Update

Sports Field Managers Association of New Jersey

November/December 2003
Vol. 3, No. 6

e-mail: hq@sfmanj.org
www.sfmanj.org

George Toma to Headline NJ Turfgrass & Landscape Expo... *the place to be in 2003*

By Brad Park, Rutgers University
park@aesop.rutgers.edu

George Toma is likely the most famous sports turf manager in the world. He has been the NFL field consultant for all 37 Super Bowls. The son of a Pennsylvania coal miner, Toma began his career 62 years ago as part of Cleveland's minor league baseball system.

Toma will speak at the 2003 New Jersey Turfgrass and Landscape Expo (December 9-11) at the Trump Taj Mahal Casino Resort at Virginia Avenue and the Boardwalk in Atlantic City, NJ.

New Jersey Turfgrass Expo 2003 continues the proud tradition as a "pacesetter" in the turfgrass and landscape industry. Featuring an expanded Trade Show, Expo 2003 will mark yet another step forward in response to the continued interest of registrants and exhibitors.

Sports Field Managers Sessions

Wednesday, December 10, 2003
4:00-6:00 pm
Panel: SYNTHETIC SURFACES FOR ATHLETIC FIELDS

Playing Surface Characteristics of In-filled Systems
Dr. Andrew McNitt, Penn State University

Experiences with Playability & Maintenance
Fred Stengel, Bergen Catholic HS

Economic Considerations
Dr. Henry Indyk, TurfCon GSI Consultants, Inc.

Experiences & Concerns with Synthetic Turf
George Toma, NFL Field Consultant for Super Bowl; APPEARANCE COURTESY OF LOFTS/ PENNINGTON SEED

Thursday, December 11, 2003
8:30 – 10:00 am
Panel: UNDERSTANDING WEAR & ITS MANAGEMENT

What is Wear?
Brad Park, Rutgers University

Turfgrass Species & Varieties: Selecting for High Traffic Areas
Dr. Stacy Bonos, Rutgers University

Management Practices for Minimizing Impact of Traffic
Dr. James Murphy, Rutgers University

continued on page 3

Inside This Issue

This newsletter is the official bi-monthly publication of the Sports Field Managers Association of New Jersey.
For information regarding this newsletter, contact: SFMANJ at 730-7770 or 908-236-9118
Co-editors:
Jim Hermann, CSFM
&
Eleanor Murfitt

SFMANJ Business

Next Board of Directors Meeting - Dec. 3, Wed. 5:30pm at Rutgers Geiger building, Ryder's Lane, New Brunswick.
Anyone interested in serving on the Board of Directors for the 2004/05 years you may attend this meeting.

2003

SFMANJ Board of Directors

Mission Statement
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.

Contact us at:

P.O. Box 370
Annandale, NJ 08801
Web Site – www.sfmanj.org
E mail – hq@sfmanj.org
Ph/Fax – 908-730-7770

National Organization
Sports Turf Managers Association

www.sportsturfmanager.com
e-mail: SportsTMgr@aol.com
Phone: 1-800-366-0391

SFMANJ Membership Registration form
* **receive update** information by **email**

Name	
Title	
Employer	
Address	
City	
State	**Zip**
County	
Phone	**Fax**
***E-mil**	
Signature	

Individual	$35
Associate	$35
Organization/Institution	$35
Additional member from facility	$20
Commercial/Contractor/Vendor/Supplier	$85
Additional member from company	$25
Student	$10

Send with Check or voucher to:
SFMANJ
P.O. Box 370
Annandale, NJ 08801

Welcome New & Renewed SFMANJ Members

Currently we have 286 members. If you did not see your name this year call (908) 730-7770. Renewal forms will go out into the mail the end of November. Please Take **Note**: This year you can not renew with STMA, the National Chapter.

James Chimento	JC Landscape Construction/ Management Co.
Yves Delpeche	Orange Township DPW
Pieter Dykstra	Individual
John Helton	Cinnaminson Board of Ed.
George Lynch	Red Bank Borough
Jeffery Marcason	Northvale, Borough of
Paula Redmond	Pemberton Township
Chuck Reynolds	Reed & Perrine
Don Savard	Salesianum School
Ronn Seamon	Aspenn Environmental Services I
Craig Tolley	County College of Morris

Looking For an Engineer Experienced in Building Athletic Fields?

by Eleanor Murfitt

As I began interviewing engineers for designing my township's 60-acre site, I wondered how many engineers write effective specifications for athletic field construction? How many use broiler plate **DOT** specifications? How many directors's like myself know the difference? What are effective specifications? When looking at previous projects the engineer was involved in, would I be able to determine who was

continued from page 1

School IPM – It's the Law – What You Need to Know (Core points)
Ann Waters, NJDEP

Thursday, December 11, 2003
12:30 – 2:30 pm
SFMANJ Business Meeting - Elections

Field Preparation for the Super Bowl
George Toma, NFL Field Consultant for Super Bowl;
Appearance Courtesy of Lofts/Pennington Seed

Topdressing: Benefits, Materials, & Techniques
Dr. Andrew Mcnitt, Penn State University

Meeting the Challenges of Sports Field Management
Kevin Meredith, National Soccer Hall of Fame

Specifications for Contracted Maintenance Services
James Hermann, Total Control, Inc.

