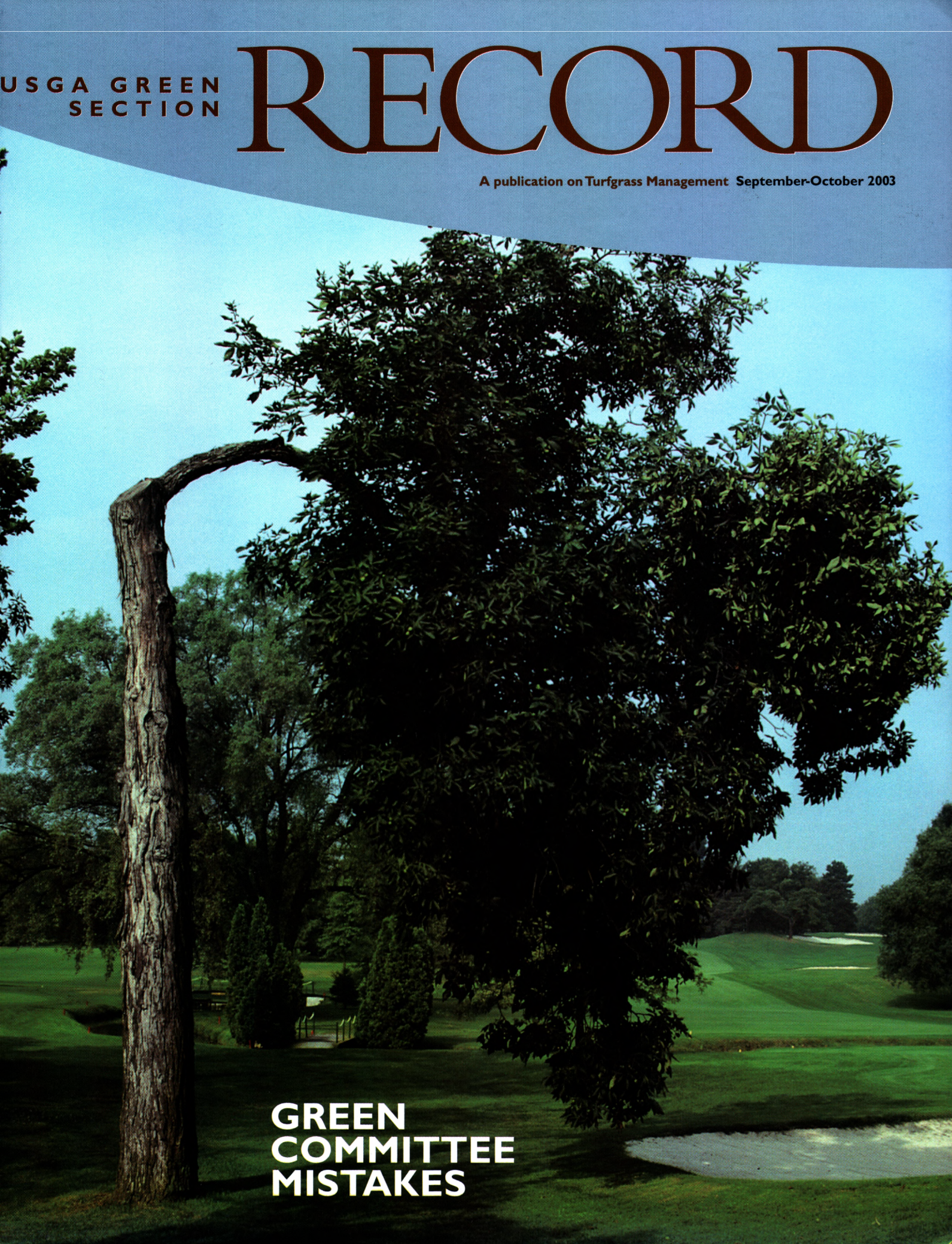
USGA GREEN SECTION

RECORD

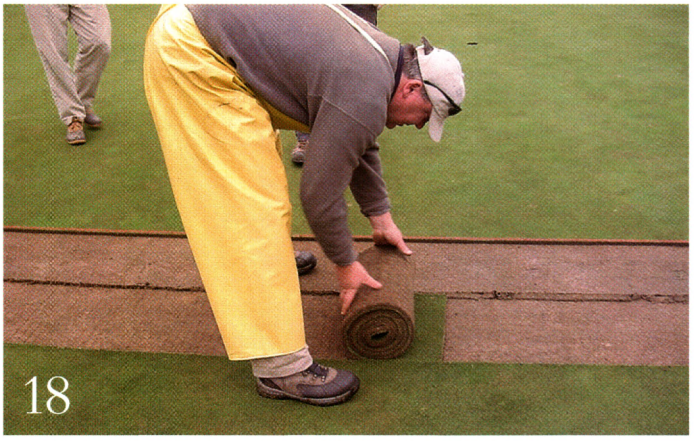
A publication on Turfgrass Management September-October 2003

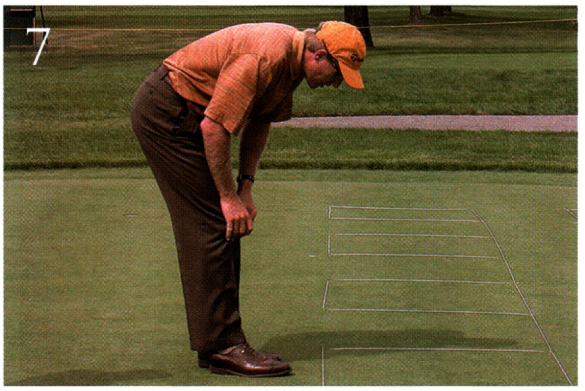


GREEN COMMITTEE MISTAKES

Contents

September-October 2003 Volume 41, Number 5





Cover Photo
Some Green Committee decisions can leave you scratching your head wondering about the rationale for a decision. Tree removal can be the ultimate test for a Green Committee's resolve.

THE TEN MOST COMMON GREEN COMMITTEE MISTAKES

Green Committees serve a vital role in the management of a golf course, but there is a great disparity in their relative effectiveness.

BY DAVID A. OATIS

Green Section agronomists make nearly 2,000 Turf Advisory Service visits to more than 1,500 different golf courses during the course of each season. Visits are made to every type of course imaginable, from elite championship sites to public and municipal courses, to low-budget nine-hole facilities, and the structure and relative effectiveness of the various committees that oversee the operation of these courses vary nearly as much as the facilities themselves. Nevertheless, most of these varied courses have a few things in common. They all take pride in their facility and have a strong desire to improve it. And yes, most of the committees that guide them have the propensity to make mistakes. Just as each course has its strengths and weaknesses, so do their committees. Some are remarkably effective, while others squander funds and/or are ineffective. You might be surprised to learn that the mistakes made by Green Committees often are quite similar, both from course to course and decade to decade. World-renowned architect Alister Mackenzie apparently had little regard for committees. In his 1930s manuscript, *The Spirit of St. Andrews*, he wrote, "The history of most golf clubs is that a committee is appointed, they make mistakes, and just as they are beginning to learn from their mistakes, they resign office and are replaced by others who make still greater mistakes, and so it goes on."

So, Green Committee mistakes are not new, nor are the mistakes they make very original. Most have been made countless times before by countless committees at countless golf courses. Upon surveying the Green Section staff (whose resume includes a combined total of 250 years of service and approximately 30,000 Turf Advisory Service visits), it became quite clear that there is a distinct pattern to the mistakes most commonly made by Green Committees. Although it has been said that "a wise man learns from his mistakes," the author prefers the adage "Only a

A Green Committee should have a workable number of members (7-11) to promote discussion and to reach timely decisions. Committees should be comprised of golfers of all playing abilities and both genders to take into account different perspectives and to keep lines of communication open.

fool learns from his own mistakes. A wise man learns from the mistakes of others." It is hoped that this effort to identify common Green Committee mistakes will help your committee avoid them.

THE ROLE OF THE GREEN COMMITTEE

No discussion of Green Committee mistakes would be complete without first discussing the role of the committee. Much has been written on this subject, and a good discussion is contained in *A Guide for Green Committee Members* by the USGA Green Section, available from the USGA order department (Publication #PG 1715, $2.00 each, 800-336-4446). You can also contact your regional Green Section office for a copy.

Green Committees have the responsibility of overseeing the management of the golf course, but they must not be involved in its day-to-day management. Rather, they are an advisory board whose role should be to hire a golf course superintendent and make broad-based decisions on budget and policy. They need not have specific knowledge of turfgrass management, but they must understand the game of golf, have a desire to learn, and have time to devote to the process. Effective participation on a Green Committee requires a significant commitment of time and energy, and it is not a commitment to be taken lightly.

In charge of the committee is the green chairman. His task is to organize and hold regular meetings of the committee and to develop and maintain a close relationship with the golf course superintendent. At courses with problems or conflicts, this can be a most unenviable role, yet it also has the potential to be extraordinarily rewarding. An effective chairman and committee working with a competent superintendent can develop and implement plans to maintain and make improvements in a golf course that can be enjoyed by golfers for generations. Conversely, when an ineffectual committee and a superintendent cannot cultivate a constructive relationship, it can drag the course down, creating or adding to problems, the effects of which will be suffered for years. Perhaps the simplest description of the committee's role is that **". . . they must protect the golf course from the golfers!"** If the average golfer had his way, the greens would never be aerified, pesticides and fertilizers would never be applied, and trees would only be planted and never removed. In truth, chaos would reign, turf would fail, and playability would be abysmal!

Being a chairman or member of the Green Committee is not a popularity contest. Tough decisions frequently must be made regarding disruptive and expensive programs and projects, and thick skin and an ample dose of conviction are required. Green Committees serve a vital role in the operation of the golf course. In this role, committees have many opportunities to make mistakes, so now let us review what the Green Section staff believes are the ten most common ones.

TOP TEN GREEN COMMITTEE MISTAKES

No. 10: Shopping for the Right Opinion

"Their minds are made up and they do not wish to be confused by the facts," describes the committee that falls into this trap. Some committees look for a superintendent or consultant who will give them the answers and corresponding recommendations they desire. "Sure, we can keep the greens in championship condition all season!" . . . "Heck no, you don't need to aerify!" . . . or "We don't need to close the course for maintenance!" might be some of them. Sadly, there are superintendents and consultants who will give committees the answers they are looking for. Green Section agronomists occasionally have been labeled as "the superintendent's mouthpiece" by such committees. Realistically, however, if the opinions of the USGA agronomist happen to be in concert with the superintendent's, it just may be because the superintendent has it right in the first place.

Turfgrass and golf course maladies often require complex, expensive, and/or disruptive solutions that every golfer would choose to avoid if given the option. It is the mission of the USGA Green Section to help courses devise the most reasonable and effective solutions to their problems, but cheap and easy are of little value if the solution is not effective. Sometimes, courses need to take a step back in terms of conditioning in order to take several steps forward. For instance, courses that want top-notch putting greens usually need to put up with the disruption of aerification, verticutting, topdressing, and pest management programs. All of these programs are disruptive to the golf schedule, but failure to follow through with sound management programs will produce turf problems that will be even more disruptive.

Medicine doesn't always taste very good, but we still have to take it!

Second opinions are valuable, but solutions should be selected based on whether or not they are logical and will be effective as opposed to whether or not they will inconvenience the golfers. Motives always should be considered when reviewing the recommendations.

No. 9: Not Enough Time to Participate Fully

An effective Green Committee member must put in the time! This means attending as many of the regular meetings as possible. It also means educating oneself on the subject of turfgrass management and learning specifically about issues that might be facing their individual course. Prospective committee members should not underestimate the time commitment or the effort it takes to attend meetings, seminars, and Turf Advisory Service visits, or the time it takes to educate oneself. Reading textbooks, articles, trade publications, and the *Green Section Record* are part of the process. It also is essential to spend time with the superintendent, both on the course and at conferences and seminars. Chairmen and committees also must take the time to develop open, honest relationships with the golf course superintendent. The committee member who doesn't have time to participate fully generally is not capable of making informed decisions.

No. 8: Figurehead Chairman

The green chairman should be a duly elected course official and a voting member of the Board of Directors. The green chairman in that capacity has far more leverage and influence on the outcome of controversial issues and is a much more persuasive advocate of the golf course management operation.

Conversely, the structure at some courses is for the green chairman to serve "at the will (read 'whim') of the president." While this arrangement can function acceptably in some cases, it can fail miserably when personalities clash and/or difficult decisions have to be made. It also sets the stage for the green chairman to effectively become the "puppet" of the president. When personalities or agendas clash, the green chairman can easily be removed from office and replaced with a more agreeable candidate. Frequent turnover in the leadership position of the Green Committee is never a good idea, but it can be especially disastrous when it happens in mid-season!

Sometimes the cheapest route is not the best decision. The Green Chairman at this golf course owned a sand supply business and offered the course an inexpensive sand source. Unfortunately, in less than two years, the sand had to be removed in slabs due to contaminants in this riverbed sand.

No. 7: Micromanagement

Green Committee members and chairmen must have a basic understanding of and a strong interest in course management programs. It is a steep learning curve indeed for Green Committee officials, and armed with plenty of newfound knowledge, it is easy to become a backseat driver. It is uncomfortable and inhibiting to have one's every move scrutinized, and that should not be the role of the Green Committee. Rather, the committee should make broad-based policy decisions and should not be involved in the day-to-day maintenance of the golf course.

