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Compost Foundation

Using Compost In Erosion and Sediment Control

by Ron Alexander

Erosion and sediment control on residential and commercial construction sites, as well as on highway projects, has become a major environmental concern over the past 20 years. Today there has been extensive environmental damage caused by the off site movement of soil into rivers, streams and lakes. This sediment often carries nutrients and other chemical pollutants, threatening the health of fish and other aquatic organisms, as well as species that require fresh water for their habitats and sustenance.

According to the U.S. Department of Agriculture, the United States loses more than two billion tons of topsoil through erosion each year, while landscapers, general contractors and government entities struggle to identify the most cost effective and practical means of controlling it. Erosion and sediment control is not only important for the environment (surface and groundwater protection), it is also necessary in order to protect the structural integrity of buildings and roads, as well as the long-term productivity of our farm soils, natural habitats and drinking water quality. Healthy soils act as "biofilters" binding and degrading a variety of pollutants as water carries them through the soil profile. For these reasons, preventing erosion and minimizing sediment movement is vital to our future.

All state environmental agencies, as well as many federal agencies, have implemented regulations that describe erosion/sediment control requirements (e.g., plans, best practices, etc.), as well as allowable erosion/sediment control management techniques. The U.S. Environmental Protection Agency has addressed these issues in its National Pollution Discharge Elimination System (NPDES) regulations. Their "Phase I" regulations provide regulatory guidance for construction sites that are five acres in size or larger. With the NPDES Phase I regulations currently in effect, the US EPA is preparing for the implementation of the NPDES Phase II regulations, which will affect construction sites as small as one acre in size. The US EPA's Office of Water has stated that permit applications from operators of construction sites 1 to 5 acres in size will be due in 2002/early 2003.

Current Practices

A variety of techniques and products are used in order to control erosion and minimize the movement of sediment. These techniques include: hydroseeding,

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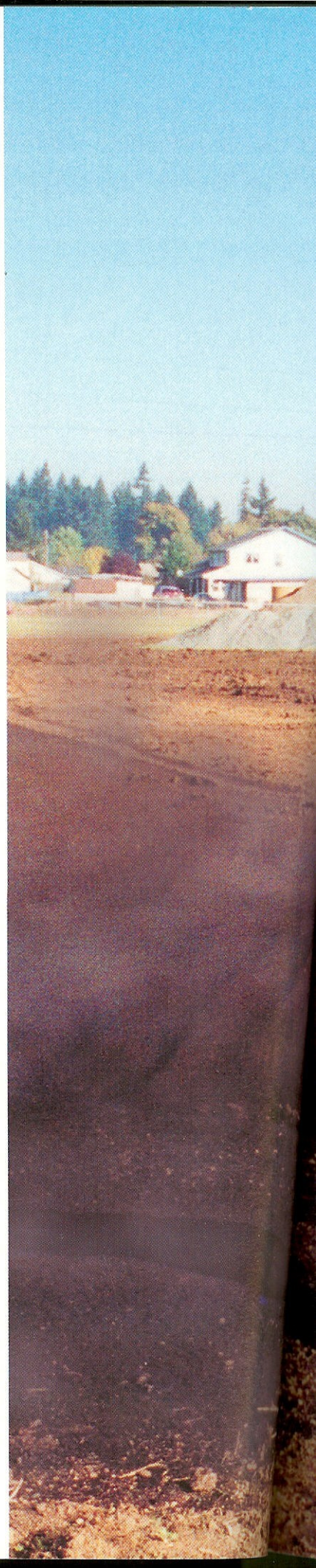

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The compost was pneumatically applied along with seed on the waterway slopes. The benefits of using compost-based techniques such as hydroseeding, straw mulching, erosion blankets and geotextiles, hay bales and sediment dams include: immediate and effective control, they bind and degrade specific chemical contaminants, and help in the efficient establishment of vegetative cover.

straw mulching, erosion blankets and geotextiles, hay bales, silt fencing, check dams, vegetated filter strips, sediment basins.They are usually used in conjunction with seeding, for the establishment of short- or long-term vegetation. At most sites, the ultimate goal is to establish a dense cover of vegetation once construction activities are completed. Low growing vegetation that is "above ground" helps to capture sediment during rain events, while an extensive root system helps to effectively hold the soil in place.

The management technique or "best practices" used in a particular site situation will depend upon a variety of site and related conditions, including existing geology and topography, potential flow, proximity to surface water, etc. In most areas of the country, the specific erosion and sediment control method used on a particular project are not prescribed to site managers and engineers by their specific regulatory body. However, the organizations that are empowered to protect soil and water, do provide technical guidance in this area.

Often, best practices documents are available to excavation, construction and landscaping companies, assisting them in identifying the appropriate erosion and sediment control technique(s) for their project. Further, these same entities will require that an erosion and sediment control plan be submitted and approved for projects of a particular size. These entities will also typically possess regulatory authority for inspecting project sites, and where necessary, issuing fines.

