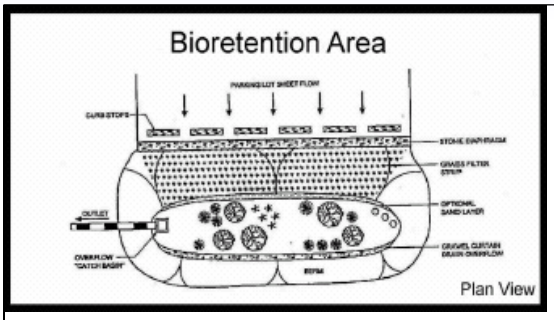
3.1 Bioretention Area

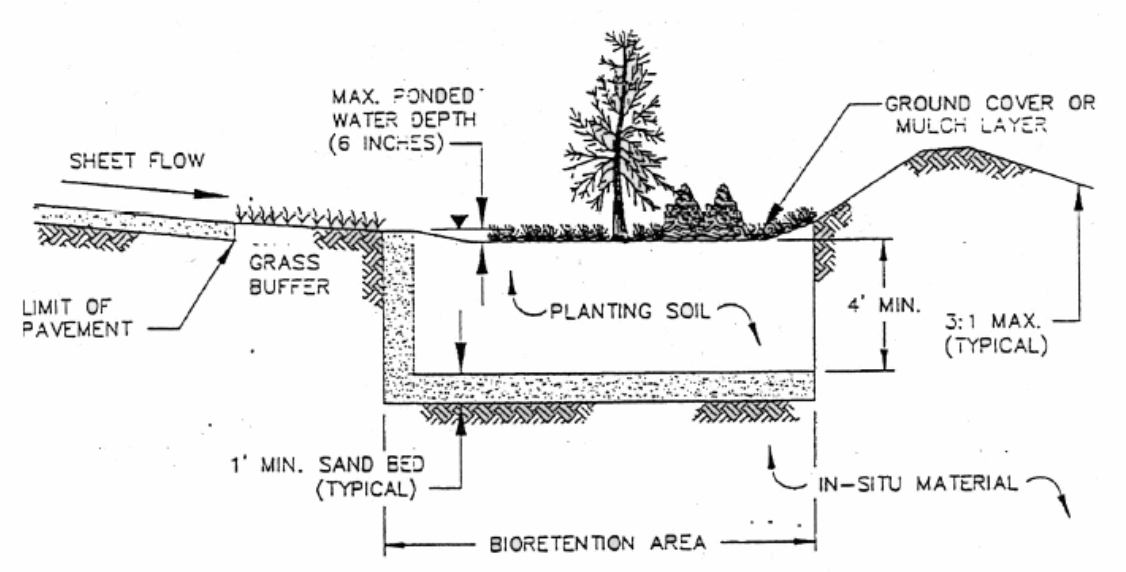


Bioretention Area at 63rd Street and Platte. Lincoln

Description	Bioretention areas are soil- and plant-based stormwater management practices that filter runoff from developed sites by mimicking natural vegetated systems; these naturally control hydrology through infiltration and evapotranspiration. A typical application for a bioretention area is to infiltrate and treat surface runoff from parking lots, in which the bioretention area may consist of a recessed, slotted-curb parking island. Bioretention areas are small vegetated depressions into which surface water is diverted. Stormwater flows into the bioretention area, ponds on the surface, and gradually infiltrates into the soil bed. Pollutants are removed by processes that include adsorption, filtration, volatilization, ion exchange, and decomposition. Treated water is allowed to infiltrate into the surrounding soil, or is collected by an underdrain system and discharged to the stormwater system or directly to receiving waters.
Effectiveness	Improves water quality. According to estimates, bioretention areas have the potential to remove 90 percent of suspended solids, 65 percent of phosphorous, 50 percent of nitrogen, and 80 percent of metals from stormwater.
Advantages	• Provides effective stormwater flood control by slowing down runoff and increasing water infiltration into the soil. • Minimally consumes land. • Reduces site runoff. • Provides aesthetic enhancement. • Increases groundwater recharge. • Can be used as a stormwater retrofit.
Disadvantages	• Should not be installed until the entire contributing drainage area has been stabilized. • Requires proper plant selection and maintenance.

Disadvantages	• Susceptible to clogging by sediment, may require pretreatment. • Treats a relatively small drainage area.
Implementation Considerations	• Pine mulch and wood chips are not acceptable in the mulch layer because they are displaced during storm events. • Provide clean-out pipes on the underdrain to facilitate cleaning. • Incorporate a uniform mix of the planting soil during construction so that stormwater infiltrates evenly and does not create preferential pathways. • Minimize compaction of the base and planting soil as compaction results in design failure because it reduces infiltration. • Vegetation for the bioretention area should consist of native plant species with hydric tolerances. Do not place woody vegetation near the stormwater inflow location. Plant trees primarily along the perimeter of the bioretention area. • Water should remain on site for less than 48 hours to prevent mosquito breeding.
Cost	Typical costs can be from $0.50 to over $1.00 per cubic foot (USEPA, 1999). Cost range reflects economies of scale in designing detention basins.
Main Design Components	• The surface area of the bioretention system should be between 5 to 10 percent of the impervious area it is draining. • Bioretention areas are best applied to areas with relatively shallow slopes (usually about 5 percent or less). • Bioretention areas can be applied in almost any soils as runoff percolates through a made soil bed and is returned to the stormwater system. It is also possible to design a bioretention system like an infiltration system. • Bioretention should be separated from the water table to ensure that the groundwater does not intersect with the bottom of the bioretention area. A typical bioretention system involves the following components: • Pretreatment: Because bioretention areas are susceptible to clogging from sediments, pretreatment to remove suspended sediments is recommended. • Ponding area: A ponding area provides surface storage of stormwater before it filters through the soil bed. • Organic mulch layer: This layer protects the soil layer from erosion, retains moisture to sustain plants, and provides a medium for biological activity to decompose organic pollutants and adsorb inorganic pollutants. • Planting soil bed: Provides water and nutrients to support plant life in the bioretention system. Stormwater filters through the planting soil bed where pollutants are removed by sorption and biodegradation. • Under-drain: An under-drain is a perforated pipe in a gravel bed installed along the bottom of a sand bed to collect and filter stormwater directing it to an outflow or stormwater systems.

Main Design Components	• Provide redundant overflow structures to convey flow from large storms to the storm drain system. • Plants: Plants are an important component of a bioretention system. They remove water through transpiration, remove pollutants, enhance soil biological activity, and promote water infiltration. The plant species selected should replicate a native forest or grassland system, and be able to survive flooded conditions.



Example of the Basic Lay-Out of a Bioretention System