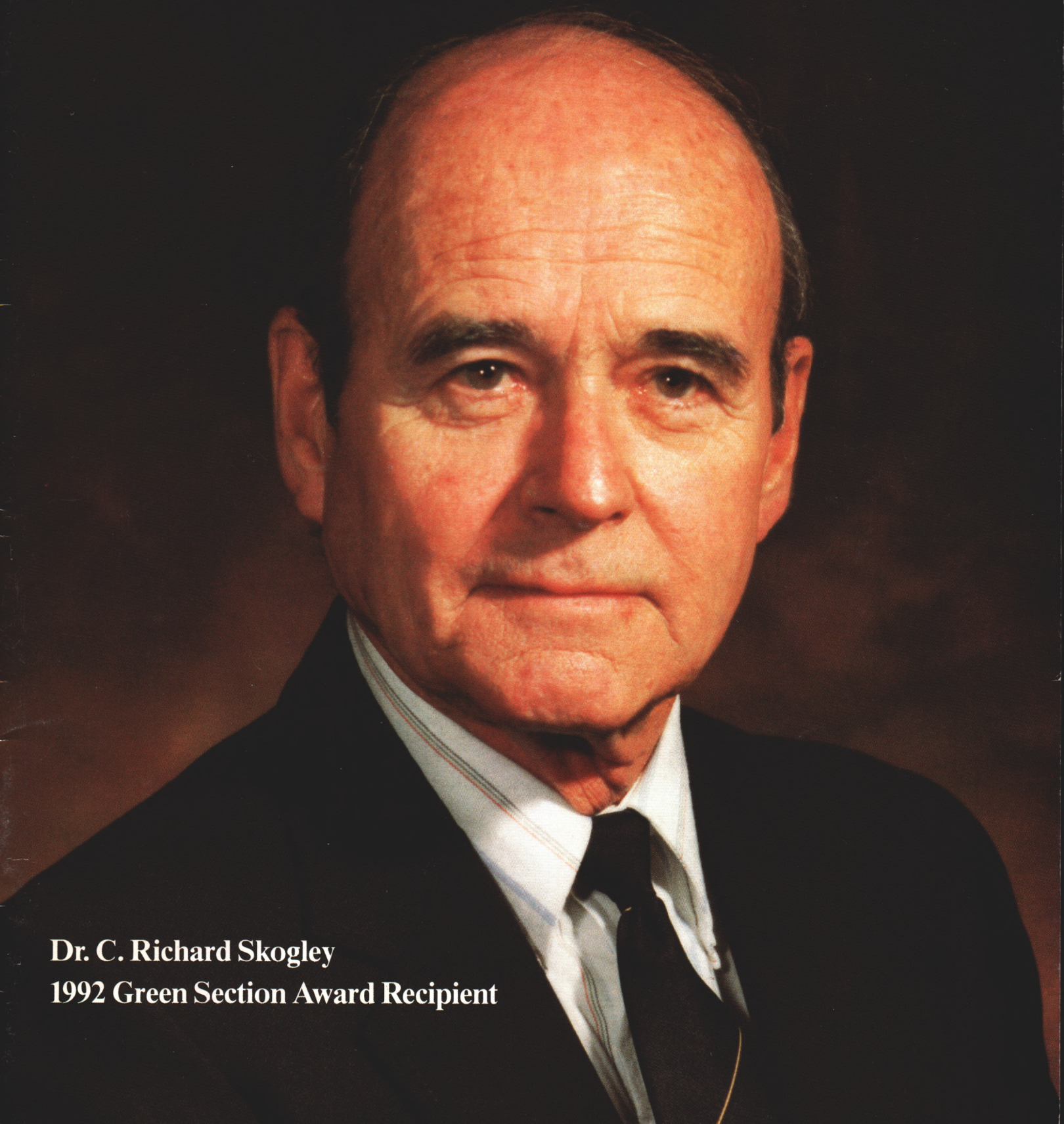
USGA® Green Section
# RECORD

May/June 1992

A Publication on
Turfgrass Management by the
United States Golf Association®



**Dr. C. Richard Skogley**
**1992 Green Section Award Recipient**

USGA®

Vol. 30, No. 3
MAY/JUNE 1992

# Green Section RECORD







GREEN SECTION RECORD (ISSN 0041-5502) is published six times a year in January, March, May, July, September and November by the UNITED STATES GOLF ASSOCIATION®, Golf House, Far Hills, N.J. 07931. Postmaster: send address changes to the USGA Green Section Record, PO Box 708, Golf House, Far Hills, NJ 07931-0708. Subscriptions, articles, photographs, and correspondence relevant to published material should be addressed to: United States Golf Association Green Section, Golf House, Far Hills, N.J. 07931. Second class postage paid at Far Hills, N.J., and other locations. Office of Publication, Golf House, Far Hills, N.J. 07931. **Subscriptions $12 a year. Foreign subscriptions $15 a year (surface mail) or $24 a year (air mail).**

# C. Richard Skogley Receives USGA Green Section Award for 1992

DR. C. RICHARD SKOGLEY, a turfgrass breeder and educator, has been named the 1992 recipient of the Green Section Award of the United States Golf Association. Dr. Skogley received the award on February 17, 1992, at the annual banquet of the Golf Course Superintendents Association of America in New Orleans, Louisiana. The award has been presented annually since 1961 in recognition of distinguished service to golf through work with turfgrass. Presenting the award was Raymond B. Anderson, Chairman of the USGA Green Section Committee.

"I am very pleased to receive this award," Skogley said. "I am proud to receive the acknowledgement of my peers for my years of work in turfgrass."

Dr. Skogley has been active in turfgrass management programs at the university level for nearly 40 years. He received a B.S. degree in agronomy from the University of Rhode Island in 1950 and an M.S. degree in 1952. He took a position as research assistant at Rutgers University in 1953 and received his Ph.D. from Rutgers in 1957. From 1957 to 1960, Dr. Skogley served as the Turfgrass Extension Specialist at Rutgers University. In 1960, he accepted a position at the University of Rhode Island to research and teach in the field of turfgrass management.

Through Dr. Skogley's energies and direction of the University of Rhode Island turfgrass program, he has taught hundreds of students in the four-year turfgrass science program and has guided many graduate students through their studies and into prominent positions in the turfgrass industry. In addition, he has directed the University of Rhode Island Turfgrass Research Program, which originated in 1890 and is recognized as the oldest continuous turf program.

As a researcher, Dr. Skogley has produced several important turfgrass cultivars, including Providence creeping bentgrass, Jamestown and Jamestown II chewings fescue, Georgetown Kentucky bluegrass, Kingstown velvet bentgrass, and Exeter colonial bentgrass. He also has been involved in developing cultural maintenance practices that have been widely adopted on golf courses throughout New England.

*C. Richard Skogley accepts the 1992 Green Section Award from Raymond B. Anderson, chairman of the USGA Green Section Committee.*

Dr. Skogley has been the author of numerous articles for scientific, professional, and trade journals and other publications. He has been the featured speaker at turfgrass programs throughout the world. For his dedication to the turfgrass industry, he has received many honors, including the Oregon Seed Trade Association Man of the Year and the Distinguished Service Award of the Golf Course Superintendents Association of America.

A comment from one of the award nominations provides an insight into Dr. Skogley as a man dedicated to his profession: "Dr. Skogley is a gentleman, a scholar, and a soft-spoken, compassionate individual who loves the game of golf and the turf on which it is played. When you invite him to play golf, he always has his soil sample tube in his back pocket — just in case he runs into a problem on the course where he can be of assistance."

For his nearly four decades of tireless work as a teacher, researcher, and extension specialist in turfgrass science and management, and for his successful introduction of several important turfgrass cultivars, Dr. Skogley is highly deserving of the 1992 Green Section Award.

**1992 GREEN SECTION EDUCATION CONFERENCE**

# Practical Solutions for Today's Problems

**February 17, 1992, New Orleans, Louisiana**

FOR THE 11TH CONSECUTIVE YEAR the annual Green Section Education Conference was held in conjunction with the Golf Course Superintendents Association of America International Turfgrass Conference and Show. This year more than 1,200 people attended the Green Section's program on Monday, February 17, at the New Orleans Convention Center. James T. Snow, National Director of the USGA Green Section, introduced the morning's program of 21 speakers who addressed this year's theme, "Practical Solutions for Today's Problems." Following are the full proceedings.