Calendar of Events

NJ Turf Grass Association

Dec. 8 – 11 Expo 2003 Atlantic City, NJ
Athletic Field Educational Session ½ day Dec. 10 & full day Dec. 11. For information call 856-853-5973 or 732-821-7134

Rutgers University Athletic Turf Classes

* February 24-26 Athletic Field Construction and Maintenance course
* March 9th The Importance of Understanding Athletic Field Soil
* March 16th The Importance of Understanding Athletic Field Turfgrass
* March 23rd Understanding Athletic Field Project Specifications
Information call 732-932-9271

NJ Landscape 2004 27th Annual Trade Show & Conference
February 25th, Wed. 8:30am to 4:30pm. Meadowlands Exposition Center in Secaucus, NJ. Booth spaces available. For information call 201-664-6310 or www.njlca.org

Nominations Wanted for SFMANJ

Board of Directors

2003/04

Here is your chance to have a voice in 2003-05 leadership of the SFMANJ. We are now accepting nominations for Board of Directors. No experience necessary.

There are 12 people representing Parks & Recreation, Schools, Colleges, Professional DPW, Facilities, Education/ Extension, Commercial/Contractors and Buildings & Grounds who serve on the chapters' Board of Directors. Each Director serves a two-year term beginning January 1, 2003. There are six openings. A nomination committee will select members based on the following criteria:

1. Have been interested and active in SFMANJ (a member in good standing)
2. Are proven leaders
3. Are representative of the entire organization, both professionally and geographically
4. Are willing to commit time to the development of our organization
5. Understand when accepting this nomination you are expected to attend one meeting a month (evenings, minimum of 8 meetings), be a Chairperson of one committee, report on that committee at the monthly meeting and help with field days.

If you or someone you know are interested in serving on the Board of Directors fax or send the name, address, biography and phone number. E-mail or fax by November 30, 2003 to:

SFMANJ
PO Box 370
Annandale, NJ 08801
or fax to 908-730-7770, E-mail, hq@sfmanj.org

Rutgers University October 2003 Sports Turf Field Day

by Brad Park, Rutgers University
park@aesop.rutgers.edu

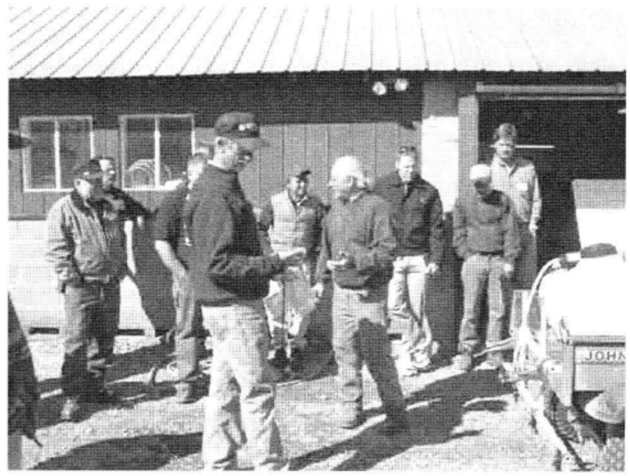
On a beautiful early-fall day at the Rutgers Snyder Research and Extension Farm located in Pittstown, NJ, Rutgers University in cooperation with Sports Field Managers Association of New Jersey (SFMANJ) sponsored the October 2003 Sports Turf Workshop.

After a great lunch and introductory remarks made by Eleanora Murfitt, President, SFMANJ; Dr. John Grande, Director, Snyder Farm; and Dr.

Bruce Clarke, Director, Rutgers Center for Turfgrass Science, 73 participants began a tour of sports turf demonstration plots.

The tour consisted of field demonstrations created for the purpose of conveying practical and applied information to sports turf managers. Brad Park, Rutgers University, described his broadleaf weed control herbicide demonstration as well as the concept of including a plant growth regulator in turf marking paint. Dr. John Grande and SFMANJ-sponsored student intern, Rob Shortell, Rutgers University showed the results of seeding different turfgrass species at multiple soil depths as well as seeding turfgrasses in early winter. Dr. James Murphy, Rutgers University, illustrated the need for frequent mowing when turfgrass is intensively managed as part of a turfgrass mowing and nitrogen fertilization demonstration conducted on both perennial ryegrass and tall fescue.

The final stop of the field plot tour was an interactive description of baseball/softball infield mixes recently installed at the Snyder Farm. The infield mix plots afforded the sports field managers in attendance the opportunity to view different mixes they might encounter and be responsible for managing as part of their job responsibilities. Jim Hermann, Vice President, SFMANJ, took part in the demonstration by describing strategies and management practices required to maintain infield mixes.



As part of a presentation that carried 1 Core NJDEP Pesticide re-certification credit, Geoff Slifer and Bob Hasse, Rutgers Snyder Farm, showed proper techniques for storing and handling pesticides as well as the process of calibrating a sprayer.

