

### M-7. Rain Gardens

A rain garden is a shallow, excavated landscape feature or a saucer-shaped depression that temporarily holds runoff for a short period of time. Rain gardens typically consist of an absorbent-planted soil bed, a mulch layer, and planting materials such as shrubs, grasses, and flowers. An overflow conveyance system is included to pass larger storms. Captured runoff from downspouts, roof drains, pipes, swales, or curb openings temporarily ponds and slowly filters into the soil over 24 to 48 hours.

#### Applications:

Rain gardens can be primary or secondary practices on residential, commercial, industrial, or institutional sites. This practice is typically used to treat runoff from small impervious areas like rooftops, driveways, and sidewalks. Rain gardens can also be used in retrofitting and redevelopment applications and in series where existing slopes require energy dissipation.

#### Performance:

The  $P_E$  values determined by Equation 5.3 may be applied to the ESD sizing criteria when rain gardens are designed according to the guidance provided below.  $Re_v$  requirements are also met when the  $P_E$  from Equation 5.3 meets or exceeds the soil specific recharge factor listed in Section 2.2.

#### Constraints:

The following constraints are critical when considering the use of rain gardens to capture and treat stormwater runoff:

- **Topography:** Rain gardens require relatively flat slopes (< 5%) to accommodate runoff filtering through the system. Some design modifications can address this constraint through the use of infiltration berms, terracing, and timber or block retaining walls on moderate slopes.
- **Soils:** Clayey soils or soils that have been compacted by construction equipment greatly reduce the effectiveness of this practice. Loosening of compacted soils may improve drainage capability.
- **Drainage Area:** The drainage area to a rain garden should be relatively small, typically less than 2,000 square feet.
- **Infrastructure:** The location of existing and proposed buildings and utilities (e.g., water supply wells, sewer, storm drains, electricity) will influence rain garden design and construction. Landscape designers should also consider overhead electrical and telecommunication lines when selecting trees to be planted.

➤ **Location:**

- Lot-by-lot use of rain gardens is not recommended in residential subdivisions due to removal by homeowners. If used on a lot-by-lot basis, educating the homeowners will be needed to prevent removal.
- Rain garden excavation in areas with heavy tree cover may damage adjacent tree root systems.

**Design Guidance:**

The following conditions should be considered when designing rain gardens:

- **Conveyance:** *Runoff shall enter, flow through, and exit rain gardens in a safe and non-erosive manner. Energy dissipation shall be provided for downspout discharges using a plunge area, rocks, splash blocks, stone dams, etc. Runoff shall enter a rain garden at the surface through grass swales and/or a gravel bed. A minimum internal slope of one percent should be maintained and a shallow berm surrounding the rain garden is recommended to avoid short-circuiting. For sloped applications, a series of rain gardens can be used as “scalped” terraces to convey water non-erosively.*

- **Treatment:** Rain gardens shall meet the following conditions:

- *The drainage area to a rain garden serving a single lot in a residential subdivision shall be 2,000 ft<sup>2</sup> or less. The maximum drainage area to a rain garden for all other applications shall be 10,000 ft<sup>2</sup>. Micro-bioretenion (M-6) or bioretention (F-6) should be considered when these requirements are exceeded.*
- *The surface area (A<sub>f</sub>) of rain gardens shall be at least 2% of the contributing drainage area. A P<sub>E</sub> value based on Equation 5.3 shall be applied to the contributing drainage area. Temporary storage of the ESD<sub>v</sub> may be provided above the facility with a surface ponding depth of 6 inches or less.*

$$P_E = 10" \times \frac{A_f}{DA} \quad (\text{Equation 5.3})$$

- *Excavated rain gardens work best where HSG A and B are prevalent. In areas of HSG C and D, at-grade applications or soil amendments should be considered.*
  - *A minimum six to twelve-inch layer of planting soil shall be provided.*
  - *A mulch layer two to three inches deep shall be applied to the planting soil to maintain soil moisture and to prevent premature clogging.*
  - *The planting soil and mulch shall conform to the specifications found in Appendix B.4.*
- **Landscaping:** *Landscaping plans shall clearly specify how vegetation will be established and managed. A rain garden should be located in full to partial sun, at least two feet above the seasonal high water table and be 12 to 18 inches deep. Plants selected for use in a rain garden should tolerate both saturated and dry conditions and be native or adapted to*

Maryland. Neatly trimmed shrubs, a crisp lawn edge, stone retaining walls, and other devices can be used to keep a rain garden neat and visually appealing.

**Construction Criteria:**

The following items should be addressed during the construction of projects with rain gardens:

- **Erosion and Sediment Control:** *Rain gardens shall not be constructed until the contributing drainage area is stabilized.* During construction, runoff should be diverted and the use of heavy equipment avoided to minimize compaction.
- **Planting Soil:** Planting soil should be mixed on-site prior to installation. If poor soils are encountered beneath the rain garden, a four-inch layer of washed gravel ( $\frac{1}{8}$  to  $\frac{3}{8}$  inch gravel preferred) may be used below the planting soil mix.
- **Landscape Installation:** The optimum planting time is during the Fall. Spring planting is also acceptable but may require watering.

