Topdressing Turf with Compost

by

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QUALITY COMPOST, SOIL, & MULCH

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INTRODUCTION

Topdressing is the process of adding a thin layer of material over the surface of turf. A variety of materials can be used in a topdressing program including sand, soil, and compost, as well as mixtures of sand and composts. Adding materials in very thin layers over the surface of turf makes it possible to add organic amendments and gradually change the soil without disturbing the actively growing plants.

The purpose of this guide is to provide useful information on the practice of using compost for topdressing turf. Information is obtained both from research performed at various universities as well as from direct experience with professional turf managers who are using a variety of composts and it is intended to provide general guidance. Whenever compost is being used, soil testing should be performed and a professional consultant should be contacted to insure that the proper application rate is used and that the desired results are obtained.

> Composts derived from a variety of materials (including manures, yard wastes, and municipal biosolids) have all been successfully used in topdressing turf. However composts derived from different materials and produced under different conditions will behave differently, and turf managers need to understand the properties of the particular compost they are using. This guide includes information on how to evaluate and select composts.

EXPERIENCE

Composts of various types are used throughout the country for topdressing. The value of topdressing as a routine practice to maintain golf greens in proper condition has been well established and documented by various USGA publications since the 1920s. Topdressing with mixtures of sand and various organic amendments, such as peat, has been used extensively in the golf industry and more recently has been commonly used for other turf areas including sports fields and lawns. The availability of abundant supplies of consistent quality composts has expanded the use of compost as a substitute for peat. Composts, unlike peat, are renewable resources that are produced throughout the country from a variety of feedstocks including manures, biosolids, and yard wastes.

In the northeastern United States, composts have been widely used for topdressing golf courses, sports fields, and lawns. University-based research programs have focused attention both on the improved performance obtained through using composts as well as the environmental benefits. The value of using compost in a range of turf applications has been documented by these various research studies and by technical publications. University extension publications provide guidance on application rates

and the selection of composts for topdressing (see PA State University Cooperative Extension publication; http://turfgrassmanagement.psu.edu/composts.cfm).

In recent years, there has been increased attention from the general public toward "organic" lawn care in order to avoid the use of conventional fertilizers and pesticides. Information on the use of compost for topdressing turf is addressed in various publications directed to those interested in "organic' management approaches (see *Managing Healthy Sports Fields* by Paul Sachs, 2004 and *Ecological Golf Course Management* by Paul Sachs and Richard Luff, 2001).

The use of compost in topdressing programs for lawns, sports fields, and golf courses has become wide spread and a generally accepted practice, which has been adopted by not only those practicing "organic" methods but also the traditional turf managers. Use of compost is fully compatible with integrated pest management (IPM) programs that seek to reduce use of fertilizer and pesticides. One example of a program where compost topdressing has become standard practice is the Massachusetts Development sports fields located in Devens, MA. Mike Cabral, public works manager, has been using composts annually since 2002 on about 40 acres of playing fields. The use of compost has resulted in significant reductions in the use of fertilizer, irrigation water, and over seeding. Cost savings directly attributed to using compost have been a significant factor; however the quality of the turf has also been improved.

BENEFITS

Topdressing with compost is primarily practiced as a means to improving turf quality. Specific benefits that have been documented include the following:

1. Providing nutrients
2. Increasing organic matter
3. Improving soil structure
4. Reducing irrigation
5. Reducing thatch
6. Improving surface irregularities
7. Adding beneficial microbes
8. Reducing winter damage
9. Reducing weeds
10. Reducing nutrient losses to surface and ground water

Composts are most often generated from waste materials and thus considered a recycled product. Accordingly the use of composts is promoted as having secondary benefits to the environment by diverting wastes from either incineration or landfill disposal. For example, a study performed for the Town of Merrimack, NH, has shown that

composting the wastewater biosolids rather than disposing in a landfill significantly reduced the emissions of greenhouse gasses associated with climate change (Beecher, 2009).