In some instances, strong-willed green chairmen have begun directing maintenance personnel, and this jump in the chain of command can only cause chaos and confusion. If a course official believes that additional direction is needed or priorities should be shifted, he or she should discuss it with the superintendent face to face and never in front of the maintenance staff. The committee member also must realize that the competent superintendent has a better appreciation of the "big picture" and may have other maintenance issues to deal with that have higher priorities.

No. 6: Unrealistic Demands

Just about every committee wants more in terms of turf quality and playing conditions than they can afford, and some want more than is humanly possible. Perhaps it is just basic human nature, but placing unrealistic demands on the golf course superintendent, maintenance personnel, and turf-

grass is an all too common pitfall. Examples include trying to maintain championship conditions every day of the year or requiring that the greens be a specific speed every day. These are problems often fueled by televised golf coverage. Most of the courses portrayed each week on television are in nearly flawless condition, and this one-sided view of course conditioning gives golfers everywhere the unrealistic notion that the courses are maintained in this condition every day of the year.

This golf course allows the club president to select and plant a tree of his choice in the location of his choosing! Planting the wrong type of tree in the wrong location creates a problem that can last for generations.

The extraordinary playing conditions achieved for the United States Open Championship frequently are cited by golfers who never realize that the courses hosting national championships are selected years ahead of time and then may go through a lengthy (and often very expensive and disruptive) period of intense conditioning to achieve those remarkable conditions, which, by the way, are maintained for a single week in June. Rarely do normal courses have access to the hundreds of volunteers U.S. Open course superintendents have. Let there be no mistake, extraordinary conditions are achieved during the United States Open Championship and other televised events. However, these conditions cannot be maintained on a regular basis throughout the year. Turfgrass has its limits, even if the budget does not, and golfers everywhere need to keep in mind that there usually is a direct relationship between fast putting green speeds and dead grass.

Interestingly, noted architect Dr. Alister Mackenzie also had something to say about perfection: "It is possible to have too high a degree of perfection. If we have never had a bad lie, we are not likely to appreciate a good one, and moreover, the ability to play from a bad lie differentiates between a good player and a bad one."

No. 5: The Legacy

According to Freud, all humans have egos. Based on personal experience, some egos are much larger than others, and a committee or chairman with a large ego can be easily transformed into someone who wants to "leave their mark on the course." To that end, peculiar and impractical designs are sometimes contrived and perpetrated on the course, squandering labor and funds and wreaking havoc on the course. Low priority, pet projects are sometimes funded, even when there are not enough funds to purchase much-needed supplies or equipment, and this freqently occurs to the detriment of the golf course and the maintenance budget. It may also hurt the superintendent's credibility if he is forced to "go along" with an inappropriate project.

Green Committees can avoid this pitfall by utilizing and listening to competent consultants and by developing master plans for long-range improvement. Such plans often address proposed architectural changes for the golf course, but also should include the more mundane infrastructure necessities such as irrigation and drainage systems, maintenance facilities, cart paths, tree management programs, etc. The plans should be updated and re-prioritized regularly and adhered to as closely as possible. This is the way to keep focused and on track.

No. 4: The Inability to Make Tough Decisions

The duties of a green chairman and Green Committee are not for the fainthearted. Issues often arise that require tough decisions that may raise the ire of an entire golfing membership. It should always be the goal of the superintendent and the course officials to avoid disruption of the golf course and golf schedule, but the solutions to some problems require just that. Severe soil problems may require aggressive cultivation programs. Badly deteriorated bunkers may require total reconstruction. An antiquated irrigation system may require an expensive replacement project, and playability problems and poor turf performance may require tree removal programs. Issues such as these can be emotionally charged, and the decisions will have far-reaching impacts on the viability of the course.

There are many undesirable consequences of not following through with the necessary cor-

rective programs, and one of the most common outcomes is continued poor turf performance. The ever-popular band-aid approach rarely is effective, yet it continues to be selected in lieu of more expensive and/or more disruptive solutions. While a band-aid approach might be needed on a short-term basis, consistent reliance on this type of approach winds up wasting money and perpetuating problems. At some courses, "it seems there is never enough money to do the project right the first time, yet there always seems to be enough money to do it over!"

No. 3: Unbalanced Representation or Fails to Represent All Golfers

Committees can be too large; of that there can be no doubt. Large committees (more than 12-15 members) often have difficulty staying focused and on track. They tend to have too much discussion and have trouble reaching decisions. Some have suggested that the most effective committee size is an odd number less than three, but there is risk involved in having such a committee and it is not common. A workable committee size usually is between seven and 11 members.

Committees that are unbalanced often fail to consider the effects their actions will have on golfers of different abilities. It should be no surprise that many of the changes made in the name of "toughening up the course" or "modernizing" it wind up penalizing shorter hitters and/or higher handicappers. Green Committees should be comprised of golfers of both genders and all abilities. This helps to take different perspectives into account, and it helps to keep lines of communication open with other golfers.

No. 2: Short Tenure

Individual committee members spend a tremendous amount of time learning about the science of golf course management, and the experienced committee member becomes an extremely valuable resource. Superintendents typically spend a tremendous amount of time helping to educate committee members, as this is an important part of their duty. Frequent turnover in Green Committee members produces duplication of this effort, is wasteful of the superintendent's valuable time, and can be extremely frustrating. Frequent turnover also wastes the time and expense incurred in each committee member's educational process, and it greatly increases the odds of making those *rookie mistakes*. Frequent turnover makes continuity an impossibility.

No. 1: Poor Communication Skills

Maintaining an open and direct line of communication between the superintendent and the Green Committee is essential, and it can be difficult to achieve. After all, committee personnel usually change on a regular basis, so the committee that

Some committees expect the world in terms of conditioning, yet fail to provide the necessary tools to get the job done right. A poor irrigation system or worn-out maintenance equipment can prevent the turf management program from achieving its full potential.

hires the golf course superintendent is likely not to be the committee the superintendent answers to just a few years later. Taking into consideration that individuals often volunteer for different committees to effect change, it is to be expected that the goals of the committee will change according to the personnel who make them up. When these changing goals are not clearly communicated to the superintendent, problems are guaranteed to arise.

One of the more effective means of keeping committees and superintendents on the same page is specifying maintenance guidelines (see "When in Doubt, Spec It Out," March-April 1997 *Green Section Record*). This should be mandatory reading for all Green Committee members. Assuming effective communication is maintained between committee and superintendent, the next step is to ensure that the committee communicates effectively with the Board of Directors and the golfers.

The old adage "a little knowledge is a dangerous thing" certainly applies here. Frequently, committee members try to answer complex agronomic questions and wind up giving inaccurate information that just confuses the process. Even the most experienced Green Committee member should be quick to say, "I don't know the answer to that question, but I'll check with our superintendent and get back to you." Doing so can save a tremendous amount of embarrassment, confusion, and grief!

One could argue that many of the world's problems are the result of poor communication, and this is certainly true of the realm of turfgrass management. Golf course superintendents rarely consider themselves salespeople, yet sales is a big part of their job. Successful superintendents must sell their management programs and philosophies to the golfers and to the various committees they answer to. The same can be said of Green Committees. Together with the superintendent, they must sell their programs to the golfers. While good playing conditions alone help sell the programs, an ample amount of written and oral communication must also be provided. Committees need to communicate effectively with the golf course superintendent and with the golfers, particularly when major projects or expenditures are being considered.

Some programs are hard to sell, but Green Committees that try to educate the golfers, schedule town meetings, and provide written documentation and access to their consultants to explain why the programs are needed, generally fare the best. Conversely, committees that take an arrogant approach and assume the golfers will simply take their word for it, frequently experience vehement opposition and fail to gain the support of the golfers.

Being a Green Chairman or Green Committee member can be a tough job. Someone is always out to get you!

CONCLUSION

Understanding some of the most common pitfalls will help committees and superintendents avoid them, so the next step is to put all of these ideas to work. Discussing the many pitfalls at the board and committee level is an excellent idea. Committees might even give themselves a grade in each category as a means of assessing their relative effectiveness. But the acid test is to get outside input, and this is only for Green Committees with extremely thick skin. The ultimate challenge is to have a few golfers give the Green Committee a grade in each of the categories. An unbiased opinion from the outside will assuredly provide some useful information, and for less-effective committees, it might just be an awakening.

DAVID OATIS *joined the USGA Green Section in 1988 as an agronomist in the Mid-Atlantic Region and has been director of the Northeast Region since 1990.*

PGA Touring Pros Evaluate Putting Greens for Spike Damage

Researchers seize an opportunity to learn about the performance of spikes.

BY THOMAS A. NIKOLAI

During a practice round of the 2002 Buick Open at Warwick Hill Country Club (Grand Blanc, Michigan), 70 PGA Tour pros evaluated the damage to putting greens created by various combinations of golf shoe outsoles and either metal or alternative spikes.

The original Softspike swirl was created as a green-friendly design for winter golf in the Pacific Northwest. The concept of a green-friendly spike soon took hold, and approximately a decade ago, a handful of country clubs banned the use of metal spikes at their facilities. Those actions initiated an alternative spike revolution for the game of golf.

Initially, numerous alternative spikes hit the market with green-friendly designs. However, just being green friendly wasn't enough. Alternative spikes that can survive in today's market are not only friendly to both putting greens and infrastructure, they also must have the best possible traction for golfers. Opponents of early alternative spike designs regularly cited lack of traction and often complained, "The pros wear metal spikes, and I should be able to wear them too."

TURNING TIDE

It can be argued that the PGA Tour is the last bastion of the metal spike-wearing golfer. However, the majority of PGA Tour pros freely choose to use alternative spikes. It would surprise most golfers to learn that the majority of professional golfers wear the Black Widow and fewer than 25% of the pros were wearing metal spikes at the conclusion of the 2002 season.

Recall those debates that took place in your locker room and clubhouse when your course entertained banning metal spikes? Imagine what those debates would be like if your entire membership made their living playing golf. Also remember that the Rules of Golf do not allow golfers to repair spike marks (uplifted turf or indentations) in the line of a putt. Certainly, PGA Tour

Table 1

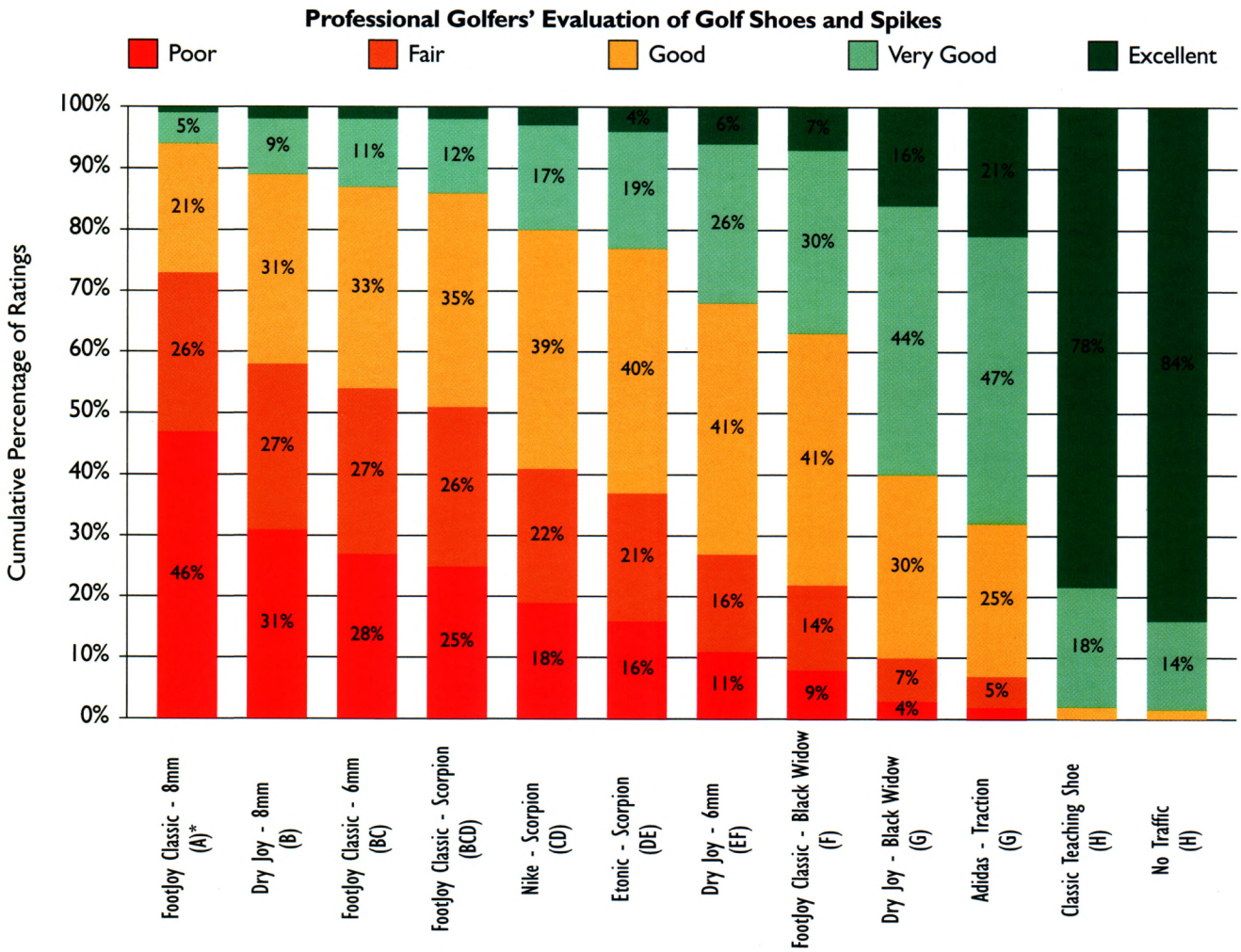
Treatment list for the 2002 Buick Open Spike Study

Treatment Combination	
Spike	**Outsole**
1. 8mm metal	FootJoy Classic
2. 8mm metal	FootJoy Dry Joy
3. 6mm metal	FootJoy Classic
4. 6mm metal	FootJoy Dry Joy
5. Black Widow	FootJoy Classic
6. Scorpion	FootJoy Classic
7. Black Widow	FootJoy Dry Joy
8. NONE	FootJoy Classic Teaching Shoe
9. Scorpion	Nike
10. Scorpion	Etonic
11. Traction cleat	Adidas
12. (CHECK) None	None

Traffic was applied to each plot to represent 70 rounds of golf around the cup. Each person who applied traffic wore every pair of shoes (all wore a size 11 shoe) in the study and applied the same number of footsteps in a similar manner for each plot.

