



# CHIPS & PUTTS

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## Organic Turf Management: Direct Route or Detour to Sustainability?

By: Frank S. Rossi, Cornell University Turfgrass Team

From: Cornell University Turfgrass Times Volume: Ten, Number: Four

A recent court ruling in Suffolk County, NY could have substantial implications for golf development in the US. The State Supreme Court in Riverhead, NY ruled that the feasibility (financial practicality) of an "organic, pesticide-free" golf course must be explored before further development can proceed. This includes issues such as the use of composted organic waste as a soil amendment, exclusively using organic fertilizers and no chemical pesticides.

On the one hand, there are aspects of this decision that run counter to scientific principles, including practical water quality concerns relative to phosphorus loading and runoff. On the other hand, society has decided, as it often does with scientific illiteracy at an all-time high, to push the envelope and explore the possibilities. So, this could be a good thing in spite of the motivation.

Beyond this development issue, lies the broader question: Can we manage a golf course with only fertilizers derived from natural organic sources and without the use of synthetic pesticides? As my good friend Jim Moore, the Director of Construction Education Programs at the USGA, always tells me: It depends!

### Evolution of Expectations

The unaltered linksland of coastal Scotland provided a golfing habitat as early as 1414. The native sandy soils afforded exceptional drainage and an occasional hazard. The primary means of fertilization was organic waste from an animal or composted leaf mould. The vegetation was already adapted to the harsh conditions of the land, so that regular care for the purpose of turfgrass survival was not required.

The modern American golf course has evolved in both spirit and substance to become a judiciously managed landscape in an increasingly urbanized society. Player demand has been met with advances in technology from biological and chemical to mechanical, capable of being deployed to provide a unique recreational experience. Still, while much has changed about the golf course in the last 500 years, the constant is that the plants still need to be fertilized, however now the turf must provide so much more than the grasses of the linksland.

### Our Daily Nitrogen

Turfgrass fertilization has not been immune to the evolution of "golfer expectations." Organic fertilization persisted as a primary means of feeding turf through the 1950's. The advent of synthetically processed fertilizer that relied on energy to "trap" nitrogen became a common means of supplying nutrients in a more "controlled" fashion. The golf course super now had the ability to more precisely manage turfgrass growth.

The synthetic slow-release fertilizers of today are technological marvels in that they provide all the benefits of controlled nutrient release that is similar to, but more complete

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**"Can we manage a golf course with only fertilizers derived from natural organic sources and without the use of synthetic pesticides?"**

### In this issue.....

- *Made in the Shade*
- *Effects of Primo*
- *Results of Woodloch*



## President's Message.....

Unfortunately I was not able to attend the June meeting at Woodloch Springs, but as usual, our host, Mark Eisele, provided an excellent golf course and superb hospitality. Thank you, Mark and your staff, along with all Woodloch employees for a great day.

The weather has been cooperating quite nicely for us this year. Isn't it ironic, The Susquehanna River Basin Commission informs us of the new water use charges, and now we are getting plenty of rainfall. With this abundant rain, will this mean the price per M/gallons will go up due to low water usage? We are scheduled to discuss the SRBC at the July meeting at Stonehedge with a roundtable discussion. I know of a few members who have been doing a lot of leg work with the SRBC deadline coming, so please try to attend!

A few things to think of: Clambake 2000 at Pocono Farms (August 14) and Board of Directors elections at the annual meeting (October Meeting). Consider getting to both meetings.

Keep the good weather coming...

See you all at the meetings!

*Ron Garrison, CGCS*

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## From the Editor's Desk.....

*Nothing from the Editor this month...*

## GONE GOLFING!



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natural organics. They can be designed to release over a 4 to 16 week period, independent microorganism activity. Comparatively, small amounts of liquid fertilizer applied on a frequent basis (spoon-feeding) to putting greens enables superintendents to more precisely manage growth, efficiently utilize resources and provide consistent playing quality. The concept of spoon feeding has a parallel in human nutrition. Instead of eating one big meal each day, we eat smaller meals to make nutrients available to our body as we need them.

Continuing with this thought, exclusively organic fertilization might parallel vegetarianism. As a former vegetarian, I remember how much more I thought about my nutrition and occasionally had to supplement my diet with vitamins or other minerals. It took many months to learn what my body required and I had to eat very deliberately. As time passed, I realized I could still eat healthy, adding meat products to my diet in moderation. Herein lies the challenge: the best fertility management program on golf courses likely utilizes both organic and synthetic sources of nutrients.


