Bioretention Factsheet

1.0 General Description

Figure 1. Bioretention

Potential Treatment Mechanisms								
I	ET	FA	B	RH	S	F	P	T
✓*	✓	✓	✓		✓		✓	✓

Legend: I = Infiltration; ET = Evapotranspiration; FA = Filtration and/or Adsorption; B = Biochemical Transformation; RH = Rainfall and Runoff Harvest; S = Sedimentation; F = Floatation; P = Plant Uptake; T = Trash Capture

*For unlined systems

Bioretention planters are depressed landscapes into which runoff is directed and allowed to collect, filter, and sometimes infiltrate. These planters come in a variety of configurations. All include a few inches of ponding depth (often 4 to 6 inches). A raised inlet allows a means of bypass in case of overflows. Under the ponding zone is the planting zone. The planting zone is constructed using various media blends that support growth and filter and retain pollutants. Mulch is sometimes applied over the planting zone for plant health and weed management. The ponding zone temporarily stores runoff and promotes percolation into the planting mix and bioretention mix below. In addition to storing the runoff in its pore structure, the bioretention mix filters and biotreats the runoff. In some configurations, water drains into a subsurface storage layer (typically gravel or porous road base) below the bioretention mix. These systems are preferably unlined to allow infiltration into the underlying native soils. A perforated underdrain can be located at the top of the storage component to reduce the amount of untreated overflows that can occur where the soil type or available area limit infiltration. A schematic of this configuration is shown in Figure 2.

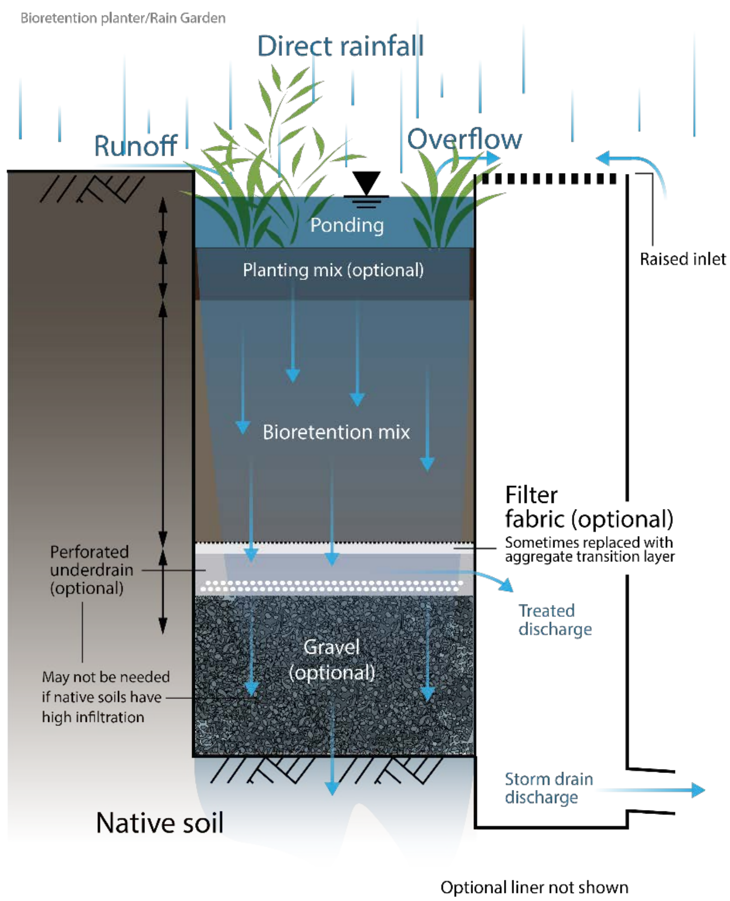

Figure 2. Schematic of a basic bioretention planter

Topsoil may or may not be used within the planters. Some practitioners argue topsoil is necessary for plant growth in some climates, while others believe it is not needed and hinders infiltration. Some use a geotextile fabric placed below the bioretention mix in configurations with gravel storage to prevent the smaller-sized bioretention mix particles from migrating into the storage zone and possibly escaping via the underdrain. Alternatively, to avoid possible fabric clogging, some practitioners use a transitional-sized aggregate or a porous base with smaller pore spaces than gravel.

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1.1 Variations and Alternative Names

- Rain gardens
- Lined bioretention planters
- Infiltrating stormwater planters
- Bioretention cells/planters
- Vegetated filters
- Biotreatment

2.0 ADVANTAGES & LIMITATIONS

2.1 Advantages

- ✓ When done well, rain gardens can be both inexpensive and add aesthetic appeal
- ✓ Can create habitat
- ✓ Can be used in areas with limited space
- ✓ Can optimize load reduction by allowing both infiltration and filtration (treat and discharge) components

2.2 Limitations

- ✗ Requires terracing for steeper slopes
- ✗ Limited to a small contributing drainage area

3.0 SITING

The site should be relatively flat and, in some climates, irrigation should be available during the dry season.

4.0 DESIGN CONSIDERATIONS

When designing a bioretention planter or rain garden, the following parameters should be considered:

- ❑ Contributing drainage area
- ❑ Flat layers (no slope)
- ❑ Design volume
- ❑ Drawdown time
- ❑ Transitional side slopes
- ❑ Surcharge depth
- ❑ Soil types and media
- ❑ Layer depths (ponding, planting, and subsurface storage)
- ❑ Area
- ❑ Underdrain
- ❑ Overflow
- ❑ Containment curb/curb cuts (optional)
- ❑ Precise inlet, overflow, and media depth elevations
- ❑ Hydraulic soil group of existing subsurface material at final excavation depth
- ❑ Planting mix design
- ❑ Storage layer:
    - o Usually when underdrain is used
    - o Media type
    - o Media depth
- ❑ Liners for high groundwater or contaminated soils
- ❑ Soils testing of delivered fill material

5.0 CONSTRUCTION CONSIDERATIONS

- ❑ Stabilize drainage area or divert any flows to prevent sediment loading and/or erosion during construction

- ❑ Replace plants damaged during construction
- ❑ Provide temporary irrigation until plants are established
- ❑ Ensure correct elevation before and during concrete work

6.0 MAINTENANCE

- ❑ Plant management
  - o Identification and promotion of desired species
  - o Removal of unwanted species (not all volunteer species are undesirable)
  - o Increased plant density can decrease weeds
- ❑ Litter removal (for areas prone to litter)
- ❑ Inspections for standing water to prevent mosquitos and other vector breeding
  - o Top layer of the planter may need to be replaced if standing water becomes a chronic issue

7.0 REFERENCES

California Stormwater Quality Association (CASQA 2003). *Stormwater Best Management Practice Handbook: New Development and Redevelopment*. January 2003.

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