At the end of the traffic period, the plots were rated using a "report card" scale of A through F where:

A = Excellent (No visible wear due to golf spikes or sole)
B = Very Good
C = Good (Visible foot traffic but acceptable wear)
D = Fair
F = Poor (Suggest banning spike/sole due to excessive wear)



*Bars sharing a letter are not significantly different ($P < 0.05$).

pros have a great deal at stake when they are putting, and it is understandable if they are concerned about what their competitors are wearing on the soles of their golf shoes.

TO THE RESEARCH DRAWING BOARD

With this friendly banter taking place in locker rooms, the PGA Tour contacted Michigan State University regarding alternative spike research. It was decided a study would be set up for PGA Tour pros to rate greens trafficked with the most common golf spike/sole designs worn on the PGA Tour to determine from the professional perspective the extent of damage done by the various spikes and spike/outsole combinations.

The study was a randomized block design with 12 shoe/spike designs, and each treatment combination was replicated three times. It was conducted on the Warwick Hill Country Club nursery green on August 6, 2002, during a practice round of the Buick Open in Grand Blanc, Michigan. The putting green was a mixture of creeping bentgrass and annual bluegrass (*Poa annua*) mowed at 0.125 inch. The maintenance practices of the nursery green were similar to those practiced on all the other greens of Warwick Hill Country Club.

Approximately 70 PGA Tour pros took the time to rate the plots. From their comments it was clear that this was a serious matter to them. Many politely commented on why they preferred either the alternative spike or the metal spike as they carefully investigated the wear on the plots. One chuckled, "Those wearing metal spikes should have to use wooden clubs with steel shafts." Another argued that those who do not wear metal spikes should be able to repair spike marks, but those who wear metal spikes should not be able to do so. Yet another pro claimed that alternative spikes were around only because metal spikes caused damage to infrastructure. Nevertheless, all participants were cordial, and nearly all of them expressed their gratitude for our efforts.

HOW DID THEY PERFORM?

Results of the study are presented in Figure 1. Note that every rating is accounted for and the cumulative percentage of the responses is on the y-axis. The x-axis has the treatments expressed from the most visible damage (left) to the least visible damage (right). Treatments sharing the same capital letter in parenthesis are not statistically different from each other.

The 8mm metal spike in the FootJoy Classic was the least favorable among the pros, with 46% rating the treatment as poor. The no-traffic check plot and the FootJoy Classic teaching shoe were the most favored treatments, with excellent ratings of 85% and 78%, respectively.

Results also indicate the golf shoe outsoles (bottoms) can make a difference. The FootJoy Classic has a smooth (or flat) outsole, while FootJoy Dry Joys have some protrusions or built-in studs in their outsoles. Golf shoes with these traction elements built in are referred to as "combination outsoles." Numerous individuals see the traction elements built into the outsoles and understandably assume these aggressive-looking protrusions would cause additional damage to a green. However, results from this study indicate otherwise.

Note that the 8mm and 6mm metal spikes, as well as the Black Widow in the Dry Joys combination outsole, created less visible wear than the 8mm and 6mm metal spikes and the Black Widow in the FootJoy Classic (flat) outsole, respectively. This makes sense, since the increased points of contact on the combination outsole decreases the amount of pressure at each point. This is not unlike snowshoes increasing the surface contact area allowing an individual to travel atop snow. However, note that all combination outsoles in the study performed equally well as the Nike combination outsole with the Scorpion cleat and were not significantly better than the FootJoy Classic with the Scorpion cleat.

Other interesting comparisons include the Black Widow and the Scorpion cleats inserted into the FootJoy Classics. From this cleat comparison in identical outsoles, it is apparent the pros felt the Black Widow was more green friendly than the Scorpion cleat. In regard to combination outsoles with different cleats inserted into them, the Adidas with the Traction cleat and the FootJoy Dry Joy with the Black Widow cleat were seen as more green friendly than the Etonic and Nike outsoles with the Scorpion cleat inserted into them.

The 6mm metal spike in the Dry Joy combination outsole received significantly better ratings than the Scorpion spike in the FootJoy Classic and in the Nike combination outsole. Additionally, it was just as green friendly as the Scorpion cleat in the Etonic and the Black Widow in the FootJoy Classic.

OUTSOLES MAKE A DIFFERENCE

The majority of the PGA Tour pros have freely switched to alternative spikes. The results of the study at the Buick Open indicate that the 8mm metal spike in smooth-sole shoes causes the most unfavorable putting surface. However, the type of outsole (smooth vs. studded) does make a difference. In fact, 6mm metal spikes were rated as less damaging to the putting surface than two other non-metal treatments when the 6mm metal spikes were inserted into a pair of Dry Joys.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the efforts of superintendent Phil Owen, CGCS, and assistant Dave Makulski at Warwick Hill C.C., as well as the PGA Tour.

THOMAS NIKOLAI, PH.D., *is a turfgrass specialist at Michigan State University and the associate coordinator of the two-year golf turfgrass management program.*

Research *You Can Use*

Innovative Management of Earthworm Castings on Golf Course Turf

Can a simple topdressing application provide long-term relief from annoying earthworm activity?

BY R. CHRIS WILLIAMSON

Earthworms are abundant, well-known inhabitants of the soil, referred to by a variety of names such as angleworms, fishworms, nightcrawlers, and dew worms. Earthworms play an important role in recycling nutrients from leaf litter and other organic debris back into the soil. They live in a variety of locations ranging from forests to lakes and streams. They also are found in a wide variety of soil types, though they tend to be relatively scarce in sandy soils.

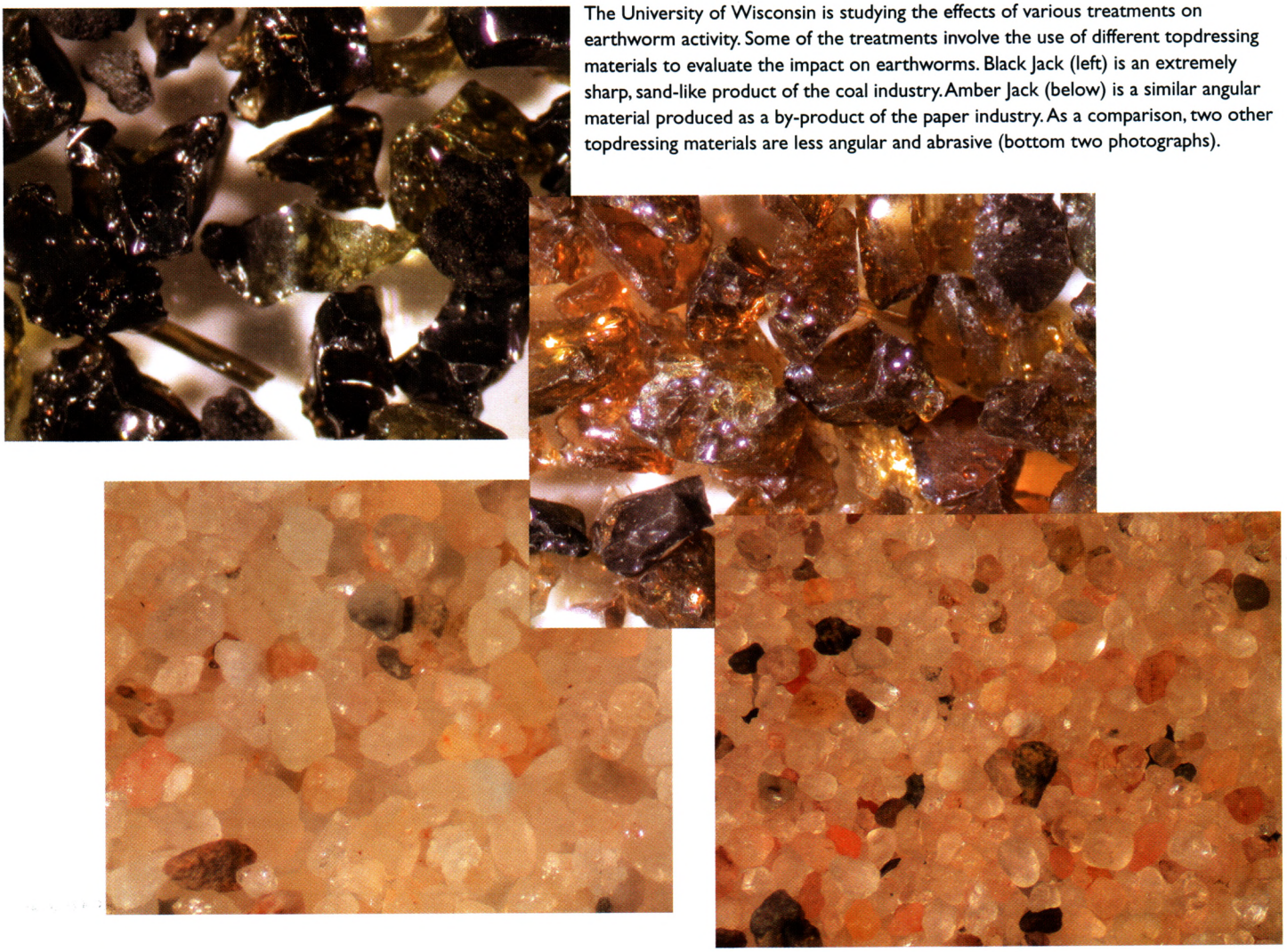
Earthworms have two primary requirements: 1) moist soil and 2) an organic matter food source, and there is no shortage of either on the average golf course. Consequently, earthworms often populate greens, tees, and fairways. They can be particularly abundant in shaded, well-irrigated sites.

Although earthworms are highly beneficial to the soil ecosystem, they can be a major nuisance on golf courses by creating soil mounds, called *castings*, on closely cut playing surfaces. Earthworms feed by ingesting soil and organic matter, such as turfgrass leaf tissue. The soil and organic matter pass through the digestive system and are then deposited as fecal matter castings at the entrance to the earthworm burrow.

There are 24 known species of earthworms in North America; only three species have been reported to occur in turfgrass. Of these three earthworm species, only two create soil castings. *Lumbricus terrestris* Linnaeus, the night crawler, is the most common and abundant species of the two that construct earthen castings. It is understood that *L. terrestris* is native to Europe and was introduced in America like many other pests such as the Japanese beetle.

Although earthworms are highly beneficial to the soil ecosystem they can be a nuisance on golf courses by creating soil mounds called castings. During periods of heavy earthworm activity, a casting will be deposited above a burrow each night.

Soft, wet castings are readily mashed flat by early morning mowing operations. Closely mowed turf under the leveled casting is smothered. As a result, the appearance and playability of the course is affected in areas densely populated by earthworms. Because earthworms are considered beneficial organisms, **NO** pesticides are registered or labeled for control of earthworms; therefore, **ANY** pesticide application specifically intended to control earthworms is illegal. For this reason, alterna-



The University of Wisconsin is studying the effects of various treatments on earthworm activity. Some of the treatments involve the use of different topdressing materials to evaluate the impact on earthworms. Black Jack (left) is an extremely sharp, sand-like product of the coal industry. Amber Jack (below) is a similar angular material produced as a by-product of the paper industry. As a comparison, two other topdressing materials are less angular and abrasive (bottom two photographs).

tive, non-chemical earthworm management strategies are needed.

Earthworms migrate up and down through the soil profile in response to changes in soil moisture content and soil temperature. The cuticle (skin) of earthworms is remarkably sensitive, and sand and other abrasive substances would probably irritate and repel them. We directed our research to exploit this weakness.

In the spring of 2002, an earthworm activity study was initiated that included the following treatments: 1) untreated control; 2) thiophanate-methyl (Cleary's 3336) fungicide applied every 14-21 days; carbaryl (Sevin) insecticide applied every 14-21 days; 4) soap, Joy® dishwashing detergent applied every 7 days; 5) Hydroject™ water injection every 28 days; 6) Dragon spice (ground oriental mustard seed), one application; 7) Zeolite soil amendment, one ⅛-inch application; and 8) Black Jack™ 20/40 crushed coal slag, one ⅛-inch application.

Treatments were applied to a bentgrass/*Poa annua* fairway (Blackhawk Country Club, Madison, Wisconsin) maintained at 7/16 of an inch. This site was selected based on a history of earthworm activity.

