Pasco County Department of Public Works
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Bioswales

General

Although similar to rain gardens, bioswales are linear, much larger in size and receive stormwater runoff directly from parking lots and roadways.

Bioswales or vegetated swales are a form of bioretention system used for water quality treatment, peak discharge attenuation and storm runoff conveyance away from critical infrastructure.

Water Quality

Bioswales provide the pre-treatment or treatment of stormwater to remove sediments and pollutants by passing runoff through surface vegetation, extending soil percolation time, disconnecting impervious areas from downstream waterways, and reducing stormwater runoff flow velocities. May be designed to provide online water quality treatment through retention and infiltration of a pollutant abatement volume.

Feasibility

Bioswales are an economic alternative to urban section (curb and gutter) roadways, and traditional stormwater piping. Bioswales can be effectively integrated into parking lots and roadway medians to convey, infiltrate, and treat stormwater runoff. For areas with well drained soils, stormwater treatment can be increased through the use of ditch blocks or weirs to capture small volumes of runoff to increase soil infiltration time. May be integrated in rural section roadway designs for low density residential developments. Ideal in A and B soils.

Constraints

Slopes should be less than 5 percent. Installed in areas with well drained soils, deeper seasonal high ground water tables and an outlet control to safely convey high runoff flows.

Cost

Approximately $8 per square foot of the swale area.

Cisterns

General
These rainwater-harvesting systems intercept, divert, store, and release rainwater for future use to supplement irrigation, vehicle washing, indoor graywater use, and dust control. Harvesting rainwater from roof rainwater runoff is an easy and inexpensive way to capture and store water.

Water Quality
Rain water is a relatively clean source of water. However, the initial runoff from a roof can contain dust, fecal material, and particulate matter that accumulates on the roof. This initial runoff is diverted from the cistern by using a first-flush diverter. Rainwater is also a source of nitrogen; harvesting the rainfall results in a reduction in the nitrogen load to water bodies, as well as other pollutants.

Feasibility
Cisterns are suitable for single-family, high-density residential and commercial developments. Because the size and shape of the cistern is flexible, it can be incorporated into many landscaping and site designs.

Constraints
The roof must have gutters or drains with the appropriate screens to collect the rainwater. The site must have adequate space for a cistern and the cistern may need to be anchored to a structure. A makeup water source may be needed for periods of infrequent rain.

Cost
Approximatey $600 - $2,200 for a 500 gallon cistern and accessories.

Permeable Pavement

General

This pavement system is also referred to as geo-blocks, pavers, plastic grids, or poured concrete pavement. These systems incorporate permeable or semi-permeable materials that overlay a gravel storage layer, which allows direct infiltration and the temporary capture and storage of rainwater. In contrast, almost all of the surface water on impervious pavement becomes runoff that requires a larger drainage system for removal and treatment.

Water Quality

Allows direct surface water infiltration to underlying soils reducing runoff volumes, peak flows, pollutant loads, and facilitates groundwater recharge. When considering pervious pavement as part of the stormwater treatment system, benefits are based on available subsurface storage volume and the ability of the system to readily recover the water quality storage volume.

Feasibility

Suitable for residential subdivision and commercial developments. Substituting pervious pavement for impervious pavement has the potential to reduce the size of the stormwater drainage system as well as the required retention/detention pond storage volume. Ideal in Hydrologic Groups A or B soils.

Constraints

Requires a certified pervious pavement installer. Paved areas must have a shallow slope of less than 5 percent. Additional surface maintenance for pervious pavement areas. In-situ soils must drain well.

Cost

Approximately $8 per square foot of pavement area. Typical construction cost varies from $5 to $10 per square foot.

Grass surfaced parking is an aesthetically pleasing and environmentally friendly solution to protecting the quality of ground water. These sytems use plastic grids to absorb traffic, provide stability, and provide grass protection while allowing stormwater to permeate through the entire surface.

