CORNELL UNIVERSITY TURFGRASS TIMES

# CUTT

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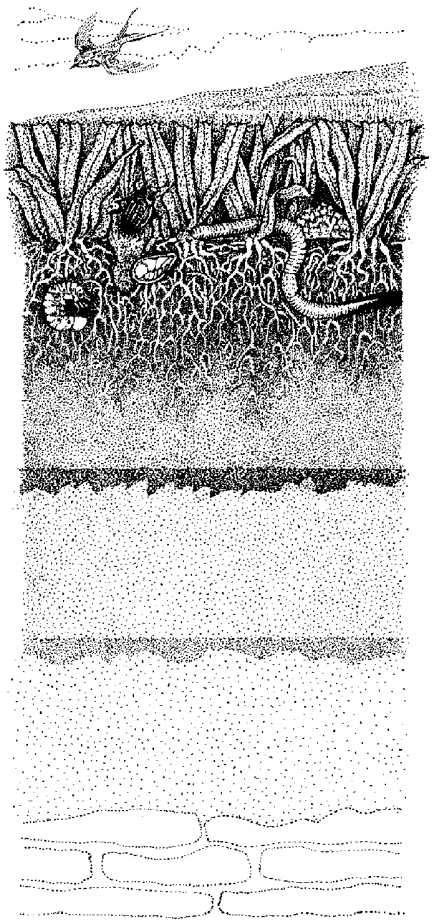

# The Art and Science of Turfgrass Soil Management

Fall is often a season when turfgrass managers have the time and opportunity to consider doing some important soil management techniques. Soil management includes the modification of both the chemical and physical properties of soil. Because turf problems related to soils are often considered "hidden" due to their below-ground nature, they are often misdiagnosed, ignored or forgotten. ■

Turfgrass symptoms of soil problems include the following:

- shallow but extensive root system
- little or no roots below 4"
- little or no top growth
- off-color, very chlorotic tissue
- easily wilted
- low density with weeds
- poor response to fertilization and soil-applied pesticides
- prolonged wet soil that limits recreational uses
- water easily runs off the turf surface.

Some sites may have all of the above symptoms while others may have just a few. Some symptoms may take a long time to show (like root growth) while other symptoms are quickly visible (top growth). Many other factors can cause the symptoms described above, making a definitive diagnosis nearly impossible. Thus, soil management often is considered an art more than a science. Turfgrass managers must understand and utilize more scientific principles to improve the art of soil management.

### Managing Soil Physical Conditions

Most turfgrass sites have been disturbed, or at least changed from their natural state, as the result of construction where the natural order and state of soil layers (profile) has been rearranged by the bulldozer. Often construction debris may be buried in the disturbed soil, further affecting the ability of turfgrass plants to survive.

There are many sites, like residential lawns, where no soil physical management practices are used; whereas, there are sites like golf greens or intensively management sports fields that use every available soil physical management tool. The soil physical management tool box contains methods such as:

- Cultivation; coring, slicing, spiking, grooving, water and air injection, drilling, solid tine cultivation

- Amendments, either of a physical, chemical and biological nature

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## This Times

# Short Cutts

***Dr. Skogley's legacy lives on in the many turf students he advised in his career and the many graduate students he guided to become leaders in the turfgrass industry.***

***Professor Bob Emmons, the turfgrass program leader at SUNY Cobleskill, is the recipient of the Chancellor's Award for Excellence in Teaching.***



## A Note of Passing
### *Dr. C. Richard Skogley*

The turfgrass industry has lost one of its great pioneers and gentleman with the passing of Dr. C. Richard Skogley in early September. "Doc" as he was referred to fondly by his many students and colleagues embodied the essence of a man committed to serving his family, his country, and his scientific discipline. Dr. Skogley, born in Deer Lodge, MT, was a navy veteran of World War II returning to college as many of his era on the GI Bill to pursue an education in agriculture. He received degrees from the University of Rhode Island and Rutgers in the 1950's and joined the URI faculty in 1960.

Dr. Skogley's legacy lives on in the many turf students he advised in his career and the many graduate students he guided to become leaders in the turfgrass industry, e.g. Dr. Rich Hurley of Lofts Seed, Dr. Rich Cooper of North Carolina State University, Dr. J. Scott Ebdon of UMass, Scott Niven of The Stanwich Club, John Carlone, Meadowbrook Golf Club, and Dennis Petruzelli of LakeOver National among others. The Rhode Island Golf Superintendents who benefited regularly from his "What's up, Doc?" column awarded him their "man of the year" honor in 1977. He received the United States Golf Association Distinguished Service Award in 1992 as a measure of his widespread influence on the selection and development of bentgrasses and fescues. Dr. Skogley was involved in the development and release of industry standards such as Jamestown chewings fescue, Exeter colonial bentgrass, Kingstown velvet bentgrass, and most recently, Providence creeping bentgrass.

I recall the days during my graduate studies at URI, when every Friday afternoon, Doc would walk the plots with me to rate the hundreds of varieties in his collection. He always viewed himself as a collector, not a breeder. He would place his cap on his head with a slight tilt to the right, pack his pipe, and off we went. I recall those afternoons with great fondness as he told stories of the students and friends that passed through his office. Later during my studies Doc and Jane opened their home to me and I had the privilege of sharing a room with C. David Skogley. That time with the Skogleys provided a unique opportunity to experience Doc as a husband and father, as well as my mentor. I carry a piece of that experience with me each day as do many turfgrass managers who had the privilege of sharing his polite and sincere company. Our thoughts are with Jane, David, Tom, and Elizabeth as well as the entire Skogley family.

