

## First Annual Fall Demo/Field Day Concentrating on Athletic Turf and Equipment August 8<sup>th</sup>

HARRY DUNHAM PARK, Bernards Township  
 (NJRPA's Award Winner in Excellence in Design)

### Agenda

8:00am Registration, Coffee, Donuts & pastries

8:30am Classes begin

11:30am Lunch, Pig Roast & Visit with vendors:

Menu: Whole roasted pig, potato salad, cole slaw, garden salad, corn on the cob, watermelon fruit basket, rolls

12:15pm – 3:30pm Equipment demos

3:30pm Door Prizes

Pre Registration: \$30.00 Members

\$40.00 Non members

After July 31 Register On Site - \$10.00 additional registration fee

### Educational sessions will be provided on:

- Site specific turf management practices.
- Come see 5+ different goal mouth and general renovation options.
- Learn the dos and don'ts of developing specifications for maintenance and equipment needs.
- Topic discussion will be provided in conjunction with equipment demonstrations utilizing various equipment necessary in the care and maintenance of sports turf to include but not be limited to **mowing, aeration, topdressing, seeding, soil preparation and field painting.**
- See turf modules as used on the field at Giant Stadium
- Come see tools of the trade provided by Rutgers Extension Resource Center

**Vendors** interested in participating should call for more information.

Contact: SFMANJ at 908-236-9118

### PARTICIPATING VENDORS

As of June 18<sup>th</sup>

Storr Tractor Company  
 Wilfred MacDonald, Inc.  
 Moyer & Son Inc.  
 Sherwin Williams  
 Storr Irrigation Dept.  
 Storr Dingo Dept.  
 JDL Equipment

TheTerre Co.  
 GreenTech  
 Till Paint  
 Finch Services Inc.  
 Graco  
 Prosser Equip. Co. LLC

### Donations by

Leon's Sod Farm – Sod  
 Fertl-Soil – Topdressing  
 The Terre Co. - Fertilizer

Partac - Topdressing  
 National Seed – Seed

### Door Prizes Donated by

Graco – Jacket  
 Till Paint – 5 gal. marking paint  
 Storr Tractor Company – Toro hand held blower  
 Prosser Equip. Co. – 20 ft. Alum. Retractable flag pole w/ flag  
 Moyer & Son Inc. - \$100 gift certificate  
 Sherwin Williams – Yankee tickets and hats

JDL Equipment - \$30 cash  
 The Terre Co. - Turf tools

### Demo Equipment

Toro Wide area rotary mower  
 Toro 3500 Grounds Master mower  
 IS22 Walk behind rotary mower  
 Aeravator by Storr  
 Bannerman aerator  
 Ty-Crop 180 topdresser  
 Earthquake soil de-compactor  
 Ground Breaker by Blec  
 Orbit Screen screening equip  
 Graco field stripping machines  
 Till Paint field stripping machine & paint  
 JDL Equipment field stripping machine

Toro ASV/Dingo  
 Toro Workman  
 Aebi Tractor w/ bat wing  
 John Deere 1500 aerator  
 Bannerman seeder  
 Bannerman topdresser  
 CR10 Turfco topdresser  
 Verti-drain  
 Turf modules  
 Sherwin Williams paint

and much more!

### SFMANJ BUSINESS

Next Board of Directors meeting – Tuesday, July 23<sup>rd</sup>, 3:30 pm at Rutgers University. Horticulture Farm 2, Geiger Conference Room, Ryder's Lane, New Brunswick.

SFMANJ is dividing NJ into four districts in order to serve you better. We are looking for people to work with our committees for each district. Please attend this meeting or call for information. We welcome your ideas.

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This newsletter is the official bi-monthly publication of the Sports Field Managers Association of NJ. For information contact:  
 Jim Hermann or Eleanora Murfitt  
 Att (908) 236-9118

**2002  
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"SFMANJ Update" Newsletter Co –editors  
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Committed to enhancing the professionalism of athletic field managers in New Jersey by improving the safety, playability and appearance of athletic fields at all levels through seminars, field days, publications and "networking" with those in the sports turf industry.

