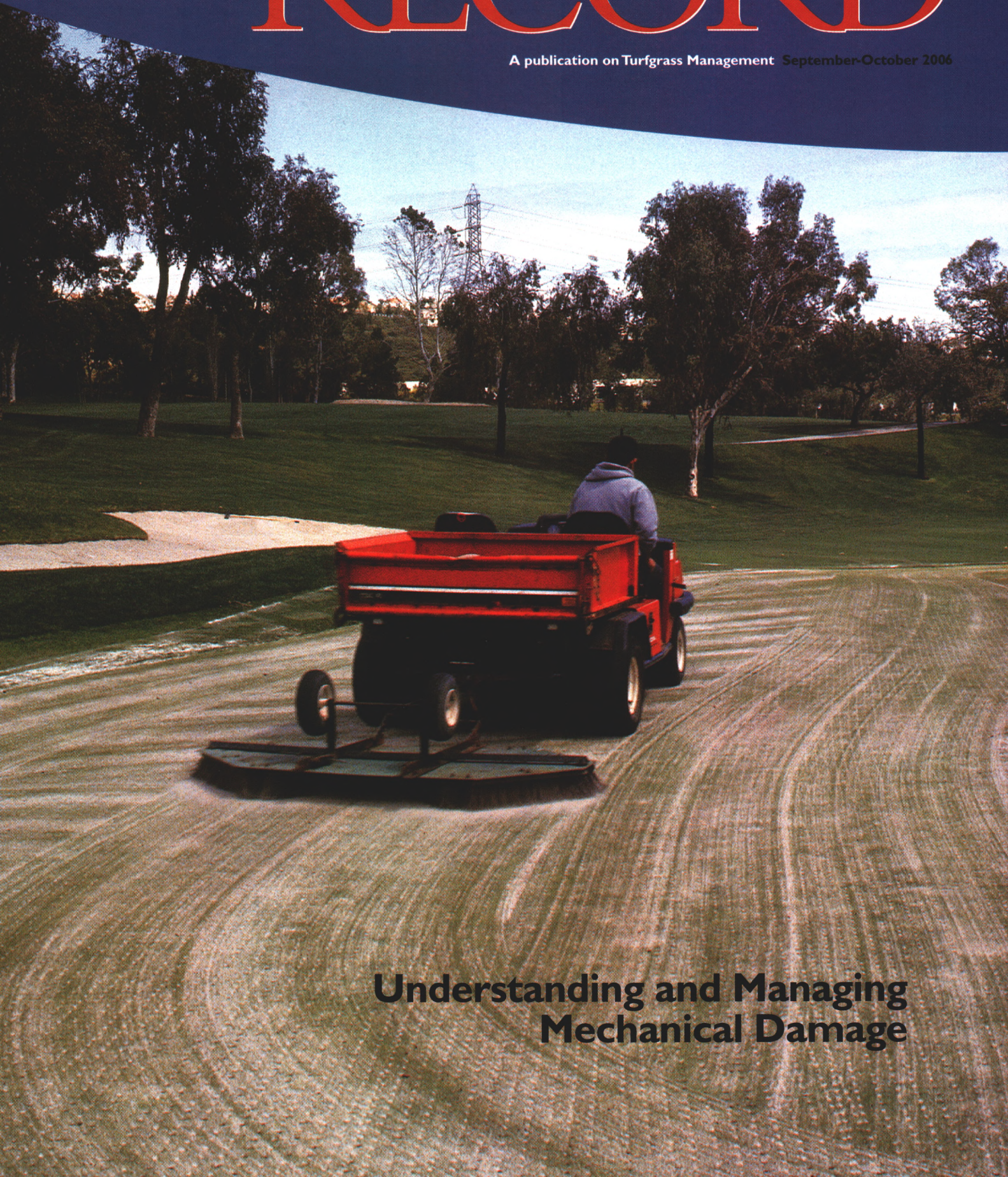


USGA GREEN  
SECTION

# RECORD

A publication on Turfgrass Management September-October 2006



**Understanding and Managing  
Mechanical Damage**



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September-October 2006 Volume 44, Number 5



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Mechanical damage to putting greens can occur in multiple direct and indirect forms. An understanding of this problem is necessary to minimize the potential damage.



# Understanding and Managing Mechanical Damage

Are you hurting your greens without knowing it?

BY STANLEY J. ZONTEK

**W**hat is mechanical damage? Most turf managers probably would say, "It's when I scalp the grass." They are correct. Scalped turf is the easiest form of mechanical damage to see and understand. However, there are other less obvious forms of mechanical damage that can be just as injurious to the turf, especially over time and in conjunction with other forms of stress.

Direct and indirect forms of mechanical damage are becoming an increasingly widespread problem worldwide on putting greens. For whatever reasons, golfers are demanding lower and lower mowing heights to achieve faster green speeds, and they want these speeds on a regular basis. Once these maintenance levels are achieved, it's hard to go back.

Most people are oblivious to the consequences of closely cut greens on a daily basis. Here are several definitions and some historic background on the problem of close mowing and the resulting subtle form of mechanical damage many turf managers now face.

## MOWING HEIGHT TIMELINE

A number of timelines have been published over the years showing how mowing heights have gradually been getting lower. Suffice it to say, the traditional mowing height for golf greens in the 1950s to the early 1970s was  $\frac{1}{4}$  inch (6mm) to  $\frac{3}{16}$  inch (5.5mm).

Things began to change in the late 1970s with the development of the Stimpmeter. This device was originally developed by Edward Stimpson, a volunteer for the Massachusetts Golf Association, to help locate holes on greens at courses hosting their tournaments. Measuring green speeds was a secondary consideration. Over time, the intent obviously changed, and an unintended conse-



Triplex ring is a classic example of mechanical damage.



quence has occurred. Stimpmeter readings for putting green speeds have become the measure of how golfers perceive what is “quality” in a putting surface. There is a mistaken belief that the faster the green, the better it is.

We all know this oversimplifies a complex issue. What is not in dispute is the effect this attitude has had on green speeds and on the gradual reduction in putting green mowing heights over the past three decades. There are huge consequences from today’s ultra-low mowing heights. When will it end? The first step is to recognize the problems associated with mowing greens as closely as possible on a daily basis. The second step is to manage the grass to minimize mechanical damage.

The gradual reduction in mowing height took some years to occur, and today’s mowing heights are commonly  $\frac{1}{8}$  inch (3mm), with  $\frac{1}{10}$  inch (2.5mm) or lower on golf courses striving for championship conditions on a daily basis. The agronomic consequences from today’s ultra-low mowing heights are significant, especially when combined with continuous daily mowing, periodic groomings, topdressings, double and triple cuttings, etc., along with other stresses, including low putting green fertility and the weather extremes many regions of our country now seem to be experiencing.

The elements are in place for the greens on many of today’s golf courses to be weakened, albeit in a slow, gradual manner. This makes greens, especially older greens with early-generation grasses and *Poa annua*, more susceptible to disease, insect injury and weed problems.

## SOME DEFINITIONS

**Direct Mechanical Damage.** In simple terms, it is often scalped grass. This is an acute form of turf injury. This type of damage can occur when:

- The mower is not properly adjusted.
- The mower is damaged or falls out of adjustment.
- The grass becomes soft and puffy due to hot, humid, and wet weather, and/or when the grass is over-fertilized.
- The grass “rebounds” from growth regulator applications.
- The mowing height is lowered and mowing frequency is increased for special events.

Again, direct mechanical damage can easily manifest itself as scalped grass, which is easily recognized. Corrective action, including raising

mowing heights, mowing less often, and beginning a recovery process is usually quickly implemented once the damage has been seen. After all, even the average golfer can recognize scalped grass! It is the indirect and more subtle forms of mechanical damage that are much harder to understand, diagnose, and appreciate.

**Indirect Mechanical Damage.** This is much more subtle way to weaken and injure the grass. Whereas the effects of direct mechanical damage (scalped grass) are easy to see and correct, the effects of indirect mechanical damage are almost never seen. This makes it much more difficult to realize that something is going wrong.

This type of injury is more common on older golf courses, especially compared to newer golf courses that have modern sand-based greens and new-generation grasses growing on them. Almost all of these new grasses were bred and developed to better tolerate the lower mowing heights common today. They are dwarf grasses, having greater plant density, finer blades, and greater tolerance to lower mowing heights. It can be unrealistic to compare old vs. new courses, but unfortunately it is done all the time. This contributes to indirect forms of mechanical damage.

**Predisposition.** Predisposed turf is weakened turf. The grass can be weakened by one of a long list of factors by itself or working in conjunction with other factors. It generally is recognized that once the grass plant or stand of grass has been predisposed or weakened, it suffers from reduced disease resistance, lower thresholds for nematodes, shallower roots, reduced turfgrass vigor, slower recovery/recuperation from traffic and other injury, reduced tolerance to heat, drought, shade, poor drainage, and poor grass growing environments associated with poor air circulation.

Turf predisposed by mechanical damage can also be more easily invaded by moss, algae, and weed grasses like *Poa annua*, crabgrass, and goosegrass. Weakened turf lacks color and density and looks unhealthy. Predisposed turf, once infected with a disease, does not always respond well to fungicides. Thus, disease control is harder to achieve.

Predisposed turf almost never occurs at reasonable mowing heights and when a good putting green maintenance and management program is in place. This problem of predisposition is becoming a common occurrence on turf cut at low to ultra-low mowing heights. True, some grasses growing in some soils in some parts of the



country and under some careful (and expensive) maintenance practices can tolerate many predisposition factors. However, this is true Management On The Edge.

## SHORT-TERM OPTIONS

An important role of a golf course superintendent is to know when to be *aggressive* in terms of mowing heights, green speeds, and overall putting green maintenance, and, equally, when to be careful and *conservative* in managing the grass on the course. The average golfer or course official sometimes does not appreciate this important fact.

Following are a number of options golf course superintendents and the management team should consider when managing direct mechanical damage.

**Prevention.** It is important to recognize that mechanical damage generally is a problem only on closely mown turf, and its effects are preventable. That is, to an extent, it is possible to prevent the grass plant from becoming predisposed and weakened. Do the obvious.

- Establish reasonable mowing heights and mowing frequency *for the grasses you have*, not for some other course to which you might be compared.
- Exercise good water management. Do not over-water, and maintain reasonable surface and internal drainage.
- Grow healthy grass. Provide the turf with enough hours of sunlight, good air circulation, drainage, and enough balanced fertility, etc.
- Manage the zone of organic matter accumulation. Topdress and surface aerate frequently, at least once a month, to encourage root growth, promote water movement in the soil, relieve surface compaction, and allow the soil to breathe.
- Modify the soil in greens that were not built well. Core aerate to remove the old soil, topdress with sand to fill the holes, and maintain a good topdressing program. Deep aeration can also benefit old, tight, and slow-draining soils.
- Apply plant protectant chemicals when necessary to control damaging diseases, weeds, and insects. These chemical applications can also include commonly used plant growth regulators that maintain healthier, denser, and slower-growing grass.

Thus, the first step in managing mechanical damage is to prevent it from happening in the first place. Some might call this Common Sense



Turfgrass Management. It is not cutting edge, but it works.

## MANAGING STRESS

Once the grass is under stress, there are many options the turf manager can consider to relieve stress and encourage turf recovery.

- **Raise Mowing Heights.** Oftentimes, this is the first thing to do. And although it also is the simplest, easiest, and most cost-effective option, it is sometimes the most difficult for golfers to accept.
- **Mow Less Often.** When weather extremes occur or when casual water exists on the surface of a green, raise mowing heights and defer mowing until the grass and soil can tolerate the traffic. Mechanical damage almost certainly will occur when the mowers are pushing water as they attempt to cut the green.
- **Roll Greens.** Rolling a green rather than mowing a weak or wet green may be a good compromise to maintain smooth greens with good speed without damaging the grass. Research has shown that rolling greens up to three times per week has little long-term effect on the grass or soil.
- **Growth Regulators.** Various plant growth regulators, including Primo (Trinexapac-ethyl), Trimmit, TGR (Paclobutrazol), and Cutless (Flurprimidol), are commonly used tools to help achieve healthy grass at higher mowing heights and smooth, fast greens. Slower growing, chemically dwarfed grass, in theory, may allow higher

Mowers must be carefully adjusted to avoid direct mechanical damage. A new, heavier walk-behind greens mower was used. Although the settings were the same, the result was scalped turf.





When expanding the putting green, extra care must be taken to avoid injury caused by scalping.

cutting heights and less-frequent mowing. Contact your regional USGA agronomist, university turfgrass extension specialist, or company technical representative for more information.

- **Topdressing.** A dedicated program of light, frequent topdressing creates a situation where the grass plant grows upward through this topdressing as it accumulates. This can insulate and protect the important growing points of the grass, its stem and crown. When the grass grows through the topdressing, the mower clips the grass blades, not the stems and crowns. This helps avoid scalped turf. Topdressing also helps manage surface organic matter and any puffiness, if or when it develops. Topdressing is a form of preventative maintenance, but improperly scheduled summer topdressing has the potential of creating its own form of mechanical damage. Be careful.

- **Balanced and Adequate Fertility.** The grass plant needs a balance of nitrogen, phosphorus, and potassium in general ratios of 4-1-2, 3-1-2, or even 4-1-4, and soil tests remain the best tool to monitor soil fertility levels. At one time, it was a trend to maintain “hungry grass.” Today, there is the realization that this practice can be taken too far. Putting greens need adequate fertilization. Some diseases, including anthracnose and dollar spot, are recognized as being diseases associated with low nitrogen use. Contact your local USGA agronomist or university turfgrass extension specialist for unbiased answers to your fertility questions.

