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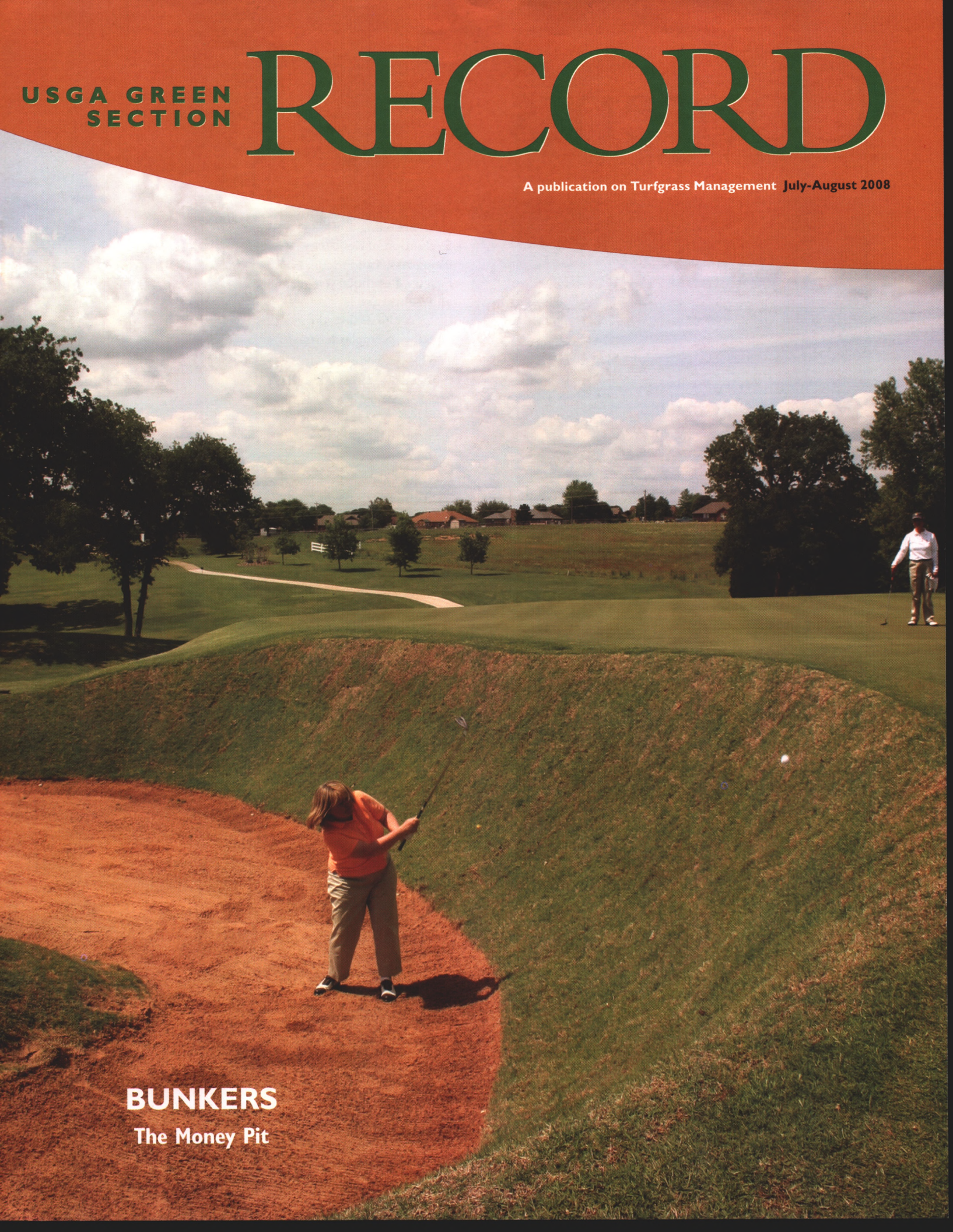

BUNKERS

The Money Pit

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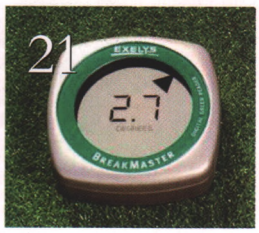

Cover Photo
Few golfers realize how costly bunkers really are to the bottom line.

The Money Pit

Do golfers really understand how much bunkers cost?

BY JAMES F. MOORE

USGA folks and Rules aficionados are fond of correcting golfers who refer to sand bunkers as "traps." However, given the rapidly rising cost of building and maintaining bunkers, the word *trap* might better describe the overall impact on golfers' pocketbooks. For a variety of reasons discussed in this article, bunkers may well have passed greens in terms of their ultimate cost to the consumer.

This article addresses construction, maintenance, and golfer expectations, and how each affects the overall cost of bunkers on a high-quality course. Right or wrong, these courses often define golfers' expectations of what they would like to have at their course. Unfortunately, few golfers realize how costly it would be to have what they see on television.

The figures quoted in this article are derived from extensive telephone interviews with golf course superintendents, golf course builders, sand suppliers, bunker liner distributors, and trucking companies. It should be kept in mind that the figures represent broad ranges and that all of the costs associated with the construction of bunkers are highly subject to change — largely due to the uncertainty of fuel costs.

DESIGN

Bunker design has perhaps the greatest impact on the long-term cost of maintaining bunkers. Steep, flashed sand bunker faces may be striking to the eye, but they are also extremely prone to erosion during even moderate rain events. A great deal of hand labor is frequently necessary to shovel the sand back onto the faces. Newly shoveled sand is loose and soft and thus prone to "fried-egg" lies until it has had time to compact. Heavy rain events often move not only the sand but the underlying soil as well. This soil contaminates the sand with silt and clay, quickly reducing the sand's ability to drain. Eventually, the sand becomes so contaminated that it must be completely replaced. Although bunker liners have helped reduce erosion and contamination, they are expensive to install and maintain. This is discussed in greater detail below. Grass faces

While grass faces eliminate the problem of erosion, they still require extensive maintenance — often by hand.

Drainage is critical in every bunker construction project and typically costs approximately $5.00 to $6.00 per linear foot.

are far less prone to erosion problems, but often they are difficult to mow and even more difficult to irrigate and fertilize. They are also far less dramatic in appearance and therefore utilized to a lesser extent by most architects.

In addition to determining the style of bunker faces, architects determine the shape of the perimeters. Bunkers with intricately shaped, serpentine lines require a great deal of extra hand labor for edging and are therefore more costly to maintain.

Perhaps the greatest single design factor affecting the cost of construction and the maintenance of bunkers is simply how many there are on the course. Most courses have from two to three bunkers per hole, but there are courses with more than 200 and courses that have no bunkers at all. Based on survey data from the Golf Course Builders Association of America (GCBAA — Golf Course Builders Association of America *2008 Construction Guide Tool* compact disc), the average total square footage is about 100,000 square feet, with the average size of a single bunker being about 1,500 square feet.

CONSTRUCTION

Although there are many ways to build bunkers, all utilize a similar sequence of steps.

Construction of the Core, Subgrade Preparation, and Edging

This step involves the digging of the hole and the shaping of the bunker floor and edges. Large, simply shaped bunkers can often be built with small dozers and skid loaders. Small, intricately shaped bunkers require extensive hand shaping, which drives up the cost. A broad estimate of the cost of this step ranges from $.75 to $1.50 per square foot.

Install Drainage System

Subsurface tile drainage is utilized in most bunker construction and typically is installed by digging 8-inch-wide ditches 8 to 10 inches deep. Perforated 4-inch drainage pipe is placed in the ditches and covered with gravel. Approximately 150 linear feet of drainage tile is used in a 1,500-square-foot bunker, with an installation cost of about $5.00 to $6.00 per linear foot (including materials).

Liners

Liners are a relatively new concept for bunkers and are available in a very wide range of materials and designs (far too many to discuss in this article). All liners are installed between the soil floor of the bunker (subgrade) and the sand. Liners are claimed to reduce the erosion of sand from the bunker faces and, as a result, reduce the contamination of the sand with soil, thus prolonging its ability to drain. Liners fall into two broad categories — those that are rolled out over the bunker floor, much like carpet, and those that are sprayed or spread over the floor to form a sealant. The cost of liners varies widely depending on their thickness and composition, while the cost of installation varies a great deal depending on the amount of hand work necessary. Roll-out liners range from $0.25 to $0.75 per square foot, with installation adding $1.00 to $2.00 per square foot. The sealant-type liners are usually installed by the liner representative and typically range from $1.00 to $1.50 per square foot (including materials).

A hidden cost of all liners is the labor necessary to avoid damaging them during bunker maintenance. Sufficient sand must be continuously maintained over the liners to prevent contact by golfers and maintenance equipment. For this reason, many golf course superintendents find it necessary to hand-rake bunkers with liners. This can be extremely expensive, as discussed below under "Maintenance."

Bunker Sand

At one time, selecting a sand for use in bunkers was a fairly simple task. Typically, a mason or brick sand would be purchased from a local sand and gravel plant. The sand was then hauled the relatively short distance to the course, resulting in extremely reasonable trucking charges. Fuel surcharges were a rarity.

Things have changed. Ironically, one of the most contentious aspects of course maintenance today is the playing quality of a hazard — the bunker. In an effort to find the "perfect" sand for their bunkers, golfers seem to be willing to pay any price. In addition, it is not uncommon for courses to select a sand that must be hauled hundreds and even thousands of miles, resulting in freight and fuel charges that can far exceed the cost of the sand itself.

The cost of sand is usually made up of three factors: 1) the cost of the sand, 2) the cost of the freight, and 3) the addition of a fuel surcharge. In many states you also have to pay tax on the product or the freight (including the fuel surcharge), and in some cases both. For example, Pennsylvania taxes both at a rate of 6%.

Bunker sands today fall into two broad categories. Native sands are sand products that are mined and then screened to achieve the proper particle size distribution. As a general rule, screened native sands range from $15.00 to $25.00 per ton FOB (the cost at the plant in this case). Manufactured or crushed sands make up the second category. These are sands that are mined and then passed through a crushing device. They are sometimes screened after crushing. The crushing process typically doubles the cost of the sand, with manufactured sand ranging from $30 to $50 per ton FOB.

The sand must then be hauled to the project. In most cases, trucks carrying 23- to 25-ton loads will be used to haul the product. The cost of hauling is affected by many factors, including tolls, traffic (time), and distance. In most cases, the 23-ton load costs from $1.75 to $3.50 per mile. Assuming $2.00 per mile, trucking the sand 100 miles would result in a freight charge of $200.

Unfortunately, that will not be the final cost of the sand. Given the rapid rise of the cost of fuel, trucking companies must now add a fuel surcharge on top of the freight charge. As everyone knows, the cost of fuel varies regionally, and thus surcharges do as well. Surcharges can range from 10% to 30%. Assuming 20%, our $200 freight charge has increased to $240 per 23-ton load per 100 miles.

Yet another caveat regarding fuel expense is the fact that the cost per gallon of fuel can rise quickly. When contractors are trying to bid on a project, they must estimate what fuel charges will be at the time they purchase the sand. However, since sand is often not installed in bunkers until the very end of a construction project, a year might elapse between the time the bid is submitted and the time the sand is actually purchased. Does anyone want to try to guess what diesel fuel will cost a year from now? For this reason, the fuel surcharge is very likely to change from the time you first check on the cost of the trucking until the time the product is actually hauled.

Sand Installation

The cost of placing four inches of sand into a bunker cavity ranges from $10.00 to $14.00 per ton. Based on a telephone survey of five of the most commonly used sand suppliers across the country, new golf course construction typically utilizes from 2,500 to 3,000 tons of bunker sand, while renovations often require less — in the range of 1,500 to 2,500 tons.