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**"Welcome New SFMANJ Members"**

Our membership is growing fast. Currently we have 219 members. If you haven't renewed your membership please call (908) 236-9118 in order to continue receiving this newsletter.

|          |            |                                   |
|----------|------------|-----------------------------------|
| Dennis   | Anderson   | Delaware Valley Regional HS       |
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**DROUGHT UPDATE**

DEP Commissioner Bradley Campbell has been holding "meet the Public" meetings to discuss the drought emergency. The state has been divided into six multi-county regions for drought management and each region has been having one of these meetings with the commissioner and Drought Coordinator Dennis Hart. Campbell said it is highly unlikely there will be any changes in the current restrictions before the end of the summer, regardless of rainfall improvement. The DEP re-visits the administrative order at the end of June. For updates, consult the DEP website at [www.njdrought.org](http://www.njdrought.org) or call their hotline at 1-800-448-7379.

(This Week in Farm bureau, June 8, 02, [www.njfb.org](http://www.njfb.org))



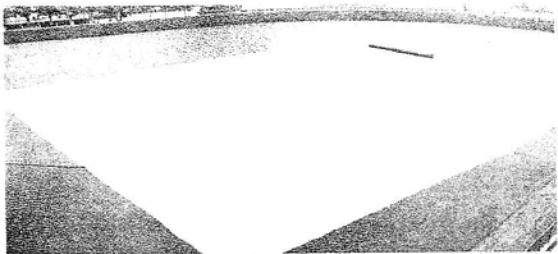
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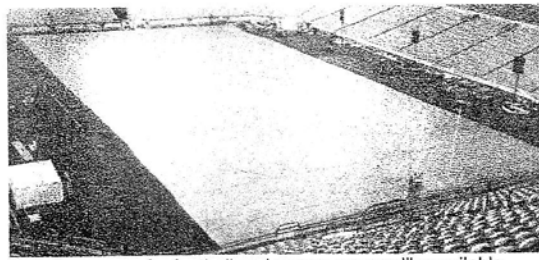
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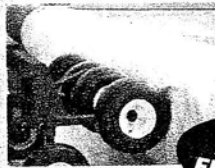
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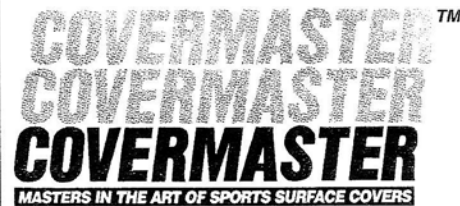
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## "RUTGERS CORNER"

### 'Turfgrass Species and Soil Conditions Affect Irrigation Requirements'

by Dr. James A. Murphy, Specialist in Turfgrass Management

Many factors influence the water requirements to grow turfgrass. A healthy, high-quality turf may need up to 1¾ inches of water per week to keep it growing vigorously under hot, dry, windy summer conditions. This total water requirement includes both rainfall and irrigation. Turfgrass will require much less water when the weather is cool or cloudy. Turfs that produce a deep root system will require less frequent irrigation than a shallower rooted turf. In many cases, rooting is limited by poor soil conditions and subsequently such turfs require more frequent irrigation to produce healthy vigorous growth and an acceptable playing surface.

Turf-type tall fescue will require less frequent irrigation than Kentucky bluegrass, if it can grow a deep root system. In many cases, however, tall fescue rooting is limited by poor soil conditions and, subsequently, such turfs require as much watering as Kentucky bluegrass to look good and maintain healthy vigorous growth. Perennial ryegrass will typically have poorer drought tolerance than tall fescue and Kentucky bluegrass.

Turf, or any plant, should be irrigated in a manner that applies enough water to moisten as much of the root zone as possible. A soil probe can be used to determine what the average rooting depth is in a turfed area lawn. If the roots grow down to 6 inches deep, irrigate to moisten the soil to that depth.

In addition to rooting (soil) depth, the quantity of water to apply is also a function of the soil's texture, organic matter content, structure, and bulk density. Examples of the effect of soil texture on soil water availability are provided in Table 1. From Table 1, it is evident that the amount of irrigation water applied in a single event is predicated on the soil's ability to hold water. Sands typically can only be irrigated with a ¼ to ½ inch of water at a time, whereas a silt loam can have 1½ or more of water applied in a single irrigation event (provided that the water is not applied too intensely resulting in runoff).

Continued on next page.

