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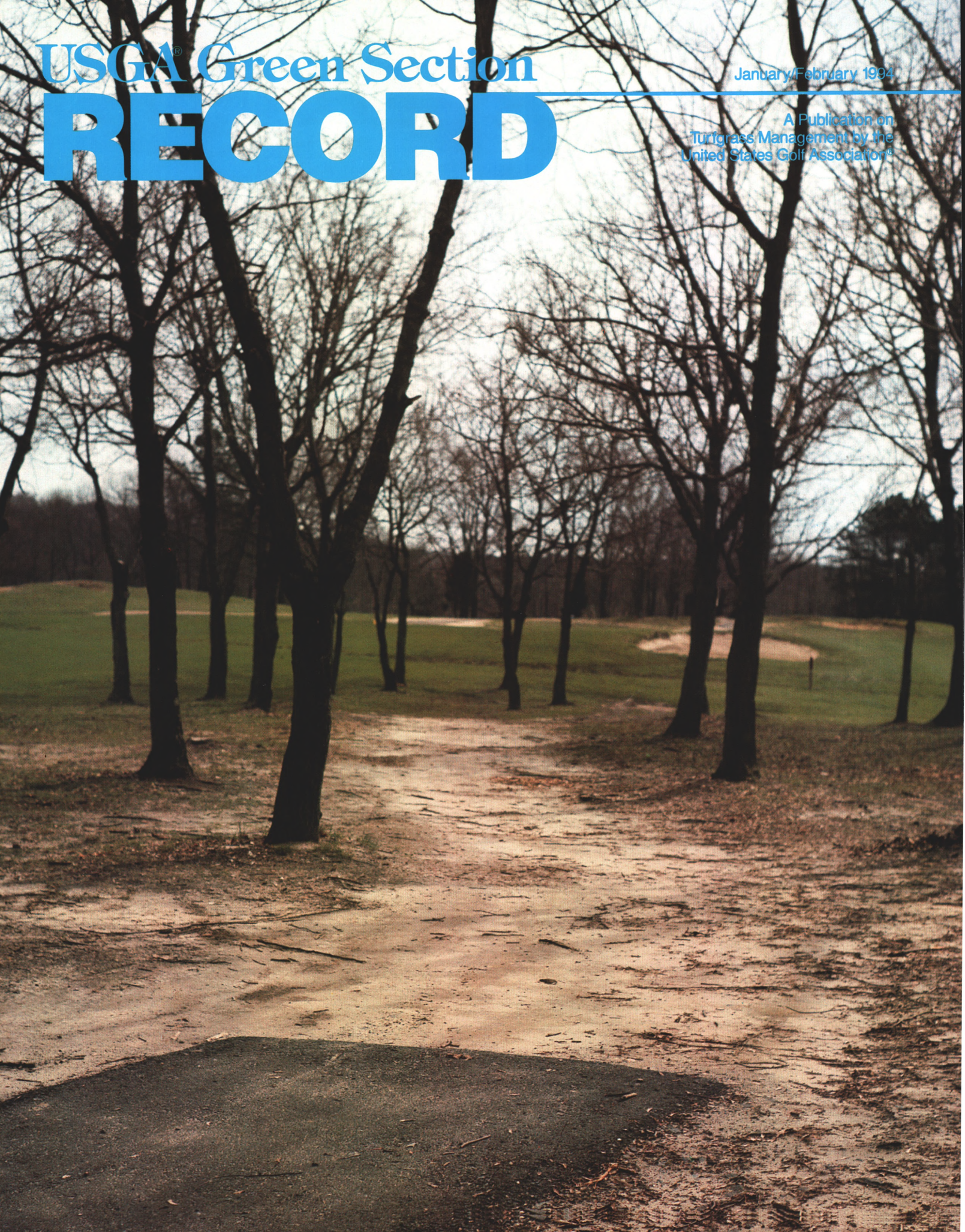

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Cover Photo:
Limited access to cart paths and tree competition spell wear problems.

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COMMON SENSE CART PATHS

by DAVID A. OATIS
Director, Northeastern Region, USGA Green Section

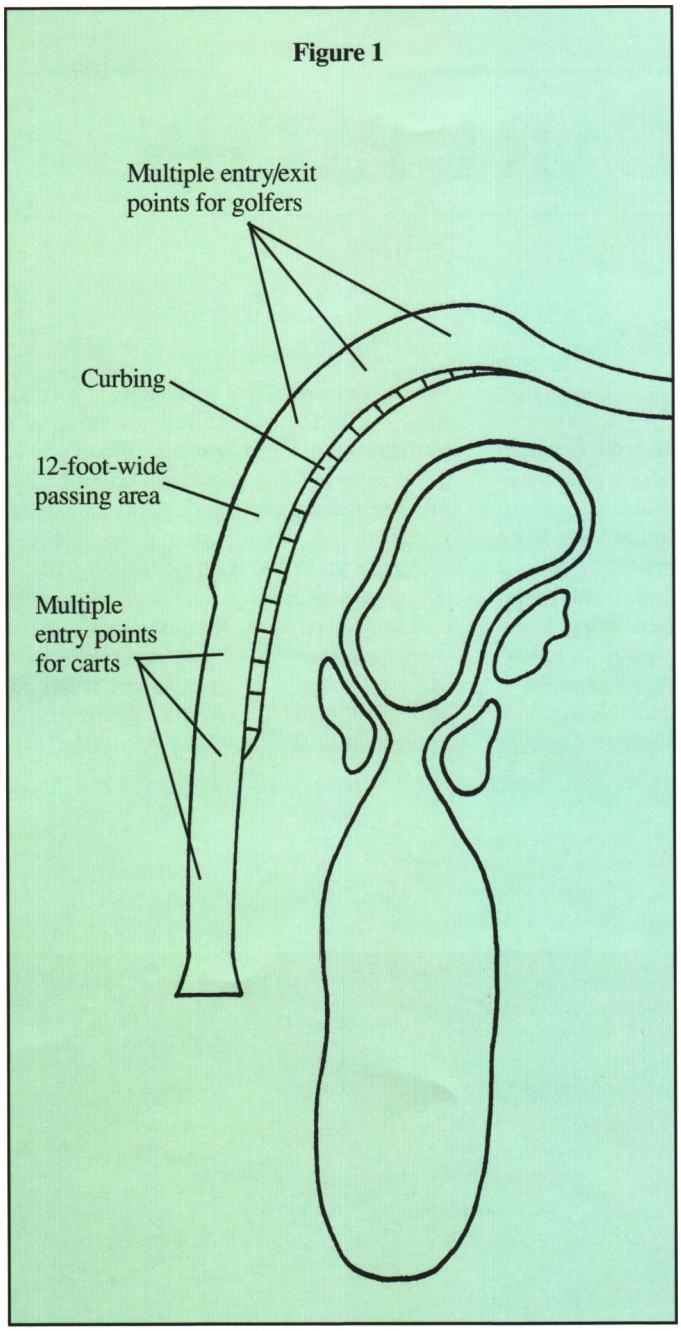
AS A GREEN SECTION agronomist who sees more than 150 golf courses each year, I believe that the vast majority of cart path projects do not accomplish their most basic objectives, which are to minimize wear problems and improve aesthetics. This truly is one of the most overlooked areas in golf course maintenance.

Although there are more than a few ugly cart paths in existence, I contend that they all have one or more of several characteristics in common: poor design, construction, or location. Traffic from golfers and their carts can make it impossible to grow healthy turf, and the resulting worn turf and rutted or bare soil is unattractive and provides a poor playing surface. Rules problems also can result. Under the Rules of Golf, relief cannot be granted unless the area is marked "ground under repair" or is deemed to be a part of the road or path and is so marked. When these situations occur in high-play areas, definition and marking complications ensue.

Aside from the remedial cultural programs that can be employed to minimize the effects of traffic on turf, there are two basic ways of handling traffic successfully: channel the traffic on hard, impervious surfaces or spread it out over as large an area as possible. Although these concepts may seem elementary, it is more complicated when the prospect of making a transition from one method to the other is considered.

Somewhere along the line, concentrated wear usually occurs. If a continuous system of paths is not to be installed, or if golfers will be allowed to venture off the paths, provisions must be made for getting the carts

Funneled traffic results in unmanageable wear.



Effective cart path design for green complex.

on and off the paths without causing excessive wear at those locations. The paths themselves must be wide enough and durable enough to withstand traffic and retain definition without being a burden to the maintenance staff and the budget. They also must be designed in such a way as to be easily used by the golfers, but they must not be so obtrusive as to affect playability adversely. The project is getting a bit more complicated now, isn't it?

"We Have Met the Enemy and They Are Us"

Some of the most intelligent people in the world play golf, yet when these same people drive golf carts, intelligence often is conspicuous by its absence. Simply put: golfers sometimes commit incredibly foolish acts of thoughtlessness when they are behind the wheel of a golf cart. Generally they are concentrating on their game, trying to locate their golf ball, or talking to other golfers when operating golf carts. Little thought is given to how their carts should be operated. Since it is not like driving an automobile, where the threat of personal danger tends to keep one's thoughts more focused on driving, many golfers don't think much about obeying golf course traffic rules. Thus, traffic patterns and cart path usage should be kept as simple as possible.

The nature of the clientele at a course also must be considered. Golfers at some courses respond favorably to direction and make a concerted effort to operate carts safely and in a non-destructive manner. On the other hand, golfers at some courses are practically impossible to control. For courses with a difficult clientele, directional accessories (signs, stakes, ropes, barriers, etc.) should be sturdy and resistant to damage. They also should be more obvious. For instance, a single stake with an arrow or simple message may be sufficient to direct carts to enter or exit a path at a course with conscientious golfers. But even sturdy stakes and nylon rope may not be entirely effective at courses where golfers are less mindful. All directional accessories should be easy to move so that traffic patterns can be adjusted frequently.

It also may be possible to locate cart paths farther from play at courses where golfers are more cooperative. Although it may slow play slightly, keeping paths farther from play can reduce their impact on play and course aesthetics. Entry and exit opportunities should be provided only where appropriate.

Planning

It is essential to avoid safety problems regardless of the nature of the golfers. Serious accidents can result in disability or death, and expensive lawsuits are a possibility that must be planned for. Where possible, avoid dangerous design features such as steep slopes and sharp, improperly banked turns. For particularly difficult projects it is wise to involve a qualified engineer in the design phase and to research local construction codes. It is also a good idea to discuss proposed cart path projects with your insurance agent. Golfers are out for fun and competition; while safety may not be uppermost in their thoughts, liability and safety should be uppermost in yours.

Whether or not there are immediate plans to install a system of tee-to-green cart paths, a comprehensive plan to do so should be developed. A qualified golf course architect can be an invaluable aid in planning a cart path system. Such a plan can be implemented over a period of years to spread disruption and cost and reduce the possibility of waste. Installing a system of paths in piecemeal fashion without a sound plan is likely to create as many problems as it corrects.

Avoiding Wear Around Cart Paths

Since the reason for establishing cart paths in the first place is to eliminate wear problems, it does not make sense to install them so that the goal cannot be accomplished. Unbelievably, that is precisely what is done at many courses. With many cart paths, wear problems are common at entry and exit points, around the feature areas (greens, tees, and primary landing zones), and at points where carts frequently have to pass each other.

