Article 109

Technical Note #3 from Watershed Protection Techniques. 1(1): 13-14

Innovative Leaf Compost System Used to Filter Runoff in Northwest

The use of organic media to filter out stormwater pollutants appears to be a promising direction for urban best management practices. An example is the leaf compost system developed by W&H Pacific in Portland, Oregon. About 30 compost systems have been installed in the Pacific Northwest to treat runoff from small sites. Performance data on a prototype of the compost treatment system has recently become available.

The basic design of the system is shown in Figure 1. Runoff enters a forebay, and then passes into a series of compost treatment cells. Each cell contains a one-foot depth of compost, followed by a filter fabric, a six-inch layer of small diameter rock, and two inches of pea gravel. Runoff filters through the compost and is then collected by a perforated pipe and directed toward the outlet. The slope from the inlet to the outlet of the hundred foot long filter bed is two percent and requires about three feet of head. Like most stormwater filtering systems, the filter bed and subsoils are separated by an impermeable polyliner.

The filter system served a 74-acre mixed-residential watershed, and was sized to provide 200 square feet of surface area per cfs of incoming flow. The local target for runoff treatment is to capture one-third of the two year design flow. This roughly translates to about 0.10 watershed-inches of storage, assuming a 2.25 gpm/ft^2 rate for the first 30 minutes of runoff.

The key to good performance is proper selection of compost. A suitable compost has the following characteristics:

- Mature (i.e., organic matter no longer rapidly degrades)
- Hemic
- Low contaminant levels
- High permeability
- Locally obtainable at a reasonable cost

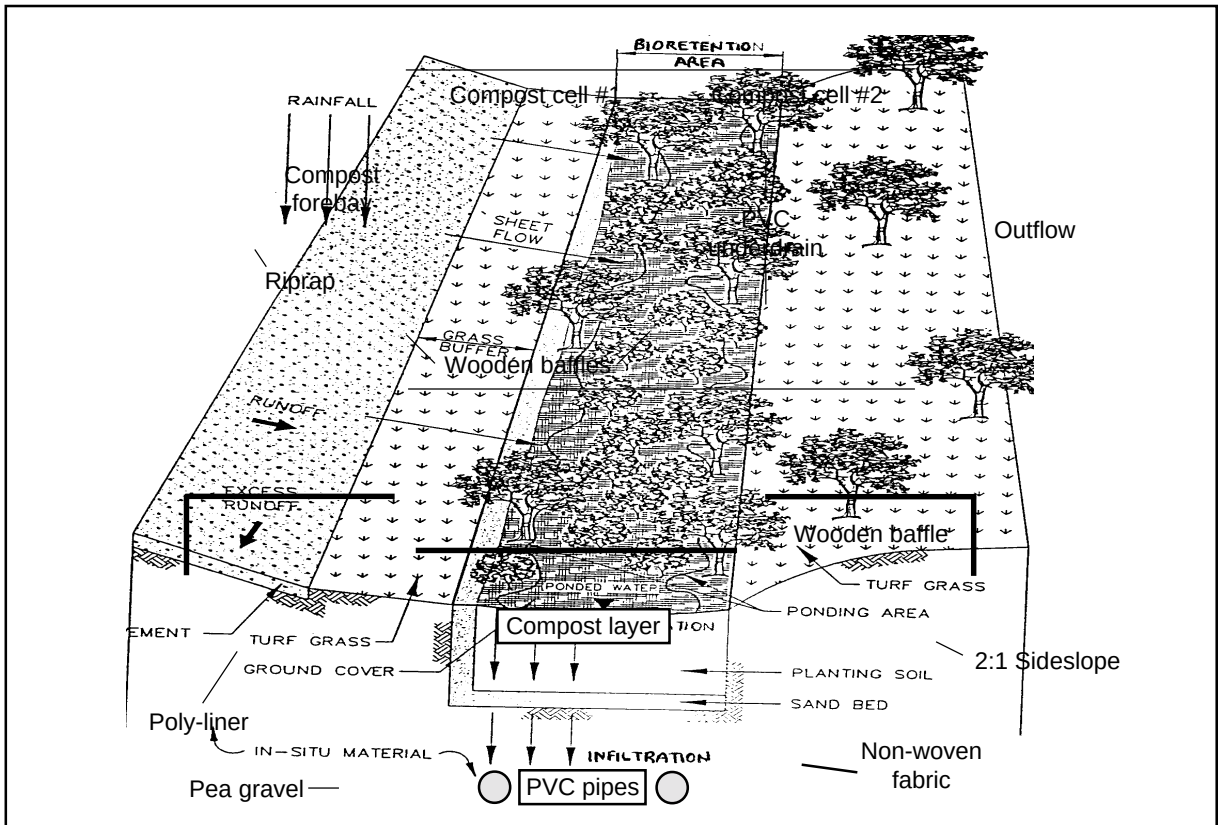

Figure 1: Plan View and Cross-Section of the Leaf Compost Treatment System (Stewart, 1992)

After extensive testing, the authors selected leaf compost as the ideal medium. It was available from a city compost system at about $10.00 per cubic yard. In contrast, compost derived from yard wastes met many of these criteria, but failed leaching tests.

The pollutant removal performance of the prototype was computed based on flow composite monitoring of seven storm events (Table 1). The system provides excellent removal of sediment, particulate nutrients, organic carbon, hydrocarbons and some heavy metals. Total dissolved solids, however, increase after passing through the compost filter, which appears to reflect the exchange and/or leaching of cations within the compost. Similarly, while particulate nutrient forms are trapped within the compost, the system exports soluble forms of nutrients, such as nitrate and soluble phosphorus. Subsequent monitoring in 1992 has confirmed that these removal rates can be equalled or exceeded. In general, the compost system was most effective during the first flush of runoff and in smaller storms, with removal rates declining as storm size increased. Better removal rates can probably be attained by increasing either the surface area or storage volume of the compost system.

Table 1: Pollutant Removal Performance of Leaf Compost Filter (Stewart, 1992)

Pollutant	Percent Removed
Total Suspended Solids	95
Total Dissolved Solids	-37
COD	67
Total Phosphorus	41
Soluble Phosphorus	(negative)
Organic Nitrogen	56
Nitrate	-34
Cadmium	N.D.
Lead	N.D.
Zinc	88
Hydrocarbons	87
Chromium	61
Copper	67
Boron, Calcium, Potassium, Magnesium, Sodium	(negative)

The compost system requires annual or biennial removal and disposal of the compost layer, followed by replacement with fresh compost. This routine maintenance operation can cost the owner several thousand dollars. Early tests indicate that the used compost can be safely landfilled. A few operational problems have been encountered with the compost system. The key problem has been sediment deposition over the surface of the compost bed that reduces the permeability rate. Perhaps the use of larger forebays, lower design permeability rates, or regular raking/discing of the filter bed surface could relieve the problem. W&H Pacific are continuing to refine the design to increase its effectiveness.

—TRS

Reference

Stewart, W. 1992. *Compost Stormwater Treatment System.* W&H Pacific Consultants. Draft Report. Portland, OR.