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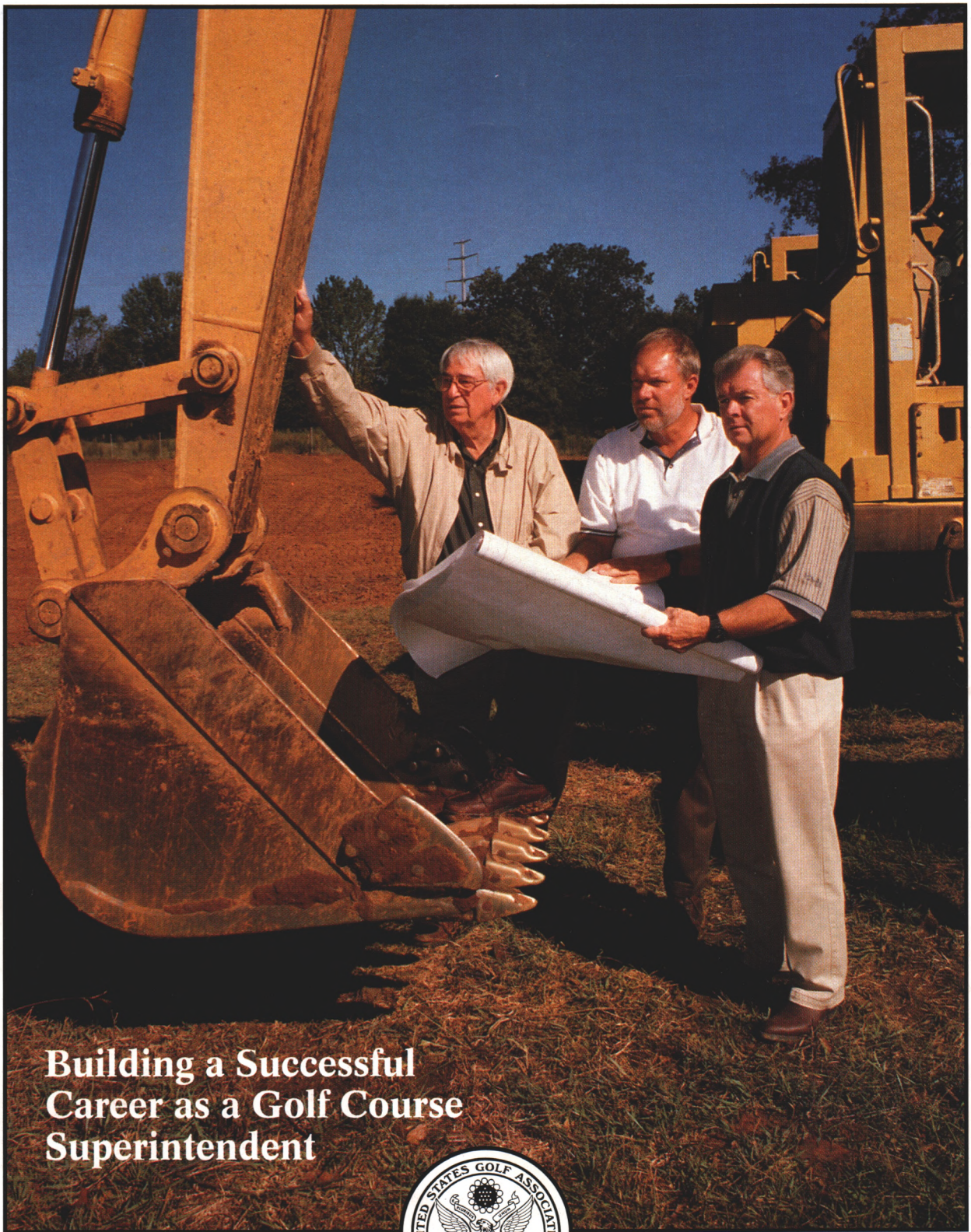

Building a Successful Career as a Golf Course Superintendent

A PUBLICATION ON TURFGRASS MANAGEMENT

BY THE UNITED STATES GOLF ASSOCIATION®

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Cover Photo:
A golf course superintendent takes the lead in many projects around the golf course. As one example, organizing a complete reconstruction team, including the superintendent, builder, and architect, helps ensure a successful renovation project.

A cutworm emerging from its burrow to do its nocturnal damage. See page 6.

As the floodwaters receded from Fargo Country Club, the greens were washed as soon as possible to prevent the accumulation of silt in the upper root zone. See page 13.

USGA® GREEN SECTION
Record

Profiles of Professional Golf Course Superintendents

There's more than one way to build a successful career!

by PATRICK M. O'BRIEN

WHAT TYPE of training does it take today to become a successful golf course superintendent? Many people believe that to become a great golf course superintendent requires plenty of luck or favorable politics. After almost 20 years of consulting with superintendents, I have found there is no single blueprint. Every individual is different, and there are many ways to acquire the skills needed to become a successful superintendent.

The purpose of this article is to provide several models for the most popular career paths superintendents have followed. By describing the backgrounds of several successful superintendents, it is my hope that the next generation can gain some insight about how to shape their careers. Also, advice from these professionals regarding their secrets for success will be offered.

Model #1: A Man of Tradition

Being a caddie and working on the golf course maintenance staff can provide a young person with many opportunities. Bill Anderson is living proof. Bill was awarded the prestigious Evans Caddie Scholarship sponsored by the Western Golf Association as a result of caddying at Point O' Woods at Benton Harbor, Michigan. "Caddying was the only job I qualified for when I was 14 years old," says Bill. Bill used the Evans Scholarship to attend Michigan State University, where he earned a BS Degree in Crop Science under noted turfgrass Professors James Beard, Paul Rieke, and Joe Vargas.

Bill Anderson

"Once I could drive, I began working on the maintenance staff for Norm Kramer," recalled Bill. Norm was President of the GCSAA and one of the most respected superintendents in Michigan. Based on Norm Kramer's example, Bill knew he wanted to become a successful superintendent, too.

After graduating from Michigan State, Bill went to work for John Moreland at Carmel Country Club, Charlotte, N.C. After two years as an assistant, Bill accepted the superintendent position after John retired. Bill's been on the job for 25 years now. Bill is a blueprint for today's traditional superintendent profile.

Model #2: The Old-Fashioned Way

You don't always need a college degree to reach the top of your profession. Bill Womac is an example of success obtained by hard work and commitment to self-development. Bill grew up on a dairy farm in Athens, Tennessee, and learned at an early age how to work the soil and operate and maintain machinery. Normal working hours were sunup to sundown. Bill went to school in the same building for 13 years and "never missed a day of school."

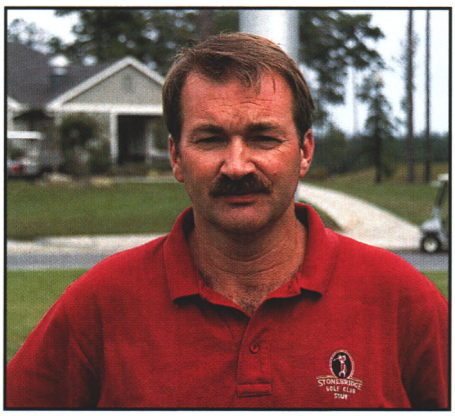
After graduating from high school, Bill worked for General Motors in Atlanta, but after only three days a car model change forced Bill to be laid off temporarily. Bill needed another job. The landlord of the apartment building where Bill was living suggested Bill ask another tenant, who was building a golf course, for a job. The construction superintendent hired Bill to pick up rocks and later drive a tractor. "I liked outside work and I needed the money," said Bill.

Bill Womac

Each summer during model changes, Bill would return to golf course work. After the third summer, Bill was offered an assistant position at Atlanta Country Club, working for George Burgin, who became Bill's mentor. Bill accepted his first superintendent position at Chestuee Country Club, in his home town, after only one season as an assistant. "George said I could handle the job, so I took it," recalls Bill. After three years, Bill returned to Atlanta and accepted the superintendent position at Dunwoody Country Club, where he has remained for the last 25 years. "I have no regrets about the path my career has taken. If I could do it again, I would do it the same way. All I wanted was a chance, just one chance to show I could manage a course." In many ways, Bill found out later in life that his family farm experience helped him with his career. Most importantly, he used his work ethic to master the latest techniques, participate actively in the superintendents association, and develop professional relationships with course officials and committees.

Model #3: Changing Lifestyles

Randy Mangum grew up in a house located on a nine-hole course in Anniston, Alabama. A typical summer day included picking up range balls, washing golf carts, and even playing



Randy Mangum

golf with his brothers and parents. Randy later worked on the maintenance staff, helping with the irrigation and driving a tractor. However, working on a golf course was really only a matter of convenience while growing up, and after high school Randy got a job with a construction company and studied welding at a technical school in the evenings.

Randy's older brother Ken was a golf course superintendent. Randy often visited Ken, and after 12 years of construction realized that he didn't want to stay in this business for a lifetime. During those years, Randy and Ken kept talking and thinking how it would be great to be in the same industry. At age 30, it was time to either make the change or stop thinking about it. With a wife and two children, Randy quit his construction job and went to Abraham Baldwin Agricultural College (ABAC) on a partial scholarship from the Georgia State Golf Association. His family lived off the profits from the sale of their home for the next two years. In the summer months, Randy worked as an intern for his brother Ken at the Atlanta Athletic Club.