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## Fertl Soil

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**Table 1. Available soil water for various soils.**

| Soil Texture        | Available Soil Water |                   |
|---------------------|----------------------|-------------------|
|                     | inches               | per foot of depth |
| Sands               | 0.5                  |                   |
| Loamy Sands         | 1.0                  |                   |
| Sandy Loams         | 1.5                  |                   |
| Loams               | 2.0                  |                   |
| Silt and Clay Loams | 2.5                  |                   |
| Clays               | 2.0                  |                   |

Adding organic matter (e.g., peat, compost) to soil will increase the water holding capacity of a soil. Unfortunately, the structure of a soil is often destroyed during earthmoving operations and typically creates a very high soil bulk density. High bulk density soils will not only suffer from poor water infiltration but also low soil water availability. Thus, turf grown on soil damaged by compaction will be extremely prone to drought stress because it dries out very quickly. To improve your ability to conserve water, devote considerable effort to loosening (cultivating) any soil that is compacted during earthmoving operations. Cultivation with an agricultural subsoiler, chisel plow and discing equipment prior to establishing a turf will greatly improve the capacity of the soil to avoid drought problems (high frequency of irrigation) after establishment. ▲

## CALENDAR OF EVENTS

### RUTGERS

**July 31 - Rutgers Landscape Turf Field Day,** Adelphia Plant Science Research Station, Adelphia, NJ. (Learn about the research on turf grasses to improve your turf).

**August 1 – Golf & Fine Turf Research** Hort. Farm II – Ryder's Lane, North Brunswick, NJ  
**For information call:** Bea Devine (732) 821-7134 or Dick Caton (856) 853-5973 or (732) 932-9711 ext. 135.

**Pesticide Recertification Credits Offered On Both Days**

### SFMANJ

**August 8 – Field Day** at Bernards Twp's Harry Dunham Park, a day loaded with equipment demos, five ways to attack your goal mouths, writing specs, maintenance programs and more. 8:00am to 3pm. Fliers were mailed in June. Call Eleanor at 908-236-9118 for info.

### NEW JERSEY RECREATION & PARKS ASSOC.

**September 25 – Skatepark Risk Management Workshop** - 9:00 am to 1:00 pm  
 Red Hill Activity Center, Middletown, NJ  
 Contact: NJRPA at (732) 568-1270  
 Registration: \$80.00 NJRPA member, \$100.00 non member

### NEW JERSEY TURFGRASS ASSOCIATION

**December 10-12 - New Jersey Turf and Landscape Expo 2002**, Taj Mahal, Atlantic City, NJ. (Athletic Field Educational Sessions begin Wed., Dec. 11 from 4pm to 6pm. & Thurs. Dec. 12 from 10am to 3:30pm with annual SFMANJ meeting at 1pm, Thursday).

### SFMANJ Membership Registration form

**Name** \_\_\_\_\_

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**Did you know?** If you store your string trimming line in a bucket of water it will remain softer, less brittle and will last longer.

## "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            | 7. Loam        |
| 2. Silty Clay      | 8. Silt Loam   |
| 3. Sandy Clay      | 9. Sandy Loam  |
| 4. Clay Loam       | 10. Silt       |
| 5. Silty Clay Loam | 11. Loamy Sand |
| 6. Sandy Clay Loam | 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.*



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### 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...*



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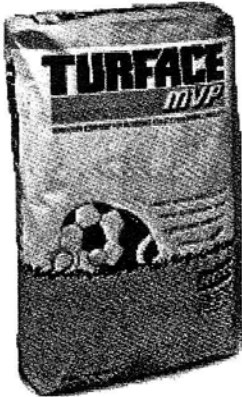
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With compost materials, as with any other topdressing material, care must be taken to provide adequate cultivation in conjunction with the topdressing procedure. As was stated earlier, the more a topdressing material differs from the existing root 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 aerated twice over using a solid tine vibrating aerator. 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 vaped; 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 aerator equipped with a seed box calibrated at half rate. We aerated 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 3/4" tines and maintain a maximum distance of 2" between holes you will bring up the equivalent of 1/4" 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. ▲

