

Excerpt from Chapter 7 of Volume IV of the November 2011 Draft of the Stormwater Management Manual for Western Washington

<http://www.ecy.wa.gov/programs/wq/stormwater/wwstormwatermanual/2012draft/DRAFTVolume4Nov2011.pdf>

Default Bioretention Soil Mix:

a. Mineral Aggregate

Table 7.1 provides a gradation guideline for the aggregate component of a BSM specification in western Washington (Hinman, Robertson, 2007). The sand gradation below is often supplied as a well-graded utility or screened and with compost is balanced with enough fines to provide adequate water retention, hydraulic conductivities within recommended range (see below), pollutant removal and plant growth characteristics for bioretention soil mixes.

Table 7.1 – General Guideline for Mineral Aggregate Gradation

Sieve Size	Percent Passing
3/8"	100
#4	95-100
#10	75-90
#40	25-40
#100	4-10
#200	2-5

b. Compost

- Meets the definition of “composted materials” in WAC 173-350, section 220 (including contaminant levels and other standards), available online at <http://www.ecy.wa.gov/programs/swfa/compost/>
- Must have an organic matter content of 35-65%.
- Must have a carbon to nitrogen ratio below 25:1 (the C:N ratio may be as high as 35:1 for plantings composed entirely of plants native to the Puget Sound Lowlands region).
- Produced at a composting facility permitted by the WA Department of Ecology. A current list of permitted facilities is available at <http://www.ecy.wa.gov/programs/swfa/compost/>
- Stable (low oxygen use and CO₂ generation) and mature (capable of supporting plant growth) by tests shown below. This is critical to plant success in a bioretention soil mixes.
- Moisture content range: no visible free water or dust produced when handling the material.
- Tested in accordance with the U.S. Composting Council “Testing Methods for the Examination of Compost and Composting” (TMECC), as established in the Composting Council’s “Seal of Testing Assurance” (STA) program. Most Washington compost facilities now use these tests.
- Screened to the size gradations for Fine Compost under TMECC test method 02.02-B (gradations are shown in the specification in Appendix)
- pH between 6.0 and 8.5 (TMECC 04.11-A)
- Manufactured inert content less than 1% by weight (TMECC 03.08-A)
- Minimum organic matter content of 40% (TMECC 05.07-A)
- Soluble salt content less than 4.0 mmhos/cm (TMECC 04.10-A)
- Maturity greater than 80% (TMECC 05.05-A “Germination and Vigor”)
- Stability of 7 or below (TMECC 05.08-B “Carbon Dioxide Evolution Rate”)
- Carbon to nitrogen ratio (TMECC 04.01 “Total Carbon” and 04.02D “Total Kjeldahl Nitrogen”) of less than 25:1. The C:N ratio may be up to 35:1 for plantings composed entirely of Puget Sound Lowland native species and up to 40:1 for coarse compost to be used as a surface mulch (not in a soil mix).

c. Compost to aggregate ratio and organic matter content

- Compost to aggregate ratio: 60 percent mineral aggregate, 40 percent compost.
- Organic matter content: 5-8 percent by weight.
- Compost and mineral aggregate must be uniformly mixed.

Design Criteria for Custom Bioretention Soil Mixes:

Soil mixes for bioretention areas (typically composed of 60% mineral aggregate and 40% compost by volume in this region) need to balance three primary design objectives to provide optimum performance:

- Provide high enough infiltration rates to meet desired surface water drawdown and system dewatering.
- Provide infiltration rates that are not too high in order to optimize pollutant removal capability.
- Provide a growth media that supports long-term plant and soil health (Hinman, 2009).

Bioretention Soil Mixes must demonstrate compliance with the following criteria:

- CEC = 5 meq/100 grams of dry soil;
- pH between 5.5 and 7.0
- 5 - 8 percent organic matter content;
- 2-5 percent fines passing the 200 sieve;
- Minimum soil depth of 18 inches
- Initial saturated hydraulic conductivity of less than 12 inches per hour
- Long-term saturated hydraulic conductivity of more than 1 inch per hour. Note: Long term shc is determined by applying the appropriate infiltration correction factors as explained below under "Determining Bioretention soil mix infiltration rate."

Soil Depth:

- Soil depth must be a minimum of 18 inches to provide water quality treatment and good growing conditions for selected plants
- A minimum depth of 24 inches should be selected for improved phosphorus and nitrogen (TKN) removal where under-drains are used.