Upon graduating with his turf management degree from ABAC, Randy sent out resumes and was hired as the second assistant of the Riverside Course at the Atlanta Athletic Club. After three years as an assistant, Randy was promoted to superintendent at the Riverside Course. "I finally reached my goal of becoming a superintendent," recalled Randy. "I credit my wife for being so understanding during my career change, and my brother Ken for helping me to get started in the business." Randy now is the superintendent at Stonebridge Golf Course in Rome, Georgia. He has shown it is possible to switch careers and become a successful superintendent.

Model #4: A Family Affair

The Maples family tree has its roots in the golf business all the way back to Old Tom Morris through Donald Ross. It would seem only natural that Palmer Maples, Jr., whose father was golf professional and superintendent at Benvenue Country Club, Rocky Mount, North Carolina, would also enter the business. While growing up, Palmer helped his dad on the golf course daily and admired his lifestyle.

After high school, Palmer attended Abraham Baldwin Agricultural College (ABAC), where he completed a two-year degree in turf management. During the summer months, Palmer assisted Dr. Glenn Burton with his bermudagrass research plots. Palmer sharpened the mowers, mowed, top-dressed, and overseeded the plots. Tifgreen bermudagrass was released from this plot work. After ABAC, Palmer was drafted into the Army and later graduated from the University of Georgia with a B.S. degree in agronomy.

Palmer Maples

While finishing his college degree at the University of Georgia, Palmer helped the Charlotte Country Club convert its putting greens to Tifgreen bermudagrass. After graduation, Palmer returned to Charlotte as assistant and was later promoted to superintendent in 1959. This was the beginning of Palmer's 38-year career as a golf course superintendent. "My goal every day was to set up the course so the golfers could play by the Rules of Golf," said Palmer. "I've had a beautiful career as a superintendent. I couldn't have scripted it any better." Palmer is a blueprint for the man born to be a superintendent.

Tips for Success from the Pros

Golf course maintenance is a big business today. A successful golf course superintendent must possess much more than just technical ability. He or she must be an agronomist, financial and personnel manager, and much more. The superintendents profiled in this article have experienced firsthand the challenges a superintendent faces each day and have shared a few tips to help others stay on the road to success.

1. *Work for a superintendent who is as good a manager of people as he is of turf — someone who could be a mentor.* Mentors are needed to teach new people in the industry the integrity and the tradition of the game and the cooperative spirit that exists among many superintendents. It is the sharing of information and the willingness to rely on each other that makes the industry so strong and a pleasure to work in. Many turf managers have regretted not spending enough time working as an assistant to an excellent superintendent prior to taking a job as a superintendent. Working for successful superintendents who take an interest in your development will benefit you for the rest of your career.

2. *Work as an assistant superintendent before putting your job career on the line as a golf superintendent.* There is much more to becoming a successful superintendent than knowing how to manage the turf. As an assistant, you will be able to observe how a superintendent works through the challenges of managing a crew, dealing with a Green Committee, and working with representatives who market turf-care products. Most assistant superintendents improve their technical knowledge of the job and are given more responsibility for decision making as their tenure at the course increases. Avoid the temptation to jump at the first job offer. You and the superintendent should be able to evaluate whether you are ready for the challenges of being a superintendent.

3. *Understand club politics. It is essential to understand that the individuals monitoring the golf course maintenance program come from varied backgrounds.* At most private courses, the Board of Directors and Green Committee change frequently — sometimes annually. At municipal and privately owned facilities, a more stable environment usually exists. Successful superintendents get to know their new Green Chairman and gain a perspec-

A successful superintendent develops and hires good talent for the staff. One way to keep the staff up to date is to let them participate in educational opportunities. Occasionally, superintendents will ask the USGA agronomist to meet with the maintenance staff during Turf Advisory Service visits to answer questions and talk about course conditions.

tive of that person's goals. The superintendent takes the initiative to develop a good relationship and understands the Chairman's expectations. There may be times when you just can't get along, but the successful superintendent knows how to be flexible, outlasting this individual's term without making an enemy.

4. *Develop and hire good talent for your staff.* With the demands on today's superintendents being what they are, it is essential to hire talented individuals for the maintenance staff. Irrigation and spray technicians, first and second assistants, mechanics, horticulturists, special project foremen, secretaries, and support staff are vital for success today. It is impossible to do it all by yourself.

5. *Avoid taking risks that could cause a major disaster.* Everyone has seen this in the business. A superintendent will mix a "witch's brew" of products and apply these to the greens. Why do it? Even if it works out perfectly, what benefit could equal that risk just taken? With today's high golfer expectations, unacceptable turf conditions at even one green are not tolerable.

6. *Keep golfers informed. Newsletters are an excellent communication tool to keep members informed about golf course projects and routine operations.* Provide tentative dates for aerification and other disruptive practices, and avoid saying a project will be done by a specific date. If a date must be used, be sure to emphasize the unpredictability of working with nature and that such dates represent only a best estimate. Report information and avoid promises.

7. *Develop a budget. It is imperative that the superintendent is involved with the development of the course operational budget.* Avoid having the course owner or Board of Directors be the ones in charge of developing the budget, but seek their input. Always seek guidance and work with the General Manager on this important task. Regardless of the size of the budget, the superintendent determines how the funds are spent, based upon maintenance objectives.

8. *Take on as much responsibility as you can handle. Additional responsibility helps both politically and financially.* This may require hiring more staff, but you will benefit in the long run. With the swimming pools, clubhouse grounds, golf carts, and tennis courts at most golf facilities today, many opportunities are available to expand your areas of responsibility. If the clubhouse grounds look either good or bad with upkeep by a con-

tractor, there is no sign to let the membership know who gets the credit. It is not easy accepting more responsibility, but it can mean higher salaries and the perception of a more valuable employee.

9. *Dress like a manager.* It is important to dress appropriately when attending professional seminars and conferences. In most instances, when on the golf course, dress as a golfer. Obviously, you have to get dirty on the job from time to time, but always have a change of clothes for the expected or unexpected meeting at the clubhouse with the Green Committee or general manager.

10. *Avoid challenging the members.* If a scheduling mistake happens, minimize the impact by accepting responsibility or resolving the problem. For example, a superintendent could be correct with the agronomic benefits of fairway aeration, but if it is performed before the club championship, problems can arise. Instead, try to schedule the aerification at another time and do not jeopardize your image with the golfers at the club. It could take years to overcome this mistake. Both the golf professional and superintendent need to work together on a compromise between the golf calendar and maintenance schedules, especially at courses that are open daily.

11. *Find the proper balance between the needs of the turf and the needs of the golfers.* To provide golfers with the high-quality playing surfaces they desire and deserve, occasionally they will have to yield to vital maintenance practices. For example, wilting putting greens on a hot afternoon need to be tended to, and course workers must have the chance to apply the needed water. Although every effort must be made to minimze disruptions during play, they cannot be avoided completely. Newsletters, posters, and taking time to visit with golfers on the course provide excellent opportunities for education and increased golfer understanding of maintenance needs.

12. *Maintain a professional relationship with the members. It is important to know the club members or golfers, but the goal should not be to become best friends with them.* At the same time, a superintendent should not consider himself a second-class citizen. Experience will enable you to determine when to be sociable with the members. Superintendents should be made welcome at the clubhouse, teeing it up occasionally with members or course officials, and representing the club at area and membership events. Active participation in community affairs is an excellent means of demonstrating that you have much to offer in addition to knowing a lot about golf course maintenance.

13. *Play the golf course.* Make the time to play the golf course. After all, you and your staff have the greatest influence on the game, and you must know how your agronomic programs are affecting play. You will be in a much better position to respond to questions about the playability of the course if you play regularly. Do not displace a member during heavy play times, and stay on the alternate list for club events, always giving members preference. It also is important to study the Rules and traditions of the game.

14. *Attend turf conferences, USGA Green Section Conferences, and annual training workshops.* Never stop learning and asking questions. Most clubs will encourage and pay for their superintendent's continuing education. Know your limitations, and see where you need additional training. Education is a lifelong process. Become involved with the GCSAA and the local superintendents' organizations.

15. *Do not spend too many hours at the golf course.* When the job demands the time, be there! Most golf course operations are run from 7:00 AM to 4:30 PM. What is a superintendent doing who stays until 8:00 PM each evening? Is this person doing jobs that didn't get done in the day, or is it job insecurity? In many instances, better scheduling can avoid this work overload, as can adding more staff or supervisors. Courses with lower budgets need to set limits on expectations if these solutions aren't possible. Avoid staying late unless something has to get done. Nobody but the superintendent himself can make his job pleasurable. It is not the responsibility of the Board of Directors or Green Committee to ensure your happiness. Be sure to make time for your family and other activities to help ensure you continue to like your work.

Do your homework so you're prepared for potential questions from the golfers. This preparation includes studying the Rules of Golf and the traditions of the game.

Student interns gain valuable experience working on the golf course crew. Working for a successful superintendent can provide a rewarding experience.

16. *Accept constructive criticism.* No one likes criticism, but it can happen even at courses with excellent playing conditions. Criticism can come from just about anyone, including employees, golfers, employer, or spouse. Politicians are the best at never seeming to take criticism personally. Superintendents need to have the same philosophy. One golfer complaining about the "fluffy" bunker sand may become very irritating, but it is the bunker sand and not you that is the source of the irritation. Superintendents need to separate the complaint from the complainer, leave personal feelings back at their desk, and evaluate the validity of the complaint.

