Using Compost for Erosion Control and Revegetation

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Dairy Compost Utilization

WHAT IS COMPOST?

Composting refers to the biological decomposition and stabilization of organic materials by microorganisms under aerobic (in the presence of oxygen) conditions. During the composting process, biologically produced heat under proper moisture and aeration conditions, accelerates decomposition of raw material followed by stabilization and well managed curing of the product. As a result, good quality compost is produced that is biologically stable, relatively uniform in appearance, free of most pathogens and weed seeds, and has benefits as a soil amendment material with essential nutrients for plant growth. Thus, compost from various feed stocks including yard, manure, food processing residuals and other organic materials has been used to improve soil quality and productivity as well as prevent and control soil erosion.

COMPOST FOR EROSION CONTROL

Soil erosion from construction sites can be as much as 10 to 20 times greater than that from agricultural lands. Research reports from academia, the EPA, state departments of transportation (DOTs) and other sources suggest that compost can be effective in controlling erosion from construction sites including road rights-of-way, general construction and land development.

Figure 1 illustrates the use of compost as immediate, temporary erosion and sediment control in filter berms and compost blankets on top of existing soil on a steep slope. The berms or filter socks manage storm water run-on and retain sediment from above the slope, as well as retain runoff and sediment from the slope itself. The compost blanket controls slope erosion by reducing water flow velocity and the volume of sediment coming off of the slope.

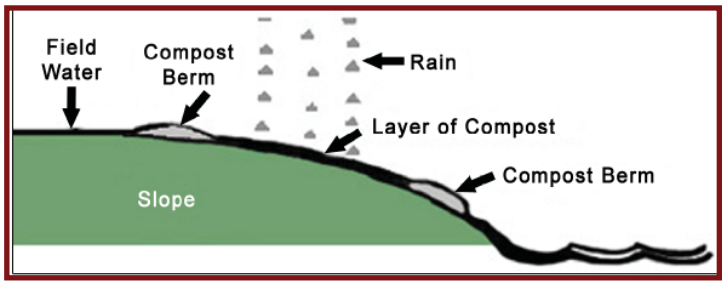

Figure 1. Compost filter berms and blankets (layer of compost covering the soil) for sediment and erosion control on steep slopes.

Compost can also be incorporated as a soil amendment or topsoil blend to improve soil structure. Both practices help establish a protective vegetation cover, which provides long-term erosion and sediment control. Due to compost's nutrient value and abundant organic matter, vegetation established in compost amended soils grows healthier, faster. It is better able to endure extreme climatic conditions compared to vegetation planted in soil that receives commercial fertilizer as a sole nutrient source.

The same characteristics that benefit vegetation may also create water quality problems. Therefore, it is important to

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analyze the nutrient (N, P, K and other micronutrients), pH and soluble salt content of the compost before selecting and establishing its application rate for sediment or erosion control. Biosolid composts also require analysis for heavy metals. Lower nutrient composts should be considered for use on nutrient impacted areas. For example, a two-inch layer of compost weighing 1,500 pounds per cubic yard, applied over one acre will equal an application rate of nearly 200 tons per acre. If the compost contains average to high nutrient concentrations, this rate of application may be higher than the nutrient requirements of vegetation used for soil stabilization. This could lead to negative water quality impacts. The blending of compost with wood chips as an erosion-control blanket material may reduce the amount of nutrients applied per acre and their rate of release.

STORM WATER MANAGEMENT APPLICATIONS

New federal storm water permit requirements for general construction activities and for municipalities have placed much greater responsibility on local governments and construction contractors to put effective erosion and sediment controls in place. At the same time, research has been demonstrating the effectiveness of several practices using compost to stabilize soil, reduce suspended solids and sediment in runoff, reduce chemical loads and delay the onset and volume of runoff. Guidelines and specifications for the use of compost in erosion and sediment control applications can be found in the TCEQ reference document BMP Finder, http://www.tnrcc.state.tx.us/water/quality/nps/nps_stakeholders.html#bmp%20finderD.

