Wisconsin Influence Spreading to Texas

By *Tom Schwab,* *O.J. Noer Turfgrass Research and Education Facility, University of Wisconsin-Madison*

Many of you have listened to the personable and dynamic Kurt Steinke at WTA Summer Field Day. He has presented his research on phosphorus runoff, growing turf in the shade, increasing sod shelf life, and other pertinent issues to today's turf industry. Kurt won't be presenting to Wisconsin's turf industry anymore, except when he is invited back as a visiting turf professor.

This past January, Kurt finished his PhD work in the Department of Horticulture at the UW-Madison under Dr. John Stier. He will be taking what he learned at the UW-Madison to his new position of assistant professor at Texas A&M University in College Station, Texas. There he will embark on his new career in teaching and research of turfgrass ecology in their Department of Soil and Crop Sciences.

This new appointment is an important milestone of recent years. Kurt is the only student to receive a degree from the UW-Madison who went on to become a professor in turf education, since the old guard of Bob Newman, Jim Love, Chuck Koval, Gayle Worf, and Wayne Kussow.

Kurt's research in Madison included runoff work of turf vs. native prairie systems, various projects to study shade, herbicide and cold stresses to supina bluegrass, and the use of different PGRs to increase shelf life of sod for transport.

He started his college life receiving a Bachelor's degree in soil science from UW-Stevens Point in 1999. In the summers he worked at both Hancock and Arlington Agricultural Research Stations doing studies with potatoes and other vegetable crops. From there he moved on to UW-Madison where he received a Master's degree working with turfgrass in the Department of Horticulture under Dr. Stier's guidance. After graduation, he worked a year for Naturescape in Milwaukee before returning to Madison to receive his PhD of horticulture in turfgrass studies.

Texas A&M will be quite the opportunity for a young professor. Presently A&M has between 100 and 110 undergraduate students in their turf program. And the turf industry is huge, as is everything else in Texas. As a comparison, the turf industry in Wisconsin is estimated to have a one billion dollar impact on the state's economy. In Texas that number is eight billion dollars.

Kurt's appointment is 70% research and 30% teaching. Although he doesn't have any appointment to do extension work, I'm sure he will spend some time traveling around Texas, giving presentations to serve that huge turf industry.

That isn't the only big news in Kurt's life. He just became engaged to Beth, his girlfriend of three years and they already bought a new home in College Station. Things are looking bright for this ambitious new professor and we wish him the best. He answered many important turf questions during his time in Madison and will take this information south with him where he will continue to discover better ways to grow healthy turfgrass.

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The Decline of Take-all Patch?

By Paul Koch, *Turfgrass Diagnostic Lab, University of Wisconsin-Madison*

During my short tenure here at the Turfgrass Diagnostic Lab, I have been repeatedly asked what our most frequently diagnosed problem on turf in Wisconsin is. From our home lawn samples, nearly half of the samples that are submitted come from recently sodded lawns that are severely infected with necrotic ring spot (*Ophiosphaerella korrae*). Due to the intense cultivation found on golf courses, there is a much wider array of diseases that are submitted. In most years, our most commonly diagnosed disease from golf course samples is take-all patch, caused by the fungus *Gaeumannomyces graminis* var. *avenae*.

As frustrating as take-all patch is for golf course superintendents to control, it is equally as frustrating for us at the TDL to diagnose. It is fairly well-known that take-all patch occurs most frequently on sand-based putting greens within the first ten years of construction. It has also been reported that the severity of the take-all patch decreases substantially in the first four years after construction (Landschoot *et al*, 1997). But we have observed weak take-all patch symptoms on courses older than most people reading this article, certainly well out of the range of the traditional take-all patch infection period. This past summer especially, courses that had not seen take-all patch for years saw nondescript bronzing and thinning of their bentgrass. When these samples were submitted to us, masses of black mycelium commonly found with take-all patch were found infecting the turfgrass roots and crowns. I'm sure more than one superintendent was surprised to hear when we diagnosed their samples as take-all patch.

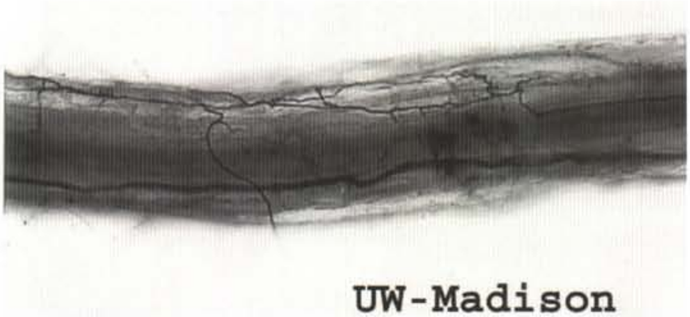

Figure 1. Take-all hyphae colonizing the surface of a creeping bentgrass root.