Turfgrass diseases are often overlooked in sports field management. Dr. Bruce Clarke ended the October workshop by delivering a talk on how cultural practices in turfgrass management influence disease severity.

A special thanks goes out to all those who attended the 2003 October Sports Turf Workshop at the Rutgers Snyder Farm. ◆

Rutgers Corner - Differences Exist Among Infield Mixes

By Rob Shortell (shortell@eden.rutgers.edu) & Brad Park (park@aesop.rutgers.edu), Rutgers University

Introduction and Rationale

Management and potentially selection of an infield mix are an integral part of a sport turf manager's responsibilities if he or she is required to oversee the maintenance of a baseball or softball field. In many cases, a field manager will only be familiar with his or her infield mix and be unaware of the variety of mixes that are available on the market. In Summer 2003 we created plots at the Rutgers Snyder Research and Extension Farm for the purpose of demonstrating different infield mixes.

Our goals in selecting mixes were to choose various mixes that fell within American Society for Testing and Materials (ASTM) standards as well as choose materials that did not meet ASTM specifications.

According to ASTM specifications utilizing sieve designations, no more than approximately 7% of an infield mix may contain gravel (particle sizes greater that 2.0 mm) and 80-94% of the mix should be comprised of sand. The remaining portion of a mix should be silt and clay.

However, the ASTM standards contain a passage, which states, "In the absence of particle size data to assess materials, a reasonable approach would be to prepare a mixture using 15 to 30% clayey soil and 70-85% sand ...". Using these criteria, we designed the Summer 2003 demonstration that included a total of 5 mixes; two falling within ASTM standards, and three falling outside ASTM standards.

Materials and Methods

A uniform, non-sloped, well-drained site was chosen and three pits (approximately 30 ft x 10 ft) were excavated by rototilling to a depth of 3.0 inches and removing the loosened soil with a front-end loader. Large stones were removed from the pits and the base of each pit was scarified to a depth of 1.0 inch and rolled.

Two pits were individually filled with two mixes that generally fell within ASTM specifications at the high and low end of percent sand composition. Approximately 0.5 inch of mix was added to a pit, rolled to create a firm surface, and additional mix was added and rolled at 0.5 inch increments.

Mix 1: 88% sand, 12% silt/clay

Mix 2: 70% sand, 21% silt/clay, 9% gravel

We divided the third pit into three equal 10 ft x 10 ft sections and filled each section with a mix that clearly fell outside the range of acceptability as defined by the ASTM standards.

Mix 3: 95% sand, 5% silt/clay

Mix 4: 66% sand, 17% silt/clay, 17% gravel

Mix 5: 50% sand, 44% silt/clay, 6% gravel

Mix 3 (excessive sand) was prepared by modifying Mix 1 with additional sand. The volume of a 10 ft x 10 ft pit was determined and a calculated volume of sand was added to a known volume of Mix 1 to completely fill the 10 ft x 10 ft pit. Using similar methods, additional gravel was added to Mix 2 to create Mix 4 (excessive gravel).

Excavated pits were filled with infield mixes using a front-end loader.

While Mix 5 falls outside of ASTM standards due to excessive silt/clay, it must be noted that this mix is acceptable for use in the construction of pitchers' mounds and batters' boxes.

Maintenance Regime & Discussion

Following installation, the infield mixes were left uncovered and therefore exposed to weather conditions ranging from heavy rainfall to prolonged dryness.

In order to maintain a "game-ready" infield surface under dry conditions, it was necessary to supply moisture to Mixes 1,2,3, and 4 several times daily followed by hand raking.

We define a "game- ready" infield surface as surface that is firm yet cork-like (using one's thumb to create an imprint in the mix) and can be worked with a rake or other scarification tool to create a loosened "cap layer" of mix.

Rob Shortell, Rutgers University, adds additional sand to Mix 1 (88% sand) to create Mix 3 (95% sand)

While the addition of moisture to Mix 3 (excessive sand) added some stability to the mix, because of the excessive sand content and subsequent inability to retain moisture, we deemed Mix 3 to be commercially unacceptable.

Mix 5 (excessive silt/clay) was extremely difficult to manage and was rarely game-ready. During dry weather, this mix became rock-hard and cracked. Following rainfall, Mix 5 was soft, slick, unplayable, and an illustration of another commercially unacceptable mix.

Mixes 1 and 2 (both conforming to ASTM specifications) showed differing moisture requirements and drying times following exposure to dry and wet conditions, respectively. Under dry conditions, Mix 1 (88% sand) required the addition of more moisture compared to Mix 2 (70% sand) to bring to game-ready conditions. Following heavy rains and subsequent dry weather, Mix 1 required less drying time to become "workable" with hand rakes and thus easier to prepare for a game-ready surface.

Under all conditions Mix 4 (excessive gravel), displayed identical characteristics (wetting and drying) to Mix 2, indicating the additional gravel had minimal impact on the behavior of the mix. The 17% gravel content comprising Mix 4 (ASTM standards suggest 7% maximum) presents a significant safety hazard and, in our opinion, mixes similar in composition to Mix 4 should not be used as infield playing surfaces.