17. *Pay attention to small details.* Many superintendents spend the majority of their time dealing with large issues, and in the process overlook the importance of the little details. Everybody sees the big picture, but the little details seem to multiply. Move the big rock and thousands of small rocks appear! It has been said many times by golf course architects that a golf course is judged 80% on its visual appearance. How does a golf course look to the golfer each day? One noted superintendent always rides the golf course regularly with his wife, who has a keen eye for small details.

18. *Remember that there are members at most clubs who do not play golf.* Many clubs have social memberships for non-golfers. Find ways to contribute to these members' enjoyment of the club, such as the care of the clubhouse grounds, the Audubon Cooperative Sanctuary Program, firewood, home-lawn articles in the newsletter, tree planting programs, jogging paths, etc.

19. *Be a* ***leader*** *and a* ***manager*** *with the maintenance staff.* Provide leadership for these employees based on ethical, moral, and professional goals, not through threats, berating, or badgering. Maintain a *supervisory* position with your employees. You can be their friend, but not their buddy. Make sure you communicate one on one with employees and not just through memos. Always seek to raise the standards of the employees by your own daily activities, such as being on time. Strive to have patience with employees, even after mistakes, such as mowing down your recent wildflower planting. Respect your employees, their differences, and their pursuit of happiness.

Your staff usually can sense attitude changes. If you slow down, it provides your employees the same opportunity, and problems will occur during the golf season. When this happens, take time to devise a plan. By taking charge with a plan and priorities, a successful superintendent will get the ship back on course. Most employees want someone to provide direction, especially during tougher times.

20. *Learn effective maintenance scheduling.* As much as possible, avoid scheduling maintenance work when it could interfere with play. Scheduling maintenance around play will avoid disrupting golfers and will allow employees to work more efficiently. Most superintendents know how long it takes to complete the various tasks on the course. Always know where the employees are, and set time limits for completion of daily chores to enhance productivity. Always say bunkers will be raked by 10:00 AM and not "let's rake the bunkers today."

21. *Take advantage of the latest technology.* Technology can make your job easier and help produce a higher-quality result. Always strive to raise the club standards daily.

22. *Build your resume to ensure your value because the superintendent field is so competitive today.* Choose turf schools very carefully, and work with experienced superintendents. A strong educational background is a current market trend. Today more than 88% of all superintendents have some sort of formal college training, and 67% have completed a two- or four-year degree program. A good education that includes training in business and environmental science is going to become increasingly helpful to remain competitive. Be sure to document regular participation in educational programs for your resume.

23. *Hire other professional talent for assistance with projects or problems.* During a renovation, a successful project is the result of a team effort between the superintendent, builder, golf course architect, and club leadership. For new landscaping, hire a landscaper to help with the design. Hire arborists to assist with long-range tree-care plans. Consult with the USGA agronomist annually to find out the latest information about turfgrass management, new products, and trends. The USGA Green Section also can help a superintendent assemble the ideal team of experts and materials for new courses and renovations with the new Construction Education Program.

Conclusion

Being a golf course superintendent is a great career today. The job is very rewarding and requires many skills to master. There are many different career pathways to become a golf superintendent, and successful superintendents can come down any road. Overall, the successful superintendents work smart and always seeks better ideas and methods to make themselves and their jobs even more successful.

PATRICK O'BRIEN *is director of the USGA Green Section's Southeastern Region, visiting golf courses throughout his six-state region. His USGA Green Section career began in 1979.*

A USGA-SPONSORED RESEARCH PROJECT

An Innovative Approach to Black Cutworm Management

Black cutworms can be controlled by a few changes in your turf management program.

by R. CHRIS WILLIAMSON, Ph.D., and DANIEL A. POTTER, Ph.D.

Little is known about the behavior of black cutworms in turf, but the damage is well documented. At night, the larvae emerge from soil burrows to devour leaves and stems, resulting in sunken, pockmarked areas.

BLACK CUTWORMS are major pests of golf courses, especially on creeping bentgrass putting greens and tees (Potter 1998). Cutworms emerge from soil burrows at night to devour leaves and stems. This causes sunken pock-marks that reduce the smoothness and uniformity of the playing surface. Not only do cutworms cause direct damage, but birds and other animals that prey upon them cause further injury by pulling up tufts of turf. Because their damage interferes with ball roll and reduces overall aesthetic quality, tolerance for black cutworms is extremely low. Consequently, many superintendents apply cutworm treatments several times per growing season. Golf course putting greens receive more pesticides per unit area than any other turfgrass site (Smith and Tillotson 1993), making them a focal point for environmental concerns and potential human exposure.

Until recently, little was known about the behavior of black cutworms in turf. In fact, nearly all previous research on this pest had been done on agricultural field crops such as corn. This lack of knowledge, and the importance of black cutworms as turfgrass pests, prompted us to study their behavior on golf courses. We studied where the eggs are laid, effects of mowing on egg removal, survival of eggs on clippings, and nightly behavior of cutworms on putting greens. Our results suggest ways that black cutworms can be managed more effectively, with reduced use of insecticides.

Cutworm Biology

Black cutworm moths (adult) fly at night, depositing eggs on the foliage of turfgrasses and weeds from April to September. The eggs hatch in about five days, and the young larvae, or caterpillars, begin to feed and grow. The caterpillar is the only damaging life stage. Black cutworms typically undergo six or seven molts, increasing in size each time. The stages between molts are referred to as instars. When the large fifth and sixth instars mature, they burrow into the soil or thatch to form a pupa, a transformation stage between larva and adult. The adult moth emerges from the pupal case in 10 to 14 days. Females begin to lay eggs soon after mating. The moths feed on the nectar of flowers. Each generation (egg to adult) averages 40 to 50 days, depending mainly on temperature, and development is fastest during the summer.

In North America, nearly all areas in the cool-season turfgrass zones have one to three generations per year. There usually are three or four generations in the transition zone, and five or more generations per year in warm-season turf areas.

Removal of Eggs by Mowing

Under typical golf course mainfenance schedules, putting greens are mowed daily, whereas tees, collars, and aprons are cut several times per week. Clippings from greens and tees are collected in mowing baskets and discarded, often strewn in surrounding high grass or rough. Clippings from the higher-mowed areas are usually left on the surface to be incorporated back into the turf profile. We sought to determine how mowing affects the fate of black cutworm eggs deposited on putting greens.

Black cutworm moths were caged over a creeping bentgrass putting green maintained at two conventional cutting heights (⅛ and 3⁄16 inch) and allowed to lay eggs. Numbers and locations of eggs on grass plants were then determined. Twenty leaf blades with single eggs were marked with orange paint within each plot. Then, a standard walk-behind greens mower was used to mow

the plots and collect the clippings containing eggs into mowing baskets. Grass clippings from plots of each cutting height were recovered and inspected for eggs.

Black cutworm moths laid similar numbers of eggs regardless of cutting height. All eggs were laid on leaf blades; none were found on leaf sheaths. Most eggs were laid singly, and more than 97% were laid on the tips of the leaf blades. Importantly, we found that 88% and 87% of the eggs were removed with a single mowing at cutting heights of ⅛ and 3⁄16 inch, respectively. These findings suggest that mowing removes most of the black cutworm eggs laid on putting greens. Where, then, do cutworms come from?

Nocturnal Activity and Movement of Larvae

Understanding the behavior of any insect pest is essential to effective management. Because the feeding activity and movement of black cutworms on putting greens was undescribed, we needed to study these behaviors.

Nightly activity of black cutworms was determined by visually inspecting three infested putting greens every two hours from just before sunset until one hour after sunrise. Observations were made over two summer nights, using a hand-held lantern and systematically walking back and forth across each green. During each interval, we recorded the numbers of cutworms actively feeding or crawling on the putting surfaces.

Although some cutworms became active just after dusk, the greatest number was observed between 11:30 p.m. and 6:30 a.m. Most of these burrowed back into the turf before dawn. Heavy bird predation was observed on those caterpillars that remained on the putting surface at dawn. At this same time, mowing crews arrived to mow the putting greens, and the few cutworms that were still active on the surface were shredded by the greensmower.

During monitoring, we observed that black cutworms may crawl considerable distances within a single night. To document this, we measured cutworm tracks left in the early morning dew, tracing them back to their point of origin and determining the distance traversed by each caterpillar on the putting surface. Of the caterpillar tracks measured, about half originated from high grass off the putting green and terminated on the putting surface. The average length of the tracks was about 30 feet, although the greatest distance that a cutworm was tracked was more than 70 feet! These observations suggest that black cutworm infestations on putting greens may originate, at least in part, from peripheral areas such as collars and roughs.

Survival of Caterpillars on Clippings

Since the large larvae can crawl considerable distances in a single night, many of the black cutworms found on putting greens may originate from peripheral areas. Indeed, our research showed that black cutworms thrive on perennial ryegrass and tall fescue, as well as on creeping bentgrass. Thus, reservoir populations may develop in roughs or fairways with these grasses. One source of infestation could be the eggs on clippings removed with greensmowers and then strewn in adjacent areas. Thus, we investigated the survival of black cutworm eggs on grass clippings from putting greens.

As for the egg-removal study, black cutworm moths were caged on putting greens to lay eggs, and the grass then was mowed at ⅛ or 3⁄16 inch height. Clippings were removed from the mowing basket and carefully inspected for the tiny eggs. Those with eggs were taken back to the laboratory, where they were distributed into petri dishes or fine-mesh bags. Twenty grass clippings, each with one egg, were placed in each of five petri dishes or mesh bags. The dishes were placed in a growth chamber simulating outdoor light and temperature conditions. The mesh bags with egg-bearing clippings were returned to the high grass surrounding the putting green, where clippings would normally be discarded. Both sets of eggs were observed every day to determine egg hatch. Once hatching was finished, we evaluated overall egg survival.