## The Best Turf Tips from the Green Section Staff

*One of the most popular annual features of the Education Conference is the Best Turf Tips. This year, 16 of the Green Section's agronomists reported on some of the helpful ideas and ingenious innovations they came across while visiting golf course superintendents in every part of the country during 1991. Four other Turf Tip sessions appear later in this issue.*

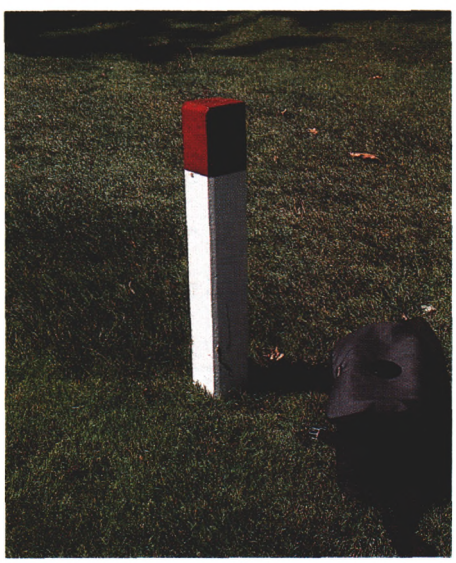
## *Guideposts for Good Drivers*

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

MOTORIZED golf carts have been considered by some to be necessary to the game of golf ever since 1912, when it was feared that the rubber ball would require courses to be redesigned to extraordinary lengths. These contraptions have now become such a significant fiscal force that many golf operations depend on them as major sources of income. It is difficult, however, to reconcile highly visible income with the unseen, insidious damage done to the soil and the easily ignored problems in turf.

Several means of reducing turf damage have been tried, but few are truly acceptable. Concentrating wear in the rough is no real answer, even in bermudagrass country.

The good people at the Essex Country Club, in Windsor, Ontario, must be more cooperative than most or are more easily trained, since they have successfully used a system of positive, passive guidance for several years. A variation on this theme is used at other clubs, but the Essex system, implemented by superintendent Stuart Mills, CGCS, is the subject of this report.



*Simple white posts with red tops signal Essex Country Club golf cart drivers to exit the fairways at that point and drive on the side, off the fairway. Spikes in the base permit the posts to be moved easily.*

Golf carts have the run of the course when soil conditions permit, except near the greens. Guidance comes in the form of simple white posts with a red top, fitted with a steel rod at the base, as a spike. It is easily moved from place to place, as needed, to spread wear. The only guideline is that the golf carts exit the fairway and be driven outside the post, *wherever* it is located. If the guidelines are followed, traffic around greens can be shifted to the left or right rough, near or not so near the greens. This eliminates signs, ropes, and painted lines in an unobtrusive way.

The same guidance principle follows for directing traffic away from ground under repair, heavily worn areas, or wet spots. These devices are smaller

*The key to cooperation is communication rather than coercion. Reasonable people usually respond to reasonable requests if they know why. Tire tracks indicate the driver in the background, and others, stayed outside the post. No group is perfect, though, as shown by the tracks on the inside of this post.*

diameter white poles (like broomsticks) with blue tops. The message is simple and understandable: Avoid this area! Again, no ropes, signs, or paint.

Let's say that these passive, positive guidelines are only 75% effective. It is doubtful that other restraints get much better compliance. Good communication usually gets good cooperation, and reasonable people respond to positive guidance more readily than negative restrictions. These fixtures present a much less cluttered landscape.

# Wheels of Misfortune

**by JAMES E. CONNOLLY**
Agronomist, Northeastern Region, USGA Green Section

GOLF CARTS can provide benefits to golfers and golf courses. Those unable to walk long distances can still enjoy the game by riding in a golf cart, and revenue produced from rental and sales provides financial benefit to courses, golf professionals, and those involved with marketing golf carts. In some instances, golf carts can speed play, allowing for faster rounds of golf, a higher volume of golfers, and increased revenue.

These benefits, however, are often overshadowed by the negative effects associated with these units. Golf carts are sometimes viewed as motorized menaces, causing damage to golf course grounds! Golf course superintendents are all too familiar with the damage to soil structure and turfgrass caused by cart traffic. Uncontrolled, it can destroy playing conditions. Another related problem is the presence of unsightly directional accessories in the form of signs, ropes, and barriers.

Woodland Golf Club, located in Auburndale, Massachusetts, a suburb of Boston, set out to solve the problem. They knew that controlling cart traffic would reduce turfgrass damage and maintain the beauty and appearance of the golf course. Past attempts to control traffic with ropes and signs were somewhat successful, but physical directives cluttered the landscape and detracted from the appearance of the course. Another approach was needed.

Superintendent Norman Mucciarone, with the help of his son, David, and the Green Committee, recommended a program that not only described the policy for cart operation, but carried stiff penalties for violations. The board of directors accepted this plan and distributed it to the entire membership.

There is a saying: *People do what's inspected — not expected.* This is true when it comes to cart rules. Most courses have a written policy on cart operation, but they lack the ability to enforce the rules. Without the fear of penalty, golfers continue to ignore cart rules. For this reason, Woodland Golf Club developed a series of penalties for violations. They are as follows:

First Offense — Written Warning

Second Offense — Formal Admonition from the Board

Third Offense — Suspension of Cart Privileges for One Month

Each member registers for a golf cart in the pro shop, where a number is assigned. *Any* member or crew personnel can report a violation. The date, violation, and cart number are turned in to the green chairman on a prepared form. More than 50 violation notices were sent out during the first summer of the program. The membership has accepted the program and is participating in the beautification of their golf course.

The benefits of the program include:

1. No ropes, signs, posts, etc. The maintenance crew does not have the hassle of moving these items during mowing.
2. The daily maintenance of the ropes and signs themselves is eliminated.
3. Damage to the course is greatly reduced due to the fear of penalty.
4. Respect for the property is instilled in the membership and staff.

Woodland is a private club, but this program may be applicable at a public golf course with some alterations. Perhaps a higher rental fee could be charged on a violator's next visit to that golf course. This would help control the chronic offender. One public course

*The telltale sign of traffic on stressed turfgrass demonstrates the need for better traffic control.*

gives demerits to violators, much like a traffic points system. When a certain number of points are accumulated, cart privileges are suspended. Education by the golf professional and course officials is the answer for the beginning golfer.

Golf carts have become part of golf for many people. The extent of their negative impact on golf courses will depend upon developing policies and methods of controlling traffic. Without penalties and enforcement, however, rules and regulations will probably provide little benefit.

# Ideas You Can Take to the Bunker

**by CHUCK GAST**
Agronomist, Florida Region, USGA Green Section

PROPER UPKEEP and maintenance of sand bunkers on a consistent basis is unquestionably a time-consuming and labor-intensive task. Few other areas on a golf course demand as much attention as the sand bunker for maintaining acceptable appearance and playability on a day-to-day basis. Following are a few ideas to minimize the headaches encountered in maintaining top-quality sand bunkers.

A typical problem associated with sand bunkers is maintaining an acceptable edge at the sand/turf interface. Movement of sand out of the bunker by wind and water erosion or iron "blast" shots is a common occurrence. Foot traffic in and out of the bunkers further deteriorates turf quality on the slopes around these areas. Even with the best routine management programs, periodic renovation and resodding of the bunker edges is essential to reestablish an aesthetically pleasing character.

To assist in reestablishing bunker edges and slopes during bunker renovation, a method of vertical sodding may be just the ticket. George Thompson, CGCS, at the Country Club of North Carolina, recently utilized this procedure and found it to be very beneficial in his bunker renovation program.

As the name implies, once the bunker edge is redefined and the slopes are properly prepared, strips of sod are installed vertically along the sand/turf interface. The turf side of the sod is installed toward the turf side of the bunker. The depth of the sod (width of the cut) is determined by the degree of slope immediately adjacent to the bunker. Naturally, the greater the slope, the deeper the sod should be installed to provide the desired results.

Using vertical sodding at the edges of more steeply sloped areas around sand bunkers provides an efficient method to promote sub-surface soil stabilization and, in turn, improved turf root development on the slopes. A more natural look is achieved, since the need for plastic or plywood edging is eliminated. Through natural degradation, the vertical sod gradually decomposes as proper establishment and root development of the surrounding turf is promoted.

Another problem that commonly "arises" with the proper upkeep of sand bunkers is the contamination of the sand with small rocks that migrate to the surface. As small pebbles or shell rock work their way to the surface, bunker playability becomes less desirable. Worse yet, these "clinkers" often end up on the turf surface, waiting to inflict damage to delicate mower bedknives during the next mowing operation.

If your bunkers are heavily contaminated with rocks and debris, the best approach is completely removing the old sand and replacing it with good-quality bunker material. However, if your bunkers are only slightly contaminated, a sand screening method observed at the Links of Key Biscayne will definitely assist in prolonging the life and quality of your bunker sands.

