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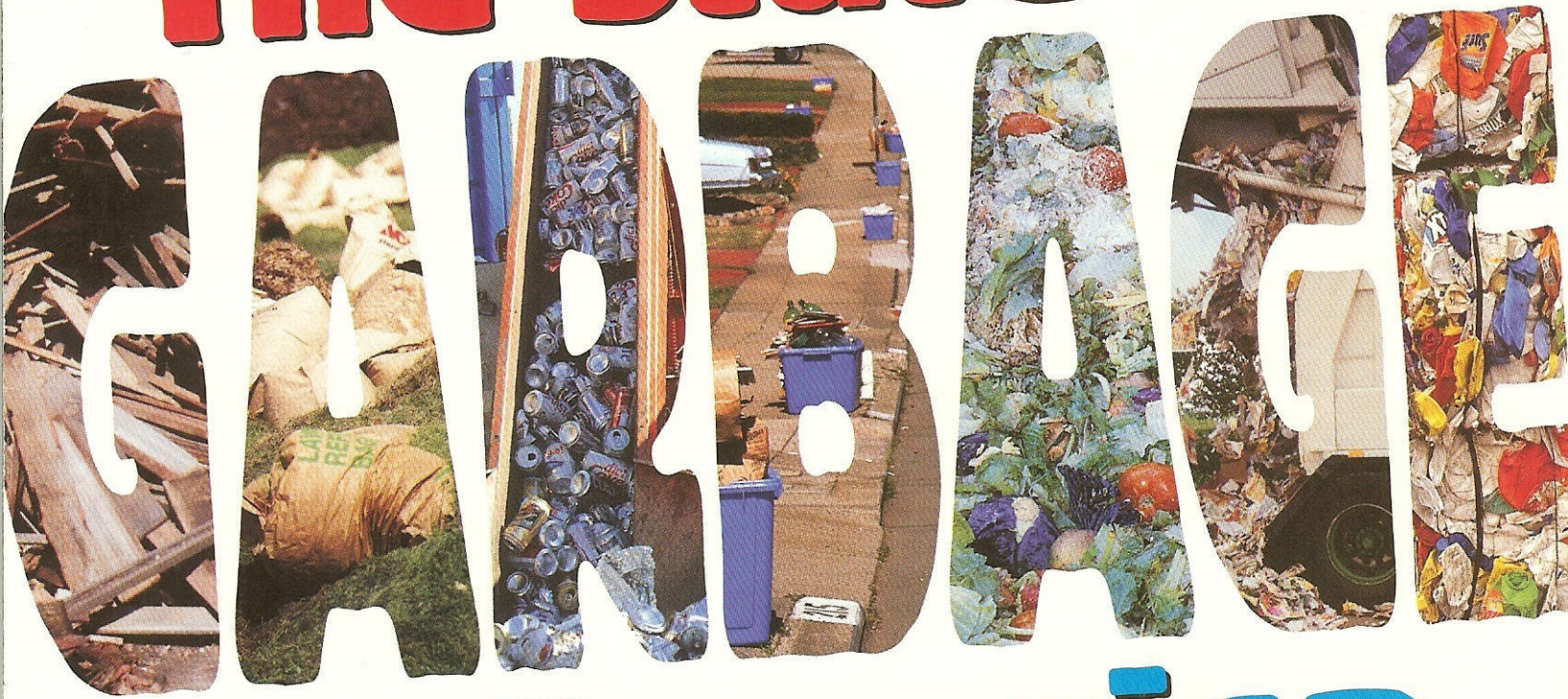
The State Of GARBAGE In America



REACHING 65 PERCENT DIVERSION • COMPOSTING EQUIPMENT DIRECTORY
ENVIRONMENTAL MARKETS FOR COMPOST • CHIPPING AT THE CURB
RECYCLING AT PRODUCE TERMINALS • SAFETY AT GRINDING OPERATIONS

COMPOST MARKETS GROW WITH ENVIRONMENTAL APPLICATIONS

The use of compost in various environmental applications is one of the most intensive areas of compost research being pursued today. The high organic matter content and biological activity of compost makes it effective for use in a variety of applications. Five of these will be reviewed in this article: erosion control, revegetation, biofiltration, bioremediation, and wetlands construction.