FRANK ROSSI

## Emmons Recognized for Excellence in Teaching

Professor Robert (Bob) Emmons, the turfgrass program leader at SUNY Cobleskill, received the Chancellor's Award for Excellence in Teaching at the 1997 graduation ceremonies. The effort to bring this award to Bob was headed by Professor James Bates who was charged with collecting letters of support from current and former students as well as turfgrass industry leaders. As expected, the letters not only poured in, but were filled with genuine admiration and respect for a man that had a positive influence on their professional and personal lives.

Bob, a native Bostonian trained at the University of New Hampshire, has spent much of the last twenty two years mentoring students to become leaders in the golf turf industry. In addition, he has elevated the Cobleskill program to be one of the finest in the country, due in no small part to the attention he brought with the publication of his text, *Turfgrass Science and Management.* The program at Cobleskill continues to grow under his leadership and with the support of the turfgrass industry in New York State, especially the New York State Turfgrass Association (NYSTA). Bob remains actively engaged in a variety of activities outside of his heavy load at Cobleskill, including teaching at Cornell Cooperative Extension and NYSTA Programs such as the Turfgrass Short Course and Sports Turf Field Days.

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## More on Corn Gluten Meal (CGM) for Weed Control

Iowa State researchers, under the direction of Dr. Nick Christians, the individual who identified the herbicidal properties of the material, have expanded their search to enhance this natural product's weed control potential. A recent paper published in *Crop Science* described the effects of the active molecule responsible for the herbicidal action of CGM on perennial ryegrass seedlings as a model species. The dipeptide Alaninyl-Alanine (Ala-Ala) was identified as one having the highest level of growth regulating, root inhibiting effects at low concentrations. This study explored the precise inhibitory action on morphological and anatomical aspects of ryegrass seedlings. The results indicate that root length was reduced 42% with specific abnormalities observed regarding cell walls, nuclei and mitotic structures.

What does this all mean? The CGM project is a wonderful example in our industry of how science works, once it "stumbles" onto a new technology, in this case the development of a new pest management tool. At this stage, with concerns over the nitrogen content in the CGM products, the researchers are investigating the water soluble active components that could be developed and formulated in a more easy to apply system and eliminate problems associated with applying excessive amounts of N under spring growth flush conditions.

*(From: Unruh, J.B., N.E. Christians, and H.T. Horner. 1997. Herbicidal Effects of the Dipeptide Alaninyl-Alanine on Perennial Ryegrass Seedlings. Crop Sci. 37:208-212.)*



## Bentgrass Relations

Up until the last seven years, the selection of seeded types of creeping bentgrass was very limited. In fact, there have been more bentgrasses developed for release in the last seven years than the previous 40 combined! As my friend, Dr. Virginia Lehman, of Lofts Seed says, "the good news is you have more bentgrasses to choose from, and the bad news is you have more bentgrasses to choose from." Now that we have many new cultivars, researchers are concerned about maintaining a diversity within the species so that resistance to diseases and environmental stress is conserved. To this end, researchers at Michigan State University utilized an analytical technique that could determine the relationship among eighteen commercially available cultivars and a European introduction from 1958. The goal of the study was to see how much the bentgrasses have in common with each other so that if continued development persists, breeders are aware that they may be narrowing the genetic base of cultivars while improving for other desirable traits.

Results indicated that the bentgrasses in the study segregate into two main clusters, one cluster includes ten cultivars (penncross, penneagle, putter, trueline, viper, emerald, 18th green, cobra, crenshaw, and seaside) that all seem to relate back to seaside creeping bentgrass introduced in 1924. The second cluster contains eight cultivars that break into two groups; four of them are almost indistinguishable (southshore, pennlinks, pro/cup, and lopez). The remaining four cultivars (providence, sr1020, national, and cato) do not group closely with other cultivars and appear to be unique. The fascinating aspect of this study is related to crenshaw and sr1020, that share three of the same parental materials, yet cluster differently. This may indicate a weakness with the technique or demonstrate the well known within cultivar variability of this cross pollinated species under the selection pressures imposed by the breeders. Nevertheless, our ability to understand genetic relationships will ultimately contribute to the development of grasses that can produce desirable traits, all that's left is figuring how to manage them!

*(From: Warnke, S.E., D.S. Douches, and B.E. Branham. 1997. Relationships Among Creeping Bentgrass Cultivars Based on Isozyme Polymorphisms. Crop Sci. 37:203-207.)*

*continued on page 11*

# Scanning the Journals

***A review of current journal articles***

***Researchers are investigating water soluble active components that could be developed and formulated in a more easy to apply system and would eliminate problems associated with applying excessive amounts of N.***

***With many new bentgrass cultivars now available, researchers are concerned about maintaining a diversity within the species so that resistance to diseases and environmental stress is conserved.***

# Soil Management

*continued from front cover*

***All types of cultivation only have a positive influence on a small zone of soil surrounding the cultivation hole.***

***For maximum positive impact, cultivation tine spacing should be no greater than 2 inches on center, which can be accomplished by narrow tine spacing units or multiple passes.***

## Cultivation

Turfgrass managers understand the agronomic need for cultivation, but the users of many of the sites are not so understanding. There is nothing that raises more flack from golfers than core cultivating the greens. The reasons for cultivation include: increasing infiltration and percolation of water and other materials (nutrients, pesticides) through soil; removal of unwanted layers; aiding in overseeding; as part of a thatch management program; and improving the health and vigor of the site. Improving infiltration occurs when the cultivation hole extends from the turf surface to below the zone of restriction. The zone of restriction is a layer of soil that is very dense and has a very slow rate of water movement through it. The zone of restriction caused by normal use of a site (maintenance equipment, carts and foot traffic) is usually contained in the surface few inches of soil. Shallow forms of cultivation like hollow and solid tine aerifiers are effective in improving the soil physical conditions on sites with this shallow restrictive zone. On sites with deeper zones of restriction, usually created during construction from heavy earth moving equipment, deeper forms of cultivation are needed which include the solid or hollow tine deep aerifiers, water injection and deep drilling. If the depth of restriction is deeper than the depth of cultivation there may be very little improvement in the soil physical condition.