#### Do the Plants or the Microorganism Care?

Turfgrass plants derive nutrition from a pool of resources in the soil. While we debate organic vs. synthetic nutrition, the plant simply absorbs the nutrients it needs for growth regardless of the source in which they are supplied. An exclusively organic program presents challenges in providing a balanced nutritional program. In addition, in northern climates where soils are cool for longer periods, microorganism activity that breaks down the organic sources to release the nutrients are not active. Subsequently, nutrients, and in particular nitrogen may not be available to the plant. Therefore, in the shoulders the season (spring and fall) when soils are cool, plants not supplemented with synthetic fertilizer will be weak and less able to withstand traffic or other stress.

Invariably, people who claim that exclusively organic approaches are beneficial to the soil microorganisms, imply that synthetic materials "sterilize" the soil. In fact, there is a significant amount of evidence that suggests the measurable microorganism population in the soil is unaffected or enhanced by synthetic fertilizers and pesticides (both are good carbon and nutrient sources). In addition, except in the most troubled soils, there is limited impact of synthetic materials on the physical properties of the soil.

Still, there are many benefits to using natural organic fertilizer sources. Clearly the addition of organic matter in these fertilizers benefits many soils both physically by enhancing soil structure and chemically by introducing a complex pool of nutrients that can become available to the plant over time. In addition, studies at Cornell University have demonstrated that some composted materials provide disease suppression. This suppression can be short

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## Made in the Shade: Using PGR's on Shaded Turf

Estimates are that approximately 25% of all turfgrass areas are managed under some type of shaded conditions. When a turf is shaded by vegetation, such as a tree canopy, not only is the amount of light reduced, but rather the quality of light is reduced. For example, because tree leaves are green, they remove almost all the light that is useful for photosynthesis. The remaining light that penetrates the turf canopy is significantly altered and triggers certain plant hormones that result in a unique growth response.

Researchers at Michigan State University have been investigating growing turf under low light, but not under a tree canopy. Drs. John Stier (now at the University of Wisconsin, Madison) and John (Trey) Rogers have been working on growing grass in indoor stadium, similar to their project for the 1994 World Cup. Under these conditions, the challenge is not only reduced light, but also intense traffic from sports such as soccer.


A covered stadium simulator facility (CSSF) was constructed to determine if the plant growth regulator (PGR), Cutless (flurprimidol), applied to a Kentucky bluegrass stand and known to influence specific plant hormones, could enhance turf quality. Cutless was applied above, at and below the labeled rates after placing the turf into the CSSF and again at 6 weeks. Fertilizer applications were made to supply 4 lb. of nitrogen per 1000 square feet per season. Simulated traffic was applied to determine traffic tolerance and general turf quality assessments were made to evaluate the length of time the turf provided acceptable quality under low light. Surprisingly, results indicated that the below label rate afforded high quality turf without traffic up to 70 days. When supplemental lighting was supplied with Cutless treatment, the turf provided acceptable quality for too days. Additional rooting and tiller data suggest that the PGR is able to alter the hormonal response and improve the elasticity of the shoots to allow for improved clipping quality. Therefore it appears that the average shady turf, with limited traffic, could benefit from light rate applications of a PGR to improve quality, however, research is continuing into the relationship between PGR's and fertilization.

(From: Stier, J. C., J.N. Rogers, J.R. Crum, and P.E. Rieke. 1999. Flurprimidol eJJ~cts on Kentucky bluegrass under reduced irradiance. *Crop Science* 39:1423-1430.)



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## The Effects of Primo on Penncross Creeping Bentgrass Root Growth

By: Fred Yelverton (From: TURFAX; volume 8, number 1)

The effects of any cultural practice or application of any product to a bentgrass putting surface is of concern to golf course superintendents. Of particular concern are the effects of any practice on bentgrass root growth. Of course, it is much more difficult for turfgrass managers to assess the effects of various chemical and cultural practices on root growth. In an effort to view root growth, most turf managers use a cup cutter or profile indicator, and take a slice to view the roots. While this can be helpful, it is not a good indicator of root biomass (root weight) but rather, is an indication of rooting depth. Root biomass may or may not correlate to rooting depth. Total root biomass is a better indication of root growth than root depth.