One key to avoiding wear around paths is to *maximize the number of entry and exit points* for the carts. This may sound basic, but it is overlooked more often than not. Forcing carts to enter and exit in just a few restricted areas causes unmanageable wear problems. The solution usually is to extend cart paths well out in front of the feature area to provide 20 to 40 linear yards of potential entry and exit points. If the location of the path is along the perimeter of the hole, the extensions may start or end in a straight line parallel to the line of play (see Figure 1). Unfortunately, the presence of

mounding or bunkering (particularly in an approach) may make this difficult or impossible. If that is the case, the cart path can be extended beyond the obstacle, or the entry point at least can be located in a less important play area. If the location is more towards the center of the hole (in front of a tee), the path should end in a wide arc (see Figure 2).

The shading and root competition effects of trees are magnified in high-traffic areas. Thus, entry and exit points should not be located in heavily treed areas. Further, avoid cart path locations that place trees between the entry and exit points and the primary traffic flow. Trees form immovable barriers that funnel traffic in addition to competing with turf.

It is a common practice to build wide, fan- or ball-shaped entry/exit pads for cart paths. Often this is helpful, but rarely is it sufficient by itself. Combining the extensions with the widened starting and stopping points is much more effective. Regardless of which method(s) are used, some type of barrier usually is needed to indicate where carts should enter and exit the paths. Again, keep it as simple as possible when selecting signs and/or barriers.

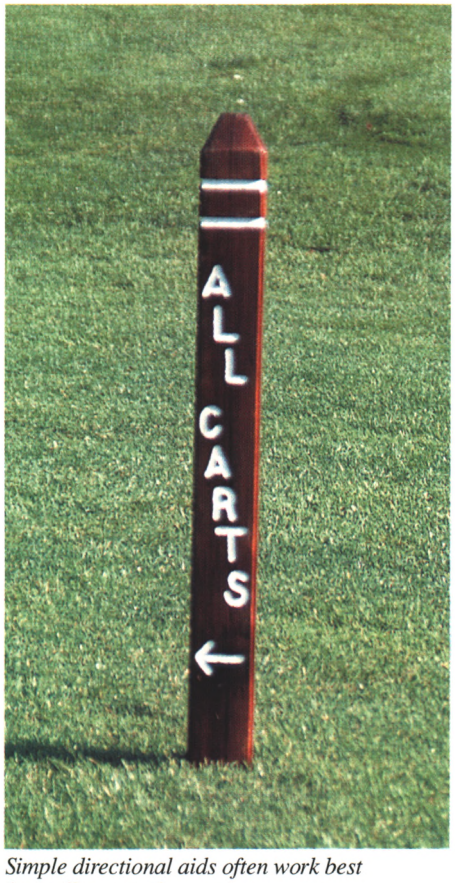
Topography must be carefully considered when the location and length of the extensions are determined. Paths should never start or stop on or near slopes. Aside from obvious safety concerns, the slopes will tend to channel traffic. More friction and slippage between tires and turf result when carts change speeds on slopes, and this will cause even more wear damage.

Location

The locations chosen for cart paths have a big impact on playability, wear, and safety, but they also greatly affect aesthetics. Unfortunately, their locations sometimes are chosen by default. That is, the path is installed wherever the wear spots develop. This amounts to taking the path of least resistance, and it falsely assumes that paths should necessarily be located where the golfers currently drive carts.

Assuming that the carts have multiple entry and exit points, getting golfers to and from the feature areas must now be considered. Routing a cart path to the edge of a green and off to the edge of the next tee guarantees wear problems because it provides a very limited number of entry and exit points for the golfers. This is made worse by the presence of immovable obstructions between the path and green or tee. Trees, shrubs, severe mounding, bunkers, etc. all serve to funnel traffic.

Wherever possible, wrap paths around tees and greens so that multiple entry and exit points are provided for the golfers (Figure 1). Aside from logistical obstacles (hole design, topography, etc.), safety issues may be the biggest limiting factor with this type of installation. Cart paths should not be located in areas where golfers might be subject to shots from adjacent holes. *Golfer safety is of paramount importance in cart path design.*



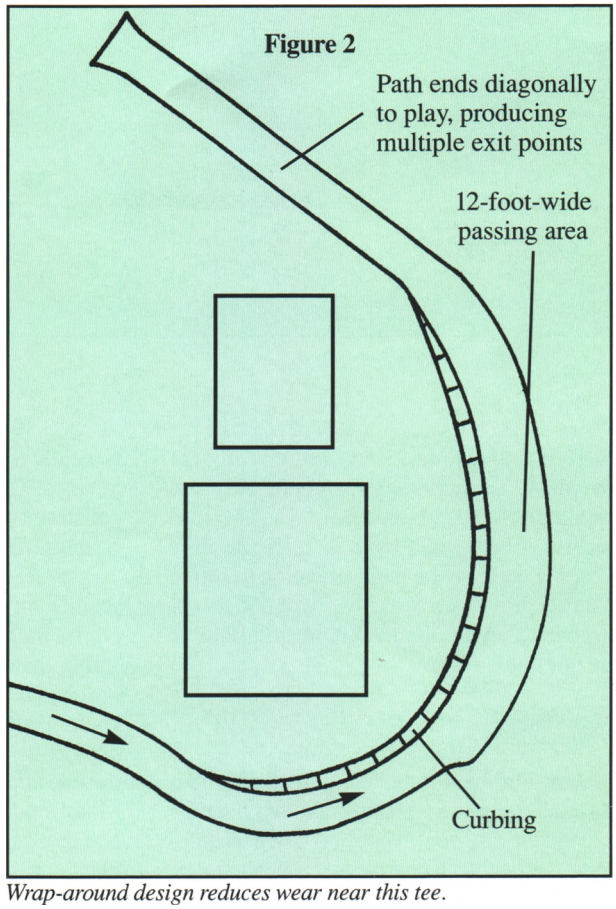
Simple directional aids often work best for traffic control.

In situations where wrap-around design is not possible, be sure that the area between the path and feature area is as wide and unobstructed as possible. Redesign of greenside bunkers and mounding may be necessary to widen the passageway. Removal or relocation of trees, shrubs, ornamental plantings, or even ball washers and trash receptacles also may improve traffic flow. As mentioned earlier, traffic control accessories should be designed to be effective and easily movable.

Nothing is more aesthetically disruptive than an exposed view of a cart path in an otherwise natural setting. Depending on the architectural design of the golf hole and its topography, it often is possible to hide cart paths from view. First, identify the intended line of play and the areas where golfers are most likely to congregate. Tees and landing zones are obvious choices, but there may be others. Next, consider how the existing topography might be used to obscure the cart path or make it less obvious. Utilization of mounding or curbing or performing regrading work all can be effective means of blocking the view of a path. However, mounding or use of curbing must not be so severe as to adversely affect traffic flow.

One of the easiest ways to hide paths is to pay close attention to the angle at which they are installed. Installation at an angle away from the primary view can make them practically invisible (see Figure 3). On relatively flat terrain, this may have little impact on the cost of installation and requires only careful planning. This method also is effective when paths cross areas in play or are routed up steep slopes. Routing the path across the slope and tilting it inward is an especially good ploy.

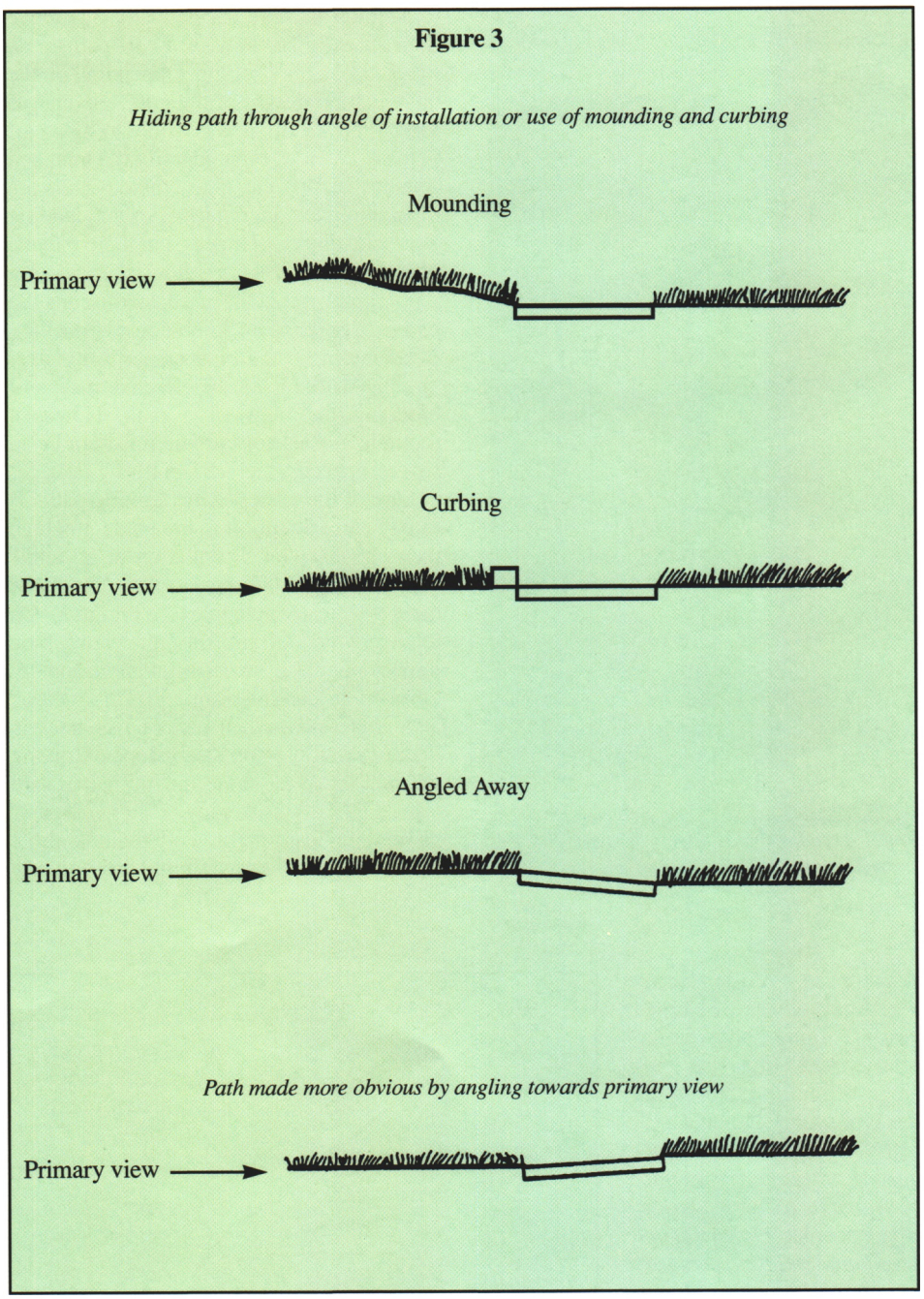
Winding cart paths tend to look more natural, but the turns should be properly



Wrap-around design reduces wear near this tee.

Figure 3

Hiding path through angle of installation or use of mounding and curbing



banked and gentle. Since golfers are not paying close attention to where they are driving, sharp bends are one of the first areas where golfers will have a difficult time keeping carts on the path. Locating a path in a dense grove of trees may do a good job of hiding it, but entry and exit areas should be free of trees.