All types of cultivation only have a positive influence on a small zone of soil surrounding the cultivation hole. A dye movement study conducted by Dr. Panayiotis Nektarios while a graduate student at Cornell revealed that most forms of cultivation studied positively influence the 0.5 to 1 inch of soil surrounding the cultivation hole. Water injection cultivation had a larger zone of influence up to 2 inches of soil at the bottom of the hole. Thus, for maximum positive impact, cultivation tine spacing should be no greater than 2 inches on center, which can be accomplished by narrow tine spacing units or multiple passes.

**The reasons the fall is an ideal time for cultivation are: to alleviate the compaction caused during this year's growing season, take advantage of the cooler soil temperatures so as to promote root growth, enhance fall overseeding, and to improve the general health and vigor of the turfgrass.** On areas with large reserves of annual bluegrass seed, core cultivation is often delayed until mid to late fall to discourage annual bluegrass seed germination/encroachment.

## Amendments

Amendments come in various forms as either physical, chemical or biological types. Some amendments, such as organic matter, can influence all three areas. Others, like sand, may influence one, the physical properties. The physical properties altered include water movement through soils, moisture holding capacity, compaction resistance, and aeration. Chemical properties include nutrient holding capacity (cation exchange capacity), nutrient source and pH. Biological properties include the general microbial population, disease antagonistic organism activity, and microbes important in nitrogen transformations and pesticide degradation.

The most common amendments are: sand, soil, calcine clay, calcine diatomite, and organic matter sources. There are several new amendments, most notably the natural zeolites like clinoptilolite. Table 1 summarizes amendments, properties and uses.

A major concern of any amendment is how stable it is to breaking down, especially if used to amend sand. If the amendments to sand break down into very fine particles, the highly pervious nature (well drained) of sand could be destroyed and the site made less usable, especially during rainy periods. Amendments can break down into smaller particles in several ways, by microbial decomposition, chemical decomposition and physical forces like weathering and traffic.

We have been studying the stability of amendments to some of the above breakdown forces, weathering and traffic (impact and abrasion). There currently is no accepted method of assessing the stability of amendments. We choose to use several suggested ASTM methods used to assess aggregate stability. One method involves simulating weather by wetting samples in a saturated sulfate salt solution (magnesium sulfate) then overdrying. We found all of the routinely used soil amendments (calcine clay, calcine diatomite and sand, as well as 6 sources of clinoptilolite) were stable to weathering. We are currently assessing their stability to traffic forces and maintenance practices (abrasion and impact) using the LA Abrasion test method. The initial data suggests that all of the amendments tested do break down to some degree, but further analysis is needed to determine if the breakdown is excessive enough to destroy the well drained nature of sand based turf areas.

Amendments can be used to partially amend soils (topdressing or shallow incorporation into the root zone) or complete incorporation into the

**Table 1. Sources of soil amendments, the properties they influence and the forces involved in degrading amendments.**

| Source | Amendment of | Properties Improved: Physical | Chemical | Biological | Degradation Forces* |
|---|---|---|---|---|---|
| Sand | soil | yes | no | no | C, T |
| Calcine Clay | sand soil | yes | yes | no | W, T |
| Calcine Diatomite | sand soil | yes | no | no | W, T |
| Natural Zeolites | sand soil | yes | yes | no | W, T, C |
| Organic Matter | sand soil | yes | yes | yes | B |
| Soil | sand | yes | yes | yes | |

* Forces involved in degrading amendments include C=Chemical, T=Traffic, W=Weathering and B=Biological.

root zone. The factors involved in choosing one over the other involves: the time one can wait for positive results (topdressing is long term while complete root zone modification is very quick fix), cost and which amendment is used.

MARTY PETROVIC
CORNELL UNIVERSITY TURFGRASS TEAM

## *Turfgrass symptoms of soil problems:*

- **shallow but extensive root system**
- **little or no roots below 4"**
- **little or no top growth**
- **off-color, very chlorotic tissue**
- **easily wilted**
- **low density with weeds**
- **poor response to fertilization and soil-applied pesticides**
- **prolonged wet soil that limits recreational uses**
- **water easily runs off the turf surface**

***Amendments come in various forms as either physical, chemical or biological types. Properties altered include:***

***Physical properties***

- ***water movement into/through soils***
- ***moisture holding capacity***
- ***compaction resistance***
- ***aeration***

***Chemical properties***

- ***nutrient holding capacity (cation exchange capacity)***
- ***nutrient source***
- ***pH***

***Biological properties***

- ***general microbial population***
- ***disease antagonistic organism activity***
- ***microbes important in nitrogen transformations and pesticide degradation***

# The Turfgrass Pathology Program

## Program Update

***Research goals are to develop sustainable nonchemical approaches to disease control and to develop an understanding of how soil microorganisms influence plant health.***

***The most common disease diagnoses in 1996/97 were for* Pythium *root rot, anthracnose,* Leptosphaerulina *leaf spot, and summer patch.***

In this and coming issues of *CUTT*, we will discuss various aspects of our research, outreach and teaching programs, and current issues in turfgrass pathology. The first article of this series presents an overview of the Turfgrass Pathology Program at Cornell.