- **Spoon Feeding.** The application of light amounts of fertilizer sprayed onto the grass is a good way to manage plant growth in the summer and stimulate recovery of damaged, stressed turf when bad weather conditions subside. Biweekly, weekly, or sometimes even twice weekly applications can be scheduled.

- **Aeration.** It might seem counterintuitive, but aeration can be a good tool to manage mechanical damage! Remember that grass roots grow in the soil in the presence of air. Tight soils with few large pores restrict rooting. Also, water drains through the soil in these same large pores. Shallow-rooted surface growth is inherently more prone to mechanical damage. Aeration in conjunction with topdressing helps alleviate this condition.

- **Proper Irrigation.** Do not over-irrigate or severely under-irrigate the grass. Although drier grass and soil are always preferred, there needs to be a balance between too much and too little soil



water. One extreme is wet wilt from too much water in the soil, and the other extreme is dry wilt from too little water in the soil. When grass is cut while it is under wilt stress, be it dry wilt or wet wilt, mechanical damage can result.

- **Defer Regular Maintenance.** That is, if you suspect the grass is being stressed due to weather extremes, close mowing, double or triple cuttings, too much topdressing, aggressive grooming, etc., don't add extra stress. Defer these treatments. Trust your agronomic intuition and common sense. Be conservative. Defer maintenance in the short term until the stress period passes and the turf is healthier and better able to handle this maintenance.

- **Communicate.** Direct and indirect forms of mechanical damage on the golf course are not problems for the golf course superintendent to endure quietly and alone. There needs to be good communication within the management of the golf course. People want to know how their course is doing. Post notices and keep the golf shop, course administration, and decision makers informed. Emails, course newsletters, and course websites are all effective communication vehicles. This helps bring everyone "into the loop" so informed decisions can be made on what is best for the course.

The goal of all this work is to manage your existing greens without major regrassing or reconstruction. In essence, you are "working with what you have."

## LONG-TERM OPTIONS

An increasing number of older golf courses recognize the fact that the soil in the greens is not good, green sizes are too small, green contours and slopes are too severe, and the grass the staff is trying to grow on the greens is a problem. It's a fact. In most regions of the country, modern sand-based greens are better than older soil-based greens. New and better grasses have been developed to tolerate closer mowing and have better density, better rooting, finer leaf blades, and improved disease and stress tolerance.

- **Putting Green Regrassing.** Many courses choose to regrass existing greens. This occurs when the base soil in the greens is deemed acceptable, when the greens enjoy classic design with subtleties in movement, when climatic stress factors are deemed less

severe, etc. The goal of regrassing is to replace early-generation grasses with newer varieties without a complete reconstruction of the greens. For guidance on regrassing vs. reconstruction, consult your regional USGA agronomists or other courses in your area that have regrassed.

- **Putting Green Reconstruction.** Many scenarios can lead to the conclusion that it is time to rebuild old greens to modern specifications. Turf managers need to discuss the pros and cons with their owners, course officials, consulting architects, and their USGA agronomists. New grasses and new fresh soils are not panaceas, but they are better in many ways.

## CONCLUSION

Historically, when greens were being cut at  $\frac{1}{4}$  inch (6mm) or even at  $\frac{5}{32}$  inch (4mm), lowering the mowing heights a few thousandths of an inch seldom produced many ill effects to the grass. Today, this has changed. Our ultra-low mowing heights have themselves become a stress factor that can trigger all kinds of problems that can threaten the health and playability of greens. There is little margin for error with today's low mowing heights and high golfer expectations.

STAN ZONTEK is director of the USGA Green Section's Mid-Atlantic Region.

Poorly timed verticutting can result in direct mechanical damage to the putting green turf.





# Perfecting a Good Relationship with Your Green Chairman

At Merion Golf Club, as at all clubs, the rapport between superintendent and chairman is critical.

BY WILSON GREENWOOD, JR.



Golfers will surely notice this effort to eliminate coarse-textured tall fescue from the bunker bank. Make sure your green chairman knows why this is being done, as he will be the one who fields questions from golfers.

**T**he history of most 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 greater mistakes still, and so it goes." This statement was written about 1930 by Alistair Mackenzie and is referred to regularly on Web sites and in articles as the reason for the growth of restoration projects, tree programs (out, not in!), and many other capital projects at clubs throughout the country.

At the Golf Industry Show this year, Dr. Joe Duich of Penn State University received the Old Tom Morris Award for service to the industry. His comments were enlightening and educa-

tional about the history of turfgrass education and tie directly into Dr. Mackenzie's quote. In 1930, the same year in which Mackenzie was bemoaning the problems with managing by committee, the basis for turfgrass education at Penn State was created during a visit to the campus by Joseph Valentine, the greenkeeper at Merion Golf Club. He recognized the need for a formal educational program for turf management, and look where we are today!

Is Alistair Mackenzie's quote still accurate? Sure, but not nearly as much as it was then because of the success of these programs. Can it be better? Absolutely, and the key ingredient is the relationship between the Green Chairman and the Superintendent.

## DOES THE SUPERINTENDENT NEED A GREEN CHAIRMAN? YES.

You need an advocate on the Board, and the Board wants a contact person. The members want their questions answered and everybody wants to know what's going on. The superintendent wants feedback from the membership, his eyes and ears in many ways, and finally, you need someone to talk to. This is a high-stress responsibility in every way, typically under-funded and interfered with by Mother Nature. You need a Green Chairman and, for both of you to be successful, you need to manage this relationship as effectively as you do your employees.





Superintendent Matt Schaffer shows Green Chairman Bill Greenwood the bermudagrass contamination that needs to be eliminated from this bunker bank.

How do you make your “boss” aware of the breadth of your responsibility? To start with, I suggest an inventory, but of the real estate and people, not bags of fertilizer.

Example:

- 4.5 acres of greens
- 3 acres of teeing ground
- 22 acres of fairway
- 60 acres of rough
- 4,796 feet of stream bank
- 1.7 miles of roadside
- Over 100 bunkers
- 290 rakes

Plus 46 Green Department

Employees:

- 7 full-time employees
- 14 seasonal
- 18 temporary
- 7 interns

Agronomic program management, landscape management, human resource

management, and training programs all rolled into one. You’re *not* finished! How about your boss?

He comes to your office on the way to play golf. He wants to enjoy the club, the course, and his interaction with fellow members. He doesn’t speak your language, but he’s more likely to be asked a technical question by a member than you are. And many times he’s been put into the job *after* all of the planning for the current year. How do you get your relationship up to speed, and quickly?

### PLAN TO COMMUNICATE

He comes to your office; you don’t go to his. Keep your office clean and neat. Make it as inviting as you can. Make sure there is a dry-board or chalkboard handy where you can discuss concepts, agronomic or otherwise. Be certain that the seating is clean and comfortable, and that includes your cart. Provide the Chairman with a mail bin where he can pick up mail, memos, or articles of interest. Keep interesting things in sight, like seed samples, drawings, or plans. This can stimulate conversation.



Make sure your chairman knows about your efforts to be a good steward of the environment. Here, clippings and other debris are removed from the wash water and are degraded. The water stays in the system and is recycled.





An occasional tour of the course allows the green chairman to learn more about on-course activities. In this case, two sand storage platforms are being built in key locations to facilitate easy replenishment of sand for topdressing fairways.



Your green chairman likes to know a little about the club's equipment and other facets of the maintenance program. Take him on a tour of the maintenance facility sometime.

## REMEMBER THAT HE'S THERE TO PLAY GOLF

Before getting started, ask what his time schedule looks like. Don't start something that you can't finish. Likewise, let him know if there is anything on the course or around the clubhouse that is less than perfect. Somebody is going to ask, so give him answers to the likely questions.

## GREEN CHAIRMEN DON'T DO HOMEWORK

It is a non-credit course! Present situations or problems for discussion with some prepared alternatives, even if you think they might not work. This will help quicken the pace of the discussion.

## HE DOESN'T SPEAK YOUR LANGUAGE

Every business has its own acronyms, and turf management is no different. Educate your Chairman about some of your favorites. Discussing weed identi-

cation and cutting height is an excellent way of sharing the scope of your responsibility and the technological advances of your industry.

## HELP THE CHAIRMAN DEFINE HIS ROLE

Everybody wants to be successful. Help your chairman understand what you need. You are the only one getting paid.

- Ask for clear, understandable goals.
- Show your Chairman how you manage members of your department.
- Ask your Chairman to help you with the evaluation process.
- Ask your Chairman how the Committee will evaluate your performance.
- Ask your Chairman what he or she needs.
- Follow through on promises.
- Use e-mail, the phone, or even regular mail to communicate.
- Start discussing next year's goals in August, not January!

## HELPFUL HINTS FOR MANAGING UP

Whenever possible, give credit to others. Make your Chairman a winner, and at that critical budget meeting you'll have a seat at the table. Communicate to your members through the Green Chairman.

Make sure that your résumé is kept up to date and that your Chairman has a copy. It's the easiest and most complete way of letting him know who you are. Likewise, ask him for his résumé or at least a verbal discussion about who he is. The more the two of you know about each other and how you got there, the more likely the chance for success. After all, your relationship will set the standard for you, your employees, and the entire membership.

*WILSON GREENWOOD, JR., is an account executive with Altus Partners, Inc., and First Vice President, Board of Governors, and Green Chairman of Merion Golf Club, in Ardmore, Pa.*



# Customized Cultivation

What is the goal of your cultivation program? The most effective long-term benefits are achieved from customized cultivation.

BY BOB VAVREK



Cultivation . . . the word is derived from the Latin word *cultus*, to till. Cultivating or tilling the land became important long ago when prehistoric people evolved from nomadic hunter-gatherers to farmers. Indeed, cultivation was around long before golf courses. How long? References regarding cultivation can be found very early in the Bible (Genesis 3:23).

There aren't many references made about cultivation in early turf management publications. Authors of the few early references were generally skeptical about the benefits of cultivating established turf due to the potential damage to root systems and disruption of the playing surface.

Over time, the importance of modifying soil structure to improve growing conditions for turf became apparent to astute observers like Tom Mascaro. He invented and patented the first aerifier for turfgrass in 1946 and the verticutter in 1952, tools to remove thatch from greens. The need for more aggressive cultivation equipment coincided with the increasing popularity of golf

and heavier play on old soil-based greens. Since then, play and the use of motorized carts have increased dramatically. Consequently, the importance of developing a sound cultivation program is greater than ever.

Today's playing surfaces need to be cultivated for two primary reasons. They are affected either by compaction or excess organic matter (OM) accumulation. When one of the primary problems occurs, many secondary problems are sure to follow. For example, severe soil compaction can lead to weed encroachment, decreased root growth, low soil oxygen, poor drainage, and wet spots. Excess OM can lead to black layer, puffiness, scalping, localized dry spots, footprinting, and shallow rooting.

Turf managers often treat the symptoms of compaction and excessive OM accumulation and tend to ignore the primary problem. For example, raising the height of cut to alleviate scalping across a thatchy playing surface reduces stress to the turf but does not address the problem of excess organic matter accumulation.

## COMPACTION

Soil compaction causes an increase in bulk density (mass/unit volume) due to a decrease in soil porosity. Pore space is necessary to get oxygen to the roots, hold water for the turf, and aid rooting. Foot traffic, cart traffic, construction traffic, and maintenance equipment traffic are the common causes of compaction on golf courses.

There is never a shortage of compaction at popular, heavily played courses. When traffic becomes concentrated, compaction increases, particularly when soil is wet. Tees, fairway turf adjacent to bunkers, and turf along the entrance and exits to greens are often affected by compaction. Initial golf course construction and construction associated with renovation will cause localized compaction as well.

Standing water in the hole after moderate to heavy rainfall is an indication that greens would benefit from more aggressive cultivation. Deep-tine or deep-drill cultivation can improve internal drainage through old soil-based greens.





Water injection tends to fall in and out of favor among super-intendents. Limitations of slow ground speed and short-lived benefits are more than offset by its ability to relieve compaction and enhance water movement through the soil profile while causing relatively little disruption to the playing surface.

## EXCESS OM ACCUMULATION

Excess OM accumulation is a common cause for failure of or problems with new sand-based greens.<sup>1</sup> OM is constantly recycled into the upper rootzone of greens when shoots, roots, stolons, and other plant parts die back and are replaced throughout the season. Soil microbes decompose OM and under optimal conditions the rate of OM decomposition can keep pace with the rate of production. However, this rarely occurs on a golf course, where watering, high inputs of nutrients, shade, climate, and other factors either increase tissue production or inhibit microbial degradation.

New ultra-dense varieties of bentgrass and bermudagrass are especially susceptible to excessive OM accumulation due to high shoot density and their ability to grow a deep, dense root system in a sand-based rootzone material. Working topdressing into a tight canopy of turf is a challenge, and much of the sand can be removed with the clippings. Undiluted OM will quickly clog pore space and make the surface of the new greens wet and spongy. Excess moisture

at the surface creates playability issues, such as pitted ball marks and footprinting. Secondary concerns include moss/algae encroachment, scalping, black layer, and shallow rooting.

Excess OM is not difficult to diagnose; you can see it and feel it. A discrete dark, spongy layer in the upper soil that holds excess water is hard to miss, yet many turf managers are in denial.

