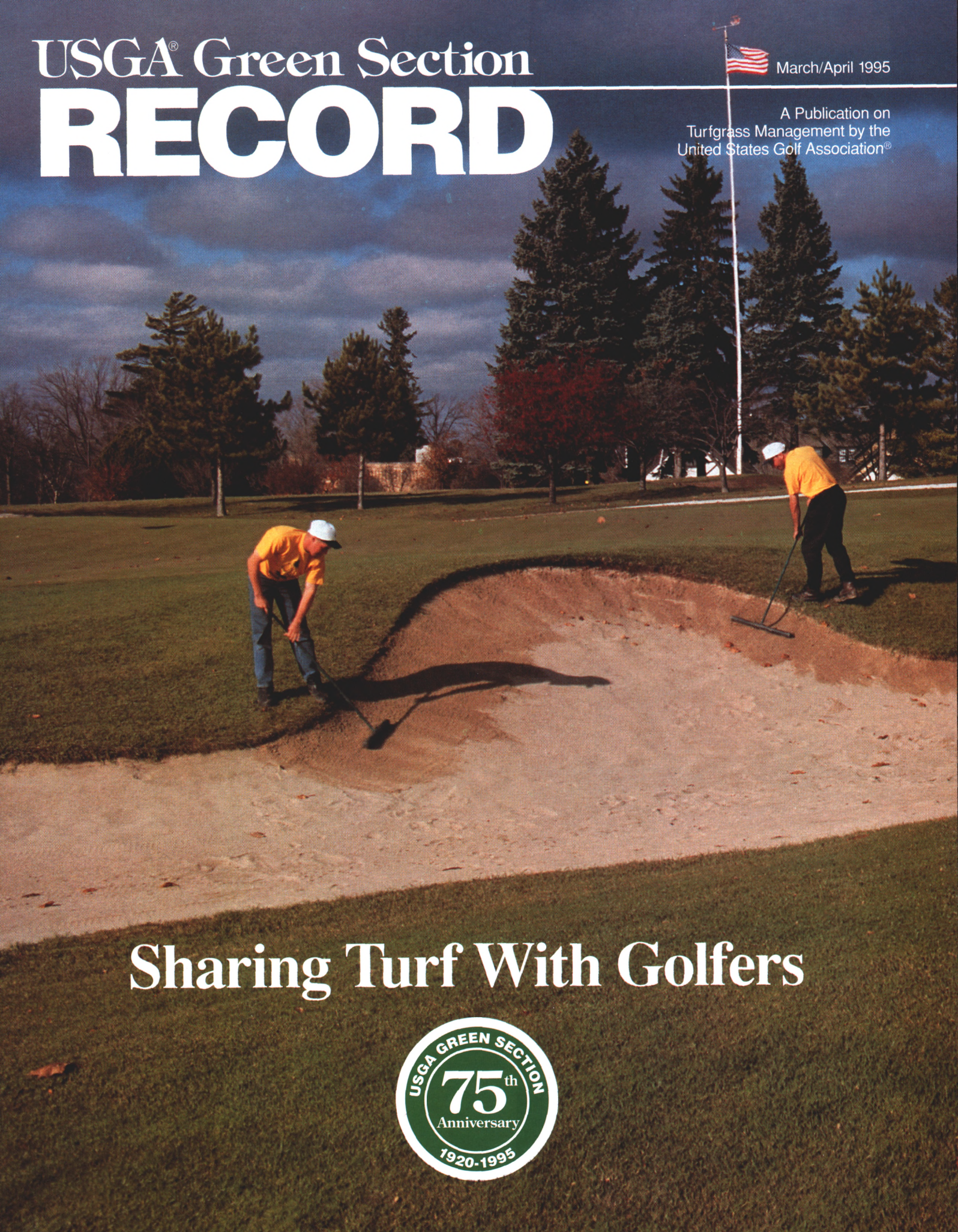


# USGA® Green Section **RECORD**

March/April 1995

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United States Golf Association®



## Sharing Turf With Golfers





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# USGA® Green Section RECORD

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Highly visible uniforms distinguish the crew from golfers on the course and may provide an added degree of safety to employees. Pine Hills Country Club, Sheboygan, Wisconsin.

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*When golfers and crew share the same turf, the maintenance equipment can be modified to provide protection from errant shots.*

# FORE!

## Guidelines to Consider When Golfers and Maintenance Crews Share the Same Turf

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by **ROBERT C. VAVREK**  
Agronomist, North-Central Region,  
USGA Green Section

**S**IMPLE MATHEMATICS dictate that as more people play golf, the time once set aside for uninterrupted maintenance of the course will be used for additional tee times. At popular, heavily played public courses, the only time for maintenance without golfers is during the early morning, the very early morning, because play is often

permitted at first light. Even the traditional practice of closing the course on Monday at many private clubs has slowly gone by the wayside.

Junior golf, corporate outings, and Monday afternoon member play are only a few of the reasons why the "day of rest" has become just another day of business as usual.

Let the golfers off from the front and back nine at the crack of dawn, then throw in a few 7 a.m. shotgun starts for good measure, and perhaps try a few night outings with golf balls that glow in the dark. It is very obvious why golfers and mowers share the same turf much more now than at any time in the past.



*As the popularity of golf increases, the unavoidable distraction of maintenance activities will become a more frequent occurrence. Cog Hill Golf Course, Lemont, Illinois.*

Only a few private clubs still enjoy the luxury of being closed all day on Monday, although many are closed to member play or outings at least until noon. Most private clubs hold back play, at least on weekdays, to provide ample time for the crew to stay well ahead of the golfers. Where golfers and equipment occasionally meet, the employee typically is instructed to create as little distraction as possible — get out of sight and turn the engine off until the members play through. This policy is impossible on the majority of daily-fee public courses, except perhaps at the most elite resorts.

Various factors and situations at a number of courses also dictate maintenance practices that interfere with play. Oakland Hills Country Club, the site of many U.S. Open Championships, is a good example of an unusual problem. Fairways are mowed four to six times a week during the afternoon despite the heavy play at this very popular course. Granted, there are several reasons why afternoon mowing is advantageous. Mowers produce a cleaner, more uniform quality of cut on dry fairways compared to wet fairways. Furthermore, the smashing and smearing of earthworm castings are much less of a concern when the fairways are cut after the turf and the castings have dried. It could even be argued that dry mowing is

less likely to spread diseases across the playing surfaces than dew-laden early morning mowing operations.

The primary reason for mowing in the afternoon at Oakland Hills Country Club, however, is the absence of suitable sites to spread the clippings that are collected after mowing. They don't have an adequate site for composting, and there is a limited rough area out of play for clippings or other plant debris, so the fairways are mowed frequently and the dry clippings are returned to the playing surface. Consequently, golfers and mowers meet almost every afternoon at Oakland Hills and on an increasing number of other courses.

### **Not A Clue**

The unfortunate reality is that many new golfers don't have even the slightest knowledge about course etiquette, and many experienced golfers have chosen to forget. Allowing faster golfers to play through, being ready to hit when it's your turn, repairing ball marks, and keeping carts a proper distance from greens and tees are but a few examples of procedures that have no meaning to many neophyte golfers. Ask a non-golfer to mimic a golfer on the tee, and many will make a few wild and crazy gyrations and then yell "fore!" as they

swing. It's ironic that "fore" is heard only on rare occasions despite the numerous snap hooks and power slices produced on many crowded courses each day.

Perhaps the escalating fee for a round of public golf or the cost of membership at a private club fosters the attitude that golf should be played without even the slightest annoyance or distractions. Maybe the golfers' desires to emulate their favorite tour professionals make them believe that the round of golf they see on TV on Sunday afternoon is the same round of golf they are entitled to when they play, every time they play. Some golfers begin to expect manicured courses, ultra-fast greens, and several officials who wave "Quiet Please" signs at the slightest

cough or murmur. At this point these golfers seem to have little regard as to where they hit the ball and who may be in the path.

The initial session of my first group golf lesson was spent learning course etiquette. It was stressed that I was responsible for my golf shot — where it goes and the consequences of what it hits. If the drive is hit out of bounds to the left, over the fence and trees and into a car in the parking lot, then I was responsible for the damage, not the ball. When the shot endangers anyone on the course, we were instructed to shout "fore" as a warning.

Just how responsible a person is for the damage or injury a golf ball causes is a legal issue and beyond the scope of this article. In today's litigious society, where convicted felons in prison sue the arresting officer for interfering with their armed robbery attempt, hearing of a golfer suing the driver of a moving vehicle for stealing a ball after it is hit through the windshield might not be all that surprising! The bottom line is that regardless of the golfer's attitude, a considerable amount of course maintenance is being done when golfers are present. Let's assume that under normal circumstances the golfer is responsible for his ball, and now let's discuss ways to make the golf course a safer place for everyone.

