TechLink Research Summary #3310

How Important Is Particle Size in Specifications for Filtrexx® Slope Protection?

Filtrexx® Slope protection used for slope stabilization and vegetation establishment have been evaluated in research and field demonstration projects more widely than compost used for sediment control (Ettlin and Stewart, 1993; Demars and Long, 1998; Glanville et al, 2001; Kirchhoff et al, 2003; Mukhtar et al, 2004; Faucette et al, 2004; Faucette et al, 2005). While specifications for compost blankets have been accepted and published by the Texas Department of Transportation (TX DOT), the American Association of State Highway Transportation Officials (AASHTO), the US Environmental Protection Agency (USEPA), Indiana Department of Natural Resources (IN DNR), Coalition of Northeast Governors/Connecticut Department of Transportation (CONEG), and many other public agencies, no research has been conducted to evaluate the most critical section of the specifications, the particle size distribution of the compost used to make the erosion control blanket. Of the 23 compost blanket treatments evaluated by Demars and Long (1998), Glanville et al (2001), Kirchhoff et al (2003) and Faucette et al (2004, 2005) none met any of the particle size specifications for Filtrexx® Slope protection. Mukhtar et al (2004) reported that TX DOT specifications were followed, however, particle size distribution was not determined.

Table 1: Particle size specifications for compost erosion control blankets

Specifying Agency	% Pass 2 in	% Pass 1 in	% Pass ¾ in	% Pass ¼
TX DOT*	95	65	65 (5/8 in)	50 (3/8 in)
AASHTO	100 (3 in)	90-100	65-100	0-75
US EPA	100 (3 in)	90-100	65-100	0-75
IN DNR	100	99	90	0-90
CONEG	100	100	100	70 (1/2 in), 50 (1/12 in)

** 1:1 blend of compost and untreated wood chips (termed Erosion Control Compost)*

In Filtrexx® Slope protection larger particles (overs or blended mulch) are the primary material that prevents soil loss, while the small particles (compost fines) are the primary material that prevents runoff. Large particles prevent splash erosion and soil dislodgement by reducing the energy of raindrop impact, additionally, they reduce sediment transport in overland runoff by reducing runoff rates due to their size and weight. The small particles in compost can hold a significant amount of moisture (from rainfall), which likely increases infiltration and evaporation, additionally, it is the small particles that provide the nutrients and structure for plants (and their roots) to establish and maintain a healthy cover (which is generally the end goal of erosion control). It is also likely that any benefit of increased soil quality (over time) will result mainly from the small particles in the Filtrexx® Slope protection (and biota in the soil and compost).

Table 2: Particle size distribution of compost and soil loss from erosion control blanket

Treatment	Soil Loss (g)	Suspended solids (g)	Turbidity (NTU)	Particle size % passing		
				1 in	1/2 in	1/4 in
Compost 1	46	25	36	99	64	30
Compost 2*	62	29	60	99	85	67
Compost 3*	100	31	87	99	89	76
Compost 4**	196	136	288	99	99	95

**Did not meet TX DOT specification for erosion control compost particle size distribution.*
***Did not meet TX DOT, USEPA, IN DNR, or CONEG specification for erosion control blanket particle size distribution*

Research conducted in 2005 at the University of Georgia Institute of Ecology Field Test Site, in Athens, GA, evaluated the influence of particle size distribution of compost used as an erosion control blanket. Four 2 in thick compost blankets, with different particle size distributions, were tested on a 10% slope, on a compacted sandy clay loam subsoil, under 4 in/hr for 60 minutes of simulated rainfall, on plots 3 ft wide by 16 ft long. Test methods and analysis followed methods developed by the USDA National Soil Erosion Research Lab Water Erosion Prediction Project (WEPP) and those published by Faucette et al (2005) in the Journal of Soil and Water Conservation.

Based on this research total soil loss can 4 times as high, suspended solids can be 5 times as high, and turbidity can be 8 times as high if particle size specifications are not followed. Additionally, depending on which specification is followed (TX DOT, AASHTO, US EPA, IN DNR), total soil loss and turbidity can be twice as high from one compost specification relative to
another.

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