Harry Britt, District Supervisor with the Metro-Dade County Parks and Recreation Department, and his crew have taken ordinary aluminum scoop shovels and modified them with a wire mesh insert to serve as a portable,

*(Top left) Vertical sodding of bunker edges provides an effective method of soil stabilization to enhance turf establishment on bunker slopes. Arrow points to vertical sod piece. (Top right) A simple alteration to an aluminum scoop shovel produces an effective and efficient means to maintain clean bunkers and extend the life of bunker sand and mowing equipment as well. (Above) Add that extra touch to your bunkers during the next special event quickly and effectively by using a multiple-head hand rake.*

lightweight sand cleaning device. This simple and very effective tool is great for the removal of rocks, grass clippings, or any other debris while providing efficient return of desirable sand material to the bunker.

On a final note, hand raking the bunkers may be worth your consideration to enhance the aesthetic appeal and to produce that extra touch during the next "special event." While it can be cost prohibitive to hand rake bunkers daily, many superintendents have found this method beneficial for producing that finishing touch at tournament time. Also, following bunker renovation and the addition of fresh sand, minimizing the use of mechanical rakes and utilizing hand rakes will assist in promoting the sand settling process and produce a more firm, desirable bunker in a shorter period of time.

Constructing a multiple rake apparatus helps facilitate the hand raking process. At the 1992 USGA Junior Amateur Championship, Dwight Kummer, superintendent of the Bay Hill Club, in Orlando, Florida, used an aluminum frame to attach three leaf rakes together. The results were outstanding and the hand raking process was completed in a timely and efficient manner.

Maintaining consistently high-quality sand bunkers is undoubtedly a challenge. Through the implementation of suggestions such as these, your bunker headaches can be minimized. As future course management and improvement plans at your facility are being formulated . . . take these ideas to the bunker.

*Crows in search of grubs can cause a considerable amount of damage to the turf surface. Current research investigations are focusing on biological and cultural grub controls.*

# USGA/GCSAA Research Results You Can Use

**by DR. MICHAEL P. KENNA**
Director, USGA Green Section Research

RESEARCH is like a fine wine — it takes time! After reading this article, I hope you will agree with me that as "environmental consciousness" has increased in the 1980s and 1990s, the research objectives of the USGA's turfgrass and environmental research programs have proven to be prophetic.

### Turfgrass

Let's begin with an update on the ten-year (1983-1992) USGA/GCSAA Turfgrass Research Program, which is beginning its final year. The goals of the Turfgrass Research Program are to: develop minimal-maintenance turfgrasses for golf courses through a 50-percent reduction in water use and maintenance costs associated with golf course turf; develop the Turfgrass Information File, a large collection of publications on turfgrass science and management, and a database of this information, searchable by computer; develop young leaders in turfgrass science through our direct involvement and financial support of higher education in the United States.

Reducing the water use and maintenance costs of today's golf courses is a difficult, yet achievable goal! This research program started at a funding level of $250,000 in 1983, and has now become the most focused, well planned, national research mission in turfgrass science. An annual budget of $750,000 is currently distributed among 20 projects located in 14 states.

The USGA/GCSAA Turfgrass Research Program has made tremendous progress increasing the knowledge on water management strategies, extending the range and adaptation of turfgrasses that use less water, improving the heat and drought tolerance of preferred turfgrass species, and evaluating the turfgrass potential of native grasses.

Water management strategies developed through detailed physiological studies of the water use rates of desir-

able turfgrasses have allowed researchers to develop methods to make more efficient use of water. Ten years ago very little was known about the evapotranspiration rates (ET) or crop coefficients ($K_C$) of our major turfgrass species used on golf courses. This vital information, coupled with the computerization of irrigation systems, development of inexpensive weather stations, and technological improvements in the performance of delivery systems, has significantly reduced the water use of golf courses compared to 1982 figures. If your golf course is located in an arid part of the country and is not taking advantage of these improvements, then there is a strong likelihood that your golf course is wasting water.

By extending the range and adaptation of a turfgrass species which uses less water, substantial savings can be achieved. The best two examples include work on bermudagrass and zoysiagrass varieties to improve ease of establishment and their ability to survive transition-zone climates where water-dependent, disease-susceptible ryegrass and bluegrass varieties are currently used. Extending the green color retention of warm-season grasses in the mild coastal climates of California and Florida would reduce the need for overseeding with cool-season species. Improving the putting quality of bermudagrass to satisfy golfers will allow their usage in areas where bentgrasses require twice as much water and a much greater need for pesticide applications.

A more difficult task has been to improve the heat and drought tolerance of existing species preferred as the playing surfaces for golf. Bentgrass has received the most effort in this area, aiming to increase its ability to survive in southern climates where it is poorly adapted. Efforts to develop disease screening techniques to increase the resistance of bentgrasses will help reduce fungicide applications in locations where the turfgrass is better adapted. Developing bermudagrass and zoysiagrass varieties with better drought tolerance will help reduce the water needs of golf courses in the arid southwest.

Native grasses have the greatest potential in regions of the country where water, poor soils, or climate are the limiting factors in providing quality playing surfaces. Taking advantage of the natural selection that has occurred over millions of years obviously will be more successful than a ten-year breeding program; however, the domestication of native species is not a simple task either. Buffalograss is the shining example of how a species native to North America can be utilized for golf courses. To date, buffalograss has been improved to the point where it will make an adequate playing surface for golf course roughs. Continued research efforts should allow this species to be used on fairways where more traditional grasses are not well adapted.

Buffalograss is by no means a panacea, but it represents a major step in the recognition of a valuable natural resource for the turfgrass industry to utilize. Maybe someday grass nicknames like alkali, gramma, salt, or mesquite will be as familiar to our ears as rye, bent, fescue, and blue!

**Breeding Update**

Buffalograsses adapted for use on golf course roughs and low-maintenance areas have been developed. The University of Nebraska has released NE 84-609, and it is being produced in Texas, Oklahoma, California, and Florida. Sod and plugs are the only available methods to establish 609; however, five seeded buffalograsses are currently being evaluated in the National Turfgrass Evaluation Program. A seeded buffalograss may be available for expanded testing by fall 1993.

Bentgrasses for putting greens and fairways with better heat, drought, and disease resistance have been developed through the turfgrass breeding efforts at Texas A&M University. The increased use of bentgrass on fairways and support of bentgrass breeding, on the part of the USGA, has renewed the interest of U.S. seed companies and universities. Several new varieties, including Providence, Pennlinks, Putter, SR-1020, Cobra, and others, have recently been made available to the industry.

Bermudagrasses that can be established by seed have been received favorably by U.S. and international golf course markets. NuMex Sahara seed supplies sold out in 1991 and produced royalty income in excess of $40,000 for the USGA Foundation to reinvest in turfgrass research. Oklahoma State University is nearing completion of new cold-tolerant seeded bermudagrasses for the transition zone climates of the U.S., and they will be entered into the National Turfgrass Evaluation Program in 1992.

The first year of selection for improved putting green bermudagrasses has identified several plants that can tolerate extended periods of close mowing under Florida golf course conditions. New fine-textured bermudagrasses which provide faster green speed and better winter color may decrease the need for overseeding with cool-season species (bentgrass, *Poa trivialis*, etc.).

Zoysiagrasses with better color retention and playing quality have been developed at Texas A&M University. The improved vegetative varieties DALZ 8502 for tees and DALZ 8507 and 8512 for fairways are nearing release. These improved types and seven other selections are currently being evaluated in the National Turfgrass Evaluation Program.

Native grasses, including alkaligrass, blue gramma, and curly mesquite, have been improved for turfgrass characteristics and have potential use for low-maintenance areas on golf courses or areas with poor water and soil quality. Colorado State University has begun negotiations with seed companies for new alkaligrass and blue gramma varieties. The University of Arizona is one to two years away from completing the assessment of curly mesquitegrass selections collected from wild populations growing naturally in the desert southwest.

Annual bluegrass varieties may become a reality with initial seed yield trials in Oregon underway. Researchers at the University of Minnesota have identified several lines with promising characteristics for golf course putting greens, including perennial growth, increased cold hardiness, and deeper root systems. The release of an improved "perennial" bluegrass is still two to three years away.

TGIF, or the Turfgrass Information File, will receive its last year of USGA funding in 1992 before becoming a self-sustaining operation at Michigan State University Library. TGIF has more than 21,000 publication records, greatly improved ease of use, and increased on-line and off-line usage. Plans to increase subscriptions and usage will be carried out with increased marketing efforts, development of software and print products, and optional interface with the USGA's GHIN system.

Biotech has developed the methodology to insert foreign DNA into the bentgrasses used for putting greens. Progress at Rutgers University will allow scientists to insert herbicide-resistant

genes and evaluate new disease-resistance mechanisms for creeping bentgrass. Extensive field testing will be needed to fully evaluate the benefit of the new "transgenic" grasses.

Young turfgrass scientists are being trained on USGA/GCSAA projects which will produce our leaders for tomorrow. Thirty-one graduate students have received M.S. or Ph.D. degrees on USGA/GCSAA-supported projects. More than 96 scientific publications, theses, and dissertations have been published. The financial support and leadership provided by the USGA/GCSAA Turfgrass Research Program are very important and significant contributions!