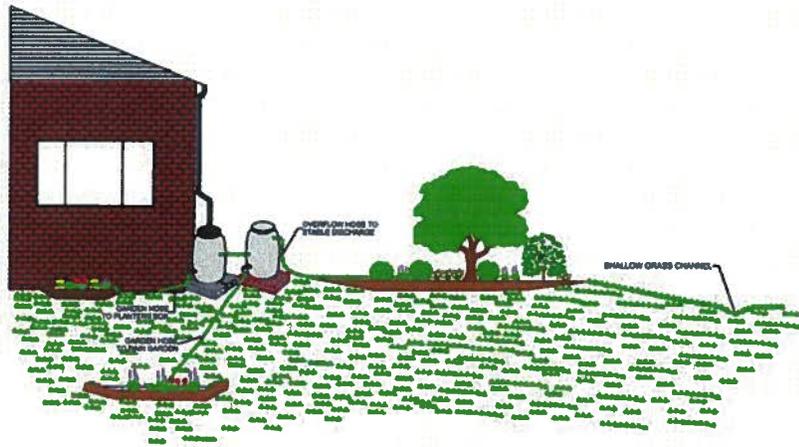
**Inspection:**

- Regular inspections shall be made during the following stages of construction:
  - *During excavation to subgrade and placement of planting soil.*
  - *Upon completion of final grading and establishment of permanent stabilization.*

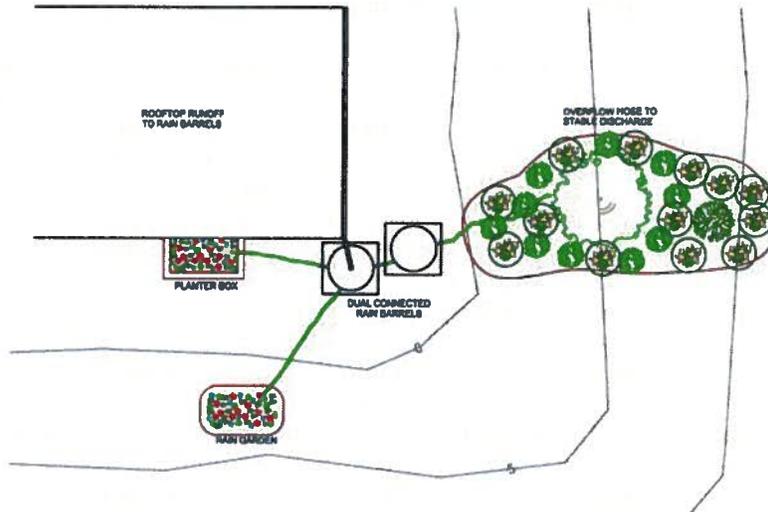
**Maintenance Criteria:** The following items should be addressed to ensure proper maintenance and long-term performance of rain gardens:

- *Privately owned practices shall have a maintenance plan and be protected by easement, deed restriction, ordinance, or other legal measures preventing its neglect, adverse alteration, and removal.*
- Rain garden maintenance is generally no different than that required of other landscaped areas.
- The top few inches of the planting soil should be removed and replaced when water ponds for more than 48 hours. Silts and sediment should be removed from the surface of the bed as needed.
- Where practices are used to treat areas with higher concentrations of heavy metals (e.g., parking lots, roads), mulch should be replaced annually. Otherwise, the top two to three inches should be replaced as necessary.
- Occasional pruning and replacement of dead vegetation is necessary. If specific plants are not surviving, more appropriate species should be used. Watering may be required during prolonged dry periods.

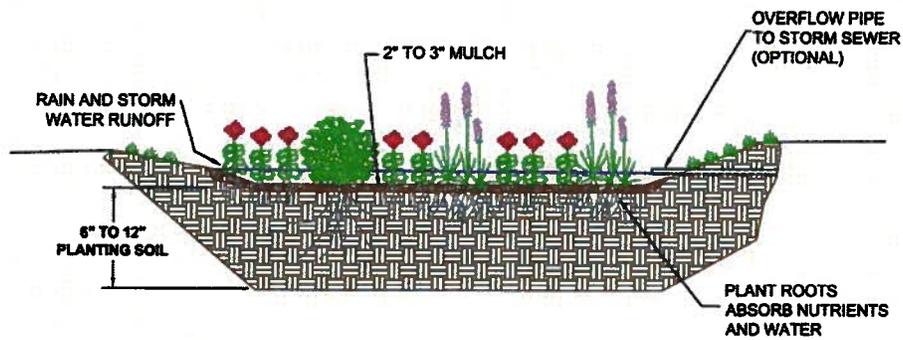
Figure 5.17 Rain Garden



Section



Plan View



Section