## The Solutions

The most obvious, but most difficult to achieve, solution is to complete as much maintenance as possible before the golfers tee off. Sometimes the layout of the course provides the crew enough time to stay well ahead of the golfers except during the shotgun-start events or when golfers are allowed to tee off on the first and 10th holes.

Attempts to spray, mow, or perform other maintenance tasks during the night or before dawn have achieved only marginal success at very few courses. The risk of injury to the employee and to the turf is high, even when equipment with headlights is provided. Observing the spray pattern and the mowing pattern, or detecting hydraulic fluid leaks and many other potential problems, are almost impossible to achieve at night. Furthermore, almost all courses irrigate at night, a practice that also interferes with most other maintenance programs.

An increasing number of courses are requiring the maintenance crew to wear hardhats. There is no denying that a hardhat can minimize the potential for serious head injury from a golf ball, especially when the employee is facing away from play. Many golf course owners believe the use of protective hardhats reduces the liability associated with on-the-job injuries and that their policy indicates an effort to address safety concerns.

Some superintendents, however, believe that the use of hardhats is a two-edged sword. They do provide a margin of safety, assuming the errant golf ball hits the hardhat instead of other vulnerable parts of the body. Does the use of protective devices, though, encourage the golfer to hit into the crew under the assumption that they are less likely to injure someone? Similarly, does wearing a helmet make the crew less attentive to

nearby golfers because they feel less threatened? If the use of hardhats makes the crew and the golfers more careless, then they may not provide the desired level of protection. Conveying the limitations of head protection to all parties will depend on the communication skills of the golf professional and superintendent.

The use of highly visible shirts can be another effective, but more passive, form of

example, many courses utilize the roll-over protection available on some models of lightweight fairway mowers as a base for netting, plexiglass shielding, or hardware cloth barriers to enclose and protect the operator. The climate generally dictates what degree of protection is safe and acceptable to the employee; for example, a plexiglass enclosure is not practical when afternoon mowing is done during hot, humid weather.

## Guidelines for the Golfers

"Fore" is the universal signal used to warn golfers of an imminent or errant shot. Unfortunately, many golfers signal too late or not at all. Some simply have never been instructed in the basics of golf course etiquette. Golfers are never too young or too old to learn proper etiquette. An interesting observation made at many courses is that an increasing number of employees are being hit and injured by golf balls during junior golf days. The young beginners have a limited ability to control where the ball is hit and often hit away without warning when the crew is working nearby. Although the golf professional is usually responsible for the junior golf program, a number of courses encourage the superintendent to talk to the participants regarding safety on the course, replacing divots, repairing ball marks, etc. Junior golf is an important and

very popular program at many courses, a program that provides a unique opportunity to educate beginners before bad habits develop. Without adequate education, golf may not continue to be a "gentleman's game," or even a safe game.

Employees generally are instructed to keep a watchful eye for golfers, and most make every effort to cause as little distraction as possible. Most operators will move to the side, stop, and then idle the equipment until the golfers hit through. Golfers can do their part by being ready to hit as soon as



A well-placed sign informs golfers that the crew has the "right of way" when the flagstick is out of the hole. Bonnie Brook Golf Course, Menomonee Falls, Wisconsin.

protection for the employees. Most golfers have little trouble seeing an employee riding a large moving mower, but they may have difficulty detecting someone hand-raking a bunker or repairing an irrigation head. A bright red or yellow shirt can address this problem. The use of a consistent uniform also distinguishes the employee from the golfers, an important consideration that may help speed play on a busy course.

Other ways to protect the employees on rough or fairway mowers is to construct a safety barrier around the operator. For



*Whether or not hardhats provide a reasonable amount of protection from injury is a subject for debate. Some superintendents believe that golfers are less likely to warn the crew, by shouting "Fore" or waving, when hardhats are worn.*

it is their turn — good advice regardless of the employee situation.

If there is doubt as to whether or not the employee is aware of the golfers, then a simple hand signal can be used. When the employee acknowledges the wave with a return hand signal, then it is okay to hit away because the employee will watch for the ball. If the employee is not on a noisy mower, for example, or repairing an irrigation leak, then shouting "fore" followed by a hand signal will readily get their attention. Although common sense would dictate that a hand signal and/or the word "fore" is needed, many golfers overestimate their ability and believe they will never hit into the crew. If this were so, then there would not be a large bin of low-cost golf balls rescued from the water hazards in the pro shop of nearly every course.

Hand signals and the acknowledgement by the employee are especially important when hitting to the green. If the employee signals to the golfer to hit, then the golfer should do so without hesitation. Golfers should not expect the crew to interrupt their maintenance work and then hide out-of-sight while the golfer selects a club, makes several practice swings, and then hits, especially on a busy course. All golfers prefer minimal annoyance and interference, but in reality, distraction is part of the game, a part golfers should learn to cope with, just like wind, rain, or a difficult lie.

Golfers should not hit to the green from the tee or the approach when the employee

has removed the flagstick from the hole. This is a signal used at many courses as an indication that the employee is performing an important maintenance task that requires concentration. He or she cannot watch for errant shots and will try to finish the task as soon as possible, after which the flagstick will be replaced. The flagstick will be out most often for mowing, but may also be removed for bunker maintenance.

### The Rules of the Game

Under the Rules of Golf, distraction is considered a part of the game (Decision 1-4/1). There will be times when noise from mowers or other maintenance practices cannot be avoided.

### Through the Green

Mowers and other maintenance equipment are generally considered outside agencies (Definition, Rule 18). If a drive hits a mower and ricochets out of bounds, it is a rub of the green (Rule 19-1). If a ball at rest is moved by a mower, the golfer is allowed to return the ball to the original spot without penalty (Rule 18-1). If the ball is not immediately recoverable or is deemed unfit for play after, for example, being damaged by a mower, another ball can be substituted (Rule 5-3).

If a ball is imbedded by maintenance equipment, the golfer is permitted to lift, clean, and drop the ball, without penalty, as

near as possible to the spot where it lay but no closer to the hole (Rule 25-2).

### On the Putting Green

If a stroke played onto the green is moved by an outside agency, it is considered a rub of the green (Rule 19-1). If a ball at rest is moved by an outside agency, it can be replaced on the original spot without penalty (Rule 18-1). If a ball played from the putting green is moved by an outside agency, before the ball comes to rest, then the stroke is cancelled and replayed without penalty (Rule 19-1b).

### Summary

Golf without interference from day-to-day maintenance is a luxury fewer courses will enjoy in the future. Even private clubs find that as the amount of play increases, golfers and employees will spend more time sharing the same turf. For example, despite the negative impact on the pace of play and the health of the turf, the golfers' desires and expectations for faster greens for day-to-day membership play necessitate much more employee time on the greens spent double cutting, rolling, etc. Junior programs and outside outings are becoming more of a priority at many courses. The annual corporate outing may be the only time some golfers play all season. The limited ability and limited knowledge of golf etiquette possessed by these groups of golfers pose a significant hazard to the maintenance crew.

There are several ways the employees can minimize the potential for injury, including the use of hardhats and high-visibility uniforms. The following set of guidelines for golfers may further help minimize the risk to the employee as well as the inconvenience to golfers. Courses may elect to modify the guidelines to suit specific needs or situations at a particular site.

1. Learn how and when to use the universal warning "fore."
2. Signal to the employee if possible, and hit as soon as your signal is acknowledged.
3. Do not hit onto the green when the flagstick has been removed from the hole by the maintenance crew.
4. Be prepared to hit as soon as the flagstick is replaced or when the golfer is motioned by the crew to hit away.

An effective way to introduce the guidelines might be during an introductory golf lesson or during the organizational meeting of the various leagues that exist at many courses. A note in the membership newsletter, a message on the scorecard, or signs in the pro shop or locker rooms can be effective as well.

Be considerate, and everyone will have a safe and enjoyable round of golf.

# WINTER KILL!

by JIM HARRIS

CGCS, Stonebridge Country Club, Memphis, Tennessee

**W**INTER KILL is a catch-all term that is used to cover a multitude of sins as well as the abnormalities of nature. The label *winter kill*, in simple terms, refers to the loss of turf during the winter season. Actually, this turf problem is much more complicated than that.

The culprit most associated with winter kill, especially in southern areas, is low temperature; however, there are many factors that contribute to this multifaceted monster, including low mowing heights, too

much water, too little water, desiccation, traffic, shade, and others.

Looking for a pattern in the dead turf area is the best way to determine the cause of turf loss. The loss of warm-season grasses on the northern exposure of hills would indicate direct low-temperature kill, whereas southern slopes receive more heat from sunlight, which oftentimes is a key component in surviving harsh winter months. Dead turf at the base of slopes and in drainage ways would be an indication of too much water,

which during the winter leads to intracellular freezing of the turfgrass plant. Dead turf at the top of hills could be an indication of desiccation. Turf loss in fairways, leaving the rough areas unscathed, is a sure sign of mowing too low. And dead turf directly under trees as a result of low-temperature kill can be associated with excess shade, tree root competition, and possibly concentrated traffic conditions.

