouldin Creek into a sedimentation basin. The sedimentation basin then discharges runoff slowly as overland flow to a 0.43 acre native grassland vegetative filter strip, where additional treatment and infiltration occurs. The control removes approximately 100,000 pounds of Total Suspended Solid per year, removing 12% of the watershed's total suspended solid load.

In addition to removing stormwater pollution, the project removed invasive plants from the Critical Water Quality Zone, increased native vegetation, and repaired erosion damage caused by urban runoff. The project also provides protection to a nearby wetland due to the extended detention and infiltration design.