DEPARTMENT OF TRANSPORTATION APPLICATIONS

The use of compost in erosion and sediment control has been extensively applied and studied in the stabilization of highway rights-of-way after construction or maintenance. In 1997, a survey of trends in using compost for road side applications revealed that nearly 70 percent of the nation's DOTs were either experimenting with or routinely using compost. Some of the uses listed by these DOTs were:

- Mulch or top dressing
- Erosion control blankets for steep slopes
- Filter berms to control sediment movement (similar to silt fences)
- Hydroseeding (seed, water and compost mixed and sprayed on ground to establish vegetation)
- Wetlands mitigation
- Bioremediation (composted organic matter can break down pollutants into simpler, safer forms)
- Filter socks (mesh sock containing compost or mulch material)

Figure 2: Grass seed and compost being applied as a compost blanket for erosion control and revegetation of a road right-of-way.

In Texas, the DOT has used composted dairy manure, feedlot manure, chicken litter, cotton gin burs, yard trimmings, and municipal biosolids as compost blankets for hydroseeding road rights-of-way to control soil erosion from steep slopes (Figure 2), and as filter berms to control erosion and sedimentation from low volume runoff (Figure 3). Recent projects utilize filter socks rather than berms as socks have a greater ability to withstand concentrated flows and retain sediment (Figure 4). In other applications, a West Texas municipal landfill uses compost produced from a mixture of poultry manure, sawdust and other wood residuals to control erosion, as a soil amendment and to create a vegetated cover over closed landfill cells.

Figure 3: Grass seed and compost being applied as a filter berm in a city park waterway to control runoff and sedimentation.

The Texas DOT (TxDOT) accepts high-quality compost such as dairy manure compost for use in compost manufactured topsoil (CMT), in erosion control compost (ECC) and as general use compost (GUC) (TxDOT Special Specification 1058, Compost). Compost is also used by TxDOT in the form of filter berms for erosion and sedimentation control (TxDOT Special Specification 1059, Compost/Mulch Filter Berm). A one-time use Special Specification is available from TxDOT regarding the use of filter socks. TxDOT requires all compost to be sampled and tested according to the Test Methods for Examination of Composting and Compost (TMECC) and must be Seal of Testing Assurance (STA) Program certified.

For TxDOT contracts, the CMT should consist of 75 percent topsoil blended with 25 percent compost on a volume basis. For ECC, 50 percent untreated woodchips are blended with 50 percent compost by volume. When used as GUC, 100 percent of the material should be compost. The compost filter berm will be a combination of 50/50 compost and wood chips. Table 1 provides general physical requirements for compost to be used for TxDOT contract work. For a detailed description of all the requirements, see TxDot Specifications 1058 and 1059 at http://www.dot.state.tx.us/des/landscape/compost/specifications.htm.

Figure 4. Compost and wood chip mixture applied in a mesh casing as a filter sock to control runoff and sedimentation.

Table 1. Physical and chemical requirements of compost utilized in TxDOT Special Specification 161.

Property	Requirements
Particle Size	95% passing $^{5}/_{8}$" sieve, 70% passing $^{3}/_{8}$" sieve with TMECC Method 02.02-B
Heavy Metals	Following Pass in accordance with TMECC Method 04.06 Arsenic (As), Cadmium (Cd), Copper (Cu), Lead (Pb), Mercury (Hg), Molybdenum (Mo), Nickel (Ni), Selenium (Se) and Zinc (Zn)
Soluble Salts	≤ 5.0 dS/m (≤ 10.0 dS/m accepted for CMT) with TMECC Method 04.10-A
pH	5.5-8.5 with TMECC Method 04.11-A
Maturity	80% with TMECC Method 05.05-A
Organic Matter Content	25-65% (dry mass basis) with TMECC Method 05.07-A
Stability	≤ 8 with TMECC Method 05.08-B
Fecal Coliform	Pass in accordance with TMECC method 07.01-B

TxDOT Specification 1059 defines placement and use of compost as a filter berm. Such compost must still meet guidelines outlined in TxDOT Specification 161. See TxDOT Specification 1059 for additional requirements.