This leads us to the phenomenon of multiple contributing factors, which is probably

*Several factors, including low mowing heights, high-traffic conditions, and competition from trees, contributed to winter kill at the edge of this Tifway (419) bermudagrass fairway.*



what happens in most situations of winter kill. The concerned golfer wants to find the specific cause for dead turf and eliminate it so it won't happen again — logical, but sometimes not practical.

The predominant factor governing the extent of winter kill is directly related to the whims of "old man winter," of which no one has control. Furthermore, rather than one specific controllable factor, more times than not a combination of factors collectively contribute to the loss of turf in conjunction with excessively cold temperatures.

The fact that height of cut directly affects turfgrass root depth, and good root depth is a factor in minimizing winter kill potential, is a given. Almost any superintendent can determine the appropriate mowing height for the upcoming winter if an accurate season-long winter weather forecast could be made. Unfortunately, this "ideal" situation does not exist in real life. If the course is mowed at elevated cutting heights and the winter is severe, then the superintendent is considered a hero. On the other hand, if it is a relatively warm winter, then he is viewed with less enthusiasm because the need for higher mowing heights was perhaps not necessary. As too often is the case, due to player demands for extended summer play

conditions, the height of cut is maintained too low prior to the onset of dormancy and then the potential for winter kill is back in the hands of "old man winter."

Another aspect of winter kill relates to various other factors with respect to fertilizer and pesticide applications, particularly with respect to timing (education), weather conditions (meteorology), carriers (technology), method of application (employee training), how bad a night the person applying them just had (personnel management), and if the applicator was mad at the superintendent when he put them out (ability to motivate).

The precautions that can reduce winter kill potential are some of the very things that make the game of golf more difficult and to some degree less enjoyable, such as higher heights of cut, elimination of cart traffic, reduction of foot traffic, wetter or drier turf, and many others. The tongue-in-cheek saying among golf course superintendents is that the golf course would be a great place to work if it weren't for the golfers. This, of course, is ludicrous, but it does demonstrate the predicament that turf managers face.

Another aspect of winter kill is not winter kill at all, but *spring kill*. Many people rolled their eyes and respectfully kept quiet when Dr. Lloyd Callahan of the University

of Tennessee first mentioned this several years ago. Research shows that he was right. Less is known about spring kill than winter kill, but it is a reality and the average golfer is totally unfamiliar with the term. The research side of it shows that green-up periods that are dominated by cloudy and rainy weather sometimes yield turf that suddenly goes from being vibrant and alive to dead. From the standpoint of evidence, many superintendents dig down and find white stolons that break with a snap in late winter or early spring, and the same stolons are brown and limp a few weeks later. This is called spring kill due to the fact that actual death occurred during the spring rather than winter.

The spring of 1994 emerged with significant turf loss across a large section of the southern part of the country. Golfers were dumbfounded because it had been, for the most part, a mild winter. Superintendent Dave Green, CGCS (Golf Club of Tennessee and the ultimate record keeper) believes that when average temperatures are as much as one degree below normal, some degree of turf loss can be expected.

Golfers unhappy about golf cart restrictions and the disruption this spring caused by sprigging, seeding, and sodding work

initiated a cry across the country that the reason for the problem had to be poor management practices on the part of the turf managers. What was the cause? What was the pattern? Who was to blame if not the superintendent?

As it became clear that specific turf areas were not going to green up, the search for patterns began. The first accusation was low mowing heights. Many fairways and tees showed more kill than did rough areas, but a less-noticed pattern was that some areas maintained at lower mowing heights were the first to green up. Next was the north slopes, but by mid-season the amount of dead turf on south slopes was about equal to that of north slopes. There was dead turf found in low areas, an indication to some that the superintendent was watering too much, but dead turf at the high points was equally

*High-traffic areas adjacent to tees were especially prone to loss of bermudagrass from the cold winter temperatures.*





*Winter kill of bermudagrass on north-facing slopes, especially in high-traffic areas, can be a common occurrence.*

much, but dead turf at the high points was equally visible. There was no green-up under trees, a sure sign to those whose ball landed there that a pruning program must be implemented immediately. High-traffic areas near landing zones showed turf loss, but loss was also seen in the seldom-trod-upon front yards of clubhouses and home lawns. Some golf courses actually recovered from the turf loss before a pattern could be fully identified.

What then? A pattern that few people remembered or even recognized, except by those who kept records, was one that showed the grass breaking dormancy, followed by a heavy frost. This was followed a month later by another green-up and another equally heavy frost. This scenario was repeated a third time by a lighter frost, but one that was just as deadly. The visual patterns indicated that virtually all previously mentioned factors contributed to this winter kill situation, but not as evident was the factor of spring kill, which seemed to be the biggest culprit this past season. This is not to say there was

no winter kill; however, the extent of the damage depended on where in the country the course was located.

Each year in late winter, turf managers would be wise to bring in selected sample plugs from low areas, high areas, low-mowed areas, high-mowed areas, and any other turf area that is often associated with winter kill. Plant these representative samples in a pan of native soil (with holes for drainage), place them in a room beneath a heat lamp and grow light, maintain favorable soil moisture, and force an early break in dormancy. This will give you an early indication (the emphasis is on *indication*) of what might come if winter kill in fact occurs. (Note: The more samples taken, the better the indication for damage.) This particular preview test procedure may not be totally accurate, however, if some degree of spring kill is experienced after these samples have been taken.

Each year in mid-spring, if turf loss is obvious, concerned golfers should ask if

this problem is unique to their course/city/region/state. If your course appears to be the only one to sustain damage, there may (emphasis is on the word *may*) be a management or personnel problem. Don't take the word of an irate golfer. Rumors survive until late in the season, and truth sometimes never breaks dormancy. Check with your regional Green Section agronomist, as he usually has a broad view of the range of such problems.

Also, remember that golf courses sometimes have little in common other than the game of golf. An 18-hole course spread out over 160 acres with 30,000 rounds often doesn't sustain the damage of an 18-hole course with 60,000 rounds spread out over 95 acres. There are many, many factors that must be entered into the winter/spring kill equation.

The most difficult culprit to identify in winter kill and spring kill is a varmint called *work place politics*, but that is a story for another time.



*The game of golf is enhanced by and dependent upon the natural surroundings. Superintendents take the responsibility of managing these natural areas very seriously. Oakdale Golf & Country Club, Downsview, Ontario, Canada.*

# Developing Environmental Guidelines for Canadian Golf Courses

by **TERI YAMADA**

National Director, Royal Canadian Golf Association

**T**HE TURFGRASS INDUSTRY has improved its management practices in the past few decades to reflect the increasing awareness of the general population to environmental issues. Many superintendents employ Integrated Plant Management (IPM) techniques to ensure water, fertilizer, and pesticides are applied only as needed, reducing loss from runoff and leaching. But if turfgrass managers are such good stewards of the environment, why do we continue to read and hear reports criticizing our industry?

Let's face it — we have been preaching to the converted. We have developed edu-

cational programs for turf managers without letting the general public, including the average golfer, know about our advancements. As an industry, we know the type of management we strive for, but we have failed to document our goals.

It was for this reason, in the fall of 1991, that the Royal Canadian Golf Association (RCGA) decided to develop a set of environmental guidelines for Canadian golf clubs. The intent was to summarize turf management practices that current research has shown to be the most environmentally responsible. The guidelines would provide RCGA member clubs with

a point of reference from which they could compare and improve their own turf management operations.

We consulted other industries that had developed similar guidelines, as well as a federal agency involved in sustainable development issues. We were advised to consult with groups that may be considered to be on the other side of the issue.

This was perhaps the most daunting aspect of the project. Environmental interest groups and government agencies had been seen as adversarial in the past, and some golf industry groups were concerned their involvement would only provoke further

## GUIDELINES FOR GOLFERS

The game of golf is enhanced by and, indeed, is dependent upon the natural surroundings. The quality of golf and life is enhanced by the preservation and conservation of our natural resources. The Royal Canadian Golf Association and the Canadian golf industry have developed a code of practice to ensure that the golf course continues to afford us the same natural experience for future generations. You can help to continue to provide the highest quality golfing experience by considering the following guidelines.

1. Enjoy the natural environment and help to enhance and protect it by respecting all local regulations.
2. Avoid activities which endanger plant, fish, and wildlife populations or can potentially threaten their habitat.
3. Assist in our conservation efforts by the efficient use of all water and energy resources.
4. Work with the management and directorship of your golf club to develop and implement environmental enhancement programs.
5. Golf was meant to be played in a natural environment. A natural environment is by definition imperfect. Support your club's efforts to balance course conditioning with environmental enhancement and conservation strategies.

problems. Nothing could have been further from the truth.

**Phase I** involved interviews and surveys of federal and provincial government environmental agencies and environmental interest groups. They were asked to articulate what specifically concerned them about golf courses. All of the concerns were listed in preparation for **Phase II**.