Survival rates for eggs on grass clippings held in the growth chamber averaged more than 75%. Hatching

Black cutworms are a major pest for the golf course superintendent, especially on creeping bentgrass putting greens and tees.

Black cutworm moths fly at night and lay eggs on the tips of creeping bentgrass leaf blades. One objective of this research was to determine how mowing affects the fate of cutworm eggs deposited on putting greens.

rates for eggs on grass clippings in fine-mesh bags averaged 50.3% and 48.1% for ⅛- and 3/16-inch cutting heights, respectively. This confirms that many eggs survive passage through a greensmower and may hatch if clippings are strewn beside putting greens.

Implications for Pest Management

This work suggests that daily mowing removes most of the black cutworm eggs laid on creeping bentgrass putting greens. Since eggs may survive in grass clippings, it is important to dispose of clippings well away from greens. Older larvae can crawl considerable distances, and many of the large fifth and sixth instars that damage putting green surfaces originate from adjacent, high-mowed turf. We therefore suggest that control actions should include a 30-foot buffer zone around greens. Managing reservoir populations in these peripheral areas may reduce the need for repeated applications of pesticides on putting greens. Because black cutworms are nocturnal, treatments are best applied late in the day (i.e., as close to dusk as possible). This method also reduces potential photodegradation, volatilization, and exposure to humans. Our observations indicate that many black cutworms feed on the surface of putting greens. Pre-dawn mowing, which is already practiced on some golf courses, may provide significant mechanical control of these larvae.

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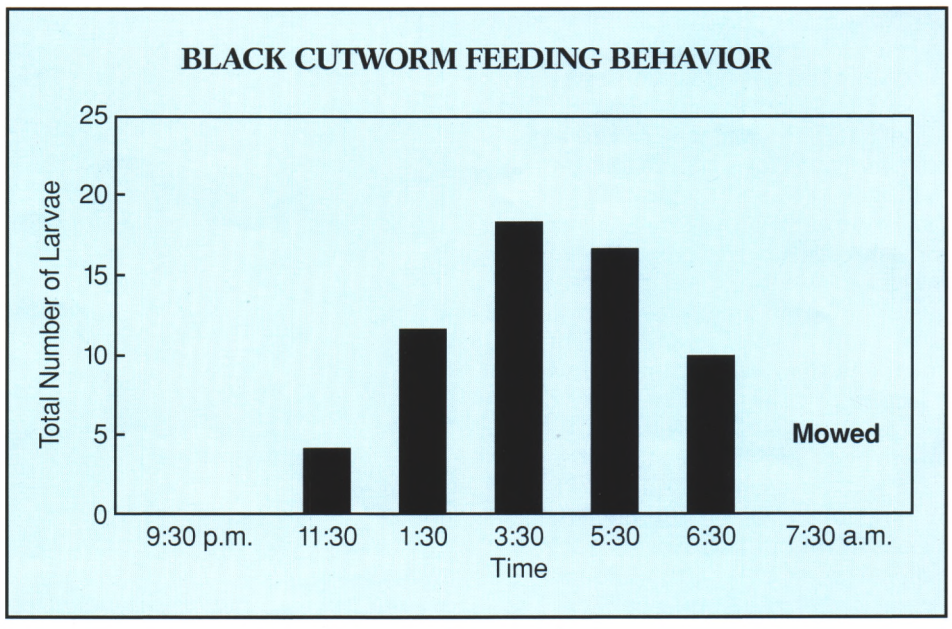
This work, which received funding from the United States Golf Association Environmental Research Program, was conducted as part of the doctoral research of R. C. WILLIAMSON *at the University of Kentucky. Dr. Williamson currently is Research Scientist, TruGreen-Chemlawn, Delaware, Ohio.* DR. D. A. POTTER *is Professor of Entomology, University of Kentucky, in Lexington, Kentucky.*



How to Select the Best Sand for Your Bunkers

There's a lot to learn about the sand you select for your course.

by JAMES FRANCIS MOORE

WITH THE possible exception of green speed, sand bunkers are the most controversial and discussed features on golf courses, regardless of the golfer's ability. Predictably, opinions vary widely on issues such as design, location, playing quality of the sand, and even what color is best. Generally, there are four major areas that must be considered when evaluating bunkers. These are sand selection, architecture, construction, and maintenance.

Selecting the proper sand for bunkers is arguably the most difficult of these four areas. The makeup of the sand strongly impacts maintenance and playing quality. The sand can also influence the architecture and style of construction of bunkers.

There are seven factors that should be considered when selecting the sand.

- Particle size.
- Particle shape and penetrometer value
- Crusting potential
- Chemical reaction (pH) and hardness
- Infiltration rate
- Color
- Overall playing quality

Values for and interpretation of particle size, shape and penetrometer value, crusting potential, chemical reaction and hardness, and infiltration rate all should be determined by an accredited physical soil testing laboratory. Color and overall playing quality are highly subjective values that are based on personal preference.

Playing quality is unquestionably the most subjective parameter when choosing bunker sand. The most important component in the selection process is allowing an adequate amount of time to fully evaluate the various factors.

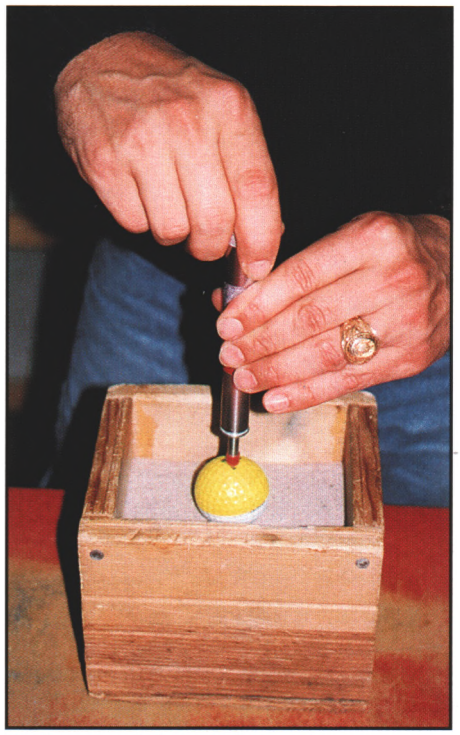
Particle Size

As a general guideline, a sand used in bunkers should be composed of particles with a large majority in the range of 0.25-1.00mm. Silt and clay (particles below 0.05mm) should be kept to a minimum, since they are associated with surface crusting. Note that this size range should be utilized only as a first step in determining whether the sand is likely to be acceptable overall. In other words, it is unlikely that a sand that falls significantly outside this range will perform well in terms of crusting, hardness, porosity, and/or playing quality. On the other hand, it would be a mistake to assume that a sand will be appropriate for bunker use simply because it falls within this particle size range. For example, depending on particle shape, some sands that fall in this range would be considered too firm or too soft for play. Since particle size screening is a simple, inexpensive test that is performed by most sand suppliers, it is the best first step in determining if the sand is worthy of further testing.

When evaluating the particle size range of the sand for bunker use, keep in mind that bunker sand often ends up on the green in surprisingly large quantities. As golfers blast their way free of the hazard, the sand is thrown onto the adjacent green. **Therefore, when selecting sand for use in green-side bunkers, the makeup of the green's rootzone must also be considered.** The best rule of thumb is to avoid using a sand in the green-side bunkers that is significantly finer in gradation than that used in the rootzone of the green. This is the same basic rule used for selecting greens topdressing materials. You can safely lay a coarser material over a finer rootzone mix without creating significant drainage problems, but just a few topdressings with a finer material over a more coarsely graded rootzone can cause drainage problems.

If a bunker sand is selected that is significantly finer in gradation than the rootzone mixture used in the greens, additional aerification should be practiced on the affected areas of the green. Backfilling the aerifier holes with a more coarsely graded sand helps mover water more rapidly into the rootzone.

Material that is too coarse also can create problems. Particles greater than



Soil testing laboratories perform a penetrometer test to measure a sand's resistance to compression. The value from this test is used to predict the sand's potential for fried-egg lies.

2.00mm are classified as gravel. If present in large quantities, particles in this range damage mowing equipment and cause the ball to deflect off line.

Particle Shape and Penetrometer Value

The shape of the sand particles has a strong influence on playing quality and maintenance. A sand particle's shape is classified by examining both the relative sharpness of the particle's edges and the overall shape of the particle itself. By referring to Figure 1 — Angularity and Sphericity of Sand Particles, it can be seen that the surface of particles can range from *very angular* (many sharp, well-defined edges) to *well rounded* (smooth surfaces). The shape of the particle can range from *low sphericity* (an elongated particle) to *high sphericity* (a particle that is nearly round).

The angularity and sphericity of the particles have a strong influence on the playing quality of the sand. For example, a low-sphericity, very angular sand generally has high resistance to *fried-egg* lies. Such sands also tend to stay in place better on the face of the bunker. However, this same sand would produce very firm bunkers that some players may find objectionable. Well-rounded, high-sphericity sands can produce fried-egg lies and are more likely to move off the bunker face during maintenance and irrigation rainfall.

Sands usually consist of a mixture of particle shapes and sizes. This is important to the stability and playing quality of the sand. Again, as a general rule, sands that are highly uniform in size range and shape (particularly if rounded with high sphericity) tend to be less stable than a sand that has a wider range of particle dimensions.