So what is happening underneath the soil surface to allow for such severe take-all infections immediately after construction? Why is that followed by decreasing take-all patch symptom severity for several years? Most confusing, why are we seeing take-all patch symptoms many years after the last symptoms have been observed?

The phenomenon of decreasing take-all severity has been observed in other continuously cropped systems, such as wheat, and has come to be known as take-all decline (Landschoot et al, 1997). The key to understanding the process of take-all decline is to understand the delicate balance of the soil microbiology in our golf course putting greens.

Let's start at the beginning, at the construction of a new sand-based putting green. The sand root zone used in putting green construction is usually fumigated to kill off any unwanted weed seeds, fungal pathogens, or insects. Unfortunately, this also kills off beneficial organisms that benefit the turfgrass plants in many ways (Unruh *et al*, 2002). Take-all patch is one of the first organisms that can migrate into this new root zone, and with potentially competing organisms killed in the fumigation, will be able to feed on the roots of the bentgrass with minimal competition.

Take-all patch can infect a new green through machinery such as mowers and core aerifiers (Landschoot *et al*, 1997). Once the fungus is present in the root zone, it will quickly colonize the surface of the roots with ectotrophic runner hyphae, periodically penetrating the root and eventually causing root death (Figure 1). With little competition from other organisms, the take-all fungus can quickly spread from root to root and cause severe take-all patch outbreaks (Landschoot *et al*, 1997). Chemical controls are usually needed to control take-all patch in this phase.

Over time though, other microbial organisms migrate into the root zone and increase the competition for the colonization of the root surface. *Phyalophora graminicola* is a common fungus that colonizes the surface of the root, but does not penetrate the root surface and hence is not pathogenic to the plant itself. Another organism that competes for colonization of the root surface is the bacteria *Pseudomonas*. Over time, both these organisms can out-compete the take-all fungus for space on the root surface, leaving the take-all hyphae to dry up and die. This process continues over the next several years, leading to the decreased severity of take-all patch (or take-all decline) observed in sand-based putting greens as they age (Dernoeden, 1997).

But we observed certain golf courses this past summer with moderate to severe take-all symptoms that were at least 10 years old, and much older than that in some cases. These symptoms are dependent on abnormal field conditions such as high soil pH or poor root health. High soil pH will lower the populations of organisms antagonistic to take-all patch dramatically, allowing the take-all fungus more room to colonize the surface of the root (Dernoeden, 1997). Factors leading to poor root health such as shade, compaction, poor drainage, or intense heat will lead to increased expression of take-all patch symptoms due to the lack of overall roots in the root zone (Jackson, 1997). If you have an increased size and increased number of roots in your root zone, your turfgrass will be better able to cope with the loss of a small per-

