"GIVE IT WHAT IT NEEDS"

"Selection of Topdressing Materials" by Jim Hermann

The following information is based on practical experience (some good, some bad) and a great deal of research. It is one person's opinion offered as food for thought and does not promote the use of any specific products or materials. It should be pointed out that there are exceptions to the principles and situations discussed that go beyond the scope and complexity of this article. This article is directed to the Public Works departments, Parks departments and all those whose job it is to maintain native soil fields, many of which are heavy textured, problem fields. The intent is to bring attention to some of the considerations necessary when selecting a topdressing material. It should be mentioned that there are very few absolutes in this or any other area of athletic field management.

In order to have a successful topdressing program, it is necessary to have an understanding of a few very basic physical properties of soil.

Soil is made up of sand, silt and clay (physical analysis). The proportion of each is what determines the coarseness or fineness (texture) of a soil.

New Jersey soils can vary from very fine, heavy textured clayey soils to very coarse, light textured sandy soils, depending on the location. Therefore if the same topdressing material is used on different locations it may have different results. Maybe good, maybe not so good.

Soil is divided into 12 different classifications based on texture. The lower the corresponding number, the heavier and finer the texture.

These classifications are:

1. Clay
2. Silty Clay
3. Sandy Clay
4. Clay Loam
5. Silty Clay Loam
6. Sandy Clay Loam
7. Loam
8. Silt Loam
9. Sandy Loam
10. Silt
11. Loamy Sand
12. Sand

Note: The number assigned to each classification is used solely for the purpose of understanding and clarification and is not a universally accepted means of classification.

It is important to know the texture of the soil in your root zone. A physical analysis of your soil will give you this information. Most soil testing laboratories provide this service.

Water movement

It is a generally accepted fact that water will permeate sand faster than it will permeate clay. You will notice clay and sand are at opposite ends of the soil texture list. Sand is coarse or light textured and clay is fine or heavy textured. Keeping this in mind, you can assume water will infiltrate sandy loam (#9) faster than silty clay loam, under most conditions (#5). Likewise silt (#10) usually has a higher percolation rate (hydraulic conductivity) than loam (#7). Hydraulic conductivity is a term used to describe the ability of a soil to transmit water. (Natural Turf for Sports and Amenity, Adams and Gibbs 1994).

It should be mentioned that in addition to the proportions of sand, silt and clay in a soil, the coarseness or fineness of the sand portion, (it's particle size distribution or sieve analysis) also has an effect on the physical properties and water conductivity) of a specific classification of soil.

Example: A medium size sand with a relatively consistent particle size (lower gradation index) usually has a higher rate of hydraulic conductivity than a material containing a more diverse blend of coarse, medium and fine particles, (higher gradation index) such as quarry screenings. As you are probably well aware, quarry screenings can pack like concrete. This is due to the higher gradation index or broad range of particle size distribution.

A principle to remember; water will move from a coarser textured soil to a finer textured soil more readily than the other way around, providing there is adequate pore space between the particles. For this reason, always try to topdress with a material that has the same or coarser texture than the existing root zone of your field (coarser is better, within limits). Always seek the advice of an agronomist or turf consultant when selecting a topdressing material.

When using any material to modify an existing root zone, adequate cultivation is necessary to insure proper incorporation of the material. The more a topdressing material varies from the existing root zone in relation to its texture classification and physical properties, the more cultivation is typically needed.

Without adequate cultivation there remains a very real potential for layering in the soil. Anytime there is a layer created in the soil, the interface between the layers will have the potential to negatively effect hydraulic conductivity, root penetration and even air and gas exchange characteristics of the soil.

Purpose

Before you can determine the proper topdressing material to use, you must first determine why you are topdressing. What are you attempting to accomplish? A few reasons for topdressing are:

- Modification of existing root zone
  - Increase water conductivity
  - Increase organic matter content
  - Increase tilth
  - Increase (Cat ion Exchange Capacity)
- Increase success rate of renovation thru improved soil seed contact
- Smooth a rough uneven surface

Continued on next page.

Root zone Modification

There are as many reasons to modify a root zone as there are soil classifications and growing conditions. Two common materials used to modify a root zone are organic matter (in the form of compost) and sand. Caution must be practiced with either material.

In certain situations, sand can be used to ensure that the playing surface is smooth and firm under wet conditions. It does not improve drainage unless cultivation and topdressing reach a soil depth below the surface that has improved water percolation. If improved drainage is the prime focus of your topdressing program, be sure there is somewhere for the water to go. Be sure there is an outlet. Another approach to improve drainage is to combine sand-based topdressing with vertical/slit drains.

