

Rain gardens

A rain garden is a depressed area with porous backfill (material used to refill an excavation) under a vegetated surface. These areas have an underdrain to both encourage filtration and reduce the duration of standing water and an overflow system that prevents water from spilling over into yards and roads. Rain gardens provide groundwater recharge, pollutant removal, and runoff detention. Rain gardens are an effective solution in suburban areas where green space is available but limited. Ideally, plants should be selected that can withstand alternating inundation and drought conditions and that do not have invasive root systems, which may reduce the soil's filtering capacity.



Permeable pavers

Permeable pavers promote groundwater recharge. Permeable interlocking concrete pavements (PICP) are concrete block pavers that create voids on the corners of the pavers. Concrete grid paver (CGP) systems are composed of concrete blocks made porous by eliminating finer particles in the concrete which creates voids inside the blocks; additionally, the blocks are arranged to create voids between blocks. These systems allow the runoff to pass through the pavement, reducing the need for inlet structures. Additionally, underground detention could be provided that may reduce the size of pipes necessary to convey the runoff.



Permeable pavement

Permeable pavement is an alternative to asphalt or concrete surfaces that allows stormwater to drain through the porous surface to a stone reservoir underneath. The reservoir temporarily stores surface runoff before infiltrating it into the subsoil. The appearance of the alternative surface is often similar to asphalt or concrete, but it is manufactured without fine materials and instead incorporates void spaces that allow for storage and infiltration. Underdrains may also be used below the stone reservoir if soil conditions are not conducive to complete infiltration of runoff.



Rain barrels and cisterns

Rain barrels and cisterns harvest rainwater for reuse. Rain barrels are placed outside a building at roof downspouts to store rooftop runoff for later reuse in lawn and garden watering. Cisterns store rainwater in significantly larger volumes in manufactured tanks or underground storage areas. Rainwater collected in cisterns may also be used in non-potable water applications such as toilet flushing. Both cisterns and rain barrels can be implemented without the use of pumping devices by relying on gravity flow instead. Rain barrels and cisterns are low-cost water conservation devices that reduce runoff volume and, for very small storm events, delay and reduce the peak runoff flow rates. Both rain barrels and cisterns can provide a source of chemically untreated “soft water” for gardens and compost, free of most sediment and dissolved salts.



Tree box filters

Tree box filters are in-ground containers used to control runoff water quality and provide some detention capacity. Tree box filters contain street trees, vegetation, and engineered soil that help filter runoff before it enters a catch basin or is released from the site. Tree box filters can help meet a variety of stormwater management goals, satisfy regulatory requirements, protect and restore streams, retrofit existing areas, and protect watersheds. The compact size of tree box filters allows volume and water quality control to be tailored to specific site characteristics. Tree box filters provide the added value of aesthetics while making efficient use of available land for stormwater management. Typical landscape plants (for example, shrubs, ornamental grasses, trees and flowers) are an integral part of the bioretention system. Ideally, plants should be selected that can withstand alternating inundation and drought conditions and that do not have invasive root systems, which may reduce the soil's filtering capacity.



Stormwater planters

Stormwater planters are small landscaped stormwater treatment devices that can be placed above or below ground and can be designed as infiltration or filtering practices. Stormwater planters use soil infiltration and biogeochemical processes to decrease stormwater quantity and improve water quality, similar to rain gardens and green roofs but smaller in size—stormwater planters are typically a few square feet of surface area compared to hundreds of square feet for rain gardens. They include an underdrain to encourage filtration and reduce the duration of standing water and an overflow system that prevents water from spilling over into yards and roads. Types of stormwater planters include contained planters, infiltration planters, and flow-through planters.



Bio-swale

Bio-swales are bands of dense vegetation planted downstream of a runoff source. The use of natural or engineered filter strips is limited to gently sloping areas where vegetative cover can be established and channelized flow is not likely to develop. Bio-swales are well suited for treating runoff from roads, roof downspouts, driveways, and impervious surfaces. They are also ideal components for the fringe of a stream buffer, or as pretreatment for a structural practice.



Infiltration trenches

Infiltration trenches are rock-filled ditches with no outlets. These trenches collect runoff during a storm event and release it into the soil by infiltration (the process through which stormwater runoff penetrates into soil from the ground surface). Infiltration trenches may be used in conjunction with another stormwater management device, such as a bio-swale, to provide both water quality control and peak flow reduction.



Sources

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