163 Yard Par 3 eighth hole at the Refuge Golf Club in Oak Grove, Minnesota.

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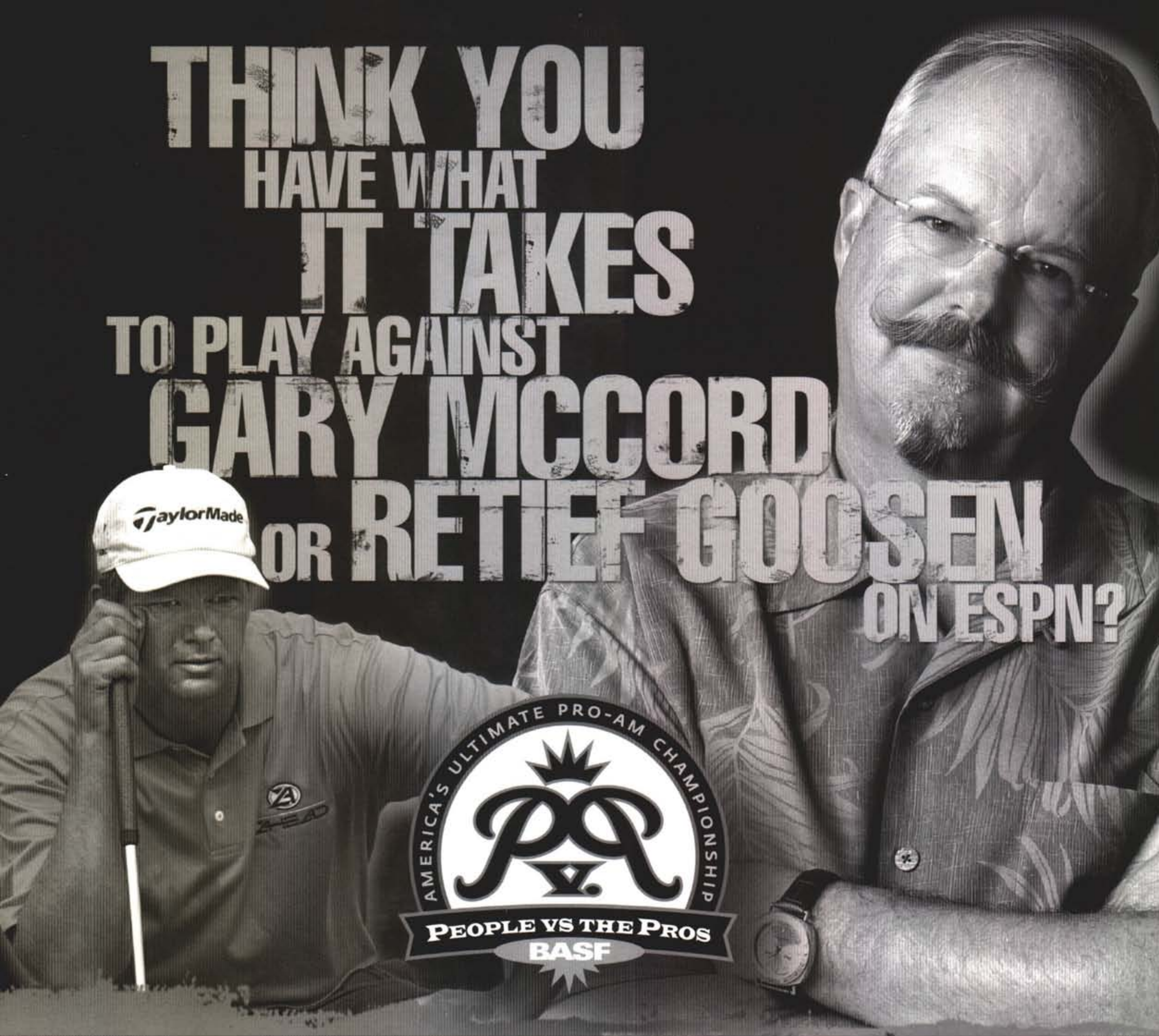

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centage to take-all infection than a poor root system.

The high number of take-all patch symptoms observed this past summer was most likely due to decreased root systems brought about by extremely stressful weather conditions. These stressed root systems were unable to cope with small levels of take-all infection, causing disease symptoms where in most years there would be none. In an average summer, with less stressful growing conditions, the turfgrass plant will be able to handle small levels of take-all infection.

There have been attempts to apply organic topdressing material to increase *Phialophora* and *Pseudomonas* populations in the soil, but these have been only moderately successful in controlling take-all patch and can lead to other problems such as decreased drainage (Dernoeden, 1997).

We currently have two take-all patch studies in progress. One study is at the OJ Noer Turfgrass Research and Education Facility, and it is an intensive look at controlling take-all patch on inoculated plots with fungicides, fertilizers, and a combination of both. The other is a fungicide trial at a Wisconsin golf course that experienced a rather severe take-all outbreak in the stress-filled summer of 2005. The results of both studies will be available this upcoming summer, so please feel free to contact Dr. Jung or myself on the outcome of either study.

References

Dernoeden, P. H. 1997. Integrating Strategies for the Management of Patch Diseases Caused by Root Invading Ectotrophic Fungi. Turfgrass Patch Diseases Caused by Ectotrophic Root-Infecting Fungi. B. B. Clarke and A. B. Gould, eds. APS Press. St. Paul, MN.

Heckman, J. R.; Clarke, B. B.; Murphy, J. A. 2003. *Crop Science*. July/August. 43(4): p. 1395-1398.

Jackson, N. 1997. Geographic Distribution, Host Range, and Symptomatology of Patch Diseases Caused by Soilborne Ectotrophic Fungi. Turfgrass Patch Diseases Caused by Ectotrophic Root-Infecting Fungi. B. B. Clarke and A. B. Gould, eds. APS Press. St. Paul, MN.

Landschoot, P. J., Gould, A. B., Clarke, B. B. 1997. Ecology and Epidemiology of Ectotrophic Root-Infecting Fungi Associated with Patch Diseases of Turfgrasses. Turfgrass Patch Diseases Caused by Ectotrophic Root-Infecting Fungi. B. B. Clarke and A. B. Gould, eds. APS Press. St. Paul, MN.