The Turfgrass Pathology Program examines environmental issues surrounding disease control. Research projects are focused on golf turf with studies in the following areas:

- impacts of microbial inoculations and compost amendments on disease control
- the impacts of fungicides and compost amendments on disease control and soil microbial properties
- biological and chemical seed treatments to improve stand establishment
- mechanisms of biological control by bacterial inoculants
- bentgrass rhizosphere microbiology
- *Pythium* tolerance among bentgrass cultivars
- the biology and ecology of *Pythium* species and *Sclerotinia homoeocarpa*.

These projects maintain an applied focus but also are designed to examine basic biological and ecological interactions among plants, microorganisms and soils.

The main emphases of our research have been on studies of biological disease control and on the ecological relationships of soil microbes to turfgrass health. These are areas of research for which few scientists have been engaged and for which many of the answers to sustainable disease management lie. Our goals are to develop sustainable nonchemical approaches to disease control as well as to develop an understanding of how soil microorganisms influence plant health so that management practices that maintain optimum soil quality can be used to maximize turfgrass health.

The results of our research efforts are extended to turfgrass managers through outreach programs. The turf pathology outreach program is focused primarily on educating turfgrass managers about disease diagnosis and nonchemical management strategies. Turfgrass disease diagnoses and associated educational programs are handled by the Insect and Plant Disease Diagnostic Laboratory on the Cornell campus under the direction of Diane Karasevicz. Currently the diagnostic laboratory processes between 50 and 60 turfgrass samples a season, providing information on causal agents and disease management strategies. In addition to microbial plant pathogens, nematode diagnoses are also handled by laboratory staff. The most common disease diagnoses in 1996/97 were for *Pythium* root rot, anthracnose, *Leptosphaerulina* leaf spot, and summer patch.

Major turf pathology educational offerings occur as part of the following campus-based programs:

- **The Cornell Turfgrass Short Course,** offered each year during the first half of January. Six hours of turfgrass pathology instruction covers basic aspects of turfgrass disease identification and management.
- **The Cornell Advanced Diagnostic Turfgrass Short Course,** offered in selected years during the first week of August. This 2-day course offers intensive training in both field and laboratory disease diagnosis and in IPM methodologies.
- **The Cornell Turfgrass Field Day** takes place annually during the third week of August and provides opportunities to review current research and outreach efforts.

In addition to these campus-based programs, there are dozens of regional, statewide and nationwide programs providing current information on various aspects of turfgrass pathology. These include such New York-based programs as the Cornell Long Island Turfgrass Short Course and the New York State Turfgrass Association Conference and Show. Throughout the year, presentations are made at many other state-sponsored turfgrass conferences, usually dealing with aspects of biological control and soil microbiology, and at selected national and international conferences and educational programs. Additionally numerous written resources are prepared each year; *CUTT* is one example.

In the next issue, we will be reviewing some of our recent research findings and how they may be of use to you. Stay tuned!

ERIC B. NELSON, GARY E. HARMAN, CHERYL M. CRAFT, KRISTEN L. ONDIK, DIANE KARASEVICZ
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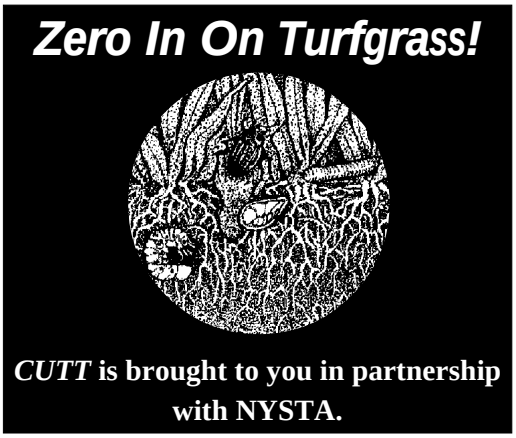

# The Influence of Plant Growth Regulators on Creeping Bentgrass Fairway Turf

Natural resource conservation is becoming an important issue facing many turfgrass managers. Resources such as water for irrigation and fuel used in many maintenance operations are two prime examples. In the Northeast, we have not taken water conservation as seriously as the West has, where the cost of water for irrigation can be the single most costly expenditure after labor.

Plant growth regulators (PGRs) have been used by turfgrass managers for decades, generally on low value but difficult to mow sites like steep embankments, along fences, near trees and other structures. PGRs have had limited use on high value areas like golf courses except as part of an annual bluegrass reduction program or for annual bluegrass seedhead suppression.

The older classes of PGRs generally caused unacceptable visually quality if applied at rates to give plant growth suppression, especially in summer months. Thus, they were not widely used on higher value turf. Recently released PGRs, however, appear to not affect visual quality, while suppressing the shoot growth rate. Trinexapac-ethyl (Primo™) is one of the new PGRs that inhibits gibberellic acid synthesis. This inhibition results in a decrease in cell elongation and internode length, thus producing shorter plants requiring less mowing.

The primary objective of this research study was to determine the impact of the PGR trinexapac-ethyl on the water use, shoot growth and turf stress of creeping bentgrass fairway turf.