Quantifying the amount of OM in the soil profile is another story. Different labs use different tests and unique methods for preparing a sample. Don't compare the results from one lab to another. However, measuring and comparing the OM content from healthy versus problem greens can be helpful and provide the baseline values needed to monitor the progress that occurs over time when cultivation and topdressing programs are modified.

## MAKE THE RIGHT CHOICE

Cultivation can help relieve compaction and manage OM accumulation. The key is to choose the right cultivation tool for the job . . . remember the classic line from the movies — “You don’t



bring a knife to a gunfight.” Far too often the least disruptive, and least effective, cultivation technique is used to minimize golfer inconvenience, with little chance of addressing the problem. The following outline can help guide you through the process of choosing the most appropriate form of cultivation. Keep in mind that serious problems generally require a serious and often disruptive remedy. OM buildup and compaction usually develop over a period of years, so it takes time for corrective management practices to begin to improve the condition.

## OM MANAGEMENT OPTIONS

### Highly Effective

#### Standard ½" - ⅝" hollow-tine cultivation

##### *Advantages*

- Removes organic matter from soil profile when cores are removed.
- One pass with ⅝" tines on 1.25" centers affects ≈ 13% of the surface.

##### *Disadvantages*

- Temporary surface disruption.
- Significant cleanup.
- Close center cultivation causes surface instability.

##### *Comment*

- Topdressing and rolling can alleviate post-cultivation instability.

#### Deep Scarification (Graden, Sisis, etc.)

##### *Advantage*

- Wide blades and close spacing can affect ≈ 11% of the playing surface.
- Removes significant amounts of OM.

##### *Disadvantages*

- Labor-intensive cleanup.
- Surface instability.
- Lines in greens distract golfers long after initial turf recovery.

##### *Comment*

- Ideal cultivation tool for sodded greens and new sand-based greens where excess OM is located near the surface.

### Effective

#### Carbide-Tipped Vertical Mowing

##### *Advantages*

- Capable of removing OM in the upper soil profile while causing minimal surface disruption.

- An excellent pre-treatment for greens before topdressing.
- Useful for management of ultra-dense bentgrass/bermudagrass.

##### *Disadvantage*

- Considerable turf thinning/injury.

#### ¼" Hollow-Tine Cultivation (Quadratinex)

##### *Advantages*

- Removes OM from the upper soil profile.
- Minimal disruption and rapid recovery.

##### *Disadvantage*

- Only affects 2% to 3% of the surface, depending on the spacing. Has limited impact with one treatment.

#### Deep-Tine Cultivation (Hollow Tines)/ Deep Drill

##### *Advantages*

- Deeper penetration than standard coring operations.
- Removes minimal OM from the soil profile.

##### *Disadvantages*

- Slow recovery following use of large-diameter tines.
- Affects minimal amount of surface.

##### *Comment*

- Should not be used as a substitute for standard hollow-tine cultivation where excess OM is a primary problem.

High-tech options for cultivation are great, but don't forget that plenty of simple, inexpensive, and effective cultivation equipment can be found on many courses.





## *Marginally Effective/Ineffective*

### **Standard Vertical Mowing**

#### *Advantage*

- Effective pre-treatment to topdressing greens.

#### *Disadvantages*

- Limited depth of penetration.
- Removes minimal amounts of OM.

### **Solid Tine/Water Injection/Air Injection**

#### *Advantage*

- Can create temporary channels through an OM layer to improve balance of air/moisture in the soil profile.

- Limited to no surface disruption.

#### *Disadvantages*

- Does not remove OM.
- Transient benefits.

Deep-tine aeration is commonly employed across greens, but this operation is just as effective across tees, fairways, and roughs.

### **Spiking**

#### *Advantage*

- Can improve balance of air/moisture in upper soil profile affected by excessive OM accumulation.

#### *Disadvantages*

- Does not remove OM.
- Transient benefits.

## **COMPACTION MANAGEMENT OPTIONS**

### *Highly Effective*

### **Standard Hollow-Tine Cultivation**

#### *Advantage*

- Leaving holes open will reduce bulk density when side walls collapse.





#### *Disadvantages*

- Relatively shallow depth of penetration.
- Surface disruption.
- Labor-intensive cleanup.
- Potential for hardpan development.

### **Deep Tine/Deep Drill**

#### *Advantages*

- Affects soil beyond depth of standard hollow-tine cultivation.
- Adjustable depth of penetration relieves/prevents hardpan development.
- Kicking action of deep tine fractures soil.

#### *Disadvantage*

- Limited ability for penetration into rocky soils.
- Slow operation.

### **De-compactors (Blec Ground Breaker, Verti-Quake, etc.)**

#### *Advantages*

- 8" depth of penetration.
- Capable of fracturing compacted soils between slits.
- Minimal disruption.

#### *Disadvantages*

- Limited availability.
- Limited effectiveness in rocky soils.

#### *Comment*

- Good potential for relieving compaction following fairway regrading/renovation work.

## **Effective**

### **Air Injection Tines (Sisis Aer-Aid System)**

#### *Advantages*

- 5" depth of penetration.
- Injects air through tines.

#### *Disadvantages*

- Availability of equipment.
- Limited effectiveness in rocky soils.

#### *Comment*

- New cultivation option from Europe.

### **Water Injection/Air Injection**

#### *Advantages*

- Deep penetration.
- Unaffected by rocky soils.

#### *Disadvantages*

- Cost of equipment/contract services.
- Slow ground speed.
- Short-lived benefit.



The most effective way to remove excess organic matter from the upper soil profile has not changed much over the years. Cultivate with hollow tines, remove the cores, and fill the open holes with sand.

## **Marginally Effective/Ineffective**

### **Solid-Tine Cultivation**

#### *Advantages*

- Can shatter soil under ideal soil moisture conditions.
- Speed, minimal disruption.
- No cleanup.

#### *Disadvantage*

- Potential for hardpan development.

### **Spikers**

#### *Advantages*

- Speed and minimal disruption.
- Low-cost equipment.

#### *Disadvantage*

- Minimal depth of penetration.

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BOB VAVREK helps superintendents customize their maintenance operations at courses across Michigan, Minnesota, and Wisconsin.



# Stream Restoration Project Hits 'Hole in One' at Delaware Golf Course

A deteriorating stream finds new life through the Ecological Restoration Program.

BY STEVE WILLIAMS

The 18-hole Three Little Bakers Golf Course is nestled in the Pike Creek stream valley of northern Delaware. It is located in an area that geologists refer to as the Piedmont Physiographic Province. For golfers who may be a little rusty on their geology, this term refers to an *uplifted area* in northern Delaware and

southeastern Pennsylvania where elevations reach as high as 400 feet above sea level. This elevated area of gently rolling hills not only offers some challenging fairway shots, but also provides the relief, or changes in elevation, that causes streams in the area to flow at accelerated rates, especially during storm events.

This relief, combined with the pressures from development and increased volumes of water entering the stream system with each rain event, has left a section of Pike Creek that flows through Three Little Bakers in need of some serious attention. For this reason the popular golf course caught the eye of the Ecological Restoration Team of

The lack of streamside vegetation to hold stream banks in place resulted in the undercutting of banks and the loss of fairway and trees.

Holes seven, 15, and 16 were impacted on the Three Little Bakers site.





Delaware's Department of Natural Resources and Environmental Control.

Ecological restoration, a proactive environmental movement that's been sweeping the country over the past several years, is a term that more people are hearing about. Typically led by state and federal governmental agencies and non-profit environmental organizations, the goal is to improve the overall quality of our watersheds. With the increase in commercial and residential development over the past two decades, the impacts associated with urban sprawl are starting to take a serious toll on the habitat, water quality, and stream stability in many suburban areas.

Several stream valleys in the northern part of the state are showing some of the tell-tale signs of environmental degradation. Jim Chaconas, an environmental scientist with the Delaware Department of Natural Resources and

Environmental Control, has witnessed some dramatic changes over the past ten years. "I have actually seen some of the stream channels migrate laterally up to five feet in some locations," said Chaconas. "Streams are dynamic systems that are constantly shifting and relocating sediments. The problem is that we see these events occur far too frequently and the streams have no time to reach a state of equilibrium. They are under constant pressure."

Some of the causes can be traced back to the rapid increase in impervious, or hardened, surfaces that are a byproduct of the overdevelopment of watersheds. More rooftops, driveways, roads, and parking lots mean less permeable surfaces available for rainwater to soak into. This causes the volume of surface water runoff associated with each storm event to increase, which in turn results in more water entering waterways at a much faster rate.

The rate at which the runoff is reaching streams, rivers, and even small creeks is resulting in excessive erosion, the destruction of habitat, and water quality degradation. Stream banks are being undercut, channel bottoms are being incised deeper, and large volumes of sediment are being released into waterways and redeposited further downstream.

In an attempt to improve the health of some of Delaware's waters, the Department of Natural Resources' Ecological Restoration Team has been actively restoring degraded rivers and streams since 2001. The first step in the process requires the team to evaluate the condition of the streams. Equipped with tape measures, survey rods, global positioning system (GPS) units, cameras, and scientific instruments, team members have hiked and boated more than 300 miles of streams in northern Delaware. After collecting and studying







Once a grassy field routinely mowed by the golf course maintenance staff (above), a one-acre wetland as created to establish wildlife habitat and filter water from neighboring developments before entering Pike Creek.



the field data, they were able to identify some of the most degraded stream segments in terms of stressed habitat, severity of eroded banks, and lack of streamside vegetation. One of the most stressed stream segments was found along Pike Creek in the area where it flows through the Three Little Bakers Golf Course.

Representatives from the Ecological Restoration Team approached Steve Segui, course superintendent at Three Little Bakers, and discussed some of the environmental issues related to the stream and the concept of stream restoration. Although a little cautious, his initial reaction was optimistic. “We were watching our fairway in the areas of holes seven, 15, and 16 literally disappear before our eyes with each major storm event. The banks were eroding at an extremely rapid rate,” said Segui.

Three Little Bakers golf professional Dick Matthias was in total agreement. “Finding a solution to stabilize the stream banks and improve the environmental conditions of the stream would be nothing but a win-win solution for everyone,” stated Matthias. But the next step was to sell the general manager, Jim Rose, and owner, Hugo Immediato, about the idea of stream restoration.

One can only imagine the look on Mr. Immediato’s face back in 2003 when representatives from the Department of Natural Resources told him that they “would like to apply some state-of-the-art fluvial geomorphological techniques to stabilize the rapidly eroding stream that flows through the golf course.” And if that wasn’t bad enough, they went on to say, “In some areas we want to actually relocate the stream channel.”

“Well, needless to say, the blank expression on his face said it all,” recalls stream restoration expert Vince Sortman with Biohabitats, Inc.

It took several more meetings, presentations, and a lot of educating to help Three Little Bakers management and staff understand what stream restoration was all about. In the end, Mr. Immediato was so excited about the potential outcomes that he willingly assisted with some of the expenses and also applied for grant funding offered by the U.S. Department of Agriculture’s Natural Resources Conservation Service.

As time moved forward, the restoration team became increasingly excited about the possibility of implementing a restoration project in this area because this watershed possessed a number of unique environmental features. It was part of the White Clay Creek water-





Before construction, the banks where the stream crosses the 16th fairway were lined with nondescript rocks known as “rip-rap” (above). The same area has been restored to a more natural state (left) using logs, tree stumps, boulders, and live-branch willow layering to stabilize the banks and create habitat for fish, macro-invertebrates, and other aquatic species. An added benefit is that golfers now enjoy the new look and sound of the revitalized stream.

shed, a designated National Wild & Scenic River System. It was one of the few trout-stocked streams in the state. It provided a habitat corridor in an area of dense development and a potential migratory corridor for the endangered bog turtle. But most importantly, it served as a source of public drinking water.

The team established several goals for the project, including: stabilization of the stream banks to reduce erosion, creation of habitat by putting in sequences of riffles and pools in the stream channel and planting the banks with a large number of native trees and shrubs, improving the water quality,

reducing the number of out-of-bank flooding events, and restoring and maintaining the natural features of the stream.

Over the next two years, the Ecological Restoration Team worked on obtaining the additional funds that were needed to cover the planning and construction costs. The services of Biohabitats, Inc., located in Timonium, Maryland, were secured to assist with the restoration design plans and construction oversight. Departmental personnel busied themselves with obtaining the necessary permits from a host of different federal, state, and local agencies.

By the time 2005 rolled around, everything had come together as planned, and it was time to secure a qualified construction company with experience in stream restoration. After evaluating several companies, the Department awarded the contract to Meadville Land Services, Inc., a mobile restoration company from northwestern Pennsylvania.

In early March 2005, Delaware Governor Ruth Ann Minner kicked off the project at a rainy groundbreaking ceremony, Department of Natural Resources Secretary John Hughes turned the first excavator bucket of soil, and it was time for Meadville’s crew to





go into action. Over the next six months they installed a series of meander bends to reduce flow velocities and a host of restoration structures that not only stabilized the banks and channel bottom but also maintained a natural look to the stream.

By late September, Meadville had restored 5,000 linear feet of Pike Creek, the largest stream restoration project ever undertaken in Delaware. In addition to restoring the stream, three acres of floodplain wetlands were created in several areas adjacent to the stream channel. The largest wetland complex was once a grassy field routinely mowed by the grounds crew.