Unruh, J. B.; Brecke, B. J.; Dusky, J. A.; Godbehere, J. S. 2002. Fumigant alternatives for methyl bromide prior to turfgrass establishment. Weed Technology. 16(2) p. 379-387.

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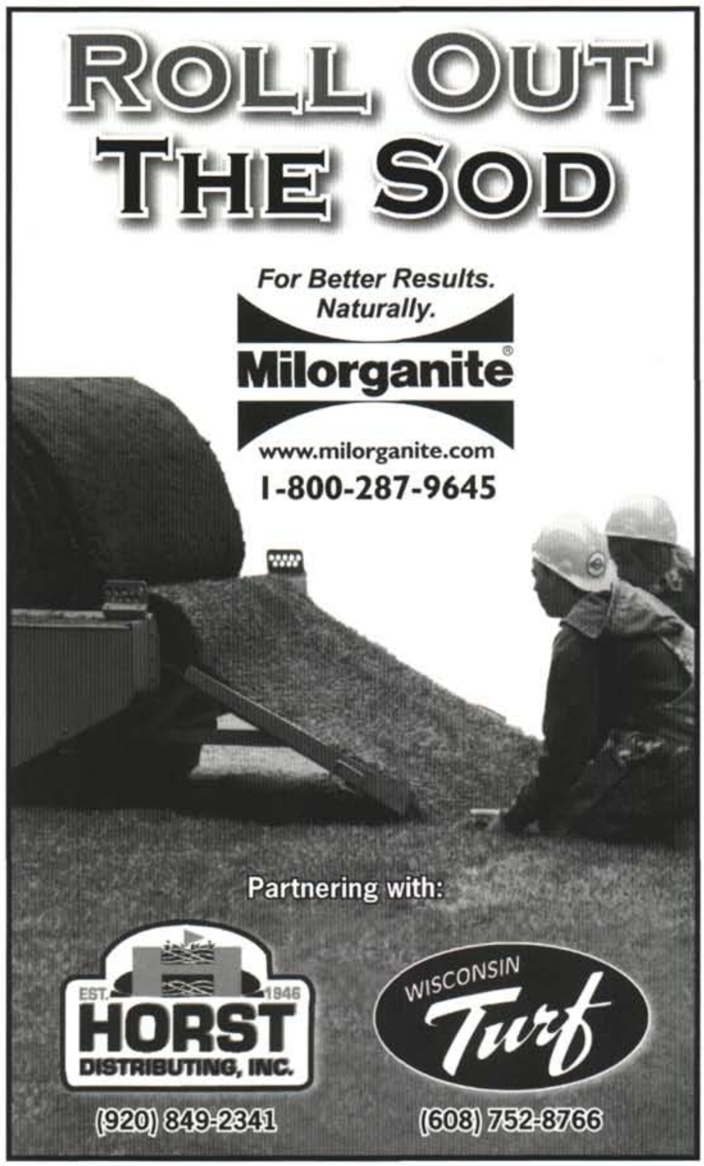