### Experimental Procedures:

The site for the study was the free draining lysimeter plots in the rainout shelter facility known as the ARESTS Facility, located at the Cornell University Turfgrass Field Research Laboratory in Ithaca. The lysimeters are 12' X 12', containing 17" of soil, with individually controlled irrigation and drainage collection systems. All natural rainfall was excluded from the plots by the rainout shelter (moveable greenhouse). The site was established in 1987, reseeded with Penncross creeping bentgrass in May of 1991 and maintained as a typical moderate maintenance fairway: mowed at 0.5" with a reel mower and clippings collected, fertilized 3 times per year with a 32-3-10 methylene urea fertilizer (3 lbs. N/1000 sq. ft./yr), and pest control periodically applied (mostly fungicides). For this study, lysimeters containing sand were used.

The study was conducted for two years. In 1995, treatments included trinexapac-ethyl applied at a rate of 0.75 oz./1000 sq. ft., mefludide (Embark™) at 1.32 oz./1000 sq. ft. and a non-treated control. In 1996, trinexapac-ethyl was also applied at a lower rate (0.25 oz./1000 sq. ft.) and mefludide was not applied due to severe damage noted in 1995. Treatments were applied monthly from July through September, with a small hand held sprayer.

Data collected included daily water use rate, clipping yields and canopy temperatures as a measure of turfgrass stress for August into October.

### Results:

As seen in Table 1, the applications of PGRs had a variable effect on water use with always a reduction in the amount of clippings produced. In 1995, a year that was hot and dry, the PGRs substantially reduced the amount of water used by the creeping bentgrass turf. This would translate into a water savings of at least 26%. The amount of clippings produced was also reduced by at least 55%, which would result in a significant fuel savings by either reducing the number of mowings, the fuel used to mow or the fuel used in the clipping disposal process. Repeated

*continued on page 8*

**Table 1. Impact of trinexapac-ethyl and mefludide on clipping yields and water use of creeping bentgrass.**

| PGR Treatment | Rate of Application | Clipping Yield | | Water Use | |
|---|---|---|---|---|---|
| | | 1995 | 1996 | 1995 | 1996 |
| | oz./1000 sq. ft. | % of control amount | | | |
| Control | — | 100 | 100 | 100 | 100 |
| trinexapac | 0.25 | — | 65 | — | 119 |
| | 0.75 | 45 | 56 | 74 | 164 |
| mefludide | 1.32 | 9 | — | 62 | — |

# Research Update

***The primary objective of this study was to determine the impact of the PGR trinexapac-ethyl on the water use, shoot growth and turf stress of creeping bentgrass fairway turf.***

***Results suggest that trinexapac-ethyl can reduce the need for irrigation during dry years, while apparently not putting the turf under stress.***

# Management: More Than Turf

## Human Resource Update

***Why we <u>think</u> a turf organization has high employee turnover:***

- ***good employees are not available***
- ***employees do not like horticultural work***
- ***people just do not work like they used to***
- ***turf cannot compete with other businesses***

The turf season is slowly coming to an end. Leaves are beginning to cover the grass. Does this mean the turf manager can look forward to having nothing to do?

The answer, of course, is **no.** Why? Because the turf manager is a manager of more than grass, a golf course, a landscape, a park, or an athletic field. To help you, the turf manager, function better as a manager, we will look more closely at management, and we will analyze problem identification and diagnosis, important tools for the manager.

### Management is the Success Key

Management is the key to the successful operation of any organization. In turf-oriented facilities we have viewed management as a generic term describing essentially anything dealing with successful operation of an organization involved with turf and have failed to give the term definition and rigor. The result is that management has become an almost mystical term that we apply to turf organizations with high productivity and/or profitability. To provide more rigor, management is defined as: *Determining what must be done and achieving results through the efforts of oneself and other people. Management is planning, organizing, staffing, directing, and controlling the business resources toward the accomplishment of established objectives and goals.*

Note that management is defined in terms of people. Management deals with people, including oneself, who then work with turf, fertilization, etc. This can be illustrated by an example of analyzing why a turf organization has high employee turnover. The usual answers — good employees are not available, employees do not like horticultural work, people just do not work like they used to, turf cannot compete with other businesses — are technical and external to the turf organization. If one continues to ask "why", answers relating to management are detected:

- No one plans employee tasks so the employees are unproductive and/or unmotivated.
- No one is monitoring how employees are performing and feeling.
- It is unclear who the employees supervisor is.
- The skills of the individuals hired is not appropriate for the job they are performing.
- The manager is not providing leadership.

These management answers are people oriented and are more amenable to a long lasting solution.

A management definition of a problem always involves one of the five functions listed in the definition. The management solutions delineated above involve planning, controlling, organizing, staffing, and directing respectively. These functions can serve as a job description for the turf manager.

## Plant Growth Regulators

*continued from page 7*

mefludide applications resulted in very poor turfgrass quality by the end of the first year and were not used in 1996.

In 1996, a cooler and wetter year, trinexapac-ethyl reduced clipping production similar to the first year but with no reduction in water use. In fact, more water was used by the creeping bentgrass sites treated with trinexapac-ethyl. Thus, at times when plant water use is high, we would expect trinexapac-ethyl to reduce the need for irrigation, while at times of low irrigation need, no water saving would be realized.