The final phase of the project involved the planting of more than 3,500

native trees and shrubs along both sides of the stream. These plantings not only help hold the stream banks in place, but they will also eventually create a canopy over the stream. This will create better habitat and improve water quality by shading and cooling the water, resulting in increased levels of oxygen in the water column for fish and other aquatic species. Post-restoration biological monitoring will continue at the site to evaluate fish and macro-invertebrate communities and will be compared to pre-restoration data. This analysis will help determine the effectiveness of the restoration effort and will be considered when planning future projects.

The project took a lot of work and involved a number of partners, including Three Little Bakers, Christina Basin

Clean Water Partnership, U. S. Environmental Protection Agency, Delaware Department of Transportation, Natural Resources Conservation Service, New Castle Conservation District, Partnership for the Delaware Estuary, and the Department of Natural Resources and Environmental Control.

Was the effort worth it? Linda Stapleford, river administrator for the White Clay Creek Wild and Scenic River Program, gives the project high marks. "It has made a significant improvement to the stream and will have positive impacts to the ecological health of the White Clay Creek watershed," she said.

Jim Rose agrees, along with a lot of golfers who were able to watch the entire project unfold as the construction





(Far left) The Three Little Bakers restoration project serves as an excellent outdoor classroom for students, the general public, and environmental professionals.

(Left) There is nothing like the scenic beauty and sound of a babbling stream that came into existence when this sequence of step pools was constructed near the 15th green. It was created to allow for upstream fish passage that was previously impossible because of a concrete structure that existed across the stream channel.

(Below) The six-month-long construction phase was sequenced so that no holes were ever closed to golfers. The ball was always in play!

work was sequenced so that no holes were ever closed. "We are extremely pleased with the positive contributions this project has made to enhance Delaware's environment as well as what it has done to beautify our course, stabilize our stream banks, and create a more scenic and relaxing setting for the golfing community," Jim said. "It was so well worth all the long-term planning. This project is truly a 'hole in one'!"

*STEVE WILLIAMS works for the Division of Soil and Water Conservation and is the Ecological Restoration Coordinator for the Delaware Department of Natural Resources and Environmental Control, overseeing stream and wetland restoration projects throughout the state.*





# Overseeding Fine Fescue in Buffalograss Turfs

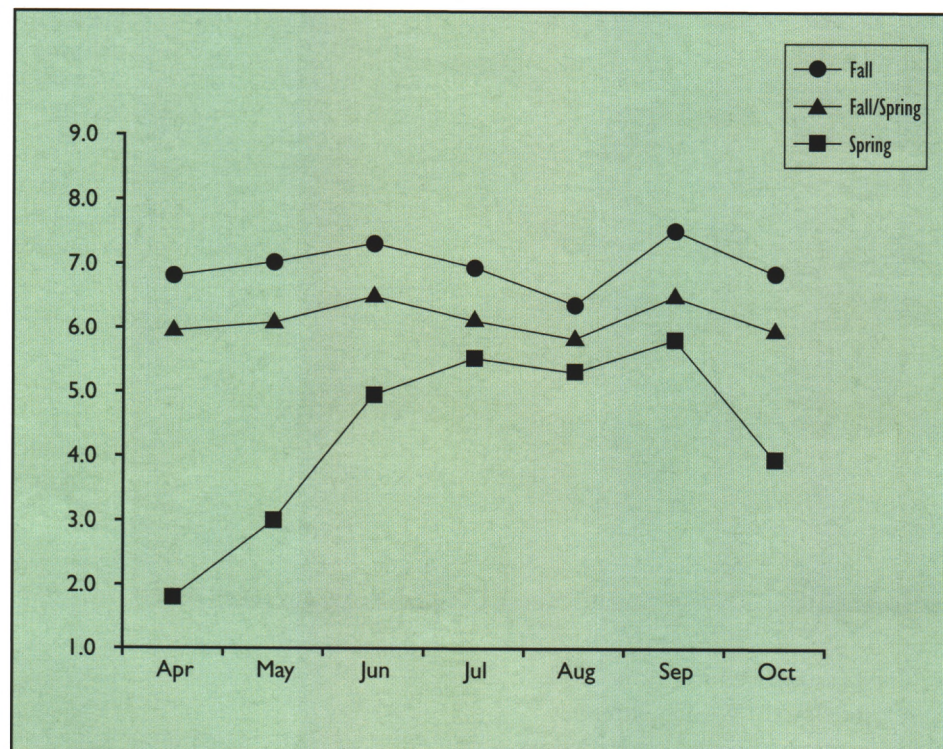
University of Nebraska researchers overseed buffalograss with blue fescue to extend the color of this native turfgrass.

BY R. C. SHEARMAN, S. SEVERMUTLU, T. P. RIORDAN, AND U. BILGILI

**B**uffalograss (*Buchloë dactyloides* [Nutt] Engelm.) is a warm-season turfgrass with excellent drought resistance and a strong potential for use where water conservation is an issue.<sup>4</sup> Buffalograss grows from central Mexico to the prairie provinces of Canada, and many cultivars of buffalograss have excellent low-temperature tolerance. This trait sets it apart from most warm-season turfgrasses.<sup>1,5</sup> Low-temperature-tolerant buffalograss cultivars go dormant in the fall, usually with the first killing frost, and have a winter dormancy period that extends into the late spring. This annual dormancy limits the acceptance and use of buffalograss as a turf.<sup>4</sup>

In theory, mixtures of warm- and cool-season grasses seem practical because the optimum growth conditions for each species should complement one another, with cool-season grasses growing well in spring and fall and warm-season grasses growing best in the summer.<sup>2</sup> However, the consequence of these mixture attempts often is a patchwork quilt appearance that results in undesirable turfgrass uniformity and quality.

Research was initiated to study the potential of overseeding fine-leaved fescues into established buffalograss turf and to improve turfgrass color and quality. The first studies investigated species, seeding rate and date, and core cultivation effects on overseeding establishment and buffalograss performance with turfs maintained as golf course



**Figure 1.** Turfgrass quality ratings for overseeded buffalograss when blue fescue was seeded in fall, fall/spring, or spring (i.e., 1-9 visual rating scale with 1 = poorest and 9 = best).

roughs. Recent studies investigated overseeding effects when turfs were maintained under fairway conditions.

## ROUGH OVERSEEDING STUDIES

Overseeding date and rate studies were conducted for two years on buffalograss turfs maintained as roughs at the University of Nebraska John Seaton Anderson Turfgrass Research Facility located near Mead, Nebr. Three fine-leaved fescues (SR 3100 hard fescue, SR 3200 blue fescue, and SR 5100

chewings fescue) were used in both studies. Fall, spring, and fall-spring seedings were compared in the seeding date study.

In the seeding rate study, seed rates of 2.0, 4.0, and 6.0 lbs. of pure live seed/1,000 sq. ft. were compared. The fine-leaved fescues were overseeded into mature stands of buffalograss that were mowed down to one inch with mowing debris removed. The turfs were core cultivated prior to applying seed. After seeding, the cores were broken up and a starter fertilizer was applied at 1.0



lb. N/1,000 sq. ft. Turfs were irrigated sufficiently to maintain a moist soil to enhance fine fescue seedling establishment. After establishment, turfs received 2.0 lbs. N/1,000 sq. ft. and were mowed weekly at 2.5 inches with clippings returned.

## FAIRWAY OVERSEEDING STUDIES

A second set of buffalograss overseeding trials was conducted in 2004 and 2005.

Buffalograss cultivars maintained as fairway turfs were overseeded with Bighorn blue fescue at 1.0 and 2.0 lbs./1,000 sq. ft. in early September. Bighorn blue fescue was selected as the overseeding species based on its drought resistance, low-fertility performance, and its grayish, blue-green color. Establishment procedures were the same as those described for the seeding rate and date trials except for the mowing height and frequency differences. Buffalograsses

were mowed three times per week at 0.63 inches and received 2.0 lbs. N/1,000 sq. ft. per season and 1.0 inch water per month, either as irrigation, rainfall, or both.

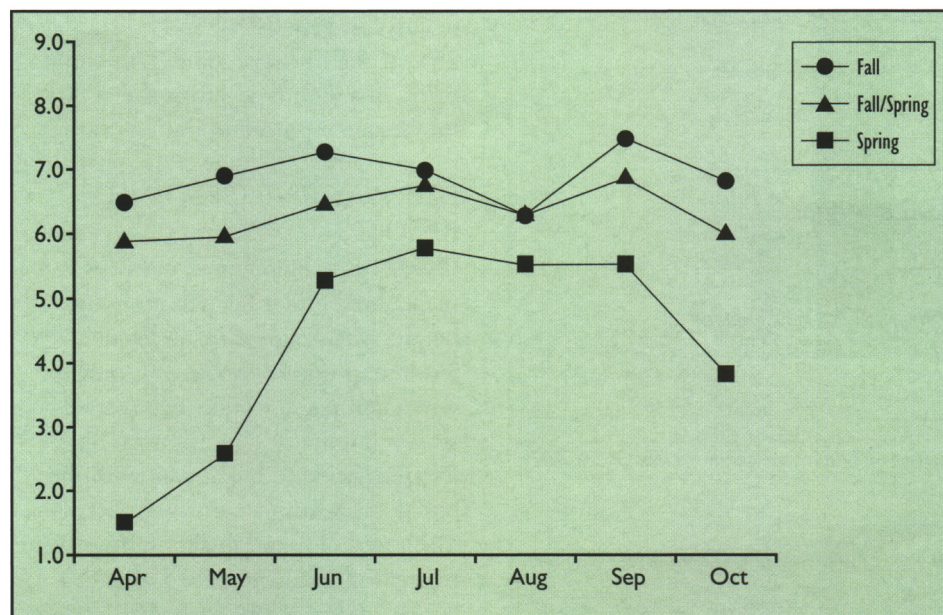
## RESULTS OF SEEDING RATE AND DATE STUDIES

In the seeding date studies, fall overseeding gave the best turfgrass quality and color, and highest shoot density ratings compared to spring or fall-spring plantings (Figures 1, 2, and 3). Spring overseeding had the lowest shoot densities, and fall-spring seeding was mostly intermediate in response. Fine fescue shoot density was highest in May and declined gradually through September, when it began to increase with the onset of cooler soil temperatures. Buffalograss composition increased during the summer months, as expected.

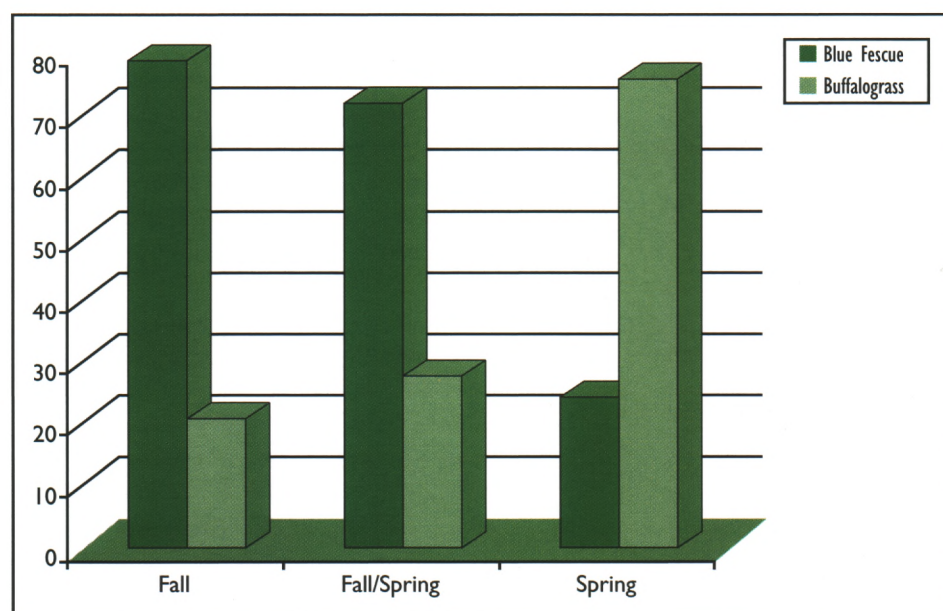
Fall overseeded blue fescue had the highest ratings for turfgrass quality and color throughout the study (Figures 1 and 2, respectively). The blue-green color of blue fescue blended well with buffalograss, giving a better season-long performance compared to the other fine-leaved fescue species studied. Buffalograss mixed with chewings or hard fescues exhibited more summer stress than the blue fescue mixtures, but all turfs expressed a decline in turfgrass quality during the summer stress period (Figure 1).

Fall overseeded blue fescue-buffalograss mixtures maintained acceptable quality ratings during summer stress periods. Research conducted in Utah reported similar findings with blue fescue and buffalograss mixtures.<sup>3</sup> In our studies, Chewings fescue overseeding treatments gave unacceptable turfgrass quality when buffalograss was dormant, due primarily to the lack of uniformity in turfgrass appearance.

There was a linear response for increased shoot density and turfgrass quality and color ratings as seeding rates increased from 2.0 to 6.0 lbs./1,000 sq. ft. (Figures 4 and 5). Turfgrass quality



**Figure 2.** Turfgrass color ratings for overseeded buffalograss when blue fescue was seeded in fall, fall/spring, or spring (i.e., 1-9 visual rating scale with 1 = straw brown and 9 = dark green).