After several weeks of allowing the mixes to be exposed to variable weather conditions, we made the decision to cover the mixes with tarps. We made this decision, in part, by noting that the ASTM specifications say, "When budget allows ... areas should be covered with an appropriate impervious cover when not in use. Such covers prevent evaporation in dry weather and protect the area from excess water during rainfall or general irrigation of an infield."

Considering Mixes 1 and 2 (both conforming to ASTM standards), following rainfall, the covers kept the mixes dryer and reduced the amount of time necessary to prepare the mixes for game day conditions. Despite covering the mixes, Mix 1 (88% sand) continued to require less time to prepare compared to Mix 2 (70% sand) following rainfall.

Conversely, Mix 2 retained moisture longer compared to Mix 1 following prolonged dry weather and removal of covers. As part of this demonstration, we estimated that infield mix maintenance inputs were reduced by as much as half as a result of covering the mixes.

As part of the Sports Turf Workshop held on October 2, 2003 at the Rutgers Snyder Farm, we allowed 1/3rd of each mix to remain uncovered for approximately 2 weeks, and the other portion of the mixes to remain covered until the morning prior to the Workshop. We prepared the covered portions of all the mixes to game-ready conditions on the morning of the Workshop. The advantages of covering were evident on October 2 as the covered areas were game-ready whereas the uncovered sections were rock hard.

Additional Considerations

The infield mix plots at the Rutgers Snyder Farm demonstrated concepts described by the ASTM specifications, most notably the fact that management of an infield mix is affected by relative percentages of sand and silt/clay in the mix. According to the ASTM standards, "... top mixes with 6 to 10% silt/clay [90-94% sand] are better suited in rainy climates due to greater internal drainage. In dry periods, they will require frequent irrigation to minimize dust and to provide a firm surface." Whereas, "... the presence of clay is desirable from the standpoint of providing both a firm and stable surface for good footing ... top mixes 11 to 20% silt/clay [80-89% sand] will drain more slowly but will retain more water. Frequency of irrigation will be less. These mixes will be more cohesive and will be more difficult to loosen when they compact."

Sports field managers should consider their budgets, availability of labor, and typical environmental conditions (dry climate vs. moist climate) when choosing an infield mix.

Infield mix maintenance has often been considered as much an "art" as it a "science." While the ASTM standards provide a starting point from which to choose a particular mix, and we effectively demonstrated three mixes that are not acceptable (Mix 3, 4, and 5), the quality of an infield playing surface is most significantly affected by the actions and decisions made by the sports field manager.

"It has often been observed that the skills of the grounds manager are a greater contributing factor to high quality skinned areas than the materials used to construct these areas. Successful grounds managers must select management practices that are appropriate for the field at hand, or modify field conditions to match a given maintenance program." – ASTM Standards F 2107-01 ◆

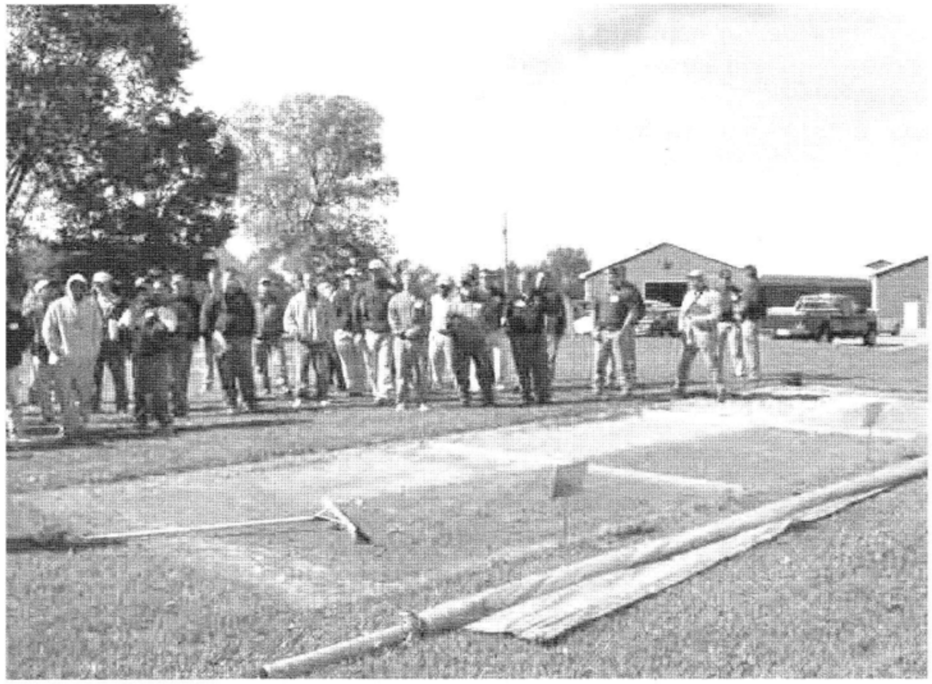
Acknowledgements

The authors wish to thank Sports Field Managers Association of New Jersey for financial support of this project and Jim Hermann, CSFM, for project design input and help in mix maintenance and installation.