Unfortunately, in some areas of the country, enforcement of existing erosion and sediment control regulation has become a major concern, with construction and excavation companies blatantly ignoring existing regulation. This is unfortunate, considering the environmental consequences and since a variety of effective and inexpensive techniques exist in our soil conservation arsenal.

New Techniques - Overview

A relatively new and promising application for compost and composted products has been developed in the area of erosion and sediment control. Compost, and other composted mulch type products, are being used as both soil blankets for erosion control and filter berms for sediment control. Research has even shown these compost-based techniques often out perform conventional slope stabilization and sediment control methods. Other, more advanced, compost-based systems are also being used in some areas of the country, such as bioswales and wetland establishment using compost.

Probably the greatest advantages to using compost-based techniques are that they: provide immediate and effective control, bind and degrade specific chemical contaminants, and help in the efficient establishment of vegetative (turf) cover. These organic soil blankets and filter berms are created using a variety of composts (e.g., yard trimmings, food waste, biosolids, etc.) and mulches (e.g., ground wood waste, bark, etc.).

Experience and Research

European gardeners have successfully been using compost to stabilize deep slopes in vineyards for many years. When used as a soil blanket, compost and compost blends are typically placed on up to 2:1 slopes at an application rate of 2 to 4 inches. The lower application rates are typically used in areas of lower potential water flow and on less severe slopes. This compost layer not only absorbs the energy of the rainfall (which causes the movement of soil particles), but can also absorb a substantial volume of moisture, as well as reduce its flow velocity, which

improves the percolation of water into the soil profile. Composted products derived from yard trimmings, recycled wood, biosolids, manures, barks, etc, have been used with great success in this application.

For almost 10 years, the Maine Department of Transportation has been using a blend of fine and course (woody fraction) compost particles, along with approximately 10 to 20 percent stone, bark, sand and/or gravel for slope stabilization. These organic "soil blanket" products are typically applied using a bulldozer, grading blade or pneumatic blower. The more coarse or woodier composts used in erosion control are often not seeded following application, but may later be seeded as the product stabilizes over time. Research performed for Portland Metro, an environmental regulatory body based in Portland, Ore., further showed that yard trimmings compost was capable of not only controlling erosion, but also of filtering, binding and degrading contaminants from the storm water passing through the organic layer.

The benefit of using compost as a soil blanket lie in its ability to:

- Act as a buffer to absorb rainfall energy.
- Reduce wind and water erosion immediately.
- Stimulate microbial activity to increase decomposition of organic materials in the soil, thereby adding to the soil structure.
- Prevent soil compaction and crusting, thereby facilitating percolation.
- Slow the flow of water over the surface of the soil.
- Capture and retain moisture, reducing soil moisture loss, thereby facilitating plant growth.
- Provide suitable microclimate for seed germination.
- Capture blowing snow to increase the insulating effect of winter protection.
- Improve and stabilize soil texture.

Research and field experience has also shown that the use of compost filter berms, which can be placed at the base of slopes and around construction sites, are very effective in sediment control. These filter berms are typically 1 to 2 feet tall by 3 to 4 feet wide. They act as excellent sediment filters and can even be used in conjunction with silt/sediment fences in areas of heavy flow. Recent research completed by the New England Transportation Consortium found that

This waterway slope is free of vegetative cover. Low growing vegetation that is "above ground" helps to capture sediment during rain events, while an extensive root system helps to effectively hold the soil in place. The U.S. Department of Agriculture estimates that the United States loses more than two billion tons of topsoil through erosion each year.

A compost filter berm is established around the perimeter of a project site. These berms are typically 1-2 feet tall and 2-4 feet wide. They act as excellent sediment filters and can even be used in conjunction with silt/sediment fences in areas of heavy flow. Recent research has found that certain "wood waste materials can be effective as mulch for erosion control or as a filter berm at construction sites to prevent eroded soil from leaving the site."

even certain "wood waste materials can be effective as mulch for erosion control or as a filter berm at construction sites, (used) to prevent eroded soil from leaving the site."

Rexius Forest By-Products in Eugene, Ore., manufactures and markets compost and mulch, as well as a pneumatic blower unit to apply both of these products. Rexius, and their pneumatic blower truck owners, have been applying compost and mulch onto slopes, for erosion control, with great success. They have also used its blower truck to construct compost and mulch filter berms on slopes and construction sites as an alternative to silt fences. The technique has been approved by various cities, and Rexius truck owners are able to construct the filter berms at a lower cost ($1.50-3.00/linear foot) than traditional methods ($1.50-3.50/linear foot + removal for silt fencing).

Dan Sutton of Rexius stated that they "typically use a screened compost to construct the filter berms on construction sites and gradual slopes, whereas a coarser mulch is used on more severe slopes. This allows water to pass through the filter berm, catching the sediment but not allowing blow-outs to occur because of the more excessive flow velocity."