EROSION CONTROL

Erosion control is a relatively new and promising application for compost. Research has shown that compost can often outperform conventional slope stabilization methods, such as hydroseeding and hay/straw mulching. Compost and compost blends typically are placed on up to a 2:1 slope at an application rate of three to four inches. This compost layer absorbs the energy of the rainfall (which causes the movement of soil particles) and a substantial volume of moisture, as well as reduces its flow velocity, improving percolation rates. These blends are typically made from a homogeneous mix of fine and coarse (woody fraction) compost particles, along with approximately 10 to 20 percent stone, bark, sand and/or gravel. The blends generally are applied using a bulldozer, grading blade or pneumatic blower. The coarser or woodier composts used in erosion control often are not seeded following application, but may be seeded later as the product stabilizes in the field. A research project performed for Portland (Oregon) Metro, which involved application of a stable, relatively dry yard trimmings compost, showed the compost not only controlled erosion, but also filtered and bound contaminants from stormwater passing through the layer.

Compost berms at the base of slopes are very effective for erosion and sediment control.

Research also has shown that the use of compost berms, placed at the base of slopes, are very effective for erosion and sediment control. These filter berms are typically 1.5 to two feet tall by three to four feet wide. They can be used alone or in conjunction with silt/sediment fences. Rexius Forest By-Products in Eugene, Oregon manufactures and markets compost and mulch, as well as a pneumatic blower unit to apply both of these products. The company has been applying compost and mulch onto slopes for erosion control with great success. It also has constructed compost and mulch filter berms on slopes and construction sites as an alternative to silt fences. The technique has been approved by the cities of Eugene and Springfield. Rexius constructs the berms at a lower cost ($1.50/running foot) than traditional methods ($3 to $4/running foot for silt fencing). "We typically use a screened compost to build the berms on construction sites and gradual slopes, whereas a coarser mulch is used on more severe slopes," says Dan Sutton of Rexius. "This allows water to pass through the berm, catching the sediment, but not allowing blowouts to occur because of the more excessive flow."

Compost is playing an ever important role in cleaning up contaminated soils, treating storm water runoff, reestablishing wetlands and stabilizing slopes.

Ron Alexander

REVEGETATION AND RECLAMATION

Compost has been used extensively in revegetation and reclamation of marginal and low quality soils. Benefits include improved soil quality, reduced erosion, en-

A pneumatic blower unit applies compost for establishment of a berm.

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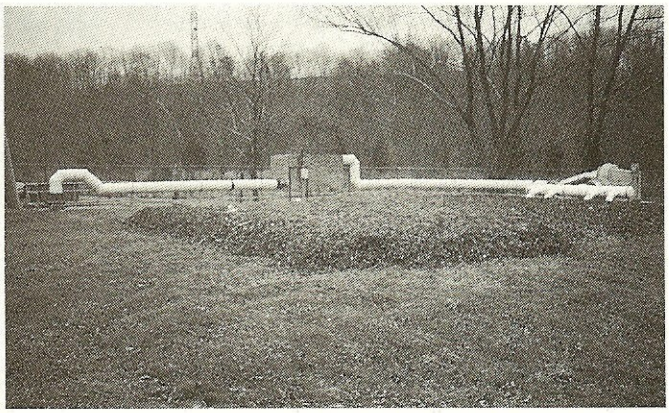
hanced plant establishment, immobilization of toxic metals and supplying of microbes. Sites ranging from landfills, factories, roadsides, mines and brownfields have been reclaimed and revegetated using compost products. Compost used for these applications is often applied at inclusion rates of 20 to 50 percent, or 25 to 175 tons/acre.