The ten benefits to the turf cited above may or may not be readily observable to the compost user. The general observation most often reported, improved turf appearance, may be attributed to a variety of specific responses caused directly or indirectly by the application of composts. Although some impacts (e.g., a deeper green color) may be observed soon after application of compost, other results are more subtle and not as readily observed. For example, composts add organic matter and beneficial microbes that have been shown to reduce turf diseases; however this disease suppressive benefit would not be observed when the pathogens are not present or when the weather conditions favoring disease outbreaks do not occur. In addition, impacts on soil properties through compost topdressing may require repeated applications over a period of a few years.

1. Providing Nutrients

Perhaps the primary and most often recognized benefit from using compost is the provision of nutrients. Composts will contain a range of both macronutrients (e.g., Nitrogen, Phosphorus, and Potassium) and micronutrients (e.g., Manganese, Boron, Zinc, and Copper) largely in an organic form. These nutrients will be released slowly as the organic matter decays. Unlike conventional inorganic fertilizers, the nutrients in composts are not highly soluble and therefore are not readily lost during periods of precipitation. Thus one of the benefits of using compost is how it provides nutrients in a slow-release form.

Because the nutrients in the composts are in the organic form and released slowly, topdressing is generally performed less often than conventional fertilizer treatments—as little as one or two times per year. Although labor expended in topdressing with compost may be greater than spreading fertilizer alone, benefits are obtained with fewer applications.

Numerous university studies have demonstrated that topdressing with compost improves turf quality equivalent to conventional fertilizer treatments (see Geisel et al., 2001 and Garling & Boehm, 2001). In these studies, direct comparisons between compost topdressing and various traditional fertilizer treatments demonstrated that nutrients in the composts derived from both yard wastes and biosolids were available to the turf and resulted in production of high quality turf. The improved turf quality and growth response observed after topdressing with compost is most likely due to the quantity of nitrogen in the compost; however other nutrients present in the compost have also been noted as possible causes of enhanced growth and enriched color (Garling and Boehm, 2001).

The level of nutrients—and in particular, the forms of nitrogen—in composts from various sources will vary. In general, composts derived from biosolids will have higher levels of nitrogen than those composts made from yard wastes. Testing of compost is always recommended to determine the levels of nutrients. It is possible to obtain a high quality turf with topdressing and significantly reduce, if not eliminate, the use of conventional fertilizer treatments; this is true especially if topdressing treatments are performed multiple times in the year (e.g., both in the spring and fall). Compost however will not necessarily adjust soil pH; therefore lime addition may be required. Whenever topdressing with compost, one should also perform soil testing to determine soil levels and plant needs.

Examples of plant-available nitrogen provided when topdressing with two different composts are provided in Appendix A. A single topdressing application can provide between 0.6 and 0.9 lbs of plant-available Nitrogen.

2. Increasing Organic Matter

Soil organic matter is a critical parameter for obtaining good turf growth. Recommended levels of organic matter will depend on the specific application; however regardless of soil type, increasing organic matter through compost can provide numerous benefits. For example, soil organic matter provides increased cation exchange and thus allows for nutrients to be held and released in an efficient manner.

Although the best time to add organic amendments such as compost is *prior* to planting, when topdressing, the organic matter is added without tilling or turning over the soil. Thus topdressing turf areas allows the soil to be improved without removing or disturbing the turf. This is particularly important where disturbance could lead to erosion and soil loss. In addition, topdressing is particularly useful for maintaining sports fields due to the ability of a topdressing program to improve the soil without taking the field out of use.

3. Improving Soil Structure

Improvements to soil structure obtained from the addition of organic matter have been linked to a wide variety of benefits. In the case of sandy soils, organic matter is essential for holding both water and nutrients.

On the other hand, soils with high clay contents benefit with improved soil structure, reduced surface crusting, and compaction yielding better drainage. Increasing organic

matter through compost topdressing has been shown to decrease soil bulk density and improve the ability of water to infiltrate into the soil (Johnson et al., 2006; Landschoot and McNitt, 1994).