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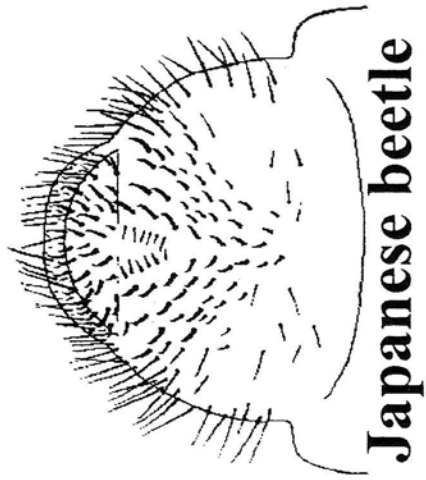
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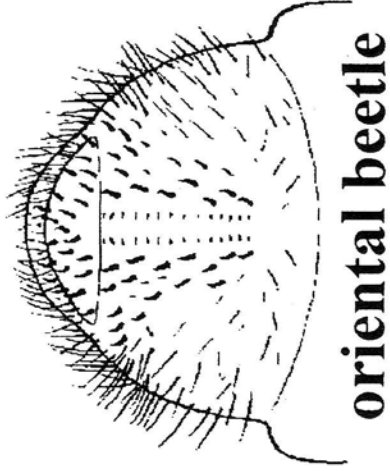
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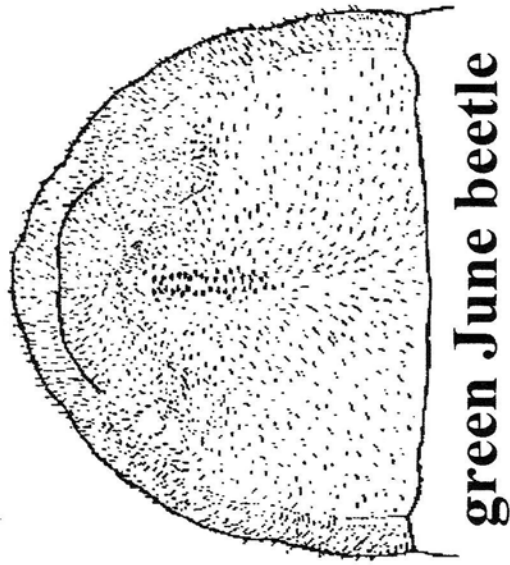