An excellent example of how compost can bring the life back to a dead soil is a Superfund project underway at the closed Drake Chemical plant in Lock Haven, Pennsylvania. The facility manufactured dyes and other chemical products, leaving the soil contaminated with beta naphthylamene, among other pollutants. The site is being treated by OHM Remediation Services/IT Group using a thermal method and reclaimed using yard trimmings compost (Leafgro) supplied by Maryland Environmental Services. The top 12 to 15 feet of soil were removed from the eight-acre site and thermally remediated. The process left a coarse soil with no organic matter, a low cation exchange capacity and little water holding capacity. "It destroyed the soil structure, and the thermal process caused much of the fine particles in the soil to be blown off," says Richard Stehouwer of Pennsylvania State University, who is completing pot trials to determine the most appropriate compost and fertilizer application rates.



Compost biofilters remove a wide range of compounds at relatively high contamination rates.

Approximately 6,000 cubic yards (cy) of compost will be incorporated into the top 16 to 18 inches of soil in order to improve the soil and establish vegetation. It is also hoped that the compost will help reduce the soluble salt content of the soil — which averages between 4 to 6 mmhos/cm — and make those salts less available for plant uptake. High salt levels resulted from the thermal remediation process.

BIOFILTERS AND BIOSWALES

A smaller, but important niche environmental application for compost is as a component to biofilter media. The ability of compost biofilters to remove a wide range of compounds at relatively high contamination rates indicates that these filters could be effective in many applications. Compost is typically used in biofilter media at an inclusion rate of 25 to 33 percent, but rates can range from five to 40 percent. Other media ingredients include bark, wood chips and ground wood. (Some composting plants effectively use only compost as the media.) The goal is to produce a media which has good porosity and water holding capacity, supplies proper nutrition for microbial growth, allows for uniform air distribution and does not readily shrink. Compost-based biofilter media has a relatively long life span, from one to three years, depending on loading rates.

Davenport, Iowa's biosolids composting facility constructed two, one-half acre biofilters that have been 85 to 90 percent efficient in removing a variety of odorous compounds and VOCs. Scott Plett, facility manager, says the media was changed after approximately two years of operation due to a bacterial slime growing on the filter cloth layer, which restricted air movement. The filter cloth was used to separate the layer of pea gravel (which contains the perforated pipe used for air distribution) and the filter media. It was replaced by a six-inch layer of wood chips, then capped off with a 36- to 40-inch layer of filter media containing one-third biosolids compost and two-thirds wood chips.

Although the majority of biofilters are

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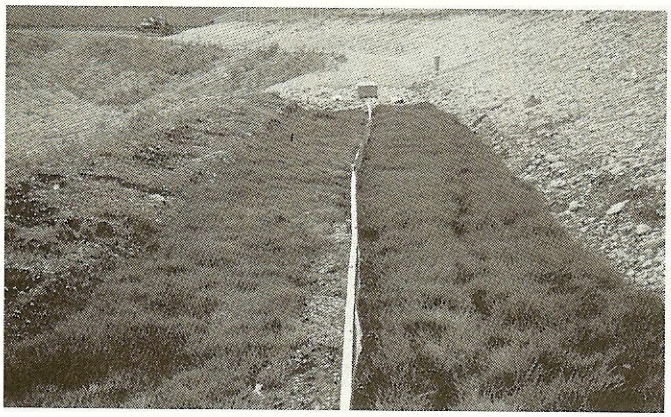

In bioswales constructed from soil (left) and a compost/soil blend (right), the latter allowed for a faster, denser stand of grass.

used to treat air streams, more recent research has shown that they are suitable for treating contaminated water. Storm water treatment systems have been developed and patented using compost biofilters.

Bioswales constructed using compost are another method to treat contaminated water. A bioswale is designed for an area of known surface runoff quantity and quality (e.g., parking lots, roadsides) and would allow collected water to flow through it once vegetated. The bioswale can capture sediment, adsorb nutrients and degrade petroleum hydrocarbons. Through research sponsored by the Clean Washington Center, E&A Environmental Consultants, Inc. in Bothell, Washington constructed bioswales out of both soil and a compost/soil blend. Both bioswales were made from on-site soil; one had a two-inch layer of yard trimmings compost incorporated into its top six inches. The bioswales were 200 feet long and 10 feet wide.

