Compost Blankets

Description

A compost blanket is a layer of loosely applied compost or composted material that is placed on the soil in disturbed areas to control erosion and retain sediment resulting from sheet-flow runoff. It can be used in place of traditional sediment and erosion control tools such as mulch, netting, or chemical stabilization. When properly applied, the erosion control compost forms a blanket that completely covers the ground surface. This blanket prevents stormwater erosion by (1) presenting a more permeable surface to the oncoming sheet flow, thus facilitating infiltration; (2) filling in small rills and voids to limit channelized flow; and (3) promoting establishment of vegetation on the surface. Composts used in compost blankets are made from a variety of feedstocks, including municipal yard trimmings, food residuals, separated municipal solid waste, biosolids, and manure.

Application of a 2 inch-thick compost blanket to a 1:1 rock slope using a pneumatic blower (Austin, Texas, 2002). Source: McCoy, Texas Commission on Environmental Quality (TECQ), 2005

Compost blankets can be placed on any soil surface: rocky, frozen, flat, or steep. The method of application and the depth of the compost applied will vary depending upon slope and site conditions. The compost blanket can be vegetated by incorporating seeds into the compost before it is placed on the disturbed area (recommended method) or the seed can be broadcast onto the surface after installation (Faucette and Risse, 2001).

In general, compost-based erosion and sediment control systems have several advantages over more traditional stormwater best management practices (BMPs) such as geotextile blankets. Advantages provided by compost blankets include the following (Alexander, 2003; Faucette, 2004):

- The compost retains a large volume of water, which helps reduce runoff, prevents or reduces sheet and rill erosion, and aids in establishing vegetation in the blanket.
- The compost blanket acts as a buffer to absorb rainfall energy, which prevents soil compaction and crusting and facilitates rainfall infiltration.
- Compost blankets facilitate plant growth by capturing and retaining moisture and providing a suitable microclimate and nutrients for seed germination.
- The compost stimulates microbial activity, which increases decomposition of organic matter, increases nutrient availability for plants, and improves the soil structure.
- Compost can remove pollutants, such as heavy metals; nitrogen; phosphorus; oil and grease; and fuel, from stormwater, thus improving downstream water quality (W&H Pacific, 1993; USEPA, 1998).

Applicability

Compost blankets are most effective when applied on slopes between 4:1 and 1:1, such as stream banks; road embankments; and construction sites, where stormwater runoff occurs as sheet flow. Compost blankets are not applicable for locations with concentrated flow. Because the compost is applied to the ground surface and not incorporated into the soil, a compost blanket provides excellent erosion and sediment control on difficult terrain—including steep, rocky slopes.

Siting and Design Considerations

Compost Quality: Compost quality is an important consideration when designing a compost blanket. Use of sanitized, mature compost will ensure that the compost blanket performs as designed and has no identifiable feedstock constituents or offensive odors. The compost used in compost blankets should meet all local, state, and Federal quality requirements. Biosolids compost must meet the Standards for Class A biosolids outlined in 40 Code of Federal Regulations (CFR) Part 503. The U.S. Composting Council (USCC) certifies compost products under its Seal of Testing Assurance (STA) Program. Compost producers whose products have been certified through the STA Program provide customers with a standard product label that allows comparison between compost products. The current STA Program requirements and testing methods are posted on the USCC EXIT Disclaimer website.

The nutrient and metal content of some composts are higher than some topsoils. This, however, does not necessarily translate into higher metals and nutrient concentrations or loads in stormwater runoff. A recent study by Glanville, et al.

(2003) compared the stormwater runoff water quality from compost- and topsoil-treated plots. They found that although the composts used in the study contained statistically higher metal and nutrient concentrations than the topsoils used, the total masses of nutrients and metals in the runoff from the compost-treated plots were significantly less than plots treated with topsoil. Likewise, Faucette et al. (2005) found that nitrogen and phosphorus loads from hydroseed and silt fence treated plots were significantly greater than plots treated with compost blankets and filter berms. In areas where the receiving waters contain high nutrient levels, the site operator should choose a mature, stable compost that is compatible with the nutrient and pH requirements of the selected vegetation. This will ensure that the nutrients in the composted material are in organic form and are therefore less soluble and less likely to migrate into receiving waters.