Intricate designs are eye-catching and dramatic. However, the extensive hand labor necessary to build and maintain them makes them extremely expensive.

Combined Cost of Construction, Sand, and Freight

Adding up these individual charges illustrates just how expensive it is to add bunkers to a golf course construction project. As an example, let's assume we are building a new course that will have three to four bunkers per hole, with each bunker approximately 1,500 square feet in area, for a total of 100,000 square feet of bunkers. We will use a liner and we will purchase a manufactured sand from a plant 300 miles away. Our project will require 3,000 tons of sand.

Construction at $1.00 per square foot	$100,000
Install 1,000 linear feet of drainage at $5.50 per foot	5,500
Purchase and install liner at $1.50 per square foot	150,000
Purchase 3,000 tons of sand at $35.00 per ton	105,000
Ship sand to project at $2.00 per mile *(Each truckload will cost $200. 3,000 tons will require 131 truckloads or $26,200)*	26,200
Fuel surcharge of 20%	5,240
Install sand in bunkers at $12.00 per ton	36,000
Total bunker cost	$427,940

Based on the assumptions in the table, our bunkers will cost $4.28 per square foot or about $6,400 per bunker.

MAINTENANCE

As frightening as the cost to add bunkers to a course might be, an even greater expense is their perpetual maintenance. As the Green Section agronomists travel the country and visit courses of all budget levels, the most common complaints from golfers involve bunkers. Depth of sand, "fried-egg" lies, lack of consistency, and even varying moisture levels are all sources of dissatisfaction. Many golfers believe they are entitled to a certain quality of lie in a bunker and that anything less is a sign of poor maintenance or bad sand, and usually both. Unlike the other hazards on the course, bunkers now have to be "fair."

As noted earlier, architects frequently use bunkers for aesthetic reasons as well as to add challenge to the course. The bright white sand in a bunker provides a beautiful contrast to the acres of green, intensively manicured turf surrounding it. During televised golf events, aerial cameras zoom in on perfectly edged bunkers with perfectly groomed sand that come closer to resembling oriental gardens than hazards. So how do superintendents produce such "works of art"? They do so by using a lot of hand labor to complete a variety of tasks. In preparation for this article, I surveyed ten superintendents across the country at courses that are known for top-quality bunkers. What follows is a summary of their practices.

Raking

Raking is usually broken down into two types — a full raking and a touch-up procedure. Full raking is a total grooming of the entire sand area, while touch-up simply corrects any irregularities in the sand left by careless golfers. Most of the courses hand-rake the bunkers in lieu of powered equipment. This is done to create a firmer surface and to avoid contacting the liners.

Edging/Trimming

Keeping those sharp, well-defined edges requires a lot of hand trimming. During the times of the year when grass is actively growing, the courses contacted trim weekly using line trimmers. Edging using a sidewalk edger or similar equipment is typically a monthly task in the parts of the country that use cool-season grasses, while those with bermudagrass conduct this task twice per month. After a bunker is edged, additional labor is necessary to clean up the debris.

Mowing

Courses with grass faces have to mow regularly to keep a manicured look. Floating mowers are the most common tool due to the steep slopes associated with most bunker designs. Mowing is a weekly task and one that is almost always followed by blowing clippings out of the bunker.

Leaf and Clipping Removal (Blowing)

A surprisingly high labor requirement in bunkers is the need to constantly remove leaves, grass clippings, and other debris. Most of the courses contacted for this article viewed this task as a daily necessity, involving at least two laborers with backpack blowers.

Packing Sand Faces

Few things anger golfers more than a ball plugged into a steep sand face. As mentioned earlier, the sand on these faces is often loose as a result of having to be periodically moved back onto the face from the lower part of the bunker. To reduce plugging as much as possible, the maintenance crew has to pack the faces with hand tampers. Obviously, the more often the sand is washed off the faces by rain or runoff, the more often the packing process must be done. This operation is conducted once or twice per month.

Checking Sand Depth

Keeping the sand at the proper depth on the bunker faces also helps reduce fried-egg lies. For courses with liners, it is an absolute necessity

Liners are effective in reducing contamination of sand with underlying soil. However, they are expensive to install and difficult to maintain.

to keep enough sand over the liner to prevent players from contacting it during a shot. The goal is to maintain a depth of 1 to 2 inches on the bunker faces. To achieve this goal, the depth must be checked weekly and reestablished with hand shoveling as necessary.

Replacing Lost Sand

Sand is gradually lost from bunkers as a result of being blasted out by players, blown out by wind, and removed by the maintenance staff. Following heavy rains it is commonplace for the sand in the lowest portion of a bunker to be covered with a thin layer of silt and clay, as well as organic debris that has blown or floated into the bunker. This layer should be removed to prevent plugging of the sand pores, which in turn will reduce the sand's ability to drain. One or 2 inches of new sand should be added annually, as opposed to adding greater amounts over a longer period. By adding smaller amounts more frequently, the problem of a deep layer of new soft sand is eliminated.

Pumping

As bunkers age, their ability to drain rapidly decreases. Heavy rains can result in older bunkers looking more like water hazards. To restore the bunkers for play as quickly as possible, crews are sent out with pumps and shovels. After the water is pumped out, the silt and clay layer is removed and the bunker is allowed to dry out enough to hand rake.

Maintenance Summary

Given the very high labor requirements necessary to keep bunkers in top condition seven days per week, all of the courses contacted have established specialized bunker crews, often led by a bunker foreman. These teams perform all the tasks described above and are reinforced with additional crew members following heavy floods or when large volumes of new sand must be added.

Bunker crew sizes and schedules varied widely, depending on the number and design of bunkers. Keeping in mind that all ten courses are considered high-end facilities in their region, the least demanding schedule devoted 4 to 6 workers, spending 6 hours per day on the bunkers, 6 to 7 days per week, or a total of approximately 200 labor hours weekly. Another course sent out 13 employees each day for 5 hours per day, 4 to 5 times per week, for a weekly total of about 275 hours. The highest labor commitment in this survey utilized an average of 8 workers, 8 hours per day, 7 days per week, for a weekly total of about 450 hours.

With hourly wages for these workers in the $8.50- to $9.50-per-hour range, it is obvious that bunker maintenance has become extremely expensive. In fact, all of the superintendents contacted expressed the opinion that the cost of

maintaining bunkers at their courses was now approaching, and in some cases exceeding, the cost of maintaining greens.

CONCLUSION

Given the data described in this article, the reader should be convinced that bunkers are extremely expensive features to add to any golf course. They are expensive to build and even more expensive to maintain — at least at the level many golfers today are demanding. Although the wealthiest courses have the funding available to maintain bunkers at championship quality on a daily basis, the rest of the golfing world needs to be more realistic about how to best use their more limited resources. The following list of suggestions is offered with this in mind.

- Make every effort to educate players at your course concerning the cost of maintaining bunkers at a high level. This article should help.
- Eliminate bunkers on your course that seldom come into play and/or are rarely seen. At the very least, convert them to grass hollows, but do so in a professional manner. Simply removing the sand and filling the cavity with soil is not the answer. Hire a professional golf course contractor to do the work, including the reshaping of the surrounding area to create a more natural appearance.
- Convert those high, flashed sand faces to grass. Although grass faces still require a great deal of effort, they reduce erosion problems, thus prolonging the life of the sand.
- Include funding in the capital improvement budget to rebuild the bunkers every 5 to 7 years. Typically, this involves removing the old sand, installing new drains, and installing new sand. This interval can easily be stretched to 7 to 10 years if players are willing to tolerate less than ideal conditions for a few days following heavy rains.
- Bunkers do not have to be raked on a daily basis — that is, if golfers make a better effort to rake out their footprints. Unfortunately, this aspect of golf etiquette seems to have slipped even more than the fixing of pitch marks. Courses with small budgets might even solicit the aid of their players by asking them to volunteer to touch up certain bunkers — much like the roadside litter programs popular in many states.
- Be sure to check local sands when purchasing new sand for bunkers. Have the local sands tested by an accredited laboratory before assuming that the only good sand for your bunkers is three states away.
- Of course, the biggest saving of all will come from convincing your golfers that the bunkers are hazards and that players simply cannot and should not be guaranteed a perfect lie every time. If you figure out how to do this, please contact the Green Section agronomists immediately so we can share your "cure" with the rest of the country.

ENDNOTE: The author would like to thank all those who participated in the telephone interviews. Special thanks is extended to the Golf Course Builders Association of America for their assistance. GCBAA has developed an excellent tool to help estimate the cost of construction of bunkers as well as all other areas of a golf course. This CD-based tool can be obtained by visiting www.gcbaa.org.

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The cost of bunker maintenance can be reduced by converting flashed sand faces to grass. The conversion process itself is labor intensive and expensive.

Research *You Can Use*

Managing *Poa annua* Seedheads on Putting Greens

Successful seedhead inhibition can improve spring playability of *Poa annua* putting greens.

BY JEFFREY A. BORGER

This overview of the *Poa annua* seedhead plots at the Penn State University Blue Course clearly shows the impact of effective seedhead inhibition. The "brown" grass is actually just large numbers of emerged *Poa annua* seedheads.

Poa annua, commonly referred to as annual bluegrass, is widely adapted to putting greens in areas where cool-season grasses are maintained. Under optimum conditions, *Poa annua* provides a level of putting green quality that is second to none. Unfortunately, several maintenance challenges are prevalent with *Poa annua*. Winter injury, susceptibility to diseases such as anthracnose, and poor performance under hot, humid conditions increase the challenge of maintaining putting green performance throughout the year. Spring seedhead production reduces putting quality at a time when weather conditions allow for more aggressive *Poa annua* maintenance.

Fortunately, chemical options are available to reduce the impact of seedhead production on playing quality. This article provides a summary of many years of seedhead inhibition research and is applicable in areas where a distinct winter/spring transition occurs with a true flush of seedhead production in April and May. In areas such as California, where mild temperatures persist throughout the year, seedhead inhibition will be achieved with different programs.

Over the years, different formulations of Embark (mefluidide, now Embark Turf and Ornamental) have been the standard for inhibiting *Poa annua* seedhead production during the spring with late March or April applications. In recent years, the combination of Primo MAXX (trinexapac-ethyl) and Proxy (ethephon) also has been used to inhibit seedhead production with good results. Both Embark T/O and the Primo MAXX/Proxy combination can provide effective *Poa annua* seedhead inhibition leading to better spring putting quality. Both options provide advantages and disadvantages in terms of turf discoloration, especially when frost occurs after application.

Proper application timing is extremely critical. The goal is to control as many seedheads as possible with Plant Growth Regulators (PGRs). Research suggests that with proper timing, seedhead inhibition of *Poa annua* can routinely approach 90 percent, greatly enhancing

spring putting quality. Common sense suggests that *Poa annua* could have a higher quality throughout the growing season if less energy is spent by the plant to produce seedheads, but research results have been variable.

Several different methods have been used to determine proper application timing. Proper timing is often stated to be when the seedhead is "in the boot" of the plant. However, this often is difficult for superintendents to determine in the field. Growing degree models also have been used with varying levels of success, depending upon spring weather. Another rule of thumb is that, generally, higher cut turf can be monitored for seedhead emergence to predict the ensuing emergence of seedheads on greens. When seedhead emergence is noted in fairway turf, emergence on putting greens will not be far behind. This is a general guideline, and daily monitoring of greens is necessary to determine "boot stage" of development. Start searching on southern exposures.