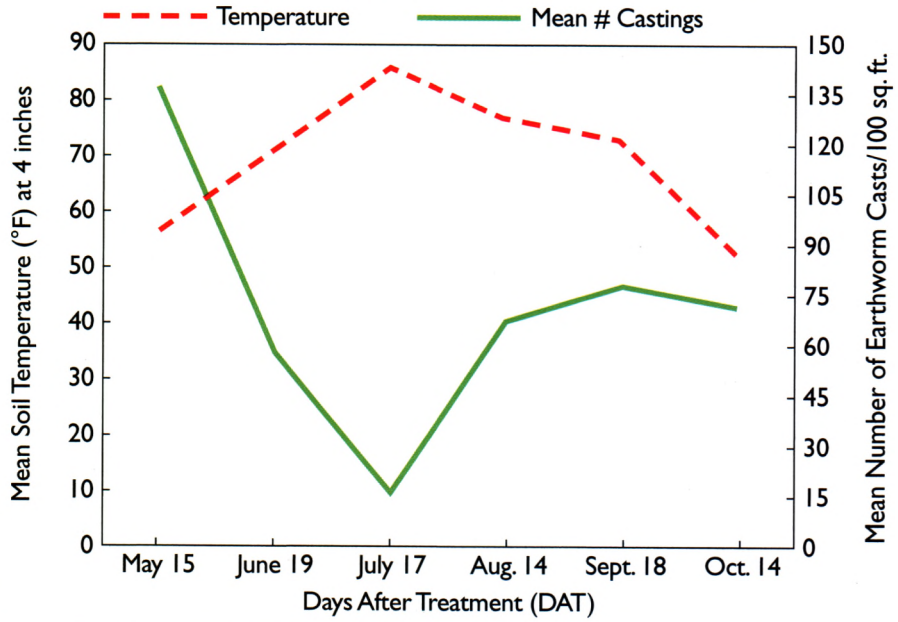
Treated turf plots were evaluated for the mean number of castings every 7 days. The fungicide and insecticide treatments reduced earthworm castings. The soil amendments (i.e., Black Jack and Zeolite) reduced earthworm castings to levels comparable to pesticide applications. Other treatments had relatively little effect on earthworm activity.

Based on the promising results of the 2002 study, another similar experiment was initiated during the spring of 2003. New treatments included a finer grade of Black Jack, another abrasive aggregate called Amber Jack, and an angular topdressing sand.

Black Jack is a by-product of the coal industry; essentially, it is the remains of coal after it is burned for production of electricity. Once burned, it is processed by crushing the resulting 1-2 inch colloids, fractionated into respective size ranges, de-magnetized, and kiln dried. Black Jack is essentially inert, extremely hard, highly angular, and predominantly black in color. Amber Jack is comparable to Black Jack, however Amber Jack is a by-product of the paper industry. It too is inert, highly angular, extremely hard, and considerably lighter in color,

Figure 1

Correlation between soil temperature and earthworm castings on creeping bentgrass turf located on a golf course fairway.



ranging from almost clear to a reddish amber.

The effects of spring vs. fall applications of topdressing and the effects of multiple light applications of topdressing will be evaluated in 2003. Turf quality, thatch accumulation, and disease activity will be rated throughout the season to document any adverse effects a thin layer of abrasive material might have in the upper rootzone of intensively managed golf course turf.

What is the significance of this research to the golf course superintendent, and why is further research needed? Just compare the following scenarios.

BEST CASE SCENARIO

Several approach areas to a green are plagued by earthworm castings every season. The superintendent makes an application of abrasive topdressing to these sites and the worms are irritated to the point where they migrate to the adjacent roughs. The castings in the roughs are not a problem in the 2½-inch turf. In addition, the topdressing firms up the approach areas, and golfers can now play a bump-and-run shot to the green. Life is good.

WORSE CASE SCENARIO

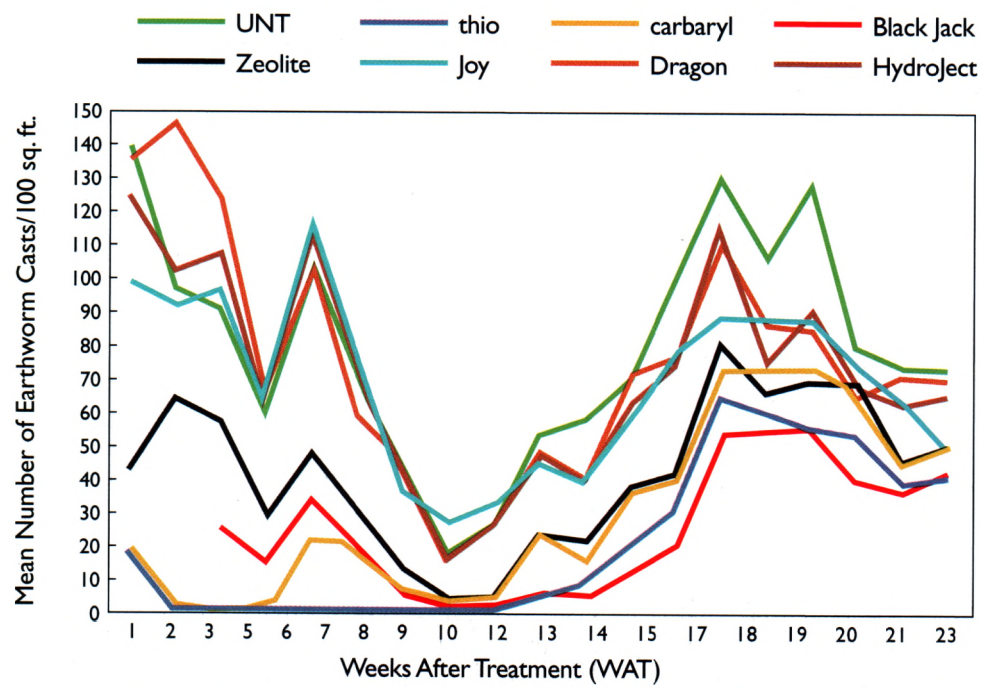
The superintendent makes the same application of sharp topdressing material to approaches. Worms go away, but the layer begins to abrade and injure turf roots and shoots in response to the compaction caused by mowers, motorized carts, and concentrated foot traffic. Roots die back, diseases run rampant, and the turf wilts constantly. Life is not good and you realize that it is very easy to add a foreign material to the rootzone and very difficult to remove it.

Needless to say, thorough research is needed to determine which scenario is most likely to occur before jumping on the Black Jack bandwagon.

DR. R. CHRIS WILLIAMSON *is quite familiar with taking a worm's-eye view of the turfgrass ecosystem as assistant professor of turfgrass and ornamental entomology at the University of Wisconsin – Madison. His research regarding cutworm control for putting greens required long hours observing the nighttime feeding and movement habits of this pest.*

Figure 2

Effect of various treatments to suppress earthworm castings on creeping bentgrass turf located on a golf course fairway.



MICRO-MANAGING

Do not underestimate the importance of micronutrients in intensively managed turfgrass.

BY JIM SKORULSKI

Micronutrient nutrition is probably the least understood facet in turfgrass fertilizer management programs. This is understandable, considering acute deficiency and toxicity symptoms are rare and only recently have scientists begun to understand the complex functions micronutrients play in turfgrass plants and the field situations that enhance deficiencies or excesses. Analytical tests for micronutrients in soils and plant tissues are also becoming more refined for turfgrass systems. The knowledge base is not complete by any means, but the mysteries of micronutrients are slowly disappearing.

So who should be concerned with micronutrient nutrition? Every turf manager should at least be able to identify the plant essential micronutrients and understand the situations or conditions where deficiencies or excesses may exist and the potential impacts they can have on a turfgrass system. Golf course superintendents irrigating with effluent or salt-affected water, growing-in a new golf course, working with low-CEC and heavily leached soils, or managing highly acidic, calcareous or organic soils are more apt to deal with deficiency or micronutrient imbalances and should have a greater knowledge of the role of micronutrient availability and nutrition.

Manganese-deficient bentgrass plants are more susceptible to take-all patch disease. The manganese (Mn) is critical in the production of the lignin found in cell walls and makes the plant more resistant to disease. Soil acidification programs or supplemental applications of Mn can be used to maintain adequate levels of Mn in the rootzone.

THE ROLE OF MICRONUTRIENTS

The essential macronutrients — nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), and sulfur (S) — are used in large quantities by plants as building blocks for amino acids, proteins, sugars, and starches. Iron (Fe), manganese (Mn), zinc (Z), copper (Cu), molybdenum (Mo), boron (B), chlorine (Cl), and nickel (Ni) are also considered essential nutrients for plant growth but are found in much lower concentrations in the plant and thus are termed micronutrients. Their role is equally important, serving as catalysts in a wide array of metabolic functions. Table 1 provides a list of functions for various micronutrients.

SOIL AND TISSUE TESTING

Micronutrients are monitored with soil and tissue nutrient tests. Laboratories most often utilize weak acids or chelating agents such as DTPA (diethylene triaminepentaacetic acid) or the universal extracting agent Mehlich-III combined with the chelating agent EDTA (ethylene diamine tetraacetic acid) to extract plant-available

Table 1

Micronutrient functions and soil, management, and climatic conditions associated with deficiencies and excesses/toxicity.

	Functions	Deficiencies	Excesses/Toxicity
Fe	• Chlorophyll synthesis • Electron transfer in Pn • Activator for enzyme in respiration • Constituent of antioxidant enzymes • Lignin synthesis	• Soil pH > 7 • Weak root system • Excess thatch • Cold soil temperatures • High [Cu], [Mn], [Zn] • Calcareous, arid soils	• Can induce Mn deficiency • Leaf blackening • Centipedegrass sensitive • Acidic, poorly drained soils can produce toxic levels of soluble Fe
Mn	• Oxygen evolution in Pn • Chlorophyll synthesis • N utilization and assimilation • Lignin synthesis • P and Mg uptake • Enzyme activation	• High pH soils • Highly leached, low pH or calcareous sands • Peat, muck soils pH > 7 • High [Cu], [Zn], [Fe], [Na] in low CEC soils • Dry, warm weather	• Soil pH < 4.8 • Anaerobic soils with low pH • Induce Fe, Ca, or Mg deficiencies
Cu	• Electron transfer in Pn and respiration • Synthesize antioxidant enzyme • Lignin synthesis	• High pH soils • Peat and muck soils • Highly leached calcareous soils • Rarely deficient in turfgrasses	• Acidic soils • Heavy applications of copper-based fungicides • Reduced shoot and root production • Suppress uptake of Fe, Mn, Zn, and Mo
Zn	• Structural component of many enzymes • Constituent of antioxidant enzyme • Carbohydrate metabolism • Protein synthesis	• Rarely deficient in turfgrasses • High soil pH • Peat and muck soils • High [Fe], [Cu], [Mn], [Na] • Cool, wet weather • High soil moisture	• Toxic levels may inhibit root and rhizome development • High levels may induce Fe and Mg deficiencies • Some mine spoils and municipal wastes may contain high levels of zinc
B	• Cell wall, plasma membrane structure • Synthesize antioxidant enzyme • Root cell elongation	• Most grasses insensitive to B deficiency • pH > 6.5 • High [Ca] • Dry soils • High [K] in B deficient soils • Peat or muck soils	• Irrigation water with high [B] • Soils naturally high in B (arid and semi-arid soils) • Some composts • Overapplication of B fertilizer • Toxic levels in tissue range 100 - 1,000 ppm

Fe, Cu, Mn, and Zn from soils. Hot water or a water-saturated paste extract is used for B. Micronutrient concentrations are reported in parts per million in the soil test report. Sufficiency ranges for micronutrients in soils are listed in Table 2. The sufficiency ranges are *guidelines* used to help interpret a test and make recommendations.

Soil test recommendations for micronutrients involve a ranking system that is based on expected plant response. The rankings are often titled deficient, low, optimum, excessive, etc. A deficient or low ranking indicates that a positive plant response is likely to occur as a result of an application of that nutrient. A low ranking does not necessarily mean that a deficiency symptom will be evident in the field. This is especially true with Zn and Cu. Rankings for Fe and Mn are generally more consistent. A low ranking should be used as a red flag, indicating the need to investigate fertility and management programs more closely. Similarly, a high or excessive ranking for a particular nutrient does not mean that symptoms of toxicity will appear, but that a closer look should be taken at fertility practices.

Micronutrient analysis is not always a standard part of a soil nutrient test, and it may have to be

requested. Ask the laboratory to include the ranking scale and to list the extractant used for the test. The frequency of testing will depend upon your site conditions. A micronutrient test should always be included as part of the general soil nutrient test for any new golf course site, during grow-in programs, or where micronutrient problems are expected. Periodic testing is recommended even where there are no problems to monitor changes and evaluate ongoing fertility practices.

A soil analysis is an important tool to help predict potential micronutrient deficiencies and imbalances. A tissue test may be more helpful to confirm suspected deficiencies and toxicity problems. The tissue test is only as good as the sample collected, so care should be taken to keep samples clean and free of soil and limited to the site you wish to be tested. Clipping samples can be collected from both problem and non-problem areas for comparison purposes. A more representative sample should be used if the test is for monitoring purposes. The clippings can be collected from mowing baskets on greens or clipped manually from other golf course areas. Root tissue samples can be obtained using a soil probe. Avoid sampling soon after a fertilizer application has been made. The laboratory you will use to complete the test can also provide more information on specific sampling techniques and packaging of the tissue samples.

Commercial and university laboratories are equipped to complete an analytical tissue test. The clipping or root samples received in the laboratory are first washed and then dried or ashed and treated with strong acids to dissolve the nutrients. The concentrations are calculated and the results provided along with a ranking that compares the values with normal ranges. Table 3 provides sufficiency ranges for micronutrients in turfgrass tissues.