Additionally, the authors would like to thank Geo. Schofield Co. Inc. and Partac Peat Corporation for donating materials used in this demo.

Literature Cited

ASTM. 2002. Standard Guide for Construction and Maintenance of Skinned Areas on Sports Fields. Volume 15.05: Designation F 2107-01.



A 30 minute presentation on the installed infield mixes was part of the October 2, 2003 Sports Turf Workshop at the Rutgers Snyder Research and Extension Farm located in Pittstown, NJ.

continued from page 2

responsible for the outcome? Did the engineer oversee and enforce the contract properly? Did the contractor follow the specifications to the T? Did the administration cut corners to save money and meet their time-line?

How many of you have asked yourselves these questions? How many of you have had great projects or ones that were not so great? Tell me about them. I would like to hear from directors, contractors, engineers, administrators and the sports field manager. I do not need names or company's just successes or failures we can all learn from. You do not have to give your name if you do not want it revealed. E-mail or write to the SFMANJ address in this newsletter. ◆

**Eleanor Murfitt is the director of Parks/Recreation & B&G forWashington Township (Morris County) Long Valley, NJ*

Monthly Field Tip - Crabgrass Control

by Jim Hermann, CSFM*

Now is the time to inspect your turf and determine the need for spring pre-emergent crabgrass control. Dead and dying annual grassy weeds, such as crabgrass, are easily distinguished from desirable grasses.

For some, crabgrass control may be an aesthetic application determined by unsightly clumps of incompatible coarse bladed grass. For others the need for crabgrass control is brought about by a desire to promote a more durable playing surface. Competition developed as crabgrass populations increase cause the deterioration and thinning of desirable grasses. Whatever your reasons, make the decision now. ◆

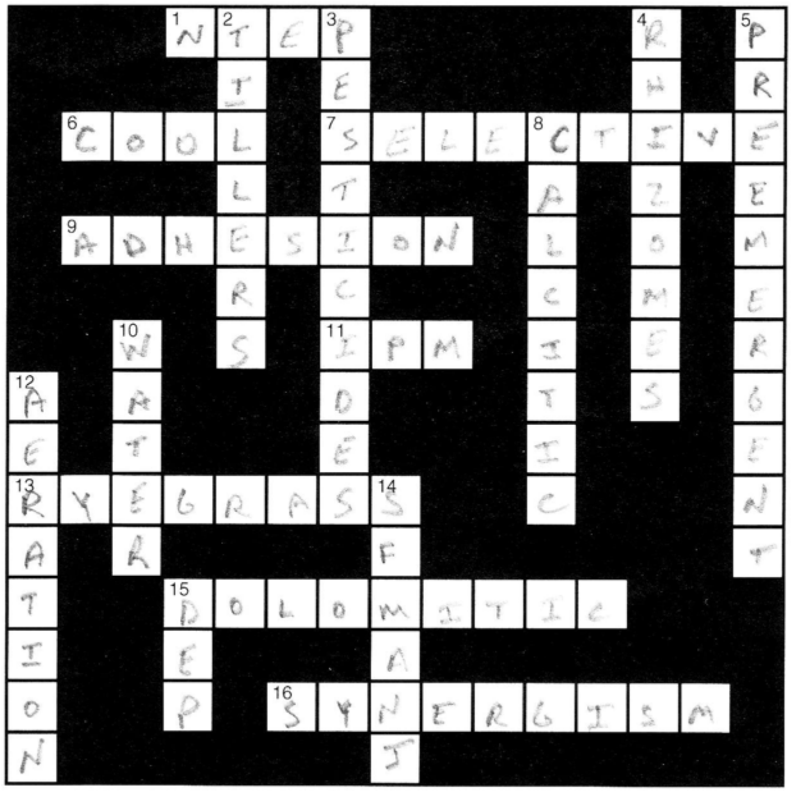
Complete this crossword puzzle correctly. Be the first person to send it to SFMANJ and receive a ***one-day pass*** to the **Athletic Field Educational Session** on Dec. 11th at the NJ Turfgrass Expo in Atlantic City. Complete and fax with name and contact number by November 30th to: 908-735-7777.

Across

1. Abbreviation for the program responsible for evaluating and reporting new turf seed varieties.
6. Bluegrass, tall fescue and perennial ryegrass are species of______ season turf.
7. Herbicides that control some vegetation while not controlling other vegetation _____.
9. The attraction of dissimilar substances as with soil and water.
11. Method of pest control that attempts to minimize yet not eliminate the use of pesticides.
13. Turfgrass species know for quick germination and establishment.
15. Lime applied to the soil for the purpose of raising soil pH and increasing magnesium levels.
16. The working together of two things (herbicides for example) to produce an effect greater than the sum of their individual effects.