**Figure 3.** Turfgrass species composition (i.e., percentage of each species) when blue fescue was seeded in fall, fall/spring, or spring.



and color ratings followed similar trends. Turfgrass quality ratings were highest for the 6.0 lbs./1,000 sq. ft. treatment (Figure 5). In Utah, fine-leaved fescue seeding rates of 2.0 and 4.0 lbs./1,000

sq. ft. in a buffalograss overseeding study resulted in similar shoot density and quality responses.<sup>3</sup> Shoot density seemed to stabilize around a 3:1 ratio of fine fescue to buffalograss shoots when

overall seeding rates and the entire growing season were considered (Figure 4). Fine-leaved fescue composition was highest in May and decreased while buffalograss increased from late spring to early fall.

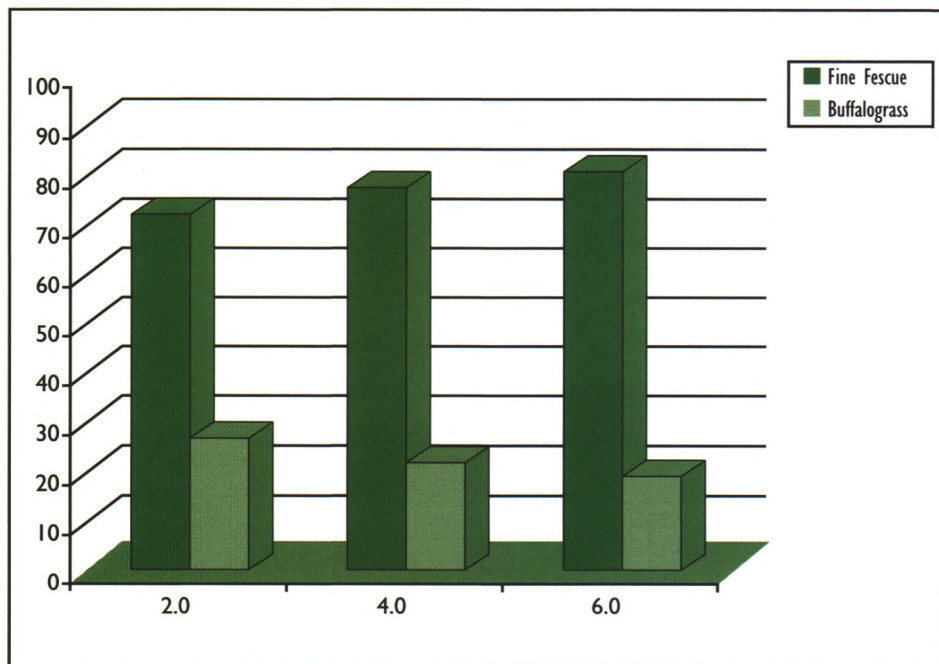
Recent trends in developing more aggressive, high-temperature-tolerant cool-season turfgrass cultivars may decrease the competitive advantage of warm-season turfgrasses during summer stress periods.<sup>5</sup> Two years after establishing these studies, fall overseeded blue fescue comprised 75% and buffalograss 25% of the turfgrass stand. This composition was slightly less than the > 80% fine fescue reported in the Utah study.<sup>3</sup>

## FAIRWAY OVERSEEDING RESULTS

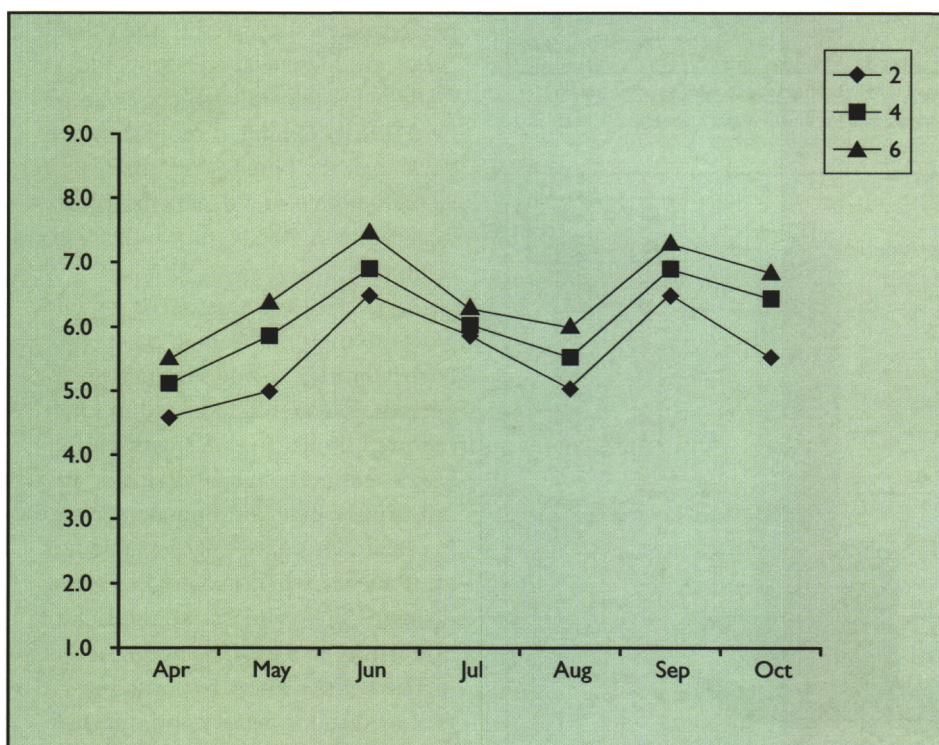
Overseeding buffalograss cultivars maintained under fairway mowing heights with Bighorn blue fescue resulted in improved turfgrass quality when compared to non-overseeded grasses (Figure 6). The Bighorn blue fescue seemed to blend well with the buffalograss from a color perspective. Turfgrass color and quality ratings were higher for turfs overseeded with 2.0 versus 1.0 lbs./1,000 sq. ft. of Bighorn blue fescue. Turfgrass quality ratings over the growing season differed by cultivar, with Prestige having the highest mean quality rating for the season (Figure 6). Prestige is a tetraploid cultivar that is planted vegetatively and has demonstrated earlier spring green-up when compared to the other cultivars tested in this trial. It also tends to hold its green color longer into the fall season.

Turfgrass color ratings taken in November 2005 demonstrated the benefit of overseeding buffalograss with blue fescue (Figure 7). The non-overseeded buffalograss color ratings ranged from 1.0 to 2.9 and represent the typical color of dormant buffalograss turfs, while the overseeded turfs had color ratings ranging from 5.0 to 7.1.

The results from the seeding rate and date studies and those from the fairway

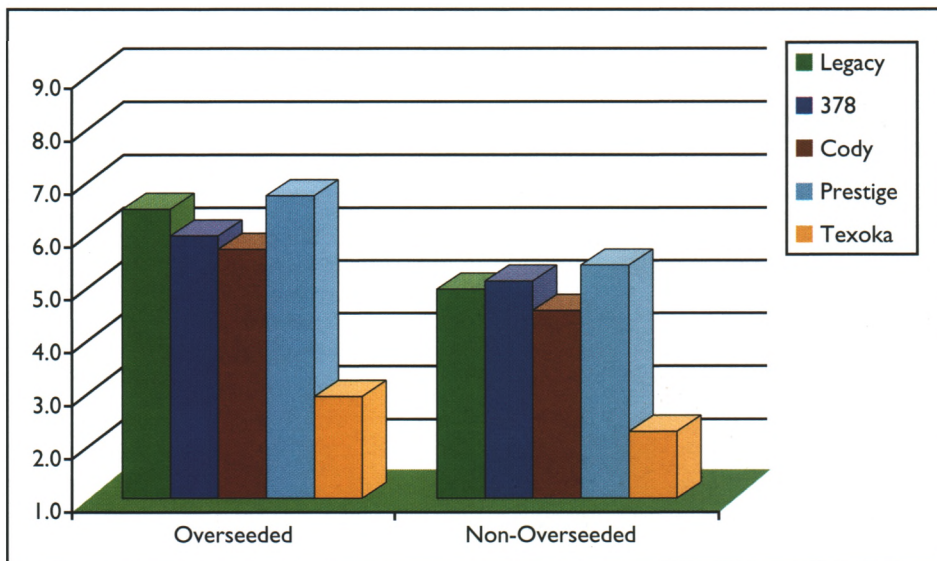


**Figure 4.** Percentage of turfgrass species composition based on fine fescue seeding rates of 2.0, 4.0, and 6.0 lbs./1,000 sq. ft. (10, 20, and 30 g/m<sup>2</sup>).



**Figure 5.** Turfgrass quality ratings for overseeded buffalograss when fine fescue was overseeded at 2.0, 4.0, or 6.0 lbs./1,000 sq. ft. (10, 20, and 30 g/m<sup>2</sup>) (i.e., 1-9 visual rating scale with 1 = poorest and 9 = best).





**Figure 6.** Mean turfgrass quality ratings for buffalograss cultivars overseeded with Bighorn blue fescue in fall 2004 compared to those same buffalograss cultivars not overseeded with Bighorn blue fescue.

buffalograss trials indicate that buffalograss turfs overseeded with blue fescue in the fall provide improved quality and color and extend the green appearance both earlier and later in the growing season. Spring overseeding resulted in poor turfgrass establishment, lack of uniformity, and lower turfgrass quality ratings than fall or fall-spring overseedings. Turfgrass quality, color, and shoot density responded linearly to fine fescue overseeding rates for buffalograss maintained at rough heights of cut.

In the later fairway study, lower seeding rates of 1.0 to 2.0 lbs./1,000 sq. ft. of blue fescue provided satisfactory turfgrass quality ratings and extended turfgrass green cover well into November. Blue fescue overseeded in the fall extended the green cover response by more than two months in the rough-height-of-cut study. The results obtained in these trials support the use of blue fescue and buffalograss mixtures as a means of enhancing turfgrass color retention and prolonging the green cover response compared to non-overseeded buffalograss turfs.

## ACKNOWLEDGEMENTS

The United States Golf Association, Nebraska Turfgrass Association, and University of Nebraska Agricultural Experiment Station provided funding

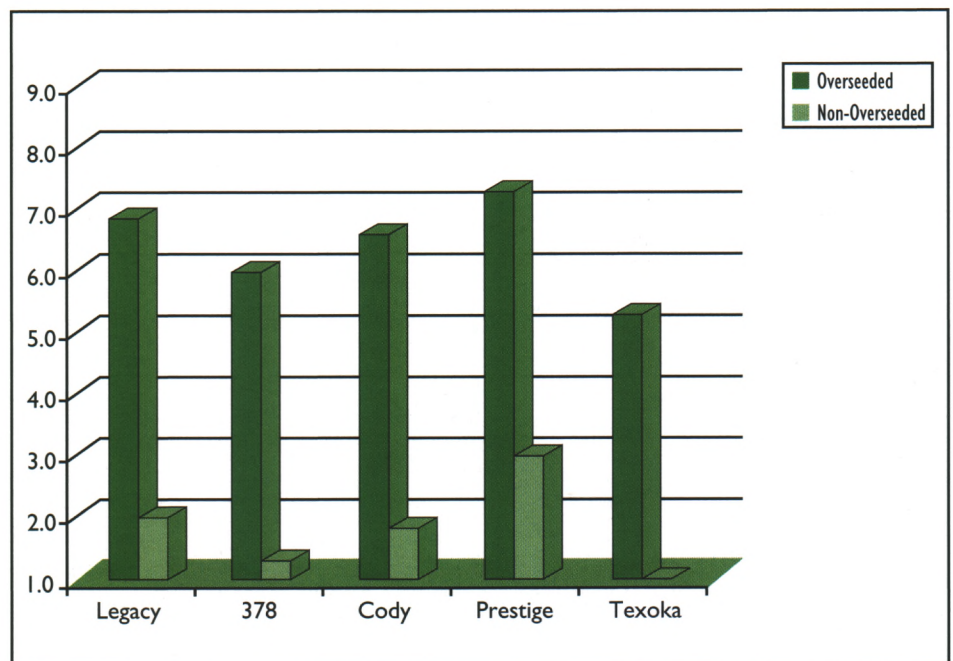
in support of this research. Special appreciation is expressed to Leonard A. Wit for his supervision of the care and maintenance of these research trials.

**Editor's Note:** A complete report of this study and other research can be found at *USGA Turfgrass and Environmental Research Online* (<http://usgatero.msu.edu>). The specific URL for this report is <http://usgatero.msu.edu/v05/n09.pdf>.

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**Figure 7.** Turfgrass color rating of buffalograss cultivars overseeded with blue fescue and compared to those same buffalograss cultivars not overseeded. Ratings were made in November 2005 (i.e., 1 to 9 visual rating scale with 1 = straw brown and 9 = dark green).





Research at the University of Nebraska demonstrates that buffalograss fairway and rough turfs overseeded with blue fescue in the fall provide extended green appearance and enhance turfgrass quality.



Buffalograss is a warm-season turfgrass that has extended winter dormancy when grown in northern climates. Mixtures of buffalograss and fine-leaved fescues (foreground) may enhance turfgrass color retention compared to buffalograss alone (background).



The blue-green color of blue fescue blends well with the color of buffalograss and provides a uniform turfgrass appearance. Fall overseeding of fine-leaved fescues was preferred to spring or fall/spring seeding. Note the difference in stand composition for the Chewings fescue established in the fall (upper left) versus spring (right).



**A Q&A with DR. ROBERT SHEARMAN, University of Nebraska, on the use of buffalograss on golf courses.**

**Q: What's the primary use for buffalograss on golf courses, and do you think the use of buffalograss on golf courses will increase in the future?**

**A:** Buffalograss is most suited for use on golf course roughs, fairways, and tees, and has turfgrass characteristics similar to bermudagrass. I believe buffalograss use on golf courses will increase in the future, particularly as we develop even more improved cultivars and as water restrictions become increasingly more common.