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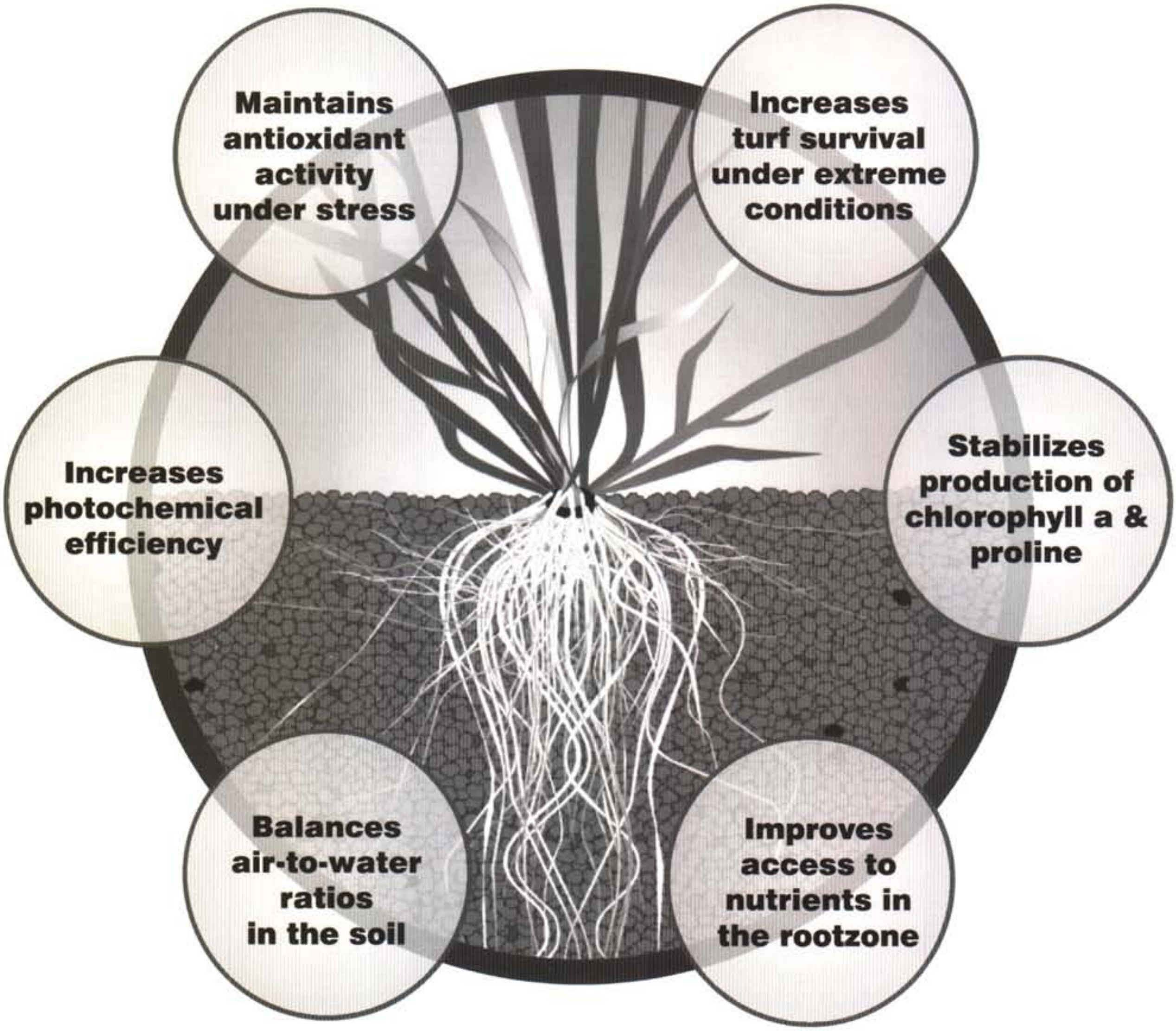

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Spring Education Meeting Kicks Off New Golf Season

By Matt Schmitz, *Golf Course Superintendent, The Bruce Company*

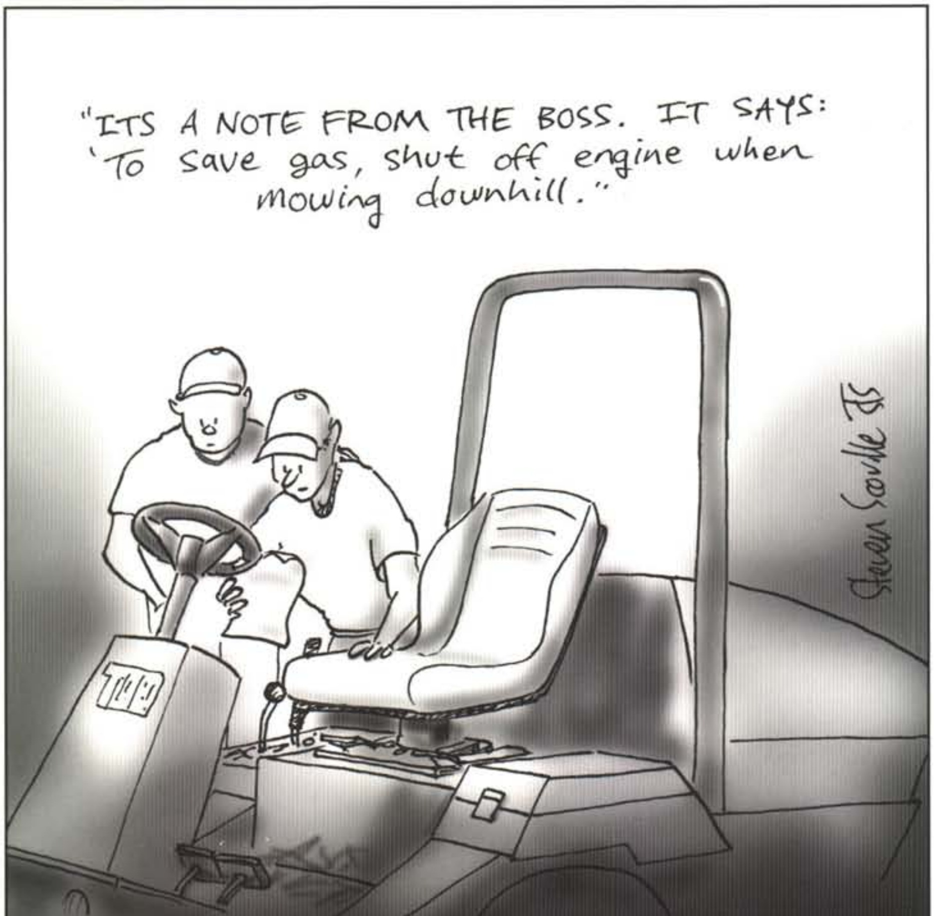
On March 6th we met for the spring business meeting at the Ramada Plaza Hotel in Fond du Lac. Bob Langjahr, Aquatic Biologists Inc., started off the education portion of the meeting with a presentation that focused on preventative maintenance of ponds and water features. The first step in any pond maintenance program is to determine how many outside acres influence the pond site and build a program from there. Key points in preventative maintenance were: establishing buffer areas around the ponds, using diffused air aeration to tie up nutrients, grading landscape to direct water runoff away from the pond, and the use of aquatic plants. Bob talked about the importance of reducing phosphorous fertilization around ponds and gaining water chemical tests for total N, P, dissolved oxygen, pH, and many others. These tests will give you a basis for your management program. He also stressed that just about any pond, stream, etc. is considered "waters of the state" and if treatment of your pond is necessary, gain the proper permits and licenses.