4. Reducing Irrigation

> —"Higher soil organic matter content allows more moisture to be retained in the soil, which improves mineralization of nitrogen and, therefore, turf grass growth." (Kropp and Guillard, 2002)
>
> —"Compost topdressing can be considered an important water conservation method for turfgrass management." (Johnson et al., 2009)

Improved soil structure and increased levels of soil organic matter can lead directly to reducing the need to irrigate turf areas. By increasing the amount of organic matter in soil, the ability of the soil to hold water is increased. Just by raising the overall level of organic matter by 1% increases the ability of an acre of soil to hold 16,500 gallons of water (GA Urban Agriculture Council; http://www.urbanagcouncil.com/docs/water-conservation.doc). In addition, the improved ability of turf areas to allow water to infiltrate into the soil results in less water running off following rain events. Thus addition of organic matter to soils can improve the ability of the soil not only to store water but also to absorb water. The impact on irrigation of athletic fields has been observed by Mike Cabral, public works manager at Devens, MA, who was able to reduce use of irrigation water by more than two thirds after starting a compost topdressing program.

Recent research (Johnson, G. A., et al., 2009) has shown that topdressing followed by core aeration had a significant positive result on soil water content and was an effective means of water conservation while maintaining "aesthetically appealing turfgrass." Areas that received topdressing stayed greener longer after periods of drought. Topdressing also improved water infiltration even when core aeration was not performed. In addition compost topdressing resulted in lower temperatures in the turf canopy reducing stress.

5. Reducing Thatch

> —"Changing the physical characteristics of the thatch layer to provide microecological sites that promote continued activity by the resident microflora may be the most important attribute of topdressings." (Koths, 1972)

Thatch is the organic layer that forms between the soil and the actively growing grass. Although a normal component of turf, thatch can cause problems in highly managed turfgrass. There is general recognition that topdressing can reduce accumulated thatch and reduce thatch levels. The compost promotes the growth of active microorganisms that decompose the thatch layer. Studies by Koths (1972) on various treatments for

reducing thatch concluded that compost topdressings were of greater value than mineral soils in promoting the active decay of thatch**.**

6. Improving Surface Irregularities

One of the earliest recognized values obtained from topdressing golf greens was the creation of a smooth and level surface. For highly managed turf areas with closely cut grass, such as golf greens and tees, compost/sand mixes are routinely used for this purpose. In less highly managed situations, such as lawns and sports fields, topdressing will have a much less dramatic effect on the surface. Topdressing areas of sports fields that get extensive wear can improve the playing surface both by filling in divots and by building more dense plant growth. Improvements to turf quality and soil condition (e.g., reduced compaction) can lead to reducing injury risks on sports fields.

7. Adding Beneficial Microbes

Composts can support large and diverse populations of microorganisms. When properly made, the high temperatures associated with the composting process will kill plant pathogens as well as weed seeds. However as the compost cools, it will be readily colonized by microbes that can grow at normal soil temperatures. Research has shown that certain of these microbes can play an important role in inhibiting plant pathogens and suppressing various turf diseases (see Nelson, 1996; Nelson and Boehm, 2002).

Compost applications have been repeatedly associated with reduced disease; studies with some common turf diseases, such as Dollar Spot, have shown that repeated use of compost of a variety of types can lead to reduced disease to the point that chemical controls can be reduced if not eliminated (Boulter et al., 2002). University research suggests that characteristics of the compost (e.g., type of feedstocks and composting method), presence of various microbes, and nutrition may be important factors in achieving disease control with compost (Landschoot and McNitt, 1997; Hoitink and Boehm, 1999; Nelson, 1992).

8. Reducing Winter Damage

> —"One effect of composts is to improve growth in early spring and promote recovery just because of their nitrogen content." (Hsiang et al., 1999)

In the northeastern United States, compost has been used by many golf course managers for winter cover over greens and tees to prevent or reduce damage caused by ice and snow. Compost topdressing provides an insulating layer that prevents damage and allows the greens to recover more quickly in the spring.