Materials

Any number of different materials can be used to build cart paths, and they can be organized into the two basic categories — loose and stable. Concrete and asphalt are the most commonly used stable materials and typically require much less long-term maintenance. Due to differing tastes, budgetary constraints, and potential effects on play, courses often use less stable materials such as gravel, rock or brick dust, decomposed granite, crushed shells, pine straw, woodchips, mulch, etc. Unfortunately, the less-stable materials are subject to a number of problems, most of which are related to unwanted movement. For instance, most are subject to erosion, which can be especially troublesome with paths located on slopes. Many tend to be dusty when dry, and muddy and prone to splashing when wet. Woodchips may stick to golf spikes, and the dustier materials may be tracked onto turf areas by both foot and cart traffic. Carts and turf maintenance equipment may dislodge coarser materials (stones especially), which may present a hazard or cause costly damage to mowing equipment.

In addition, path definition problems tend to arise when less-stable materials are used. Installation of forms is suggested, and provisions should be made in the budget to permit the necessary maintenance, which may be substantial.

Curbing is essential around feature areas to prevent paths from growing wider. Golfers have a subconscious urge to pull carts off the paths by just a foot or so unless they are physically prevented from doing so. Regardless of the material utilized, the curbing should be installed with the soil and turf flush with the top of the curb. This makes trimming easier. Materials that can be used for curbing vary widely and include, but are not limited to, the following: steel, concrete or concrete fabricated products, asphalt, Belgian block, landscape timbers, and railroad ties. Just be sure to install curbing only in areas where the carts are not to be given options for exiting or entering the path. Provisions for disabled golfers also should be given full consideration.

Adequate width is an essential component of a successful cart path project, and a common failing is to install paths that are less than eight feet wide. Narrow paths are more difficult for golfers and maintenance equipment to negotiate, hence this recommendation. Installing paths less than eight feet wide leads to wear along the edges and more rapid deterioration of the path. Paths must be even wider in areas where carts congregate or pass one another and in areas heavily used by the maintenance staff. Widths in these areas should be 12 feet or more.

Drainage

Cart paths can have a significant effect on surface drainage. Installed above grade, paths can block surface drainage and cause water to collect in adjacent turf areas. Installed below grade, the paths may remain wet. They can be used in a positive way to intercept water and channel it to appropriate collection points. Drainage swales can be designed into cart paths. Keep in mind that there may be environmental factors to consider, the most important being the potential impact on course runoff into streams or other water bodies.

Conclusion

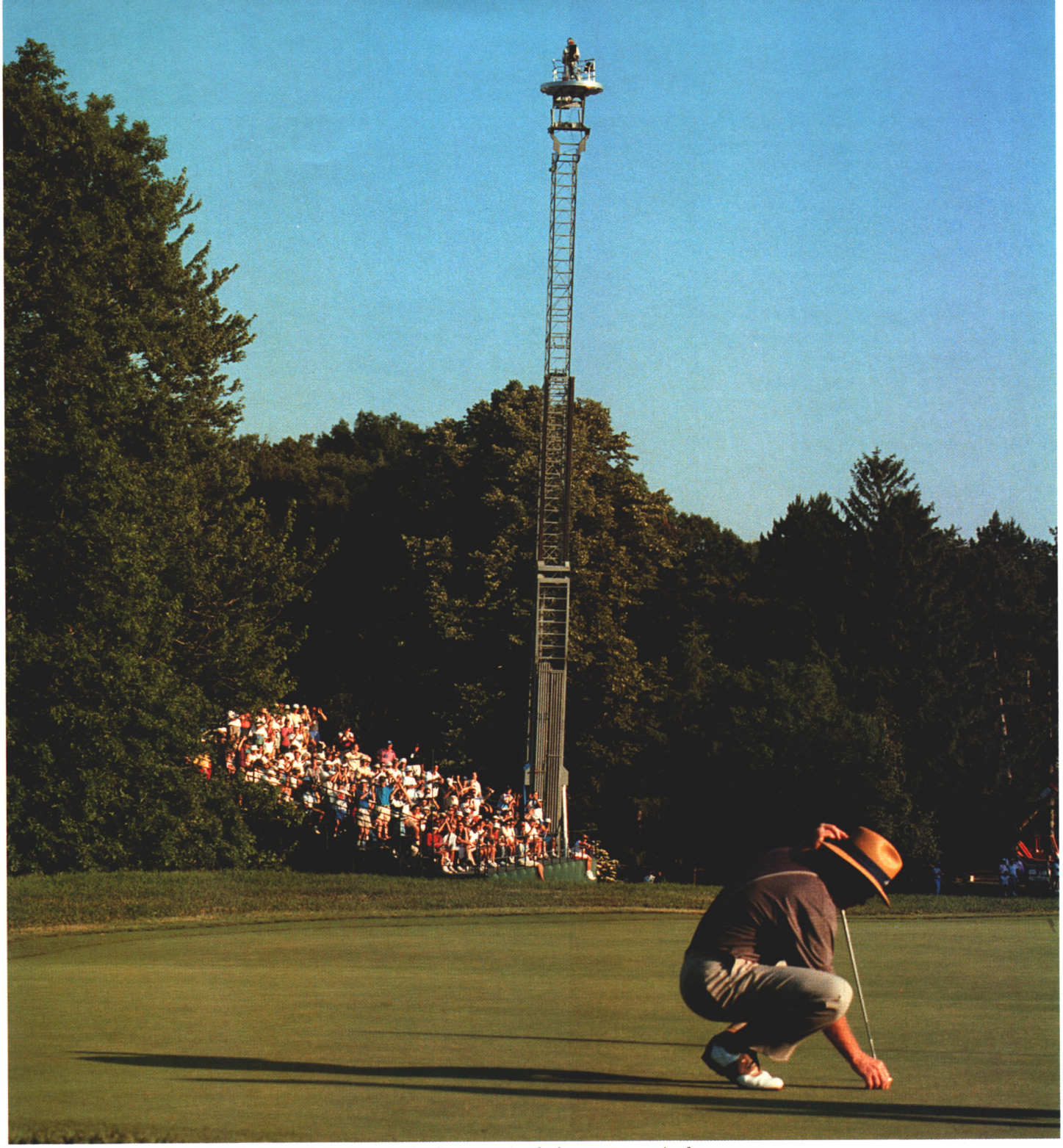
Cart path installation can be expensive and disruptive, and since most golfers find them distasteful, there is a strong tendency to do

the bare minimum. The shortest routings possible are often chosen, and widths are made as narrow as possible. This is a false economy. Cart path systems can be installed in phases to spread the cost over a period of time, but the urge to skimp on design and materials should be avoided at all costs. When considering a cart path project, it is imperative to start with a good plan and to make a firm commitment to quality. The common excuses of "it's the best we could do," "you should have seen it before," or "it's all we could afford" don't wash. Poorly planned and installed cart paths are a waste of money because they are no more attractive or useful than the bare, eroded soil they replace. Cart paths are a long-term investment, so take the time and effort to design and install them properly.

A Checklist for Developing a Cart Path System

- Have applicable safety guidelines been met?
- Have multiple entry/exit points been created for carts?
- Have multiple entry/exit points been created for golfers?
- Are the paths of adequate width?
- Has curbing been installed where appropriate?
- Has disabled golfer access been included in the design?
- Has surface drainage been considered?
- Has environmental consideration been given to storm water disposal?
- Have stable materials been chosen for paths subject to erosion?
- Will the new paths be clearly and cleanly defined?
- Have tree root interference problems been avoided in high-traffic areas?

Wear around cart paths in high-play areas results in poor playability.



Expensive towers and equipment rise up on the golf course landscape to give the best vantage point for coverage.

THE MEDIA AND THE GAME OF GOLF

by DON HEARN
CGCS, Weston Golf Club, Weston, Massachusetts

TELEVISION viewing of golf events has reached huge proportions, with millions of people watching golf on TV each year. The U.S. Open Championship gained full coverage of all 18 holes of the final two rounds in 1977. Over 9.9 million people viewed the last half hour of the 1993 U.S. Open! Every major television network will carry some type of golf event this year. The American golfer watches televised golf in numbers greater than in all of history.

Golf on TV is covered by announcers with various backgrounds, from football player to sportswriter to professional golfer. Devout viewers receive much of their education on the game from these announcers and, therefore, they (the announcers) have tremendous influence on the way many golfers think.

The game depends upon accurate interpretation of the Rules and precise definitions of terms. However, many announcers, playing the role of ringmaster, are carelessly using terminology that is confusing and inaccurate. A new generation of golfers, educated by TV, is emerging on the scene.

It seems the game of golf has taken on an air of almost "blood sport" proportions, the combatants being the players and the golf course! The judge and jury are the media — particularly the television analysts and commentators. No longer does a player's ball *roll* across the green — the ball "releases." Approach shots do not stop quickly — they "check."

On a recent telecast, viewers were told the "greens aren't releasing." It's as if the *green* was an active participant playing the role of opponent! The announcer leads the viewer to believe the green chose not to cooperate with the golfer. Imagine that! One would not dare insinuate that perhaps the golfer did not hit it . . . hard enough! The truth is, the player, not the green, is the source of the deficiency.

It is amazing how the laws of nature change during golf tournaments. For example: Winds don't blow — they swirl. Balls don't roll one way or the other because of surface slope and gravity — grain makes this happen. Greens don't become drier as the day goes by — they become crusty. I've been a golf course superintendent for 25 years and I've never seen a crusty green. Firm, yes. Dry, yes. But crusty? Burnt toast is crusty.

I am sure commentators and other media people do their best to describe what takes place in a way that is interesting to viewers, listeners, and readers. The incorrect use of adjectives and other technical agronomic terms, however, is hardly professional.

There seems to be an almost sycophantic relationship between the media and the players. The announcers place great stock in the professional golfers' assessments of golf course conditions and events. Case in point: A very popular professional golfer stated he would not have played in the PGA Championship at Inverness if he had known the greens would be as slow as he thought they

Viewers and listeners want to see the action and hear about it too. They depend upon the commentators' remarks.

Professional golfers' assessments of golf course conditions and events have a significant impact on commentators, the media, and spectators.

were. In his opinion, they were "too slow" for a major championship.

Some years ago, a famous golfer exclaimed he did not play in the Pleasant Valley Golf Classic in Sutton, Massachusetts, because the fairways, at the time, were Kentucky bluegrass, not bentgrass! (The fact is, there was almost no Kentucky bluegrass in the fairways, but lots of annual bluegrass — the same grass that dominated the fairways at most other PGA Tour stops in the North! — Editor).

The media accept these statements as if the player has infallible knowledge and authority. As a result, the player feels a power to persuade the masses, and the focus by others becomes the golf course and the playing conditions. The axiom "play the ball as it lies" no longer is the theme of golf. Golfers have become catered-to athletes.

Grain on greens, particularly during the early part of the Tour schedule, is the number-one topic of announcers. Grain can cause golf balls to defy the laws of gravity! Grain, for the record, is the direction or arrangement of grass leaf blades, often forming a pattern. During the Bob Hope Chrysler Classic, played on different courses in the Palm Springs area, viewers were frequently reminded that putts will break toward the close-by community of Indio. Viewers were also informed that the grain grows toward the setting sun, and therefore will affect the route of putts. Further, they were told putts will break away from the mountains. Now, if Indio is east of the tournament site, and the sun sets west of the same site, and the closest mountains are located south . . . which way will the putt break?