The Turfgrass Research Committee has been instrumental in making this project work. The USGA has successfully implemented several important research projects and kept university indirect costs down to 16 percent, or less in some cases. The members of the committee also make at least one on-site visit per year to each university to evaluate research progress firsthand and tell the USGA/GCSAA story to the university administration.

In summary, water management, and our knowledge about how much water golf turfgrasses use, has greatly improved. Turfgrass royalties, to be reinvested in turfgrass research for new varieties, started to trickle in in 1990 and 1991. At least five or six additional variety releases are expected in the next three years. Each additional new variety may gross royalties in excess of $50,000 per year for future research needs. The Turfgrass Information File, or TGIF, will be completed at the end of the year. More than 30 M.S. and Ph.D. graduate students have received degrees, and 96 scientific or technical articles have been published. Finally, 29 of the 36 projects started during the last ten years will be completed by January 31, 1993.

The future direction of the turfgrass research program will include continued involvement with conventional turfgrass breeding programs and more projects in biotech. Resource management projects will evaluate other alternative pest control programs and cultural practices that will help reduce maintenance costs. The program will continue to develop young leaders in the biological sciences and engineering. Of the 81 new pre-proposals submitted in fall 1991, 34 investigators were selected to submit full proposals for evaluation in March 1992, and 21 of those were selected for funding beginning in 1993.

**Environmental**

The USGA has just completed the first year of its three-year, $2.8-million Environmental Research Program. The important goals of this program are to: evaluate the impact and fate of chemicals applied to golf courses; explore alternative pest management strategies; document human, wildlife, and environmental benefits of golf courses.

The environmental research program covers a diversity of climates and geography across the contiguous United States of America. Institutions in 16 states are receiving nearly $900,000 in USGA Environmental Research grant funding. Specifically, research projects receiving grants for pesticide and nutrient fate research are located in these states: New York, Pennsylvania, and Massachusetts in the Northeast; Georgia and Florida in the South; Michigan, Iowa, and Nebraska in the North Central; and finally, Nevada, Washington, and California in the West.

The pesticide and nutrient fate projects began with a flurry of activity in 1991, and investigators have completed the construction of facilities and the development of procedures that will

*(Opposite page) Research work on buffalograss establishment and cultural practices continues to aid the turfgrass industry in the utilization of this recently improved turfgrass species.*

*(Top) Water use, water quality, and conservation will continue to be important issues in the future. Reducing water use and maintenance costs on today's golf courses is a difficult, yet achievable goal.*

*(Above) Tissue culture techniques provide an effective method for screening large amounts of plant material for resistance to various biological and environmental stresses, in this case brown patch disease.*

generate data on the fate of chemicals applied to turf managed under golf course conditions. An extensive quality assurance program was developed to insure that research results are of the best quality and are properly documented.

In addition, research studies concerning the evaluation and development of alternative pest management procedures have produced both interesting and promising results. Antagonistic microorganisms, nematodes, and other biological controls are being evaluated at Cornell University, USDA-ARS, University of Florida, University of California at Riverside, Iowa State University, and University of Kentucky. Much more needs to be understood about the management and efficacy of these "natural" products before they are highly recommended or widely used on golf courses.

USGA-supported projects on human and environmental benefits, wildlife toxicology, and the restoration and management of natural wildlife habitats are all making progress. As protectors of the game of golf, we need to document golf course benefits. A new book, *Golf Course Management and Construction: Environmental Issues*, is more than 900 pages in length and will be available in June of this year. This reference text is a comprehensive review of the scientific literature concerning what is known about the potential movement of pesticides and nutrients from turfgrass areas and will serve as a valuable resource text. A second book, *Naturalizing the Human Landscape*, will be available in late fall of 1992.

An article entitled "Benefits of Golf Courses and Turfgrass on the Environment, People, and Other Biological Organisms" will be submitted to *Science* magazine to initiate and encourage a factual, scientific debate on the value of golf courses in our society.

Two golf course benefits studies will be conducted over the next two years. The first is a study on the "Impact of Golf Course Activities on Wildlife." This research will tell us if, or how, pesticides and nutrients accumulate in the biological food chain. Second, a study on the "Human Benefits of Golf Course Views: Emotional Well-Being, Stress, and Performance" will be conducted.

Golf is more than just striking a small ball with a stick; it is an experience, an activity, an enjoyment of God's green earth. We need to document golf's impact on the environment and then tell the world why we value this game.

# "SHAKE, RATTLE, AND ROLL!"

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

YOU'VE SEEN the commercial, "Tastes great! . . . Less filling!" For a moment, replace these words with, "Fast greens! . . . Healthy turf!" The image is vivid. The players with single-digit handicaps demand ultra-fast greens without considering the negatives. The golf course superintendent strives for a healthy stand of turf to combat environmental extremes. It is a problem that has been with us for years; however, a technique viewed this past year may provide some workable answers allowing both sides of this dilemma to reach an agreeable and positive solution.

The golfer desires a medium-fast to fast playing surface that is smooth, consistent, and somewhat firm. The golf course superintendent often desires these same characteristics, but without placing the turf in jeopardy. The usual maintenance programs of reducing mowing height, double mowing, vertical mowing, grooming, light topdressing, and reducing fertility can all produce positive results. Unfortunately, when mowing heights are lowered at the wrong time, the greens and the superintendent can end up in the same location . . . gone!

*Varying* Poa annua *growth habits is a common problem that can be addressed by water aerification and rolling, better known as "squirting and squashing."*

Superintendent Dean Gump, of Pasatiempo Golf Club, in Santa Cruz, California, experienced this same dilemma in 1992. Through a combination of new equipment and common sense, he has found a system that has changed persistently bumpy *Poa annua* greens into smoother, faster, and healthier surfaces while *raising* mowing heights, not lowering them!

The first step was to reduce surface disruption caused by multiple aerifications. With the introduction of water

*Rolling greens can be another good tool in achieving desired green speed.*

aerification, this technique reduced (not eliminated!) standard core aerification while increasing the total number of aerifications. The greens were smoother, yet the perennial *Poa annua* still possessed inconsistent characteristics. It was time to introduce the concept of green rolling. With monthly aerification to relieve compaction, Superintendent Gump began a program of rolling greens on Wednesdays and Saturdays. The results were instantly positive as far as the membership was concerned and produced the following changes:

1. Reduced mowing frequency from 7 days per week to 5 days per week.
2. Discontinued all double-mowing practices.
3. Decreased labor time spend on greens.
4. A virtual halt to player complaints.

These positive results benefitted the overall golf course maintenance operation. The growth and playing characteristics of the greens, however, have also changed:

1. An increase in mowing height from .15″ (between 9/64″ and 5/32″) to .17″ (11/64″).
2. A consistent increase in overall average speed from 8′6″ to 9′6″.
3. An overall improvement in surface smoothness and a reduction in footprinting.
4. Improved daily consistency and surface firmness.
5. An apparent increase in rooting depth.
6. A slight reduction in pesticide use and a slight increase in bentgrass.

The program described here has been used for approximately one year and continues to produce outstanding results. Are you faced with similar problems? One point that definitely rings true is that any program that can potentially minimize pesticide usage, produce healthier turf, *and* provide a desired putting green speed with good surface smoothness is worth a demonstration. It may well be worth the effort to do what the song says: "Shake, Rattle, and Roll!"

# *A Tall Tale from the Great White North*

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

TOO MANY OF US have faced the predicament of convincing well-intentioned golfers that a particular tree, although pretty and valuable, should be removed because of its negative effect on turf quality or play. Superintendents, informed Green Chairmen, and yes, even Green Section agronomists have been psychologically bloodied after recommending the removal of a mature tree that, in the golfer's eye, could not possibly be responsible for all those nasty problems.

Perhaps there is a light at the end of the tunnel, at least for those golf courses in the northern latitudes of the United States and Canada. No longer does the recommendation have to only be to remove a tree. Instead, it might sound more like "move it or lose it." This new option is a result of work completed by Jean Payette, retired superintendent, and Norman Hunt, golf professional, at the Mount Bruno Country Club, in St. Bruno, Quebec.

Payette and Hunt have devised a transplanting technique which they have successfully used to move large 30′ to 40′ trees at Mount Bruno Country Club. The transplanting technique was first used at the club to replace several strategic and aesthetically important elm trees lost to disease. It enabled the club to replace those trees with mature trees found on the property. The operation has been used to move red and white pine, and red, sugar, and silver maple trees that were considered too large or too costly to move with the more conventional tree spade technique.

The procedure is not complicated, but it does require a dozer in the D-8 class and an experienced operator. A backhoe also is helpful for trenching work and excavating the new planting hole. The ground must be frozen to minimize disruption of the root ball and allow for effective transport of the excavated tree. Excavation work is initiated in late fall while the soil is still workable.