Table 2

DTPA and Mehlich III extractable Fe, Zn, Cu, and Mn levels used by many laboratories for micronutrient availability.[a]

Micronutrient	Low (Deficient)	Medium	High (Sufficient)[b]
DTPA[c]	---------- ppm ----------		
Fe	< 2.5	2.6 - 5.0	> 5.0
Mn	< 1.0	1.0 - 2.0	> 2.0
Zn	< 0.5	0.6 - 1.0	> 1.0
Cu	< 0.2	0.2 - 0.4	> 0.4
Mehlich III[c]			
Fe	<50.0	50 - 100	>100.0
Mn	< 4.0	4.0 - 6.0	> 6.0 (pH 6.0)
	< 8.0	8.0 - 12.0	> 12.0 (pH 7.0)
Zn	< 1.0	1.1 - 2.0	> 2.0
Cu	< 0.3	0.3 - 2.5	> 2.5

[a]After Tisdale et al. and Mortvedt.

[b]Extractable micronutrient levels are preferred to be within the High range for high-maintenance, recreational turfgrass sites but within the Medium range for non-recreational grasses.

[c]Rankings for micronutrients are more accurate for plants sensitive to a particular micronutrient, such as vegetable crops, than for turfgrasses, which are not sensitive to micronutrients.

Reference: R. N. Carrow et al. 2001. p. 251.

SITE ANALYSIS

The following considerations are helpful when evaluating the status of micronutrients at your site:

- Are site conditions conducive to a particular deficiency?
- Are there visual symptoms present on individual plants that may indicate a deficiency?
- Are there any "red flags" indicated in the soil nutrient tests?
- Is there anything in the water quality tests that may influence micronutrient status?
- Have tissue tests been completed for affected and non-affected areas?
- Are you managing grass species or cultivars that have special requirements?
- Have smaller-scale test applications of micronutrients been completed to confirm a suspected deficiency?

Micronutrient deficiencies may occur because of certain weather conditions or interactions with other micronutrients. Examples of deficiencies can sometimes be seen with iron, when soil temperatures remain cool, wet, or when roots become dysfunctional because of high soil temperatures or disease. Excessive concentrations of one micronutrient may induce a deficiency of another. The heavy leaching requirements of salt-affected soils can also cause deficiencies of Fe, Mn, Cu, and Zn.

Soil pH probably has the largest impact on micronutrient availability. Micronutrient deficiencies occur more commonly in calcareous sands or soils, or where water pH is high. Excessive liming can have the same impact. Fe, Mn, Zn, and Cu are more soluble in acidic soils, and deficiencies are not anticipated unless the soils are heavily leached. Excessive levels of Fe,

Table 3

Sufficiency ranges for nutrient concentrations in clippings from turfgrass.

Nutrient	Sufficiency Ranges for				
	Bermudagrass[a]	Creeping Bentgrass[a]	Perennial Ryegrass[a]	St. Augustinegrass[a]	General[b]
N, %	4.00 - 6.00	4.50 - 6.00	3.34 - 5.10	1.90 - 3.00	2.75 - 3.50
P, %	0.25 - 0.60	0.30 - 0.60	0.35 - 0.55	0.20 - 0.50	0.30 - 0.55
K, %	1.50 - 4.00	2.20 - 2.60	2.00 - 3.42	2.50 - 4.00	1.00 - 2.50
Ca, %	0.50 - 1.00	0.50 - 0.75	0.25 - 0.51	0.30 - 0.50	0.50 - 1.25
Mg, %	0.13 - 0.40	0.25 - 0.30	0.16 - 0.32	0.15 - 0.25	0.20 - 0.60
S, %	0.20 - 0.50	no data	0.27 - 0.56	no data	0.20 - 0.45
Fe, ppm	50 - 500	100 - 300	97 - 934	50 - 300	35 - 100
Mn, ppm	25 - 300	50 - 100	30 - 73	40 - 250	25 - 150
Cu, ppm	5 - 50	8 - 30	6 - 38	10 - 20	5 - 20
Zn, ppm	20 - 250	25 - 75	14 - 64	20 - 100	20 - 55
B, ppm	6 - 30	8 - 20	5 - 17	5 - 10	10 - 60
Mo, ppm	0.10 - 1.20	no data	0.5 - 1.00	no data	no data

[a]Mills and Jones, 1996.

[b]Jones, 1980.

Reference: R. N. Carrow et al. 2001. p. 172.

Mn, Cu, and Zn are more likely to be available to plants in highly acidic soils (pH<5). Boron toxicity is also more prevalent in low-pH soils where B levels in the native soils or irrigation water are high. High levels of a micronutrient may also accumulate in soils and plant tissue following repeated use of certain composts, sludge-based fertilizers, and plant fugicides.

FERTILIZER STRATEGIES

Micronutrients can often be managed proactively with an application or two of a fertilizer containing a complete micronutrient package and by managing soil pH. Seldom will applications of Cu, Zn, or B alone be necessary, and adequate concentrations of those nutrients can be maintained by using one of the fertilizer packages. Fe deficiencies are the most common among the micronutrients. Foliar applications of Fe are common to correct the deficiencies and to maintain desirable color. Mn deficiencies are less common, but supplemental applications may be required in high-pH soils, heavily leached low-pH sands, or where patch diseases are a concern. Calcareous soils, salt-affected sites, or heavily leached sandy soils (CEC<2-3 meq per 100 gm soil) may require more frequent and light applications of micronutrient-based fertilizer packages or supplemental applications of Fe or Mn.

Micronutrient fertilizers are available in soluble formulations for foliar or soil applications. Foliar applications of micronutrients may be desirable where a rapid response is required or if there are concerns about soil availability (see Table 1).

Chelated formulations of micronutrients are available for foliar and soil applications as well. The chelates are more expensive but will remain available to plants longer in high-pH soils or other instances where availability is a concern.

Foliar application of any fertilizer requires time for absorption into the plant, so delaying mowing practices will ensure that higher concentrations of nutrients are absorbed. Foliar applications of both Fe and Mn must be made frequently, as the nutrients are not

Table 4

Application rates of various micronutrients for test plots to determine the need for wider-scale applications.

Micronutrient	Lbs. per 1,000 sq. ft.	Fluid oz. per 1,000 sq. ft.*	Fertilizer Sources
Iron	.0250	2.000	Ferrous sulfate (20% Fe)
Manganese	.0125	.800	Manganese sulfate (26-28% Mn)
Zinc	.0100	.460	Zinc sulfate (35% Zn)
Copper	.0030	.140	Copper sulfate (25% Cu)
Boron	.0020	.190	Boric acid (17% B)
Molybdenum	.0010	.036	Sodium molybdate (47% Mo)

*Fluid oz. of product applied in 1-3 gallons of water per 1,000 sq. ft.

mobile inside the plant. Zn, Cu, B, and Mo are more mobile, and deficiencies can be corrected more easily with foliar applications. Soil applications of Mn are most effective to increase Mn concentrations in the roots.

Soil and tissue tests help chart micronutrient status in soils and the plant. However, a suspected deficiency of a micronutrient can also be confirmed by completing a field application of that nutrient over a small test plot. A plant response following the application confirms the deficiency and perhaps the need for wider-scale applications. Table 4 provides application rates of the various micronutrients for such tests.

Managing micronutrients is not an exact science. Those managing sandy or high-pH soils, salt-affected sites, or who are growing-in a golf course should be familiar with the interactions among micronutrients, the factors that can cause imbalances, and what fertilizer strategies can be used successfully. So take the time to learn more about the role of micronutrients in turfgrass systems and how site conditions, management practices, and weather conditions can impact their availability. This is one time when micro-managing is not just acceptable, but is downright necessary.

ACKNOWLEDGEMENT

A very special thank-you goes to Dr. Bob Carrow, University of Georgia, for his helpful guidance during the writing of this article.

REFERENCES

Carrow, R. N., D.V. Waddington, and P. E. Rieke. 2001. Turfgrass Soil Fertility and Chemical Problems: Assessment and Management, John Wiley & Sons, Inc. 375pp.

Hill, W. J., J. R. Heckman, B. B. Clarke, and J. A. Murphy. 1999. Take-All Patch Suppression in Creeping Bentgrass with Manganese and Copper. *HortScience* 34(5):891-892.

Hull, R. J. 1999. Iron Usage by Turfgrasses. *Turfgrass Trends* 8(2):1-10.

Hull, R. J. 2001. Zinc Usage by Turfgrasses. *Turfgrass Trends* 10(7):7-11.

Hull, R. J. 2001. Manganese Usage by Turfgrasses. *Turfgrass Trends* 10(9):6-13.

Hull, R. J. 2002. Copper is Essential Bridge for Many Plant Functions. *Turfgrass Trends* 11(9):14-16.

JIM SKORULSKI *is the Green Section agronomist who visits golf courses throughout New England and eastern Canada.*

Cold soil temperatures and an already weak root system can impact nutrient absorption and result in nutrient deficiencies in the plant.

Recontouring a Golf Green Without Total Reconstruction

Two case studies on how to change severely sloped greens.

BY DEAN GRAVES AND TIM KENNELLY

As green speeds have gotten faster, many greens with severe contours and slopes have more limited areas for hole locations. "This green is unfair" is often mumbled by the average golfer who may experience the frustration of putting on such a green.

The simple answer is to rebuild the green complex, change the green, make it bigger, flatten out the contours, and soften the slopes causing the problem. While this option may solve the problem, it can create others. Reconstruction also is the most expensive option. For these reasons, most courses tend to live with their difficult greens and dismiss their golfers' frustrations.

The purpose of this article is to show how two golf courses in the same geographic region solved their individual green contour problems.

The inspiration for this concept of putting green recontouring comes from Rick Christian, golf course superintendent at Pine Valley Golf Club in New Jersey. Working with architect Tom Fazio, the staff carefully lifted the sod and added a compatible soil to raise and soften the green contours without noticeably changing the character or feel of these greens.

CASE STUDY #1: BALTIMORE COUNTRY CLUB, EAST COURSE

In the fall of 2001, Baltimore Country Club (Baltimore, Maryland) hired golf course architect Keith Foster to provide a master plan for the East Course,

To begin the recontouring project, Baltimore Country Club (Maryland) stripped and folded the sod prior to removing it from the 12th green.

designed in 1926 by A.W. Tillinghast. Through a series of meetings with course officials, Mr. Foster made a number of recommendations, taking into account the character of the 1920s Tillinghast design. While there were numerous recommendations provided in the overall master plan, the decision to soften the slopes on greens 3, 9, and 12 would have the most impact.

THE PROBLEM

The clay-based push-up greens had a great deal of pitch from back to front for surface drainage. Through the years, the golf course was relatively unchanged except for a green regrassing program in 1993. At the time of this regrassing, the greens were enlarged and expanded to their original sizes and shapes.

Today, with the demand for greater speeds, the greens in question had very few hole locations when Stimpmeter readings were consistently above 10 feet. In fact, there were only two hole positions for the #9 green (4,600 sq. ft.) and three hole positions for the #3 green (5,700 sq. ft.) and #12 green (7,700 sq. ft.). Because of the putting speeds common today, the membership found these greens frustrating to play. The grounds staff were equally frustrated with so much traffic concentrated in too few areas on the greens.

THE PROCESS

To obtain an idea of the scope of work needed, Golftech, Inc. (Canton, Ohio), was hired to provide a contour and slope analysis map of each green. The slope analysis maps provided key information about the relationship between slopes and total square footage for usable hole locations. These greens were very pitched and in many locations had slopes in excess of 8%. We found our best hole locations for these greens were at nearly 5% slope.

With this information, Mr. Foster presented a plan in which additional hole location areas could be gained through slight softening or reduction of the slopes. The objective was to complete the work without compromising the original character of the design to attempt to complete the job so that the average golfer would find it difficult to tell that work had been done.

RESTORATION/ ENHANCEMENT PROCESS

In October, 2002, the work began. The existing Pennlinks sod was removed and

set aside in close proximity to the green. Two to four inches of the existing rootzone mix was removed, cleaned of organic matter, and stockpiled in close proximity to the green for reuse. On the 12th green, the soil removed by lowering the back of the green was to be used to raise the front of the green. The soil subgrades were either raised with the on-site material (in some cases 9 to 14 inches in the front of the green) or lowered (up to 4 inches at the back of each green) to achieve the goal of softening the severe green slopes.

Mr. Foster was on-site most of the time, and following the approval of the new subgrade contours, the rootzone mix was reinstalled and the surfaces compacted. Where additional mix was added, the soil was thoroughly tested. Based upon numerous physical soil property tests done at an A2LA-accredited laboratory, and working with our soil supplier, a compatible soil was developed.

Prior to the reinstallation of the sod, the final grade was compacted again. Compacting the soil to reduce settling was a critically important step in the recontouring process.

AFTERCARE/MAINTENANCE PLAN

Soon after each green was completed, the putting surface was extensively aerated using shallow, solid tines and rolled. One unanticipated setback we experienced was the one factor we could not control, the weather. Following the 2002 summer drought, it started to rain and it didn't seem to quit.

Because of a cool, wet fall and record amounts of winter precipitation, the greens had little rooting and remained very wet. In December, each green was covered with Wintergreen, a non-woven fabric, to increase soil and surface temperatures. On December 9, 2002, there was a 9-inch snowfall, and these surfaces were not seen again until mid-March, 2003.

Once the covers were removed, an intensive management program began. When conditions allowed, greens were frequently rolled to smooth the surfaces. Deep-tine aeration and the drill-and-fill technique aided drainage through the soil profile. Shallow, solid-tine aeration improved turf rooting into the soil. In between, numerous applications of straight sand top-dressing were made to smooth the surfaces.