This practice has also been suggested as a means to control damage caused by various snow mold pathogens (see Adding Beneficial Microbes above and Nelson, 1992). Compost applied to the greens is believed to reduce disease through antagonistic

microbes and provide nutrients which promote rapid recovery of the winter-damaged turf.

9. Reducing Weeds

Another of the benefits that has been documented from topdressing with compost is the reduction of weeds (Geisel et al., 2001). This effect appears to be directly related to improvements in the density of grass providing a competitive advantage over the weeds. However improperly composted manures can be sources of weed seeds. During the composting process, it is important that temperatures in excess of 130˚F (55˚C) be maintained for a prolonged period (at least three days) to insure that both pathogens and weed seeds are killed. Proper storage of compost also is important to reduce the introduction of windblown seeds.

10. Reducing Nutrient Losses to Surface and Ground Water

Although nutrient run off from turf is generally recognized as low in comparison with row crops, there is increasing concern that conventional fertilizers, especially when applied late in the season, can lead to nutrients entering surface or ground water (Petrovic, 1990). The use of organic sources of nutrients that are contained in compost has been shown to effectively reduce potential nutrient losses that may be associated with conventional fertilizers to levels equal to unfertilized areas (Guillard and Kropp, 2004).

Other studies have shown that even when turf areas received high rates of compost, losses of both nitrogen and phosphorus were no greater than from areas that received no compost (Johnson et al., 2006). Researchers concluded that when compost topdressing is performed in conjunction with soil testing and is based on plant nutrient requirements, there is little risk that nutrients will lead to increased nutrient run off.

> Perhaps most importantly research studies show that by improving turf shoot density and water infiltration (both common improvements observed when topdressing with compost), nutrient runoff can be significantly reduced (Easton and Petrovic, 2004).

METHODS AND EQUIPMENT

Topdressing with compost can be performed successfully using a variety of methods and equipment. For small areas, compost can be broadcast by hand and distributed over the lawn using either a rake or a leaf blower. For large areas such as athletic fields, a variety of equipment is available. Topdressing equipment developed for golf course greens and tees can be used effectively for many composts and compost/sand mixes.

Topdressing Turf with Compost

In recent years, small-capacity topdressing equipment has become available for applying compost over small areas and residential lawns. The Ecolawn Top Dresser is a motorized applicator developed specifically for topdressing; it is very versatile and works well for topdressing turf with compost in particular (www.ecolawnapplicator.com).

Courtesy of Hartney Greymont, Inc.

Equipment used to topdress compost should be operated to apply a layer that is from ¼ to ½ inch thick in an even manner. After application of the compost, it is common to use a drag mat to insure that the compost is evenly distributed. If compost is applied too thick (1 inch or more), there is risk that grass growth will be impeded.

Aeration of turf immediately before or after application of the topdressing is commonly performed and will aid in the incorporation of the compost into the soil. Core aeration when performed with compost topdressing will decrease soil bulk density and improve water infiltration.

Irrigation of topdressed areas immediately following application of composts is often desirable to enhance the integration of the compost down into the turf. Addition of water will also facilitate movement of water soluble nutrients into the root zone and stimulate the microbial activity. If topdressing is performed during dry summer months, the irrigation of topdressed areas is highly suggested to reduce stress.

SELECTING AND EVALUATING COMPOSTS

> —"The experience level of those managing the composting facility also may significantly influence the final product. More experienced compost suppliers may provide a more consistent and high-quality compost." (Boehm et al., 2000.)

Not all composts are alike and there may be considerable difference among the composts available for use. One of the most critical characteristics to consider when evaluating composts for topdressing is particle size. The compost should be screened to remove any large particles (1/2 inch or larger). Although a finer textured product may work into the turf more readily, any particles that remain visible on the surface of the turf will often quickly disappear.

In general, composts are made from three different types of feedstocks: biosolids, leaf and yard wastes, and manures (primarily dairy and poultry). All three types may be suitable for use but will have different properties and thus may have differing results.