The first step is to roughly trench around the tree with a backhoe or trenching machine, taking care not to damage the root ball. Two sides of the trench are then further excavated to provide access for the dozer blade to reach the root ball. Roots severed during the excavation should be cut cleanly around the edge of the root ball, and the final excavation and undercut work should be completed by hand.

The planting hole at the new site is executed to the same depth and dimensions. The sides of the new hole also are excavated to form a gentle grade that will permit easy access for the incoming transplant. Finally, several stakes are implanted around the hole to serve as anchors for the future transplant.

The size of the root ball is obviously dependent on the size of the tree, and more specifically, the trunk diameter at breast height (DBH). A general recommendation given by arborists is to size the root ball diameter approximately 10 times the tree's DBH. Since most roots are in the upper soil profile, the root ball should be sized about 30″ deep. This is a general recommendation, and successful transplants have been completed at Mr. Bruno Country Club in which the root ball dimensions were below the recommended size. Generally, Payette sizes the root ball so that it can be conveniently moved with the available dozer.

Moving the trees is not attempted until winter, when the ground has frozen thoroughly. At that time, the dozer and experienced operator are brought in to complete the operation. Payette stresses that it is most important to have an experienced operator carefully and slowly break the root ball free from the soil. Once free, the tree is pushed from the hole to the new planting site, where it is carefully pushed into the awaiting hole. If the new hole's dimensions are incorrect or if the tree is not straight, the transplant is pushed out

and the proper modifications are made. Staking is then completed to secure the tree.

Little more is done at Mt. Bruno Country Club until the soil is workable in the spring. At that time the hole is completely backfilled and a 1½′ to 2′ berm is constructed around the entire root ball to aid in irrigation. Several inches of shredded bark or wood chips is installed within the berm as a mulch. The berm is left in place for at least two growing seasons or until the tree is fully established.

The trees are treated like any other transplant, with care taken to maintain adequate moisture in the root zone. A well-balanced, agricultural-grade fertilizer can be broadcast within the berm at approximately 1 lb. actual nitrogen per 1,000 sq. ft. in winter or very early spring of the following year. The tree canopy can also be pruned lightly to remove damaged or weak interior branching and thus reduce the burden on the establishing root system.

A few additional tips might further improve a transplant's likelihood for survival. The first suggestion is to root prune around the tree one or two years prior to transplanting. This stimulates more vigorous rooting within the area that will constitute the future root ball. The chance of success also can be improved if the trees are moved to sites with similar soil texture and drainage. Finally, it is helpful to cover the exposed root ball with a light mulch or cover to buffer the drying winds and cold, especially if snow cover is absent. The backfill soils also should be covered to prevent freezing and allow for the completion of the backfill operation immediately after transplanting.

This operation has been successful in six out of seven attempts at Mt. Bruno Country Club. The single failure was thought to be related to inadequate site drainage. In any event, this transplanting technique is an economical alternative for moving larger valuable trees. Norman Hunt indicated that the operation's largest expense is associated with the dozer. The Club has found, however, that costs for the dozer are not excessive during the slow winter season. According to Hunt, an experienced operator can move several large trees in a day. Payette advises that, at least initially, you should start small when using this method to gain experience before tackling one of the giants. Once mastered, the technique can be used to move full-sized trees, with the only limitations being the size of the dozer, the contours of the land, and your tolerance of the elements.

*(Left) Moving the transplant trees is accomplished during the winter, after the ground has frozen thoroughly. A D-8 class dozer is required to move larger trees.*

*(Below) Jean Payette (left) and Norm Hunt pose before one of the successful transplants. Note the berm height that is used to aid irrigation. Once the tree is established, the berm can be softened.*

*The power of a typical lightning bolt is approximately 100 million volts.*

# Tree Lightning Protection and How It Should Impact Play

**by PATRICK M. O'BRIEN**
Director, Southeastern Region, USGA Green Section

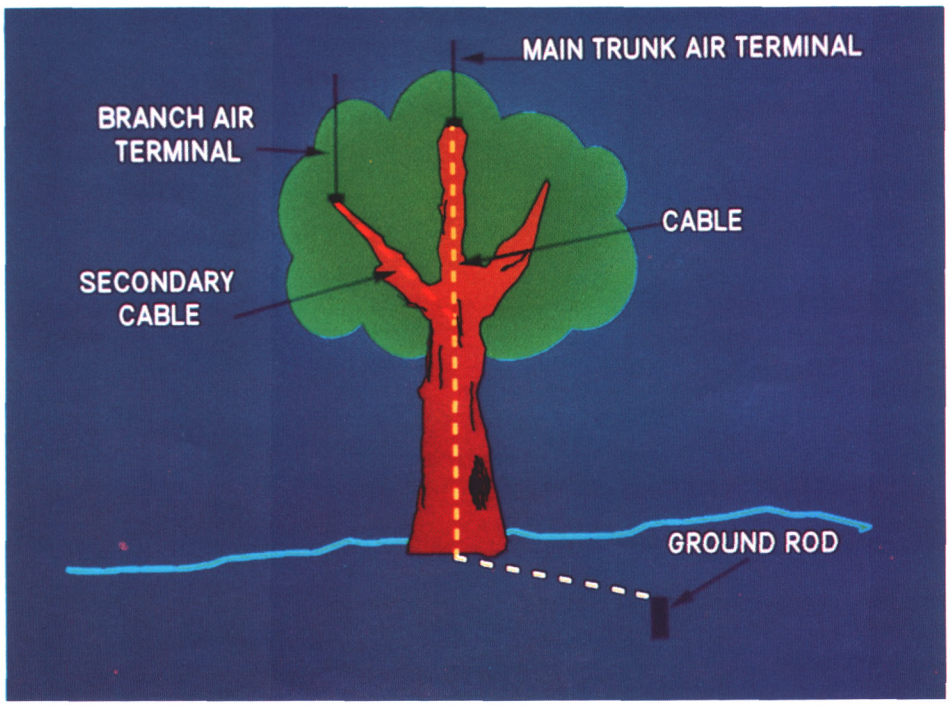
THOUSANDS of trees on golf courses are severely damaged or killed every year by lightning. Proper lightning protection equipment can help reduce these landscape losses without adversely affecting play.

The main features of a lightning protection system are the air terminal, conduction cable, and the grounding rod. The first step involves having a skilled climber attach a copper bronze air terminal, as high as possible, into the upper tree. If possible, attach the air terminal within 10 feet of the top of the tree for optimum protection. The main down conductor must be a 32-strand, 17-gauge, braided copper wire that weighs a minimum of 187.5 pounds per thousand linear feet. Secondary air terminals and cables are essential if the tree crown is comprised of more than one main leader. All connecting cables are attached to a 10-foot long, 5/8-inch diameter, cooper-clad ground rod driven vertically into the ground at least 30 feet from the trunk of the tree or to a distance beyond the major root system. The cable to the ground rod should be buried to a sufficient depth (usually 2 to 4 inches) to prevent later damage.

Two primary grounding cables and two ground rods are recommended if the tree trunk is greater than 36 inches in diameter. These should be installed at approximately 180 degrees to each other. Follow all other specifications in accordance with Underwriters Laboratories, the Lightning Protection Institute, and the National Arborist's Association codes for lightning protection systems. A skilled consulting arborist can determine which trees to protect and how to protect them.

When providing tree lightning protection, there is an unavoidable exposed wire on the tree trunk that may interfere with play. The cable is, by definition, an immovable obstruction, and relief is provided without penalty under the Rules of Golf. Typically, a