Sod from the green was cut at a depth of ½ inch and placed on plastic adjacent to the green. The Chevy Chase Club maintenance staff carefully numbered each sod strip so that it could be relaid in the same location when the recontouring was completed.

CONCLUSION

On May 1, 2003, the greens were opened for limited play while topdressing, aeration, and drainage installation efforts continued. Although the method described does not follow today's new construction methods, the goals of the club have been met. Through great teamwork, we carefully recontoured our most severely sloped greens without changing their character.

CASE STUDY #2: THE RECONTOURING OF THE 11TH GREEN AT THE CHEVY CHASE CLUB

On September 25, 1895, the first six holes opened at The Chevy Chase Club at its present location in Maryland, one-half mile outside of Washington, D.C. This opening was followed by a three-hole expansion in 1896, and a nine-hole addition in 1898 brought it to a full 18 holes. In 1915, Donald Ross completed the new 18-hole course layout. Further changes were made by the design team of Alison, Colt, and Mackenzie, and the course was re-opened for play in 1923. In 1998, a master plan was implemented by Mr. Arthur Hills. His approach was to research old photographs to restore the golf course to its original intent of shot-making and play while rebuilding the greens to modern sand-based specifications and adding a practice range.

At the time of reconstruction and restoration, the greens were built using a modified sand greensmix while maintaining the construction method of the perched water table and internal drainage. The green surfaces were sodded to washed *Agrostis palustris* Crenshaw sod. The vast majority of the green surfaces were built to exactly replicate the existing greens prior to reconstruction. The general characteristic of the greens is to slope from back to front, and several greens have severe contours. The new greens average 6,800 square feet with generous hole locations. This makes for interesting putting, especially when you consider the average daily green speed is now 10 to 11 feet as measured by the Stimpmeter.

THE PROBLEM

The 11th green was a medium-length, uphill par-4 with a very severe slope in

the front two-thirds of the green. The hole could only be placed along the back of the green. Holes placed on the front of the green resulted in balls rolling off the green and onto the approach. The limited hole locations made for redundant approach shots to an otherwise splendid hole. After lengthy discussions with the Green and Golf Committees and Mr. Hills, the decision was obvious. If the front of the green was to be used, recontouring was required.

A mini-excavator was used in the Chevy Chase project to remove the appropriate amount of mix without disturbing the gravel layer and construction mix.

THE PROCESS

The plan was to start the recontouring project in early November, 2002, with a completion date of Thanksgiving and an opening in early April, 2003. The alterations were relatively straightforward. The front of the green would be raised 18 inches to provide new hole placements in the middle left and front of the green. The front of the green also needed to be extended forward approximately 15 feet, expanding the green surface by approximately 350 square feet. The approach and rough areas also had to be redone to accommodate the new grades and a larger green.

Sod was utilized from the existing green, and the remaining amount was purchased from a reputable grower. Arthur Hills, of Arthur Hills/Steve Forester and Associates, was used as the consulting architect, and Jim Wachter of the Watchmen Group, Inc., was employed to do the earthwork and contouring. The Chevy Chase staff completed the final grading and sod work.

The sod from the green was cut at a depth of ½ inch and placed on plastic outside the area of disturbance, but near the 11th green. We felt it was of paramount importance to have the sod relaid back on the green in exactly the same location. To accomplish this, each sod strip was removed, numbered, and placed on plastic near the green.

Next, the existing construction mix was removed and placed on a nearby paved area. This topmix was eventually mixed with additional compatible sand to compensate for any losses and the additional putting area to be added.

The subsurface gravel and drain lines were not disturbed. A mini-excavator was positioned on the mix as the material was removed from the cavity. This enabled the mini-excavator to remove the desired amount of mix without disturbing the gravel and construction mix with its tracks. To complete this step, the thin interface layer of contaminated sand and gravel was manually removed and discarded. The additional green area was excavated and outlined with a plastic wicking barrier, separating the construction mix from the native soil.

Once the final contour and outline of the putting green addition were achieved, accurate grade stakes were positioned in the green cavity. Additional construction mix was delivered and equally incorporated with the recycled excavated greensmix. Great detail was given to this calculation due to the importance of producing a homogenous mix in the new area that was similar to what existed in the non-disturbed part of the old green. Even with a confident calculation of mix volume, an additional ten percent was added for peace of mind.

PREPARING THE GREEN SURROUNDS

To soften the contour of the green, the new section was ultimately raised 18 inches above the original green grade. This necessitated changing the front of the green complex. Transforming the old subsurface drainage system was managed by adding additional gravel that was compatible with the original construction mix and gravel. Only minor drainpipe alterations were required to accommodate the additional surface area. The subsurface drainage was completed, additional soil was imported to raise the approach to match the elevation of the new green surface, and the cavity was now ready for the construction mix.

COMPLETING THE GREEN

The placement of the new mix was the reverse of the removal process. The mix was delivered to the green cavity via small dumptruck loads and spread with the mini-excavator. Great detail was employed to keep the integrity of the internal piping intact and the gravel layer undisturbed. The mini-excavator only journeyed onto the gravel blanket area when there was a full 12-inch complement of mix over the stone. Once the cavity was filled and the mix contour matched the intended grade, the grading stakes were removed. A

bunker rake repeatedly tracked the mix to firm the surface. Once this was accomplished, a vibratory plate tamper was run over the mix numerous times in several directions. After the required grade was met, several predetermined soil amendments were incorporated into the mix with the bunker rake. Again, the plate tamper was used across the mix to establish the final grade. Surface grades were checked to make sure additional hole locations were established and surface drainage was adequate.

Once this was achieved and the elevations of the mix minus the thickness of the sod were met, resodding commenced. Great care was made to assure there was no scalping or interrupted transition between the surfaces. The transition between the new green and the original green needed to be seamless and unnoticeable to the golfers.

There was apprehension as the first pieces of sod were laid, but the sod installation went without a hitch. Efforts were made to keep the sod from being stretched during placement because of the natural tendency of sod to shrink. The seams were topdressed to assure smoothness and rapid knitting between the sod pieces.

Once completed, turf blankets were immediately installed after an initial drenching of irrigation water and application of a soluble starter fertilizer. A blanket of snow covered the Washington, D.C., area for the winter. Essentially, the green stayed in this state because of the hard winter.

When the snow finally melted and the ground thawed enough to pull the sod staples, the cover was removed. Disappointingly, there was no root growth due to the continually frozen soil, and some minor settling had occurred. A light topdressing was applied and the cover reinstalled. Thankfully, within two weeks the roots leapt from the sod into the greensmix.

Mowing commenced as soon as the sod rooted and tacked down enough to assure putting surface stability. Some pockets of settling did persist even after numerous topdressings and light rollings. Since the sand couldn't be compacted, a 2,000-pound roller was used to smooth the green. This process worked so well that plywood did not have to be laid on the green surface to cushion the roller. The roller was used in different directions, and the result was a very smooth surface.

With the project complete, the final grade was compacted to minimize settling prior to the reinstallation of the sod.

The green opened for play on April 15, 2003, to membership approval. This project was a success and amounted to constructing a new green, but on a much smaller scale.

CONCLUSIONS

Fast greens will continue to present maintenance and playability headaches. In reality, most older golf courses share the same problem; most have one or more greens that were designed and constructed during times when the standard mowing height was ¼ inch. Today, new and old greens are cut at ⅛ inch, and sometimes less. Greens designed for the slower speeds of yesterday can have limited hole locations and be frustrating to play and maintain under today's conditions.

DEAN GRAVES, CGCS, *is golf course manager at The Chevy Chase Club. He has been managing golf courses in the Mid-Atlantic Region for 24 years.*
TIM KENNELLY *has been golf course superintendent at Baltimore Country Club since 2002.*

THE TURF ADVISORY SERVICE

Part Three: 50 Years of Service to Golf

BY JAMES T. SNOW

Green Section staff in 2001, left to right, first row: Bob Vavrek, Keith Happ, Darin Bevard, Larry Gilhuly, Mike Kenna. Second row: Jim Baird, Bud White, Kimberly Erusha, Jeff Nus. Third row: Dave Wienecke, Bob Brame. Fourth row: Stan Zontek, Kathy Antaya, Pat O'Brien, Matt Nelson, Dave Oatis. Fifth row: Jim Skorulski, Jim Moore, Todd Lowe, Jim Snow, Chris Hartwiger, John Foy, Paul Vermeulen. Missing: Pat Gross.

The final installment of this three-part series about the 50-year history of the Green Section's Turf Advisory Service provides insight about the interaction of the TAS with our publications and outreach programs, the Green Section Committee, and the Turfgrass and Environmental Research Program.

PUBLICATIONS AND OUTREACH

For 50 years there has been a staff of agronomists whose sole mission has been to provide practical information to golf course superintendents and course officials for the betterment of the game of golf. In the process of visiting as many as 150 or more courses per year, each agronomist has gained a unique perspective of golf turf culture and of the trials and politics involved in golf course maintenance. This perspective has been shared on Turf Advisory Service (TAS) visits and in other outreach programs and publications over the years.

The *TurfLetter* was the first Green Section publication derived from the TAS. This regional newsletter was published 3-6 times per year, depending on seasonal turf problems and the time constraints of the agronomists. It included such items as seasonal pest and disease control recommendations, suggestions for timely cultural practices, accounts of problems in the field, research results, and news of meetings and conferences. The *TurfLetter* was produced from 1953 until early 1963, when the *USGA Green Section Record* magazine was first published. The intro-

(Above) Over the years, the Green Section Committee volunteers from across the United States have been instrumental in offering help and advice concerning Green Section programs and activities.

(Left) Richard Tufts was the chairman of the Green Section Committee from 1950 through 1953 and was instrumental in conceiving and establishing the Turf Advisory Service (then called the Regional Turf Service) in 1953. It caused a change in the direction of the Green Section, from primarily a research organization to one whose major role became visiting golf courses and offering advice on course maintenance problems. Tufts served on every USGA committee and was its president in 1956-57. He helped introduce the modern handicap system, standardized course setup for USGA championships, and worked with the Royal & Ancient Golf Club of St. Andrews to unify the Rules of Golf in 1951, among many other accomplishments. Tufts was a grandson of the founder of the Pinehurst Resort and was involved in running Pinehurst for 50 years, the last eight as its chairman.

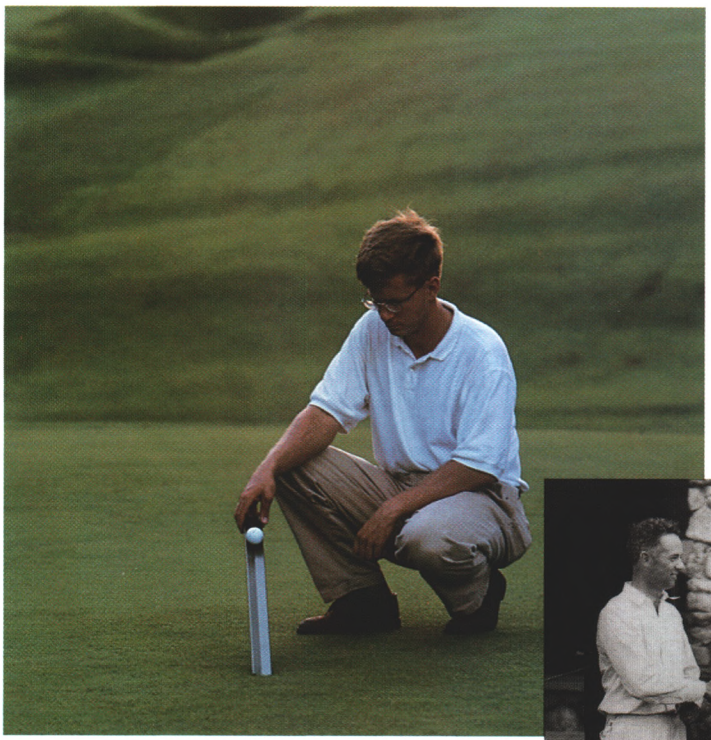
duction of the *Record* also marked the end of the USGA's *Golf Journal and Turf Management* magazine, which split into two publications — *Golf Journal* and the *Green Section Record*.

Over its 40-year history, the *Record* has grown with the Green Section itself. The articles written by Green Section staff reflect the problems and successes they observe firsthand on TAS visits. Guest articles and research articles arranged by the staff also bring forth cutting-edge ideas that help move the industry forward. During the past dozen years the *Record* has expanded to include articles on environmental issues and environmental research and a regular contribution from Audubon International, whose programs have guided the industry toward a more sustainable future. The *Record* itself has gone from a small-format black-and-white publication in 1963 to a 5" × 7" color magazine in 1978 to a standard-sized format in 1979.

The second edition of the USGA-sponsored book *Turf Management*, by H. Burton Musser (1962), was the first to benefit from the field experiences of the USGA agronomists. Bill Bengeyfield, Dr. Marvin Ferguson, Charlie Hallowell, and Al Radko all served on the editorial board and contributed a wealth of practical information to the book. Later, many USGA agronomists contributed in a similar manner to the first (1981) and second (2002) editions of the USGA-sponsored book *Turf Management for Golf Courses*, by Dr. James B. Beard.

Beyond these USGA publications, Green Section field agronomists have written thousands of articles and updates for other turfgrass periodicals, conference proceedings, golf course superintendent chapter newsletters and magazines, and other turf and golf-related publications worldwide. In addition to these contributions, they have given many thousands of presentations about golf course management issues to audiences at local, state, national, and international turfgrass and superintendent meetings, and at golf and golf-related organization meetings and conferences at every level.

