

4.3 Bioretention (Rain Gardens)

Bioretention, also referred to as a rain garden or porous landscape detention, utilizes soil, plants, and microbes to treat stormwater runoff before it is either infiltrated or discharged. Bioretention facilities filter stormwater in an aesthetically pleasing manner. For most storms, water should fully drain out of a bioretention facility in 12 hours to 24 hours.

4.3.1 Functional Description

Rain gardens have six main components: inflow points (inlets), energy dissipaters, filter (or growing) media, underdrain, outlet structure, and containment walls. Inflow points are any point where water enters the rain garden, often through a pipe roof downspout, surface channel, or a curb cut. Energy dissipation devices, typically riprap, are designed to reduce erosion of filter media near the inlet.

Growing media removes pollutants as stormwater filters through the particle void space and is designed to support the growth of selected plants that filter water and provide a more pleasing aesthetic. The growing media inside a rain garden must comply with the specifications as described in MHFD BMP Fact Sheet T-3, *Bioretention*, and care should be taken to adhere to the same specifications when replacement of the media is required. The time required for water discharging into a rain garden to being fully absorbed and filtered will typically take no more than 12 hours. If the drain time exceeds 24 hours, the facility should be inspected for clogging.

Underdrains prevent stormwater runoff from discharging to groundwater by capturing stormwater underneath the filter material and directing it to the outlet structure. Not all rain garden facilities have underdrains. Outlet structures discharge excess water that exceeds the storage capacity of the rain garden and water from the underdrain (if present) into the storm drain system. Containment walls surrounding the sand media create an artificial shallow pool for the containment of water.

4.3.2 Inspection Requirements

Rain gardens should be inspected at least twice per year following a precipitation event. If standing water remains for more than 24 hours after a precipitation event, clogging may be an issue. The site should also be checked for the potential movement of riprap (if present), erosion at either the inlet or outlet, sediment buildup that blocks or impairs the inlet, and buildup of debris and trash at the outlet structure. Vegetation should also be inspected to ensure proper growth and health of the plants and to check for any undesired weeds growing in the filter material.

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4.3.3 Maintenance

4.3.3.1 Routine Maintenance

Debris and trash removal should be completed regularly and should be removed from the inlet, surrounding vegetation, and the outlet structures.

Only vegetation specified in the original design drawings of the facility should be in the rain garden. All other vegetation should be considered weeds and removed immediately if noticed during an inspection or other maintenance. Weeding should be performed as often as necessary. Grasses should be allowed to establish before mowing, or mowing should be accomplished with hand-held string trimmers.

Irrigation may be required throughout the growing season to maintain healthy vegetation. This may be performed as necessary and may not be needed on native grasses and drought-tolerant vegetation. If using an irrigation system, inspect sprinkler heads for damage and repair them as required. Irrigation systems need to be drained during the winter months.

Sediment should be removed from inlets periodically. While this may be a minimal volume of sediment, if ignored, it can lead to significant blockage of the inlet and impede the filter material. Sediment should also be removed from energy dissipation components to prevent similar issues. Waste sediment may be contaminated with various pollutants and must be disposed of properly.

If the rain garden contains wood mulch, the mulch should only be replaced as needed to maintain a maximum depth of approximately 3 inches. Excess mulch will reduce the volume available for storage and may impede inlets and outlets. Fertilizer should be applied minimally, if at all; once vegetation is established, it may not be necessary.

4.3.3.2 Minor and Major Improvements

Maintenance activities to repair rain garden sediment and filtration media will vary with the facility's nature and design. If clogging is primarily related to sediment accumulation on the surface of the filter media, it may be as simple as raking the media or scraping off the top layer of clogged sediment. If the clogging is more significant, it may require the partial or complete removal and replacement of the growing media. Plants should be preserved if possible in order to speed up recovery times. If the issue involves the underdrain system, the growing media and vegetation may need to be replaced along with the underdrain. Erosion and structural repairs do not have a specified frequency for maintenance but should be addressed immediately anytime either are noted during an inspection.

Table 4-3. Bioretention and Rain Gardens: Common Indicators of Required Maintenance

Component	Hazard	Indicator	Solution
Inflow Structure (Inlet)	Debris	Pile of trash mixed with sediment	Shovel out trash and sediment and dispose of properly.
	Undesired Vegetation	Large woody vegetation surrounding the pipe	Chainsaw and root removal should be used to prevent damage to concrete.
	Erosion	Gaps between components or often these gaps will be filled with dirt. Cracked concrete	Minor repair may require adding energy dissipation techniques such as riprap or concrete patching. Major repairs may require an engineer and heavy equipment.
	Blockage	Sediment or filter media above the level of the inlet that impedes flow. Ponding of water outside of the inlet	Immediate removal of the sediment and filter media that is impeding the flow.
Energy Dissipater	Debris and sediment	Ponding of water, visible trash, and noxious smells	Removal of trash and sediment using proper methods.
	Any Vegetation	Any vegetation in the energy dissipation components (also a sign that sediment may need to be removed)	Immediate removal of vegetation and sediment if necessary.
	Weathering	Cracking of concrete	Concrete patching.
	Riprap migration	Riprap stones found elsewhere in the sand trap beyond the original design area. Riprap stones are missing.	Movement of the displaced riprap back to the original location of riprap. If this is a repeated issue, it is recommended that the current riprap is replaced with larger D50 riprap.

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Component	Hazard	Indicator	Solution
Filter Media	Debris	Visible trash	Immediate removal of trash and restoration of any damaged media.
	Weeds	Unwanted vegetation that does not match original plants or resembles a weed	Complete plant removal of weeds, including roots.
	Erosion and grading	Rain garden media is no longer smooth and flat and now possesses grooves or drainage channels	Replacement of lost filter media and likely maintenance of the inlet and energy dissipaters is required. For grading issues, simple raking might be sufficient.
	Snow storage	Snow storage evidence present in the winter and spring	Contact snow removal companies or the City and instruct them to no longer store snow there.
	Oil/Chemical Sheens	Visible sheen on filter or water surface, gas, or chemical smell	May indicate a possible illicit discharge inside of the watershed. Contact the stormwater authority immediately.
Underdrain	Sediment buildup or blockage	Rain garden no longer drains fully in the 24-hour period after a storm, no matter the amount of filter material replacement that happens	Recommend removing sediment to access the underdrain and then replacing the underdrain. New filter media should be used after the underdrain is replaced.
Outlet Structure	Debris	Well screen, orifice plate, and or trash rack are all visibly covered in trash and debris	Cleaning to remove trash.
	Removed or missing parts	Any of the designed parts are moved or missing from previous inspections and design drawings	Replace part and securely fasten down access. Repetitive loss resulting from repeated vandalism may require contacting law enforcement.