Down

2. Ryegrass and tall fescue increase in area by producing ________.
3. Herbicides, insecticides and fungicides are all ____.
4. Bluegrass differs from other cool season grasses because it produces _____ as it spreads.
5. A herbicide which interferes with seed germination and minimizes the emergence of undesirable and sometimes desirable vegetation.
8. Lime applied to the soil for the purpose of increasing soil pH and sometimes lowering magnesium.
10. Quickly available nitrogen sources are _____ soluble.
12. Form of soil tillage to relieve soil compaction within turf areas.
14. Our local chapter of STMA.
15. State department concerned with pesticide regulations.



Concepts In Moisture Management

by Jim Hermann, CSFM

As the demand for Sports turf quality and playability continues to increase, moisture management has the ability to become the limiting factor in an otherwise effective management program. Irrigation and drainage, a marriage made in heaven. The irrigation giveth and the drainage taketh away. The increased individual benefit created by their combined applications (synergism), developed through the proper understanding and implementation of each of these systems will without question add to the durability and quality of any athletic field.

In order to understand moisture management a basic understanding of soils is necessary. The soil is composed of many individual particles. These particles are classified by order of their size. Sand being the largest particles, silt in the middle and clay being the smallest particles in the soil. The spaces between these particles are known as pores. There are smaller pores created by the stacking of smaller particles known as 'micro' pores, which hold moisture and nutrients in a soil solution, and there are larger pores created by the stacking of larger particles known as 'macro' pores, which not only provide an avenue for water and good air (oxygen) to enter the soil, but also an avenue for the escape of bad air (gases) produced in the soil. Turf roots generally require larger pores in excess of .1mm to efficiently force their way through the soil. At .1mm we are talking about pores around 4/1000 of an inch in diameter.

'Soil solution' is defined as the aqueous liquid phase of the soil and its solutes. Harpstead, M.I., T. Sauer, W.F. Bennett. 2001. *Soil Science Simplified* Iowa State University Press, Ames Iowa, 4th edition

In an adequately aerated, well structured soil, excess moisture drains through the macro pores, providing of course there is a place for the water to go. Water also infiltrates the soil through these macro pores. Infiltration is defined as the downward entry of water into the soil.

In a coarse textured sandy soil, the larger particle sizes create the macro pores. In a fine textured clayey soil the macro pores are the product of soil aggregates. Aggregation is the cementing together of smaller soil particles to create larger particles by various organic compounds, clay, oxides and various salts. Many influences affect aggregation and therefore the macro or larger pore space of finer textured soils. In high traffic areas of athletic fields such as goalmouths, soil structure or aggregation of finer textured clayey soils can break down, severely compromising macro pore space and therefore compromising infiltration, percolation, aeration, root development and efficient moisture and nutrient utilization. Once soil structure is destroyed, it can take years to reestablish.

When discussing moisture management, a few terms need to be understood. Saturation, free water, field capacity and wilting point are terms used when describing moisture levels in the soil. 'Saturation' of the soil is reached when all the soil pores are filled with water. 'Free water' or gravitational water as it is also referred to, is the water contained within the larger pores when the soil is saturated. This is the water that has the ability to drain from the soil given the forces of gravity and a place to go. 'Field capacity' would be considered the point at which all 'free water' has drained from the larger pores of the soil due to gravity. At field capacity, all remaining moisture in the soil is held against the force of gravity in the 'micro' or smaller pores.

I believe it important to note; the same fine textured clayey soil that can remain completely saturated at field capacity also has the potential to attain acceptable drainage characteristics given adequate particle aggregation, aeration and a place for the water to go.

Here is an example of saturation vs. field capacity: take a sponge and submerse it in water. Once the bubbles stop, the sponge is totally saturated. All the air space has been replaced with water.

Note: there will always be some air trapped in the sponge and also the soil but we will say 'all' for the sake of argument. When you remove the sponge from the water, the water that flows freely from the sponge is known as 'free water'. When the water stops flowing, the sponge is said to be at sponge or 'field capacity'. The amount of water that remains in the sponge after all free water is removed varies with the size and number of pore spaces within the sponge just as it does within the soil. If the sponge is allowed to dry due to evaporation of remaining moisture, this lack of moisture could be compared to the 'wilting point' of soil. The 'wilting point' is the point at which plants can no longer extract moisture from the soil.

As the soil moisture level increases and this level comes closer to field capacity the soil becomes increasingly unstable. The soil has less resistance to the forces of traffic and wear. There is an increased tendency for the soil to compact under vertical pressure. Moisture surrounding the soil particles acts like a lubricant allowing the soil particles to more easily slide closer together, interpacking. Smaller particles are capable of filling the macro pores created by larger particles, minimizing macro pore space and creating compaction, poor drainage and inadequate aeration of the soil. There is also the increased tendency for turf tear out caused by the lateral pressure of stopping, twisting and turning. As the soil goes beyond field capacity and saturation is reached, the soil is even more unstable. At the point the soil is more capable of smearing and eroding. Soil structure and aggregation can be severely compromised.

As moisture levels diminish from field capacity, the soil becomes more stable. It becomes more wear tolerant. The forces of cohesion and adhesion become stronger holding the soil particles together. Cohesion or surface tension as it is sometimes referred to, is the waters attraction to itself and is the force that creates water droplets. Adhesion is the attraction between moisture and soil particles. This combined force could be considered the glue that holds the soil particles together creating increased stability at lower moisture levels.