Today, the Internet has opened up a whole new information thoroughfare for companies, organizations, agencies, and individuals to share information. On its Web site, the Green Section has placed a vast amount of practical information at the fingertips of anyone searching for articles or reports dealing with nearly every aspect of turfgrass maintenance and golf course management. The capability to communicate via e-mail also has been a boon to Green Section agronomists, who now



Edward Stimpson (below left), shown here at the start of the final round of the 1935 Massachusetts Amateur Golf Championship, first introduced the concept of measuring putting green speed in the mid-1930s. His prototype was refined by the USGA and the Stimpmeter was made available for golf course use in 1977 to provide golf course superintendents with a method to prepare golf greens for play.

can survey their fellow staffers on any question and receive responses within a day or two, even when they are on the road. This means better and timelier responses to questions put forth by TAS subscribers and others calling for advice.

Green Section agronomists also serve on committees and boards of golf and turf-related organizations, lecture to college and university students, and interact with governmental agencies and organizations outside of golf. The information they glean from their TAS visits reaches well beyond the actual subscribing courses, and this is great for the game of golf!

DOING GOOD THINGS WITH HELP FROM OUR FRIENDS!

Since its inception in 1921, the Green Section has enlisted volunteers to offer help and advice concerning its programs and activities. Collectively, these volunteers constitute our Green Section Committee. The chairman of the committee is appointed from the USGA Executive Committee by the USGA president, and other volunteers are appointed by the Green Section's regional directors. Appointments are for two years, with the possibility of renewal. Today, 170 members from all facets of the industry serve on the committee. They include:

- Golf course superintendents.
- Club presidents.
- University faculty.
- Golf course architects.
- Persons with special technical expertise.
- Green committee members.
- Club managers.
- Golf association representatives.
- Golf course builders.
- Golf business industry representatives.

The volunteers on the Green Section Committee serve many roles, which include:

- Promoting the use of the Turf Advisory Service among other superintendents, course officials, and club managers.
- Promoting other Green Section programs, such as the Audubon Cooperative Sanctuary Program, construction education, and regional conferences.
- Regional conferences — help plan, give talks, participate as moderators, etc.
- Writing articles for the *Green Section Record* and other Green Section publications.
- Serving as liaisons to organizations of superintendents, club managers, architects, course builders, industry, and academic groups. In this role, they either promote TAS or invite our agronomists to speak to or interact with their members on topics we believe are of interest and importance to them.
- Providing a sounding board for ideas, new programs, etc.
- Providing constructive criticism and feedback about our Turf Advisory Service and other programs.
- Representing the Green Section at certain meetings and functions.
- Serving as a source of in-depth expertise on topics where our agronomists are generalists, such as irrigation systems, turfgrass pathology, environmental engineering, golf course construction, etc.

The Turf Advisory Service is stronger today due to the active participation of several thousand volunteers on the Green Section Committee over the years, for which the Green Section is most appreciative.

TURFGRASS RESEARCH AND TAS — BETTER TOGETHER

As stated earlier, the Green Section changed course in 1953 from a research organization to one that emphasizes outreach and one-on-one consultation with individual golf courses. The idea was to take university research and combine it with field observation and experience to offer golf courses the best advice possible for their very real problems. In fact, the USGA has continued to fund turfgrass research annually since 1953 and has spent more than $21 million on turfgrass and environmental research grants since 1983. This is an ideal arrangement for our TAS agronomists, who can take unbiased research from7 universities and apply it in a real-world sense to the problems they see on golf courses.

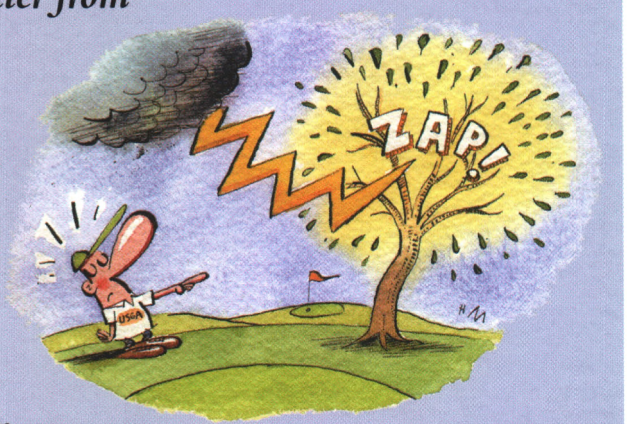
In reality, you need both — research *and* field outreach. Research is not useful by itself unless the information is valid and is applied properly, and field consultation is only as good as the science background, the experience, and the good common sense of the consultant. Bill Bengeyfield, longtime Green Section agronomist and former national director, often quoted a statement from Oliver Wendell Holmes, who said, "Science is a first-rate piece of furniture for a man's upper chamber if he has common sense on the ground floor." Amen!

In 1933, Johnny Farrell (right), 1928 National Open Champion, and Dr. Fred Grau, Green Section National Director, tested the putting qualities of grasses at the Arlington turf garden research plots. A mechanical putter was used to minimize the human factors within the test.

The story of the Green Section's Turf Advisory Service program is one of service and success. From Charlie Wilson's one-man office in Davis, California, in 1953, the program has grown to include 18 regional agronomists and another 22 full-time and part-time support staff in 13 offices nationwide, serving more than 1,600 individual golf courses and conducting nearly 2,000 visits each year. After 50 years of leadership in putting useful information into the hands of golf course superintendents and course officials, our staff believes strongly that golf courses are better today than they would have been without the Turf Advisory Service. By many measures, the Green Section's mission to help golf courses produce better turf for better golf has been a great success!

JIM SNOW *joined the USGA Green Section staff as an agronomist in 1976. In 1990 he was named national director.*

At times there are questions if USGA agronomists possess super powers! Agronomist Dave Oatis received the following letter from an impressed Green Committee member.



Dear Dave,

The tree to the right rear of number 12 green was struck by lightning last week and is now browning out and will surely die. In all the years I've been around and many old-timers — we have never seen this reaction to a lightning bolt. Bark was scattered in all directions from the tree for yards around, even covering the green area 40 feet away. This is the same tree which you suggested we remove to prevent it from shadowing the green most of the day and blocking the ventilating effect of the movement of air through the opening we had previously created. Much reaction against removal was expressed at our next green meeting, but no one on the committee realized the power or connection the USGA had with the Lord's electrical emissaries and influential relationship you agronomists had with the powers to be. We bow our heads to your obvious influence. Needless to say, we are currently reevaluating all your other suggestions with attentive enthusiasm as much of the new equipment you recommended has been placed on our next two annual budgets.

Looking forward to your next visit.

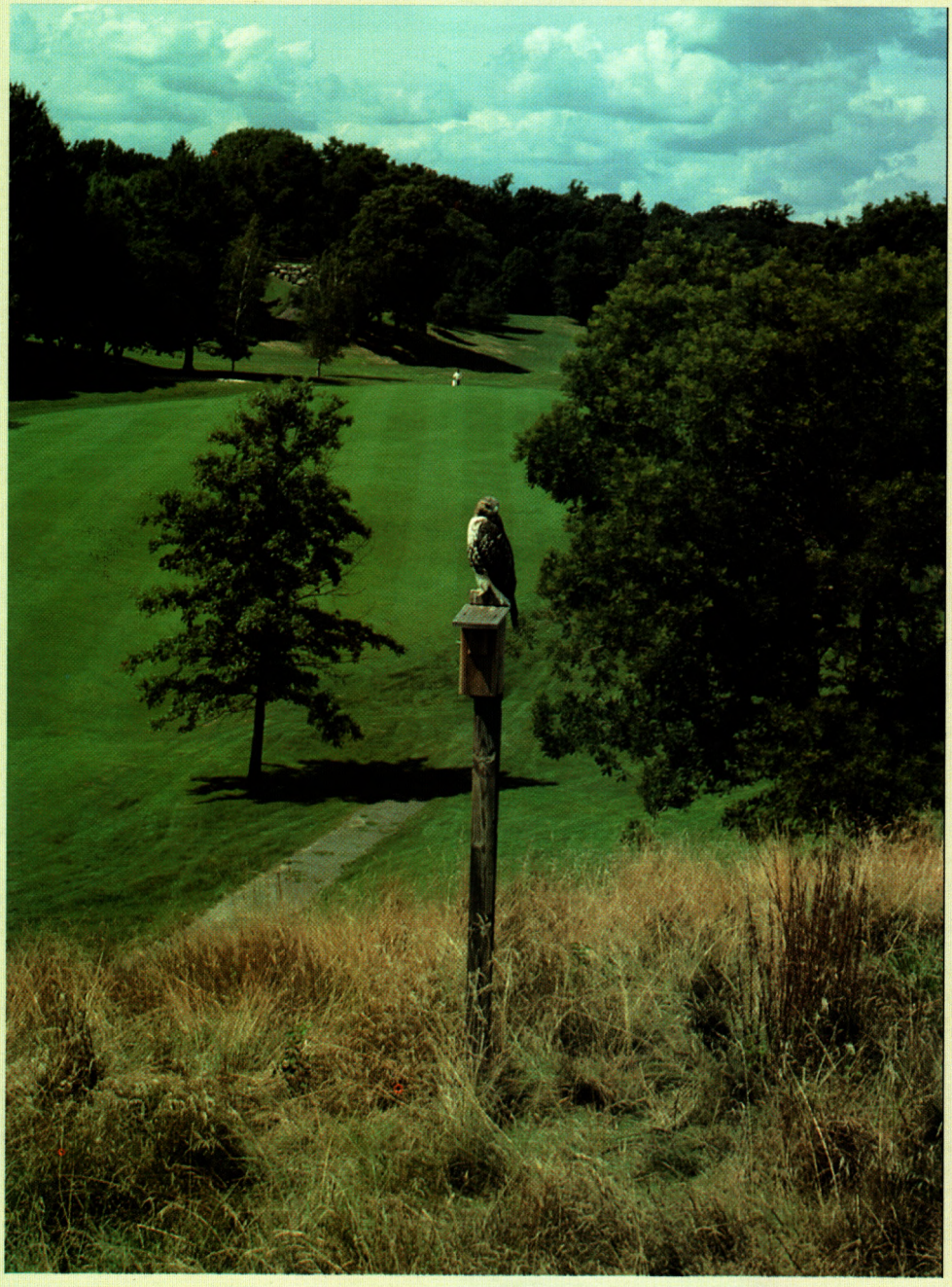
Sincerely,

E.G.M.

MAKING MONEY MATTER: The Business Value of Environmental Stewardship

Taking care of the environment does indeed make good business sense.

BY KEVIN A. FLETCHER



Making money *and* caring for the environment; that can't be a real combination, can it? Yes, it can, but only when you start thinking differently about environmental stewardship.

An increasing number of golf courses recognize the business value of environmental stewardship, especially in a tight economy. People are taking voluntary steps that help the environment and save money.

MAKE YOUR GREEN BE *GREEN*

The first step is to conduct a site assessment. Find out where you're spending your financial resources. What are your greatest costs — plant protectants, energy, waste, resource selection? Once you do this, you can begin to take actions that impact your green (financial) and the earth's green (nature).

Ask yourself: What are the resources that you use? Are they all necessary, or are there ways to reduce costs while still maintaining high quality playing conditions and customer satisfaction? How can you spend your money more efficiently or more effectively?

Here are several areas where resource savings can have a significant impact on the environment and your bottom line.

ARE THERE WAYS TO BETTER MANAGE YOUR WATER USE?

Look at your entire site to find "leaky" investments. Do you pay for the water you use for irrigation? By paying atten-

What did your golf course spend last year on fertilizers and pesticides to maintain the golf course? Efficient utilization of these resources through an Integrated Pest Management program impacts the bottom line.

tion to where and how you use water, you'll save money from washing down the drain.

- Eliminate non-targeted watering to sidewalks, pathways, or ponds by ensuring that your irrigation system is designed correctly and functioning properly.
- Look for places where you can switch to half-circle irrigation heads to eliminate unnecessary water use.
- Repair leaks.
- Incorporate evapotranspiration and weather data into your irrigation schedule.
- Turn off the irrigation system when rain is anticipated.
- Consider ways to build a water capture and reuse system to store stormwater — a system of drainage pipes with a storage pond can work well.
- Look for opportunities to save water indoors. Fix leaky faucets; replace older, large-gallon toilets; and install faucet aerators for dramatic water savings.

CONSIDER YOUR ENERGY COSTS

During the 1970s energy crunch, Americans paid attention to reducing their energy use through conservation. Thirty years later, there's a misperception that those *easy* ways to reduce energy usage have been exhausted. This is not true. The United States uses more energy than Western Europe and Central and South American combined — with 6% of the world's population, we consume 30% of the world's energy. This is not sustainable, nor is it economical.

Consider simple steps, like replacing light fixtures and worn-out electrical equipment with high-efficiency models (e.g., air conditioners, pumps). Studies have shown that investing in high-efficiency energy upgrades can be less risky, with a higher return, than investing money in the stock market — especially these days. Consider these points:

- Lighting in commercial buildings accounts for 40% of electricity costs.
- Energy-efficient lighting upgrades can reduce bills by 35% to 40% per year.
- Ninety percent of the energy of an incandescent bulb is lost in heat.

CAN YOU REDUCE CHEMICAL USE?

What was spent last year on fertilizers, pesticides, and all of the other chemical treatments needed to maintain your golf course?

According to a recent poll of golf course superintendents, nearly half of all golf courses spend more than $100,000 per year on chemical control products, while another quarter spend between $50,000 and $100,000 per year. By focusing on cultural practices and Integrated Pest Management programs, many courses are dramatically reducing chemical use and thus saving money. Based on preliminary evidence from Audubon Cooperative Sanctuary Program golf members, it's clear that the savings can be significant — from a few thousand dollars to more than $50,000 saved in chemical costs annually.