Measuring root biomass under field conditions is also very difficult for turfgrass scientists. The procedure generally accepted by turfgrass scientists is to take multiple cores, wash away as much soil as possible, dry the resulting root sample, obtain a weight, ash the sample at a very high temperature (usually around 900°F), which removes all the root biomass, and then re-weighing the resulting material. Root weights are then determined from the difference in weight from pre-ashing and post-ashing. Such measurements are very labor intensive and are expensive. In addition, very small differences in root weights can be difficult to detect. Also, quantifying root weights in sand culture is more accurate than in finer-textured soils because it is easier to remove roots from sand-based soils than silt or clay soils.

The effects of trinexapac-ethyl (Primo®) and other plant growth regulators on bentgrass root growth is a much-debated topic among turfgrass managers and turfgrass scientists. And of course, any positive or negative effects on root growth affect the stress tolerance of bentgrass and other turf species. In fact, the manufacturer of Primo®, Novartis, contends their product will "condition" the plant to stress if applied prior to the stressful conditions. "Pre-stress conditioning" is the term most often used by the manufacturer. What is the basis on which they make these claims?

Before this can be addressed, it is important to understand

the mode-of-action of Primo®. It is well documented that Primo® is a foliar absorbed product that suppresses gibberellin biosynthesis in plants. Gibberellins have several effects in green plants, such as cell and stem elongation. Therefore, by suppressing gibberellin bio-synthesis in plants, Primo® and other plant growth regulators that have similar modes-of-action (paclobutrazol or TGR Turf Enhancer® and flurprimidol or Cutless®) result in a shorter, more compact plant. This is the reason why the mowing requirement can be reduced with turf plant growth regulators that suppress gibberellin biosynthesis. Research has shown these products to be effective in reducing the mowing requirement of various turf species.

Previous studies have also shown that a vast majority of Primo® remains in above-ground plant parts. Therefore, the argument goes that Primo® only slows above-ground shoot growth and therefore photosynthates are redirected down into root systems, thereby increasing root growth. Does this really happen?

A hydroponics study was initiated at North Carolina State University to evaluate the effects of Primo® on root growth of "Penncross" creeping bentgrass. Because it is a soil-less medium, root biomass can be easily quantified with a high level of accuracy and precision. Seven root-zone temperatures were utilized to determine if Primo® had a different effect when the root-zone temperature was altered. Root-zone temperatures were 57, 64, 72, 79, 86, 93, and 100°F (14, 18, 22, 26, 30, 34, and 38°C). Bentgrass plants were treated with Primo®, then exposed to the various root-zone temperatures, and allowed to grow for 2 weeks prior to harvest. The results of the effects of Primo® on bentgrass root growth are shown in Figure 1.

Primo® had a significant positive effect on bentgrass root growth at 5 of the 7 temperatures. Only at the 2 extreme temperatures (57 and 100°F) did Primo® fail to in-

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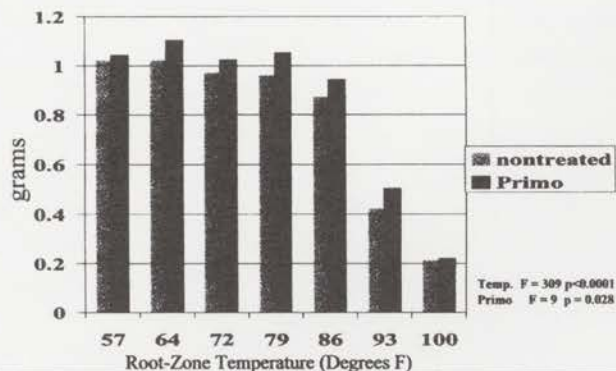


Figure 1. Penncross bentgrass fresh root weights at various root-zone temperatures with and without Primo.

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crease root growth. However, while root growth was enhanced, the resulting increase was very small. The increase in root growth was no more than 10% at any temperature. Therefore, the increase was so small one could argue that it has no biological significance and may not mean anything under field conditions. However, the results of this study clearly indicate that root growth was increased, albeit very small. Therefore, the debate continues.

Also note that when temperatures exceeded 79°F, bentgrass root growth slowed. At 93 and 100°F (34 and 38°C), bentgrass roots were severely injured and root death was obvious.



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term in a similar fashion to a fungicide, or longer term, by enhancing populations of microorganisms that antagonize and suppress turf diseases for many years. This type of work is encouraging and holds much promise, however, the study of microorganisms (the linchpin of the organic approach), is in its infancy and highly site specific.

