Temporary Landscaping of Ranges using Composted Mulch

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Introduction:

Industry and the Army have focused on the use of geosynthetics and riprap over the past 20 years. With the reduction in budgets and labor and the increased pressure on training lands, a more effective, low cost solution is needed for rehabilitation of training lands. Composted mulch BMP's may prove to be an effective alternative for current land practices. Currently, several state DoT's recommend the use of composted mulch in lieu of silt fencing for sediment and erosion control. Little research has taken place to determine the proper ratio of compost vs. non-composted mulch, optimal particle size distribution, additives, optimal flow rates, sediment particle size limitations, nutrient adsorption and leaching, life span, installation limits, or fire and traffic tolerance.

In addition, training lands are limited in size and capacity for reconfiguration. Reconfiguration of ranges generally involves extensive ground disturbing activities. Excavation, contouring, and other ground disturbing activities are costly and result in loss of training opportunity, increased erosion and sedimentation. A low cost solution for temporary range reconfiguration is required.

Failed geotextile and riprap BMPs on military training ranges.

Typical training range designs. Extensive earth movement, stationary, expensive, and high impacts to environment.

Objectives:

Hypothesis: Composted materials used in combination with soil and vegetation provide a means for erosion control and training land reconfiguration eliminating expensive ground disturbing activities.

Our objectives are to determine the proper ratio of compost vs. non-composted mulch, optimal particle size distribution, additives, optimal flow rates, sediment particle size limitations, nutrient adsorption and leaching, life span, installation limits, and traffic tolerance while evaluating the efficacy of composted mulch structures (berms) and other compost BMP's on disturbed military lands. Research will address:

1) Environmental consequences/fate of composted mulch best management practices in regards to erosion and sedimentation;
2) Cost-effectiveness, lifespan, and determine suitability of rapid-nondestructive training range reconfiguring;+
3) Applicability and realism of "mock" composted re-configurable ranges.

Study site at AL A&M with scaled 3:1 berms. May replace standard bern designs.

Methodology:

A randomized complete block design with eight (8) berm treatments, was constructed to represent military impact berms with 3:1 front slopes and 1:1 back slopes. Berms will be subjected to simulated and natural rainfall events, with collection of runoff. Berms will be accessed for physical, chemical and biological processes. The anticipated data will be used to develop methods of compost usage for range structures and erosion control BMPs. Field demonstrations at full scale are anticipated on several Army sites.

Analysis will include:

- Nutrient content in runoff and sediment,
- pH,
- Organic matter,
- Sedimentation,
- Berm internal temperature,
- Moisture content of berm material,
- Compost particle size distribution,
- Soil "treatment" strength,
- Soil "treatment" plasticity,
- Soil surface strength,
- Infiltration rates,
- Rate of subsidence of berm mixes.

Compost Berm Project

Plot #	(Treatment #) Description	Plot #	(Treatment #) Description
1	(3) 100% PB	5	(8) 3 CP, 3 WC, 3PB
2	(5) 2 CP,2 WC,2 PB, 4 Soil	6	(1) 100% CP
3	(6) 2 CP, 2 WC, 2 PB, 2 Soil	7	(4) 100% Soil
4	(7) 3 CP, 3 WC, 3 PB, 1 Soil	8	(2) 100% WC
9	(5) 2 CP,2 WC,2 PB, 4 Soil	13	(4) 100% Soil
10	(8) 3 CP, 3 WC, 3PB	14	(6) 2 CP, 2 WC, 2 PB, 2 Soil
11	(2) 100% WC	15	(7) 3 CP, 3 WC, 3 PB, 1 Soil
12	(1) 100% CP	16	(3) 100% PB
17	(3) 100% PB	21	(5) 2 CP,2 WC,2 PB, 4 Soil
18	(6) 2 CP, 2 WC, 2 PB, 2 Soil	22	(2) 100% WC
19	(4) 100% Soil	23	(1) 100% CP
20	(8) 3 CP, 3 WC, 3PB	24	(7) 3 CP, 3 WC, 3 PB, 1 Soil

List of treatments

Treatment #	Compost (CP)	Wood Chips (WC)	Pine Bark (PB)	Soil
1	100%	0%	0%	0%
2	0%	100%	0%	0%
3	0%	0%	100%	0%
4	0%	0%	0%	100%
5	20% (2 scoops)	20% (2 scoops)	20% (2 scoops)	40% (4 scoops)
6	25% (2 scoops)	25% (2 scoops)	25% (2 scoops)	25% (2 scoops)
7	30% (3 scoops)	30% (3 scoops)	30% (3 scoops)	10% (1 scoops)
8	33.3% (3 scoops)	33.3% (3 scoops)	33.3% (3 scoops)	0%

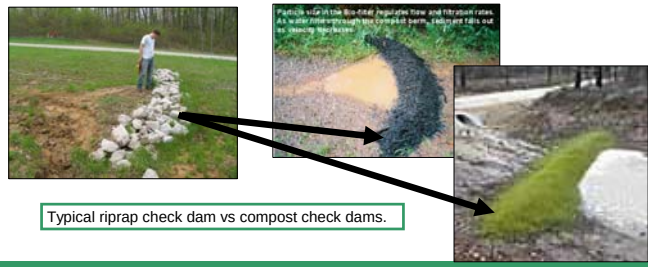
Study Design - Treatments

Installation of AL A&M field study site.

Potential Military Benefits

Composted mulch could provide a means for quick and temporary reconfiguration of training ranges while providing long-term site improvement. Composted mulch is a biodegradable product that lends itself to "re-landscaping" and may provide improved training conditions for soldiers with limited impact to the land. Potentially, composted mulch berms could be constructed and vegetated to re-create realist conditions that "mock" other areas of the world, i.e. European landscape scenarios or the berms could be constructed to simulate training scenarios such as; convoy lanes, defilades, or fox holes. Once the training scenario is finished the "re-landscaped" terrain can be quickly be re-configured for another scenario or spread-out to provide a site amendment to help rehabilitate the area from recent impacts.

The use of composted mulch in training scenarios, erosion control or for vegetation establishment may provide installations with an inexpensive mechanism to quickly reconfigure ranges for critical mission changes while eliminating excess land clearing and grubbing.



Typical riprap check dam vs compost check dams.

The purpose of the project is three-fold; erosion/sedimentation control, simulation of landscapes on ranges, and rapid-nondestructive reconfigurability.