Adhesion and cohesion hold moisture in the soil against the forces of gravity and at higher levels against the forces of suction exerted by plant roots. These forces compete with the suction of the turf plant in its effort to take up moisture and nutrients from the soil solution. The point at which the turf can no longer extract moisture from the soil solution is again known as the 'wilting point'. At this point turf can die. In addition, as the soil continues to dry, it again becomes more unstable. Dust and wind erosion are products of this instability. Maintaining stability within the soil profile becomes an important issue in moisture management. It becomes a balancing act to provide adequate moisture for turf maintenance without over watering and developing excessive instability within the root zone.

I believe it is important to understand that these same forces that affect the stability of a root zone are the very same forces that affect the stability of a baseball infield mix. Moisture management and its affects on infield mix stability, safety and playability has the potential to become a limiting factor in your infield management program.

Moisture has two means of movement in the soil. The first and most obvious is gravitational movement of free water. Water not held sufficiently by surface tension (cohesion) and adhesion to the soil particles is pulled through the macro pores of the soil by gravitational pull. Hence the term 'water runs down hill'. This term should be altered to read 'free water runs down hill'. The other means of moisture movement in the soil is capillary movement.

Capillary movement can be described in the following manner. Once all free water has drained from the soil, the soil particles remain covered with a film of moisture. As the turf roots take in moisture from the soil solution surrounding particles adjacent to the roots, cohesion and adhesion cause moisture to move from soil particles with thicker films to soil particles with thinner films that are next to the roots.

Gravitational pull has little affect on capillary movement. Example: Create a small puddle of water on a level, flat surface such as a tabletop. The water clings to itself and remains in a puddle due to cohesion. It clings to the tabletop surface due to adhesion. Adhesion is defined as the physical attraction of two dissimilar materials and as such can vary considerably between different materials. Most tabletops have poor adhesive qualities by design, otherwise everything would stick to them. In the soil profile, on the other hand, adhesion is generally the dominant force in capillary moisture movement. Place the corner of a paper towel in contact with the puddle. The water is adsorbed 'up' into the paper towel against the force of gravity due to capillary movement within the paper towel. Moisture moves toward the turf roots, soil particle by soil particle in much the same way it moves within the fibers of the paper towel. It should be noted that lateral or horizontal movement of moisture in the soil is very slow. For this reason among others it is most beneficial for turf to have a deep dense root system in order to efficiently seek out and utilize available moisture and nutrients.

Once all free water has drained from the soil and field capacity is reached, there are two main avenues through which moisture can be eliminated from the soil solution. One avenue of elimination is evaporation directly into the air at the soil surface. The other is transpiration into the air through the turf blades as moisture is taken in through the roots and utilized by the turf. The cumulative total of these two forces is evapotranspiration or ET.

The purpose of an irrigation system is to aid natural rainfall in efficiently maintaining moisture at a level somewhere between field capacity and the turf stress point (the point where the turf is showing visible stress) by replacing moisture lost through evapotranspiration. This 'soil moisture deficit' will vary based on the soil characteristics. It is the responsibility of the sports field manager to understand the soil he is dealing with in order that he might effectively and properly manage his or her system.

Due to the reduced 'available water capacity' or amount of water held between field capacity and permanent wilting point of a sandy soil as compared to that of a clayey soil, light irrigation at more frequent intervals is necessary to recharge a sandy soil and maintain 'easily available moisture' within the root zone. Over watering will cause water and nutrients to travel or percolate beyond the root zone. Percolation is the downward movement of water through the soil.

Fine textured clayey soils should be watered more heavily and less frequently than sandy soils due to increased available water capacity. Soil must be wet to 'field capacity' during the process of irrigation to insure uniform wetting. Light frequent watering of fine textured clayey soils will encourage shallow rooting.

An interesting note: Although more moisture is held in a clayey soil between the permanent wilting point and field capacity, than is held in a sandy soil, some of this moisture is not 'easily available water' to the plant. Easily available water is that water available to the plant in excess of that which would be considered limiting in the growth of the plant. This limitation is due to the increased forces of cohesion and adhesion caused by lower moisture levels in combination with smaller particle size. Moisture is held by the soil with much more persistence than can be exerted by the plant in the form of suction. There is moisture in the soil but it is not available to the turf. In contrast almost all the water held in a sandy soil between permanent wilting point and field capacity is 'easily available water'

The purpose of a drainage system is to effectively and efficiently allow for the removal of free water from the soil profile and return the soil to field capacity. It is a misconception to believe that a drainage system can effectively remove moisture below the level of field capacity. I once heard it stated that the outlet of a drainage system was plugged because it was assumed that the drainage system caused the soil to dry out too much. This is a false assumption. Increased soil moisture deficit caused by internal man made drainage is at best localized within the area of the drains due to the inefficiency of lateral moisture movement within the soil profile.