Determining a sand's angularity and sphericity is helpful in predicting the ultimate playing quality of a bunker, but is by no means an exact science. The USGA currently is funding research to attempt to develop better measurement techniques to aid in the selection of sands for rootzone mixtures and bunkers.

The angularity of the sand is determined by examining the particles with a microscope and comparing them to the chart in Figure 1 — Angularity and Sphericity of Sand Particles. After measuring the angularity, the laboratory performs the penetrometer test to determine the sand's tendency to produce fried-egg lies. The penetrometer measures the sand's resistance to compression. The values are reported in kg/cm^2. The potential for fried-egg lies is based on penetrometer values as described in Table 1 — Potential for Fried-Egg Lies (Thomas Turf Services).

Table 1
Potential for Fried-Egg Lies
(Thomas Turf Services)

Penetrometer Reading	Fried-Egg Potential
Greater than 2.4 kg/cm^2	Very low tendency to bury
2.2 to 2.4 kg/cm^2	Slight tendency to bury
1.8 to 2.2 kg/cm^2	Moderate tendency to bury
Less than 1.8 kg/cm^2	High tendency to bury

Crusting Potential

Crusting is the formation of a layer of dried, stiff sand on the surface of the bunker. Such layers typically are ⅛ to ¼ inch in thickness, and they severely decrease the playing quality of the bunker. Sands that are prone to crusting require more frequent raking to maintain good playing quality. If the crusting potential is high, the bunkers will require raking following each irrigation and rainfall event. This greatly increases the labor required to keep the bunkers in good condition.

Crusting is directly related to the percentage of silt and clay in the sand. As silt and clay increase, the severity of crusting increases as well. To test for crusting potential, the laboratory wets a thin layer of sand and allows it to dry overnight. They then attempt to lift the layer on the edges using a spatula. Whether or not a crust has formed will be recorded on the lab test results and is usually reported as N (none), L (light), M (moderate), or S (severe).

Chemical Reaction and Hardness

Some laboratories also test the sand for its chemical reaction (pH). This value is much less important overall than the other test results and, on its own, should not be used to disqualify a sand being considered for use. The pH value provides insight into the chemical makeup of the sand. A sand with an extremely high pH (> 8.0) is likely to be strongly calcareous and therefore subject to physical and chemical weathering.

Sand particles also can change in shape and size due to mechanical wear. Sand particles that are very soft can be crushed into smaller particles during raking. A soft sand may play and drain perfectly at first, only to degrade in quality as the particles are broken down. Some laboratories now perform a hardness test to determine the likelihood of this type of degradation.

Infiltration Rate

Infiltration rate refers to the sand's ability to drain. It is also referred to by laboratories as *saturated hydraulic conductivity.* This measurement is most relevant to rootzone mixes for use in putting greens, but it is also used by some labs to evaluate bunker sands.

Since straight sand is used in bunkers, the initial infiltration rate measurement is likely to be very high — often in excess of 50 inches per hour. As a

general guideline, a sand being considered for use in bunkers should drain at a minimum rate of 20 inches per hour.

Infiltration rate measurements are more useful when evaluating the suitability of a sand that has been in the bunker for some time. In most cases, the sand in the bunker gradually becomes contaminated with the soil from the base and sides of the bunker. This process occurs more rapidly in bunkers with steep faces and in areas subject to heavy, frequent rains. A sand that has become heavily contaminated with soil and organic debris will drain much more slowly than a sand that is clean. Simply installing new or additional drainage pipe would be only partially effective under such circumstances. Complete removal and replacement of the contaminated sand may be the only complete solution.

Proper sand selection is one of four components in evaluating bunker sands. An improper choice at this course resulted in cement-like slabs that required complete removal soon after installation.

Color

Unfortunately, bunker sands occasionally are selected based primarily on their color. Although sand color is important, since it strongly impacts the appearance of the course, it should not be given greater consideration than particle size, particle shape, or crusting potential.

Laboratories measure the color of sand by comparing it to the Munsell Color Chart. As a general rule, lighter-colored sands are preferred since they contrast beautifully with the green grass. Color measurements are also useful when evaluating the visual compatibility of two sands. An annual task on many courses is to add an inch or two of sand to existing bunkers to replace what is lost from explosion-type shots and water and wind erosion. If the new sand is a markedly different color from the existing sand, it can take months of raking for the two sands to blend into a uniform color.

Overall Playing Quality

Without question, playing quality is the most subjective evaluation of bunker sands. Players vary widely in their assessment of what constitutes good playing quality. One of the few shared opinions seems to be a desire for all the bunkers on the course to play in a consistent manner. For this reason, when adding sand to existing bunkers it is a good practice to perform the work on all of the bunkers on the course.

From a testing standpoint, particle size, particle shape, crusting potential, and infiltration rate all provide insight as to how the sand will play. However, other factors that have nothing to do with the makeup of the sand have equal if not greater impact on playing quality. The other factors include:

- Raking frequency.
- Raking method.
- Green-side irrigation coverage.
- Depth of the sand.
- Length of time the sand has been in the bunker.

The number of times per week the bunker is raked has impact on playing quality. On courses that rake daily, the possibility of even minor crusting is eliminated. The upper few inches of the sand remains loose. The sand also tends to be drier as a result of increased evaporation.

Machine versus hand-raking also affects playing quality. Hand raking usually results in sand that is firmer and less prone to fried-egg lies. Machine raking can be either deep (useful to prevent weed establishment) or very light, depending on the attachment used.

Heavy rains wash soil into the bunker, detracting from the appearance and playability of the sand.

Evaluating the particle size range of the sand for bunker use is an important component in the selection process. A coarse sand will impact maintenance and playability.

The green-side irrigation system almost always overlaps into the bunkers. Thus, during times of the year when it is necessary to water the greens frequently, the sand in the bunkers will be wetter. And, since the irrigation system is designed to apply water as evenly as possible to the surface of the green rather than the surrounding areas, it is likely the bunkers adjacent to the green will receive varying amounts of water.

The depth of the sand usually varies even within the same bunker. The sand is almost always deeper on the low, flat portion of the bunker and shallower on the faces and slopes. It would be a mistake to attempt to maintain a consistent depth throughout the bunker. Golfers should gauge the depth and firmness of the sand while taking their stance and adjust their shot accordingly.

Sands often change significantly in their playing quality over the first few months as they become compacted and contaminated with soil and organic debris. Newly installed sand may seem soft at first, but soon will become more firm. The speed at which this firming occurs depends on the angularity and particle sizing of the sand, as well as raking practices. Since most bunkers are subject to at least some erosion during irrigation and heavy rainfall events, the sand will gradually become contaminated with the underlying and surrounding soil. As a result, the playing quality of the bunker gradually changes as the bunker ages. The sand particles can also change in size and shape due to mechanical weathering, as discussed earlier.

Determining which sand yields the best playing quality is such a subjective process that a test bunker is often constructed to allow golfers to field-test the sands for themselves. Assuming three sands are being considered (each of which has already been evaluated by an accredited physical soil testing laboratory), use 2 × 6's to divide the test bunker into three areas. Evaluate the sands for a period of at least two to three months to allow the sand to compact and better simulate what will happen on the course. Unfortunately, while this testing process will demonstrate the playing quality of each prospective sand, it cannot guarantee a unified opinion among the golfers. The USGA currently is funding research to better predict the playing characteristics of sands through laboratory testing.

Several soil testing laboratories provide bunker sand evaluation services. Usually, a complete analysis can be obtained for less than $200. The laboratory will need a gallon of dry sand to perform all of the tests. Be sure to submit a sample of each sand that is being considered. Allow at least two to three weeks for the laboratory to complete the tests.

Conclusion

Clearly, there is more to selecting the right sand for your bunkers than calling the local sand plant and ordering a few truckloads. Today's golfers (at least in the United States) are becoming increasingly more demanding of bunkers that play consistently, drain rapidly, and provide additional beauty to the course. One of the most important pieces of advice this article can offer is to remember that *time* is a necessary component to achieve these goals. Allow plenty of time for testing to narrow your choices to sands that are properly sized, stable, and easier to maintain. Time also is needed for the construction and use of a test bunker to allow golfers to evaluate the different sands for playing quality. Finally, time will be required for the newly installed sand to firm up and take on its final playing characteristics.

JIM MOORE *joined the USGA Green Section in 1985, spending his time conducting Turf Advisory Service visits in the Mid-Continent Region. In 1996, he assumed the duties of director of the newly formed Construction Education Program.*

Personal preference is one of the most influential factors in bunker sand selection. Allow golfers to try several sands to assess their playing qualities.

Gasoline-powered pumps and a variety of squeegees were used to wash silt accumulations from the golf greens. Washing revealed almost two inches of growth on the few greens that survived several weeks of submersion.

THE FLOOD OF 1997

Spring flooding is a common occurrence at Fargo Country Club, but record winter snows melted into a spring that won't soon be forgotten.

by CRAIG J. VIGEN, CGCS

THE RED RIVER serves as the border between North Dakota and northwest Minnesota. It originates in Wahpeton, North Dakota, and flows north into Canada, where the river terminates at Lake Winnipeg, just north of Winnipeg, Manitoba. This large, slow-moving river drains a great deal of agricultural land and is particularly susceptible to spring flooding because of the ice jams that develop as the river flows north into Canada.

Fargo Country Club was founded in 1898 and has been at its present location since 1919. Seven fairways border the Red River, and the annual confrontation between the golf course and the river flooding each spring comes as no surprise to the golfer or the maintenance staff. No one, however, could have anticipated the severity and duration of the flooding that occurred in 1997.