OTHER WAYS TO REDUCE MATERIAL USE COSTS

Consider what other materials you could be reducing, reusing, or recycling. Conduct an audit of your waste stream. Where are food wastes, office and paper wastes, construction and grounds wastes going? How might you reduce or reuse these? Do you compost and reuse it on landscaped areas? How can you operate a tighter logistics management system onsite? In the end, there are many ways to reduce, reuse, and recycle.

OTHER WAYS TO REDUCE COSTS

Ask your insurance provider if they'll reduce your rates when you reduce your chemical use risk. Many insurance providers are willing to consider the *environmental components* of any risk reduction program.

THE BOTTOM LINE

All of these steps are investments worth making. In many cases, your return on investment will easily match other projects you're considering. Whether participating in Audubon International programs or other environmental initiatives, the bottom line is to *keep the bottom line in mind.*

KEVIN FLETCHER *is director of programs and administration for Audubon International.* kfletcher@audubonintl.org.

All Things *Considered*

GOLF COURSE SUPERINTENDENT:

Expense or Investment?

Does your golf course have a superintendent with a turfgrass background?

BY PATRICK M. O'BRIEN

Although the number of professionally trained golf course superintendents continues to grow, there are still many golf courses across the country that employ superintendents without any technical training. Based on my almost 25 years with the USGA, golf course superintendents work at between 85% and 90% of the 17,000 golf courses in the United States. This fact in and of itself is not a problem. There are plenty of superintendents without turfgrass degrees who do a fantastic job for their employers. There is a problem, however, when the course owners believe they cannot "afford" a professionally trained superintendent and settle for hiring a person they know does not have the qualifications they seek. In other words, these clubs are saying that they believe reallocating $10,000 to $30,000 of the existing budget or even spending this amount of extra budget dollars to hire a professionally trained superintendent will not increase course revenue by this amount or more. My experiences in the field differ by seeing the golf course superintendent as a potential revenue generator.

A low-budget golf course in Georgia, the "Brown Acres Golf Club," a few years ago was struggling with low revenues and play due to poor course conditions. Other golf courses in the area had better conditions, and even lowering the green fees to below $10 did not attract more golfers. No knowledgeable, trained superintendent had taken care of the golf course for the past 20 years. The course was maintained with dull mowing equipment, was never irrigated properly, and was hard as a brick. The basic philosophy of the club leadership was to cut costs all the time. The result was a cow pasture golf course that nobody wanted to play.

My best friend happened to be the Green Chairman and I encouraged him to hire a superintendent to get the golf course on the right track again. I happened to know about an assistant superintendent, "Tom Green Thumb," at a nearby private course who was willing to accept a big challenge as his first job. How they could afford this college-educated individual who could do practically anything on a golf course was the big question. My advice was to hire him and pay him with existing budget dollars, and the result would be a better course. The Board of Directors agreed to try it.

Mr. "Green Thumb" found out quickly that the golf course had many problems, including a lack of water, old equipment, weeds, and terrible putting greens. First, Mr. "Green Thumb" took inventory of the old equipment and showed how an equipment leasing option would address this issue. Second, plans were made to enlarge the course pond to increase the water supply and reduce the high cost of buying city water. Maintenance standards were developed to outline what could be done with the budget dollars at key playing areas. Due to the improved course presentation and playability, revenue improved dramatically the first year. Capital projects, seldom done in the past, are now done annually due to steady revenue generated by the better course. Within 12 months, better turfgrass brought more revenue and more members.

"Brown Acres Golf Club" is the classic example of how to improve revenues through better agronomy. Many times low-budget courses hire a golf professional to run the operation. If low-budget courses have a choice between a superintendent and a golf professional, hire the superintendent. Use agronomy to attract more golfers to play your golf course. The key point is to use agronomic knowledge to grow turfgrass and to make your conditions competitive with other courses in the area.

This Georgia golf course is just one example of how to increase play and revenue through agronomy. Note that "Brown Acres Golf Club" did not increase its maintenance budget in order to hire Mr. "Green Thumb." The course paid this new staff person out of the existing budget. With a superintendent, the annual dues of $400 per year produce a better product, and all revenues generated are allocated to the course, not to any other departments. "Brown Acres Golf Course" is now competitive with other public courses in the area.

The assets of every golf course are what generate revenue. A good layout in good condition always attracts players, but remember that the most important asset of every golf course is the golf course superintendent. Hiring a trained professional with the qualifications needed to make your course a success is a money-winning proposition.

PATRICK O'BRIEN *is the director of the Green Section's Southeast Region.*

USGA

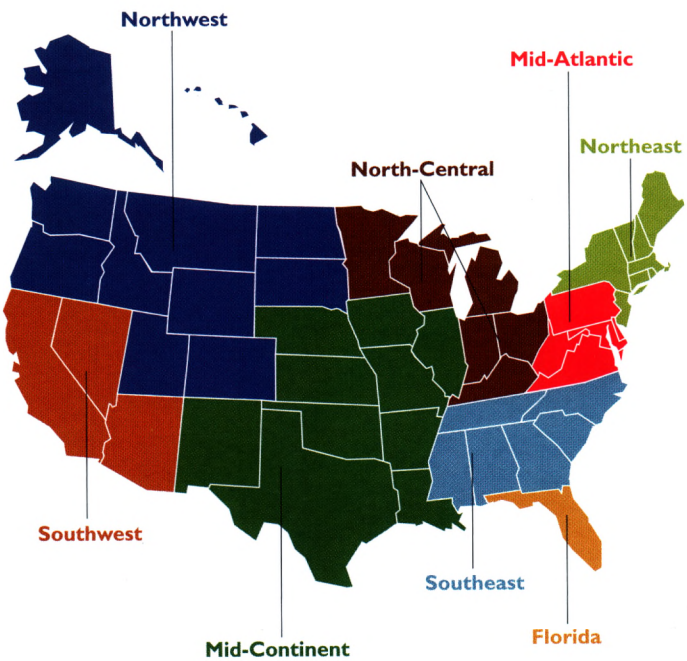
GREEN SECTION NATIONAL OFFICES

United States Golf Association, Golf House
P.O. Box 708
Far Hills, NJ 07931
(908) 234-2300 Fax (908) 781-1736
James T. Snow, *National Director*
jsnow@usga.org
Kimberly S. Erusha, Ph.D.,
Director of Education
kerusha@usga.org

Green Section Research
P.O. Box 2227
Stillwater, OK 74076
(405) 743-3900 Fax (405) 743-3910
Michael P. Kenna, Ph.D., *Director*
mkenna@usga.org

904 Highland Drive
Lawrence, KS 66044
785-832-2300
Jeff Nus, Ph.D., *Manager*
jnus@usga.org

Construction Education Program
720 Wooded Crest
Waco, TX 76712
(254) 776-0765 Fax (254) 776-0227
James F. Moore, *Director*
jmoore@usga.org



REGIONAL OFFICES

Northeast Region
David A. Oatis, *Director*
doatis@usga.org
James H. Baird, Ph.D., *Agronomist*
jbaird@usga.org
P.O. Box 4717
Easton, PA 18043
(610) 515-1660 Fax (610) 515-1663

James E. Skorulski, *Agronomist*
jskorulski@usga.org
1500 North Main Street
Palmer, MA 01069
(413) 283-2237 Fax (413) 283-7741

Mid-Atlantic Region
Stanley J. Zontek, *Director*
szontek@usga.org
Darin S. Bevard, *Agronomist*
dbevard@usga.org
P.O. Box 2105
West Chester, PA 19380-0086
(610) 696-4747 Fax (610) 696-4810

Keith A. Happ, *Agronomist*
khapp@usga.org
Manor Oak One, Suite 410,
1910 Cochran Road
Pittsburgh, PA 15220
(412) 341-5922 Fax (412) 341-5954

Southeast Region
Patrick M. O'Brien, *Director*
patobrien@usga.org
P.O. Box 95
Griffin, GA 30224-0095
(770) 229-8125 Fax (770) 229-5974

Christopher E. Hartwiger, *Agronomist*
chartwiger@usga.org
1097 Highlands Drive
Birmingham, AL 35244
(205) 444-5079 Fax (205) 444-9561

Florida Region
John H. Foy, *Director*
jfoy@usga.org
P.O. Box 1087
Hobe Sound, FL 33475-1087
(772) 546-2620 Fax (772) 546-4653

Todd Lowe, *Agronomist*
tlowe@usga.org
127 Naomi Place
Rotonda West, FL 33947
(941) 828-2625 Fax (941) 828-2629

Mid-Continent Region
Paul H. Vermeulen, *Director*
pvermeulen@usga.org
9 River Valley Ranch
White Heath, IL 61884
(217) 687-4424 Fax (217) 687-4333

Charles "Bud" White, *Agronomist*
budwhite@usga.org
2601 Green Oak Drive
Carrollton, TX 75010
(972) 662-1138 Fax (972) 662-1168

North-Central Region
Robert A. Brame, *Director*
bobbrame@usga.org
P.O. Box 15249
Covington, KY 41015-0249
(859) 356-3272 Fax (859) 356-1847

Robert C. Vavrek, Jr., *Agronomist*
rvavrek@usga.org
P.O. Box 5069
Elm Grove, WI 53122
(262) 797-8743 Fax (262) 797-8838

Northwest Region
Larry W. Gilhuly, *Director*
lgilhuly@usga.org
5610 Old Stump Drive N.W.,
Gig Harbor, WA 98332
(253) 858-2266 Fax (253) 857-6698

Matthew C. Nelson, *Agronomist*
mnelson@usga.org
P.O. Box 5844
Twin Falls, ID 83303
(208) 732-0280 Fax (208) 732-0282

Southwest Region
Patrick J. Gross, *Director*
pgross@usga.org
David Wienecke, *Agronomist*
dwienecke@usga.org
505 North Tustin Avenue, Suite 121
Santa Ana, CA 92705
(714) 542-5766 Fax (714) 542-5777

Subscriptions $18 a year, Canada/Mexico $21 a year, and international $33 a year (air mail).

Subscriptions, articles, photographs, and correspondence relevant to published material should be addressed to: United States Golf Association, Green Section, Golf House, P.O. Box 708, Far Hills, NJ 07931.

GREEN SECTION RECORD (ISSN 0041-5502) is published six times a year in January, March, May, July, September, and November by the UNITED STATES GOLF ASSOCIATION®, Golf House, Far Hills, NJ 07931.

Postmaster: Address service requested — USGA Green Section Record, P.O. Box 708, Golf House, Far Hills, NJ 07931-0708.

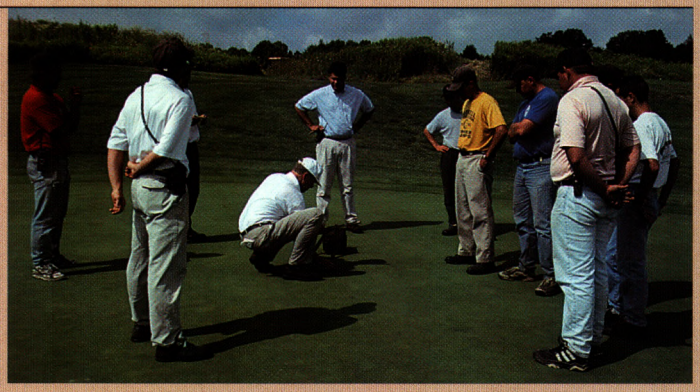
Periodicals postage paid at Far Hills, NJ, and other locations. Office of Publication, Golf House, Far Hills, NJ 07931.

Printed on recycled paper

Turf *Twisters*

Q: Over each of the past few years we have attempted to hire several turf interns to complement our summer staff. The results have been very discouraging. We've had years when not even one turf student was recruited. Do you have any suggestions? (Ohio)

A: Try putting together a multimedia presentation (e.g., print, CD, videocassette) for distribution to candidates. The presentation should include course history, maintenance objectives, learning opportunities for the intern, and other pertinent information that will present a complete picture of what the student will experience. In addition, and vital to successful recruiting, visit candidates



at their schools for one-on-one personal contact. The best recruiters get the best students — go to them; don't expect them to line up at your door.

Q: Four of our more shaded and pocketed greens have been performing poorly for some time now. With the expectations for green speed, our mowing heights have gone lower and lower. Our owners believe that rebuilding these greens to USGA specifications will take care of the problem. Any thoughts? (Virginia)

A: While rebuilding the greens may improve internal drainage characteristics, it will not address the main problem, which seems to be the poor growing environment. Even if these problem greens are rebuilt, they will likely still be prone to *Poa annua* invasion, loss of density, and increased disease problems without tree and underbrush removal in conjunction with planned reconstruction. If the other greens on the golf course located in better growing environments are performing well, construction method may not be the problem. Consider removing trees and improving the overall growing environment around these problem greens prior to making the decision to rebuild. It may provide a better return on investment.

Q: Is there a recommended overseeding rate for *Poa trivialis* in our part of the country? I have heard of rates from 8 to 15 lbs. per 1,000 ft^2, but I have also heard that too heavy rates can cause severe spring transition problems for bermudagrass. (Louisiana)

A: You are correct that too heavy an application can create spring transition problems. The preferred rate for most all courses in your area is 9 to 10 lbs. *Poa trivialis* per 1,000 ft^2, depending on fall traffic. Many courses also find that collars transition better when the putting surface rate is reduced by 25% on the collars.

USGA®

www.usga.org