**Phase II** entailed sending the summarized list of concerns to a group of Canadian golf course architects, superintendents, and club managers. They were asked to respond to each concern by outlining what they were currently doing, or were willing to do, at their properties to allay the fears of the person expressing the concern.

Initially, a few superintendents were apprehensive about being governed by a set of guidelines, but once it was understood that superintendents would not only be consulted, but were, in effect, helping to compose the guidelines, they remained cautious but more willing to cooperate.

All responses from architects, superintendents, and club managers were compiled and divided into the following three broad categories:

- **Guidelines for Golfers**, dealing with the responsibilities of all golfers while on the property.

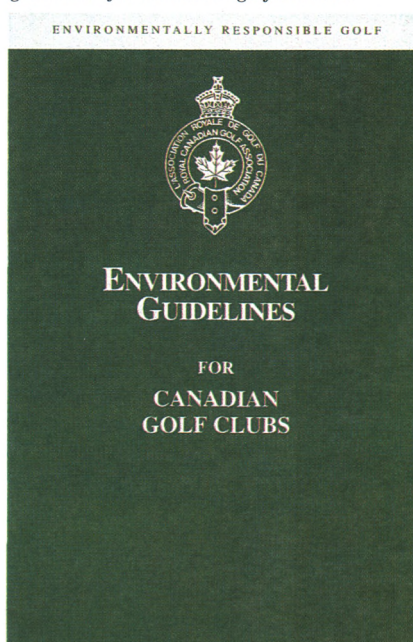
- **Guidelines for Golf Designers and Developers**, dealing with issues related to:

1. Site Selection
2. Design Considerations
3. Construction

- **Guidelines for Golf Club Directors, Managers, and Superintendents**, dealing with management of existing facilities.

The Guidelines were sent for comment in draft form to all participants from both **Phases I & II** of the project. After many rewrites and 18 months of consultations, in April 1993 we published the booklet *Environmentally Responsible Golf — Environmental Guidelines for Canadian Golf Clubs*. We acknowledge that this document

*In 1991, the Royal Canadian Golf Association (RCGA) began the process of developing a set of environmental guidelines for Canadian golf courses.*



is subject to change. As more research is conducted, and more knowledge gained, the document will be amended to include new information.

The RCGA is a national association, but environmental regulations vary among provinces. We therefore have referred to local regulations in some cases and encourage other provincial groups to use the guidelines as a starting point to develop documents more specific to their regions. So far one group, the Alberta Golf Course Superintendents, has developed a comprehensive set of position statements for their membership.

The Guidelines for Golfers were enlarged and printed on card stock and sent to all RCGA member clubs to be placed in the pro shop or clubhouse. Golfers have often been forgotten when environmental responsibilities are discussed. Although they may not be involved in the everyday operations of the club, members do place demands upon club management.

Some of the most avid conservationists who may have been responsible for the implementation of a recycling program in their own neighborhoods, or diligently compost all organic wastes at home, may be the first to complain about naturalized areas on the golf course because they lost a golf ball.

We still have a communications and education job ahead of us. The guidelines have initiated positive discussions with our member clubs as well as many environmental agencies and interest groups.

Some groups have asked how we plan to enforce our guidelines. Our intention is to take a positive position of encouragement rather than enforcement. We therefore intend to provide tools for our member clubs to help them adhere to the Guidelines.

The first such tool has been the introduction of the Audubon Cooperative Sanctuary Program for Golf Courses into Canada. The Audubon program provides good ecological information and further incentive for our member clubs to adhere to the Guidelines. As of February 1995, 96 Canadian golf clubs have registered with the Audubon program.

It is our hope that by raising the environmental awareness of our members, we have started down the road to changing their attitudes about golf course conditioning, away from the pristine images seen on television each weekend to a more natural look.

*A copy of the Canadian Environmental Guidelines may be obtained by contacting:*  
Royal Canadian Golf Association  
Golf House  
RR #2  
Oakville, Ontario L6J 4Z3  
Canada  
Telephone: (905) 849-9700

# Surround Your Greens With Quality

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by **LARRY GILHULY**  
Director, Western Region,  
USGA Green Section

**Y**OUR TEST TODAY, class, involves two questions concerning turfgrass on golf courses. They are both very easy and 100% should be expected; however, a few of you may fall short of this goal. Good luck and remember, no cheating!

Question No. 1: What turfgrass areas are the most important from a playing and maintenance standpoint? Answer: The greens, of course. Congratulations, you have completed one half of your test perfectly.

The second half is tougher. Question No. 2: What areas are the second most important from a playing and maintenance standpoint? Answer: It's not the tees or fairways, and bunkers is only half right. The second most important locations are the areas around the greens, more commonly referred to as the *green surrounds*. While most of the single-digit players are lining up yet another birdie putt, the majority of players are faced with a delicate shot from a closely cut and often

wet apron, or an uncomfortable touch shot out of inconsistent tall grass to a tight hole location or, worst of all, a shot from bare ground that has occurred due to traffic damage.

We have all faced these situations, yet there are some basic programs that can and should be conducted to improve turf growth and playability in these important areas. For the sake of this discussion, let's look at four distinct areas surrounding the greens that

*Heavily worn traffic areas — the scourge of green surrounds.*



require closer attention: the apron, traffic zones, remaining rough, and bunker edges.

### The Apron

Whether you consider the 20-yard area in front of the green as fairway or green surrounds, it is critically important to the play of the game. How many times have you been faced with firm greens and soft aprons?! Good luck, because luck will be a major part of this scenario. The aprons deserve and should receive practically the same programs that have been established for the greens. Though fertilizer requirements will vary with soil type, the aprons probably will need at least two aerations with large tines every year to relieve compaction and remove thatch. Even more aeration is needed if the apron is also a main entrance or exit area. Topdressing with an appropriate sand should then follow to fill 95% of the aeration holes.

In addition to regular aeration, light topdressing should also be conducted in conjunction with the green topdressing program, if possible. Applying  $\frac{1}{8}$  cubic yard of sand for every 5,000-6,000 square feet every three to four weeks will aid the aprons in achieving firm conditions that are so important to keep the skill of chipping in the game.

Yet another important maintenance program for aprons is the control of thatch. While light vertical mowing practiced on the greens is generally not necessary, deeper vertical cutting of the aprons would be beneficial when conducted at the time of aeration. Combining these two practices in controlling thatch greatly minimizes disruption for the players and makes for much improved aprons.

Finally, the ability to apply and remove water is critical for apron maintenance. It is surprising, and a bit discouraging, to view so many golf courses that have not addressed the basic requirement of good drainage immediately in front of a putting surface. Don't overlook this area, as golfers can definitely tell the difference between mud and firm turf! This is especially true during the summer months when the irrigation system must supplement natural water supplies. If you have followed the basic programs of good fertility, aeration, topdressing, thatch removal, and mowing, then irrigation by hand can be minimized. If supplemental watering is necessary, try to maintain aprons on the dry side to encourage the pitch-and-run shot and eliminate rutting by mowing equipment or pull carts. Power golf carts should not be a concern, as a rigid policy of banning these four-wheeled turf assassins within 30-50 yards of the greens should be followed.



*Special irrigation practices may have to be established to keep peripheral areas in good shape.*



*Clumps of different grasses can cause extremely difficult playing conditions.*

### Traffic Zones

We are all familiar with these locations. Every green has a tree, bunker, mound, or other feature that directs traffic to a small area. This location invariably suffers from severe compaction and, if not treated in an aggressive manner, complete turf loss. With

these areas situated so close to the putting surfaces, consistent care is required. Specific programs that should not be overlooked when dealing with traffic zones around the greens include:

1. Aeration. Traffic zones receive far more concentrated foot traffic than any other

area on a golf course. Although the amount of play will ultimately determine aeration requirements, you can expect to aerify traffic zones at least three or four times every year during the growing season. Cores should be removed, if possible, and holes filled with an appropriate sand topdressing material.

2. Overseeding. In cool-season areas, perennial ryegrass has proven to be the best grass to withstand heavy traffic loads; hence overseeding at rates as high as 7-8 pounds per 1,000 square feet is often encouraged at least three to four times every year.

requires a constant water supply for new seedlings. Water must be applied very carefully during the summer to maintain good growth, yet not create a muddy mess. The addition of low-precipitation irrigation heads is one method that has been successful in addressing this requirement.

6. Fertilization. The traffic zones require more frequent fertilization than other locations around the greens. An annual amount of nitrogen can be in the range of green requirements if the soil is a sandy loam, or slightly less if comprised of a native soil.