**Q: In this series of experiments, you showed that blue fescue mixes better with buffalograss than other cool-season grasses. What's the primary reason?**

**A:** We selected blue fescue for a number of reasons. First, blue fescue is a cool-season turfgrass species that grows best in the spring and fall, which are times when buffalograss is only slowly growing or dormant. As a cool-season species, blue fescue is stressed by high temperatures and grows slowly during the summer, when buffalograss is actively growing. Second, we knew that the color and texture of blue fescue would mix well with buffalograss. Finally, we also knew that blue fescue required few inputs in regard to water and nutrients, similar to buffalograss. Finding suitable mixtures of warm- and cool-season turfgrass species is not easy, but these two species seem to be compatible.

**Q: Buffalograss is a very drought-tolerant species and requires little irrigation. Do you think overseeding blue fescue into established buffalograss requires over-watering the buffalograss to maintain the fescue?**

**A:** Buffalograss certainly is most suited to reduced water inputs, but, within reason, it responds to irrigation. The water required to establish the blue fescue did not impede the buffalograss in these

studies, and I don't believe it would be a factor in maintaining the desired characteristics of buffalograss in these mixtures.

**Q: How much longer can the color be extended by overseeding blue fescue into established buffalograss?**

**A:** We extended turfgrass color by two months with this mixture. The fall and spring appearance of the buffalograss-blue fescue mixtures was similar to that of other cool-season turfgrasses growing in adjacent studies.

**Q: Given the obvious positive traits of buffalograss, why hasn't it caught on more on golf courses across the country?**

**A:** The acceptance of new turfgrass species is often slow. Buffalograss is competing for acceptance with species that have had decades of improvement and use. We've only been working with buffalograss for slightly more than 20 years, which is a relatively short time. Even so, the potential for buffalograss use on golf course turfs is very strong, particularly as we look to the future and the water restrictions that we will be facing. All of this said, buffalograss is not perfect. It has an extended winter dormancy period that limits its acceptance by many users. Vegetative cultivars, like Legacy and Prestige, must be planted from sod or plugs. This limits their use on large areas like fairways and roughs. Seeded cultivars, like Bowie or Cody, are more suited for establishment on large areas like roughs, but their turfgrass characteristic qualities are not as high as those of the vegetative cultivars. These limitations are not insurmountable, and our breeding program is addressing many of these concerns. We are selecting for improved spring green-up and fall color retention, and we have made strides in increased seed yield potential and improved turfgrass quality of seeded types. I believe we need to be patient and continue to move forward. Buffalograss is a species that will play a significant role on golf course turfs in the future. I believe this is the very near future.

JEFF NUS, PH.D., *manager, Green Section Research.*



# The National Turfgrass Research Initiative

A new initiative spearheaded by industry leaders offers hope for basic turfgrass research.

BY KEVIN MORRIS

**T**he annual value of the turfgrass industry in the United States is estimated at \$40 to 60 billion.<sup>2,3</sup> It is estimated that turfgrass covers 50 million acres in the U.S., making turf the fourth largest U.S. crop in acreage. According to estimates, there are more than 31 million acres of irrigated turfgrass in the U.S.,<sup>4</sup> making turfgrass the largest irrigated U.S. crop.

## TURFGRASS RESEARCH IN THE U.S.

Turfgrass research in the U.S. is almost exclusively conducted by state universities or private, for-profit companies. Private companies conduct research on fertilizers, new grass cultivars, pest control products, etc. for their own internal use in research, development, and marketing. However, the information obtained from for-profit companies' research is proprietary and most often not released to the public.

There are several non-profit organizations, such as the United States Golf Association (USGA), Golf Course Superintendents Association of America (GCSAA), National Turfgrass Evaluation Program (NTEP), Turfgrass Producers International (TPI) and others that also fund turfgrass research at state universities. The USGA has the largest research funding program, averaging about \$1.3 million annually. There are also various state and local turfgrass organizations that provide funding to state university research programs. In total, it is estimated that private companies and not-

**Table 1**  
**Acreage of**  
**Selected Crops in the U.S.<sup>1</sup>**

Crop	Acreage
Corn (grain & silage)	74,914,515
Soybeans	72,399,844
Hay/Forage (all crops)	64,041,337
Turfgrass (all uses) <sup>2</sup>	50,000,000
Wheat	45,519,976
Cotton	12,456,162
Orchards	5,330,439
Barley	4,015,654
Vegetables	3,698,744
Oats	1,996,916
Peanuts	1,223,093

<sup>1</sup>2002 Census of Agriculture, USDA, National Ag. Statistics Service (NASS)

<sup>2</sup>Estimated acreage; NASS collects data only on turfgrass sod production

Turfgrass acreage was estimated to be approximately 50,000,000 acres in the U.S. in 2002, making it the fourth largest crop overall and the largest irrigated crop in the nation.

for-profit organizations support \$10 million in turfgrass research annually.

Many states have at least one university with a turfgrass research program to serve the needs of the citizens and the turfgrass industry in that state. Funds for those research programs come from the private entities listed above, state government funding, as well as through the Federal Government's United States Department of Agriculture (USDA), Cooperative State Research, Education, and Extension Service (CSREES). CSREES, with an annual budget of \$1 billion, provides funding to state universities for agricultural research, education, and extension-related activities. Very

little, if any, CSREES funding is directed to turfgrass research. Therefore, the activities of state university researchers are mostly limited to what the states themselves, private industry, and organizations such as USGA and NTEP are willing to fund.

## APPLIED VERSUS BASIC RESEARCH

Almost all turfgrass research dollars are provided by the turfgrass industry or industry associations to fund applied research, rather than basic research.

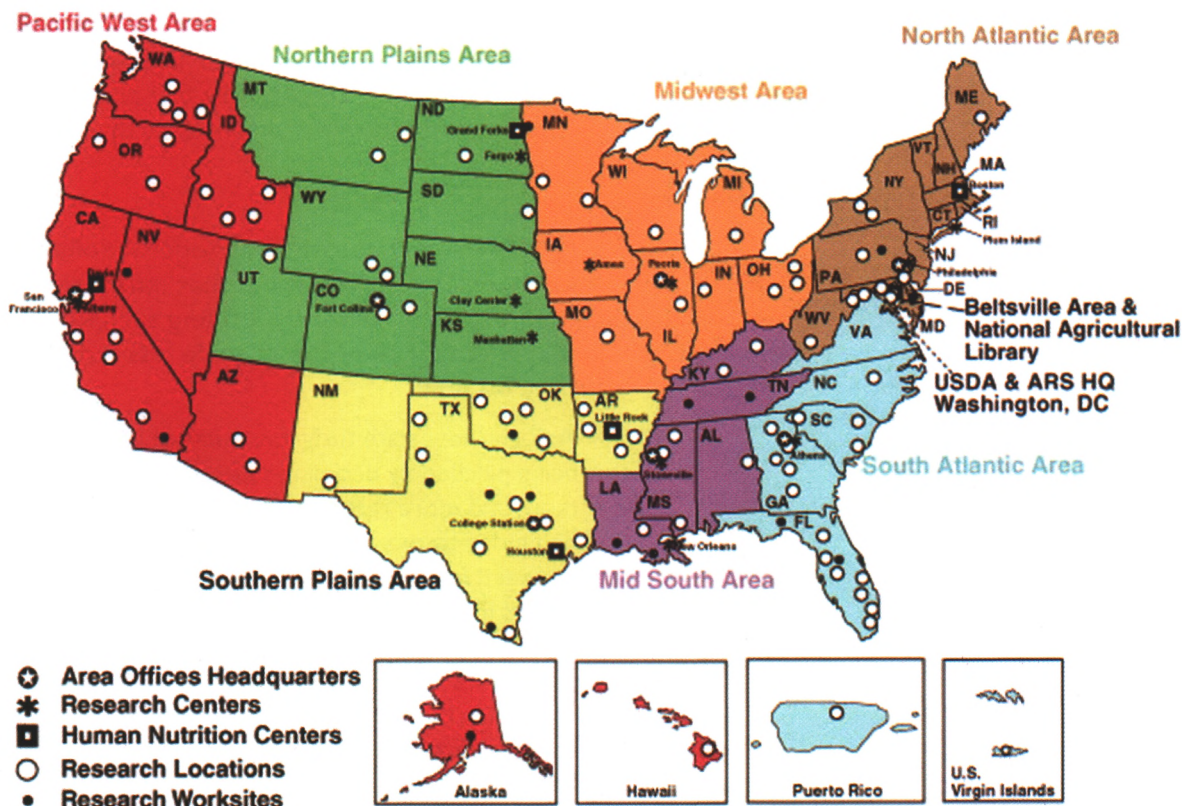
Applied research is problem-solving research, addressing and solving problems that are seen in the field by end-users such as golf course superintendents, athletic field managers, or agronomists. The shortcoming of applied research is its reliance on short-term problem solving.

Basic research lays down the foundation for applied research to follow. For example, the Human Genome project, a highly successful effort to identify the location of genes for disease susceptibility, abnormalities, and critical human traits, is classic basic research. The rewards are often large breakthroughs resulting in quantum leaps of understanding problems, development of new technologies, and important improvements in management strategies.

## ISSUES FACED BY THE INDUSTRY

There are significant issues that must be addressed to ensure that the benefits of





USDA's Agriculture Research Service has scientists at 100 locations in the U.S., many housed at or close to state land-grant universities.

turfgrass are available to all our citizens.  
Some of these issues are:

*Reduce water used and utilize recycled water.* Drought conditions in many areas of the U.S. have resulted in watering bans on lawns, landscapes, and golf courses, and restrictions on planting turfgrass by local jurisdictions. Due to incredible population growth in the drier western states, many areas have instituted lawn watering restrictions, including Las Vegas, Nev., and Denver, Colo. Even the less arid midwestern and eastern states have enacted watering bans or are considering doing so.

*Reduce pesticide use and develop biological controls.* Concerns over the impact of pesticides on human health have resulted in pesticide bans in some local communities. The city of Toronto, Canada, has banned the use of pesticides on lawns, parks, golf courses, commercial properties, and other turf-grass sites. In addition, more jurisdictions in Canada and the U.S. have enacted at

United for D.C. Public Schools commissioned a law firm to study and report on public school athletic facilities in the District of Columbia. Their report states, "... D.C. Public Schools today fail to meet the most basic standards of adequacy for athletic programs and facilities ... and run the risk of millions of dollars in legal liability in the almost certain event of a student-athlete's serious injury."

Morris and Hossain<sup>5</sup> reported that of 38 publicly funded germplasm collection trips for grasses, only two specifically targeted turfgrass; the rest were forage grasses. Very little turfgrass



**A Q&A with KEVIN MORRIS, president of the National Turfgrass Federation, Inc., on the National Turfgrass Research Initiative.**

**Q: You stated that turfgrass represents a \$40 to \$60 billion per year industry covering an estimated 50 million acres. Do you think that most people would find that surprising?**

**A:** Yes, we find that people are surprised by those figures. We even had trouble initially convincing Congressional staff that they were real. However, if you consider that there are more than 700,000 athletic fields, 80-100 million home lawns, more than 17,000 golf courses, and millions of miles of roadsides in the U.S., those figures are not hard to believe.

**Q: Why do you think that, historically, as a crop, turfgrass has received much less federal research support than other much smaller crops?**

**A:** This is a struggle many segments of the Green Industry (i.e., landscaping, floriculture, nursery crop

production, cut flowers, turf, etc.) have faced. It is because we are not traditional agriculture that produces food crops on farms. However, urban agriculture is becoming more accepted within USDA.

**Q: If NTRI is successful and federal dollars are forthcoming, do you think that national and state organizations currently funding turfgrass research may feel that they can provide less funding than they do now?**

**A:** Right now, state turfgrass research programs are being pinched by declining state support. Therefore, more and more research at state universities needs to be funded by private organizations. NTRI will not reduce the need for research at universities and, therefore, dollars for applied research will still be needed by universities. However, NTRI funding that goes to universities will help ease the pressure on state and national organizations and also allow the universities to conduct research that they never were able to do because of limited resources.

germplasm is held by the Federal Government, which stifles overall turfgrass improvement.

*Better documentation on the benefits of turfgrass.* There is little understanding among the general public of the importance of turfgrass in protecting soil and water, heat reduction, dust control, etc., even though there are data to support these claims.<sup>1</sup> One avenue to obtaining and releasing information on turf's benefits is through large, coordinated research programs.

## HOW THE FEDERAL GOVERNMENT CAN HELP

The Federal Government, through the USDA, funds basic and applied research on many crops and for many agricultural industries. The USDA's Agricultural Research Service (ARS) is the in-house research arm of the USDA, with a \$1 billion annual budget, and 2,100 scientists at 100 locations. ARS has significant programs for the big crops such as corn, wheat, and soybeans.



ARS has over 2,100 scientists nationwide, most conducting basic research on crops and animals.

However, ARS also has significant programs for industries such as aquaculture (fish farming) and floriculture (floral and nursery crops). This research is critical for these industries, helping them make giant strides in advancing the science in their industry and making large improvements that benefit end-users.

## WHAT IS THE TURFGRASS INITIATIVE AND WHY IS IT IMPORTANT?

The National Turfgrass Research Initiative (NTRI) is the blueprint for a coordinated national research program to be funded through USDA-ARS and conducted through a coalition including the USDA, the university research community, and the turfgrass industry. NTRI discusses the industry, the crucial need for this research, and specifically identifies priority research goals and key programs.