Note: lateral or sideways water movement in a soil is relative to available soil pore space just as is downward water movement. Its benefits on drainage are proportionately less than downward water movement due to the decreased force of gravity. This factor is of major concern when determining drain spacing and can only be calculated accurately through the use of mathematical formulas, which are far beyond the abilities of this sports field manager.

The moisture deficit developed within close proximity to underground drainage, made evident by browning of turf is typically only noticeable under prolonged drought conditions and should not be considered a limiting factor in the efficiency of an internal drainage system. I would be more inclined to identify inefficient irrigation as the limiting factor in that situation. I hope some of the principles discussed in this article sheds light on this misconception.

When developing a drainage strategy the first consideration is to determine whether or not the water problem you are facing is derived from ground water such as an underground spring or high water table, or if your water problem is caused by surface water such as rain or run off. At the most basic level it is important to accept that ground water needs to be intercepted underground before it reaches the surface by the use of underground piping. Surface water needs to be intercepted at the surface before it soaks and saturates the soil whenever possible. This can be done with the effective use of proper field grading, swales and diversions.

Further control of surface water can be accomplished through slit drainage. Slit drainage is a series of narrow vertical trenches dug into the field and backfilled with sand to the surface. Some have pipes in the bottom of the trench. Others do not. Usually these trenches connect with larger collector trenches, which have pipes in the bottom to carry the water away to an appropriate storm water outlet. By extending the drainage material to the surface, free water is allowed to not only enter the sides of the trench from within the soil profile but also from the surface of the trench. If installed properly this ability makes slit drainage very efficient.

It should be understood that the principles and concepts provided in this article are very basic. Most all of us are sports field managers and not soil scientists. Our understanding of the different aspects of turf management is generated on a need to know basis. As the demand for quality, safety and playability of our sports fields increases, this demand will continue to push us to the limits of our abilities and understanding. I don't claim to know all there is to know about moisture management and its relationship to soil physics but I will continue to read and increase my understanding. As I do I will continue to provide our readers with what I consider to be accurate useable information. ◆

The following books were used as reference material and are highly recommended reading material for anyone wishing to gain more knowledge in this area.

Mcintyre, K. and Jacobsen, B. 2000. *Practical Drainage for Golf, Sportsturf and Horticulture* Sleeping Bear Press

Harpstead, M.I., Sauer, T. Bennett. W.F. 2001. *Soil Science Simplified* Iowa State University Press, Ames Iowa, 4th edition

Adams, W.A. and Gibbs. R.J. 1994. *Natural Turf for Sports and Amenity.* CAB International, Wallingford UK, 1st ed.

Marshall, T.J., Holmes, J.W., Rose, C.W. 1999. *Soil Physics.* Cambridge University Press 3rd ed.

Ask The *CSFM*

Jim Hermann, CSFM is a Certified Sports Field Manager. There are 35+ CSFM'S in the country and two in NJ. Jim has over 20 years experience in turf maintenance. Send your questions to jimtc@att.net

Question: Due to wet weather and the hectic schedule I had this year, I did not get early fall fertilizer on my athletic fields until late September. I normally prefer to make this application around Labor Day. I then apply a second application around mid October, six weeks after my first application. I'm afraid it's too soon for a second application but if I wait much longer I'll miss the window. What should I do?

Answer: Fertilizer applied toward the end of the growing season is known as late season fertilization. As temperatures cool and top growth slows, the turf turns its energy to lateral growth and root development. A slow release nitrogen source at this time is beneficial to the turf in providing the nutrients necessary for continued development. Over stimulation caused by excessive amounts of water-soluble nitrogen at this time of year can cause over wintering problems such as snow mold.

The main question is this; what is the current condition of the turf? If the turf is still retaining good color and looking healthy, I would delay the late season fertilization. If fertilizer were applied after top growth ceased and the turf is totally dormant, this application would be considered a dormant application. The purpose and benefit of a dormant application differs from that of late season fertilization in that the benefits are reaped in the spring. Some of the nutrients are absorbed into the root system and some are held in the soil. In either case the majority of nutrients are utilized as the turf awakens from dormancy in the early spring. Its benefits are realized by the stimulation of root development, early green up, lateral growth and finally top growth. When dormant fertilizer is applied in the late fall, any spring fertilization should be delayed and only applied when visual evaluation of the turf reveals a deficiency. This typically becomes evident in the late spring when a light application of nitrogen along with phosphorous and potassium shown to be necessary by a soil test is all that is typically required. ◆

Sports Field Managers Association of New Jersey

P.O. Box 370
Annandale, NJ 08801

STANDARD MAIL
U.S. POSTAGE PAID
LEBANON, NJ 08833
PERMIT NO. 13

Or Current Occupant

Bradley Park
Rutgers University,Dept. of Plant
Bio/Pathology
59 Dudley Road
New Brunswick, NJ 08901

Sports Turf Managers Association

'2003 Proud Sponsor Directory'

One sponsor's name will be picked out of a hat at the December NJ Turfgrass Expo Athletic Field Educational Session. This sponsor will be featured in the next newsletter

To become a Proud Sponsor call 908-730-7770.
$150 FOR ONE YEAR