"The bioswale which contained compost allowed for a faster and denser stand of grass, and higher removal efficiency than the control side (no compost)," says Chris Peot of E&A. "The compost also seemed to help the grass endure dry spells and heavy water flows." The research showed that over several storm events, the compost bioswale provided better treatment of water, reducing sediment, nutrients, heavy metals, total petroleum hydrocarbons and biochemical oxygen demand. The King County (Washington) Surface Water Design Manual has developed design parameters for the construction of bioswales for surface water treatment, and currently allows their usage.

BIOREMEDIATION

Bioremediation through composting has proven effective in degrading and altering many types of contaminants, including chlo-

"The upfront preparation of the composting blend is critical to successful and efficient bioremediation," says Jim McGill, owner of McGill Environmental Systems.

rinated and nonchlorinated hydrocarbons, wood preserving chemicals, solvents, heavy metals, pesticides, petroleum products and explosives. Compost also has been shown to bind various heavy metals, making them less bioavailable to plants and animals. In research completed on lead contaminated soils, compost was added to city soils containing 1600 ppm of lead, reducing bioavailability by up to 60 percent.

The composting process itself has been used to treat contaminated soils. For example, at Seymour Johnson Air Force Base in North Carolina, soils contaminated through fuel spills were treated by blending 75 percent of the contaminated soil, 20 percent compost and five percent turkey manure. Other military bases have been successful treating explosives contaminated soil through composting.

McGill Environmental Systems in Rose Hill, North Carolina, Inc. has been bioremediating soils contaminated with various petroleum products, such as gasoline, diesel and industrial fuels. All contaminated soils are excavated and brought to McGill's site, then mixed with manure, wood chips and finished compost for composting. Bioremediation is done indoors to better control environmental conditions. "The upfront preparation of the composting blend is critical to successful and efficient bioremediation," says Jim McGill, the company's owner. "The particle size and thorough mixing of the composting components are critical to quality control with respect to uniform, pervasive treatment." He adds that those factors are even more critical as heavier, more difficult to degrade fuels are treated.

McGill Environmental always reseeds new batches of contaminated soil with previously bioremediated batches. This provides a supply of microbes specific to the degradation of a specific fuel type.

WETLANDS CONSTRUCTION

Organic matter in the soils of wetlands in the United States has decreased steadily over the last three decades. Environmental regulations require the reestablishment of wetlands as a means of improving water quality. The goal of this type of project is to develop a wetland that functions well in terms of hydrology, soil properties and plant community composition. A highly organic, microbially active soil possessing similar physical and chemical properties to those of native wetland soils is needed.

Compost is an excellent component to manufactured wetland soils because of its high organic matter content, water holding capacity and microbial activity. (According to the EPA, it can absorb up to four times its weight in water.) To develop an effective wetlands media using compost, a critical step is understanding the soluble salt and nutrient levels of the compost and their relationship to the wetland plants being established. Wetland construction mixes should be developed with characteristics similar to the surrounding soils.

In Hillsborough County, Florida, the 62-acre Northwest Mitigation Project was recently completed to create wetlands to replace those destroyed by site development and roadway projects. Roger Peterson of Consolidated Resource Recovery estimates that about 34,000 cy of aged yard trimmings fines (one-inch minus) were used on the project. Two parts of site soil were blended with one part fines, yielding approximately 100,000 cy of modified soil. It was spread to a depth of six to 24 inches throughout the site. One goal of using the organic matter rich, ground yard trimmings was to create a soil that contained a minimum organic matter content of 20 percent; the site's existing soil contained under a half percent of organic matter. Various types of plantings were established on the 40-acre site (e.g., conifers, hardwoods and other indigenous species), as was a large pond (totally hydrated) area. "In less than one year, the hydrated section of the marsh has established a 100 percent cover," says Don Richardson of Ecological Consultants in Tampa, Florida, who worked on the project. "Usually a vegetative cover of this density takes two to three years to establish." ■

Ron Alexander is a consultant with R. Alexander Associates Inc. in Cary, North Carolina, and has been involved in compost marketing and end use for almost 15 years.