The benefit of using compost as a filter berm lies in its ability to:

- Act as an effective physical barrier in sheet flow conditions.
- Slow the flow of water over the surface of the soil.
- Retain large volumes of sediment in its mass (pore spaces).
- Bind and degrade chemical pollutants.
- Effectively perform at a lower cost than silt/sediment fencing.
- Capture and retain moisture, reducing soil moisture loss, thereby facilitating plant growth.
- Be left "on-site" after project completion, eliminating removal costs
- Provide suitable microclimate for seed germination.
- Capture blowing snow to increase the insulating effect of winter protection.

Through a recent project sponsored by the U.S. Environmental Protection Agency (US EPA), it has been determined that 10 state Departments of Transportation (DOT) are currently specifying or allowing the use of organ

recycled products (composts, mulches) in erosion and sediment control. These 10 states are: California, Connecticut, Idaho, Maine, Michigan, Montana, Oregon, Texas, Virginia and Washington.

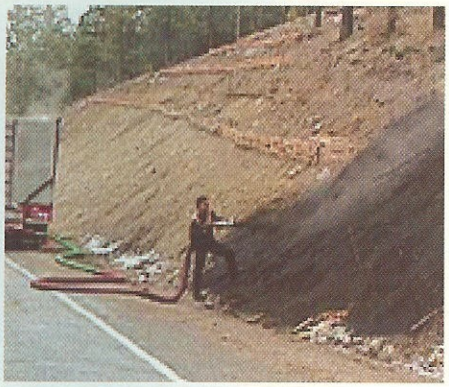
Various other organizations, such as the State of Oregon Department of Environmental Quality, have also tested the use of compost soil blankets and filter berms. They have found these techniques to be effective and have approved their use as "best practices" and "approved equals" to other erosion and sediment control techniques and products.

The overall benefits of using compost and composted products in erosion and sediment control are that they:

- Effectively reduce erosion and sediment movement.
- Are economically competitive with current erosion and sediment control techniques and products.
- Lead to improved soil quality, which leads to improved water quality.
- Bind and degrade a variety of chemical contaminants.
- Bind nutrients.
- Enhance and stimulate plant growth.
- Can sequester airborne carbon, slowing the "greenhouse" effect.

Rules of thumb for the use of Organic Soil Blankets and Filter Berms:

- Applying excessively dry material (under 35 percent moisture content) may cause the generation of dust.
- Applying wetter material (above 60 percent moisture) may reduce spreading efficiency.
- The use of a well-stabilized compost product has been found to bind and degrade specific contaminants
- Generally, the greater the precipitation potential or the steeper the slope, the thicker the layer of compost/organic soil blanket that must be applied to a slope. Alternatively, the use of multiple filter berms may be required.
- Some success has been found in planting legumes (e.g., crown vetch) in more carbon rich products because they can fix their own nitrogen.
- If planning to seed or plant directly into the compost/organic soil blanket layer, then the product's characteristics must be compatible with the plants' tolerances (e.g., pH, soluble salt content).
- More coarse or woodier products should be avoided if seeding or ornamental planting is planned. It will be difficult for a seed to establish in coarser products, and it will also be difficult to "plant through."
- Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent airborne dust from disbursing into atmosphere and surface waters.
- If woody materials are used in these applications, they should have been processed in a way (e.g., composting)



to assure that plant pathogens and noxious weed seeds are destroyed.
- Excessively coarse woody products have been found to be less effective in sediment control.

Improving soil structure through the incorporation of compost into the soil can also reduce erosion and sediment movement. In heavier, more dense soils (clays), the use of compost will reduce the bulk density of the soil, improving moisture penetration and reducing soil crusting. In lighter, less dense soils (sand) prone to wind erosion, the humus fraction of compost can improve soil aggregation making it less likely to blow and improving moisture penetration.

Many composters around the country can supply compost products appropriate for erosion and sediment control applications. The US Composting Council also markets two publications, The Field Guide to Compost Use and Landscape Architecture Specifications for the Utilization of Compost which contain specifications for the use of compost in erosion and sediment control (as well as other landscape applications). Much of this information can also be found on their Web site, www.compostingcouncil.org.

A new project funded through the Recycled Materials Resource Center, at the University of New Hampshire, will be developing updated specifications for the use of composted products in erosion and sediment control applications. These new product and application specifications will incorporate recent research and field experience into them. The US Composting Council also has copies of its DOT Project Report available for purchase (contains a model specification for compost used in soil incorporation) and operates the Seal of Testing Assurance (STA) Program. The STA Program is a national testing and verification program for compost products designed to assist compost end users and specifiers to purchase and specify the compost product they require for a particular project. For more information, call the US Composting Council at (919) 367-8350.

So as you can see, compost is more than an effective soil amendment used "in the ground" and it can also be effectively used "on the soil surface." Interest in the use of composted products in erosion and sediment control is currently sweeping across the country. This is because its use has been found to be more effective and less expensive than many other erosion and sediment control techniques, and it can provide significant environmental benefits, in more ways than one. 700400