

C.2.5 RAIN GARDEN

Rain gardens, also known as "**bioretention**," are excavated or otherwise formed depressions in the landscape that provide for storage, treatment, and infiltration of stormwater runoff. The soil in the depression is enhanced to promote infiltration and plant growth. Plants adapted to wet conditions are planted in the enhanced soil. Figure C.2.5.A (p. C-58) shows a plan view and section of a typical rain garden system.

Applicable Surfaces

Subject to the minimum design requirements and specifications in this section, rain gardens may be applied to any impervious surface such as a roof, driveway, parking area, road, or sidewalk, and to any non-native pervious surface such as a lawn, landscaped area, or pasture.

Design Considerations

Rain gardens may overflow occasionally in large storm events or more frequently if located in very poorly drained soils or areas with very high water tables. In very well-drained soils, water may drain too quickly to support water loving plants and ponding may be of short duration. Conditioning the soil in the rain garden with abundant compost will enhance the growth of plants and help the soil to more readily admit water.

Operation and Maintenance

See Section C.2.5.3 (p. C-60).

C.2.5.1 MINIMUM DESIGN REQUIREMENTS

All of the following requirements must be met in order for a rain garden to be applicable to a *target impervious surface* or *new pervious surface*:

1. A **minimum water storage volume** equivalent to 3 inches (0.25 feet) of runoff depth from the impervious surface area served is required. In other words, the volume in cubic feet shall equal 0.25 times the square footage of the impervious surface area served (see example calculation in Section C.2.5.2 below). For rain gardens serving *new pervious surface*, a minimum water storage volume equivalent to 0.5 inches (0.04 feet) of runoff depth is required.
2. The **water storage area**, containing the minimum required storage volume, shall be 12 inches deep at overflow and have side slopes no steeper than 3 horizontal to 1 vertical. The overflow point of the water storage area shall be at least 6 inches below any adjacent pavement area. The overflow point must be situated so that overflow does not cause erosion damage or unplanned inundation.
3. If a **containment berm** is used to form the water storage area, the berm must be at least 2 feet wide and 6 inches above the 12 inches of water depth. A **catch basin** or **rock pad** must be provided to release water when the pond's water level exceeds the 12 inches of water depth. The catch basin may discharge to the local drainage system or other acceptable discharge location via a 4-inch rigid pipe. The rock pad may be used with or without a constructed drainage system downstream. If a rock pad is used, it must be composed of crushed rock, 6-inches deep and 2 feet wide (perpendicular to flow) and must extend at least 4 feet or beyond the containment berm, whichever is greater. The rock pad must be situated so that overflow does not cause erosion damage or unplanned inundation.
4. **Amended soil** consisting of minimum of 4 inches of compost tilled into the upper 12 inches of soil or 12 inches of imported sand/compost blend is required in the rain garden. Tilling and amending to greater depth is desirable.
5. **Water tolerant plants** such as those in Table C.2.5.A shall be planted in the pond bottom. Plants native to Western Washington are preferred.

6. A minimum 5-foot **setback** shall be maintained between any part of a rain garden and any structure or property line.
7. Rain gardens are not allowed in critical area **buffers** or on **slopes** steeper than 20%. Rain gardens proposed on slopes steeper than 15% or within 50 feet of a **steep slope hazard area** or **landslide hazard area** must be approved by a **geotechnical engineer** or **engineering geologist** unless otherwise approved by the DDES staff geologist.
8. For **sites** with **septic systems**, rain gardens must be located downgradient of the primary and reserve drainfield areas. DDES permit review staff can waive this requirement if site topography clearly prohibits subsurface flows from intersecting the drainfield.
9. The rain garden must not create **flooding or erosion impacts** as determined by the DDES. If a rain garden is proposed near a **landslide hazard area**, **erosion hazard area**, **steep slope hazard area**, or a slope steeper than 15%, DDES may require evaluation and approval of the proposal by a **geotechnical engineer** or **engineering geologist**.