## Remaining Rough

The largest portion of green surrounds is comprised of plain old rough turf. These turfed areas need minimal aeration, topdressing, dethatching, and traffic control measures. They do, however, require more fertilizer, drainage, quality irrigation, and pest control than other rough areas. Key programs or factors that often get overlooked include:

1. Turfgrass consistency. Although different grasses are acceptable in the roughs, the green surrounds require special attention. It is particularly difficult when *Poa annua* and bentgrass begin to invade a Kentucky bluegrass or perennial ryegrass rough immediately next to a collar. The same situation can also occur with common and hybrid bermudagrass. Depending on your budget, this issue can be remedied. The simplest approach is to lower the mowing heights to an intermediate level to reduce the differences between the growth characteristics of the different grasses. If this is not acceptable, then regular overseeding with or without chemical usage can be utilized to enhance the desirable species. Finally, resodding the problem areas has proven very effective.

2. Irrigation. The use of low-precipitation sprinklers on the contours around greens has proven very successful in minimizing excess water in bunkers while providing adequate moisture on slopes. If utilized, try to provide as much control as possible.

## Bunker Edges

The green provides the main focal point for players, but it is the bunkers that truly accent or provide the framing for the target. Although bunkers are included in the green surrounds, their maintenance shall not be discussed. The edges of the bunkers, however, play an important role in defining the hazard perimeter. Whether the bunkers are edged frequently or maintained with a "natural" edge, it is critical to keep this delineation, since players cannot ground their clubs in a hazard.

Infrequent edging, poor hand raking techniques along the perimeters, exiting bunkers on a power bunker rake without removing excess sand, and the buildup of sand from frequent player use are all areas that lead to problems with bunker edges. If these four situations can be addressed in a programmed manner, you definitely will have an edge up on the competition!

The green surrounds constitute a very important part of every golf course, and they often do not receive the systematic approach normally associated with greens, tees, and fairways. Don't fall victim to this trap! Surround your greens with quality and your players will appreciate the results.



*Extra aeration and proper irrigation often are required in green surround locations.*

3. Topdressing. Traffic zones respond well to light and frequent topdressing, in addition to the sand applied after aeration. If possible, topdress the traffic zone as part of the green topdressing program, every three to four weeks.

4. Drainage. Although traffic zones are in play as much as the aprons, they are viewed close-up by more players. Good drainage is essential, and many golf courses have completely eliminated poor soil in traffic zones, added drainage, and reseeded or sodded. Regardless of the situation at your course, every traffic zone should have good drainage.

5. Irrigation. It is very difficult to maintain an area that is prone to compaction, yet

Phosphorus and potassium are also generally required in moderate amounts to encourage seedling vigor and root development.

7. The use of Crumb rubber. Recent research at Michigan State University indicates the possibility of using rubber in high-traffic areas to resist compaction. This same idea has been used with success using various organic products in Southern California on bermudagrass traffic areas.

8. Traffic control measures. If all of these programs do not produce good-quality turfs, then the traffic should be moved frequently to other areas by the use of ropes and signs. They may not be pretty, but they work!



*Pedestrian and vehicular flow around clubhouse facilities is a critical component in golf course design.*

# BRINGING IN THE HIRED GUNS

## How to Choose an Environmental Consultant

by **BARBARA B. BEALL**

Environmental Scientist, The LA Group, Saratoga Springs, New York

**A**T ONE TIME or another, everyone needs a sharpshooter for help with a technical problem. As golf course construction and management become more specialized, and regulations increase in complexity, superintendents, managers, and developers may need the professional services of an environmental consultant. In the past few years, a consulting community has developed in response to various regulatory programs and to a growing environmental awareness in the general population. There are many services that consultants can offer, and it is important to understand how the selection process should be carried out.

### Types of Environmental Consultants

**Landscape architects** are licensed professionals trained to provide comprehensive

land analysis, planning, and design services. Uniquely qualified to review the *fit* of a new development or renovation into its proposed setting, landscape architects can give a project that "picture postcard" image. Working with a golf course architect, a landscape architect can provide a detailed layout of site components, including grading and drainage, planting, lighting, parking area, roads, walkways, stormwater runoff, and the location and design of enhancement plantings.

**Engineers** also are licensed professionals, and are trained to design utility systems such as water distribution and sewage collection, as well as oversee plans for grading, parking lots, roads, bridges, and walkway construction included in a site design plan. An engineer's stamp is often required on plans submitted to county or state regulatory agencies.

**Community planners** work with municipalities on the development of land use plans and enabling legislation such as zoning ordinances. Their input can be useful during the development of golf courses through the interpretation of zoning regulations and by providing demographic and economic information for feasibility analysis. For municipal golf courses, planners can obtain grants for renovation, conduct recreational analyses to examine the need for additional golf courses, and determine how to integrate the golf course into other community recreational programs.

**Environmental specialists, including wetland scientists, terrestrial ecologists, hydrogeologists, aquatic scientists, archaeologists, and soil scientists**, are professionals with specialized training in the environmental field. Defining a site's existing con-



*Design and installation of irrigation systems require special expertise.*

ditions, analyzing a particular proposal to determine what, if any, impacts will or have occurred, and suggesting measures to alleviate those problems and/or make the proposal feasible are the usual services provided by these professionals. Specialists have a thorough knowledge of the local, state, and federal environmental regulations in their particular area of expertise, and have established working relationships with the regulators through direct project experience. Representative environmental services for golf course projects include examining water quality or reviewing the best way to control aquatic weeds in an irrigation pond, analyzing the feasibility of a groundwater source for irrigation, and resolving wetland issues.

Different professionals are sometimes combined under one roof in a multi-disciplinary firm. These companies may also

provide other services such as Geographic Information System (GIS) analysis and mapping, computer-assisted design (CAD), and construction monitoring and inspection services, and may have specialists unique to a particular region.

Multi-disciplinary firms typically are organized around a primary profession, usually engineering or landscape architecture. This focus will shape the pathway chosen to design a project and prioritize issues. For example, a landscape architecture or land planning firm may develop a site plan for a new clubhouse facility by focusing on the aesthetic features and the use of the site by members, while, simultaneously, the staff engineers work on the water and sewer systems. An engineering firm might design the same clubhouse facility by focusing on the curb cut from the adjacent

highway, the foundation construction, location of wells and leachfields, the construction of the parking lots and walkways, and have the landscape architect staff dress up the design with a planting plan.

It is important to consider these differences when selecting the consulting firm that best fits the project. A new irrigation pump-house system might be better handled by an engineering firm, due to the engineering issues involved, whereas a redesign of a clubhouse facility layout might be better handled by a landscape architecture firm, due to the aesthetic concerns of such a project. As the project scope is defined and different firms are interviewed, it will become evident which one or two firms best fit the project.

### **Determining the Need for a Consultant**

Certainly, an environmental consulting firm should be part of any new golf course development due to the multiple environmental issues that will arise. Environmental consultants can be very helpful in the assessment phase of the project, by identifying issues that will need to be addressed both in permitting and in construction design. Consultants can assist in the permitting phase by preparing applications and serving as an intermediary between the developer and the regulators, to assure that both sides get the information and agreements that they need. During construction, consulting firms can monitor the work to check that it is being done in accordance with the permits and construction drawings.

Smaller *threshold projects* also typically require the services of a consultant due to their regulatory and technical issues. These projects involve specific expertise and require significant amounts of time, which the superintendent or course officials may not be able to supply.

For smaller projects, or anytime it is uncertain whether professional expertise is needed, a consultant can be asked to provide a preliminary assessment of project issues.

The process of hiring an environmental professional should begin as early as possible in the project, as soon as it becomes evident that assistance is required.

### **Consultant Selection Process**

Many times, a local consultant who is a member of the club is hired to assist the superintendent in resolving these types of problems. While this method can and often does work, it has drawbacks. There may be political difficulties with monitoring the member's work, or the member hired may not have all the expertise or resources necessary to resolve the problem. A fresh perspective might be useful.

The first step in the selection process is to define the project scope. The superintendent,

green committee, course manager, and/or special standing committee can identify the problem or issue for which help is sought, its extent on the course, and the range of financial resources the group is willing to spend. This group should take these findings and prepare a written description of the project scope, which then is incorporated into the Request for Proposal (RFP). The RFP is a document used to solicit proposals from consultants. If a golf course architect is part of the project, he or she should be closely involved or might even direct this process. There may also be a member at the club — for example, someone on a town planning board — with knowledge about RFPs.

The RFP should contain the written description of the project scope and the particular deadline for submittal of the following information.

- Consultant's staff and expertise
- Experience with similar projects
- References for similar projects
- Consultant's approach to solving the problem
- Consultant's scope of services and proposed work tasks
- Project schedule
- Cost (fees)
- Contact name for questions

Consultants may wish to view the course or area of concern prior to writing the proposal, and times/dates and procedures for these visits should be described in the RFP as well.

After it is developed, the RFP is sent out to the consulting community. A notice of its availability may be advertised in local or larger newspapers. The mailing list of consultants can be compiled from a variety of sources. The accompanying table of sources of consultants provides ideas for obtaining or developing a list of consultants in your area. This includes looking up names and addresses in the telephone book, asking local planning boards for lists, and contacting professional societies for members in the area.