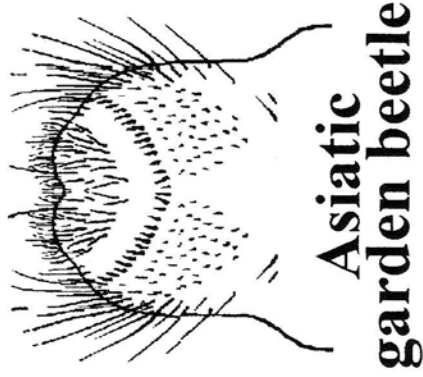
**Japanese beetle**



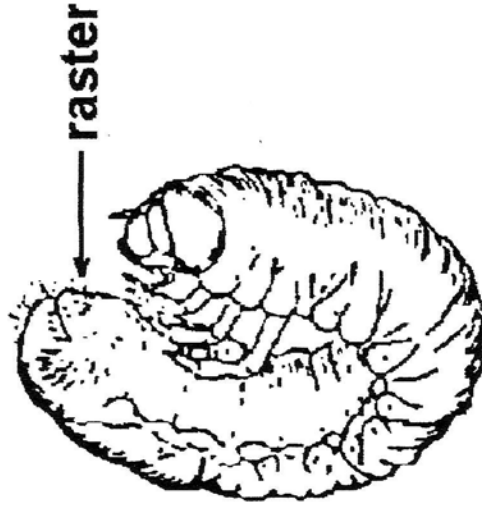
**oriental beetle**



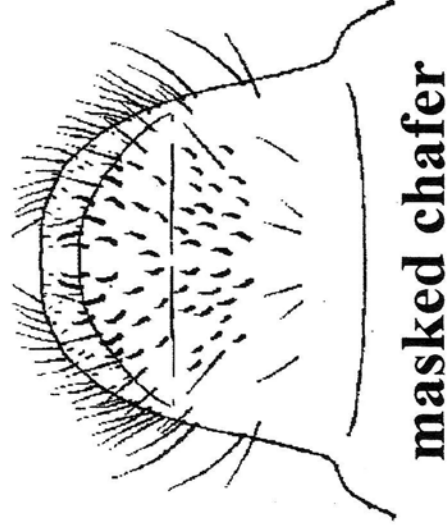
**green June beetle**



**Asiatic garden beetle**



**raster**



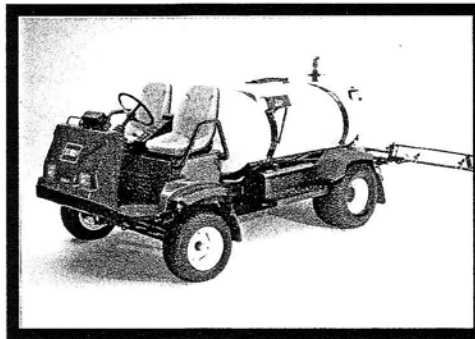
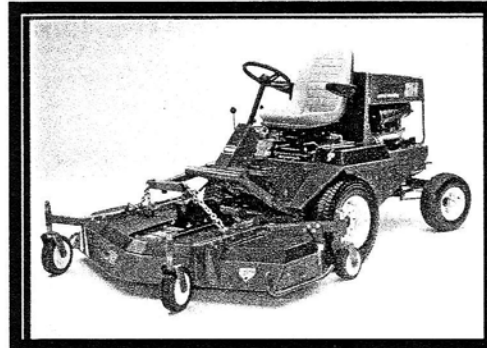
**masked chafer**

Fig. 1. Raster patterns of important white grub species in New Jersey (drawings courtesy of D. Shetlar).

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## “WHITE GRUB MANAGEMENT IN ATHLETIC FIELD TURF”

*Biology of the white grub complex* by Dr. Albrecht M. Koppenhöfer<sup>1</sup>

In the northeastern USA, a complex of primarily introduced white grub species are the most widespread and destructive turfgrass insect pests. Until recently, the Japanese beetle (*Popillia japonica*) was regarded as the key species, but surveys have indicated that the oriental beetle, [*Exomala* (= *Anomala*) *orientalis*] has become the most important white grub species in New Jersey and some neighboring areas. Thus, the average white grub species composition in New Jersey home lawns in fall 2001 (5 counties, 61 sites, primarily central NJ) was 63% oriental beetle, 14% Asiatic garden beetle (*Maladera castanea*), 9% northern masked chafer (*Cyclocephala borealis*), 8% Japanese beetle, 4% May/June beetle (*Phyllophaga* spp.), and 2% green June beetle (*Cotinis nitida*) (Koppenhöfer et al. unpublished data). Another species, the European chafer (*Rhizotrogus majalis*) is the major low maintenance turfgrass pest north and west of New Jersey and may be more common in northwestern counties of New Jersey. However, it is important to keep in mind that species composition can vary considerably among sites.

Different white grub species can vary significantly in susceptibility to different control agents. Therefore proper species identification can be critical. The safest way to identify white grub species in the larval stage is to examine the raster pattern just in front of the anal slit on the grub's underside (Figure 1, see insert). Identification is the easiest when the grubs are 3<sup>rd</sup> instar larvae but at this point, the damage is often already done or impending. Therefore, identification should be done when grub populations are being monitored to determine whether curative treatments are necessary, i.e., in mid August.

Although the general life cycle of the important white grub species is very similar, the egg-laying period (major target for preventive treatments) and accordingly the occurrence of the voracious 3<sup>rd</sup> larval stage can vary by a few weeks among species; another reason for obtaining knowledge about the prevalent species in a turf site. Adult beetles emerge between June and August, mate, and the females return into the soil to lay eggs (total of about 20-60) in several batches over a period of 2-4 weeks. The egg stage, 1<sup>st</sup> larval stage, and 2<sup>nd</sup> larval stage each last about 3 weeks so that through September most of the grubs will molt to the 3<sup>rd</sup> and last larval stage. As the soil temperatures cool down in October, the grubs move to deeper soil layers to stay below the frost line to overwinter. During this time most species are more or less inactive. As the soil temperatures warm up in spring, the grubs come up to the root zone to feed for another 4-6 weeks in April and May before they pupate in the soil.

### Signs of infestation

White grubs damage turf by chewing off roots close to the soil surface. The voracious feeding of the larger late 2<sup>nd</sup> stage and 3<sup>rd</sup> stage grubs, when combined with hot and dry conditions, can result in quick and extensive loss of turf from late August through mid-October. All cool-season and many warm-season grasses are susceptible to white grubs.