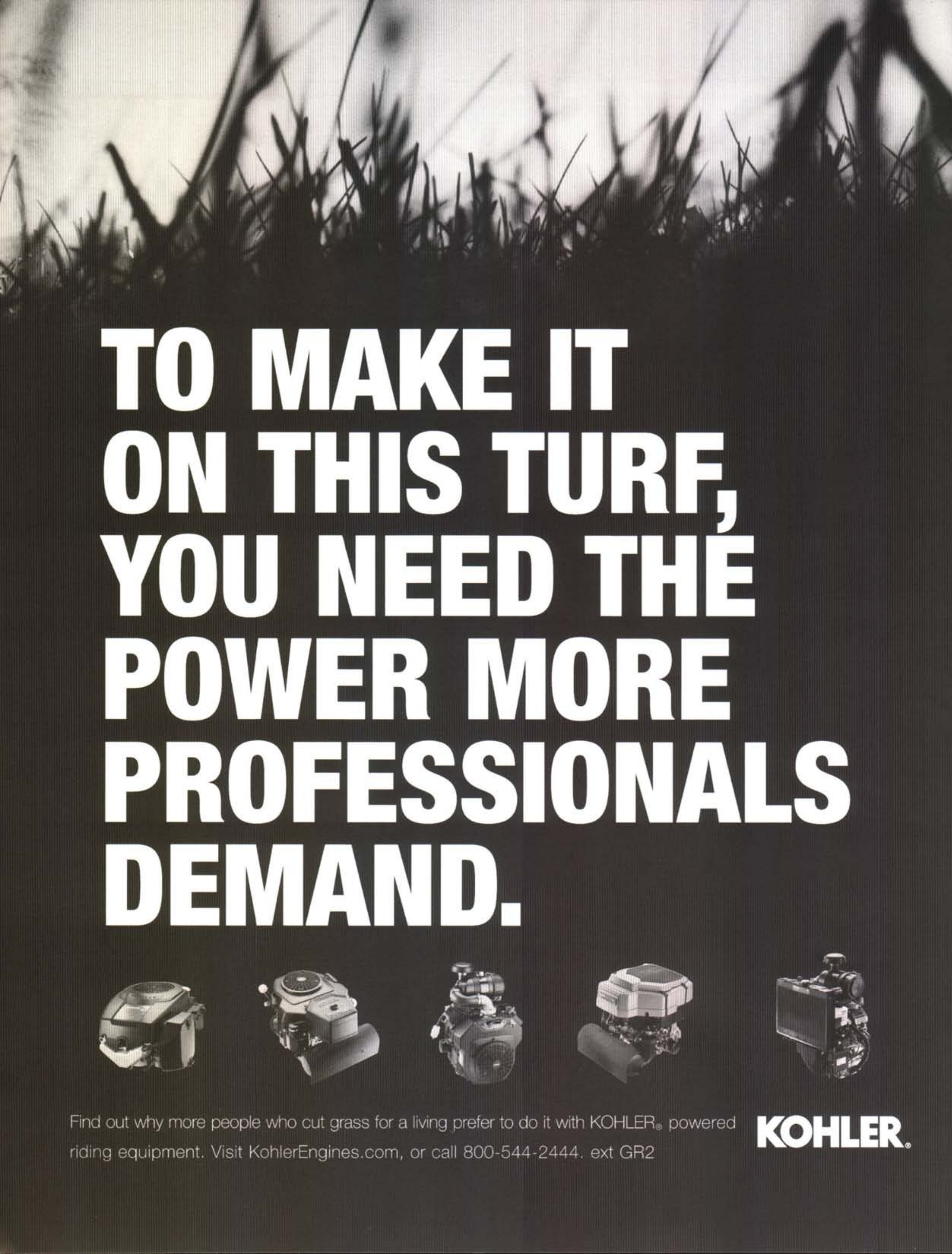
Bruce Kuhs, Financial Consultant AXA Advisors, and Ted Kosinski, Alliance Bernstein Investment Group, followed Bob and spoke about planning for retirement. They gave us some facts to consider, such as, 25% of people that live to 80 years of age will live to their mid 90's and, simply generating 1% additional return during your working years will allow for ten more years of income in retirement, which is good news for those of us in the 25% that will see 90. They also discussed building a diverse portfolio based on where you are in relation to your expected retirement. The main thing they stressed was stick to your plan and don't panic.