TABLE C.2.5.A WATER TOLERANT PLANTS		
Common Name	Scientific Name	Spacing (on center)
Western manna grass	<i>Glyceria occidentalis</i>	seed
Velvetgrass	<i>Holcus mollis</i>	seed
Shortawn foxtail	<i>Alopecurus aequalis</i>	seed
Water foxtail	<i>Alopecurus geniculatus</i>	seed
Spike rush	<i>Eleocharis spp.</i>	4 inches
Slough sedge	<i>Carex obnupta</i>	6 inches or seed
Sawbeak sedge	<i>Carex stipata</i>	6 inches
Sedge	<i>Carex spp.</i>	6 inches
Slender rush	<i>Juncus tenuis</i>	6 inches
Water parsley	<i>Oenanthe sarmentosa</i>	6 inches
Hardstem bulrush	<i>Scirpus acutus</i>	6 inches
Watercress	<i>Rorippa nasturtium-aquaticum</i>	12 inches
Small-fruited bulrush	<i>Scirpus microcarpus</i>	12 inches

C.2.5.2 EXAMPLE SIZING CALCULATION

Runoff Source: 20-foot by 20-foot driveway

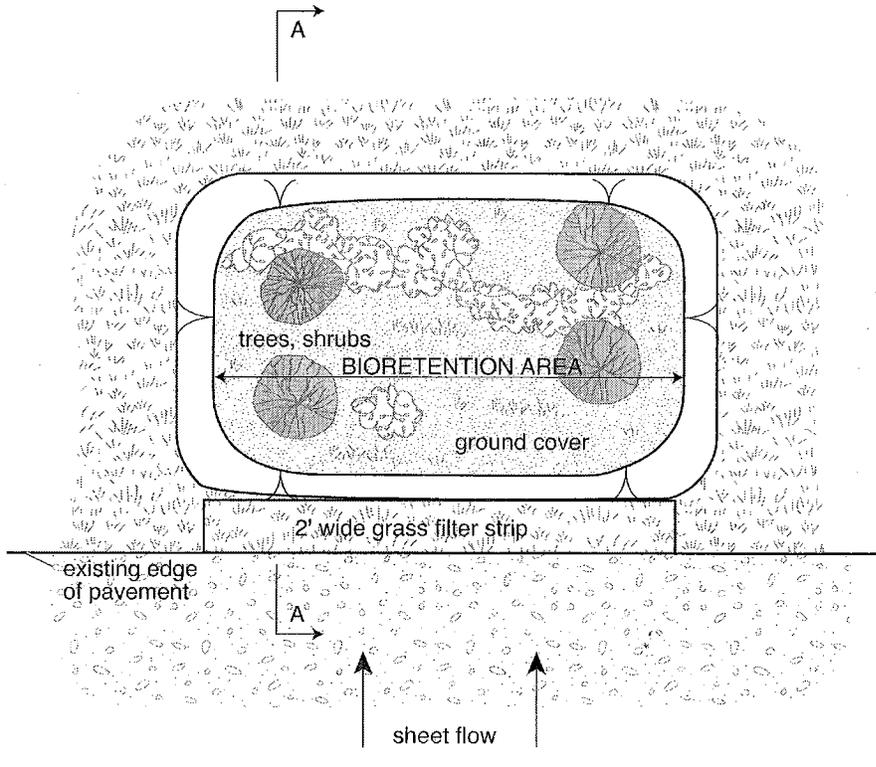
Minimum Storage Required = 3 inches (0.25 feet)