During October of 1996, Mother Nature set the stage for the historic Flood of '97. The Red River Valley received a late October rain that left behind five inches of precipitation and lakes of ice on the golf course. Shortly thereafter, Old Man Winter blanketed the region with snow. For the next five months, eastern North Dakota was punished with 13 winter storms and a record 119 inches of snow. A spring flood was unavoidable, but a 500-year flood was unimaginable. During late March the community was optimistic because the weather was warm during the day and cold during the night — perfect conditions to moderate spring snow melts.

Unfortunately, winter had one more surprise; a late winter storm developed during the first week of April. The storm produced two inches of rain and several inches of snow. Fortunately for the community of Fargo, the weather remained cold after the storm, which slowed the melt and provided more time for the community to prepare for a flood of historic proportions. On April 17, 1997, the Red River of the North crested at 39.5 feet — 22.5 feet above flood stage. This mark surpassed

the 100-year flood of 39.10 recorded in 1897.

The golf course maintenance staff was called in during mid-March to prepare for the imminent flood. Snowmobiles were used by the crew to locate and remove irrigation controllers in this area, covered by snow up to six feet deep. Spring flooding is not unusual, but the crew usually has time to remove green covers before rising water reaches the putting surfaces. This spring, as much as three feet of heavy snow had to be removed from greens before the covers could be removed. Three covers were solidly frozen to the turf and remained on the greens until they were swept away by the river. The maintenance staff recovered the lost blankets during the restoration and cleanup of the rough areas. The swift currents draped the blankets in and around trees. They were knotted and shredded — essentially destroyed.

The next line of defense for the maintenance staff was to protect two out-buildings: a concession stand and a restroom. Sandbag dikes four feet high were placed around each building. The staff prepared the dikes according to current crest predictions. Engineers discovered that the river gauge, which provided river level information, was faulty and was underestimating water levels. The depth of water surrounding the buildings prevented the staff from elevating the dikes in response to the updated water-level predictions.

The two buildings became casualties of the great flood. Although the clubhouse and the pro shop were not yet threatened by flooding, it was necessary to build a three-foot-high dike east of the clubhouse to maintain an access route from the front nine to the back nine. By April 12, all the preparations were complete and the staff focused its energies towards helping neighbors along the golf course save their homes. On April 13, the river crested for the first time at 37.6 feet and reached the second and final crest of 39.5 feet on April 17.

When the Red River was at its peak, it drowned the golf course with anywhere from several inches to more than 23 feet of water. The flood affected 19 fairways, 16 greens, and 16 tees. The river slowly began to recede on April 21 and finally reached the confines of the riverbank in early June.

Spring floods are usually no more than an inconvenience, and the cleanup affects an already short golfing season for a few weeks. The damage to existing turfgrass is usually minimal, and, in fact, the floodwater often stimulates turf growth. The late winter flood of '97, however, brought with it a new experience in coping with high water.

A combination of unfrozen soil, swift currents, and an extended period of submersion caused damage never experienced in two decades of flood cleanup at the Fargo Country Club. The river eroded holes in greens, tees, and fairways. Large wells were created around mature trees. Cart paths were washed out and the debris spread throughout the rough. Neat ribbons of sand extended outward from bunkers where the river washed out the sand, exposing the drain tile. Eight bunkers required complete renovation, including new drainage, and 13 additional bunkers needed silt removal and clean sand.

Up to two inches of turf growth occurred on the greens receiving relatively light deposits of silt during the several-week period that the course was under water. The greens with much thicker silt deposits remained dormant. One theory for this difference is that the fast-moving water was heavily oxygenated and stimulated turf growth, even under water. The initial mowing height on the affected greens was ⅝", and the mowing height was stepped down to .140" over a four-week period.

Approximately 35 acres of low-lying fairways and roughs that were submerged for up to six weeks did not survive. Six fairways required complete renovation, while several others needed partial seeding.

Spring flooding and the ensuing cleanup are nothing new for the staff at the Fargo Country Club. Assistant Superintendents George Vogt and Bill Broekemeier are seasoned veterans of many floods. They have a combined 27 years of maintenance experience at the golf course. Each played an integral part in coordinating the cleanup efforts as the maintenance staff began the arduous task of washing silt deposits from greens and tees.

Thick layers of silt and other debris contaminated the bunkers throughout the golf course. In many areas, swift currents washed the sand completely from the bunkers. Complete renovation was necessary on several holes.

Silt depths on the greens and tees varied from traces to several inches. The staff utilized several gas-powered pumps and fire-hose nozzles for washing. The pumps were often transported to the greens and tees by using an inner tube or boat. As the receding water exposed part of a green or tee, the staff washed away the silt before it had a chance to firm up, which would increase the difficulty of completely removing the silt layer. Allowing even light layers of silt to remain on the putting surface usually affects the turf quality later in summer.

Silt deposits were impossible to remove from level fairways using the conventional washing equipment.

Dried silt was broken up with harrows, and then power brooms or landscape blades were used to windrow the material to the roughs, where it was collected.

After the water receded and exposed the fairway, it was apparent that the turfgrass topgrowth was dead. The question was, "Could there still be live crowns and rhizomes in the turf mat?" It was decided to cut seed into the existing thatch/mat layer with the hope that some turf recovery from the old sod would occur. To prepare a seedbed, a Terra-type pull-behind aerifier, equipped with slicing knives, was used over the sites targeted for renovation. This unit also was frequently used during the grown-in period to maintain good air and water exchange in the root zone.

A Kentucky bluegrass, perennial ryegrass, and fine fescue blend was cut in to a depth of ¼" with an overseeder. The target seeding rate was 300 pounds per acre. Two seeding patterns were utilized — seeding several passes parallel to the fairway and seeding in three different directions. Seeding in multiple directions provided the fastest rate of establishment. The fairway seeding was completed by June 1. The fairways were treated with Subdue to prevent seedling damping-off as hot and humid weather set in. Although most of the turf in the fairways was dead, the existing mat of thatch helped prevent washouts during the heavy rain that occurred during establishment.

With the fairway work complete, the staff began the tedious task of plugging and topdressing damaged greens.

As the floodwaters receded, the several inches of silt deposited on the fairways resulted in acres of dead turf.

Several greens were aerified and overseeded. Live cores of turf were placed in the open aerifier holes where only localized injury remained.

The golf course opened in stages throughout the spring and early summer. By mid-May, seven holes were open for play on the front nine. The front nine was completely open with one par five playing as a par three on Memorial Day. On July 13, holes 10 through 17 were opened. The 18th hole could not be opened until late August, and even at that time golfers were allowed to lift and clean the ball from the thin and bare areas of turf.

The maintenance staff has already logged more than 4,300 hours on the restoration of the golf course. The task, however, is not yet complete, and a number of localized areas are still being repaired. To date, the cost of the restoration of the golf course alone has topped more than $56,000, not to mention the loss of 11 weeks of golf and more than a $34,000 loss in associated revenues.

After the initial seeding, the region received timely rainfall for the next six weeks, which accelerated the grow-in. If you believe in Guardian Angels, ours must have been an avid golfer.

As a golf course superintendent, CRAIG WIGEN, CGCS, *has addressed spring flooding problems at Fargo Country Club for 21 years.*

In places where silt deposits were thin enough, mechanical brushing was sufficient for removal.

From Doubt to Certification

One superintendent's story on Audubon certification.

by STEVE EHRBAR, CGCS

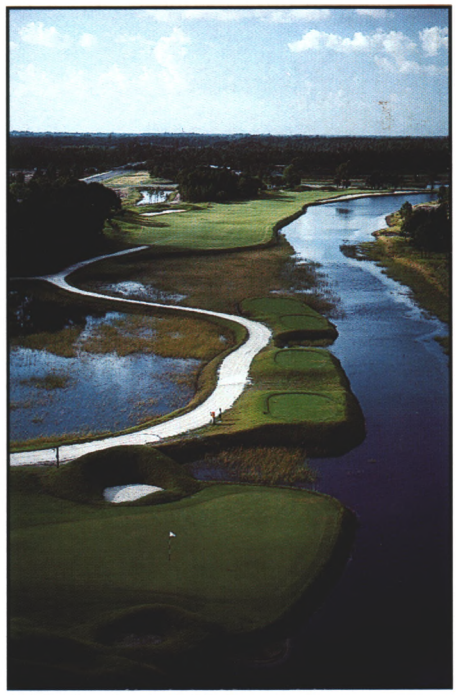
WHEN I WAS FIRST introduced to the rigorous criteria for certification with the Audubon Cooperative Sanctuary Program (ACSP), it was not a program I embraced with great enthusiasm. Initially, I did not see where I could find the time to develop, implement, monitor, and document all of the components necessary to achieve certification. We all know that the workload of managing a golf course in South Florida is demanding enough in itself without adding extra projects.

I attended several seminars during the past four to five years on the ACSP and acquired information and insight into what other golf course superintendents were doing to achieve certification status. After leaving these meetings, I would reflect on the positive aspects of the program: protecting the environment for future generations, enhancing wildlife habitats, and educating the staff along with golfers, school children, and the general public. I was still hesitant to embark on the program and could not make the commitment even when the benefits were so compelling.

One day, with the encouragement of the Audubon Cooperative Sanctuary staff, who convinced me that every golf course is different and that what some courses have done I may not be able to do, or even want to do, I decided to go forward with the program.

Old Marsh Golf Club is a unique project and it was a high priority to keep the integrity of the club intact. After notifying our Members' Advisory Board of my decision to proceed with the program, I was pleased to encounter an enthusiastic response from the membership for participation in the program.