The use of sand as a topdressing material should not be justified merely because it is an inexpensive material. A heavy textured soil requires a tremendous amount of sand, applied over a period of years to have a positive effect on hydraulic conductivity and that's if there is an outlet.

It is important to understand the physical characteristics (sieve analysis & gradation index) of the sand you are using. A steady supply of a uniform material, which conforms to very specific guidelines, should be consistently available. Variations in material uniformity can void the success of the most well planned program. An agronomist can best prescribe these specifications.

Leaf compost is being used more and more to topdress athletic fields. Production by private and public recycling plants alike has made it a widely available material. It is sometimes blended with fine sand and sold as organic topsoil. The benefit to incorporating compost into the root zone is realized through the addition of organic matter.

The addition of organic matter can provide a number of benefits. In a light sandy soil, organic matter can be of benefit by increasing the ability of the soil to retain moisture. This would be classified as an increase in "field capacity". Field capacity is the upper limit of water storage in a field layer after excess water has drained through due to gravity. This increase can maximize irrigation efficiency.

The incorporation of organic matter into a soil adds essential plant nutrients. Depending on the source of the organic matter, this "fertilizer effect" can be substantial and could replace one or more applications in a fertilization program. Organic matter can also increase the ability of a soil to retain nutrients. This increase is known as an increase in CEC (cation exchange capacity) This increase is not usually necessary with heavy textured clay soils but may be of benefit in sandy soils. Note that it takes a tremendous amount of organic matter to increase soil CEC. Thus, in most situations, the benefit of incorporating organic matter is more a result of increased water retention and nutrient addition, than increase in CEC.

The addition of organic matter can decrease the compactive tendencies of a soil and over time help to improve the soil structure (tilth) of a heavy textured soil. Tilth can be associated with the soft, fluffy texture of a well-maintained garden soil. A lack of tilth can be associated with the hard clumpy soil of a goalmouth. The benefits of organic matter can be realized in all areas of an athletic field but more noticeably in high traffic areas where existing soil structure has been destroyed.

Once soil structure is destroyed the ability of the soil to drain and maintain turf cover is severely compromised. The result is a weed-infested area of high compaction. A major cause of this destruction is playing games in wet waterlogged conditions where the soil is actually smeared under the stress of heavy foot traffic.

Materials similar to leaf compost are sewage sludge and spent mushroom compost. These materials are much the same as leaf compost in that they have high organic content but many have the added benefit of higher nutrient availability and therefore the potential for a greater "fertilizer effect".

As with any topdressing material, care must be taken when acquiring and applying compost. A quality compost material should be composted for at least a year prior to purchase and be properly screened to eliminate all twigs and debris. It should show no resemblance to its original components and have a clean earthy odor.

The results of a compost analysis report should be requested prior to purchase. These results should supply a minimum of pH, % organic matter, soluble salt levels, heavy metal levels and the Carbon:Nitrogen (C:N) ratio. Also included with these test results, should be a reference made to the acceptable levels of soluble salts and heavy metals. If it is a blended material it should carry a physical (sand, silt, clay) analysis and have a texture classification such as loamy sand, sandy loam etc. A chemical analysis is also useful in determining the potential "fertilizer effect" of a topdressing material.

The C:N ratio is used as a barometer to measure the level of decomposition and should be less than 30:1. Higher C:N ratios can cause nitrogen supplies in the soil to become temporarily unavailable to the turf until the C:N ratio is reduced through further decomposition. This can have a negative effect on turf quality.

After acquiring a compost material, a test should be done by your soil-testing laboratory to insure conformity to the compost analysis.

Continued on next page...

With compost materials, as with any other topdressing material, care must be taken to provide adequate cultivation in conjunction with the topdressing procedure. As was stated earlier, the more a topdressing material differs from the existing root zone, the more cultivation is necessary to blend the two materials. This is done to minimize the effects of layering. Applying highly organic compost to a mineral based soil such as is the predominant soil in NJ, brings with it the risk of layering. If adequate cultivation is not provided, this risk can become greater with each subsequent application. In this particular situation more is not necessarily better. An anaerobic organic layer (black layer) in the soil is a potentially devastating problem on athletic fields

Timing

Cultivation in conjunction with topdressing should be accomplished during times of the year when there is adequate moisture available, the turf is actively growing and is in a position to repair itself. With cool season turf such as Kentucky bluegrass, perennial rye and tall fescue, spring and fall typically represent the optimum conditions for topdressing and aerification. Topdressing materials with high organic matter content such as straight compost materials should not be applied when there are inadequate moisture levels or when there is the potential for drought stress. These materials have the ability to rob the turf of available moisture when moisture is in limited supply.