#### Trade-Offs

I have found that there are very few aspects of life in a modern society without trade-offs. When we want something, it seems that there is always something else that raises concern. Organic fertilization is more costly on a per unit nitrogen basis (5 to 10 times that of synthetic fertilizers). The amount of phosphorus applied can be 10 to 20 times that supplied with a commercially available synthetic source. This phosphorus, not only may not be needed for turf growth, continuous application may saturate the system resulting in an increased risk of off-site movement that can compromise surface water quality.

Synthetic fertilizers with a higher proportion of readily-available nitrogen are more likely to leach through coarse textured soils than slow release sources. There is considerable amounts of energy (fossil fuels) that go into producing synthetic fertilizers and move the industry further from sustainability. Of course, while this discussion has focused on fertilization, the use of synthetic chemical pesticides has well documented concerns regarding human and wildlife exposure as well as water quality issues.

Therefore, the answer to the initial question: Can we manage a golf course with only fertilizers derived from natural organic sources and without the use of synthetic pesticides? Yes, but not without trade-offs. Clearly, the more reasonable our expectations and the more rigorous and precise we are in the integration of all available resources, the more we maximize the benefits of each product and minimize any drawback.

#### Parting Shot

Throughout my career, I have been actively involved with environmental advocacy groups. This has included coauthoring a grant to the Great Lakes Protection Fund to work towards elimination of pesticide use on lawns in the

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*A message from your golf course superintendent and GCSAA*



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- 1<sup>st</sup> 60 – Jeff Hopeck/Tony Barlette/Dwane Schell/Chris Schuster
- 2<sup>nd</sup> 64 – John Wiblishauser/Bill Rahling/James Carville/Dennis DeSanctis

**Second Flight**

- 1<sup>st</sup> 68 – Ed Zimmerman/Craig Lambert/Eric Reed/ Jason Brandt
- 2<sup>nd</sup> 71 – Mark Eisele/Joe McConnell/Mark Reed/Joel Simmons

**Closest to the Pin**

- #4 Bill Rahling
- #15 Ed Zimmerman

**Longest Drive**

- #9 Gene Huelster

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Great Lakes Basin. In addition, I have been outspoken at the national level regarding the means that golf course superintendents are "forced" to employ in an effort to meet the increasingly unreasonable aesthetic and functional performance expectations of the American golfer. Therefore, while I share the spirit of the "organic" movement confronting the golf industry, attempting to "ratchet down" expectations, I cannot in good conscience dismiss scientific principles.

Some might say I am hiding behind the "conservative ivory tower of science." To them I say: provide the funding to address these concerns, so that we can put some science behind the "organic" process. To those in the golf industry who dismiss those "who think otherwise," I challenge them to face the fact that energy intensive golf turf management is not sustainable and the first step is maintaining reasonable expectations. The golf course superintendent is one of the most service-oriented, environmentally responsible professionals I have ever known. When the tools are made available to maintain championship conditions that are more sustainable (organic or otherwise) they will be employed. In the meantime, I believe that the road to sustainability is cleared by an open and robust discussion of the issues based on scientific principles.

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NEWS AND VIEWS FROM THE POCONO TURFGRASS ASSOCIATION

## Good Luck & Congratulations to the following:

- Bob Brown on his new position as Superintendent at Shadowbrook Resort
- Pat Ziagos: "The Greek". He is now Superintendent at the Penn State University Courses

### NEW PARENTS:



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## Helping Hand



During the NCAA Eastern Regional Championship and the Buy.com Steamtown Classic, a large amount of dedicated people provided their services, support and time to help aide the staff of Glenmaura National Golf Club. A special thanks has to be given to those outstanding individuals that volunteered and demonstrated professionalism during these tournaments. The individuals who need to be commended represented the following organizations: Andre & Sons Inc., Conklin Players Club, Elkview Country Club, Fox Hill Country Club, Glen Oak Country Club, The Hideout Golf Club, Huntsville Golf Club, Koonz Sprinklers Inc., Lesco Inc., Panorama Golf Course, Philadelphia Turf Company Inc., Pine Hills Golf Course, Turf Partners Inc., and Vestal Hills Golf Club.

Once again, I express my extreme gratitude to these individuals in the golf industry. Thank you for your time.

Andrew Jubinski, Jr.; Superintendent  
Glenmaura National Golf Club



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