Ultimately, determining the proper application timing for seedhead inhibition is more art than science on a golf course. On a research plot, you are dealing with a single location, with consistent conditions, allowing for a very exact application timing to be employed. On a golf course, several different microclimates exist that confound application timing. Again, visual observation of *Poa annua* on a daily basis is critical.

Superintendents must determine when the greatest percentage of *Poa annua* is in the "boot stage" on greens, realizing that other growing stages also will be present. Once the seedhead has emerged, these PGRs will not suppress the seedheads of that particular plant. Conversely, very early applications of these PGRs will suppress seedheads, but cold weather conditions and the residual effects of the materials used must be considered. Many times there can be a warming of temperatures and plant growth followed by cold temperatures and even frost in the Northeast. If conditions are cold enough, *Poa annua* can become off-color, and if a PGR has been applied reducing growth, this off-color can be extended. Normally, this is only an aesthetic effect and not detrimental to the turfgrass community. Many areas of the Northeast can apply one application of Embark T/O and suppress seedheads during the peak spring season. If an early application of Embark is employed, a second application may be needed to achieve the same level of suppression.

Embark T/O has a long history of *Poa annua* seedhead suppression on putting greens. It is an effective material to suppress seedheads and overall plant growth. Embark T/O is generally applied to greens at 40 oz. of actual product per acre. When a second application is made, it is generally at a reduced rate. *Remember to always read and follow label directions before applying any pesticide!* When Embark is used alone, there can be some turfgrass discoloration that is transient in nature.

Superintendents who want less discoloration can choose to tank mix Embark T/O and Ferromec, which is a nitrogen and iron source that reduces this slight discoloration. There may also be a reduction in the amount of seedhead suppression with this tank mix. For example, one could see 90% seedhead suppression with Embark T/O alone. On the same research site, when Embark T/O is tank mixed with Ferromec, one might see suppression at 75% or 80%. In this example, both applications provide suppression, but one must balance whether appearance or playability is more important in a given situation.

In recent years, the combination of Primo MAXX and Proxy has proven to suppress *Poa annua* seedheads on putting greens. Research has found that the overall level of seedhead suppression is lower than that of Embark T/O, but there is no phytotoxicity following applications. Application rates have varied, but a good standard is 5 oz. of Proxy *per 1,000 square feet* and 5 oz. of Primo MAXX *per acre.* The Primo MAXX and Proxy combination can suppress seedheads at the 60% level. In some cases, research has revealed suppression at 75%, but this is not repeatable from year to year. This combination makes a smooth transition to the commonplace applications of Primo MAXX employed during the remainder of the growing season. If the superintendent chooses to use this mixture, note that a second application should be incorporated to maximize seedhead suppression two or three weeks following the original application. Again, these products should be applied at or before the "boot stage" of development.

Today, the use of PGRs is commonplace on many areas of the golf course. The superintendent often is asked to provide higher-quality playing conditions. As a result, the suppression of *Poa annua* seedheads also has become a more routine practice.

Following are a few questions to stimulate ideas for the seedhead control planning process. How much and where is the *Poa annua* on the putting greens? Which products should be considered to achieve the desired outcome? What, if any, level of turfgrass phytotoxicity can be accepted? If the greens historically have few seedheads, can Primo MAXX and Proxy be a viable option for suppression? Once these questions are answered, a viable seedhead control program can be developed to improve spring playability on *Poa annua* or mixed *Poa annua*/creeping bentgrass putting greens. Just remember that spring weather patterns can have a dramatic impact on application timing and the ultimate results achieved.

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Get Projects on the Right Track

Selling a major capital project for a golf course is never easy, but a few common-sense guidelines can encourage approval and success.

BY DARIN BEVARD

Upgrades to golf courses and surrounding facilities have been occurring since the beginning of golf. Construction of new golf courses has slowed, but course officials at older golf courses have stepped up renovations, oftentimes to compete with the new facilities that have emerged in their area. With a golf market that is flat or, some say, shrinking, maintaining quality and value is a must. New technology, development of better grasses and need for improved practice areas help fuel the renovation trend. Renovation of buildings and grounds is especially prevalent at private clubs, but many older daily-fee and municipal golf courses also are participating in the renovation trend. Golf courses overall are becoming more family friendly facilities that include such amenities as fitness centers and children's clubs.

Replacement of the entire irrigation system can improve water use efficiency. This allows better conditions to be maintained, but costs for new systems can approach $2 million. Simply upgrading heads may help the existing system, but it is not a substitute for replacement of an aging system.

Unless yours is one of those very special golf courses, attracting people to your facility requires upgrades to the golf course and surrounding facilities to stay current with industry trends. Needs must be prioritized to get the most overall benefit for the money spent.

Gaining approval for major renovations takes careful planning. Although some of the best-planned renovations get rejected for various reasons (usually cost or inconvenience), there are several key thoughts to keep in mind that will encourage approval of future projects. Communication is the key to keep everyone who is affected involved in the process.

When golf course renovations are considered, the golf course superintendent can provide useful information.

PROVIDE LOTS OF HONEST INFORMATION

As mentioned in the introduction, communication is extremely important. In some instances, projects are thought out and planned behind closed doors, with very little information flowing to other stakeholders who will be affected at the golf course. This can establish a feeling that a major project is being shoved down the throat of the membership. Explaining why a project is needed and what the benefits are to each segment of the membership/customer base is critical. What areas of the facility will be impacted? What is the expected outcome? Projects should focus on areas that truly need improvement, and this may not be just the golf course. Clubhouse and grounds also need to be upgraded periodically. Although clubhouse renovation may be sacrilegious to the pure golfer, larger projects that address multiple areas of the facility can garner greater support, even though they come at a greater cost. Ultimately, a greater benefit for the future of the whole facility may be realized. For example, if the bunkers are renovated on the golf course as part of an overall project that also addresses the pool or tennis courts, greater numbers of members will be interested. This does not guarantee approval, but it can help.

People like to be involved with and informed about the planning process, even if it is only at a peripheral level. Town meeting type settings provide a great opportunity to exchange information and encourage feedback. These meetings can prevent secondhand, wrong information from derailing a project. USGA agronomists sometimes participate in membership or even municipal council meetings to discuss the pros and cons of a major renovation. This type of third-party feedback is usually very helpful and can provide information about the needs of the course in question as well as trends at other facilities. General cost and financing of the project can be discussed. It is natural for people to know what a project will cost them. Reciprocal privileges at other golf courses should be unveiled if the golf course will be closed. People want to know where they will play golf if the course is closed for renovation.

NEVER SELL A BAND-AID PROGRAM AS A RENOVATION

One of the biggest mistakes that any golf course can make is selling a quick-fix program as a renovation. This occurs frequently, especially at private clubs. For example, old irrigation heads are replaced with new irrigation heads, but nothing is done to address an aging pump station or aging pipes in the ground. Installing new

heads will help with an irrigation system, but pumping capacity and pipe restrictions can prevent a meaningful agronomic improvement. Adding sand to bunkers to dress them up, also referred to as capping, and announcing that bad bunkers are now fixed, is another example. The bunkers look pretty for the short term, but if drainage problems and architecture of bunkers are not also addressed, they return to their old form with contaminated sand and poor drainage.

Why is the Band-Aid fix a problem? Quick fixes that also are costly are often mistaken for renovations as in, "Why do we need to renovate our bunkers? We just spent $60,000 renovating them two years ago." No, you did not renovate them two years ago; you implemented a quick fix that really didn't fix foundational problems. When quick fixes are not clearly stated as such, actual renovations are hindered because the perception is that the area in question has already been renovated, and it does not need to be dealt with again for another 10 years.

DO IT ONCE; DO IT RIGHT

Nothing dooms future renovation projects more than a botched project from the past. Selling a project as a major improvement for your golf course only to have poor results will make it very difficult, if not impossible, to get future projects approved. When developing plans for a project, you must start with a budget that provides for the best possible outcome to be achieved. If adjustments are needed, adjust down from the ideal. Starting with a budget that allows for the minimum to be achieved and then cutting it jeopardizes the success of the project. For example, if you are regrassing greens, do not provide a price tag that doesn't include the cost for fumigation. Without fumigation, weed contamination and off-type grasses can quickly reinvade the turfgrass stand.

ESTABLISH A REASONABLE TIMELINE

For golf course renovations, the superintendent should be consulted to establish a reasonable

Putting green regrassing requires the golf course to be closed. Providing a reasonable timeline for reopening is critical for having a successful project. Reciprocal playing privileges at other golf courses can make the inconvenience easier to tolerate.

Capping bunkers with new, white sand can lead golfers to believe that bunkers have been renovated, when in fact it provides a temporary aesthetic fix at best. This technique does nothing to address the underlying problems that led to sand contamination in the first place.

time frame for the project and the reopening date. This is extremely important! For a clubhouse or pool renovation, regardless of the scheduled opening date, the actual opening date is black and white because it is clear when construction is completed. Reopening the golf course involves a lot more gray area. Physical renovations are completed months before the golf course is ready to reopen, but the grass needs time to grow and mature. The average observer sees regular maintenance being performed and lush green grass. The golf course *looks* ready to open, but it is not. Theoretically, the golf course can be reopened anytime, but reopening the golf course, especially greens, before they are ready to receive regular traffic, can be devastating and create a negative perception about the renovation.

Establishment of timelines that can be met only under a best-case scenario can create problems. When projects take longer than advertised and create greater inconvenience, future projects suffer. Articulating an average timeline that provides some flexibility and contingency for the worst-case scenario is the best approach. The tentative "reopening" date should be set with reasonable expectations in mind. If weather, construction schedules, etc. allow an earlier opening date, everyone is a hero. When an unreasonable opening date is put forward to sell a project (and ultimately not met, because it cannot be!), everyone is upset and finger pointing begins.

PROVIDE A REASONABLE BUDGET

Lowballing the cost of a project pulls together everything mentioned above. There are very few shortcuts that allow for a high-quality product to be produced, and one bad project can doom future ones. Creative financing options can be explored to fund any project, but do not promise champagne on a beer budget. Enough people will realize that a projected budget does not match the projected results. This creates a bad atmosphere to obtain approval for a project, as people come to the conclusion that the project will cost more than projected or the results will be far less than desired. Do it once; do it right. Never forget that the success or failure of any project dictates perceptions about future projects.

Additionally, do not state that a renovation project will save money in regular maintenance in the long run, unless you are very sure that it will. Generally, course improvements allow existing maintenance resources to be used more efficiently to provide better conditions. Budget reductions do not usually occur after a renovation, but the intangibles of better conditions and more enjoyment for the customer must also be accounted for when discussing costs. These intangibles should attract new members and customers who ultimately help the bottom line.

If you want your project to move forward and be successful, the key is honest, straightforward communication regarding the scope of work, inconvenience to the customer, ultimate cost, and the quality of the finished product. The best renovations are those where reasonable budgets are matched with reasonable expectations and a reasonable time line for completion is established. Promising to do too much and promising it will cost too little will only lead to disappointment and make approval of future capital projects even more difficult.

DARIN S. BEVARD *is a senior agronomist in the Mid-Atlantic Region. Assisting golf courses with major renovations and construction is just one of the ways that USGA agronomists and the Turf Advisory Service can help your golf course.*

The Human Side of Turfgrass Management

Putting into human terms important aspects of golf course turf management.

BY STEVE ISAAC

Try explaining the problems you face as a turfgrass manager to committee members or golfers and, more often than not, you will get blank looks. It is not that the people we come across in our working lives lack intelligence; they simply lack understanding of what is a fairly complex and technical business, usually because it is not their primary business. In an attempt to increase comprehension when I was a practicing agronomist, I used an analogy that everyone could relate to — comparing the golf course and its maintenance to their own body and its upkeep. Suddenly, eyes and minds were opened. So, how does this approach work?