Surely the slope of the green has the most significant influence on the direction of the breaking putt, not the mystical forces emanating from the mountains, the sun, or downtown Indio! Golfers tell me that they are sure putts can break uphill because of grain even on triple-mowed tournament turf cut at 7/64 of an inch! I wonder where they got that idea?

Being critical of the media is easy, especially of those on television. Their job must be more difficult than it looks, and to be dragged over the coals for the slightest mistake must be frustrating. However, one of their missions is to provide insight and factual information to the viewer. The "isms" spoken with authority are well beyond my ability to understand their origins. One commentator stated, "The grain's moving left to right, toward the setting sun. He [the player] played quickly. The grain got him."

Does this mean if he had played more slowly the grain would not have gotten him? Or does it mean the grain prevented the putt from falling in the hole? Either way, it seems the grain, not the player, had the most influence upon the ball.

I've often wondered — if the grain grows toward the setting sun, is there a period when it also grows toward the rising sun? And if it does, at what point in the day, or evening, does it reverse direction from growth toward the setting sun to growth toward the rising sun?

How's this one: "You can't see it or feel it . . . but it's there!" This was an analyst's observation on grain during a major Tour event. I wonder how this analyst would react if I told him the sidehill-downhill putt he was about to attempt really didn't break downhill on the sidehill. Rather, it broke uphill on the downhill because, though he couldn't see it or feel it, there was a mound on the sidehill that would cause his ball to break uphill. I'm sure my observation would be dismissed, if not my sanity questioned.

But, here is an analyst who can make an unfounded or inaccurate observation and have those listening accept it as Gospel. This is especially true if they are professionals from the Tour.

I've had golfers tell me what is said on TV must be true because professional golfers know such things. Many golfers assume, or believe, that professional golfers are well versed in agronomy. When I point out that this is not usually true, they're amazed. Some, I feel, don't readily accept this premise and probably never will. But driving a car does not make you an automobile mechanic. Does it?

The most disconcerting aspect of the incorrect information supplied by some commentators and writers is the effect it has on golf course superintendents and their profession. Although a statement like "the grain took it" may seem innocuous, it is truly amazing how golfers can believe the reason a putt behaves strangely is because of the grain they heard about last weekend on TV. Of course, grain did not affect putts to the extent it now does until commentators used it as an excuse for missed putts.

The seemingly incessant harping about the grain, particularly on overseeded greens, has reached the point of being ridiculous. If bermudagrass is the "grain culprit" and is overseeded with cool-season grasses such as ryegrass, bentgrass, or *Poa trivialis*, the ball doesn't even contact the bermudagrass because the bermudagrass lies dormant under the overseeded grasses. The cool-season grasses are not grainy because they are seeded at high rates, grow very upright, and are cut very closely.

A suggestion to help remedy what I believe is a problem is to have commentators meet with golf course superintendents prior to air time. One well-known personality told me he walks the course early in the day to get a feel for what the player will experience. USGA and PGA Tour public relations people should be interested in making sure this time is available for their golf tournaments and championships. The USGA, PGA, and PGA Tour go to great lengths to expend untold resources to insure a top-quality golf course for their events. Superintendents prepare for months prior to the event only to listen to inaccurate remarks from media personnel. Better education is the key. The media need to get together with the USGA and Tour officials and involve the people who really know the most about golf course preparation and turfgrass — the superintendents.

Televised golf has made everyone stop and take notice of golf course conditions.

DAN WALDOCH

At Tom O'Leary Golf Course, Bismarck, North Dakota. The entire Sheila Shafer Junior Links layout. The third hole is in the center of the photo. Number 1 is on the left. Number 2 tee is near the two trees in the background, with the green on the right.

Facilities for Junior Golf

by JAMES M. LATHAM
Director, Great Lakes Region, USGA Green Section

JUNIOR GOLF PROGRAMS are given high priority throughout the world of golf, since it is the natural means of preserving the sport for the future. Most are programs that are operated on a local, state, or regional basis, with some support from the $185,000 budgeted by the USGA for special junior golf programs. These are noteworthy undertakings, but most have one major flaw — a lack of readily available playing facilities. Yes, juniors are given priority on some half-days at some courses or clubs, while adults complain about losing *their* playing time. It must also be somewhat intimidating for a six-year-old to tackle an adult-size golf course, even from the forward tees.

Some organizations have recognized this shortcoming and have taken the appropriate steps to provide a real golf experience for young people, on a scale that fits their size and skill level. The design and construction can be plain or fancy and are often the creation of the golf course superintendent working with a junior golf committee or organi-

MALCOLM BROWN

(Above) Contestants, scorers, and gallery become deeply involved in these competitions — just like the grownups. (Left) Superintendent Charles Busche shows a downsized flagstick. Benches and ball washer stands on every tee are also made to measure for the players.

zation. Construction costs are minimal because play pressure is lower and player demands are less exacting than on the big course. The maintenance requirements add little to existing budgets, and these special holes also can double as personnel training and/or product evaluation facilities.

The Sheila Shafer Junior Links, Bismarck, North Dakota

This three-hole course was dedicated on June 19, 1993, to fill the needs of beginning Junior golfers age 12 and under. It occupies an acre or so of parks department land adjoining the Tom O'Leary Golf Course (municipal), and is under the direction of Dan Waldoch, golf operations manager, and Chuck Busche, the golf course superintendent at Tom O'Leary. Funds for construction were raised by the Dakota Junior Golf Association through an annual golf tournament and the generosity of the lady for whom the course is named. DJGA also supports the junior golf instruction and tournament program in the Bismarck-Mandan area and is trying to reach other communities in southwestern North Dakota.

All features of this course are scaled down.

AL FIERST

(Above) The Junior Practice Area at Oak Park Country Club receives the same high level of maintenance as the adults' area. This target green, practice bunker, and chipping area are just behind the practice tees. (Right) The target green and bunker are in the foreground, with the practice tee setup and range beyond. This area serves as the skeet range during the non-golf season.

The Scorecard

Hole	Yards	Par
1	65	3
2	57	3
3	60	3

Even the flagsticks, ball washer stands, and benches on every hole are sized to fit the younger set. The greens average about 2,000 square feet. Maintenance costs are included in the budget for the big course.

The course gets about 50 rounds per day, with tournaments drawing 100 to 120 per event. Competitions vary according to age groups: 8 and under, 3 holes; 9 to 12, 6 holes; and 13 to 17, 9 holes. Juniors also may play the regular course at reduced rates. Adults may play the Junior Links, but *only* when accompanied by a junior golfer.

(Top) This youngster has already learned to carry a rake into the bunker with him. The golfers in these programs are often better informed on etiquette and care of the course than their older counterparts. (Left) Sunset Ridge Country Club, Northbrook, Illinois.

Oak Park Country Club, Elmwood Park, Illinois

Not every club or course in a metropolitan setting has the available space for a junior course. Oak Park is one, but they did recognize the needs of juniors and provided a special area for their practice. It is separated from the primary practice tee by shrubbery and provides full range facilities, including a bunker and chipping area to a target green. Superintendent Al Fierst ensures that this area is maintained with the same degree of care as the primary practice range and, during the spring and fall when schools are in session, sees adults using the area when they want a bit of solitude.

The Junior Links at Sunset Ridge Country Club, Northbrook, Illinois

This rather elaborate four-hole course was built in 1985 on a few acres of surplus property adjacent to the practice range and a parking lot. The construction budget was about $20,000, with maintenance costs included in the general operating budget of the golf course. The bunkered greens range from 650 square feet to 1,400 square feet, plus the collars. Fairways are being converted to bentgrass, giving this course the same playing surfaces as the big course.

Juniors use the end of the single practice tee near their facility and have a bunker near their fourth green for practicing either fairway or greenside sand shots. A small practice green is set aside for young golfers at the opposite end of the practice tee, near the clubhouse.

Golf course superintendent Dennis Wilson has developed an innovative maintenance technique for the Junior Links. All of the day-to-day operations — mowing, cup changing, bunker raking, etc. — are performed by turf management student interns, after they become familiar with the procedures and equipment. Specialized work such as spraying is done by licensed full-time employees, assisted by the intern. There are few better learning experiences available for future superintendents.

The Scorecard

Hole	Par	Yards	Hdcp
1	3	60	3
2	3	45	4
3	3	115	1
4	3	125	2

The Greenshire — Par 3, Waukegan Park District, Waukegan, Illinois

The City of Waukegan does not have a junior course, per se, but it does have a good par-3 course that is reserved for junior play only on Mondays. It is available to juniors and their families at all other times. This is a free-standing, 50-acre course maintained by the staff of the Bonnie Brook Golf Course, a few miles away, under the direction of golf course superintendent Dave Beno.

There are about 150 kids aged 7-11 in this program, which has six events over the summer. There are girls' and boys' divisions: the 7- to 8-year-olds play 4 holes; the 9-year-olds, 7 holes; and the 11- to 12-year-olds, 9 holes. The 12- to 17-year-olds in the junior program play at Bonnie Brook.

The potential for instruction at these facilities is unlimited because of their exclusivity. What better opportunity exists for beginners to learn the importance of proper ball mark repair, divot replacement, and sand raking than on their own course, unspoiled by the bad habits of some adults? By the same token, the level of maintenance on these courses must remain high as an indication that youngsters are very important members of the ageless family of golfers.

Fire is used at Prairie Dunes Country Club as a management tool to maintain the prairie ecosystem in the natural areas and reduce encroachment from fire-susceptible trees.

Fire as a Landscape Management Tool

by JOHN WESTON
Ecological Restorationist, University of Missouri

FIRE! Shout it out at a movie theatre, and you are subject to a class A misdemeanor. Yet fire played as much of a role in the history of the ecosystem of the continental United States as temperature, soil, air, and water. Only in the last few years have many ecological stewards begun implementing fire as an important management tool in the preservation of plant biodiversity.

Mention trees and you have touched upon one of the savior symbols of the environmental movement. More trees mean more carbon dioxide converted to oxygen, resulting in cleaner air. More trees mean more woods, restoring our environment to its pristine state. Yet Stephen Pyne, History Professor at Arizona State University, in a landmark historical book titled *Fire In America*, found that savanna, a Spanish term meaning grassland with widely spaced trees, was the predominant ecosystem in much of America at the time of European settlement. Pyne goes on to say that dense forests are a result of, not a victim of, European settlement. Confused? Let us take a historical look through time at the role fire played in the American landscape.

During the Tertiary geological era in America, a score of a million years ago, dinosaurs, mastodons, camels (camels?), and other large mammals roamed America. During this time, our climate experienced a large warming and drying period, resulting in the western grasslands formation.

As the drying continued, dinosaurs became fossils, and the grasslands spread east with the prevailing westerly winds. The Colorado short grass begot the Kansas midgrass, which begot the Missouri tallgrass — each regime increasing in size as it got closer to the influence of Gulf moisture. At this

point the grasslands (and all prairie species associated with them) met with trees and staged one of the greatest ecological battles in American history. During wet cycles the trees predominated, pushing the grassland back west. During extended drought, the grassland reclaimed occupied territory, even advancing across the Mississippi into Illinois, Indiana, Ohio, and all the way to Long Island!