A screening committee, usually the standing committee that wrote the RFP, should evaluate the proposals received. References should be checked to verify the consultant's track record with similar projects, and whether sound solutions were provided in a timely manner. A short list of the most qualified firms then is created, and these firms are asked to present their qualifications at an interview.

While cost is an important consideration in the final selection process, it is not the only area of concern. Equally important is having confidence that the consultant can complete the work, and that the personality of the consultant will work well with the club. After all, hired guns are expected to hit their targets.

**Table 1**  
**POTENTIAL ISSUES THAT MAY REQUIRE HIRING A CONSULTANT**

#### **Regulatory Issues**

- Meeting with regulatory personnel, especially for potential violation.
- Activities in wetland areas, streams, or other water bodies.
- Building ponds for irrigation supplies.
- Pesticide/herbicide use concerns.
- Habitat preservation or development — endangered species.
- Potential impact on archeological/historic resources.
- New road entries.
- Activities requiring more than routine building permits.

#### **Technical Issues**

- Drainage project with a collection system or point of discharge (need for pipe sizing and outlet structures).
- New pond construction (spillway sizing and design, stormwater modeling).
- Major renovation of the irrigation system.
- Retaining-wall design.
- Repair of major soil erosion problem areas.

#### **Land Use Design**

- Placement of residential development adjacent to the golf course or resort.
- Design of exterior clubhouse area, including circulation patterns and plantings.
- Aesthetic changes to ponds, swales, streams, fountains.
- Cart path design or renovations.
- Major tree plantings or removals.
- Overhaul of amenities such as signage, tee markers, benches.
- Design of new buildings on the course.
- Screening of undesirable views.
- Scoreboard design and placement for tournaments.

**Table 2**  
**SOURCES OF CONSULTANTS**

- Telephone Book Yellow Pages — look under "Landscape Architect," "Environmental Consultants," "Engineers"
- Local or regional planning boards may have list of qualified consultants
- USGA and PGA professionals may know of a golf course with similar problems
- Regional golf course superintendents' association — consultants may be members

#### **Professional Societies (request regional listing of members)**

American Society of Landscape Architects  
4401 Connecticut Avenue NW, Fifth Floor, Washington, DC 20008-3202  
(202) 686-ASLA / Fax (202) 686-1001

American Society of Civil Engineers  
345 East 47th Street, New York, NY 10017  
(212) 705-7496

American Planning Association  
1313 East 60th Street, Chicago, IL 60637  
(312) 955-9100

Society of Wetland Scientists  
P.O. Box 1897, Lawrence, KS 66044  
(913) 843-1221

American Institute of Professional Geologists  
7828 Vance Drive, Suite 103, Arvada, CO 80003-2125  
(303) 431-0831

Ecological Society of America  
Arizona State University, Box 873211, Tempe, AZ 85287-3211

American Registry of Certified Professionals in Agronomy, Crops, and Soils  
Office of the Registry, 677 South Segoe Road, Madison, WI 53711  
(608) 273-8080



*Highly specialized equipment is used to shoot foreign DNA into bentgrass plant cells.*

# Herbicide-Resistant Creeping Bentgrass

by **LISA LEE, CHRISTINA HARTMAN, CYNTHIA LARAMORE, NILGUN TUMER, and PETER DAY**

Center for Agricultural Molecular Biology, Cook College, Rutgers,  
The State University of New Jersey, New Brunswick, New Jersey

**H**ERBICIDE-RESISTANT creeping bentgrass, a product of laboratory experimentation, may become a useful tool for golf course superintendents in their daily encounters with weed problems in the future.

Golf course managers use a variety of cultural practices in maintaining golf course turf, including the use of pesticides. The potential for negative effects from such materials on golf courses is a concern through exposure to golf course super-

intendents and their staffs, the general public, and the environment. Production of turfgrasses that can use safe herbicides and that require fewer fungicide treatments may help to reduce these potential problems. Biotechnology allows the insertion of foreign genes into turfgrass, a process that can lead to the production of new cultivars that require less use of herbicides and fungicides.

Some herbicides used on golf courses are not environmentally friendly chemicals. However, the application of herbicide

products to many golf course areas is required for the maintenance of excellent playing surfaces. At Rutgers AgBiotech Center, we are developing creeping bentgrasses that are resistant to a safer herbicide, glufosinate. The source of resistance is a fungal gene for resistance, *bar*, that has been shown to be effective in the transformation of both narrow- and broad-leaved plants.

This group of herbicides, glufosinate and its tripeptide bialaphos, have trade names such as Final,<sup>™</sup> Ignite,<sup>™</sup> Basta,<sup>™</sup> or Herbiace.<sup>™</sup>

They inhibit the enzyme glutamine synthetase, causing rapid accumulation of ammonia and cell death. The *bar* gene encodes an enzyme (PAT) that inactivates the active ingredient of the herbicide PPT; thus, transformed plants that carry the *bar* gene are resistant. We have used two methods to transform creeping bentgrass — biolistic bombardment and protoplast transformation. In this article, we describe how transgenic creeping bentgrass with herbicide resistance was obtained and what the implications of our work are to golf course superintendents.

### Creeping Bentgrass Tissue Culture and Regeneration

To transform creeping bentgrass, we first had to develop a tissue culture regeneration system. About 6 to 8 weeks after surface sterilized seeds were placed on callus initiation medium, embryogenic callus cultures (cell masses with embryos), were selected from germinating seedlings. These were established from seedlings of seven creeping bentgrass cultivars: Cobra, Emerald, Pennlinks, Providence, Putter, Southshore, and SR1020. Depending on the cultivars, between 5% and 30% of seeds can produce embryogenic callus cultures. Upon transfer to regeneration medium (MS medium with-

out hormone), around 200-400 plants can be obtained from each gram (fresh weight) of callus. The callus cultures were used to establish suspension cultures by placing approximately 1-2 grams of callus into liquid medium in 250 ml flasks in the dark on a rotary shaker (125 rpm). By subculturing to fresh medium twice a week, suspension cultures with small cell clusters were established for transformation. Both embryogenic callus and suspension cultures were used as target tissues in transformation.

### Biolistic Transformation

Biolistic transformation was carried out using a Bio-Rad PDS-1000/He Biolistic Delivery System. This is a device that uses a pulse of helium at high pressure to accelerate very small (1-3  $\mu$ ) metal particles coated with transforming DNA to hit target plant cells placed in their path. Some particles enter the cell nuclei and in a small proportion of these, some of the DNA carried on the particles also enters the nucleus and becomes integrated on a plant chromosome. Target tissues, either suspension cells or callus cultures, were placed on sterile filter disks in dishes containing medium prior to bombardment and kept in the dark. Foreign DNA was constructed in a plant expression

vector as a plasmid which will amplify in *E. coli* cells cultured in a broth medium to produce enough DNA for transformation. In the biolistic experiments, purified DNA was mixed with gold particles.

Herbicide was added to the tissue culture medium to select transformed cells from bombarded materials. Selection commenced 3-4 days after bombardment and continued for 8 weeks. The bombarded tissues were then transferred to regeneration medium. Regenerants appeared within 2-8 weeks. Shoots were transferred to Phytatrays™ (a presterilized clear polystyrene sundaecup-like vessel for plant culture) with regeneration medium, and roots appeared within 2-4 weeks. Plants were transplanted to soil and were tested for herbicide resistance in the greenhouse. It takes about 6 months from tissue bombardment to obtain plants in soil.

### Protoplast Transformation

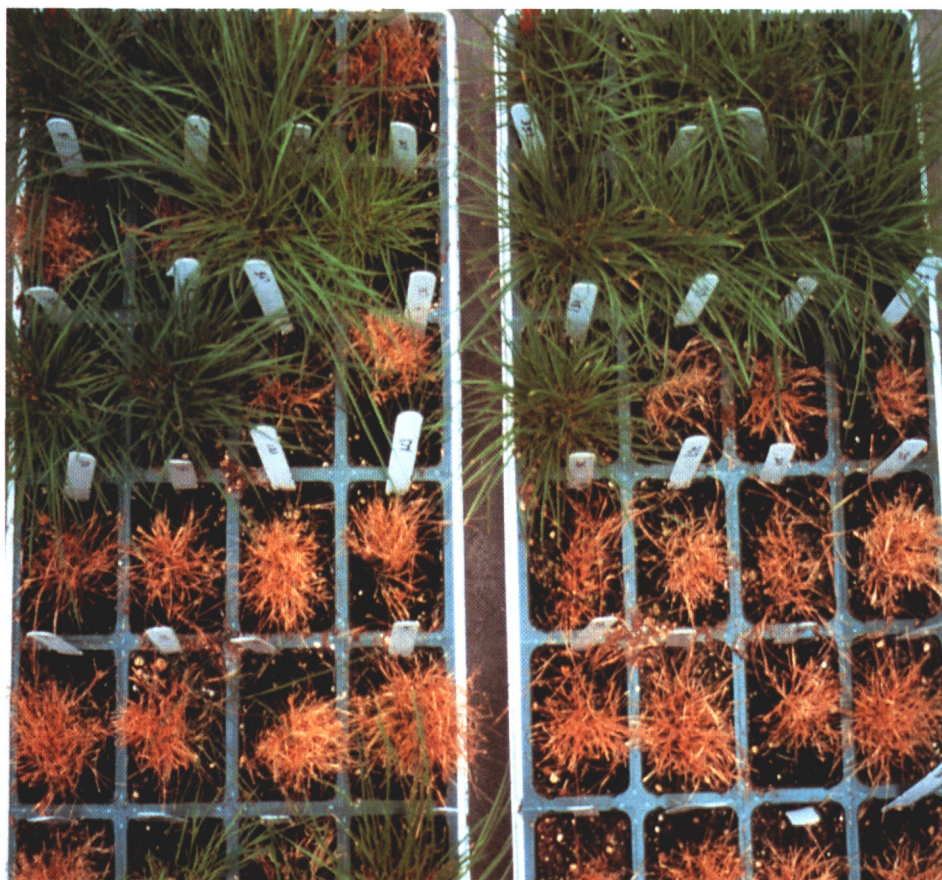
Another method used to insert desirable genes into plant cells is a process called protoplast transformation. In this process, the walls of four-day-old suspension culture cells were removed by enzyme digestion to release protoplasts that are able to take up DNA. Protoplasts were transformed with foreign DNA by polyethylene glycol (PEG)