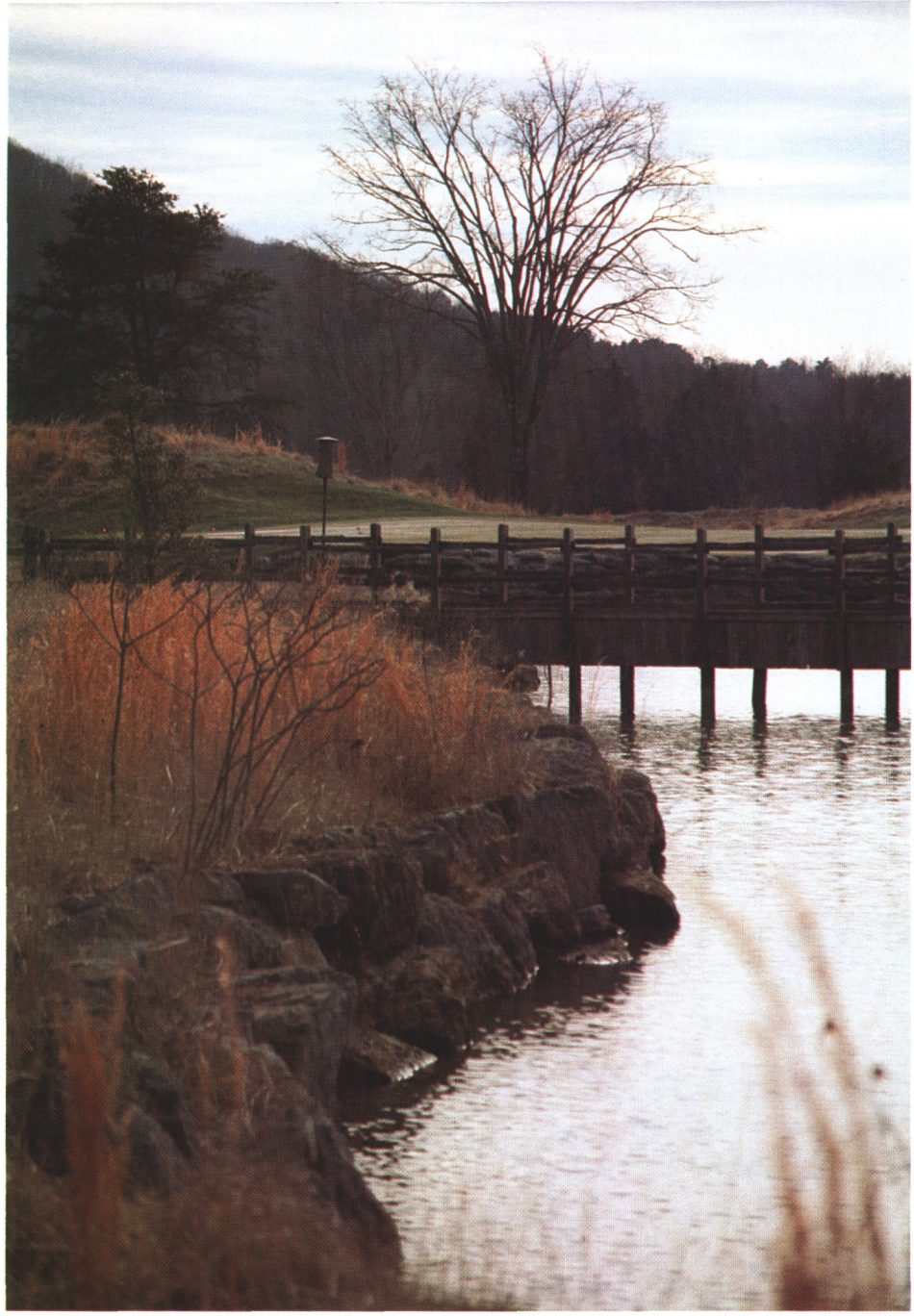
player has a difficult shot when his ball comes to rest next to a tree, and affording free relief can result in getting a free pass out of trouble! However, the Rules Committee at a course can declare the grounding cable on the tree trunk to be an integral part of the course (in the Notice to the Competitors or Local Rules sheet). In this case, the ball must be played as it lies next to the cable or else the player must proceed under the unplayable ball rule. Since free relief from this cable will not be given in most competitions, USGA Committeeman Joseph Chalmers of Tennessee has suggested installing the grounding cable on the putting green side or the back of the tree. This placement would be less likely to create a problem with play of a given hole. By following this advice, a functional lightning protection system and the playing of the game of golf are least likely to interfere with each other.




*(Top) The ground cable should be installed on the back of the tree, where it will least likely affect play. (Above) Specifications for lightning protection systems are available from the National Arborist's Association.*

# *Encouraging Wildlife at the Honors Course*

**by DAVID STONE**
Superintendent, The Honors Course,
Ooltewah, Tennessee



*A diverse habitat is available for many wildlife species on the golf course. Erecting bird houses, not mowing some tall grass areas, and leaving a few dead trees standing in out-of-play areas all provide wildlife habitat.*

WHEN I accepted the job as superintendent of The Honors Course, near Chattanooga, Tennessee, which was still under construction, little did I know that I would become a real bird lover in a few years.

In the spring of 1983 (before the course was opened), Lew Boyd, one of our board members, purchased 10 bluebird houses. You can imagine that I was not very thrilled when he called me about having someone help put up the houses. I was more worried about everything we had to get done before the course opened. He assured me they would not be in the way after they were erected.

There were already a few bluebirds on the course (a fact I remember because I had not seen any in several years before coming to The Honors Course), and they quickly took up residence in the houses. That was nice, but that was the end of my involvement as far as I was concerned.

A couple of years later, Mrs. Jonnie Lyons, an avid bird lover and the wife of one of our members, asked me if we had cleaned out the birdhouses after each hatching. I told her that not only were they not cleaned out after each hatching, but that I didn't know they were ever supposed to be cleaned out. She set me straight on why it was important, both to help keep the nest free from lice and to prevent other predator birds from reaching in and pulling out the nestlings after an accumulation of old nesting material had raised the height of the nest.

For some reason I listened to Mrs. Lyons. I assigned Joey Keef, a worker on the crew who seemed interested in wildlife, to start checking out the birdhouses about once a month and clean out the old nest as any birds were fledged. Mrs. Lyons often came to the course with Mr. Lyons to watch the birds as he played golf. Because of the way the course was maintained, there was good habitat for a wider variety of birds than she normally saw on golf courses.

Anytime she saw me on the course, she would wave me over to tell me about some birds she had seen or to ask me if I had seen a particular kind of bird. I told her I knew a few birds but had no idea what the birds she was talking about looked like. That was another mistake. In a few days, I found a copy of *The Guide to Field Identification of North American Birds* on my desk. A note was attached to it stating that the pages had better be well worn the next time she saw it. I'll admit the book was interesting, and I started learning to identify a lot more birds.

By this time we were more into our bluebird house program and did repair work on the houses in the winter. This consisted mostly of repairing the 1½-inch entrance holes that had been

enlarged by starlings and other birds. The bluebird population on the course seemed to be increasing each year.

A carpenter named Bob Pierce was working for a construction company making repairs on the clubhouse. Bob is a bluebird lover and made bluebird houses in his spare time and gave them away. He said we needed more houses for the acreage we had, and he brought us a total of 21 houses over a two-year period.

With all this help and pushing from other people, I was really into the bird business now, but what happened in the late spring of 1989 changed my interest and outlook on birds forever.

Joey came in one morning and asked if I knew of the house between holes 9 and 10 that had a bluebird family living in it. I told him I did. He said he normally saw the parents flying in and out several times a day, but that since he had not seen the parents this morning, he decided to look into the house. What he found was three dead babies and two live babies. He felt that the parents might have abandoned the nest and that the two remaining should be brought in. I told him he was probably mistaken and that we didn't know how to raise birds, but to watch them for the rest of the day and bring them in if he didn't see the parents all day. I had forgotten all about them when at quitting time Joey came in with the two infant birds.

We called a local veterinarian and he advised us to feed them raw hamburger meat. It took very little effort to get the hungry birds to eat. Putting a small glob on the end of a toothpick and whistling as a cue to open their mouths worked very well. We estimated the birds were 10 days old when we got them. We kept them in a shoe box on the secretary's desk in the shop. They wanted to be fed about every 20 minutes. It's funny how there was always someone around to feed them.

In a few days, my wife Mary called the local nature center and got more information. We stopped feeding them hamburger and started with a mix of canned Kennel Ration Original Formula dog food, applesauce, powdered baby cereal, bone meal, and liquid baby vitamins. This provided a better balanced diet for the birds. Since school had just gotten out for the summer (Mary is a school teacher), she took the birds to the house (we live on the golf course) and took care of them for the rest of the summer. She named them Bubba and Sister.

Like any parents, we were overly protective of Bubba and Sister. We kept them at least a week after they could fly, bringing them insects and putting them on the floor so they could learn to get their own food. Also, we did not release them until they would fly to us for food. This turned out to be wise, since adult birds normally take food to their fledglings for about three weeks after they have flown out of the nest while they learn to get their own food.

Sister was killed by a stray cat, but Bubba made it to adulthood. He flew down into our hands a few times a day all winter to get meal worms we bought for him. As warmer weather came and insects became plentiful, he came less and less frequently until he stopped coming altogether. He did bring a mate over one day to check out the birdhouse in our yard, but he was run off by another bluebird that had already claimed it. Still, we felt good that Bubba had adapted to the wild.

In 1990 we had even more up close and personal bird contact. First a very young crow fell out of his nest on another golf course in Chattanooga. They knew of our experiences the previous year and asked if we could raise it. We found out that they take much longer to grow to maturity than smaller birds, but we made it with him. Unfortunately, the fifth night he was out on his own, an owl killed him in a tree in the yard.

One of the crew members found a blackbird that had gotten out of the nest too soon. Since we could not find its parents, we had to raise him ourselves. He was the most interesting bird we have ever raised, staying with us for over three months before earning his wings and leaving.