Storage Volume Needed = 20 feet x 20 feet x 0.25 feet = 100 cubic feet

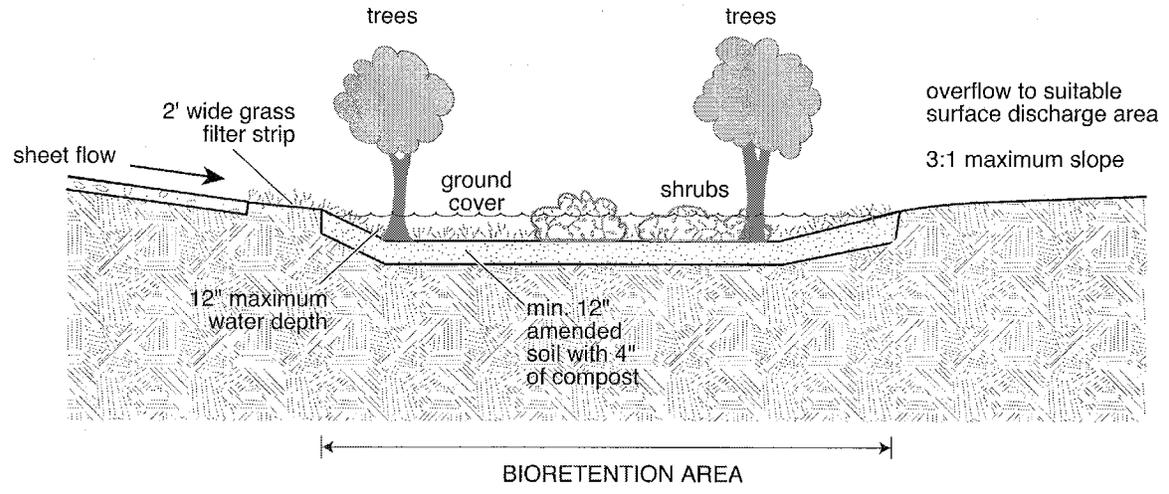
Pond Design: Choosing a 1 foot depth with 3:1 side slopes and a bottom area of 4 feet x 10 feet provides a storage volume of 100 cubic feet.

Note that if the soil percolation rate is 0.5 inches per hour, a pond 1-foot deep will take 24 hours to drain when filled. Similarly, a small storm of 0.5 inches would produce a depth of about 3 inches and drain in 6 hours.

FIGURE C.2.5.A TYPICAL RAIN GARDEN (BIORETENTION POND)

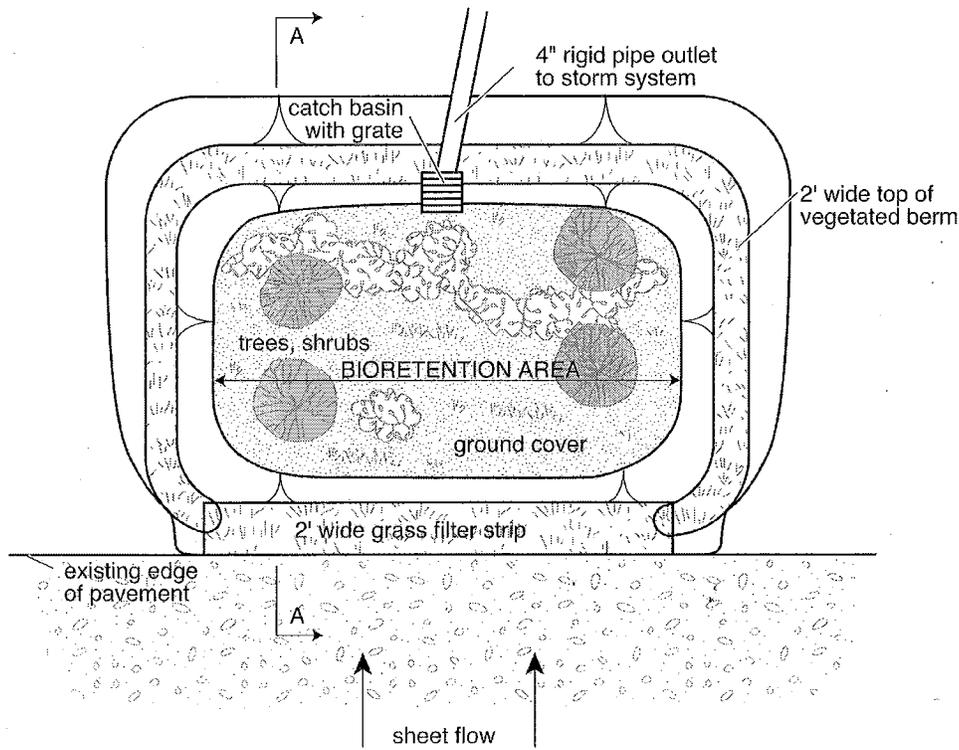


PLAN VIEW (not to scale)