Old Marsh has a great opportunity to be an outstanding Audubon cooperative sanctuary. We have 450 acres, with more than 120 acres preserved as natural wetlands. More than 35 acres of aquatic plants were planted and new wetlands created in the development of the golf course, which led to several environmental awards for the course design. Our reverse-crested fairways keep irrigation runoff from entering the sensitive marsh habitats. A 30-mile underground drainage system recycles irrigation water to special holding ponds for reuse. This system is an integrated component of our water conservation methods.



Old Marsh Golf Club in Palm Beach Gardens, Florida, has unique maintenance challenges as the golf course winds its way through 120 acres of natural wetlands.

As part of the ACSP, we have enhanced our thriving birdlife and wildlife population with feeding and nesting boxes. The endangered woodstork, the rare red-shouldered hawk, Everglades kite, and threatened sandhill crane are all residents at Old Marsh and serve as a testament to our balanced ecosystem.

We have initiated several educational programs for our residents, members, and school children. Many tours have been conducted through the property, and we've even taken one overnight field trip to Everglades National Park. These programs have been instructional and we are planning several more for next year.

I can now look back with a great sense of accomplishment on our progress with the ACSP. My original perceptions were almost unfounded. It was actually fairly easy to incorporate additional integrated pest management ideas since it is an important element of our course management practices already. In addition, we test irrigation water as a common practice, so the accurate documentation within the water management category did not create an extra workload problem.

I can see how the wildlife criteria could be a real challenge to some golf courses, but at Old Marsh we are blessed with abundant wildlife, a thriving ecosystem, and incredible birdlife. We have enjoyed helping Mother Nature with feeding boxes and nesting areas.

As a result, Old Marsh has now obtained certification in three categories, leaving us with three to go before fully certified status is achieved. We are well on our way with great momentum to work toward full certification in the program. I now realize Old Marsh, along with many other courses in the nation, is already doing many of the things the ACSP requires. It's really just a matter of documenting and learning a little more about the ACSP for golf courses. For myself and everyone at Old Marsh Golf Club, the program has been a very rewarding experience.

STEVE EHRBAR *is a certified golf course superintendent with more than 14 years of professional experience at several clubs, including Lost Tree, Cypress Links, and now Old Marsh Golf Club in Palm Beach Gardens, Florida. He is a graduate of Ohio State with an AA in Applied Science and Turfgrass Management, and in addition is a single-digit handicap golfer.*

HOW LOW CAN YOU GO?

First greens and now fairways. It's time for a call to reason.

by ROBERT VAVREK, JR.

SUPERINTENDENTS are mowing fairways shorter than ever, perhaps in response to pressure from the minority of low-handicap golfers at a particular course who prefer an extremely tight lie. As recently as five years ago, the average height of cut on bentgrass or bentgrass/*Poa annua* fairways in the North Central Region was between ½" and ⅝". Today the average height of cut is slightly under ½" and a small, but increasing, number of courses are mowing at a tight ⅜".

Older courses that once maintained Kentucky bluegrass fairways at 1" or higher are now mowing at about ⅝". Referring to these playing surfaces as Kentucky bluegrass is wishful thinking because *Poa annua* dominates the stand of turf within a year or so, after the older varieties of bluegrass thin out.

An argument could be made that there is no harm in mowing the bentgrass and *Poa* below ½" since it performs quite well on tees and collars at even shorter heights of cut. Similarly, new Kentucky bluegrass varieties are available that are well adapted to a ¾" cut. But before you decide to lower the height of cut, consider the following indirect effects of your action.

Most beginners and high-handicap golfers prefer to sweep the ball from a relatively high lie in the fairway. An increasing number of complaints are being heard at Turf Advisory Service visits regarding extremely tight fairway lies. The silent majority of golfers, who probably fear ridicule at voicing a complaint about the greens being too fast, are not having any problem making themselves heard when it comes to ⅜" fairways.

Lower the height of cut a notch and the various problems associated with earthworm castings and ant mounds will increase. Earthworm casts and ant mounds are more likely to become mashed down by mowers and affect the quality of turf when the fairways are cut shorter. This can be a significant problem on perennial ryegrass or *Poa annua* fairways because turf species that have an upright growth habit also have a limited ability to grow laterally into the bare areas. Superintendents and golfers often wonder why the worms and ants were never a serious problem in the past. One explanation is that the fairways were never cut so low in the past. Keep in mind that there are no pesticides labeled for earthworm control in the United States and that the typical treatments for ant control, at best, reduce populations for only a few weeks.

Root growth is directly related to the height of cut, so higher-cut fairway turf generally has a deeper, healthier root system compared to shorter-cut turf. Shade from all the "committee trees" that have been located too close to fairways is also a problem on many older courses. Shade limits photosynthesis, so every bit of leaf tissue is critical to intercept what little light is available under trees. Shaded, poorly rooted turf has a reduced ability to recover from divots, cart traffic, disease activity, scalping, and other stress. Furthermore, more careful irrigation management and more weed control will probably be needed on short-cut fairways, again due to poor turf density and a weaker root system.

Most superintendents are familiar with the term *triplex ring* — the wear pattern caused by riding mowers along the inside perimeter of greens. We now see *five-plex ring* along the inside perimeter of fairways where lightweight mowers are causing a similar pattern of injury. Shade, poor drainage, overwatering, and golf cart traffic definitely contribute to the turf injury, but the mower injury tends to be worse at courses mowing bentgrass fairways well under ½".

These concerns are only magnified when old Kentucky bluegrass fairways are scalped down to emulate bentgrass fairway playing conditions. The percentage of *Poa annua* skyrockets and weed encroachment becomes a greater concern each season. Then the susceptibility of the turf to winterkill increases because of the high percentage of *Poa annua*. Eventually, some scattered colonies of bentgrasses are seen, which excites the golfers because they believe they have discovered the inexpensive route to bentgrass conversion. The excitement turns sour when they discover that most of the bentgrass colonies are extremely grainy and coarse textured. Fairways that once provided consistent playing conditions at a higher height of cut are now characterized by clumpy ryegrass, scraggly bentgrass, and *Poa annua* that may or may not survive the winter or summer.

There are undoubtedly some courses where a ⅜" fairway is an acceptable and perhaps a desirable playing surface for many of the golfers. On the other hand, tighter is not necessarily better for the majority of golfers who do not have single-digit handicaps. In my opinion, fairway heights of cut are getting out of hand. It's not quite as bad as the mowing heights on greens, but it's close.

Ode to Tight Lies

There once was a course in St. Pete
Where most duffers found the (high-cut) fairways a treat.
The Club Champ, they say,
Hit a flyer one day,
So the fairways now stimp seven feet!

ROBERT VAVREK, JR., *is an agronomist in the Green Section's North-Central Region.*

Members of the British Association of Golf Course Architects paid a visit to Golf House in early October to visit with members of the Green Section staff over a two-day period. Among the topics discussed were green construction methods, the cost of golf course construction, environmental issues, and liability concerns. Representatives from Belgium, Holland, Iceland, Spain, and the U.K. gave presentations about how golf is expanding in their countries. The BAGCA is in the process of developing guidelines for golfer safety as it relates to course design and construction, a topic of interest to the golf industry worldwide. BAGCA members are seen enjoying a tour of the Somerset Hills Golf Club in Bernardsville, N.J.

The on-site variety testing program, a cooperative venture among the USGA, GCSAA, and NTEP (National Turf Evaluation Program) is in full swing. Dr. Tony Koski, turfgrass specialist at Colorado State University, is pictured establishing three plots each of 18 different creeping bentgrass cultivars at the Fox Hollow Golf Course in Lakewood, Colorado. A total of 16 golf courses nationwide are participating in this five-year study, in which the performance of new bentgrass and bermudagrass cultivars will be evaluated under actual golf course conditions. The bentgrass plots were established during the fall of 1997, while the bermudagrass plots will be planted during the late spring of 1998.

Physical Soil Testing Laboratories*

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

BROOKSIDE LABORATORIES, INC.
308 S. Main Street
New Knoxville, OH 45871
Attn: Mark Flock
(419) 753-2448
(419) 753-2949 FAX

EUROPEAN TURFGRASS LABORATORIES LIMITED
3 Cunningham Road
Springkerse Industrial East
Stirling FK7 7SL Scotland
Attn: John Souter
(44) 1786 449195
(44) 1786 449688 FAX

N. W. HUMMEL & CO.
35 King Street, P.O. Box 606
Trumansburg, NY 14886
Attn: Norm Hummel
(607) 387-5694
(607) 387-9499 FAX

THOMAS TURF SERVICES, INC.
1501 FM 2818, Suite 302
College Station, TX 77840-5247
Attn: Bob Yzaguirre / Jim Thomas
(409) 764-2050
(409) 764-2152 FAX

TURF DIAGNOSTICS AND DESIGN
310-A North Winchester
Olathe, KS 66062
Attn: Chuck Dixon
(913) 780-6725
(913) 780-6759 FAX

*Revised December 1997. Please contact the USGA Green Section (908-234-2300) for an updated list of accredited laboratories.