A tree blew down on the course that spring, killing two of the three robin nestlings in it and breaking the leg of the third one. We got his leg taped by a veterinarian. His leg made a total recovery and we raised him successfully. He stayed around for about two weeks after we let him go.

Also in 1990, three bluejays fell out of their nest at different times but only a few days apart. We raised them, too, and they stayed around most of the summer before getting wild and leaving.

In 1991 we found an abandoned bluebird nest with only one bird still alive. We were able to find another nest with birds the same size, and we put him with them. He was adopted and raised by the parents. Later that summer we found another abandoned nest with three of the five dead. One of the two remaining birds died about two hours later, but Blinkey made it. I estimate he was only five days old when we got him. Though younger than Bubba when we started with him, Blinkey was never quite as tame as Bubba. He still comes over to the house this winter, but the closest he will come to me to get a worm is about three feet. He comes with 10 or 12 other bluebirds. The others wait for us to throw them worms out in the yard. Only one of the other bluebirds will get close to us at all. We believe this is Bubba, who would be nearly three years old now.

Since we have been so close to these birds, we have increased our efforts to help other birds on the course. We already have a good diverse habitat for many species. We have put out winter food in the form of suet, have made snake guards for many of the houses, and have plans to make houses for some larger birds, such as woodpeckers. In 1991 we successfully fledged 142 bluebirds plus a few other birds in the bluebird houses. During the nesting season, we now try to check the houses twice a week. The trend is for more orphaned birds during summer periods with a lot of rain.

To attract a large number of bird species to the course, there should be as much habitat variety on the property as possible. The ideal would include some solid thick woods, some thinly wooded areas, some tall grass, water, and, of course, short grass areas.

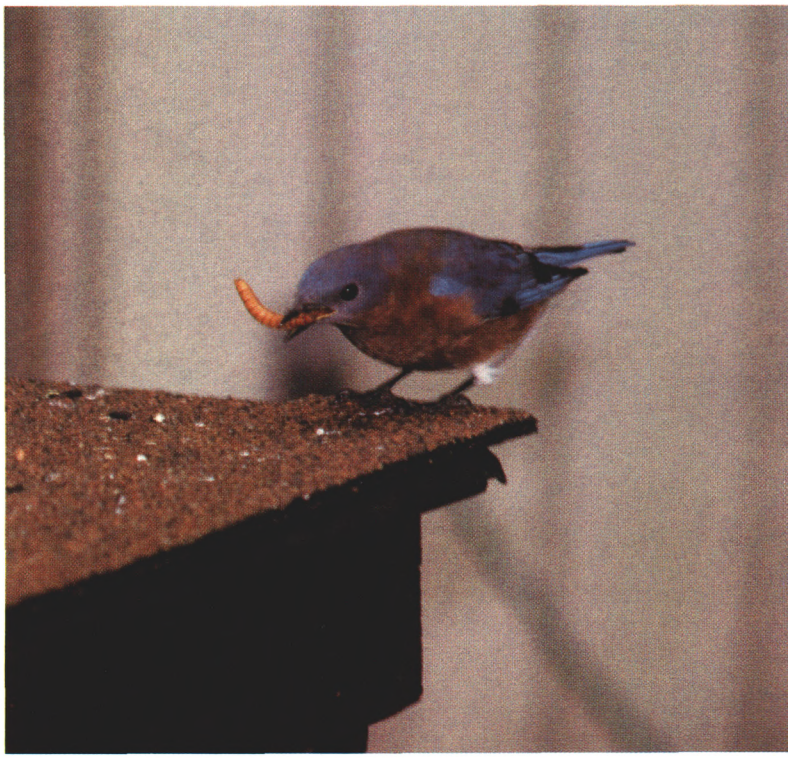
We never mow all of our tall grass areas at the same time, but we do try to get all of it mowed over a two-year period. That way the birds always have some tall grass to hide in. We never mow any tall roughs during the nesting season. Weed control in these areas (other than mowing) is done by manually chopping the most obvious weeds at times when we can't start other jobs that day.

Try to leave dead trees standing if they are not in places where they are likely to fall on someone. This well help attract woodpeckers.

If you can't grow any tall grass, you can still increase the bird population by providing nest boxes. You can probably find someone to donate the boxes, and you also may find some retired people who are willing to check the boxes for you weekly during the nesting season. As you can see, you can become very involved, or perhaps you can help the birds without spending too much of your time. I think you will be surprised at how many birds you will see and how much the members will notice them, too.

*(Left) When David Stone accepted the job as golf course superintendent at The Honors Course, in Ooltewah, Tennessee, little did he know what an avid bird lover he would become.*

*(Below) Bubba became the first of many adopted birds after he was abandoned by his parents. He was raised on a mixture of Kennel Ration dog food, apple sauce, powdered baby cereal, bone meal, and liquid baby vitamins until he was old enough to forage for insects himself.*



**Some Tips for Bluebird Houses**

- Bluebird houses can be purchased. Some carpenters may make them for you (perhaps free), or your crew can make them on rainy days. Books can be obtained that describe the proper dimensions, but perhaps the most important item is the hole, which has to be exactly 1½ inches in diameter.
- Houses should be mounted 4 to 6 feet above the ground. A post is better than a tree trunk because of the threat of flying squirrels.
- Place boxes no closer than 100 yards from each other.
- Avoid areas with heavy timber and heavy ground cover. Snakes and flying squirrels will kill the birds.
- Avoid areas near buildings, if possible, because of the proximity of starlings, sparrows, and cats.
- Mount the boxes in short grass areas, from which bluebirds obtain insects.
- Whenever possible, face the boxes toward a small tree or shrub.
- In the southern states (south of Ohio), whenever possible, place boxes so that a tree can cast afternoon shade on the boxes. This is most important for the second and third sets of nestlings, since the summer sun can heat up the boxes so much in the afternoons that the young birds jump out several days before they are able to fly. Sometimes the adults stop sitting on the eggs and abandon the nest if the boxes are too hot.
- Monitor the boxes two times per week while nestlings are in the boxes. If some young birds are dead in the box, watch to see if the parents are still feeding the ones still alive. If not, try to find other boxes with birds the same size and put the orphaned birds into the boxes with those birds. If none can be found, contact a nature center near you or try to raise them yourself.
- Clean the boxes as soon as each set of nestlings leaves the nest (you could have three families in a season — possibly 15 fledglings).
- If the hole is enlarged by other birds or squirrels, cover it with a metal washer that has an opening measuring exactly 1½ inches.
- Winter food for bluebirds includes the berries of these plants: honeysuckle, hackberry, red cedar, dogwood, sumac, American holly, bayberry (deciduous).
- If you decide to take on orphaned birds, the best food is called Jay Mix, which is a mix of Kennel Ration Original Formula canned dog food, apple sauce, powdered baby cereal, a slight bit of bone meal, and liquid baby vitamins. The consistency should be such that small globs can be fed to the birds on the end of a toothpick or similar object. They need to be fed about every 20 minutes during the daylight hours. Do not try to give water to the birds. They obtain enough moisture from the food and can be harmed by water going down their windpipe. When they can fly and you have turned them loose, you will still need to feed them several times a day for about three weeks until they learn to catch their own food.

# TURF TIPS — EVEN MORE OF THE BEST

# Let Mother Fix It!

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

TURF TIPS come in a lot of different sizes and shapes, and this one is a bit unique, not because it is so new or so revolutionary, but because it is a practical management philosophy that is being implemented at opposite ends of the country — and it is working. If you are looking for a quick fix, this tip may not be for you, but if you are looking for long-term success, give it a try.

Mike Huck, Golf Course Superintendent at Mission Viejo Country Club, in Mission Viejo, California, and Pat Lewis, at the Portland Country Club, in Falmouth, Maine, have adopted a turf management style that places more emphasis on sound cultural programs and relies less heavily on the latest chemical technology. The results have been overwhelmingly positive. On the road to success, Mike and Pat set the following basic goals:

**Goal #1 — Good Playability:** Defined as medium fast to fast putting green speed for everyday play; faster speeds for selected special events.

**Goal #2 — Good Reliability:** Defined as developing a turf that will handle the stress of a long summer or survive the ravages of a long winter. To do either, a reliable perennial putting green turf is a necessity.

Each superintendent took over *Poa annua*-infested, problem-plagued courses, and it has taken three to four years for their programs to pay off. The programs are as simple as can be, and they have allowed the desirable species (creeping bentgrass) to increase in population and become competitive with the *Poa annua*. The following points are the keys to their success and thus the heart of this turf tip:

- Close attention to water management
- Reduction in fungicide applications
- Reasonable cutting height — no lower than 5/32″
- Frequent bentgrass overseeding

*Overseeding can be carried out during routine renovation work.*

Both superintendents were forced into unhealthy irrigation practices and frequent fungicide applications in 1989 because of the presence of a high percentage of *Poa annua*. Since then, both have gradually reduced daytime syringing as well as pesticide usage, and they have produced drier, firmer playing surfaces. They have allowed minor disease problems to go untreated, since the weaker species (*Poa annua*) is often more drastically affected. For instance, Mike has allowed summer patch and anthracnose to go untreated, since neither disease has caused any damage to his bentgrasses. Pat has become increasingly slow to treat pink snowmold, which is one of his major disease problems. When pesticide applications are required, only the affected areas are being treated.