Being alert to the signs and symptoms of white grub infestations will help avoid unexpected loss. Early signs of a white grub infestation include gradual thinning, yellowing, wilting in spite of adequate soil moisture, and the appearance of scattered, irregular dead patches. The patches grow and may join together until large turf areas are affected. Due to the grubs' tunneling activity, infested turf feels spongy underfoot and can be pulled up easily, exposing the C-shaped white grubs. Secondary, often more severe, damage can be caused by vertebrate predators (e.g., crows, skunks, raccoons), that tear up the turf to feed on the grubs.

### Early detection, sampling and monitoring, damage thresholds

Mid- to late August, when the grubs are primarily 2<sup>nd</sup> instars, is the time to monitor for potentially damaging white grub populations. The only way to accurately determine the presence of white grubs is through examining the upper 3-4" of soil under the turf. Most conveniently turf/soil plugs are sampled with a standard golf course hole cutter (4.25" diam ~ 0.1 ft<sup>2</sup>). More tedious is the use of an oversized hole cutter (6" diam ~ 0.2 ft<sup>2</sup>; "turf mender") or cutting a square-foot sample with a flat-blade spade. The plugs can be broken up and examined on the spot (preferably on a tray). To improve sample survival, split the soil end of the sample first into halves and then quarters and smaller pieces to reveal the grubs that typically will occur near the thatch-soil interface. Record the number, species (check raster pattern with a hand lens), and life stages on a data sheet or map. Place the soil back in the hole and replace the sod cap. Irrigate to promote turf recovery especially when dry. Because white grub populations have a patchy distribution, several samples should be taken in a grid pattern. Rarely does an entire turf area require treatment.

To save time and effort, sampling can be concentrated on suspected infestation areas, high risk or low tolerance areas, or areas with a history of grub infestations. If historical information is not available and/or a more accurate idea of grub distributions is necessary,

*Continued on next page...*



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mapping and surveying is the thing to do. Using graph paper, prepare a general map of the turf area including landmarks. Mark sampling spots at 6-10 feet (lawns) or 10-20 feet (sports fields) apart in a grid pattern. At each spot take a sample and record number, species, and stage of grubs found (also record 0s!). Experienced samplers can process about 20 samples per hour.

To determine whether treatment is required, transform the grub numbers into 'per ft<sup>2</sup>'-values and compare to damage thresholds. Most published damage thresholds lie in the range of 6-10 (Japanese beetle, oriental beetle, European chafer) and 15-20 (Asiatic garden beetle) grubs per ft<sup>2</sup>. However, damage thresholds vary considerably with grass species, management type, and climatic conditions. In well-maintained tall fescue plots I have repeatedly observed grub densities in the range of 30 to 60 grubs per ft<sup>2</sup> without any signs of turf damage. With experience, turf managers should develop their own range of thresholds for the various turf areas they are responsible for.

### Preventative white grub control

The arrival of new insecticide chemistry with long residual activity in the soil in the last few years has added preventative applications as an option in the management of white grubs. The 2 insecticides presently on the market, Merit, a neonicotinoid, and Mach2, an insect growth regulator, can be applied as early as late May and June, respectively, to provide season-long white grub control. If applied that early, various other insect pest can also be controlled (Merit and Mach2: billbugs, annual bluegrass weevil, greenbugs; Mach2: cutworms, sod webworms) or at least suppressed (Merit: chinch bugs). If white grubs are the primary targets, the optimal application time for Merit and Mach2 is June/July when the female beetles are laying eggs. At this time, control efficacy against many white grub species is typically in excess of 90%. As the larvae hatch and go through their 3 larval stages, they become less susceptible to these insecticides (and other insecticides). Applications against the 3<sup>rd</sup> larval stage in September are not recommended.

Oriental beetle is very susceptible to Merit but MACH2 has only provided 50-60% control on average and should be applied right around peak egg-laying activity. Japanese beetle is very susceptible to Merit and Mach2, and even mid-September applications can still provide around 70% control. Applications after mid-August, however, may not kill the grubs quickly enough to avoid impending damage. Masked chafers are less susceptible to Merit, and where this species prevails, applications should be done during egg laying (June-July) and at the highest label rate. The European chafer appears to be less susceptible to Mach2 and Merit, and applications should be done during the egg laying period (June) and at the highest label rate. The Asiatic garden beetle appears to be immune to Mach2 and Merit.