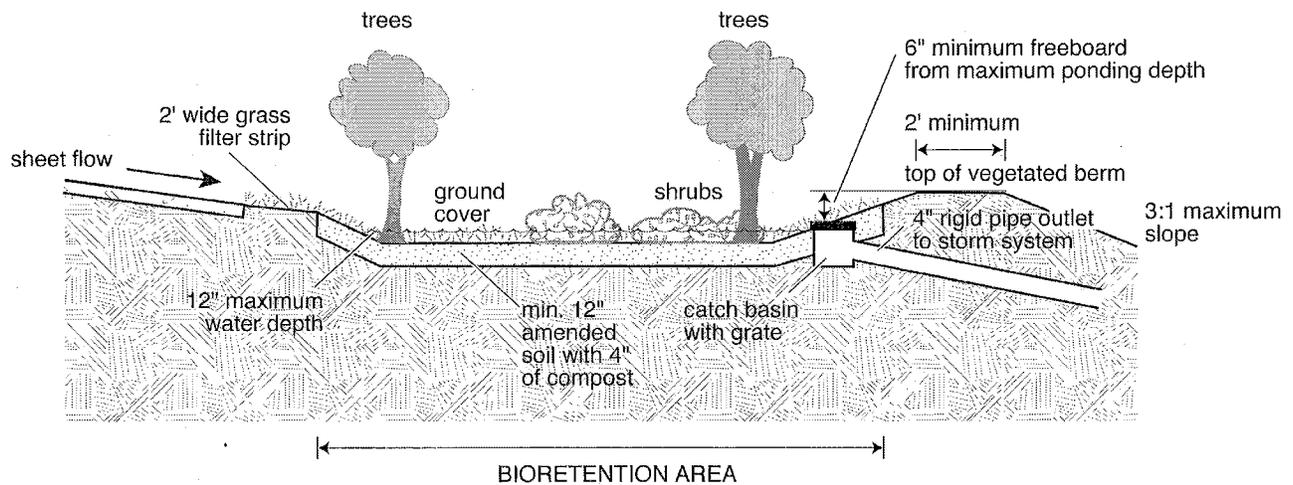


SECTION VIEW A-A (not to scale)

FIGURE C.2.5.B TYPICAL RAIN GARDEN WITH CONTAINMENT BERM



PLAN VIEW (not to scale)



SECTION VIEW A-A (not to scale)

C.2.5.3 MAINTENANCE INSTRUCTIONS FOR A RAIN GARDEN

If the rain garden flow control BMP is proposed for a project, the following maintenance and operation instructions must be recorded as an attachment to the required **declaration of covenant and grant of easement** per Requirement 3 of Section C.1.3.3 (p. C-18). The intent of these instructions is to explain to future property owners, the purpose of the BMP and how it must be maintained and operated. These instructions are intended to be a minimum; DDES may require additional instructions based on site-specific conditions. Also, as the County gains more experience with the maintenance and operation of these BMPs, future updates to the instructions will be posted on King County's *Surface Water Design Manual* website.

□ TEXT OF INSTRUCTIONS

Your property contains a stormwater management flow control BMP (best management practice) called a "rain garden," which was installed to mitigate the stormwater quantity and quality impacts of some or all of the impervious or non-native pervious surfaces on your property. Rain gardens, also known as "bioretention," are vegetated closed depressions or ponds that retain and filter stormwater from an area of impervious surface or non-native pervious surface. The soil in the rain garden has been enhanced to encourage and support vigorous plant growth that serves to filter the water and sustain infiltration capacity. Depending on soil conditions, rain gardens may have water in them throughout the wet season and may overflow during major storm events.

The size, placement, and design of the rain garden as depicted by the flow control BMP site plan and design details must be maintained and may not be changed without written approval either from the King County Water and Land Resources Division or through a future development permit from King County. Plant materials may be changed to suit tastes, but chemical fertilizers and pesticides must not be used. Mulch may be added and additional compost should be worked into the soil over time.

Rain gardens must be inspected annually for physical defects. After major storm events, the system should be checked to see that the overflow system is working properly. If erosion channels or bare spots are evident, they should be stabilized with soil, plant material, mulch, or landscape rock. A supplemental watering program may be needed the first year to ensure the long-term survival of the rain garden's vegetation. Vegetation should be maintained as follows: 1) replace all dead vegetation as soon as possible; 2) remove fallen leaves and debris as needed; 3) remove all noxious vegetation when discovered; 4) manually weed without herbicides or pesticides; 5) during drought conditions, use mulch to prevent excess solar damage and water loss.