It was during this time that grasslands found their greatest ally — lightning. Lightning strikes started massive fires that, fanned by the prevailing west wind, burned hundreds of thousands of acres at a time. These fires moved grassland plants (fire resistant) into areas frequented by trees (fire susceptible). Fire was a mode of transportation for life then (through uncontrolled lightning), as it is now (controlled in the cylinders of planes, trains, and automobiles).

Indians observed the benefits of lightning fire and used it to enhance their living conditions. They burned to control dangerous infestations of insects. They burned to expedite travel (if dense woods were the original America, we would be hacking our way through Kentucky about now). More important, they burned for hunting purposes. Buffalo were attracted to the fresh growth of grass after a fire, so the Indians burned an area and waited for the herds, and subsequent feast, to show up. Fire also was used to drive off the enemy. Hostile warring tribes or threatening early European explorers sometimes died trapped in grassland fires. Lewis and Clark's Indian guides were so paranoid of it that they became livid when orders were given to camp on dormant prairies.

It wasn't long before this paranoia was transferred to the Europeans. Where fire was beneficial to the nomadic Indian, it was an enemy to the more sedentary European communities. Villages, slow-footed livestock, and covered wagon caravans all stood to lose much as a result of landscape fire. Fire became outlawed during the late 1700s to early 1800s, and the effects on the environment were massive. As the grasses had moved east with the pyrogenic Indians, the trees moved west with the Europeans. Savannas became dense woods (a typical midwestern savanna has 350 plant species, ten times that of dense, overgrown woods), and prairies were lost to trees. In 1819 naturalist Edwin James wrote, "The fires have been eliminated, and dense groves of oaks and elms have sprung up." Soil scientist Curtis Marbut noted in 1914, "The growth of brush spread with great rapidity, young seedlings sprang up, and if not burned for a year or so, they were soon large enough to live through the average fire. The tree growth made the growing of grass impossible." Elimination of fire, combined with overgrazing and the advent of the steel plow, ushered ecological degradation into the 19th century in America in a fashion not seen before.

Communication and preparation are essential to a successful prescribed burn.

In early times, lightning started massive fires on the grasslands that burned thousands of acres at a time. The fires moved grasslands into areas previously occupied by trees.

One may wonder, "If we return to fire as a landscape tool, are we going to return to log cabins and horses?" The answer is: Not at all. Due to Mother Nature's conservative time clock, most ecologists believe that ecological restoration is not recreating the past, but discovering the future. To circumvent prejudice and misunderstanding, let us equate the natural ecosystem with our circulatory system. The similarities are striking.

A recent medical report on the human diet focused on the difference between modern man and caveman. Our forerunners were a

Specific weather conditions relative to necessary temperature, humidity, wind speed, and wind direction should be outlined in the prescribed burn plan.

hunting-and-gathering society, feeding on nuts, berries, leaves, grains, and lean meat (when their aim was good). In the millennia since then, we have changed exponentially on the outside, but on the inside, we are exactly the same. A digestive and circulatory system that evolved on fruit and fiber is now stuffed with burgers and fries. Hypertension, obesity, arteriosclerosis, and heart disease — previously non-existent with hunter gatherers — run rampant.

Unfortunately, the same has happened to our natural ecosystem. Mother Nature is the original conservative. Due to her deliberate time clock, very little plant evolution has taken place in the last million years. Five centuries ago, Mother Nature's American chapter suffered a shock to the head from which she is still reeling. Settlements, plows, livestock, dams and dikes, and fire control have ushered in a new era of imported plant material, fed to a habitat whose digestive and circulatory system have evolved from a completely different diet. In effect, we have hardened the arteries of our ecosystem.

Fire can serve as the catheter of our ecosystem. Its benefits are many: stimulating early green-up, increasing stem and flower density, reducing plant disease, evicting exotic plant material, and increasing light for new plant development. In horticultural terms, fire serves as nature's dethatcher.

But fire, like anything else, suffers from use turning into abuse (although non-use also is an abuse). Add that to the destructive connotation most people associate with the term fire, and you have a "volatile" subject. Let's examine how fire can be properly used in landscape management.

Ken McCarty is the Land Steward for the Missouri Department of Natural Resources. His responsibility is the maintenance of all the state park ecosystems, covering hundreds of thousands of acres in Missouri. After observing the onset of encroaching non-native brush in designated natural areas, he no longer feels a "hands-off" approach will result in survival of protected areas. His approach has been to reintroduce prescribed fires to preserve threatened species.

Doug Ladd, Director of Science and Stewardship for the Missouri chapter of the Nature Conservancy, is responsible for the protection of 34 preserves and manages them for the survival of rare and endangered species and exemplary natural communities. To ensure survival, Ladd believes fire is not only essential, but mandatory. Ladd burns preserves varying from woods (burning leaf litter resulting in long, slow eight- to ten-hour exercises in smoke inhalation), to savanna (burning prairie species amongst scattered tree openings), to prairie (hot fires that travel faster than you can run). Preparation is everything for the success of the prescribed fire. A typical burn project for him and his six-person crew entails:

1. A prescribed burn plan detailing location, plant species, specified weather conditions (temperature, wind, and humidity), a burn plan map, location of firebreak construction, manpower needs, potential hazardous areas, supression plans, and a mop-up plan.

2. A door-to-door notification of neighbors.

3. Notification of police and fire officials and procurement of necessary burn permits.

4. On-site weather specification needs: temperature (40-80° F), humidity (25-60%), wind speed (5-15 miles per hour), and wind direction (away from sensitive areas).

5. Final pre-burn meeting of the fire crew personnel (who previously must have passed an aerobic stress test) and issuance of tools, instructions, water, backpack water sprayers, fireproof suits, hard hats, and radios.

6. Several months afterwards a post-burn analysis and checkup are conducted to monitor species diversification and density, and the effect of fire timing and frequency.

Prescribed Fire on the Golf Course

Stan George is the golf course superintendent at Prairie Dunes Country Club, in Hutchinson, Kansas. Prairie Dunes' natural areas were being invaded by the non-native Virginia creeper, poison ivy, grape vine, and wild dogwood. In 1992, he began a prescribed fire program to preserve the prairie ecosystem at Prairie Dunes. His program is a textbook example of the use of fire management. He oversaw the following steps:

1. Recruitment of a Professor of Rangeland Management from Kansas State University to provide technical assistance in the materials and methods of prescribed fire.

2. Attendance at a fire science workshop by the grounds committee chairman, appropriate club personnel, and himself.

3. Involvement of the local fire department to assist in the actual burning.

4. Publishing three newsletters sent to the membership and surrounding community detailing the program, yearly step-by-step procedures, and benefits accrued.

5. Training of all staff employees in the prescribed fire workshop.

6. Follow-up monitoring of environmental responses by ecologically trained personnel.

The initial ecological responses at Prairie Dunes have been encouraging. Stan will continue to manage his natural areas through the use of prescribed fire as conditions warrant.

Stephen Pyne stated that if fire were presented as a new landscape management tool today, it would never make it past the Federal Regulatory Agency. Therefore, when using fire as a management tool, it is essential to observe all existing codes and regulations.

Frequently, nature's fire elicits heaven and hell on earth. In many cases, it can produce intense heat and flame, but used properly it can be easily controlled. In the majority of land-use scenarios, it is a necessary element of ecosystem preservation. After the conflagration comes renewed life. Grasses, sedges, flowers, and shrubs sprout from the warmed soil, and above- and below-ground insects and animals return. A paradise of diversity provides everlasting displays of texture and color. Fire proves what we have thought all along — in order to get to heaven, one must go through hell.

WATER RETENTION IN GOLF GREENS: Sub-Root Zone Layering Effects

by DON TAYLOR, University of Wisconsin,
and FRANK WILLIAMS and SHELDON NELSON, Brigham Young University

Editor's Note: The following article is based on research that was completed before the 1993 version of the USGA Recommendations for a Method of Green Construction *was published. The particle size distributions for the root zone material, intermediate layer, and gravel layer used in this study do not conform to current USGA recommendations. Nevertheless, results of the study reinforce the USGA's strong recommendation that all materials used be thoroughly tested before construction, that a quality control program be followed during construction, and that shortcuts or modifications not be taken. Leaving out the intermediate layer when a coarse gravel (6-9mm) is used, similar to one of the methods illustrated in this study, has never been recommended by the USGA but has been one of the most common shortcuts taken with USGA greens. As shown in this research study and in the field, this shortcut can result in excessive moisture being held in the root zone mix.*

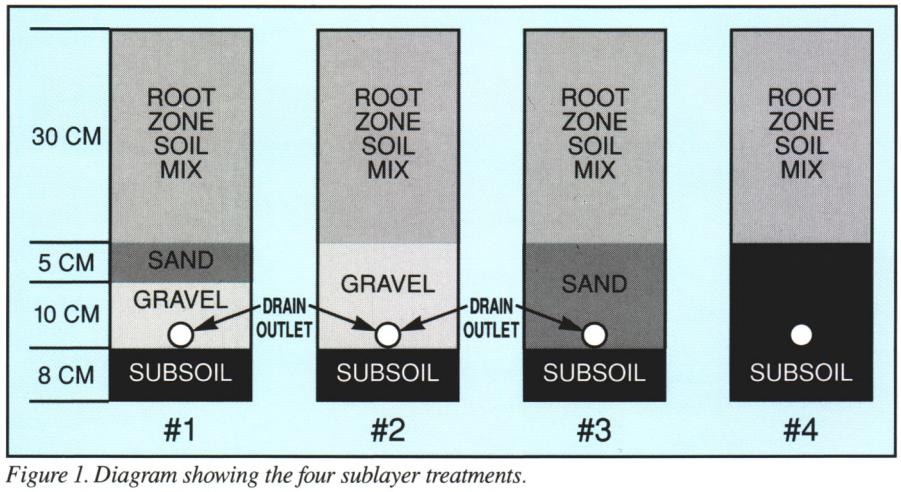


Figure 1. Diagram showing the four sublayer treatments.

GOLF GREEN construction methods, including the USGA specifications for golf green construction, almost always include a root zone soil mixture placed over coarse-textured layers such as sand or gravel. The coarse-textured sand or gravel layers have the dual purpose of quickly moving excess water to the drain tile and increasing the effective water-holding capacity of the root zone soil mixture.

The fact that soil layers of distinctly different properties can dramatically affect soil water relations has been shown many times.

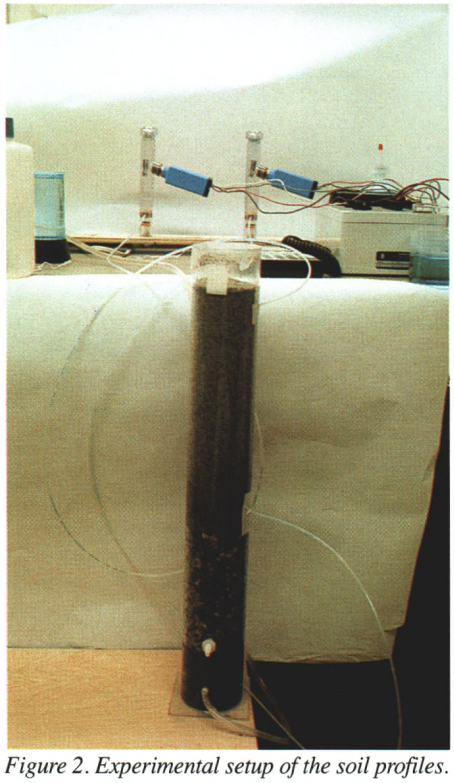


Figure 2. Experimental setup of the soil profiles.