Last, but not least, Dave Brandenburg, golf course manager at Rolling Meadows Golf Club in Fond du Lac, was awarded the Distinguished Service Award by Mike Lyons, WGCSA president and superintendent at Old Hickory CC, and Kris Pinkerton golf course superintendent at Oshkosh CC.

Dave is only the 13th recipient of the association's top honor. He started volunteering for committee service in 1993 and spent 11 years on the board of directors holding the offices of secretary, treasurer, vice president, and president. Dave served on many committees during this time, including the 75th Anniversary book committee. Currently Dave serves as business manager for Grass Roots and is on the nominating committee.

The next time you see Dave, thank him for his service to our association. He is what makes Wisconsin superintendents great.

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The New Soil Test Interpretations for Wisconsin Golf Turf

By Dr. Wayne Kussow and Steven Houlihan, *Department of Soil Science, University of Wisconsin-Madison*

The handwriting was on the wall by the year 2001. We were entering the era of regulation of fertilizer use on turfgrass based on soil tests. This has since become a reality for phosphorus use on home lawns in several communities in the state and for all of Dane County. March 10, 2008, state-wide regulations will go into effect requiring that all turf areas of 5 or more acres under single ownership be fertilized according to soil tests in abeyance with the NR 151 Technical Standards currently being developed by a DNR-appointed committee. Note that the phrase "5 or more contiguous acres" has disappeared. This has interesting implications. For example, is a 5 or more acre housing development subject to these regulations until the homes are sold? Sod farms are exempt on the premise that they are agricultural enterprises.

The specter of regulation of fertilizer use based on soil tests was disconcerting to us . Soil test interpretations for turf used by state soil testing labs prior to 1994 were developed in the 1960's. They were based primarily on forage grass research. Turfgrass research at that time was still in its infancy. These were revised in 1994 using a very meager data base derived primarily from research conducted in other states. The changes were dramatic. For example, the optimum level of soil test P was reduced from 70 to 20 ppm for established lawns. How valid was this dramatic change? We decided that it was vital to the state's turfgrass industry that our soil testing labs have interpretations whose validity and reliability had a solid scientific base and that this had to be done as quickly as possible.

Very few states, if any, have ever implemented a major research effort directed toward the development of comprehensive soil test interpretations for turfgrass. There are several reasons for this. The process is costly, time consuming, does not generate the refereed publications that junior researchers must have to get promoted, and is fraught with difficult decisions that have to be made.

The first decision that has to be made is one that is fundamental to the whole process. The starting point in soil test interpretation is determination of the relationship between soil test levels of nutrients and plant response. For field crops, selection of an appropriate plant response is obvious. It's going to be yield in bushels per acre or whatever is appropriate for a particular crop. With turf, our goal is not that of maximizing clipping production, but maintaining acceptable quality.

But there is a problem in using turf quality. Turf quality is a subjective rather than a quantitative property that is influenced by many factors other than nutrition. After giving the matter considerable thought, we decided that our plant parameter would be shoot nutrient concentration. In other words, our task was to determine, for example, how turfgrass clipping P concentrations vary with increasing levels of soil test P. This decision was the driving force behind our collection of paired samples of turfgrass clippings and soil from the area where the clippings were collected. This had to be done for all major types of turf in the state and over a broad area.