This device, which measures the trueness of a putting surface, will give the superintendent the information he needs to present better surfaces for the golfer.

WE ARE WHAT WE ARE BORN INTO . . .

Human development is controlled by the environment we are born into and grow up in, the influence of family, friends, and our genes. Grasses are no different. Sowing or sodding into a poor environment will result in a weak stand of grass, one that is difficult to manage and one that is likely to be overrun by undesirables (e.g., weeds). A poor environment for grass means inadequate drainage and access to sunlight. We need air to breathe and sunlight to avert health problems. So does the grass!

So, the human condition can be used to explain why some grass species grow happily in a particular situation while others struggle. However, it is not as simple as that. If you are not ideally adapted to a specific environment, you might be able to do something about it: change the environment or change yourself. We can do the same for turf, e.g., change the environment by improving drainage or removing trees to increase sunlight. Each grass species is adapted to do best in certain environmental conditions and under certain management regimes. Plant breeding can widen the tolerance of grasses to such conditions and factors imposed by management, e.g., mowing height, but the wrong grass growing in the wrong environment will not survive.

A HEALTHY LIFESTYLE

These days, we are constantly being bombarded with warnings about the need to lead a healthy lifestyle. Eat a balanced diet and get regular exercise. Well, the same philosophy can be applied to the grasses on a golf course.

Being obese is not a healthy option, and it can lead to heart and circulation problems. We can become obese if we eat too much, and in a similar regard, so can turf. If it is overfed with nitrogen, grass growth is lush and its tissues are soft. This condition makes it more

prone to disease and damage from other sources of stress as the grass lays down thatch at a greater rate than it can be controlled. Thatch is the equivalent of the fat we develop if we overindulge.

Thatch is the "cholesterol" of grass. It blocks the drainage arteries that are so vital to the production of free-draining, healthy greens, tees, and fairways. Few laymen appreciate how thatch adversely affects turf health and playability. I will never forget a discussion I had on a green with members of a club committee many years ago. It was a freezing, cold spring day and it had been an exceptionally wet start to the year. The committee people were bemoaning the fact that their *Poa annua*-dominated greens were a sickly yellow color, and they wanted to know why the greenkeeper wasn't producing nicely striped, green putting surfaces, just like the ones they had just seen on television. A plug was taken from the green and they were shown the thatch, which was saturated with cold water. They were asked what they thought their feet would look like if they had spent the winter months in a bucket of cold water. None were prepared to take up the challenge, but they quickly realized why we repeatedly talked about the need to control thatch and improve drainage as we walked the course.

Just as being clinically overweight can increase our risk of disease, so lush growth in grasses can bring about more debilitating conditions, e.g., *Michrodochium* patch in the United Kingdom and other cool, damp climates. The converse to this scenario also holds true to the analogy. Inadequate nutrition can result in anorexic turf. For turfgrass, dieting to "skin and bone" takes on the appearance of a sparse grass cover prone to moss, the invasion of *Poa annua*, and specific diseases such as dollar spot.

In addition to following a healthy, balanced diet, how do we prevent health issues? Exercise. While plant breeders have yet to develop a grass that can do bench presses or go jogging, there is plenty the superintendent can do to burn off that thatch. Prevention is always better than cure, for us and for the grass, so feed and water wisely and implement regular grooming, aeration, and topdressing programs to prevent excess fat — sorry, thatch — from accumulating.

Aeration holes are an essential means of respiratory aid for turfgrass, and no grass will tolerate the stresses imposed on putting surfaces if they are in deep shade.

While routine thatch management might be considered a gentle aerobics session, if your turf is already suffering from obesity, then it will need a more strenuous workout to get it back into shape. Core aeration, heavier sanding, deep scarification — turf's equivalent to liposuction! Men sweat, women glow, and turf transpires. Never forget this point.

If asked why you need to keep disturbing the greens with all of these disruptive maintenance practices, the answer is that thatch is like our hair; it just keeps growing and needs to be trimmed on a regular basis to keep it in check. If you are talking to someone who is follicly challenged, refer to fingernails instead!

A strong plant needs a good root mass to support it, and this is achieved through the regular exercise of aeration and a good diet, much in the same way that bone diseases such as osteoporosis and muscle wastage are prevented.

Healthy grass, like healthy people, can fight off infections and other problems. In the U.K., *Michrodochium* patch is just like the common cold, and I will leave the human equivalent of nema-

tode attack to your own imagination. Popping pills is not a positive lifestyle choice, and no superintendent should take pleasure in spraying turf with pesticides — in some cases it can be addictive. Following a well-turf program should reduce the need to reach for medication. This is good advice for both the grass we are trying to grow and for ourselves as human beings.

If the health of a green is beyond redemption and, let's be honest, we all start to show signs of wear with age, then it may be necessary to do some plastic surgery through regrassing or reconstruction. These options always need to be in the back of all our minds as golf courses (and ourselves) age. Few things age gracefully (my apologies to fine clarets).

GOOD PARENTING SKILLS

Unfortunately, we are not born with an innate sense of what is good for us, and the way we turn out is often a result of the way we are brought up. Children are all different and a good parent will recognize this and treat each child as an individual. The same applies to grass. There are a relatively small number of turfgrass species used on golf courses around the world, and each species has its own preferred environment and management requirements. The course superintendent (taking the role of the turf parent) has to understand this if the end result is to provide a quality and sustainable playing experience. The golf course superintendent also needs to include the rest of the golf course team in this responsibility. Each person — the golf course superintendent, golf professional, club manager, ownership, and course officials — all are "ownership partners" in the golf course they care for and enjoy.

Parents generally want what is best for their kids, and many avidly follow the advice of child-rearing experts. Implementing best practices on the golf course shows the same degree of care. The USGA, through its Green Section, and The R&A, via its bestcourseforgolf.org Web site, recognize this need. The agronomist might be considered the turf physician, a consultant brought in for a second opinion.

In order to keep ourselves in good order, we will go for a routine checkup at the health center. Benchmarking could be considered the golf course equivalent, whereby the impact of inputs on its performance are measured and compared year after year. In much the same way as we use tools to measure our fitness, e.g., devices to determine heart rate, blood pressure, the dreaded scale, and so on, implements are necessary to assess the health of our turf. We can measure drainage rates, organic content, and other factors relating to the physical condition of

Thatch clogs the "arterial" drainage channels, resulting in unhealthy grass.

the grass, but we also need to assess how the turf performs for the golfer. Devices to measure the firmness of turf and the trueness of putting surfaces are under development. Right or wrong, the Stimpmeter has become part of the nomenclature of golf and turf management. These and other tools could also take their place in the turf industry.

FINAL THOUGHTS

Some turf professionals might consider the approach described in this article as overly simplistic in discussing what is a specialized and skilled activity. However, trying to blind golfers and committees with science often results in a lack of understanding and empathy, resulting in mistrust. Golfers pay our wages, and if they are interested to know what happens on their golf course, then it is necessary to explain the processes in an understandable manner. Good communication is not simply about providing *a lot of information*; it is all about supplying knowledge in a way that others can follow, and using an analogy that consistently taps into something they are familiar with may, to continue the theme of this piece, open eyes, ears, and minds both for ourselves as well as the golf courses we maintain and play.

STEVE ISAAC *is the director of golf course management for The R&A, St. Andrews, Scotland.*

Research *You Can Use*

Breeding and Evaluation of Kentucky Bluegrass, Tall Fescue, Fine Fescue, Perennial Ryegrass, and Bentgrass

Rutgers University continues to gather germplasm from around the world for tomorrow's turfgrass cultivars.

BY C. REED FUNK, WILLIAM A. MEYER, AND STACY A. BONOS

OBJECTIVES

- Collect and evaluate useful turfgrass germplasm and associated endophytes.
- Continue population improvement programs to develop improved cool-season cultivars and breeding synthetics.
- Develop and utilize advanced technology to make current breeding programs more effective.

In 2007, more than 2,000 promising turfgrasses and associated endophytes were collected in southern Sardinia, Corsica, Lithuania, Hungary, and New England, USA. Many of these associated endophytes should be new, unique, and have properties to enhance turfgrass performance. More than 9,865 new turf evaluation plots, 92,000 plants in spaced-plant nurseries, and 30,000 mowed single-clone selections were established in 2007.

More than 154,000 seedlings from intra- and inter-specific crosses of Kentucky bluegrass were screened for promising hybrids under winter greenhouse conditions of short day lengths and cool temperatures. In addition, more than 48,000 tall fescues, 17,000 perennial ryegrasses, 9,000 bentgrasses, and 48,000 fine fescues were screened during the winter in greenhouses. The progenies of 200 new hybrid Kentucky bluegrasses were screened in spaced-plant nurseries to determine apomixis levels and other important turf and seed production characteristics.

The following crossing blocks were moved in the spring of 2007: 622 hard fescues, 422 strong creeping red fescues, 213 chewings fescues, 585 perennial ryegrasses, and 831 tall fescues. There were 12 velvet bentgrasses, 100 colonial bentgrasses, and 75 creeping bentgrasses

(Left) Dr. Reed Funk discusses one of several breeding projects at Rutgers University with members of the USGA's Turfgrass and Environmental Research Committee. (Right) Rutgers University has created a traffic machine with spikeless golf shoe soles for screening cool-season grasses for traffic tolerance.

Rutgers has made significant progress in incorporating gray leaf spot resistance in new perennial ryegrass cultivars.

moved into crossing blocks. The 30 new perennial ryegrasses identified in two different locations of the 2004 National Turfgrass Evaluation Trial in New Jersey have continued to display resistance to gray leaf spot (*Pyricularia grisea*) through 2007. These were developed in collaboration with other organizations since the fall of 2000, when the first severe epidemic occurred in Adelphia, New Jersey. We are making continuous progress with annual cycles of recurrent selection in perennial ryegrass for gray leaf spot, dollar spot (*Sclerotinia homoeocarpa*), red thread (*Latisaria fusiformis*), and crown rust (*Puccinia coronata*). Some of the newly released perennial ryegrasses this year are Calypso III, Stellar GL, Buena Vista, Soprano, Fiesta 4, Dasher 3, Attribute, Zoom, SR-4600, Integra II, Regal 5, Pacesetter, Keystone 2, Palmer V, Prelude GLS, Gator 3, Arrival, and Primary.

Promising new Kentucky bluegrasses and Texas × Kentucky bluegrass hybrids include Avid, Blueberry, Blue Note, Volt, Spitfire, Starburst, Concerto, Touché, Baroness, and Barnique.

Continued developments of turf-type tall fescue are being released with improved brown patch resistance. They include Traverse, Millennium SRP, Houndog 6, Fidelity, Rhambler, Coyote II, Finelawn Express, Falcon V, Shenandoah III, Monet, Cezanne, Van Gogh, Beagle I, Virtuoso, and SR-8650.

New fine fescue cultivars include Gotham Hard, Compass Chewings, Foxfire Chewings, Cardinal Chewings, SR-5130 Chewings, Spartan II hard, SR-5250 strong creeping, and SR-3150 hard.

In the bentgrass project, we are concentrating on identifying new sources of disease resistance. Approximately 32 creeping bentgrass clones were identified with improved dollar spot resistance. These clones will be utilized to develop new synthetic selections in the spring of 2008. Approximately 37 colonial bentgrass plants from 10 new sources were identified with improved brown patch resistance. Approximately 63 velvet bentgrass clones from 15 new sources were identified with improved brown patch and dollar spot resistance.