When a finer-textured soil mixture layer is underlain by a coarse-textured layer such as gravel, water retention in the soil mixture layer is increased because the coarse-textured gravel will not transmit significant amounts of water until the soil mixture above is very wet. Once the layer above the coarse-textured layer is wet enough to cause water flow into the coarse layer, water moves rapidly within the coarse-textured layer.

Three major factors affecting the amount of water retained in the overlying fine-textured layer are (1) size of the particles of the underlying coarse layer, (2) depth to the coarse-textured layer, and (3) the desorption or water retention characteristics of the fine-textured soil layer (Miller, 1973). Since the amount of water retained in the root zone is affected by both the soil mixture properties and the coarseness of the underlying layer, golf green performance may depend not only on the root zone soil mixture, but also on the characteristics of the layer below.

Recently, the USGA specifications for golf green construction were modified to allow root zone soil mixtures to be placed directly on a fine gravel sublayer, without an intervening coarse sand layer, if the soil mixture and gravel layer met certain specified criteria (USGA Green Section Staff, 1993). The sandwiched coarse sand layer has traditionally been considered a filter between the soil mixture layer above and the gravel layer below, but it also has important effects on water retention in the root zone soil mixture layer.

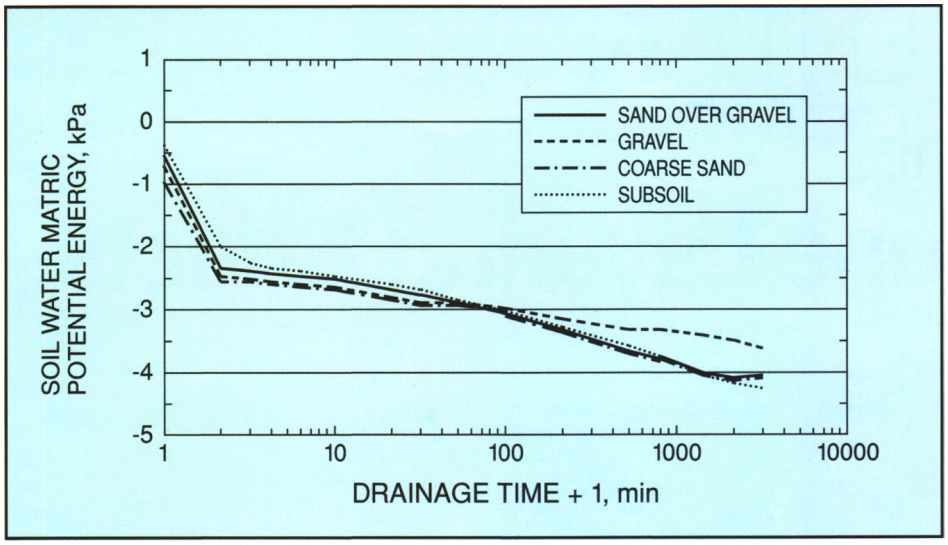


Figure 3. Matric potential energy values of soil water 2cm below the soil surface during the 48-hour drainage period. Values shown are the average of four soil mixtures.

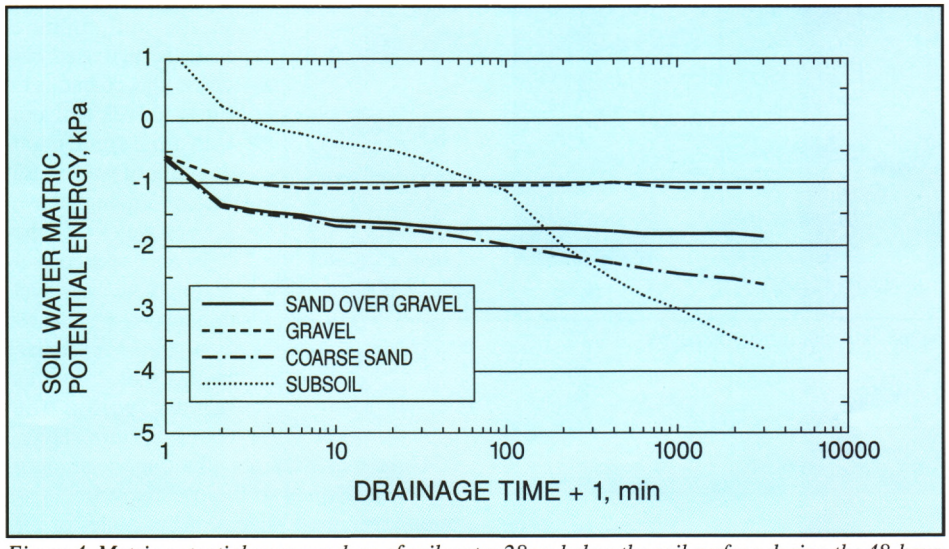


Figure 4. Matric potential energy values of soil water 28cm below the soil surface during the 48-hour drainage period. Values shown are the average of four soil mixtures.

We conducted an experiment to determine the degree to which drainage from and water retention in shallow root zone soil mixtures were affected by the properties of the underlying layers.

Materials and Methods

In this laboratory experiment, 30cm (11.8-inch) layers of four soil mixtures were packed over four distinct sublayering designs. Figure 1 shows the sublayer treatments. Water was ponded and maintained on the surface for an extended period of time. The profiles then were allowed to drain for a period of 48 hours, during which time soil water potential energy was regularly measured at depths of 2cm and 28cm (0.8 inch and 11.0 inches) below the soil surface. After 48 hours of drainage, samples were removed from the soil mixture layer and mass water contents determined. Soil water potential energies and mass water content values were used to evaluate effects of coarse-textured sublayers on water relations in soil mixtures.

Four soil mixtures were used in the experiment and consisted of:

1. An 80/20 by volume sand/sphagnum peat mixture composed from a primarily fine and medium sand (88.6% between 0.10mm and 0.50mm diameters), hereafter called the finer sand/peat mix.

2. An 80/20 by volume sand/sphagnum peat mixture composed from a predominantly medium and coarse sand (64.3% between 0.25mm and 1.0mm diameters), called the coarser sand/peat mix.

3. An 80/20 by volume coarser sand/loam soil mixture, resulting in a mixture with 3.3% clay, 6.7% silt, and 87.6% sand on a mass or weight basis.

4. A 60/40 by volume coarser sand/loam soil mixture, resulting in a mixture with 6.1% clay, 13.1% silt, and 78.8% sand on a mass or weight basis.

A more complete analysis of the sublayer materials used and the soil mixtures is given in Taylor, et al. (1993).

After packing the sublayers and soil mixture layers in a plexiglas cylinder, tensiometers were installed 2cm (0.8 inch) and 28cm (11.0 inches) below the soil surface. The lower tensiometer was 2cm above the soil mixture/coarse layer interface. Tensiometers were attached to pressure transducers and a data logger to facilitate regular measurement of soil water potential energy during the 48-hour drainage period. Figure 2 shows the experimental setup.

Results and Discussion

Soil water matric potential energy measures how tightly the water is held to the soil particles. A value of 0 bars (0 kPa) indicates the pores in the soil are essentially full of water and that some of the water is held very loosely to the soil, a condition called saturation. Figure 3 shows the matric potential energy of the water 2cm below the soil surface during the 48-hour drainage period. For simplicity, the average of the four soil mixtures is shown. In this experiment, water near the soil surface drained very quickly in the first minute or two following the disappearance of the surface water, then gradually slowed down during the remainder of the 48 hours of drainage. The almost identical curves for the four sublayer treatments indicate that drainage near the surface was determined by root zone soil mixture properties rather than by the sublayer characteristics.

The sublayer did, however, make a substantial difference in drainage properties at the bottom of the soil mixture layer, as shown in Figure 4. At a depth of 28cm below the soil surface, 2cm above the soil mixture/sublayer interface, soil above gravel quickly drained to about -0.011 bars (-1.1 kPa) and stayed there for the remainder of the drainage period. When the sublayers consisted of sand over gravel, the lower part of the soil mixture drained to about -0.018 bars (-1.8 kPa) and remained there. A sublayer of coarse sand or of loam soil caused the soil mixture to continue draining throughout the 48 hours of drainage. By the end of the drainage period, matric potential energies were down to about -0.026 bars (-2.6 kPa) and -0.032 bars (-3.2 kPa), respectively, for the coarse sand and loam soil sublayers.

In other words, drainage at the top of the root zone soil mixture layer was determined principally by the soil mixture characteristics, whereas drainage at the bottom of the soil mixture layer was determined principally by the coarse-textured sublayer. A sand/soil root zone mix over a gravel sublayer resulted in the most poorly drained situation at the bottom of the root zone, with sand over gravel next, and a coarse sand or loam subsoil layer resulted in more drainage out of the soil mixture.

Similar results were obtained in measuring the amount of water remaining in the soil after 48 hours of drainage. Figure 5 shows the water retained in the four root zone mixtures at three depths, averaged over the four sublayer treatments. Notice that at all depths the 80/20 finer sand/peat mixture retained the most water, followed by the 80/20 coarser sand/peat and the 60/40 sand/soil mixtures, the 80/20 sand/soil mixture retained the least amount of water.

Figure 6 shows the water retained in the profiles for the different sublayers, averaged over the four soil mixtures. In the upper part of the soil mixture layers, the sublayer had minimal effects on water retained, but in the lower part of the profile, the sublayer had a dramatic effect on water retained. The results showed the same effect as did the potential energy readings: root zone mixture over gravel was the wettest, followed by root zone mixture over coarse sand over gravel, and root zone mixture over coarse sand and root zone mixture over loam soil were the driest.

Implications of the Research

This research demonstrates the important fact that coarse-textured sublayers, such as gravel or coarse sand over gravel, increase the water retention in overlying root zone mixture layers. They do this principally by creating a wet zone at the bottom of the root zone mixture layer while having little impact on water retention in the upper portion of the soil mixture layer. The wet zone in the lower portion of the root zone soil mixture layer can cause problems in performance of the green if the turf rooting depth cannot extend to its optimal depth in the soil because moisture conditions are too high. This would likely happen if the soil mixture layer is too shallow or if the soil mixture contains excessive quantities of fine materials (clay, silt, very fine sand, or organic matter). The higher the water retention of the root zone mixture used, the thicker the root zone mixture layer needs to be when placed over coarse-textured sublayers. Even with an ideal soil mixture, our opinion is that a 12-inch layer of root zone mixture is the absolute minimum that should be used.

The experiment also demonstrates that the type of material used in the sublayer can have a definite impact on the drainage characteristics of the root zone profile. Soil mixture over gravel will result in the wettest conditions in the lower portion of the soil mixture layer, followed by soil mixture over coarse sand over gravel. In this experiment, a sublayer of only coarse sand resulted in rather uniform moisture conditions throughout the overlying root zone mixture layer.

Careful selection of both soil mixture and subsurface layer components is critical to avoid drainage problems in golf greens. Gravel sublayers certainly move water to drain tile quickly once water begins flowing in the gravel, but they maximize retention of water in at least a portion of the soil mixture above the gravel. If the soil mixture itself holds too much water, the underlying gravel layer simply compounds the problem of too much water.