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funded W.R. Kussow Distinguished Graduate Fellowship, to a collaborative relationship with industry, and to the cooperation of many of you, over the period of 2003 to 2005, we were able to assemble a collection of 614 paired clipping and soil samples. The single largest set of samples, some 417, was collected from golf courses because this was where there were no pre-existing data. The remaining 197 pairs of samples came primarily from lawns, institutional grounds and athletic fields. The clippings were analyzed for all the essential nutrients of importance to the study. The soil samples were analyzed for pH, P, K, Ca, Mg, B, Fe, Mn, Cu, and Zn by way of several different methods because at that point we didn't know which methods would yield the most reliable results. Through this effort we generated a data base with nearly 25,000 entries.

The use made of this large data base was to meet the objective of determining which of the various soil test methods used performed best for turfgrass. Soil test performance is judged according to the strength of the relationship between soil analyses and plant response. The stronger the relationship, the greater the assurance that the test extracts from soil only those forms of nutrients truly available to plants.

We found these relationships to be very weak, statistically insignificant, and of little value in deciding whether one test method performed better than another. More intensive inspection of our data revealed why this was the case. We were being confronted with one of the unique features of turfgrass as compared to field crops. Nitrogen application rates on field crops are set at non-growth limiting levels because this results in maximum economic returns for the crop. We determined through field experiments that in our climate it takes at least 16 lb N/1,000 ft^2/yr^{-1} to maximize clipping production on a Kentucky bluegrass lawn and in excess of 3.8 lb N/1,000 ft/mo^{-1} on a bentgrass fairway (Fig. 1). Because no one fertilizes at much more than 1/4 these rates, N is almost always growth limiting. From this we surmised that it is N that drives clipping production and, in so doing, drives turfgrass uptake of all the other essential nutrients. This phenomenon is vividly illustrated in Figure 2 for P and K. What this figure indicates is that turfgrass clipping P and K concentrations are more dependent on fertilizer N rate than soil supplies of P and K. As you might imagine, this complicated subsequent attempts to establish relationships between soil test levels of nutrients and their tissue

Figure 1a. Bentgrass N Response Curve

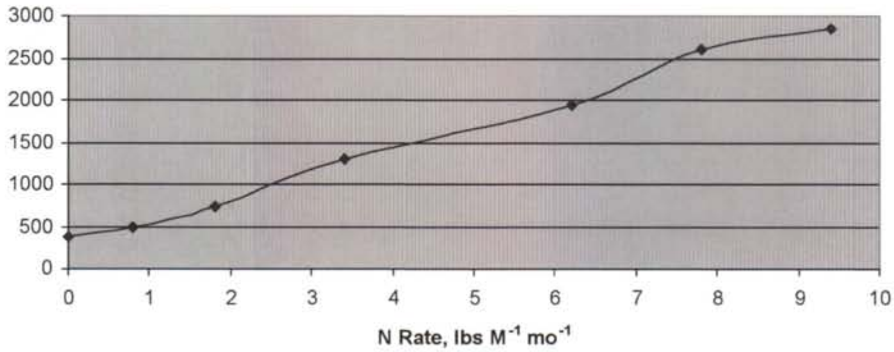

Figure 1b. Bluegrass N Response Curve

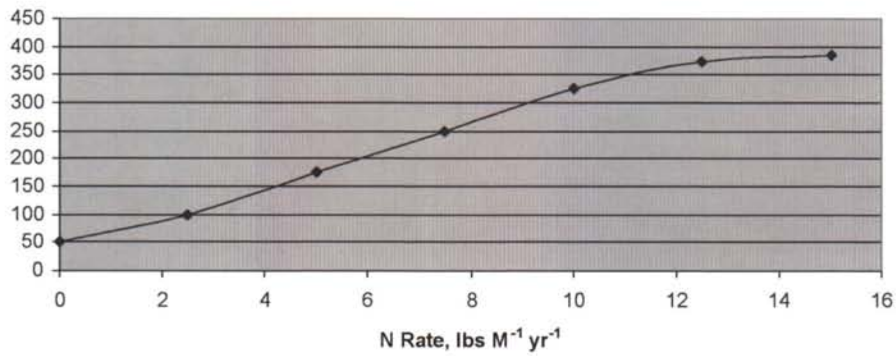

Figure 2. Clipping N vs Clipping P and K