Collection trips from New Jersey, Pennsylvania, and New York in 2007 yielded 150 new bentgrass collections. These grasses were planted in a spaced-plant nursery in the fall of 2007. Future collection trips include a return trip to Massachusetts, Maryland, Virginia, North Carolina, and Georgia.

SUMMARY POINTS

- Continued progress was made in obtaining new sources of turfgrass germplasm from old turf areas in Europe. These sources are being used to enhance the Rutgers breeding program.
- Modified population backcrossing and continued cycles of phenotypic and genotypic selection, combined

CONNECTING THE DOTS

An interview with Dr. Bill Meyer, *Rutgers University, regarding Rutgers University's cool-season turfgrass breeding program.*

Q: *Rutgers University has established itself as the preeminent university in producing new cultivars of cool-season turfgrasses. Please provide us with some historical perspective on your program.*

A: Dr. C. Reed Funk started the breeding program in 1962 as the first full-time university turfgrass breeder. Before that time, Dr. Ralph Engel was interested and did some bentgrass breeding. Back in the 1940s, Dr. H. B. Sprague did some velvet bentgrass breeding. They had the cooperation of Dr. Phil Halisky in turf pathology.

Q: *In the history of the Rutgers turfgrass breeding program, are there specific accomplishments or cultivar releases that stand out above the rest?*

A: Manhattan perennial ryegrass was released in 1967 as the first improved variety. Rebel tall fescue was released as the first turf type variety in 1980. Adelphi was released as the first man-made hybrid Kentucky bluegrass, and Midnight Kentucky bluegrass was released as a landmark variety in 1980.

Q: *From a breeding standpoint, please tell us why it is necessary to travel the world over to collect turfgrass germplasm. What relationship does the source of germplasm variability have with the location of the perceived origin of the species?*

A: All of the important cool-season turfgrasses in the United States originated in Europe and parts of Asia. These grasses came to the U.S. with the settlers, and those surviving plants in old turf areas have been selected by breeders for varieties such as Manhattan. The effort to collect in Europe on a wide basis in the last 12 years was designed to broaden genetic resources available for variety development. By going to the areas of origin of these species, there should be greater genetic variation. For instance, so far, 16 new sources of resistance to gray leaf spot have been found in perennial ryegrass from recent European collections.

Q: *What are endophytes, what is their relationship with turfgrasses, and what is their significance in turfgrass stress tolerance?*

A: Endophytes are fungi that infect and grow symbiotically in the tissues of ryegrasses and fescues and move from generation to generation through seed transmission. They apparently co-evolved with the grasses in Europe and are usually put into new varieties through backcrossing the infected parents. When they are in grass plants, they provide resistance to above-ground feeding insects and have better heat tolerance.

Q: *How do endophytes infect grasses, and, more importantly, how and when do endophytes become resident in grass seed?*

A: The can be inoculated manually into grass plants, but usually they are put into varieties by maternal breeding techniques.

Q: *It is obvious that Rutgers has a huge field screening program, utilizing spaced-plant nurseries and other aspects of conventional breeding and selection techniques. To what extent have molecular genetics techniques been utilized to produce new Rutgers turfgrass cultivars?*

A: Thus far, the molecular techniques have been used to identify trait loci for stress resistance in bentgrasses, but so far all commercial releases have been from conventional screening and breeding.

Q: *As director of the Rutgers turfgrass breeding program, what do you see as the most critical traits necessary in new cool-season turfgrass cultivars?*

A: Drought, heat, wear, salt, and disease resistance.

Q: *Have there been significant shifts in the turfgrass industry that have necessitated changes in the direction of your breeding program (e.g., improvement of salt tolerance due to increased use of recycled water, etc.)?*

A: Salinity and wear tolerance breeding are new areas.

Q: *Has the Rutgers breeding program focused on transition issues of overseeded grasses? In other words, have you developed cultivars of perennial ryegrass, intermediate ryegrass,* Poa trivialis, *or other species that are specifically designed to transition better in overseeded bermudagrass?*

A: We have not worked on early-transition varieties.

Q: *What do you feel is the most important future development in the Rutgers turfgrass breeding program?*

A: Varieties with lower input requirements for maintenance.

Jeff Nus, Ph.D., *manager, Green Section Research.*

with increasing sources of genetic diversity in turfgrass germplasm and beneficial endophytes, enables significant improvements in the performance of new cultivars. Twenty new perennial ryegrasses with improved gray leaf spot resistance were released during 2007.

- Fifteen new and improved tall fescues were released in 2007.
- Substantial progress was made in developing intra- and inter-specific hybrids of Kentucky bluegrass. Ten promising Kentucky bluegrass cultivars were released in 2007, and three inter-specific hybrids from Kentucky bluegrass and Texas bluegrass were released.
- Seven new fine fescues for low-maintenance turf were released.
- Thirty-two creeping bentgrass clones were identified with dollar spot resistance. Thirty-seven colonial bentgrass clones were found with improved brown patch resistance. Sixty-three clones of velvet bentgrass were found with resistance to dollar spot and brown patch.

RELATED INFORMATION

http://usgatero.msu.edu/v04/n03.pdf
http://turf.lib.msu.edu/tero/v02/n09.pdf
http://turf.lib.msu.edu/ressum/2007/27.pdf
http://turf.lib.msu.edu/ressum/2007/30.pdf
http://turf.lib.msu.edu/ressum/2006/25.pdf
http://turf.lib.msu.edu/ressum/2006/28.pdf
http://turf.lib.msu.edu/ressum/2005/16.pdf
http://turf.lib.msu.edu/ressum/2004/17.pdf

The USGA has provided annual financial support for the Rutgers University turfgrass breeding program since 1963.

C. Reed Funk, Ph.D., *professor emeritus;* William A. Meyer, Ph.D., *professor; and* Stacy A. Bonos, Ph.D., *associate professor; Dept. of Plant Biology and Pathology, Rutgers University, New Brunswick, N.J.*

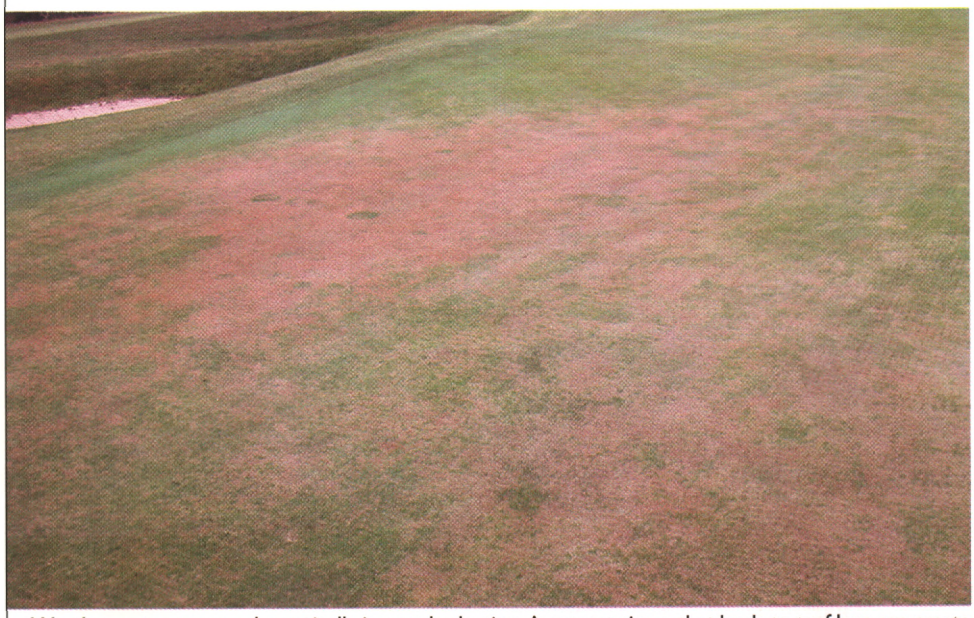
The Escalating Cost of Golf Course Maintenance

The costs of maintaining golf courses are increasing rapidly for a variety of reasons.

BY DARIN S. BEVARD AND STANLEY J. ZONTEK

Budgets at many private clubs and daily-fee facilities are going down or are at least flat. Raising green fees or attracting new members is proving difficult for reasons too numerous to mention in this article. Overall, revenue for many facilities is also stagnant. Elite clubs that are more able to absorb increasing costs are separating themselves further from the next tier of clubs, placing further pressure on turfgrass managers at clubs and courses that are impacted by changes in the economic landscape. Cost increases are evident throughout golf course maintenance budgets. Several specific areas are discussed below.

Golfers prefer to play a well-conditioned golf course. Increasing golfer expectations have led to many renovation/regrassing projects on putting greens to meet golfer expectations and attract new customers and members.



Weather extremes can dramatically impact budgeting. A severe winter that leads to turf loss can create the ultimate Catch-22. Capital beyond the normal budget is needed to repair damage, while at the same time poor turf conditions can reduce revenues.

LABOR

Labor is the biggest line item in virtually any budget, generally consuming 50% to 70% of a golf course budget. Most golfers want to play on a "well-conditioned golf course" (survey results Golf 20/20, 2005). Labor costs more. Fifteen to 20 years ago, hourly wages at a golf course were superior to those of many competing businesses (fast food, retail, etc.) and were very attractive, especially to high school and college students who didn't mind rising early and working long hours and weekends. The gap between golf course wages and other work options is far less than in the past, not requiring long days and weekend work. H-2B, a federal program that allows approximately 65,000 immigrant workers to perform seasonal labor on temporary, 10-month visas has helped, but a recent addendum to this law has greatly re-

With fewer golf course maintenance employees, it may require a very early start to the work day, longer days for each employee, and more overtime to prepare the golf course.

duced the number of available workers in this program and is hurting golf courses. Golfers expect near-perfect conditions, and it takes labor to meet these expectations. Having fewer employees means that fewer tasks can be completed daily.

OVERTIME

With fewer workers, each person must work more hours to prepare the golf course. With tight labor and the popularity of morning shotgun events, proper golf course presentation demands overtime, which further aggravates labor costs. But . . .

Every daily task on the golf course requires labor to complete. Finding qualified employees to perform tasks as simple as bunker raking can be difficult with tight budgets and a tight labor pool.

GOLFER EXPECTATIONS

As we have said, golfer expectations continue to increase. Green speed is probably the biggest measuring stick among golf courses, but other areas are also compared. Older grasses/construction on overly treed golf courses make it more costly to maintain top-notch conditions, and sometimes conditions are still less than great. Regrassing/renovation of greens, renovation of bunkers, large-scale tree removal, and total course reconstruction are popular to some degree in all areas of our region. This requires a costly initial investment, but it is easier to meet expectations with new grasses, modern construction, proper drainage, good growing environments, etc. With proper infrastructure, you can have a better golf course with less intense maintenance.

MATERIAL COSTS

Most golf course products (fertilizers, herbicides, insecticides, etc.) are petroleum based, and their cost is increasing. The cost to get these products to the golf course is increasing, too. In fact, fuel costs and fuel surcharges affect delivery costs for virtually everything, including seed, sod, topdressing, etc., not to mention the direct cost of fuel needed for the maintenance operation. This will not improve soon.

THE WEATHER

Plan for the worst with respect to the weather. The best way to manage grass in weather extremes is to grow healthy turf. This includes preventative versus curative pesticide sprays, more fertilization, and more aeration and topdressing. Extreme weather destroys the budget, especially if fungicide budgets are generated with benign weather conditions in mind!