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Figure 5. Soil water content at three depths after 48 hours of drainage. Values shown are the average of four subsurface treatments.

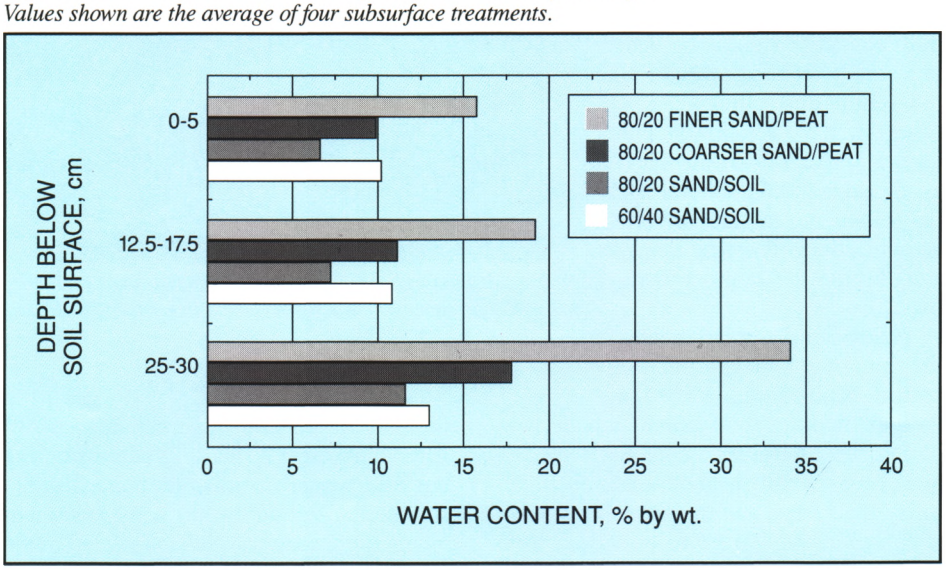
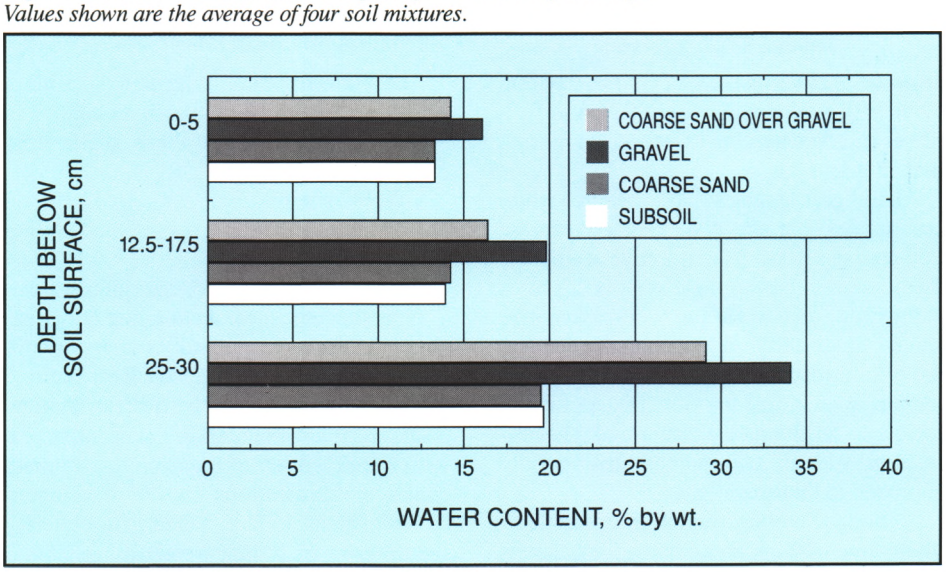


Figure 6. Soil water content at three depths after 48 hours of drainage. Values shown are the average of four soil mixtures.



ON COURSE WITH NATURE
BUTTERFLIES

by NANCY P. SADLON
Environmental Specialist, USGA Green Section

MOURNING CLOAK (not a jacket of sorrow), Comma, and Question Mark (not punctuation terms) are but three of over 700 butterfly species that need food, cover, water, and breeding areas for their survival. Naturalizing areas of the golf course, encouraging native grasses, tolerating weeds like dandelion and chickweed, encouraging native wildflowers, eliminating pesticides from certain areas, and cutting natural areas only once a year are important activities the golf course manager can do for the conservation of butterflies.

PAUL A. OPLER

Female monarch (Danaus plexippus) *nectaring at rabbitbrush, a native ornamental shrub widely used in western gardens.*

Taking care of the early stages in the butterfly's development is critical. Native meadows can provide an important food source for butterflies during the caterpillar stage. Each species must have specific plant materials on which to lay their eggs, and the plants must have uncontaminated foliage to provide a food source for the emerging caterpillar. Native grasses, weeds, and wildflowers provide food sources for caterpillars. Butterfly caterpillars are rather fussy about what they will eat. For example, Monarch caterpillars eat only milkweed species. Once natural areas are in place on the golf course, creating a butterfly garden will benefit the butterfly's life as an adult, serving as a food source and breeding area.

Many golf courses have beautification committees that add plant materials to the golf course surrounds to improve aesthetics. Trees seem to be the most popular form of expression, and while the well-placed tree can be a nice addition to the course, trees in the wrong place can be the cause of many maintenance problems. Butterfly gardening represents an alternative that provides beautification and an environmentally friendly approach to landscaping.

Although winter seems like the least likely time to think about butterflies, now is the time for planning a garden or meadow. Although there is no butterfly activity during the cold winter months, the butterflies are still there. They survive the winter season in hibernation, some as adults protected in the cracks of trees, others as over-wintering chrysalises (the pupal stage) in meadow areas or leaf litter, waiting for the return of spring.

Gardening for Butterflies

The butterfly garden needs to provide a variety of features for butterfly habitat:

- Sunshine to keep them warm and energetic,
- Flowers with nectar,
- Trees and shrubs for protected hiding places, and
- Appropriate plants for caterpillars to eat.

Of course, the idea of attracting crawling, chewing insects to the golf course may not be palatable at first suggestion. Rest assured, the golf course will not be overrun by new pests, and maintenance will not be impacted, with the exception of the need to eliminate chemical applications in the designated butterfly areas. In fact, it is rare for butterfly species to overeat their welcome.

The best way to attract butterflies is with native plants, as these are the flowers that are more familiar. Once established, native plants often are easier to care for than their ornamental counterparts, as they are adapted to soil and climate conditions. Each part of the country has flowers of regional distribution that are especially attractive to butterflies in the area. In the eastern states, wild bergamot and birdfoot violet are valuable nectar sources during the spring and summer. Morning glory vines and beggar-ticks offer abundant nectar during the long bloom season in the southeastern states. The Great Plains prairies are abundant with coneflower, ox-eye daisy, and blazing star, and the southwestern desert offers harbor milkvine. In the western states, rabbitbush and buckwheat are popular with butterflies. Observing which flowers in the wild attract the most butterflies is the best way to identify preferred species in your area.

Generally, butterflies are attracted to flowers with yellow, orange, and purple blossoms, and occasionally red, pink, and white blossoms. Flowers with flat surfaces, clustered florets, or large-lipped petals provide an area where butterflies can perch while getting nectar. Single flowers often provide more abundant and accessible nectar than hybridized, double flowers. Efforts to incorporate beneficial trees such as American elm, wild cherry, white ash, tulip tree, black locust, and sassafras can help, and an occasional wild patch that includes milkweed, goldenrod, tickseed, and black-eyed susan is invaluable to butterflies.

Start a butterfly garden near the clubhouse or as an occasional patch near play areas. The Standard Club in Atlanta, Georgia, had great success making their butterfly garden an integral part of the practice putting green. Listed in the table are some popular garden flowers that provide the needed food sources

Food Sources for Butterflies

PERENNIAL FLOWERS	*Bloom Period*	*Flowering Color*	*Height*	*Hardiness Zone*
Aster *(Aster sp.)*	late summer/early fall	varies — purple, rose, peach, white, red	12" - 72"	3-8
Black-eyed susan *(Rudbeckia fulgida)*	summer	yellow	18" - 36"	3-9
Blanketflower *(Gaillardia aristata)*	summer	yellow with purple-red center	24" - 30"	2-10
Blazing star *(Liatris spicata)*	late summer	purple	12" - 36"	3-9
Butterfly weed *(Asclepias tuberosa)*	midsummer	orange	12" - 36"	3-9
Chrysanthemums *(Chrysanthemum sp.)*	late summer/early fall	red, purple, yellow	12" - 60"	2-10
Globe amaranth *(Gomphrena sp.)*	early summer	pink	12" - 24"	3-8
Goldenrod *(Solidago sp.)*	late summer, early fall	yellow	12" - 60"	3-9
Lavender *(Lavandula angustifolia)*	summer	blue-violet	12" - 35"	5-9
Lupine *(Lupinus polyphyllus)*	late spring, eary summer	white, pink, blue	36" - 60"	3-7
Marigold *(Tagetaes erecta)*	summer to fall	yellow, red, gold	6" - 24"	2-10
Purple coneflower *(Echinacea sp.)*	summer	pink	12" - 48"	3-8
Scarlet sage *(Salvia sp.)*	late summer, fall	purple	12" - 42"	3-10
Showy stone crop *(Sedum spectabile)*	spring to summer	red, pink	12" - 42"	3-10
Vervain *(Verbena sp.)*	summer	blue, lavender	12" - 60"	4-10
Wild bergamot, bee balm *(Monarda fistulosa)*	midsummer to early fall	pink, lavender	12" - 48"	3-9
Zinnia *(Zinnia elegans)*	late summer to early fall	red, orange, yellow, pink, others	12" - 36"	3-7
SHRUBS/SMALL TREES				
Blueberry *(Vaccinium sp.)*	mid-spring	white with pink	10'	3-8
Butterfly bush *(Buddleia davidii)*	mid- to late summer	red	6' - 10'	5-10
Hackberry *(Celtis occidentalis)*	mid-spring	white	35' - 40'	5-8
Sassafras *(Sassafras albidum)*	mid-spring	red	30' - 50'	5-9
Sweet pepperbush *(Clethra alnifolia)*	mid- to late summer	white	3' - 8' height	3-4

for butterflies. Use these suggestions as a starting point, and add species you identify in the wild that have significance to local butterfly populations.

Conclusion

Beautiful butterflies are the reward for practicing integrated pest management, minimizing broadcast spraying of pesticides, and providing needed habitat. They can be a valuable symbol of your commitment to the environment and the enhancement of wildlife habitat. Beautification committees can find butterfly gardens a rewarding project, producing flowers for enjoyment by the golfers and contributing to the preservation of an important component of the natural environment.

For more information on butterflies, contact:

The Xerces Society
10 Southwest Ash Street
Portland, OR 97204

North American Butterfly Association
39 Highland Avenue
Chappaqua, NY 10514

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The Monarch Butterfly

Believe it or not, this small butterfly, one of summer's great symbols, undertakes an annual two-way, 2,500-mile migration, from breeding grounds in Mexico, Guatemala, and the southern coast of California to northern locations in search of milkweed, the sole food of the caterpillar. Habitat destruction in Mexico's breeding grounds is of concern for the Monarch's future, as is the loss of habitat areas in its winter feeding grounds in the United States. Areas that support the vital milkweed food source are valuable to the butterfly's survival. Golf courses can help by managing appropriate areas of the golf course as open fields and woodland meadows with milkweed species and thistles. Including the butterfly weed, the most popular cultivated species of milkweed, in the garden can also help the Monarch butterfly.