The obvious disadvantage of preventative applications is that they have to be done before white grub populations can be estimated through soil sampling. Thus, preventative applications are often applied to areas that would need only

partial or no control at all. This increases the cost of grub management, resistance development, and may in the long-term dramatically reduce populations of natural enemies by depriving them of prey or hosts. Smart turfgrass manager will restrict preventative applications to high-risk areas, i.e., areas with extremely low damage threshold and tolerance, areas with a history of white grub infestations, and areas with high beetle activity (egg-laying) in June-July.

### Curative white grub control

If soil sampling has revealed white grub populations, areas with densities above treatment thresholds or ongoing damage may need to be treated. This curative control approach works best if applied while the grubs are still smaller (i.e., mid August to early September). Monitoring and sampling helps optimize application timing and restrict treatments to areas that actually have high grub populations. Once the grubs have reached the 3<sup>rd</sup> instar, they are much harder to control. Spring applications (late April through May) are generally the least effective and rarely justified because the grass can outgrow most grub populations. Only extremely high grub populations, unduly stressed turf, or digging grub predators can cause damage at this time. Any necessary treatments need to be applied before the grubs pupate. Due to the annual life cycle of the grubs, areas that had no damaging infestation or were successfully treated in the previous late summer/fall, will not need treatment in the following spring.

*Continued on next page...*

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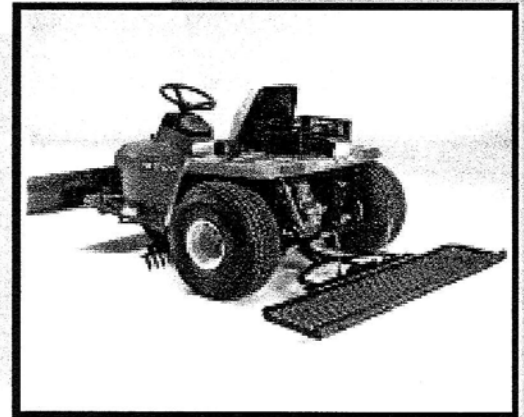
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For best results with any insecticide, mow the turf and rake out dead grass and thatch before treatment. This will reduce the amount of insecticide bound up by surface debris. Irrigate with 0.5-1" water immediately after treatment (or timely rainfall) to leach the insecticide into the root zone where the grubs are feeding. Irrigation also increases insecticide contact by drawing the grubs closer to the surface. If the soil is very dry, pre-treatment irrigation 1 day before treatment will also increase efficacy by bringing grubs closer to surface and reducing thatch binding and evaporation of liquid treatments. However, do not apply soil insecticides to saturated soil. Also, granular formulations need to be applied to dry grass to allow the granules to sift down into the thatch. Liquid and granular applications are usually equally effective, however, granular formulations may be more forgiving if post-treatment irrigation is delayed.

Successful treatments typically kill 75-90% of the grubs but product performance varies with soil type, thatch thickness, and grub species. Therefore, evaluate treatments and keep record of product performance. While speed of kills varies with insecticides, soil insecticide applications never work overnight. Affected grubs usually turn yellow or brown within a week of treatment. Wait at least 1-2 weeks before evaluating. But don't wait longer than 3 weeks to allow for a follow-up treatment if the 1<sup>st</sup> treatment was ineffective. In the latter case, don't apply the same product again at a rate exceeding the label rate. Rather try a different compound. While development of

grub resistance to insecticides is unlikely with the presently used short-residual insecticides, some grub control failures can be caused by enhanced microbial degradation of the insecticide, especially after repeated insecticide use. Avoid unnecessary applications and alternate insecticides.