The bottom line is that if you spend less, you should expect less. Even if you spend the same amount year after year, your buying power decreases. There are no shortcuts. Superintendents need to be innovative in implementing programs, but there are limits. Rather than trying to compete with every course around you, focus on providing quality on a daily basis at your golf course. Your golf course will never be all things to all people.

DARIN BEVARD *is senior agronomist and* STANLEY ZONTEK *is director of the Green Section's Mid-Atlantic Regional office in Glen Mills, Pa.*

Putting Green Speeds, Slopes, and "Non-Conforming" Hole Locations

When selecting hole locations on your greens, there are a number of factors to consider.

BY JERRY LEMONS

"That hole location is illegal! That green is just unfair! That green doesn't have enough hole locations!" These comments are just a few that golf course superintendents have heard more frequently in the last 30 years as green speeds have continued to increase on most golf courses.

What classifies a hole location or green to be illegal or unfair?

The Rules of Golf are very detailed, as Rule 32-b establishes that the Committee responsible for setting up play is to determine hole locations.

But where can the Committee find guidelines for a legal hole placement? And specifically, when does a putting green or specific hole location become "non-conforming" under the Rules of Golf? For many years, the USGA and R&A have published general guidelines for the Committee to assist in determining where to place holes fairly and how to set up greens for play.

> An area two to three feet in radius around the hole should be in good condition without any steep slopes or, if possible, any changes in the degree of slope. In other words, the green in the holing-out area should be as nearly level as possible and of uniform grade, but it need not be exactly level. In no case should holes be located in tricky places or on sharp slopes where a ball can gather speed. A player above the hole should be able to putt with a reasonable degree of boldness, and not purely defensively.[1]
>
> Championship greens should be fast and uniformly paced, firm but resilient. They should place a premium on well-executed shots, while exacting a penalty for less precise shots.[2]

These guidelines sound simple enough, but what factors help define a "conforming" hole location?

This classic 1904 Strong and Tillinghast course contains slopes that are practically impossible to negotiate when the greens are fast.

GREEN SPEED

There have been numerous articles written on green speed since the Stimpmeter was introduced in 1976. Here are a few highlights:

In 1976 and 1977, the years during which the Stimpmeter was first tested, the average speed across the country was 6'6". Any speed at 7'6" or more was considered "excitingly fast" by the Green Section agronomists.[3]

Readings at the 1978 U.S. Open: Practice Round – 8'8". First Round – 8'11". Second Round – 9'4". Third Round – 9'5". Fourth Round – 9'8".[4]

In March of 1983, a Green Section agronomist declared, "9½ feet to 10½ feet provides an excellent putting surface for most championships. However, any green faster than 11½ feet should be considered too fast for some championship play and dangerous for the long life of the green if proper attention is not given."[5]

The final *Green Section Record* edition of 1983 discovered ". . . that most golfers prefer a daily Stimpmeter speed of between 7'6" and 8'6".'"[6]

In 1992, ". . . this combination will allow for reasonable putting green speeds, somewhere between 7'6" and 9'."[7]

We found in 1995 the S.P.E.E.D. acronym chart only went up to 9'6".[8]

A 2003 article told us, "Stimpmeter readings on American golf courses generally range from 7' to 12'."[9]

By 2006, "The idea of 'target' rolling offers the perfect combination of rolling without causing excess stress, creating smooth surfaces at whatever

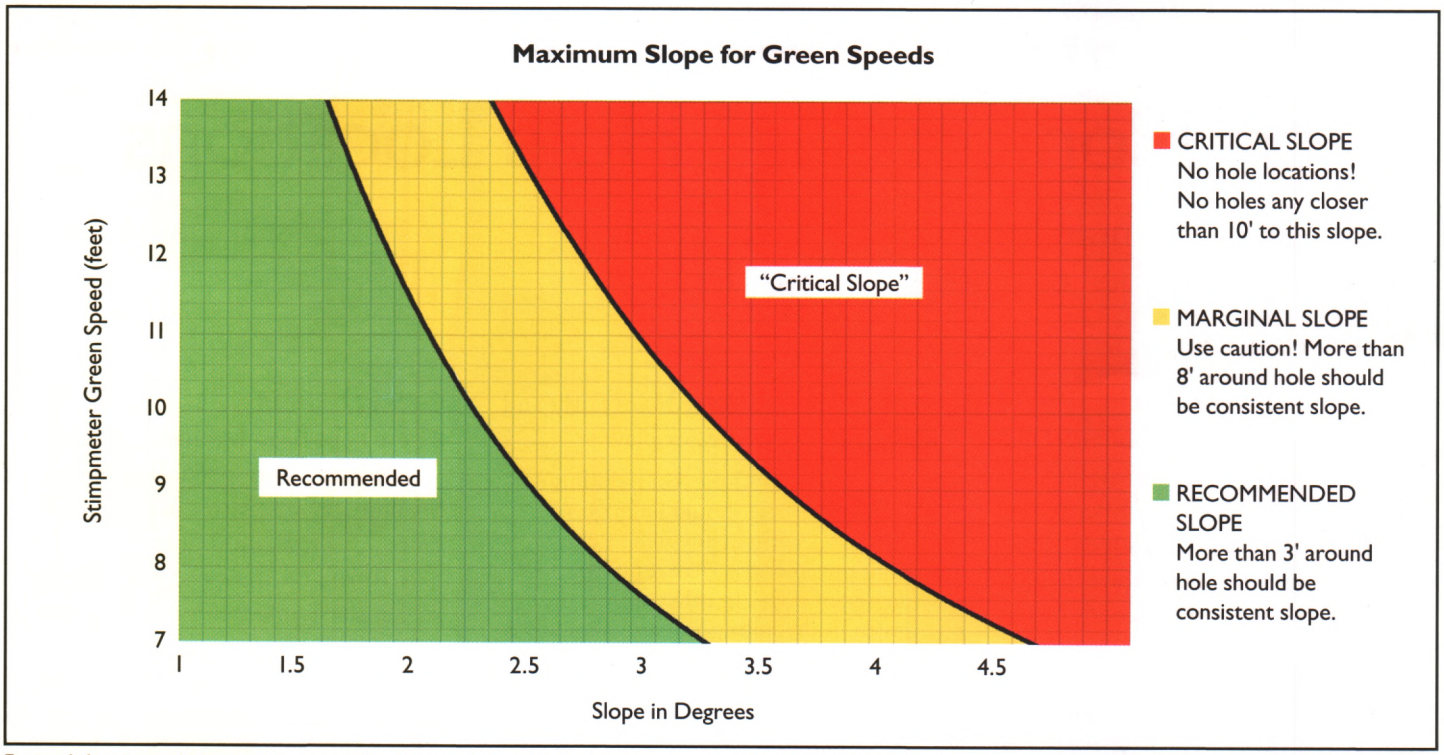


Figure 1. It is important to understand the direct relationship between green speed and putting green slope. As green speeds increase, the potential for uncontrollable slopes also increases.

speed your membership desires (stay in the 9'6" to 10'6" range, if possible)."[10]

In 2007, rated courses in Tennessee had speeds from 8'1" to 9'4" on public courses and 9'5" to 10'4" on private courses.[11]

ASGCA member Rees Jones says green speeds probably will be at 13' for the U.S. Open at Torrey Pines.[12]

Without fail, the *Green Section Record* articles warned of trying to maintain fast greens, especially for extended periods.

Since the introduction of the Stimpmeter, green speeds have inched higher. Putting green speed discussions are not going away and will likely remain part of the conversation on most every round of golf, warranted or not. In my opinion, most clubs have consistently met the goal of providing their golfers with greens at acceptable speeds. Superintendents now have better tools and knowledge and can provide faster putting surfaces if proper financial resources are available.

Will green speeds continue to climb? I doubt that we will ever again see the same significant average increase as in the last 30 years, although some of the new bentgrass varieties and ultra-dwarf bermudagrasses can be extremely fast when these greens are dormant. Green speeds on these turfgrasses can exceed 13' without intention and remain that way until the turf begins to grow.

Many golfers find that the faster green putts truer. Faster greens add another level of interest to the game. However, golfers do not like greens that are *too* fast. Greens should be considered too fast when better players experience anxiety because the ball becomes uncontrollable on a putting surface.[13]

PUTTING GREEN SLOPES

We golf course architects enjoy designing and playing greens with character. This character (for which many courses are known) can be any combination of slopes, bumps, swales, and twists of the surface. Putting greens that have too much severity of any of these traits can become unfair at a fast green speed. In short, a putt that misses the hole placed on too steep a slope on a fast putting green will not come to rest near the hole.

The *USGA Course Rating System Guide* says, "When a downhill roll on the Stimpmeter is 2 times greater in length than uphill, it is considered moderately sloped. When a downhill roll on the Stimpmeter is 3 times greater in length than uphill, it is considered steeply sloped."[14]

Over the years, the Green Section has suggested:

> The slope of a major portion of a putting green should usually not be greater than 3 percent (1.7 degrees), although some areas may exceed this for special reasons, such as difficult terrain or dramatic architectural effect.[15]

> Based on current information, any slope 3% (1.7 degrees) or greater on a 10' Stimpmeter reading is too steep for hole use.[16]

For us to understand what is "too sharp or too steep," we need to understand the direct relationship between green speed and slopes. We have all watched tournament after tournament on television where greens were so fast that players lost control of the ball

speed and the putts rolled further from the hole and even off the green. As green speeds increase, the potential for uncontrollable slopes becomes inevitable. Committees with years of experience in locating holes can appear foolish when conditions change and hole locations become too difficult.

So at what slope, at a given green speed, does a golf ball continue to roll?

To determine a "conforming" slope, we need to know the green speed and slope that cause a golf ball to continue rolling. Remember your high school physics: a moving ball tends to stay in motion with the same speed and in the same direction unless acted upon by an unbalanced force. Gravity (of steep slope) and friction (of the putting surface) are unbalanced forces on a golf ball.

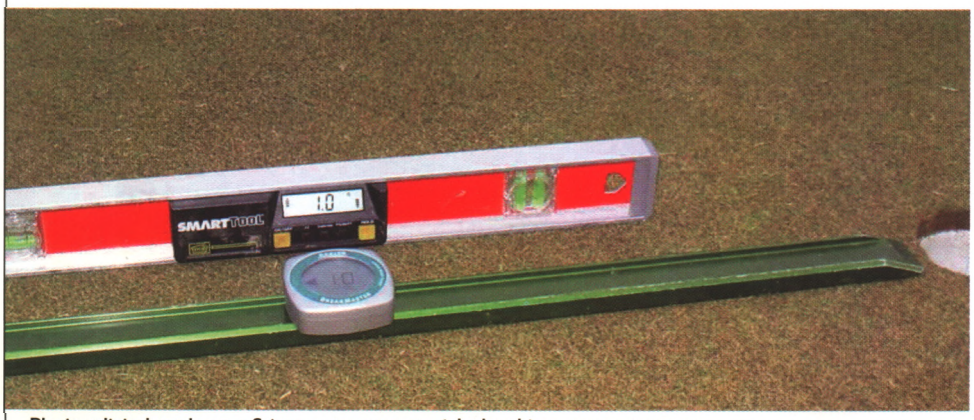
The Maximum Slope Graph (see Figure 1) shows the Stimpmeter speeds on the left and slope in degrees below. To use this graph, find your current green speed and go to the *red area*. This is the "critical" slope for that speed; it is where a golf ball will continue rolling. The *yellow area* defines slopes that are marginally conforming, while the *green area* on the graph defines "conforming" slopes for a given speed.