The American Association of State Highway Transportation Officials (AASHTO) and many individual state Departments of Transportation (DOTs) have issued specifications for compost blankets (AASHTO, 2003; USCC, 2001). These specifications describe the quality and particle size distribution of compost to be used in compost blankets. The compost blanket media parameters developed for AASHTO specification MP 10-03 are shown in Table 1 as an example (Alexander, 2003). Research on these parameters continues to evolve; therefore, the DOT or Department of Environmental Quality (or similar designation) for the state where the compost blanket will be installed should be contacted to obtain any applicable specifications or compost testing recommendations.

Table 1. Example Compost Blanket Media Parameters

Parameters[1,4]	Units of Measure	Surface to be Vegetated	Surface to be left Unvegetated
pH[2]	pH units	5.0 – 8.5	N/A
Soluble salt concentration (electrical conductivity)[2]	dS/m (mmhos/cm)	Maximum 5	Maximum 5
Moisture content	%, wet weight basis	30 – 60	30 – 60
Organic matter content	%, dry weight basis	25 – 65	25 – 100
Organic matter content	% passing a selected mesh size, dry weight basis	- 3 in. (75 mm), 100% passing - 1 in. (25 mm), 90 – 100% passing - ¾ in. (19 mm), 65 – 100% passing - ¼ in. (6.4 mm), 0 – 75% passing Maximum particle length of 6 in (152 mm)	- 3 in. (75 mm), 100% passing - 1 in. (25 mm), 90 – 100% passing - ¾ in. (19 mm), 65 –100% passing - ¼ in. (6.4 mm), 0 – 75% passing Maximum particle length of 6 in (152 mm)
Stability[3] Carbon dioxide evolution rate	mg CO_2–C per g organic matter per day	<8	N/A
Physical contaminants (manmade inerts)	%, dry weight basis	<1	<1

Source: Alexander, 2003

[1] Recommended test methodologies are provided in Test Methods for the Examination of Composting and Compost [USCC EXIT Disclaimer].
[2] Each specific plant species requires a specific pH range. Each plant also has a salinity tolerance rating, and maximum tolerable quantities are known. When specifying the establishment of any plant or turf species, it is important to understand its pH and soluble salt requirements and how they relate to the compost in use.
[3] Stability/maturity rating is an area of compost science that is still evolving; therefore, other test methods could be considered. Also, users should not base compost quality conclusions on the result of a single stability/maturity test.
[4] Landscape architects and project (field) engineers may modify the allowable compost specification ranges based on specific field conditions and plant requirements.

Siting and Design: Specific site characteristics, such as existing vegetation; climate; structural attributes of the site; annual rainfall; and rainfall erosivity, are considered when determining the appropriate depth for the compost blanket. Erosivity is the term used to describe the potential for soil to erode from disturbed, unvegetated earth into waterways during storms. Example compost blanket depths for various rainfall scenarios developed for AASHTO specification MP 10-03 are shown in Table 2 (Alexander, 2003).

Installation: The compost should be applied to the soil surface in a uniform thickness, usually between 1 and 3 inches thick. A typical application depth is 2 inches (Glanville et al., 2003). The compost can be distributed by hand using a shovel or by mechanical means such as a spreader unit (e.g., bulldozer or manure spreader) or pneumatic blower. The compost blanket should extend at least 3 feet over the shoulder of the slope to ensure that stormwater runoff does not flow under the blanket (Alexander, 2003). The pneumatic blower is best for applying compost to steep, rocky, or difficult to reach locations because the worker can stand below the slope and blow the compost up onto the slope in an even thickness or use a vehicle to reach higher slopes (see photograph on page 1). Very coarse compost should be avoided on slopes that will be landscaped or seeded, as it will make planting and crop establishment more difficult. Thicker and/or coarser compost blankets are recommended for areas with higher annual precipitation or rainfall intensity, and coarser compost is recommended for areas subject to wind erosion (Alexander, 2003).