One of the primary reasons plants take up and transpire water is to keep the turfgrass plants cool during high temperatures. If a plant uses less water, then the plants may be under more stress (as a higher temperature in the plant canopy would indicate). We measured canopy temperatures in 1995 and found no difference in canopy temperatures between plots treated with trinexapac-ethyl and the untreated control plots indicating no stress. We believe this is a result of the fact that trinexapac-ethyl reduced the shoot growth rate while transpiring less water thus having no effect on the level of stress (temperature related). Or in other words the trinexapac-ethyl treated turf maintained a transpiration rate necessary to keep itself cool.

These results suggest that the PGR trinexapac-ethyl can be used to reduce the mowing cost on the greatest high maintenance turfed area on golf courses (fairways) while also cutting down on the need for irrigation on the largest irrigated part of a golf course, while apparently not putting the turf under stress.

MARTY PETROVIC AND BILL BARRETT
CORNELL UNIVERSITY TURFGRASS TEAM

### Problem Identification and Diagnosis — Determining Root Causes

Of the many planning activities performed by turf managers, problem-solving is potentially one of the most challenging and fun. Problem solving begins with problem identification or by asking "What is the problem?" The current situation is evaluated in comparison to the objectives and goals of the golf course, landscape business, park, or athletic field. In comparing objectives and goals to the current situation, three types of opportunity areas can be evidenced. Those opportunity areas arise from three types of unsatisfied objective and goal situations: unmet, conflicting or unset.

After having identified a problem, one frequently jumps to generating alternative solutions to solve the problem. This tendency skips the essential step of problem diagnosis, or asking "What are the causes of the problem?" If the step of problem diagnosis is skipped, one is much more likely to solve a "symptom" of a deeper problem rather than the "real" problem.

If problem diagnosis were to be summed up in one word, the word would be "why." In answering why has the problem occurred, one will be finding causes for the occurrence of the problem. Often it is necessary to ask "why?" repeatedly in order to get an answer which is causal rather than symptomatic.

The initial answers to "why" are usually technical answers. Going beyond the technical causes for a problem is necessary in order to identify causes which the manager can deal with. Identifying management causes is referred to as "asking the management why." Management causes involve one of the five management functions discussed above and involve people.

Often multiple technical causes will converge on one management problem. Equipment breakdowns, undersized equipment, and poor mower maintenance might all converge on the management problem of no one having been assigned responsibility for the equipment (organizing).

Having diagnosed root management causes, you are far more likely to be focusing on the real problem rather than spending time on symptoms of the real problem. I suggest that you carve out some management time during the coming months to carefully analyze your turf business including identifying and diagnosing problems that have arisen during this turf season.

ROBERT A. MILLIGAN
CORNELL UNIVERSITY TURFGRASS TEAM

***Why, <u>really</u>, a turf organization has high employee turnover:***

- ***no one plans employee tasks, so the employees are unproductive and unmotivated***
- ***no one monitors how employees are performing and feeling***
- ***it is unclear who the employee's supervisor is***
- ***the skills of the individuals hired is not appropriate for the job they do***
- ***the manager is not providing leadership***

## Cornell Turfgrass Short Course

### *"The Tradition of Excellence Continues"*

The cornerstone of the Cornell Turfgrass Program's outreach efforts is the intensive two week experience known as the Cornell Turfgrass Short Course. Over the last 12 years the course has grown in quantity and quality of information presented and boasts over 800 alumni around the world.

This is a must-attend event for turfgrass managers new to the industry as well as for managers who have never had formal training. It serves as a comprehensive review of topics ranging from the basic scientific principles of grasses and soils, to the research behind turfgrass and environmental management practices. Specific case study work is developed for golf turf, sports turf and lawn care managers integrating the concepts learned during the course with practical experience from industry leaders and students.

As a result of the overwhelming response to the January 12-23, 1998 course in Ithaca on the Cornell campus, a second two week session is being held on Long Island February 16-27. If you'd like more information on the Short Course, contact Kelly Woodhouse at (607) 255-3090.

***Make plans now to attend Cornell's Turfgrass Short Courses in Ithaca January 12-23, 1998, or on Long Island February 16-27.***

## Short Cutts

*continued from page 2*

***The 22nd annual NYS Turf & Grounds EXPO, featuring comprehensive business and technical seminars, boasts over 67 NYS DEC pesticide recertification credits. One person could feasibly earn 13 to 15 credits towards recertification for attending the entire conference.***

***The new GCSAA College Guide is a perfect place for parents and students to start navigating the maze of careers, institutions, programs, faculty, and logistics of establishing a formal educational plan in golf course management.***

# The 1997 New York State Turf and Grounds Exposition Blazing New Trails

The New York State Turfgrass Association is "Blazing New Trails" with its 22nd Annual Turf and Grounds Exposition November 4-7, 1997 at the OnCenter in Syracuse, NY. The expansive and comprehensive program features business and technical seminars, a 350 booth trade show and this year a keynote address from former Washington Redskin quarterback and ESPN NFL analyst, Joe Theismann.

The conference begins Tuesday, November 4 with six in-depth, one day seminars on topics of interest to all aspects of the green industry. Wednesday begins bright and early with the new Early Bird Session at 6:30 am with updates on performance and use of new pesticides from Joe Vargas, Bob Emmons, and Frank Rossi. Following the Early Bird Session, Joe Theismann will give an inspiring keynote address, followed by the opening of the trade show.