United States Golf Association
Green Section Education Conference

Saturday, February 7, 1998, 2:00 - 5:00 p.m.
Anaheim Convention Center, Anaheim Room A1
Anaheim, California

Protect Your Investment — Protect Yourself

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

2:00 p.m. **Welcome**
Joe England, USGA Executive Committe

2:05 p.m. **The Best Turf Tips from the Green Section Staff**
David Oatis, Director, Northeastern Region
Bob Vavrek, Agronomist, North-Central Region
Darin Bevard, Agronomist, Mid-Atlantic Region
Paul Vermeulen, Director, Mid-Continent Region

2:25 p.m. **Swimming in Shark-Infested Waters**
Bo Links, USGA Green Section Committee
vs.
Michael Veron, USGA Sectional Affairs Committee
These two highly respected trial lawyers will debate issues of potential liability on golf courses. Spikeless shoes and other topics of interest will be discussed.

3:25 p.m. **More of the Best Turf Tips**
Pat Gross, Agronomist, Western Region
John Foy, Director, Florida Region
Brian Maloy, Agronomist, Mid-Continent Region
Jim Skorulski, Agronomist, Northeastern Region

3:45 p.m. **The Real Meaning of Success**
Jerry Schemmel
Jerry Schemmel has been the voice of the Denver Nuggets for the past six years. His message, however, goes well beyond life in the NBA.

4:30 p.m. **The Best Turf Tips Just Keep on Coming**
Keith Happ, Agronomist, Mid-Atlantic Region
Chris Hartwiger, Agronomist,
Florida and Southeastern Regions
Larry Gilhuly, Director, Western Region

4:45 p.m. **Closing Remarks**

THE USGA

1998 USGA NATIONAL & REGIONAL CONFERENCES

NATIONAL CONFERENCE

February 7	Anaheim Convention Center	Anaheim, California

FLORIDA REGION

April 20	Airport Marriott	Orlando, Florida
April 23	Palm Beach Gardens Marriott	Palm Beach Gardens, Florida

MID-ATLANTIC REGION

March 17	Dupont Country Club	Wilmington, Delaware

MID-CONTINENT REGION

March 10	*TBA*	St. Louis, Missouri
March 11	*TBA*	Omaha, Nebraska
March 18	Bent Tree Country Club	Dallas, Texas
March 19	Lakeside Country Club	Houston, Texas

NORTH-CENTRAL REGION

March 4	Holiday Inn	Missoula, Montana
March 13	Barton Hills Country Club	Ann Arbor, Michigan
March 18	Maketewah Country Club	Cincinnati, Ohio
April 7	Westwood Country Club	Cleveland, Ohio

NORTHEASTERN REGION

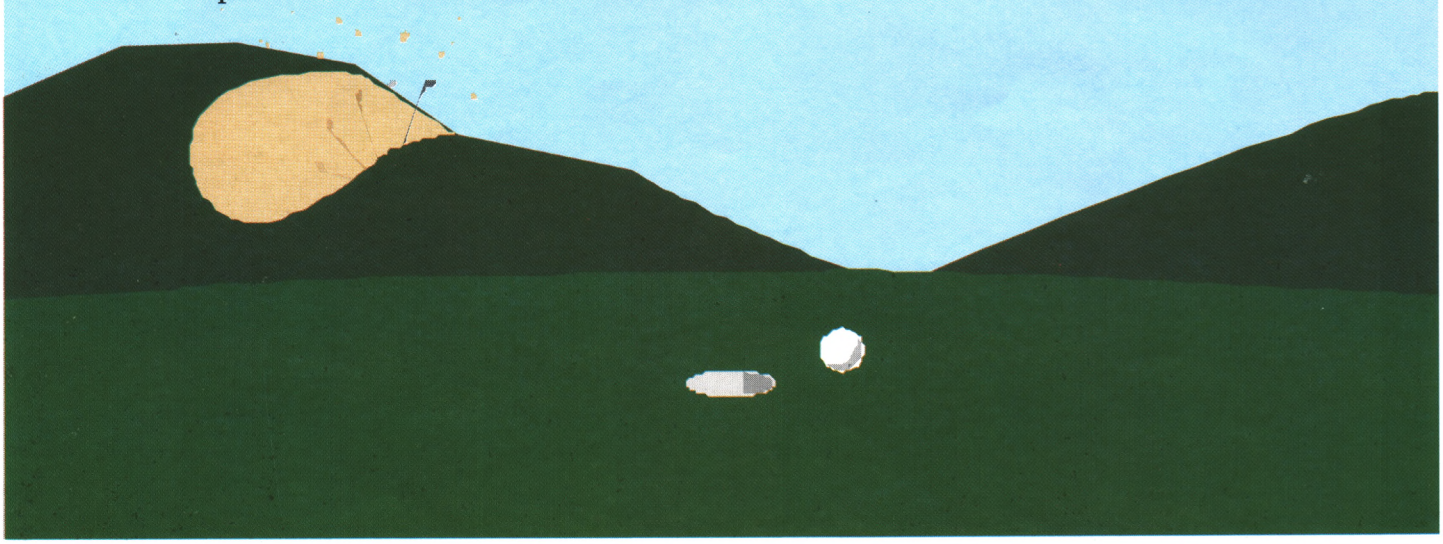
March 24	Albany Marriott	Albany, New York
March 26	The International Conference Center	Bolton, Massachusetts

SOUTHEASTERN REGION

March 24	Charlotte Country Club	Charlotte, North Carolina
TBA	Country Club of Birmingham	Birmingham, Alabama

WESTERN REGION

March 13	Lakewood Country Club	Lakewood, Colorado
March 16	Industry Hills Resort	City of Industry, California
March 17	Castlewood Country Club	Pleasanton, California
March 18	Phoenix Country Club	Phoenix, Arizona
March 25	University Park Hotel	Salt Lake City, Utah
April 6	The Reserve	Portland, Oregon
April 20	The Hawaii Prince Hotel	Honolulu, Hawaii



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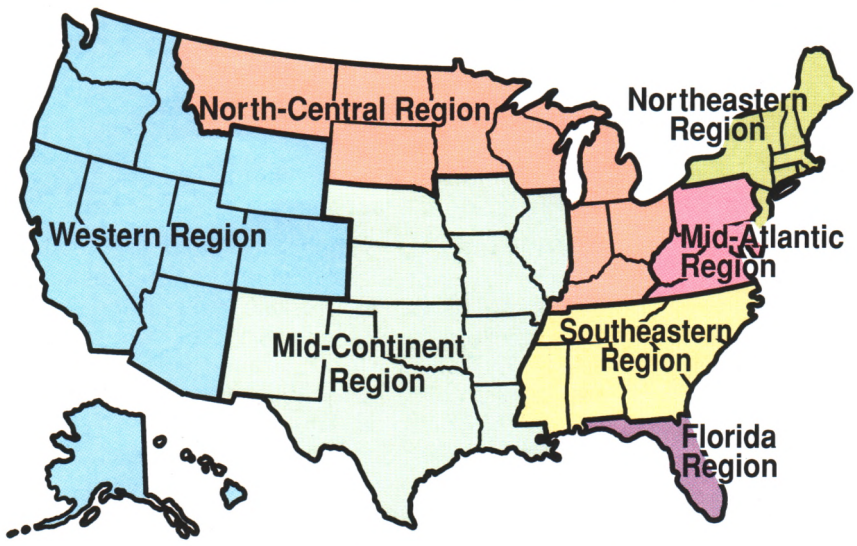
Visit the USGA's Internet site on the World Wide Web. The address is:
http://www.usga.org

Turfgrass Information File (TGIF):
http://www.lib.msu.edu/tgif
(517) 353-7209



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TURF TWISTERS

BUDGETING

Question: I would like to implement a light and frequent topdressing program. For budgeting purposes, how can I estimate the cost of such a program? (Virginia)

Answer: Plan to apply ⅓ cu. yd. of topdressing material per 5,000 sq. ft. To determine the total amount needed per application (all greens), you need to know the total area (sq. ft.) to be treated, divide by 5,000 and multiply by ⅓. Next, approximate the number of treatments that will take place during the entire season. To do so, work backwards from the fall aerification date. A treatment can be scheduled every two weeks. After this number is determined, the actual quantity of material for the entire season then can be calculated. The amount necessary for a light and frequent topdressing program then can be added to that utilized after the spring and fall core cultivation. You may be quite surprised when the totals are calculated. It may not be as much material as you first thought.

DURING THE WINTER

Question: We have experienced a relatively mild winter, providing an opportunity to do a great deal of maintenance on the course. The tees have a heavy accumulation of thatch and other organic matter. My question is, can we aerify the tees during the winter months to aggressively attack the thatch accumulations present? What type of harm could come from this off-season procedure? (Delaware)

Answer: The weather patterns will greatly influence the growth of the turf. If snow cover exists, little damage may result. However, if these turf areas remain open (without snow cover), desiccation problems could occur. If the soils are frozen, the roots cannot draw moisture to help rehydrate the leaves. In these cases little growth occurs and the hole created by aerification remains open for a prolonged period of time. Areas exposed to high winds could be stressed as a result of the wind's drying effect. The best possible scenario is to wait until the turf is actively growing so that it can recover from the mechanical disturbance.

CREATES SUMMER IMPROVEMENTS

Question: Most of the players at our course have stated that the golf course seems to be getting more and more difficult to play. How frequently should we have the course rated to determine its Slope value? (West Virginia)

Answer: Turfgrass management practices and golf course improvements can affect the Slope Rating of your course. Also, as young trees mature, golfers face an ever-increasing challenge. It is difficult to state exactly how often the course should be rated. The USGA requires that a course must be rerated at least once every ten years, even if it has not been changed in any way. However, if significant renovations are done on the bunkers, tees, greens, or fairways, you may want to contact your local golf association to be re-rated sooner. Even if renovations have only taken place in isolated areas of the course, the overall Slope Rating could change.