**Table 1**  
**List of Transgenic Creeping Bentgrass Lines Produced by Particle Bombardment**

Cultivar	Particle Bombardment Number	2.0 mg/ml Herbicide	Tissue* Clone	Phenotype
Emerald	1 14-3	3	EB.5	erect
	2 14-4	1	EB.5	erect
	3 14-18	14	EB.5	erect
	4 16-27	—		
	5 19-15	5	EBmm	creeping**
Southshore	1 16-24	4	SSB.2	petite
	2 19-25	8	SSB.2	petite
	3 19-28	20	SSB.2	petite

\*Each clone derived from one seedling

\*\*Creeping phenotype is equivalent to w.t. of two cultivars



*Herbicide resistance of transgenic plants and controls at an application rate of 2 mg/ml Herbiace. Plants were photographed two weeks after herbicide application. Resistant plants remained green, while others and controls were killed.*

treatment. PEG is used to enhance the uptake of DNAs. We have developed a system for culturing the protoplasts back to cells and subsequently to embryogenic callus cultures which then form plants by regeneration.

Transformed protoplasts were treated with herbicide 16 days after protoplast isolation, and resistance colonies of cells were detected about 3-4 weeks after selection. Plants were regenerated after transfer of resistant colonies to regeneration medium and, once rooted, were transferred to soil. It takes about 5-6 months from protoplast isolation to the production of transgenic plants in soil.

### Greenhouse Herbicide Tests

All regenerants were treated with Herbiace. Rates were determined by applying different concentrations of Herbiace to control plants by painting with a brush. Herbicide at 2 mg/ml was used, as this led to plant death in susceptible hosts in all cases. The herbicide was applied at 120 ml/flat (24 plants/flat).

Creeping bentgrass clones resistant to Herbiace were obtained from three cultivars: Emerald, Southshore, and Cobra (Figure 4). Table 1 lists the herbicide-resistant creeping bentgrass lines produced from the biolistic bombardment experiment. In five experi-

ments, involving 12 independent bombardment events, some 900 plants were regenerated for testing. Of these, 55 plants survived. The transformation frequency for herbicide-resistant plants ranged from 0% to 13.7%. Thirty Cobra plants were obtained in 3 later bombardment experiments.

Cobra transgenic plants were also obtained from protoplast transformation. A total of 153 plants were regenerated from 2 resistant colonies obtained through protoplast transformation. All these plants survived the 2 mg/ml spray rate. More than 200 transgenic plants of Emerald, Southshore, and Cobra survived 2 mg/ml herbicide spray in greenhouse tests and are resistant to 5× the field rate.

### Field Test

We conducted the first field test of herbicide-resistant creeping bentgrass in the USA in the summer of 1994 (Figure 5) at Rutgers' Research and Development Center in Bridgeton, NJ. A field test permit was obtained from USDA-APHIS. Transgenic plants from bombardment experiments of Emerald, Putter, and Southshore were tested for resistance to the herbicide Ignite at 1× (0.75 lb AI/A) and 3× (2.25 lb AI/A) the label rate (1.5-4 fluid ounces per gallon of water).

All plants that survived the 2 mg/ml greenhouse test were completely resistant to both 1× and 3× the field rate (Figure 6) in the field test. They remained green and unaffected like untreated plants in the control plot. No control plants (Emerald, Putter, and Southshore plants from seeds) survived. More than 30 (3 tissue clones) Emerald and Southshore creeping bentgrass lines are resistant to 3× the field rate.

The resistant transgenic plants will be vernalized in the field and will be moved to a containment greenhouse next spring for pollination and seed production to determine the inheritance of herbicide resistance. Suitable resistant clones will be used as parents in a traditional breeding program before a resistant cultivar is made available commercially.

### Implications

Ignite-resistant creeping bentgrass will be most useful in new golf course construction and for keeping unwanted species out of golf greens and fairways. Ignite will control undesirable grasses such as *Poa annua* at a very low rate but will not affect the transgenic bentgrass. The availability of a safe and biodegradable herbicide, such as Ignite, to deal with weed problems will aid superintendents and their staffs.

Our success in obtaining herbicide-resistant creeping bentgrass through transformation also provides us with a selection tool for introducing other agronomically important genes into turfgrass. We have inserted genes (such as chitinases) for resistance to fungi and are analyzing their expression in bentgrass plants. Transgenic turfgrass with enhanced disease resistance will require less use of fungicides. We believe herbicide-resistant and disease-resistant turfgrass cultivars will be available to the golf course industry in the near future.

We would like to acknowledge the United States Golf Association, the New Jersey Commission on Science and Technology, and the Center for Interdisciplinary Studies in Turfgrass Science for their support of this work.

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# THE TRASH BIRD

by RONALD G. DODSON  
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of New York State, Inc.

**G**ARBAGE! Junk! Trash! Three little words that do not necessarily conjure up visions of beauty. To most people garbage means work, a mess, a foul smell, and "I don't care what you do with it. Just get it out of my sight."

"Now, what," you might ask, "is *Sturnus vulgaris*, and what has that got to do with garbage?" Well, *Sturnus vulgaris* is the scientific name of the European starling, and I think that the attitude most people have about the lowly starling is the same attitude that we have about garbage.

Ask practically anyone what their favorite bird is and I'd be willing to bet a sizable sum of money that it would be a long while before anyone said, "I like starlings." In fact, it is doubtful you would discover many bird watchers visiting their local landfill to watch starlings. Likewise, you would be hard pressed to find anyone who spends time pleasantly dreaming about their garbage and all of the great times they spent creating it.

Starlings take a bad rap because they are cavity nesting birds that have competed successfully with other more "beautiful" cavity nesting birds. This makes lovers of bluebirds mad, for example. Although starlings consume vast quantities of harmful insects and the seeds and fruit of invasive plants, they are also messy, produce young in unbelievable numbers, and have spread like wildfire to all parts of North America. From a historic perspective, it's interesting to note that starlings didn't even get to the United States by themselves. That's right! Someone from New York City in the mid-1880s decided that it would just be great if every bird that was ever mentioned in a Shakespearean play could be found in America. And the rest, they say, is history.

Just like the story of the starling, the garbage found packed up and sitting outside your door did not get there by itself, either. That's right — you did it. I did it. We purchased all kinds of stuff and threw away most of it. We complain about it. We worry about so many landfills that, just like star-



lings, are found in every corner of North America. But we are the reason the garbage and the starlings are here.

The next time you see a flock of starlings, just stop a moment and think, "We brought those birds here, and now we are mad that they have done so well." And, the next time

you get ready to purchase anything, think, "How much garbage am I going to create by buying this?" People say that hindsight is 20/20, and although the starlings are already here, remember that it's not too late to change — you haven't purchased tomorrow's garbage yet!

# SPRING NEWS NOTES

## 75 Years of the USGA Green Section

The USGA Green Section celebrates its 75th anniversary this year as the nation's chief authority regarding impartial, authoritative information about golf turfgrass management.

The Green Section involves itself in every phase of golf course maintenance and management. These activities include the control of diseases, insects, and weeds; the development of improved strains of turfgrass that require less water and are more resistant to pests and stresses, and the promotion of construction and maintenance practices that are environmentally sensitive.

The Green Section's **Turf Advisory Service** remains the focal point of activity. Each Green Section agronomist visits more than 130 courses annually. The worth of the program is evident: more than 95% of all TAS subscribers continue regular visits. The 1994 list of America's Greatest 100 Golf Courses compiled by *Golf Digest* featured 72 TAS subscribers, including 40 of the top 50.