Rain Gardens

General
These are shallow landscaped depressions used to capture, treat, and infiltrate stormwater runoff. Within the rain garden area, planted vegetation, mulch, and soils facilitate treatment and removal of pollutants from stormwater runoff.

Water Quality
Can be more effective than conventional retention systems due to the increased interaction with soil, microbes, and vegetation enhancing the biogeochemical processes. They function as small, isolated dry-bottom retention basins that can retain and infiltrate some of the required pollution abatement volume for a project.

Feasibility
Suitable for single-family to high-density residential developments. Because the size and shape of the bioretention area is flexible, it can be incorporated into many landscaped designs. Rain Gardens are suited for treating stormwater runoff from roofs, sidewalks, and driveways. Ideal in Hydrologic Groups A, B or C soils.

Constraints
The rain garden area should be as close to the stormwater runoff source as possible. Seasonal high water table must be at least 6 inches below the bottom of the garden bed. The surrounding in-situ soil should be well drained sandy soils.

Cost
Approximately $4 to $12 per square foot of garden area.

Stormwater Reuse

General

Although similar to rainwater harvesting, these systems are much larger in size and utilize detention ponds or large storage systems to capture and recycle rainwater for irrigation and non-potable water needs.

Water Quality

By redistributing captured stormwater runoff across an extensive landscape area, pollutant loading is reduced and groundwater recharge is facilitated. Additionally, potable water is directly conserved because stormwater reuse acts as an alternative water source through direct substitution for landscape irrigation.

Feasibility

These systems are suitable for residential subdivision and commercial developments. Source reliability is often important. A backup source of water is required when the harvested stormwater volume is low or not available. Suitable in high seasonal high water table settings when wet detention is ideal. Their integration in the overall water quality treatment design can minimize project pond sizes.

Constraints

These systems require pumps and a horizontal water filtration system. Land area to be irrigated should be equivalent to the stormwater reuse impervious runoff area. An abundant volume of stored stormwater is required or irrigation demands must be supplemented with potable water during periods of infrequent rain. Stormwater reuse systems that are an integral part of a project's water quality and quantity control pose other legal challenges for regulatory agencies.

Cost

Cost range from $0.12 to $0.50 per kgal water.

Image above courtesy of Applied Sciences Consulting, Inc.

Vegetated Strips

General

Vegetative strips are linear areas of landscape vegetation that are located adjacent to impervious areas such as entrance roads and parking isles. They may also be placed along property lines, wetlands, and mitigation areas.

Water Quality

When placed in well-drained soils, vegetated strips directly capture rainwater and help reduce the nitrogen load in stormwater as well as other pollutants through the increased interaction with surface vegetation, in-situ soils, microbes, and other biochemical processes. Vegetated strips improve site aesthetics and help to reduce temperatures around asphalt areas.

Feasibility

Vegetative strips are suitable for residential subdivisions and commercial developments. Some basic design features to be considered are setback and width requirements, types of vegetative cover, soil amendments, in-situ soil types and optimization of infiltration rates. Buffer strips contribute to the protection of environmental habitats.

Constraints

A maximum cross slope of less than 15 percent is recommended. Flatter cross slopes improve runoff pollutant removal. The depth of flow within the vegetative strip should not exceed the height of the vegetative cover. Supplemental irrigation may be required during periods of infrequent rain. When used for water quality treatment credits, they need to be protected by deed restrictions, and made part of the common areas dedicated to the property owners association.

Cost

May range from $4 to $12 per square foot of the vegetated area.

GREEN INFRASTRUCTURE

Using low impact development strategies, developers can create healthy habitats by incorporating nature into built environments. Utilizing these practices will allow natural rainwater filtration and minimize the impacts of development on the environment.

Additional Resources

University of Florida/Pasco Extension
https://sfyl.ifas.ufl.edu/pasco
http://buildgreen.ufl.edu/lid_fact_sheets.htm

Low Impact Development Center
https://lowimpactdevelopment.org