Federal attention to the issues and research goals identified in NTRI is



**Q: You stated several issues faced by the turfgrass industry that need research. Do you think water issues may be a higher priority for turfgrass research and, as such, should receive funding sooner than other issues, such as reducing pesticide use and developing biological controls?**

**A:** I definitely feel that our best chance to convince Congress to fund NTRI is to focus on the issues and ask for funding for specific problem-solving projects. Water use is the number-one priority research area as identified by the industry and ARS. More than ever, Congress is requiring the Federal Government to be accountable, and it is easier to sell a program to a Congressional staffer if specific problems are identified and research to solve those problems is proposed. There are way too many Congressional programs that simply look bad and are therefore considered pork-barrel spending. We want to make certain any funding we receive is justified and supported by industry needs and an understanding of the issues by Congress.

**Q: How important is it for the reader of this article to become involved with this effort? How much influence can the industry have on Congress?**

**A:** One of the hallmarks of this country is our ability to voice our opinion to our representatives. This is the way a democracy works, and if no voices are heard on an issue, that issue is not deemed important. After being involved with this effort for the last several years, I can tell you from firsthand experience that Representatives and Senators respond to their constituents. They note every letter and phone call that comes in on a particular issue. Therefore, it is vital that turf industry members, individually and collectively, contact their Senators and Representatives to express support for NTRI. Without the "grass roots" support from the turf industry, NTRI will never be funded and implemented.

JEFF NUS, PH.D., *manager, Green Section Research.*

critical to the continued success of the turfgrass industry. A basic premise of NTRI is that federal research dollars should be directed toward programs that cannot be funded adequately by states or industry, particularly programs where the Federal Government can play a coordinating role not possible for any other entity.

### HOW DOES THE TURF INITIATIVE WORK?

For NTRI to get off the ground, funding has to be appropriated by Congress. NTRI proposes \$450,000 be appropriated for each research scientist position within USDA-ARS. The \$450,000 is distributed as follows: \$300,000 is used to hire a researcher and staff and purchase equipment at an ARS location. The remaining \$150,000 is allocated for that researcher to conduct cooperative research with universities. If NTRI is fully funded (\$32.4 million), this will allow ARS to hire 72 turfgrass researchers and allocate more than \$10



Agricultural engineer Kevin King examines discharge water from a turfgrass system in central Ohio as part of a research program designed to assess how land uses and management affect water quality. This research is funded, in part, by the USGA's Turfgrass and Environmental Research Program.

million annually to universities through cooperative research.

NTRI will be largely implemented by research teams. These teams will frequently involve multiple research locations spread across several states to ensure the right mix of scientific skills is available for a systematic research strategy. The research dollars will be coordinated by and through the Agricultural Research Service budget. In turn, ARS will work with university and private industry researchers to establish research teams.

### RESEARCH COMPONENTS OF NTRI

NTRI consists of the following six broad research areas:

1. Water.
2. Germplasm.
3. Pests.
4. Environment.
5. Soil.
6. Integrated turf management (ITM).

Within each component are several



To increase the genetic diversity of U.S. corn, ARS collects and combines exotic germplasm, such as this unusually colored and shaped maize from Latin America, with domestic corn lines. ARS collects and improves germplasm of many other crops, as well.



research priorities. For instance, the critical research needs in Component 1 (water) are the need to improve turfgrass water use efficiency and irrigation efficiency and the need to investigate the use of recycled or saline irrigation water. The germplasm component (Component 2) focuses on collecting valuable germplasm, developing a better understanding of the genetic systems and genes in turfgrass species, and using this material and knowledge to develop and release improved germplasm leading to improved turfgrass cultivars.

## PROGRESS TO DATE

Over the past five years, we have had many meetings and contacts with ARS and USDA officials, U.S. Senators, House members, Congressional staff, and the Secretary of Agriculture. We have stressed the size and scope of the

turfgrass industry, the important issues facing the industry, and the need for federal research dollars to solve these problems.

We have convinced the U.S. Congress to allocate funding for ARS to hire a research scientist at Beltsville, Md. (2002); conduct cooperative research in Logan, Utah (in conjunction with Utah State University); and hire a full-time research scientist in 2006 at Beaver, West Virginia. And in the proposed ARS budget for fiscal year 2007 (starting October 1, 2006), an additional \$1.88 million has been allocated for turfgrass research. This will allow ARS to hire three to four researchers in the southwest U.S. and develop cooperative projects with universities focusing on turfgrass water use issues. For this year, we also are asking Congress to include funding for five additional research positions at four different locations. We

are looking for larger increases for NTRI in the future.

So what can you do to help? First, learn more about the National Turfgrass Research Initiative at:

**[www.turfresearch.org](http://www.turfresearch.org)**  
or  
**[www.turfinitiative.org](http://www.turfinitiative.org)**

Next, contact your Senators and Representatives in Congress to let them know the importance of federal funding for turfgrass research by USDA-ARS. Ask them to support funding for the National Turfgrass Research Initiative. Finally, ask your local and state turfgrass associations and supplier companies to make a contribution to the National Turfgrass Federation, Inc., in support of this effort. The future of the turf industry is at stake. Since turfgrass is a \$40-60 billion industry and encompasses 50 million acres in the U.S., we have a good case to make!

*Editor's Note:* The complete report on this topic can be found at *USGA Turfgrass and Environmental Research Online* at: <http://usgatero.msu.edu/v05/n10.pdf>.

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KEVIN N. MORRIS is president of the *National Turfgrass Federation, Inc.*, Beltsville, Md.



# Special Services

A program for the developmentally challenged is a win-win relationship.

BY TODD LOWE

**G**olf course employees come in all shapes, sizes, and colors. The staff at any particular course can be quite ethnically and culturally diverse, but diversity is an especially important issue at The Club Pelican Bay in Naples, Florida. Not only is there a blend of ages, sexes, and ethnicities, but there is a special group of developmentally challenged employees who provide a benefit to the club as well.

A unique relationship was established between the golf course maintenance departments at Pelican Bay and Sunrise of Collier County more than 15 years ago. Sunrise is an agency that assists developmentally or mentally challenged individuals, such as those with Down's Syndrome, and places them in various jobs. Most are employed part-time with county parks, supermarkets, and Good-



Geoffrey (J.T.) Ellis (left) has been a valuable employee for Bob Bittner, CGCS, for nearly 15 years.



J.T. (right) assists with golf course service activities each weekday morning.





In addition to performing daily tasks, J.T. inspires and motivates the golf course maintenance staff.

Sunrise of Collier County supervisor Mrs. Dorothy Tomford (middle) with two wash crew workers, Walter and Gwen.



will. Pelican Bay currently is the only golf club that participates in the work program. The Director of Golf Course Operations at Pelican Bay, Bob Bittner, CGCS, has supported this program from the beginning and appreciates the service provided by the organization. The members at Pelican Bay also feel it is a valuable program, and Mr. Bittner admits, "Sometimes the maintenance budget gets a little tight, but the members are committed to this program each year."

Much of the work program at Pelican Bay occurs at the maintenance facility, as a crew of two to three workers and a supervisor washes and details mowing equipment three days a week. This allows full-time golf course maintenance employees to perform other necessary tasks. The wash crew employees are paid by the golf club, while their supervisor is employed by Sunrise of Collier County. The supervisor also assists with transportation, makes certain each task is performed

correctly, and facilitates positive interaction among employees.

One of the employees from this program, Geoffrey Ellis (J.T.), assists the golf course service staff and helps set up the golf course from Monday through Friday. While J.T. does not set hole locations, he performs other duties like servicing ball washers and wiping off flag poles and benches. In addition to golf course service, J.T. helps with maintenance practices like cart path edging and debris disposal. J.T. has been a valuable employee for nearly 15 years and, in addition to performing daily tasks, he inspires and motivates the golf course maintenance staff.

It is truly a win-win situation for everyone. The golf club receives a valuable service, while the developmentally challenged workers are offered an opportunity to make a positive impact on society and to earn an income. Dorothy Tomford is the Sunrise employee who supervises the wash crew at Pelican Bay and assists them on

and off the work site. Mrs. Tomford remarks, "These individuals are happier at the end of the day, having a sense of accomplishment. The human interaction with the golf course staff also is valuable, as many of them would most likely remain at home without this program." In fact, one of the workers prefers the golf course and usually declines work at other businesses.

Golf courses offer more than just benefits to golfers and wildlife. They can assist in the growth of developmentally challenged individuals as well. While not every course can participate in such a program, there certainly is room for other golf courses to get involved and make a difference in their communities. Contact the Department of Children and Family to see if agencies like Sunrise of Collier County are available in your region.

*TODD LOWE is an agronomist in the Green Section's Florida Region.*



# Golf and the Environment Around the World

Concern for the environment is becoming an industry standard everywhere.

BY JEAN MACKAY

**A**mong the challenges of managing golf courses well is that the job affects so much more than the game. Because the sport is intimately tied to our natural environment, what superintendents and club managers do — or fail to do — affects the quality

of our air, water, wildlife, and land. Taking care of the environment adds a level of heightened responsibility for those who manage golf courses.

As sound environmental management becomes an industry standard, there are a growing number of organizations

offering excellent resources and industry-wide support for improving golf's environmental game. From golf's birthplace in Scotland to its new frontier in Asia, environmental principles, guidelines, and practices are gaining ground around the world.

Leading the way are industry and environmental organizations, universities, and forward-thinking superintendents and club managers who put environmental principles into practice every day. The former provide support, information, and guidance, while the latter show us just how great a contribution golf courses can make when managed with careful attention to the environment.

## GOLF'S ENVIRONMENTAL LEADERBOARD

Listed below are a number of organizations leading the charge with educational programs, resources, and on-the-ground assistance. This is not an exhaustive list, but includes primarily national or international non-profit organizations.

### UNITED STATES

- **American Society of Golf Course Architects**, [www.asgca.org](http://www.asgca.org). *An Environmental Approach to Golf Course Development* by Bill Love is an excellent resource for architects.
- **Audubon International**, [www.auduboninternational.org](http://www.auduboninternational.org), has



Sound environmental management is becoming a golf industry standard worldwide, thanks to the collaborative efforts of those who maintain golf courses and a number of environmental and industry organizations. Pictured: Capilano Golf and Country Club in British Columbia, a Certified Audubon Cooperative Sanctuary.



championed environmental stewardship on golf courses since 1991. It offers education and certification programs, books, videos, and other resources to help established golf courses and new developments protect the environment and preserve the natural heritage of the game of golf.

- **Center for Resource Management**, [www.crm.org](http://www.crm.org), spearheaded collaborative efforts between the golf industry, the environmental community, and government organizations to enhance golf course environmental responsibility and performance. The group produced *Environmental Principles for the United States* (1996), *Environmental Siting Guide for Golf Course Development* (2002), as well as additional resources and demonstration projects.

- **Club Managers Association of America**, [www.cmaa.org](http://www.cmaa.org), offers an Environmental Performance Audit to help club managers evaluate current management practices. It can also be used as a set of guidelines to help plan and establish appropriate environmental strategies.

- **Environmental Institute for Golf**, [www.eifg.org](http://www.eifg.org), the philanthropic division of GCSAA, aims to strengthen the compatibility of the game of golf with the natural environment. GCSAA's educational seminars train thousands of superintendents each year, and several chapters have developed environmental guidelines. GCSAA also manages the EDGE, a comprehensive database for those who seek information on environmental issues related to golf facilities.

- **Golf and Environment Initiative**, [www.golfandenvironment.org](http://www.golfandenvironment.org). The United States Golf Association, The PGA of America, and Audubon International have joined together to foster environmental awareness and action throughout the game. The Web site provides a clearinghouse of golf and environment information and resources for golfers, architects, PGA professionals, managers, and others.

- **Golf Fore SA**, [www.saws.org/-conservation/golfforesa/](http://www.saws.org/-conservation/golfforesa/), is a program offered by the San Antonio Water System to help golf courses in Texas develop conservation and community-oriented practices and provide certification for their achievement.

- **Michigan Turfgrass Environmental Stewardship Program**, [www.mtesp.org](http://www.mtesp.org), is intended to organize efforts of the turfgrass industry, state agencies, Michigan State University (MSU), and environmental advocacy groups to advance the environmental stewardship of the turfgrass industry and to recognize environmental achievements in Michigan.

- **U.S. Environmental Protection Agency**, [www.epa.gov](http://www.epa.gov). Collaboration with the golf industry and programs, such as the Pesticide Environmental Stewardship Program and National Environmental Performance Track, provide information and incentives to help golf courses improve environmental performance.

- **USGA**, [www.usga.org/turf](http://www.usga.org/turf), offers a wide range of environmental programs and research grants. The Turfgrass and Environmental Research Program and Wildlife Links provide grants to land-grant universities to support golf course turf research. The Turf Advisory Service (TAS) works one-on-one with superintendents on day-to-day golf course management. The *Green Section Record* magazine communicates to golf course officials around the world.

## AUSTRALIA

- **The Society of Australian Golf Course Architects**, [www.sagca.org.-au/environment.asp](http://www.sagca.org.-au/environment.asp), calls upon designers to take responsibility for the protection of the environment and promotes what it calls a "total environment" approach to golf design and the inherent benefits commonly found within a golf course.