The range of insecticides available for curative white grub control has already and will continue being effected by the implementation of the Food Quality Protection Act of 1996. Among the organophosphates, only trichlorfon (Dylox) and diazinon (Diazinon) are still available. However, Diazinon production and retail sale is supposed to stop in August 2003. Diazinon may also not be very effective against Japanese beetle grubs. Of the carbamates, only carbaryl (Sevin) is still available but generally does not seem to provide good white grub control. Presently available nematode products for grub control contain the species *Heterorhabditis bacteriophora*, *Heterorhabditis megidis*, or *Steinernema glaseri*. These nematodes can be very effective against Japanese beetle and masked chafer grubs, but are not effective against grubs of oriental beetle, Asiatic garden beetle, or European chafer. While these nematode products have to be handled and stored with more care than chemical insecticides (you are dealing with living organisms!), they have the advantage of no reentry interval due to their non-toxicity. Use of the halofenozide (Mach2) and imidacloprid (Merit) is generally not recommended for curative control. While they

*Continued on page 15....*



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## "Monthly Field Tip"

*Scout for insect pests before turf damage occurs*

by Jim Hermann

- 1. Visual inspection:** The most obvious and simple technique is to get down on your knees and separate the turf with your hands and inspect for insect populations and also damage to grass blades and stems.
- 2. Disclosing solution:** If you don't see any pests they may be hiding in the thatch layer or run too fast for you to catch. Mix two tablespoons of liquid detergent with a gallon of water and sprinkle it over a square yard of turf. Within five minutes, cutworms, webworms, beetles, and even earthworms will come to the surface if they are present.
- 3. Flotation:** Insects such as chinch bugs can be discovered by using a two-pound coffee can. Cut the top, bottom, and lower rim off the can and drive the sharp edge of the can into the ground being careful not to cut yourself. Fill the can with water and stir up the turf. Within minutes you can easily count the insects, which have floated to the surface. Refill when necessary and count three minutes. *Cont pg 15...*



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## "Ask The Grub Oracle"

by Dr. Albrecht M. Koppenhöfer

*Dr. Albrecht Kippenhofer is an Assistant Extension Specialist in Turfgrass Entomology, Cook College/Rutgers University*

Ask Dr. Koppenhöfer questions concerning your insect problems by e-mailing him at HQ@sfmanj.org

**Question:** Is there any factor other than historical data that would cause a turf site to be considered a high-risk area for grub infestation?

**Answer:** Grubs prefer soil in the range from sandy loam to loam. Female beetles have a preference for nice lush looking turf and moist soil when searching for egg-laying sites and generally seem to prefer sunny areas. The eggs have to absorb water from the soil in order to develop. They actually almost double in size in the process. Similarly, the first instar grubs are much more prone to desiccation than the bigger ones. So, overall sites that are moist during egg-laying periods are more prone to get higher grub populations.

For species in which the adult beetles do a lot of feeding, the presence of preferred food plants also increases the risk of infestations because the females will often lay eggs soon after having fed. Adult Japanese beetle feed on > 300 plant species but lindens, purple leaf plums, roses, Japanese and Norway maples, bracken, elder, grape, Indian mallow, multiflora rose, sassafras, smartweed, and Virginia creeper are among the most attractive food plants. Adult Asiatic garden beetle feed on > 100 plant species but have a preference for box elder, butterfly bush, cherry, peach, rose, strawberry, sumac, viburnum, and various flowers such as aster, chrysanthemum, dahlia, goldenrod. In addition, Asiatic garden beetle like to seek shelter in orange hawkweed and sorrel.

Masked chafer grubs are fond of decaying organic matter and prefer moist soils high in organic matter. Green June beetle grubs feed mainly on decomposing organic matter and infestations are more likely where manure fertilizer or compost has been applied. ▲

*Continued from page 10... "White Grub Management"*

may still provide good overall curative control depending on grub species (see above), their speed of kill is too slow to prevent impending turf damage. ▲

<sup>1</sup>*Assistant Extension Specialist in Turfgrass Entomology, New Jersey Agricultural Experiment Station, Cook College, Rutgers, The State University of New Jersey, New Brunswick, NJ 08901.*

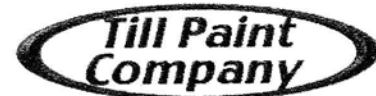
*Continued from page 13.... "Monthly Field Tip"*

- 4. Turf/soil plug samples:** See the description given on page 10, under the heading "Early detection, sampling and monitoring, damage thresholds". In Dr. Koppenhofer's article on **White Grub Management in Athletic field Turf**.

*(Turfgrass Insect & Mite Manual, David Shetlar et. al, PhD, 1990)*  
The preceding scouting techniques are only a few of the many techniques available to the turf manager for the identification and diagnosis of turf insect problems. Always identify, quantify and justify the need for any pesticide application.

▲

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