We are fortunate to have digital tools that show instantly the slope on a green (Smart Tool, Breakmaster). Like the Stimpmeter, every superintendent should have one of these inexpensive tools to help determine "conforming" hole locations. By using one of these instruments, a Stimpmeter, and this graph, it is quite simple to find a fair hole location. Keep in mind that the tools' accuracy in reading slopes depends on the straightedge upon which they are placed.

DESIGN OF GREENS — ARCHITECTURE

Among those on your list of favorite golf course architects, most all, past and present, placed an emphasis on the putting green. Since every golfer will play each putting green in a round, and putting comprises about 40% of the strokes, luck should not come into play.

Architects of the Golden Age such as Mackenzie, Tillinghast, Ross, and Maxwell created greens with bold contours. So do a few contemporary architects. The exciting movement in such greens helps to make those courses interesting to play day after day. Even with the steeper slopes, the greens had adequate fair hole locations, and the superintendent was able to move them often enough to allow turf to recover from traffic.



Placing digital tools on a Stimpmeter or a straight level improves accuracy.

However, as green speeds have increased, some hole locations on these putting surfaces have become unfair. Greens that had 15-20 fair hole locations may now be reduced to two or three. At today's faster green speeds, these masterpieces can be frustrating to play and even more difficult to maintain due to damage caused by concentrated traffic.

Keep in mind that many greens built prior to the development of the USGA's method for green construction had little or no subsurface drainage. Golf course architects of many classic courses were not only adding character to their putting greens, but they were ensuring good surface drainage on the soil greens. Fast greens as we now know them were simply unheard of.

FUNCTIONALITY

Putting greens must be designed and built to function as intended. Form must always follow function. A green that looks good but has few hole locations will suffer during stress periods. For a green to disperse golfer traffic, holeable turf area must be present so that turf recovery can occur during the rotation of hole placement.

A green typically needs no fewer than 14 days for old hole locations to recover from play. If these 14 areas have a radius of 8' (200 sq. ft.), then 2,800 sq. ft. (pi × radius^2 × 14) of space useable for hole locations on the green is needed. The putting surface from the collar inward to 10' contains about 2,200 sq. ft. This means that a 5,000 sq. ft. green needs all 2,800 sq. ft. of remaining useable space to handle normal golfer traffic. Smaller greens can accommodate play only if additional maintenance practices, such as aerification, are intensified. When steep slopes exist on these greens and are maintained at too fast a putting speed, the functionality of the green diminishes.[17]

If the number of reasonable hole locations drops below seven or eight per green because the greens are being maintained too fast, the course may become less enjoyable for regular play.

HOLE LOCATIONS

In reality, there are several factors to consider when determining a hole location, but if it is cut on the putting surface, it is legal.[18]

A hole should be placed in such a position that no matter where the

golfer is putting from, assuming continuous putting surface between himself and the hole, it should be possible to stop the ball within approximately two feet of the hole.[19]

A green so fast (or a hole cut in such a position) that a ball cannot be stopped near the hole from any point on the green, for example, is an unfair challenge.[20]

Hole placements as a general rule need to be five paces from the edge of the putting surface.[21]

No one likes to see a missed putt roll back or a well-struck putt roll completely off a green when the ball has missed the hole. We all agonize when it happens to us or a favorite professional on television. By using the charts and checking slopes near the hole, a hole location can be set far enough away from steep slopes and the edge of the green so that a well-executed shot that misses the hole will not run off the green, thus giving the player an opportunity to hole out.

The five-pace recommendation is a good one on courses with large greens, but consider that on a 5,000 sq. ft. green, 25% of the green is in the five-pace area (Figure 2). There are courses with small or irregularly shaped greens for which the five-pace suggestion just does not work. Using a 10' guideline increases holeable space by 33%. An even better guide is to make sure that a hole is no less than 10' from the edge of a putting surface, but only if no hazards or steep slopes are within five paces of the edge of the green. This allows a player enough room to have a reasonable opportunity to recover from a good shot that just missed the green.

Take care on greens with multiple contours and slopes. A hole location on the front portion of a multilevel green may be difficult for most golfers to navigate when above the hole.

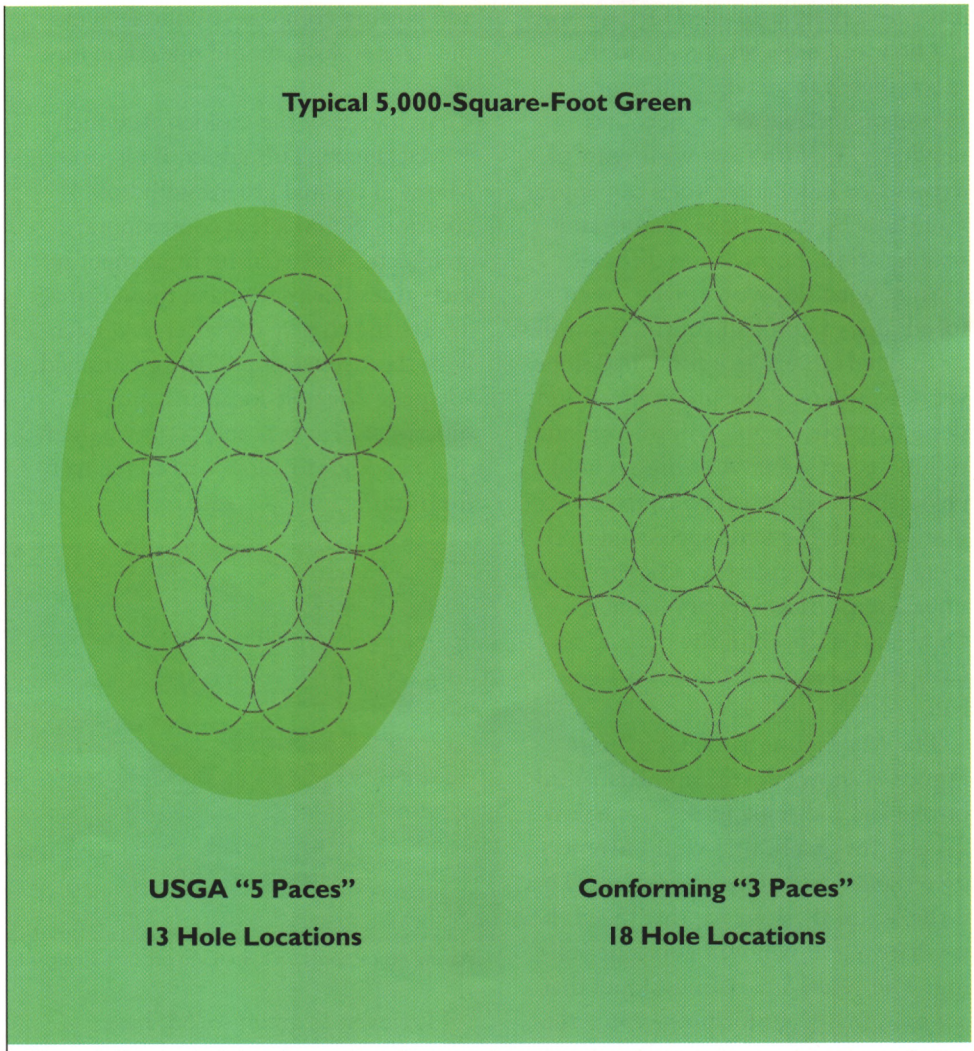


Figure 2. Keeping hole locations at least five paces from the edge of a green is a good recommendation for large greens. On courses with small or irregularly shaped greens, using a minimum 10' guideline from the green edge increases holeable space by 33%.

A CHECKLIST FOR "CONFORMING" HOLE LOCATIONS

- Check and know your green speed.
- Using the Green Speed Slope Chart, determine the maximum slope based on the speed of the fastest green, keeping in mind that weather conditions can change during the day and may result in faster green speeds.
- Study the design of the golf hole and factors affecting the shot into the green, especially the wind, length, and hazards around the green. Anticipate the probable weather conditions and how they may affect the shots played.
- Hole placements, as a general rule, need to be at least four to five paces from the edge of the putting surface. A hole should be no fewer than 10' from the edge of a putting surface if no hazards or steep slopes are near the edge of the green. A player should have a reasonable opportunity to recover from a good shot that just misses the green. There must be enough putting green surface between the hole and the front and the sides of the green to accommodate the required shot. For example, for a long iron or wood shot to the green, the hole should be located deeper in the green and further from its sides than may be the case for a short pitch shot.
- Balance hole locations from right, center, back, front, and in difficulty. Make every attempt to have six very easy, six moderate, and six moderately difficult hole locations.
- Once the above criteria are met, the turf around the area should be in good

condition, void of old cup marks, damage, and excessive pitch marks.

- The hole location should have at least 3' around the hole (holing-out area) that is consistent in slope. Hole locations using steeper slopes (yellow on the green speed slope chart) should have at least 6' around the hole. Holes should be placed no closer than three paces to critical steep slopes (in the red).

- In no case should holes be located in tricky places or on sharp slopes where a ball can gather speed. A player above the hole should be able to putt with a reasonable degree of boldness and not purely defensively. A player should not lose the ability to control the ball on a putting green, especially around the holing area.

- For a competition played over several days, the course should be kept in balance daily as to degree of difficulty. In a stroke competition, the first hole of the first round is as important as the last hole of the last round, and so the course should not be appreciably more difficult for any round — balanced treatment is the aim. An old concept of making the course progressively harder round after round is fallacious.

- In early rounds, anticipate players' traffic patterns and avoid locating many holes where walking across the green by many players could spoil good hole locations for later rounds.

- In match play, a hole location may, if necessary, be changed during a round provided the opponents in each match play the same location. In stroke play, Rule 36-4a requires that all competitors in a single round play with each hole cut in the same position. When 36 holes are played in one day, it is not customary for hole locations to be changed between rounds, but there is no Rule to prohibit it. If they are changed, all competitors should be informed.

- During practice days before a competition, it is advisable to locate holes in areas not likely to be used during play, preferably at the fronts and the backs of greens, bearing in mind the areas that will be impaired by foot traffic patterns.

- The superintendent who cuts the holes should make sure that the Rules of Golf are observed, especially the requirements that the hole liner not exceed 4" in outer diameter and that it be sunk at least 1" below the putting green surface (Definition 15). The hole should be cut as vertically as possible.

- Use common sense with hole placements: "If you have to look long — it's wrong!"

Bob Jones said, "Control of the ball is what all good golfers are striving for. The great courses in America allow the player to make use of his talent to the degree that he can, yet challenge that talent to reward only the exceptional."[22]

Although the Rules of Golf may not specifically define a "conforming" or "non-conforming" hole location, in the interest of the game, the committee should consider these recommendations when setting up their golf course for daily and championship play. Selecting fair hole locations involves using art *and* science. Neither the Rules of Golf nor the committee can use an exact formula that can be applied to every situation.

These recommendations will not only allow competitions to occur in a fair manner by identifying the player with the best skills, but they will also allow the great game we enjoy to be played in the spirit that was intended for many years to come.

Courses that maintain greens so fast that only a few conforming hole locations exist should consider slower green speeds. If a club is adamant about having faster speeds, then individual greens can be modified by removing severe slopes and still keep the architectural intent of the existing green.

Call an ASGCA member today!

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On Course *With Nature*

All for the Creek, All for the Course

Elks Club of State College, Boalsburg, Pennsylvania.

BY DAVID WILLIAMS AND KATIE OMBALSKI

Large projects can be daunting to approach, and it is in the best interest of a golf course to partner with local organizations. Not only can local partners provide on-the-ground assistance, but they often can bring expertise to a project that will benefit project efficiency and outcome. Partnerships also can bring credibility to a project, which can lead to further partner involvement and grant funding.

