



BIORETENTION

FACT SHEET

Bioretention is a shallow basin or landscaped depression designed to store, infiltrate and treat stormwater runoff. It is excavated and backfilled with well-draining, engineered soil media and planted with native vegetation, grasses or sod. Bioretention systems can also enhance habitat, mitigate for heat island effects and improve water quality.

They are designed to temporarily hold (24 hours post rain event) and slowly infiltrate stormwater runoff. Bioretention systems use many pollutant removal mechanisms (i.e., infiltration, absorption, adsorption, evapotranspiration, microbial and biological decomposition, plant uptake, sedimentation and filtration) to improve stormwater quality prior to it leaving the system. Filtered runoff can exfiltrate into surrounding native soils, or these systems can be designed to use an underdrain to collect and return filtered runoff to the conveyance system. Bioretention systems are most effective when used to treat small to moderate quantities of stormwater.

As with any type of infrastructure, bioretention and other green infrastructure practices require maintenance to ensure continued functionality. Key maintenance activities include stabilizing erosion and removal of sediment, trash and debris, particularly if inlet or outlet structure openings are impeded. General inspections and assessment of five critical features can keep the practice operational. Visual clues for inspection can be used at any time, but it is ideal to inspect the bioretention system shortly after a moderately-sized rainfall event (~ 1 inch) and, again, 24-hours later to ensure runoff is entering the bioretention cell and infiltrating.

Bioretention systems are often visual additions to the landscape and while the vegetation has a role in supporting pollutant removal, the plant health and plant density is related to the overall aesthetic value. Rating these conditions is highly subjective. When possible reference a landscaping plan and the overall site objectives.

BIORETENTION POLLUTANT REMOVAL¹

85%	of suspended solids
80%	of phosphorus
60%	of nitrogen
90%	of fecal coliform
95%	of metals



Resources are required to inspect and properly maintain bioretention systems. The maintenance cost as a percentage of capital cost is estimated at 5–7%.²

A 2015 report by American Society of Civil Engineers found the median annual maintenance cost for bioretention was \$0.68/sq. ft. (range of \$0.13 to \$2.30/sq. ft.) and median cost of \$850/yr. per location.³

¹ Georgia Stormwater Management Manual. Atlanta, 2016. 2016 Edition. <https://atlantaregional.org/natural-resources/water/georgia-stormwater-management-manual/>

² USEPA (1999). "Preliminary data summary of urban stormwater best management practices." EPA-821-R-99-012, Washington, DC.

³ Clary, J. and Piza, H. (2017). "Cost of Maintaining Green Infrastructure." ASCE. Reston, VA.



For more a more detailed inspection checklist reference:

gacoast.uga.edu/stormwater-management

Five Critical Features to Inspect

- 1 Drainage Area**

The drainage area and surrounding landscape that will contribute runoff to the practice is essential to its overall function. Unstable areas that are sources of sediment or drainage ways, including overland flow and pipes, that have pollutants such as trash, debris, sediment, and grass clippings can hinder the performance of the bioretention cell by clogging the main treatment area or contributing additional nutrient and pollutant loads.
- 2 Inlet Structures or Pretreatment Device**

There are various types of inlet structures and pretreatment devices such as forebays, weirs, filter strips, grass channels and rock-lined plunge pools. If these structures are impeded or there is evidence of erosion or that runoff is not entering the cell (i.e., short-circuiting) maintenance is required to restore function. It is important to confirm that these structures are configured properly to maintain longevity of the bioretention media.
- 3 Main Treatment**

The surface of the bioretention system is the primary location for infiltration of stormwater. Physical clues such as accumulation of fine sediment, stains, mosquito larvae or plant stress are evidence of surface clogging and subsequent maintenance needs. The vegetation is an important part of the practice because it aids in infiltration, evapotranspiration and pollutant uptake, and it provides aesthetic appeal.
- 4 Underdrain**

Not all bioretention systems are designed with an underdrain; however, cleanouts are good indicators. If cleanout caps are broken or missing, runoff could short-circuit through the system. If there are signs of an underdrain blockage, a professional may be required to complete the necessary maintenance.
- 5 Emergency Overflow or Outlet Structure**

Emergency overflows and outlet structures are necessary for rain events that are larger than the bioretention system was designed to treat. There is often a safety risk associated with the failure of these features and any signs of blockages or structural damage should be addressed immediately following inspection. It is important to confirm that these are configured for the bioretention cell to allow for the appropriate maximum and average surface ponding depth.