Besides the TAS service, the Green Section maintains a variety of other programs. From 1983 through 1994, the USGA spent \$6.3 million on turfgrass improvement research projects at 22 universities throughout the country. This commitment to innovative research dates back to the Green Section's inception, when the USGA and the U.S. Department of Agriculture collaborated in research activities at Arlington Turf Gardens near Washington, D.C., the site where the Pentagon stands today. A majority of lawns in the U.S. today contain grasses developed in these programs.

The Green Section has become increasingly concerned about the effects of golf courses on people, wildlife, and the environment. That's why the organization committed \$3.2 million from 1991 through 1993 to underwrite university studies examining pesticide use, turfgrass benefits, and alternative pest control methods. The USGA has opted to continue these efforts with another three-year, \$1.5-million program.

The Audubon Cooperative Sanctuary Program for Golf Courses, a cooperative effort between the Green Section and the Audubon Society of New York State, promotes ecologically sound land management and conservation of natural resources in six categories: environmental planning, wildlife and habitat management, member/public involvement, integrated pest management, water conservation, and water quality management. More than 1,400 golf courses around the country have joined this effort.

More than two dozen facilities have already become fully certified sanctuaries in all six categories.

Finally, the Green Section remains a publisher of advanced, authoritative information. Foremost among these publications is this bimonthly magazine, *USGA Green Section Record*. We've also produced many definitive books, as well as conducted numerous seminars around the country regarding general golf-oriented topics.

Inquiries about the Green Section and its activities are always welcome. Write or call: USGA Green Section, P.O. Box 708, Far Hills, NJ 07931, (908) 234-2300.



Marty Parkes

## Parkes Named Manager of Communications

In filling a new position dedicated to promoting Green Section activities, Marty Parkes has assumed the position of manager of Green Section communications. He will work with Kimberly Erusha, director of education, to establish an effective program to communicate the Green Section's activities.

This program, no doubt, will include writing articles for *Golf Journal* and the *Green Section Record*, publications outside the USGA, writing non-technical summaries about Green Section research and other activities for use in response to general inquiries, and developing contacts with various publications and other media.

Marty joined the USGA in 1991 as manager of communications in the communications department. He later held the position of manager of publications in the same department before moving to the Green Section. He has published articles in a wide variety of publications, including *The New York Times*. Marty's communications background will be a valuable asset to the Green Section.

A Connecticut native, he graduated from Trinity College in Hartford with a Bachelor of Arts degree in economics in 1981. He also completed one year of graduate study in international relations at The London School of Economics and Political Science, in

London, England. Marty lives in Stewartsville, New Jersey, with his wife, Catherine, six-year-old daughter, Nicole, and one-year-old son, Trevor.



Michael T. Huck

## Huck Joins Green Section Staff

The Green Section is pleased to announce that Michael T. Huck has been named an agronomist in the Western Region. Huck, who possesses an extensive turfgrass management background with both warm- and cool-season grasses, joins agronomist Pat Gross and director Larry Gilhuly in conducting Turf Advisory Service visits throughout the Western states.

Mike has had extensive involvement with USGA specifications for green construction and possesses expert knowledge in areas as diverse as turf equipment service and repair, plus computerized irrigation control systems.

Most recently, Mike served as superintendent of The Mission Viejo Country Club, in Mission Viejo, California. He oversaw golf course and grounds maintenance of the 18-hole private club that is irrigated with reclaimed water. He also remained involved in the implementation of a master plan for remodeling this Robert Trent Jones Sr. design, while coordinating improvements such as expansion of teeing areas, reconstruction of sand bunkers, and many other aesthetic improvements.

Prior to his service at Mission Viejo, Mike completed a stint as director of grounds and golf course maintenance at Industry Hills & Sheraton Resort, in City of Industry, California. This 650-acre recreational complex is built upon a landfill site and received irrigation from effluent water sources.

Mike graduated in June of 1982 from California State Polytechnic University, in Pomona, California, with a Bachelor of Science degree in ornamental horticulture. His work in the USGA's TAS will include course visits in Arizona, California, Nevada, Colorado, and Utah. He will share office space with Pat Gross in Lake Forest, California, while Larry Gilhuly works out of the Western Region office in Gig Harbor, Washington.

## ALL THINGS CONSIDERED

# Turn Off The Faucet!

by PATRICK GROSS

Agronomist, Western Region, USGA Green Section

**M**ANY WOULD ARGUE that overwatering has ruined the American game of golf. This is not necessarily the fault of the golf course superintendent, since most golfers put a higher priority on green color than on optimum playing conditions. If there are a few dry spots on the golf course, you can be sure the superintendent is going to hear about it — and boy, is he going to hear about it!

Superintendents come under heavy pressure to produce greens that will hold a shot, and to ensure green conditions on the tees, fairways, and rough. This unfortunate demand must be followed if superintendents expect to keep their jobs. Overwatering starts a vicious cycle that begins with large ball marks, spike marks, and wheel rutting caused by golf carts and mowing equipment. This is followed by soil compaction, shallow rooting, algae, moss, weed encroachment, black layer, and disease development. The grass is in a constant state of stress and the only way to keep it alive is to syringe, water, and spray fungicides.

Irrigation practices influence how the game is played. Soft, overwatered conditions force the game to be played in the air. There is very little roll on the fairways or opportunities to play bump-and-run shots. Greens are now expected to be like dart boards — if you hit the target, it should stick.

A valuable, but short-lived, lesson was learned during the recent drought and water shortages in California. Several golf courses were forced to shut off the water for an extended period of time during the hot summer months, and could only hand-water greens. Some remarkable things happened. The lack of water caused the rapid demise of *Poa annua*, and the more drought-resistant turf varieties, such as bermudagrass and creeping bentgrass, persisted. Moisture-loving weeds disappeared, and people were amazed at how long the turf survived with little or no water. But after one year of above-normal rainfall, the greed for green was once again apparent.

What was actually learned as a result of water restrictions and drought? Apparently, not much. Drought will continue to be a



cyclical event in many parts of the country, especially in California, and it will be increasingly necessary to use water resources wisely and responsibly. Researchers and turfgrass breeders have developed grasses that use significantly less water, but green committees and superintendents have been reluctant to try these grasses on their golf courses. It seems nobody is willing to make a change unless they are forced to do so.

New equipment and technology will always rise to the occasion. Soil amendments, better fungicides, state-of-the-art irrigation systems, and sand-based greens are

tools to promote healthy and consistent turf growth; they are not a license to overwater. Green color can be maintained through careful fertilization and well-timed cultural practices, without excessive irrigation. The result will be a much more durable and vigorous turf than one that gets its color primarily from water. For the good of the grass and the good of the game, it is time we tolerated a few dry spots and put playing quality above green color. Take a careful look at your priorities and watering practices, and don't be afraid to turn off the faucet if you need to.

# TURF TWISTERS

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## A FAVORABLE CUSHION

**Question:** We completed a bermudagrass greens renovation program last year. Although we have excellent turf density and putting quality, the greens are firm and the golfers are unhappy with the difficulty in holding approach shots. What's the answer? (Florida)

**Answer:** Be patient! While everything is great on the surface, a period of no less than two full growing seasons is necessary with bermudagrass greens to develop a mature turf. A favorable cushion immediately below the surface of the greens must be given time to develop to provide the degree of turf resiliency for desirable shot-holding characteristics. Remember, you can't rush Mother Nature.

## ORIENTS

**Question:** Several of our tees are oriented in a manner that directs a drive well away from the intended landing zone. The employee who sets the hole locations and tee markers has a difficult time aligning the markers. As a result, many of the high-handicap golfers have trouble lining up their tee shots. Any suggestions? (Indiana)

**Answer:** Some people have a natural aptitude for aligning tee markers and others need all the help they can get. Build a large "T" from wood or irrigation pipe. Place the "T" upside down on the tee box turf. Point the base of the "T" towards the intended landing zone. Place the tee markers just off each side of the horizontal base. The results: perfect alignment. This device can be a bit unwieldy, but it makes an excellent training tool for new employees.

## THE PURPLE MARTIN HOME

**Question:** A purple martin house was installed several years ago on our golf course, but we have had no success in attracting these beneficial birds. What can we do? (New York)

**Answer:** The dimensions and location of the nest box must meet specific criteria. Check your nest box to make sure the dimensions include an overall house size of 25" x 25" with 6 to 30 rooms. The rooms should measure 6" x 6" x 6", and the entrances should be 2" to 2¼" in diameter. The nest box should be located in an open area 30' - 40' from trees and buildings, and near water if possible. Paint the house white to make it more visible, and be sure to clean out any previous nesting material. You may be more successful keeping out competitor birds by keeping the entrances plugged until May. In New York, purple martins should return about mid-May. Dates differ across the country. Contact the Purple Martin Conservancy Association at (814) 732-2610 or your local birding groups for more information.