Core Aerification

Core aerification is generally the recommended means of cultivation with any topdressing application. Multiple passes done in different directions are typically recommended. Again, the intensity of the aerification procedure is governed by the extent of texture variation between the topdressing material and the root zone. When root zone modification or turf renovation is the intent of a topdressing application, multiple passes to provide a coring pattern of a maximum distance between core holes of 2" and at a depth of 2" to 3" is recommended. The application of topdressing should be accomplished prior to core aerification. The cores, along with the topdressing should be dragged into the core holes using a drag mat at the completion of the procedure. If a more rapid change in the surface conditions is desired, the soil cores can be removed after aerification; in this case it would be appropriate to topdress after soil cores are removed.

Where severe soil structure damage has occurred such as in goalmouths, it is sometimes necessary to till the area in an effort to blend the topdressing material with the damaged soil and create an adequate seedbed.

Be wary of over-cultivating with the rototiller style of equipment, especially if the soil is to dry. Rototiller style cultivators can actually destroy existing soil structure by pulverizing the soil into a fine grainy (dusty) material if over used. As with most soil cultivation procedures, the soil should be moist enough to hold its shape after being clenched in your fist but dry enough to crumble if rubbed between your thumb and forefinger.

Smoothing Roughness

It is not uncommon among sports field managers and contractors alike to incorporate topdressing into a renovation project. Topdressing can not only smooth and therefore improve the topography of a field, but also improve soil seed contact, which is critical to the success of an athletic field renovation.

Continued on next page...

When renovating an athletic field, it is recommended that a material very similar to the existing root zone be used for the purpose of filling holes and depressions. Once an acceptable contour is achieved, a material that provides the objectives of a desired root zone modification program can be used.

Example:

A soccer field was renovated that consisted of a heavy textured loam root zone. The center portion of the field was approximately 50% turf cover. The goalmouths and center circle were extremely depressed, along with the coaches and players. Years of abuse and inadequate maintenance had produced a very compacted soil with severely compromised soil structure.

It was August of "99", the year of the drought. The core aerator wouldn't penetrate the ground 1/2". For this reason the field was aeravated twice over using a solid tine vibrating aeravator. After which it was topdressed with 100 cu. Yds. of screened topsoil, taking care to add additional topsoil in the holes and depressions. The objective of this part of the renovation procedure was to smooth the field. The screened topsoil was very similar in texture to the original root zone.

Screened, mineral based native topsoil, available at many landscape supply companies, is one of the most difficult products to control consistency and quality. Every load has the potential to be different. It can come from many different locations before it reaches the retail supply company.

We found a supply company that had only one topsoil supplier. His product looked to be fairly consistent from month to month and the random tests we had done were acceptable to us.

Once the field was smooth we topdressed with an additional 50 yards (1/4") of 60/40 mushroom compost, sand based topsoil blend that was classified as a sandy loam. This material was a somewhat lighter (coarser) textured material than the screened topsoil used to smooth the field. This particular material was composted for three years, which gave it physical characteristics more typical of soil than compost. It was also vapamed; a treatment which, I understand, kills unwanted seeds.

If you are working with a limited amount of topdressing, once you have smoothed the major depressions and wear areas, always start topdressing in the middle of the field, up one side of the centerline and down the other side, working your way out to the sidelines. In this way, if you run out of material, it's typically in an area of lesser need. With heavier applications apply at half rate and work the same way, from the middle of the field to the sidelines and then back starting in the middle again. The more severely damaged areas down the middle will receive the most topdressing.

The field was seeded using the aeravator equipped with a seed box calibrated at half rate. We aeravated and seeded twice over which helped to incorporate the 60/40-compost blend with the base. The field was then dragged with an infield drag mat to further aid in soil seed contact and smooth the field.

Topdressing Thru Core Aerification

The most economical means of topdressing a field is through core aerification. By pulling cores and depositing them on the surface, you are topdressing your field with a material that is 100% compatible. If you core aerate to an average depth of 2.25" with ¾" tines and maintain a maximum distance of 2" between holes you will bring up the equivalent of ¼" cover of material over the entire area. On an average size soccer field this is approx. 58 cubic yards. If you figure the cost of a topdressing material, this is a very cost effective procedure.

In most situations topdressing should be viewed as a discretionary tool available to the athletic field manager. When used properly, it can provide beneficial results which, in certain situations, could not otherwise be achieved as effectively. The cost of these benefits must be justified when compared to all other available options. ▲