Biosolids-based composts are the most widely used due to their consistently high levels of nitrogen, micronutrients, and organic matter. Distribution of biosolids-based products is regulated by both the US EPA and various state agencies, and composts must meet strict standards for metals and pathogen destruction before they can be distributed. As a consequence, these composts are often very consistent in their properties and will be free of weed seeds, which are destroyed by high temperatures used to reduce pathogens. Often biosolids composts are made with either wood chips or sawdust and should be screened prior to use for topdressing. Due to the presence of residual fine wood particles, these composts may have a relatively light bulk density and are often easy to spread using conventional topdressing equipment. The presence of wood pieces in a biosolids compost may give the appearance that the compost is not completely broken down or not adequately stabilized. However research of Schumann et al. (1993) has shown that biosolids composts can be safely used on turf even after short periods of composting.

Composts derived from leaf and yard wastes often have lower levels of both nutrients and organic matter than biosolids-based products. Although these composts may be very effective for topdressing when screened to a fine particle size, there may be considerable variability in the composts that are available. If not properly prepared—for example, composted at necessary high temperatures—these composts may also contain reservoirs of weed seeds. Compost should be purchased from a known and trusted source where quality is maintained. Leaf and yard waste composts often will have a higher bulk density than biosolids-based products and thus may not be as easily spread.

Manure-based composts are not as widely available in the northeast and their nutrient content will depend upon the source and the method used in their manufacture. Often compost made from dairy and poultry manures will have high levels of phosphorus and their repeated use at high application rates could lead to build up of soil phosphorus levels. In certain local areas, spent mushroom compost may also be available. Although spent mushroom compost has been used for topdressing turf, they typically have elevated salts that may be problematic (see Landschoot and McNitt, 1994).

Due to the variability of composts that may be available, it is important that the turf manager know the source of the compost and request that the supplier provide a complete analysis of the product. A reputable supplier should be able to provide copies of testing performed by a local soil test laboratory, a representative sample, and information on where the compost has been used previously for topdressing. In the case of biosolids composts, the end user should be provided with evidence that the compost facility is permitted to distribute the compost and has performed testing to insure that the compost meets all local and federal standards.

Topdressing Turf with Compost

APPLICATION RATES AND COVERAGE

Broadcast ¼ inch to ½ inch of compost depending on turfgrass height.

Coverage				
COVERAGE PER CUBIC YARD			CUBIC YARDS NEEDED TO COVER	
Depth in inches	**Applied**		**1,000 sq ft**	**1 acre**
¼"	1,290 square feet		0.8 cubic yards	35 cubic yards
½"	645 square feet		1.6 cubic yards	70 cubic yards

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APPENDIX A: PLANT AVAILABLE NITROGEN PROVIDED FROM TOPDRESSING APPLICATION OF ¼ INCH

Ipswich All-Natural Compost	
Bulk density (as is basis)*	1,200 lbs./cubic yard
Average total Nitrogen	0.6 % (as is basis)
% of total Nitrogen available	10 %
Lbs. of available N per cubic yard of compost	0.7 lbs.
Lbs. of N supplied per 1,000 sq. ft. (1/4" application)	0.6 lbs.
Biosolids Compost Prepared with Wood and Screened to 3/8-Inch Minus	
Bulk density (as is basis)	750 lbs./cubic yard
Average total Nitrogen	1.5 % (as is basis)
% of total Nitrogen available	10 %
Lbs. of available N per cubic yard of compost	1.1 lbs.
Lbs. of N supplied per 1,000 sq. ft. (1/4" application)	0.9 lbs.

** "as is basis" means the wet weight, or compost that has not been dried*

APPENDIX B: CASE STUDY

Courtesy of Hartney Greymont, Inc.

After a single topdressing with AGRESOIL COMPOST™, a landscaping company completely revived this lawn. The existing soil had 2% organic matter content that would not hold fertilizer applications or respond to irrigation (shown in picture at left.) Topdressing with compost (3/8th inch) increased the soil organic matter content and cation exchange capacity providing for improved soil water holding and nutrient uptake by the turfgrass (as evidenced in the picture at right).