## CANADA

- **Canadian Golf Superintendents Association**, [www.golfsupers.com](http://www.golfsupers.com), has

created a very comprehensive *Environmental Management Resource Manual* for superintendents. CGSA's Environmental Management Best Practices Survey collects information related to the management practices of golf course superintendents across Canada.

- **Royal Canadian Golf Association Green Section**, [www.rcga.org](http://www.rcga.org), offers environmental guidelines for golfers, designers, and directors, managers, and superintendents to ensure that products and techniques used in the development and maintenance of golf courses present the lowest possible risk to their golfers, employees, the public, and the environment.

## EUROPE

- **Golf Environment Europe**, [www.golfenvironmenteurope.org](http://www.golfenvironmenteurope.org), is a new European initiative addressing environmental issues relating to golf. Formed by the Trustees of the European Foundation for Golf and Environment (formerly the Committed to Green Foundation), GEE's activities will be led by the European Forum for Golf and Environment — a partnership of golf and environmental organizations.

- **Sports Turf Research Institute, Ecological and Environmental Department**, [www.stri.co.uk](http://www.stri.co.uk), offers training, ecological assessment, management planning, and consulting services to golf courses throughout Europe.

## SCOTLAND

- **Scottish Golf and the Environment**, [www.scottishgolf.com/environment/](http://www.scottishgolf.com/environment/), aims to encourage environmental awareness for Scotland's 500 courses. It is led by the Scottish Golf Union, The Royal and Ancient Golf Club of St. Andrews, Scottish Natural Heritage, and the Scottish Greenbelt Foundation.

JEAN MACKAY, is director of educational services for Audubon International. To find out more about the Audubon Cooperative Sanctuary or Audubon Signature Programs, visit [www.auduboninternational.org](http://www.auduboninternational.org).



## 2007 TURF ADVISORY SERVICE FEES

Everyone is feeling the pinch of rising costs this year, and the USGA is no exception. To maintain a top-quality staff of 17 full-time agronomists to help golf courses achieve the best conditions possible, fees for the 2007 Turf Advisory Service (TAS) will rise by \$100 for half-day and full-day visits.

The USGA continues to subsidize the TAS by more than 50% to help keep the costs as low as possible for subscribing golf courses. The TAS program provides a positive environment to discuss common problems, expectations, and realistic solutions, regardless of the level of golf course budget available.

The 2007 fee structure will continue to offer a \$300 discount for payments received by May 15, 2007.

	Payment received by May 15, 2007	Payment received after May 15, 2007
Half-Day Visit	\$1,600	\$1,900
Full-Day Visit	\$2,200	\$2,500

## MEET THE STAFF

The Green Section office located at Golf House in Far Hills, N.J., receives a myriad of inquiries from people around the world. Questions are wide-ranging, such as how to order a Stimpmeter, renew a *Green Section Record* subscription, find a golf course supplier, arrange for a Turf Advisory Service visit, order tickets to the Masters (can't do!), or answer the question of how many golf courses there are in the United States, to name just a few.

It takes experience to respond to people with the right answers. The Green Section is fortunate to have two individuals who do just that. Mary McConnell (right) and Andrea Yurcik (left) have 18 years of combined experience working for the USGA Green Section. In addition to handling the general correspondence that comes with the job, they keep many in-house Green Section projects on schedule and moving forward. Both are New Jersey natives, and their pleasant manner will greet you when you call the Green Section department for help or direction.



## PHYSICAL SOIL TESTING LABORATORIES

The following laboratories are accredited by the American Association for Laboratory Accreditation (A2LA), having demonstrated ongoing competency in testing materials specified in the USGA's Recommendations for Putting Green Construction. The USGA recommends that only A2LA-accredited laboratories be used for testing and analyzing materials for building greens according to our guidelines.

**Brookside Laboratories, Inc.**  
308 Main Street, New Knoxville, OH 45871  
Attn: Mark Flock  
Voice phone: (419) 753-2448  
FAX: (419) 753-2949  
E-Mail: mflock@BLINC.COM

**Dakota Analytical, Inc.**  
1503 11th Ave. NE, E. Grand Forks, MN 56721  
Attn: Diane Rindt, Laboratory Manager  
Voice phone: (701) 746-4300 or (800) 424-3443  
FAX: (218) 773-3151  
E-Mail: lab@dakotapeat.com

**European Turfgrass Laboratories Ltd.**  
Unit 58, Stirling Enterprise Park  
Stirling FK7 7RP Scotland  
Attn: Ann Murray  
Voice phone: (44) 1786-449195  
FAX: (44) 1786-449688

**Hummel & Co.**  
35 King Street, P.O. Box 606  
Trumansburg, NY 14886  
Attn: Norm Hummel  
Voice phone: (607) 387-5694  
FAX: (607) 387-9499  
E-Mail: soilldr1@zoom-dsl.com

**ISTRC New Mix Lab LLC**  
1530 Kansas City Road, Suite 110  
Olathe, KS 66061  
Voice phone: (800) 362-8873  
FAX: (913) 829-8873  
E-Mail: istrncnewmixlab@worldnet.att.net

**Sports Turf Research Institute**  
hyperlink to [www.stri.co.uk](http://www.stri.co.uk)  
St. Ives Estate, Bingley  
West Yorkshire BD16 1AU  
England  
Attn: Michael Baines  
Voice phone: +44 (0) 1274-565131  
FAX: +44 (0) 1274-561891  
E-Mail: stephen.baker@stri.org.uk

**Thomas Turf Services, Inc.**  
2151 Harvey Mitchell Parkway South, Suite 302  
College Station, TX 77840-5247  
Attn: Bob Yzaguirre, Lab Manager  
Voice phone: (979) 764-2050  
FAX: (979) 764-2152  
E-Mail: soiltest@thomasturf.com

**Tifton Physical Soil Testing Laboratory, Inc.**  
1412 Murray Avenue, Tifton, GA 31794  
Attn: Powell Gaines  
Voice phone: (229) 382-7292  
FAX: (229) 382-7992  
E-Mail: pgaines@friendlycity.net

**Turf Diagnostics & Design, Inc.**  
613 E. First Street, Linwood, KS 66052  
Attn: Sam Ferro  
Voice phone: (913) 723-3700  
FAX: (913) 723-3701  
E-Mail: sferro@turfdiag.com



# Bermudagrass — “Old Faithful”

Don't assume that other grasses are better.

BY BUD WHITE

Controversy has arisen over the last few years concerning the performance of hybrid bermudagrasses in the southern states. The recent turfgrass craze has been to use zoysiagrass or paspalum on tees and fairways instead of bermudagrass. Although much of this desire is driven by the novelty of change — the “WOW!” factor — bermudagrass still has plenty of advantages.

The hybrid bermudagrasses, predominantly Tifway (419), have been tremendous performers for many years in the southern United States. Improvements made to Tifway, such as the development of the hybrid TifSport, patented in 1997, add an even greater degree of playability and quality of surface to tees and fairways. Not only do the hybrid bermudagrasses have a great history of performance, but consider their other attributes as well:

1. Great playing quality.
2. Ease of weed control.
3. Extremely low disease/insect susceptibility.
4. Exceptional mowing quality.
5. Strong recuperative ability.
6. Reasonable installation cost.
7. Excellent winter hardiness when properly managed.

Bermudagrass has been well adapted to all southern markets in the U.S. It has performed well on sandier-based soils and also on heavier clay soils. At times, bermudagrass performance on clay soils has been unreasonably questioned, but there is no doubt its performance on an array of soils across the southern states has been exceptional. Using bermudagrass in the fairways and roughs also allows for an easy change of mowing patterns and/or the addition of an intermediate rough. This is more

difficult when other grasses are utilized because often the fairway and the rough grasses are different species or varieties, i.e., zoysiagrass fairways and bermudagrass roughs, or two different varieties of zoysia in fairways and roughs.

The lower maintenance cost of bermudagrasses can be a critical factor when determining species selection. Very seldom, if ever, does bermudagrass require a fungicide application on tees and fairways. On the other hand, zoysiagrass and paspalum grasses need routine fungicide applications for preventative disease control. This adds a significant cost to the maintenance budget and is a factor courses must carefully consider as they weigh the cost of change. Applying fungicide to large acreages might also be an environmental concern.

Is water quality an issue? Bermudagrasses are not as tolerant of poor water quality as paspalum, but they are rated more salt tolerant than the zoysiagrasses. Additionally, bermudagrasses have very good tolerance of moderate salt levels in irrigation water when coring, soil amendments, and leaching are carried out properly.

Some in the turf industry have claimed that zoysiagrass and paspalum provide a superior surface. These turfs are not necessarily superior, but they do offer a unique aspect. In many circumstances, the newer grasses can add an enhancing factor to the marketing and appearance of a golf course. The beautiful striping of paspalums or fine-leaved zoysiagrasses is incredible.

Under circumstances such as resort play, overseeding is considered a necessity. Hybrid bermudagrasses have much better tolerance to overseeding and

provide a better spring transition from cool-season overseeded grasses than zoysias or paspalums. Spring transition can have devastating consequences to zoysiagrass, as the zoysias have difficulty recovering in the spring when overseeded. If overseeding is important, turf selection must be carefully weighed.

Installation costs are a major consideration for these newer grasses. Zoysiagrasses and paspalums are almost always solid-sodded on tees, fairways, slopes, and, in many cases, roughs, versus the much less expensive sprigging of bermudagrass. It is not uncommon for golf courses today to have a \$1-million-plus sod budget when some of the newer grasses are used. The growing trend of “sand-capping” entire fairways for zoysia sod installation is another significant cost. The newer seeded bermudagrasses also offer tremendous playing quality, and they are an excellent choice in circumstances where golf courses are trying to reduce establishment costs as much as possible.

Zoysiagrass and paspalum are truly remarkable turfgrasses in the proper environment. They add a very different look and texture to the aesthetics of the golf course, and they provide a different playing surface that many golfers prefer over bermudagrass. However, don't forget the long track record of hybrid bermudagrass, its great performance, its economical value, and its dependability over many years. Before jumping onto the “WOW!” bandwagon, evaluate which turfgrass best suits the needs and budget of your golf course. Change is not always better.

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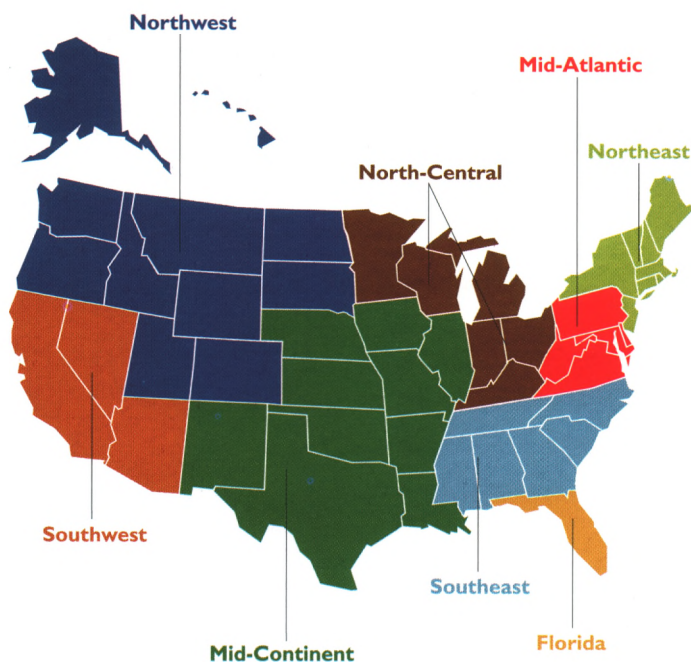


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Subscriptions \$18 a year, Canada/Mexico \$21 a year, and international \$33 a year (air mail).

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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.

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# Turf Twisters

**Q:** Our existing irrigation system is 25 years old and it has become very unreliable, so it has been recommended that we replace it. This seems to make good sense, but I question the recommendation to double the output of our pump station. Won't that just promote over-watering? (New York)

**A:** Surprisingly, having the ability to pump at a higher level may enable your superintendent to irrigate less. For example, if the course is dry and there is a threat of rain, having a limited pumping capacity may prompt your superintendent to water so as to avoid the extreme moisture stress that would

result if the rain does not materialize. If rain occurs, the result can be a saturated course that plays poorly and turf that is ripe for disease. On the other hand, having a high pumping capacity will enable your golf course superintendent to forgo irrigation, knowing that if the rain does not materialize,

the high-output system will allow him to apply enough water before play in the morning to avoid severe drought stress. It is counter-intuitive, but having a high-output system can actually allow superintendents to water less.

**Q:** We have several private carts at our course and allow one golfer per cart. Our golf course superintendent says this adds significant additional traffic and thus compaction to the course. He wants to do extra aeration. There may be more carts, but there is less weight in each cart. Can one golfer per cart really be detrimental? (Oklahoma)

**A:** Absolutely! The compaction factor is tremendously increased when individual carts are allowed. The weight per cart may be less, but compaction is greater with an increased number of carts. Concentrated traffic patterns and off-path "parking" tendencies at tees and greens



are worse for three or four carts versus only two. Two

golfers per cart should be the policy for all courses.

**Q:** Is painting a viable alternative to overseeding on ultradwarf putting greens? (Tennessee)



**A:** Yes! Painted greens offer many advantages, including avoidance of disruption for establishment and spring transition, and application of fewer pesticides and less water. Most of all, superintendents report better day-to-day putting conditions due to the opportunity to set the maintenance program up around the needs of just one turfgrass species.