WINTER NEWS NOTE

Howard Kaerwer (right) enjoying a close-up look at turfgrass research.

In Memoriam

Howard E. Kaerwer, 73, a member of the USGA Turfgrass and Environmental Research Committee, died in Minneapolis, Minnesota, on November 10, 1993. He was best known for his work in turfgrass breeding and consulting. He also was responsible for developing new technology for seed quality testing and became an international expert in alfalfa breeding.

Howard pioneered the breeding of new grasses suited for the needs of golf courses, athletic fields, parks, and lawns. He received many patents and awards for his turfgrass varieties and developed a salt-resistant *Puccinia* variety, durable enough to survive along highways. Howard traveled widely to discover new grasses that could be used to develop new varieties for golf courses.

Howard worked for the Northrup King Company for 37 years and retired in 1984 as Director of Research and Development. In 1988, he received the GCSAA's Distinguished Service Award. He was very active with the University of Minnesota Landscape Arboretum, serving as treasurer of the board of trustees and conducting research on breeding winter-hardy trees and shrubs.

He actively served on the USGA Turfgrass Research Committee for six years. Howard was known for his ability to thoughtfully evaluate the many diverse research proposals that came before the Committee over the years. His love of research and plant breeding was evident in all that he did. Howard was a wonderful person, an enthusiastic and productive member of our Research Committee, and a friend to us all. The turfgrass world will miss him very much.

A scholarship in Howard Kaerwer's name has been established at the University of Minnesota Department of Horticultural Science. Memorial contributions also may be made to the Minnesota Landscape Arboretum.

Howard Kaerwer Scholarship Fund
c/o Dr. Gary Gardner
Dept. of Horticultural Science
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ALL THINGS CONSIDERED

Attitude Adjustment

by JAMES E. SKORULSKI
Agronomist, Northeastern Region, USGA Green Section

OK, maybe it was a real hard season and everybody was just tired. Record heat, drought conditions, and major floods have that effect on people. The general mood of many superintendents was not good in August. Just ask one. Well, now it's January, and the past is the past and hopefully all of those bad memories are gone, at least for the superintendents where the snow is falling. Things have probably slowed down, allowing a little time for philosophic thought and a well-earned vacation. Put aside the airline schedules for a minute, get another cup of coffee, and read this. It may inspire some thought or at least make that vacation even more desirable.

I am sure by now everyone is very familiar with the controversies surrounding pesticide use on the golf course. Public concern over pesticides continues to grow. Even golfers are becoming cynical about pesticide applications and are questioning their need. Golf courses often are unfairly targeted in this issue. Much of the information the public receives is biased and sensationalized. Both the USGA and GCSAA currently are funding research projects that will provide fundamental, scientific data regarding pesticide fate and human exposure. The data from these projects will be used to make more rational decisions and policy concerning pesticides and their use.

With all that said, it is still safe to assume that a fair number of pesticide products currently used will not be available in future years. Companies will voluntarily choose to remove products from production to avoid re-registration costs. Other products will be eliminated due to toxicity or potential mobility. States such as California and New York rarely see new pesticides registered, which further limits the chemical tools available for management. All chemical applications may have to be formally justified. One can only guess what effects the preemption cases might have on the local scale. I am not trying to paint a bleak picture, but changes are occurring and are likely to continue.

Does this spell disaster for the turf manager and the industry? Of course not. The job certainly would not get any easier, but the most qualified superintendents would survive, and may even flourish, as their overall management skills are better recognized. Management would obviously change. Maintenance programs again would be based on sound cultural practices, such as water management, cultivation, fertility, and mowing operations. Tournaments and outings would no longer dictate timing for important maintenance tasks. Increased emphasis would be placed on proper construction and more practical designs that provide effective drainage, good soils, adequate sunlight, and good air movement. Turf species would again be grown in the climatic zones for which they are adapted. Reconstructing problem greens would become increasingly popular, and a tree removal recommendation would not raise a single eyebrow. Even the research emphasis would likely change.

So far, so good, but there is one small detail . . . the golfer.

This is where I believe increased restrictions on pesticide use would actually have a positive effect. It would quickly be realized that demands for championship conditions for everyday play are not realistic. Those demands would soon end with the ensuing turf loss that would likely occur. Emphasis would have to be placed on obtaining consistent, smooth surfaces with green speeds based on growing conditions. Unfair comparisons between your golf course and tournament golf courses on television would no longer be taken seriously. Golfers would have no choice but to tolerate some pest-related damage, and more emphasis would again be placed on playability as opposed to appearance. The golfers might even turn their attention more to the game itself and less to slight blemishes or inconsistencies that have somehow become so important in today's game.

I am not condoning a ban on all pesticides or severely increased restrictions. However, pesticides should not be used as a crutch to help overcome major cultural deficiencies or to meet unrealistic demands. Additional restrictions governing pesticide availability and use are likely to become a reality, and we must anticipate what effects those changes might have. A little change of attitude might be just what we need to bring our maintenance programs back to reality.

1994 GREEN SECTION NATIONAL & REGIONAL CONFERENCES

NATIONAL CONFERENCE

February 7	Green Section Educational Conference	Dallas, Texas

FLORIDA REGION

March 8	Palm Beach Gardens Marriott	Palm Beach Gardens, Florida
March 10	Orlando Marriott	Orlando, Florida

GREAT LAKES REGION

March 10	Meridian Hills Country Club	Indianapolis, Indiana
March 24	Best Western — SteepleGate Inn	Davenport, Iowa
April 22	Meadow Lark Country Club	Great Falls, Montana

MID-ATLANTIC REGION

March 3	Wedgewood Country Club	Columbus, Ohio
March 10	Dupont Country Club	Wilmington, Delaware

MID-CONTINENT REGION

March 22	Old Warson Country Club	St. Louis, Missouri
March 24	Lakewood Country Club	Denver, Colorado
March 29	Dallas Athletic Club	Dallas, Texas

NORTHEASTERN REGION

March 8	Westchester Marriott	Tarrytown, New York
March 17	Desmond Hotel	Albany, New York
April 5	Holiday Inn	Taunton, Massachusetts

SOUTHEASTERN REGION

March 15	Pinehurst Country Club	Pinehurst, North Carolina

WESTERN REGION

January 12	Doubletree Hotel	Palm Desert, California
March 8	Willow Creek Country Club	Sandy, Utah
March 14	The Oregon Golf Club	Portland, Oregon
March 15	Industry Hills Golf Course	Industry Hills, California
March 16	Castlewood Country Club	Pleasanton, California
March 28	Waialae Country Club	Honolulu, Hawaii
April 14	Arizona Country Club	Phoenix, Arizona

1994 USGA Green Section Educational Conference

in conjunction with the

65th GCSAA International Conference and Show

Dallas, Texas — Monday, February 7, 1994

GOLF KEEPS AMERICA "GREEN"

Moderator: James T. Snow, National Director, USGA Green Section

12:30 p.m.	**Welcome and Introduction**
12:45	**The Best Turf Tips from the Green Section Staff** Jim Moore, Director, Mid-Continent Region Chuck Gast, Agronomist, Florida Region Paul Vermeulen, Agronomist, Western Region
1:00	**Operational and Economic Impacts of Golf** Rick Norton, Vice President, National Golf Foundation
1:30	**More Turf Tips from the Green Section Staff** Patrick O'Brien, Director, Southeastern Region Pat Gross, Agronomist, Western Region John Foy, Director, Florida Region
1:45	**A New Attitude: Audubon, Our Golf Course, and the Community** Peter Leuzinger, CGCS, Superintendent, St. Charles Country Club, St. Charles, Illinois
2:15	**Even More of the Best Turf Tips** Jim Latham, Director, Great Lakes Region Jim Skorulski, Agronomist, Northeastern Region Bob Brame, Agronomist, Mid-Atlantic Region
2:30	**Sand Bunkers: Old and New** Joe Baidy, CGCS, Vice President, Golf Course Superintendents Association of America
3:00	**The Best Turf Tips Keep Coming** Larry Gilhuly, Director, Western Region Keith Happ, Agronomist, Mid-Atlantic Region Bob Vavrek, Agronomist, Great Lakes Region
3:15	**Strategies for Successful Long-Term Maintenance of Golf Courses** Ben Crenshaw, Principal, Coore and Crenshaw, Member, PGA Tour
3:45	**Last, but Not Least, of the Best Turf Tips** David Oatis, Director, Northeastern Region George Manuel, Agronomist, Mid-Continent Region Stan Zontek, Director, Mid-Atlantic Region
4:05	**Closing Remarks**

USGA GREEN SECTION RECORD
JANUARY/FEBRUARY 1994

TURF TWISTERS

PROPER LIGHT AND AIR CIRCULATION

Question: There is a lot of talk about opening up tree-pocketed areas of turf to improve air circulation and increase sunlight penetration. I understand what lack of air movement does to turf growth, but how much daily sunlight is needed on a bentgrass putting green to maintain healthy turf? (Indiana)

Answer: Light duration and intensity influence plant growth and development. While the exact amount varies, eight hours of direct sunlight each day is considered a good rule of thumb for healthy turf growth. When turf areas receive less light, the plant responds with thinner leaves, reduced shoot density, reduced tillering, and longer internodes. The net result is a turf stand that has less vigor and hardiness, and is more susceptible to environmental stress.

+ TRAFFIC MANAGEMENT

Question: The hole locations on our golf course are changed every day throughout the golf season. We try to rotate locations so that six greens have holes located on the front, six in the middle, and six at the rear. In addition, nine holes are cut on the right side of the greens and nine holes on the left. This balances the golf course playability, and when placed in conjunction with tee marker locations, helps keep the course length fairly uniform from day to day. In order to achieve this, we occasionally have to locate holes in some fairly challenging positions. My question is, what constitutes a "legal" hole location? (Ohio)

Answer: There is no such thing as a "legal" hole location. The USGA has traditionally recommended five paces from the edge of the green (a pace is not specifically defined) with no severe undulations or slopes within the immediate three- to four-foot radius around the hole. The area around the hole should be on the same plane, but not necessarily flat. This may not always be realistic on smaller putting surfaces that experience a lot of play. The bottom line is, the golf course should be defined by the committee. Your rotation program sounds very good. The goal is to be consistent and fair. After all, *everyone* is playing to the same hole location.

= TOP-QUALITY TURF

Question: We plan to regrass our bermudagrass greens within the next two years. Recently we've heard about problems in acquiring consistent, top-quality Tifdwarf bermudagrass sprigs. What can we do to insure we are getting what we pay for? (Florida)

Answer: Unfortunately, this is a problem in Florida as well as other states. Purchase of a true Tifdwarf bermudagrass can be somewhat of a guessing game because Florida does not have a turf certification program. Check the success of courses in your area that have recently completed regrassing programs. Observe renovation programs ranging in age from one to five years to accurately evaluate a supplier's material. In Florida, check with the University of Florida in Fort Lauderdale. The turf researchers there are currently performing side-by-side performance evaluations of Tifdwarf bermudagrasses from various sources.