The remainder of Wednesday through Friday will feature breakout sessions that specifically address current and emerging issues facing the various sectors of the turfgrass industry. Session themes include: biological control programs for golf turf; selecting and establishing the new bentgrasses; understanding and developing alternative lawn and landscape services; establishing low maintenance meadows and prairies; athletic field surfaces for safety; organizing to influence pesticide policy; and developing reduced pesticide turf management programs. In addition, NYSTA continues to take the leadership role, in partnership with SUNY Cobleskill and SUNY Delhi, in offering the Turfgrass Equipment Technician Sessions on Thursday.

This exposition boasts over 67 NYS DEC pesticide recertification credits. One person could feasibly earn approximately 13 to 15 credits towards recertification for attending the entire conference. In addition, credits will be awarded from Massachusetts, Vermont, and Pennsylvania as well as continuing education units from GCSAA, PGMS, ISA, and NYS Recreation and Parks Society.

For more information regarding programs, registration, and exhibitor trade show material, please call the Conference Hotline at (800) 873-TURF (8873).

# Navigating the Maze

## GCSAA College Guide to the Golf Course Management Profession

The education of a golf course superintendent has evolved over the last few decades in parallel with the growth of golf. As a measure of this evolution, recent surveys indicate that eighty eight percent (88%) of all superintendents have some type of formal education, with sixty six percent (66%) having two or four year degrees. As a service to the industry to help interested persons achieve professional success, the Golf Course Superintendents Association of America (GCSAA) has released a new publication that describes programs that offer an educational curriculum in golf turf management. The guide is organized into four sections: section one describes the profession, characteristics of educational programs, and information on financing an education; section two provides a sample curriculum for two and four year programs; section three profiles specific two and four year programs, as well as international programs; and section four lists the programs geographically.

Our New York programs at Cobleskill, Delhi and Cornell are listed and described among the 100 other programs offered throughout the world. This is a perfect place for parents and students to start navigating the maze of careers, institutions, programs, faculty, and logistics of establishing a formal educational plan that will lead to a successful professional career. For a copy of the College Guide, contact the GCSAA Service Center at (800) 472-7878, or visit the website at www.gcsaa.org.

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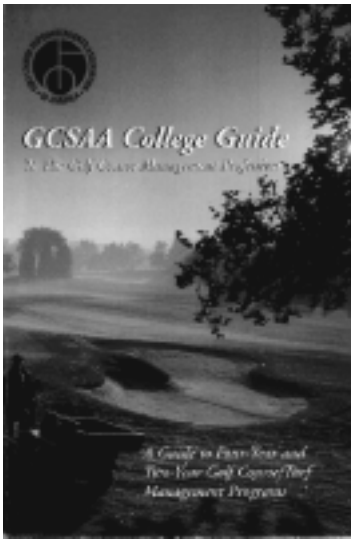


## Short Cutts

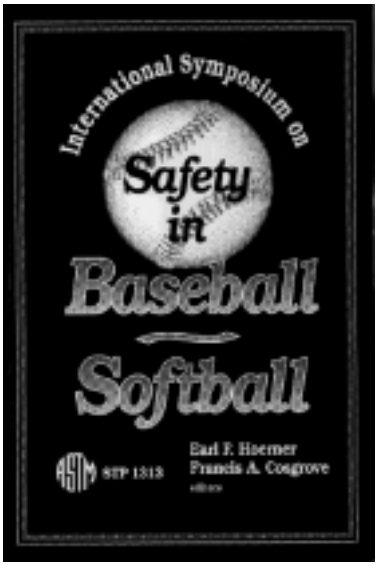
*continued from page 10*

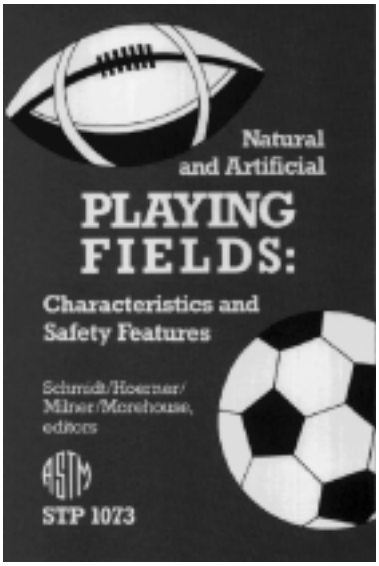
### More on Safety in Athletics

The Summer 1997 issue of *CUTT* described a text from the American Society for Testing and Materials (ASTM) on Safety in American Football. In addition, ASTM published a companion text entitled, *Safety in Baseball/Softball* that is a compilation of papers presented at a symposium held in 1995. This text, as with the football text, is filled with very technical information for administrators, coaches, players, and community leaders interested in maximizing player safety. Chapters review the number and types of injuries associated with baseball/softball; the technical aspects of equipment such as bats, balls and protective equipment; ensuring spectator safety; and, of course, constructing and maintaining safe playing surfaces. This text is a must for any sports turf, grounds or facility manager's library.

Several years ago, in 1990, the ASTM published a text that may not have received the attention it deserved. The text entitled, *Natural and Artificial Playing Fields: Characteristics and Safety Features,* provides yet another in-depth treatise on the aspects of designing and maintaining safe athletic fields. This text covers the gamut of issues related to field construction and maintenance from matching the player to the field, and the impact absorption of natural and artificial surfaces, to the role of core cultivation in reducing surface hardness and enhancing shear resistance.

Both of these texts are available from the ASTM office at 100 Barr Harbor Dr., West Conshohocken, PA 19428.