David Williams, golf course superintendent at the Elks Club of State College in Boalsburg, Pa., came across a newsletter published by a local conservation organization, the ClearWater Conservancy of Central Pennsylvania. The special edition of *Springs & Sinks* detailed the findings of a 2001 Pennsylvania Department of Environmental Protection report about Spring Creek, which runs through the Elks Club course. It was reported that parts of the creek were impaired and not supporting aquatic life as they should.

Williams became concerned as he read the newsletter. Although the risk that the Elks Club itself posed was not explicitly known, he recognized that there was certainly room for improvement. "I didn't know where to start," he said. "I needed help figuring out what role the Elks Club could play in improving the watershed."

He decided to call ClearWater Conservancy. A partnership quickly developed, and with the help of Katie Ombalski, the Conservancy's conservation biologist, the U.S. Fish and Wildlife Service soon became part of the effort to improve the Elks Club's stretch of Spring Creek. "We're hoping to foster a healthier marriage between this recreational activity and the environment. The two can peacefully coexist," says Ombalski.

With just a few phone calls and some coordination meetings, Elks Club now saves about $5,000 per year in reduced maintenance costs.

Through the partnership, it was determined that the Elks Club would focus on enhancing the water quality of Spring Creek by reducing nutrient loading and decreasing the temperature of the water. The first step was to create several low-maintenance areas. Approximately 15 acres of carefully manicured turfgrass were taken off the maintenance schedule, and natural vegetation was allowed to grow freely. This change allows a more biologically diverse habitat within the buffer zones surrounding the creek. "Some golfers don't like it that way," admits Williams. "But some prefer it and recognize its value. The members who prefer the natural look really liked the work done on the stream. It's a matter of personal choice, but it's what is right for this initiative."

Williams also placed signs labeling Spring Creek at several cart crossings and on Elks Club Road. "We knew there was a problem when some members of the Elks Club referred to Spring Creek as 'the ditch,' says Ombalski. "Installing stream crossing signs on the course was an easy way to let people know that this is a resource that needs protection."

The next step was to develop a long-term plan to ensure that further actions would be taken to conserve and restore the creek and its surrounding areas.

Spring Creek underwent quite a change when volunteers came out to Elks Club to plant nearly 800 native trees and shrubs.

Ombalski contacted the U.S. Fish and Wildlife Service, the Pennsylvania Fish and Boat Commission, the Centre County Conservation District, the Pennsylvania Department of Environmental Protection, and Penn State to help gain support and aid. The Penn State Landscape Architecture Department came up with a planting design for the project, and Ombalski applied for grants and secured plant donations from local businesses. Approximately $3,000 was donated.

On May 6, 2006, 57 volunteers from the Elks Club and ClearWater Conservancy planted more than 800 trees and shrubs along a 500-foot riparian buffer. The area had been set aside for habitat in 2000, and the low-maintenance area provided food and shelter for wildlife, helped filter runoff, and controlled erosion. The new trees and shrubs increased the value of this area by providing additional nesting sites and food sources. The habitat value of the project was immediately evident, as birds perched in the trees even before they were planted. The plantings also will shade Spring Creek, helping to protect the creek from thermal pollution (increased water temperatures), common in streams where trees and plant materials have been removed from the edges. The sun warms the creek as it flows through open areas, increasing water temperatures and reducing dissolved oxygen levels, which can be detrimental to fish and other aquatic organisms.

The donations allowed Williams to finish the project with only an investment of labor. He projects that the restoration will save him approximately $5,000 in reduced maintenance costs. "Everybody, including the naysayers, was delightfully surprised that this project was completed at basically no cost to the Elks Club," stated Williams.

In addition to guidance from ClearWater Conservancy and the U.S. Fish and Wildlife Service, Williams is ensuring that he will be able to maintain the property efficiently and in an environmentally sensitive way on his own for years to come. Through Williams' initiative, the Elks Club was designated as a Certified Audubon Cooperative Sanctuary by Audubon International. Williams hopes that the Audubon Cooperative Sanctuary Program will help the club to continue as a good steward of the land. "The course will be more aesthetically pleasing for golfers, and we will contribute to the revival of Spring Creek," he says. "I really think this is a win-win situation."

The partnership with ClearWater Conservancy helped Williams to organize a large restoration project with little effort on his part. "Katie pretty much did all of the leg work and organizing," stated Williams. "She is amazing and deserves much more of the credit on this project than I do. I would definitely recommend getting the local conservancy group involved with any type of environmental project or issue."

For more information on the Elks Club of State College, please call (814) 466-6451. For more information about the Audubon Cooperative Sanctuary Program for Golf Courses, call (518) 767-9051, extension 12.

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All Things *Considered*

It Needs to be a Relationship, Not a Battle

Communication is the starting point!

BY KEITH HAPP

Do you look forward to going to work, or do you dread having to deal with questions about how turfgrass maintenance tasks are performed and how the turf is presented? Are the challenges of the profession stimulating, or are demands so severe that you can't wait to get away? The golf course superintendent profession is being articulated by many as a "we against them" occupation. Comments such as "Golfers just don't understand!" or "How am I going to do that?" or "What should I eliminate to accomplish that task?" are very common. Economic pressures place an ever-increasing emphasis on efficiency and economy of scale. Budget cutbacks mandate significant creativity in the manner in which course preparation is carried out. Facing these daily stresses may lead one to want to escape or become invisible. Nevertheless, avoidance is the worst approach when dealing with demanding golfers. Being visible and willing to communicate is fundamental to the profession of the golf course superintendent.

Preventive maintenance used on the course should also be utilized when dealing with golfers. Proactive communication helps fertilize and perpetuate a strong relationship. It is essential to minimize incorrect interpretation or speculation regarding turf care practices. How do you build a relationship with the committees and chairpersons at your facility? Are you available? Are you willing to answer questions brought to you by the chairperson? Do you have an open-door policy that applies to golfers and not just to your employees? These are just a few of the questions that need to be answered to establish open lines of communication.

AVAILABILITY

Establish a routine that makes you available on the first tee at least once or twice a week to greet players. For example, if there is a frost delay, who better to explain to golfers the rationale for holding play until the frost dissipates? That opportunity to educate could prove to be invaluable in the future.

The practice range tee is also an excellent place to answer questions about course care and setup. The details associated with maintaining the teeing ground can be discussed, along with many other course care issues.

There are other communications opportunities to consider, too.

Make it a point to have lunch in the clubhouse. Establish a designated time when players can eat with you and ask questions. At the very least, sit at a table with four chairs so there is room for players to join you.

Train your staff to bring things to your attention. If they hear a complaint, it should be handled promptly and with a cool head. Questions or concerns ranging from difficult hole locations to dirty towels on the ball washers will arise.

Play the course with members. Once again, establish a time to allow golfers to sign up to play with the golf course superintendent. You don't have to play as well as Tiger Woods. After all, the goal is to improve communication efforts.

Don't be afraid to answer questions while playing golf or just being on the course. If a question cannot be answered immediately, just say that you don't know but will find out as soon as possible. Not knowing is not a sign of weakness. Offering a confident response is a sign of being accountable. **There are no dumb questions.** Make an effort to answer in understandable language and respond as promptly as possible.

Complaints and questions should be handled through proper channels. For example, the green chairman should be the conduit for problem resolution. However, simple questions or course setup concerns can and should be discussed in an open manner. Build your communications skills and then make the effort to exercise them. For example, speak to the various groups at your facility.

Public relations is important, and the manner in which communication is performed can characterize the person in charge. A profession is defined as a calling that requires specialized knowledge and often long and intensive academic preparation. A professional is defined as one who engages in a pursuit or activity professionally. Make the effort to stay engaged in the communication process; it will pay off. A strong relationship between the golf course maintenance department and golfers needs regular fertilization.

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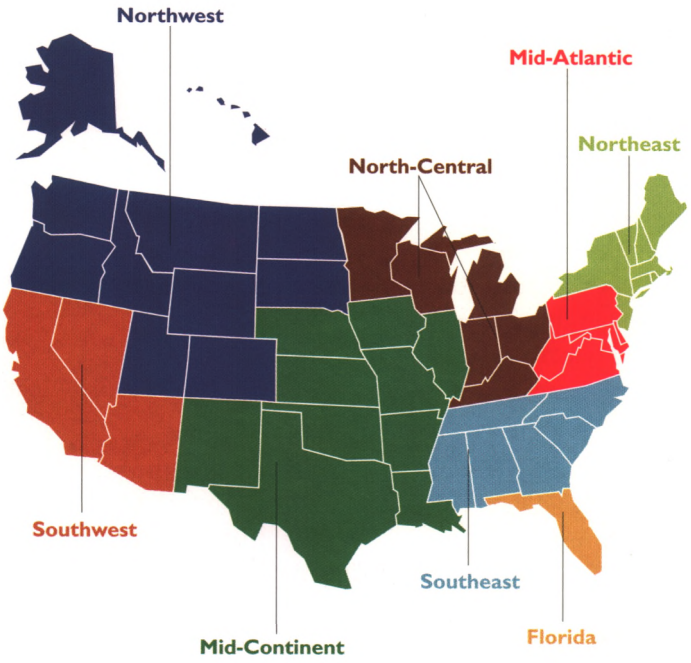

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Turf *Twisters*

Q: Divot recovery on our bentgrass tees and fairways is poor at best during the summer. What mix should we be using for rapid divot recovery? (Iowa)

A: The overriding reason for slow divot recovery in the summer is that high temperatures retard seed germination and subsequent seedling development. This same situation explains why properly replaced divots have difficulty taking root during late June, July, and early August. As for divot mixtures, there are countless variations of sand, seed, soil, and peat or compost. While many combinations work well, they all have their own unique advantages and disadvantages. On the one hand, peat added to sand offers good nutrient and moisture retention, but its dark color can increase heat absorption and subdue divot recovery during the summer. On the other hand, dyed green sand, while more expensive, can be used to improve the appearance of heavily divoted practice tees, but it won't lead to faster divot recovery.

Q: We have bentgrass greens and bermudagrass collars. Bermudagrass encroachment is a constant battle, and we seem to be losing putting surface. Isn't there any *new* solution to this problem? What about using zoysiagrass instead of bermudagrass in the collars? We have been told it will not encroach. (Oklahoma)

A: This is a problem whenever two different grasses are maintained adjacent to each other. Bermudagrass encroachment from the collar is a problem in bentgrass greens or bermudagrass greens. Zoysiagrass imposes the same problem. Some superintendents maintain an excellent green/collar interface, but they do it with weekly hand edging during the growing season and monthly during the non-growing season. It is usually accomplished by using a thin-blade edger and picking the runners by hand. It is labor intensive but it works!

Q: The ponds on our golf course deteriorate every summer when the temperatures rise and algae and aquatic weeds proliferate. The ponds become unsightly and there are limitations as to the chemicals we can apply due to our environmentally sensitive location. We have tried straw and various biological products, but the results have been inconsistent at best. Are there any biological or non-chemical options we can use to improve a bad situation?

A: The decline of shallow golf course pond systems is not uncommon and is usually due to a number of factors, including shallow water depth, heavy nutrient loads, and bank erosion. Chemical treatments for weeds and algae under such conditions usually bring short-term success, but inevitably the poor conditions return. The best advice is to contact a pond/lake manager/consultant in your region to review the site and develop an integrated management plan that addresses the inherent problems with the pond and restores it to a more balanced and natural system that requires fewer chemical inputs. A list of professional lake managers and consultants in your region can be found by contacting the North American Lake Managers Society at www.nalms.org or (608) 233-2836.

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