Table 2. Example Compost Blanket Depths for Various Rainfall Rates

Annual Rainfall/ Flow Rate	Total Precipitation (Rainfall Erosivity Index)	Compost Blanket Depth (Vegetated Surface)	Compost Blanket Depth (Unvegetated Surface)
Low	1 – 25 in. (20 – 90)	½ – ¾ in. (12.5 – 19 mm)	1 in. – 1½ in. (25 – 37.5 mm)
Average	26 – 50 in. (91 – 200)	¾ – 1 in. (19 – 25 mm)	1½ in – 2 in. (37 – 50 mm)
High	>51 in. (>201)	1 – 2 in. (25 – 50 mm)	2 – 4 in. (50 – 100 mm)

Source: Alexander, 2003

Although seed can be broadcast on the compost blanket after installation, it is typically incorporated into the compost before it is applied, to ensure even distribution of the seed throughout the compost and to reduce the risk of the seed being washed from the surface of the compost blanket by stormwater runoff. In some applications (e.g., on a steep slope), better sediment and erosion control can be achieved by using the compost blanket in conjunction with another BMP, such as lock-down netting, compost filter berms, or compost filter socks. Lock-down netting will help hold the compost in place, while compost filter berms or compost filter socks placed across the slope will slow down the flow of water. Compost filter berms or filter socks can also be placed at the top and bottom of the embankment.

Limitations

Limitations for compost blanket applications are dependent on the site specifications. Compost blankets are not generally used on slopes greater than 2:1 or in areas where concentrated runoff or water flow will occur (Glanville et al., 2003). They can, however, be used on steeper slopes (1:1) if netting or confinement systems are used in conjunction with the compost blanket to further stabilize the compost and the slope or if the compost particle size and compost depth are specially designed for the application.

Maintenance Considerations

The compost blanket should be checked periodically and after each major rainfall. If areas of the compost blanket have washed out, another layer of compost should be applied. In some cases, it may be necessary to add another stormwater BMP, such as a compost filter sock or silt fence. On slopes greater than 2:1, establishing thick, permanent vegetation as soon as possible is the key to successful erosion and sediment control. Restricting or eliminating pedestrian traffic on such areas is essential (Faucette and Ruhlman, 2004).

Effectiveness

Numerous studies conducted by a variety of universities and State DOTs have reported the effectiveness of compost blankets; only a few of the recent studies are cited here. A University of Georgia research trial (Faucette and Risse, 2002) reported that correctly applied compost blankets provide almost 100 percent soil surface coverage, while other methods (e.g., straw mats and mulches) provide only 70 to 75 percent coverage. Uniform soil cover by the compost blanket is a key component to effective erosion and sediment control because it helps maintain sheet flow and prevents stormwater from forming rills under the blanket. Compost blankets also help protect the structural stability of the slope, particularly when vegetated (BioCycle, 2002).

An Iowa State University study (Glanville et al., 2003), sponsored by the Iowa Department of Natural Resources and Iowa DOT, compared compost-treated road embankments to conventionally treated embankments (i.e., topsoil added to surface). The study exposed the test plots to high intensity rainfall (4 inches/hour) lasting at least 30 minutes. The results showed that the 2- and 4-inch thick compost blankets reduced runoff from the embankment by 80 percent. The erosion rate from the compost blanket was less than 1 percent of that from the non-composted areas, and weed growth on compost-treated areas was approximately 25 percent of that on untreated areas.

Cost Considerations

The cost of a compost blanket is comparable to a straw mat and less expensive than a geotextile blanket. Faucette (2004) reports that the cost of a compost blanket in Georgia ranges from $0.83 to $4.32 per cubic yard installed. The actual cost will depend upon the quality of compost required and the thickness of the application. According to the TCEQ (McCoy, 2005), a 1-inch thick unseeded compost blanket costs $0.99 per square yard installed, and a 1-inch thick seeded compost blanket costs $1.08 per square yard in Texas.

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