## Scanning the Journals

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### Crown Hydration of Annual Bluegrass

Crown hydration is widely thought to be the cause of annual bluegrass turf loss during the late winter-early spring fluctuating freeze-thaw conditions. Researchers at the Prairie Turfgrass Research Center (PTRC) in Alberta, Canada have been investigating this issue and are beginning to develop a database of environmental parameters that influence annual bluegrass survival.

Turfgrasses have varying levels of winter hardiness throughout the season. For example, 50% of the plants removed from the field in June will be killed at temperatures of 23 °F. However, plants at peak hardiness in January can survive temperatures as low as -6 °F; of course bentgrass can tolerate temperatures as low as -40 ° F. It is well known that this hardening process is intimately related to crown moisture content.

Still, the incipient freeze-thaw conditions in the spring can result in immediate crown hydration and subsequent death. In fact the researchers observed a significant reduction in plant hardiness when soil temperatures warmed to 46 °F for 48 hours. They noted that plants deharden in the spring well before there is visible growth and that crown tissue does not take up water until after the dehardening process has begun.

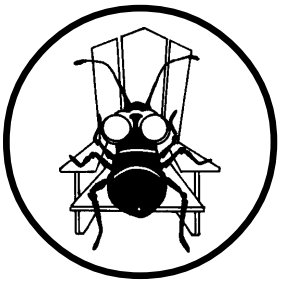
In a separate study, they investigated the role of snow cover on hardening and dehardening. It was clear that longer, more persistent snow cover aided in maintaining hardiness levels through the reduction in temperature fluctuations. Therefore, it was clear that temperature was more important than amount of moisture as it related to loss of hardiness and that it is advisable to maintain hardiness as long as possible in the spring.

*(From: Tompkins, D.K., C.J. Bubar, and J.B. Ross. 1997. Physiology of Low Temperature Injury with an Emphasis on Crown Hydration in Poa annua L. and Agrostis palustris. 1996 PTRC Annual Report, 40-50.)*

***Crown hydration is widely thought to be the cause of annual bluegrass turf loss during the late winter-early spring fluctuating freeze-thaw conditions. Researchers in Canada concluded that temperature was more important than amount of moisture as it related to loss of hardiness.***

**Safety in Baseball/ Softball,** ***a new text from ASTM, provides administrators, coaches, players, and community leaders with technical information to maximize player safety.***

# Fall Insect Control



## Pest Watch

***Insect growth regulators typically require ingestion for optimum activity so it is important that the target insect is actively feeding when they are applied.***

Early fall is the most hectic time of the year for the turfgrass entomology group at the New York State Agricultural Experiment Station. This is the season to monitor for scarab grubs on home lawns and golf course turfgrass, and to evaluate experimental chemical and biological insecticides that were applied in the spring and summer for Japanese beetle, European chafer and oriental beetle grub control.

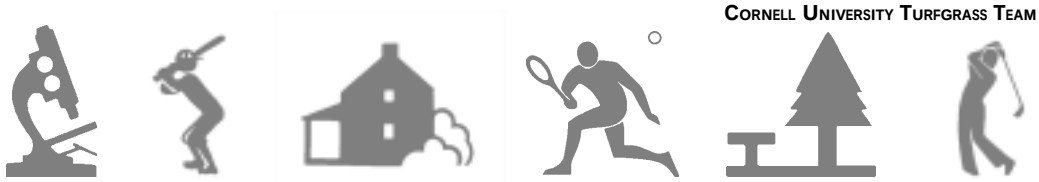
Each fall our research crew of 10-15 hard working individuals monitor some 100 home lawns and golf course fairways, using a standard golf course cup cutter to sample the turf soil for grubs. We also determine the soil properties (pH, organic content, texture, bulk density, compaction), vegetation properties (turfgrass species, ornamental plants that might serve as food and cover for scarab adults), environmental properties (topography, shade, irrigation), and history (pesticide and fertilizer history, age of stand) of each site. In this way we hope to determine those factors that are most highly correlated to damaging grub populations; our ultimate goal is to develop site specific risk ratings to help turfgrass managers pinpoint those turfgrass sites that have the greatest risk of having high numbers of grubs in most years.

### Use of Insect Growth Regulators

Our lab group has focused a great deal of time and effort on the possible use of insect growth regulators (IGRs) for controlling grubs in turf. Several chemical companies are developing novel classes of compounds with unique modes of action that interfere with the normal insect molting process by mimicking the action of the natural insect molting hormone ecdysone. One such product, MACH 2, developed by RohMid (a joint venture of American Cyanamid and Rohm & Hass companies), has recently been labeled by the U.S. Environmental Protection Agency. High doses of these IGR products typically cause rapid insect mortality, while sublethal effects include rapid maturation to the adult stage, larvae showing deformities, and larvae undergoing additional larval molts instead of changing to pupa. Specific IGR products have shown activity against scarab grubs, cutworms and sod webworms.

Insect growth regulators typically require ingestion for optimum activity so it is important that the target insect is actively feeding when they are applied. The use of an IGR on scarab grub populations late in the fall as they prepare to move down into the soil for winter, as well as the application to grubs in late spring as they prepare to pupate is ill advised for this reason. Laboratory and field studies indicate that early larval stages are susceptible to insect growth regulators and also suggests that there is a fairly wide range of activity among closely related insects such as different species of scarab grubs. Our studies have shown that one IGR shows truly impressive activity against Japanese beetle grubs but much less dramatic activity against either European chafer or Oriental beetle grubs. This specificity of these products demand that turfgrass managers determine which insect species is present to avoid disappointing results.

**Michael G. Villani**
**Cornell University Turfgrass Team**



Cornell Cooperative Extension

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