It is critical to keep the cutting heights high enough on a regular basis (not below 5/32″) to keep the bentgrass competitive with *Poa annua*. Both superintendents have allowed water, or the lack of it, to become an aid in improving putting green speeds and in promoting increases in permanent turf. In turn, this has reduced the need to employ lower cutting heights to achieve reasonable putting green speeds. For selected events where additional speed is required, both superintendents rely on additional grooming and double-cutting to increase speed. Rolling is another good option.

Bentgrass overseeding is not a new idea, and I would call your attention to two GREEN SECTION RECORD articles by William H. Bengeyfield (July 1967) and Brian Silva (September 1982) regarding the merits of bentgrass overseeding on putting greens. It is difficult to increase bentgrass populations significantly without a regular overseeding program since a single seeding rarely yields enough of a gain to be noticeable. However, multiple seedings per year will definitely increase the odds for success.

If you think this is a pie-in-the-sky turf tip, or if you would argue that what works in Maine or in Southern California won't work in Tennessee or Texas, think again. This is a program that will work anywhere *to a certain degree!* Granted, it may be difficult to reduce fungicide use by the same amount, but any reduction is good for the environment and the pocketbook. A pure stand of creeping bentgrass may not be an attainable or realistic goal with this program, but any increases gained will be worthwhile.

It is rare that just one factor is the sole cause of a turf problem, and it is also true that many factors are involved in a successful program. The various components of this program have a synergistic effect, and leaving out any portion will greatly diminish the total return. This is a program you can slip into gradually as your comfort level increases, but your golfers may need some time to adjust to a new management style. It also will require effort to educate them as to its benefits. Even if your golfers are agreeable, grass needs time to adjust to a new management regime, too, so don't try to switch from one extreme to the other in just one season.

Plan on a few sleepless nights, because making a conscious effort to reduce water and pesticide use does require some intestinal fortitude. We have been trained for years to treat preventively and to avoid stress, and this program means the opposite. A no-frills, back-to-basics program like this may not satisfy your desire for pure science and technology, but the grass will love it and playability will not suffer. Put Mother Nature to work on your golf course.

# Time-Lapse Photography and Sunlight Penetration

**by ROBERT A. BRAME**
Agronomist, Mid-Atlantic Region, USGA Green Section

WE ALL QUICKLY acknowledge that trees play an important role on many golf courses. Trees can contribute to aesthetic appeal and are often important in hole design and overall course playability. However, trees are optional to the game of golf; grass is not.

While trees are valued and important to the game, they should be kept in their place. When trees interfere with the growth of strong, healthy turf, corrective action must be taken. Selective branch thinning or tree removal not only will enhance the growth of grass in many situations, it also will encourage any remaining trees to develop into healthier, more attractive specimens. Proper tree management is vitally important to quality turfgrass management.

Tree management involves more than simply cutting down trees. The selective removal of dead and damaged limbs is also part of the package. At times, root pruning is needed to prevent trees from robbing moisture and nutrients from nearby grass plants. The planting of new or replacement trees is sometimes needed. When tree removal is necessary, it should be done on a selective basis, rather than indiscriminately. Tree management is an evolving, ongoing process.

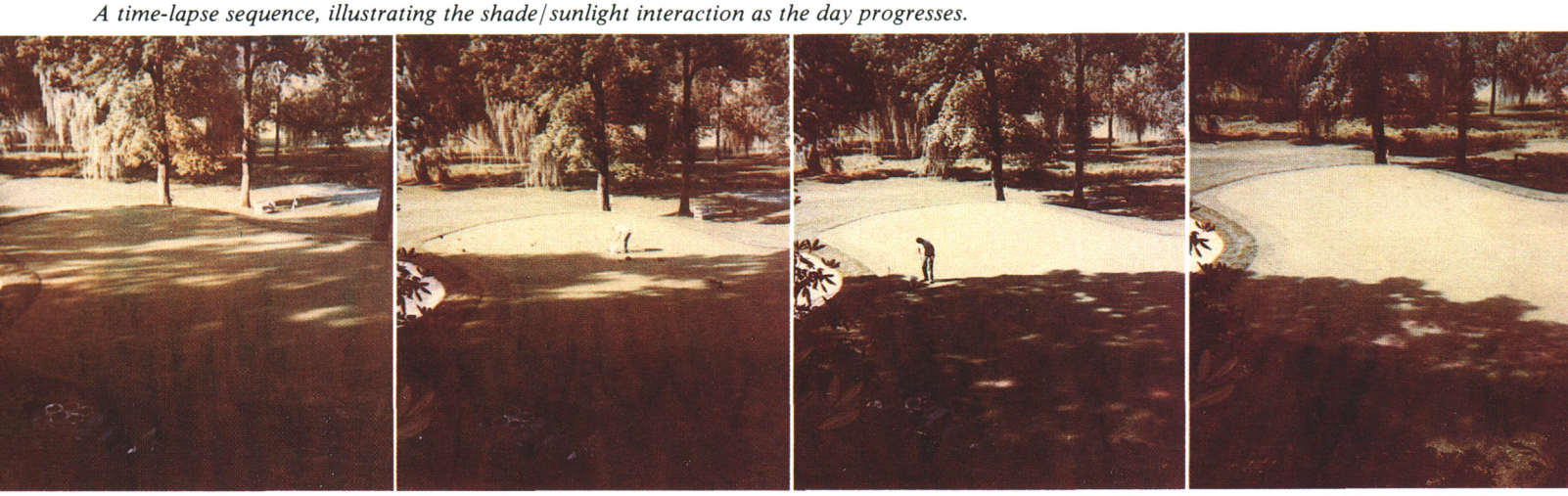
A major problem with tree management programs lies in convincing course officials of the need. Far too often, trees become sacred and untouchable. This makes the golf course superintendent's job difficult and at times impossible. Regardless of how qualified the turf manager may be, it is simply impossible to grow healthy grass without adequate sunlight. Air movement is also important to the growth of healthy turf, and trees often restrict these two vital components of grass growth. As a rule of thumb, a grass plant needs eight hours of direct sunlight each day, especially under golf course play conditions. How can this need be clearly demonstrated to those who do not manage golf course turf?

Terry Laurent, golf course superintendent at Saucon Valley Country Club, in Bethlehem, Pennsylvania, came up with a very good strategy to demonstrate how trees can adversely affect sunlight penetration and proper turf growth. The 12th green on the Grace Course at Saucon Valley has had a history of being troublesome. In the past, trees around this green have blocked both sunlight penetration and air movement. In July 1991, Terry decided to document this problem. One of his assistants was sent out with Polaroid in hand at hourly intervals, beginning at 7:00 a.m. and continuing through to 5:00 p.m. to take a series of pictures from the same spot and angle. By the end of the day, 11 pictures had been shot and labeled, clearly showing the shade and sunlight interaction on this green throughout the day.

This time-lapse photography technique clearly demonstrated the need for additional sunlight penetration. The photos further demonstrated that the weakest areas on the green were also those areas receiving the least amount of sunlight. As a matter of fact, Terry was able to document that some portions of this green received no more than five hours of sunlight, much less than the eight-hour minimum required for healthy grass growth.

This simple strategy has allowed Terry to sell course officials on the need to take positive action. Some tree and limb removal has already been completed. Plans also are being made to install an air circulation fan for the 1992 season. Terry has put the old adage "a picture is worth a thousand words" to work for him. The idea allowed him to communicate more efficiently and effectively. Knowing the answers in life is not enough; we must be able to communicate the answers to those with the questions. Give time-lapse photography a try on your course. It worked for Saucon Valley, and it can work for you.

*A time-lapse sequence, illustrating the shade/sunlight interaction as the day progresses.*



*#12, 8:00 a.m., 7-24-91* *#12, 9:00 a.m., 7-24-91* *#12, 10:00 a.m., 7-24-91* *#12, 11:00 a.m., 7-24-91*

# Roundup at the Circle Tree

**by GEORGE B. MANUEL**
Agronomist, Mid-Continent Region, USGA Green Section


*Through some innovative engineering, an out-front rotary mower can be transformed into a highly specialized spray rig. Canisters are mounted on the back of the mower body to carry herbicide mixtures.*

*After mowing around the trees, a flick of a switch applies an application of non-selective herbicide to any remaining vegetation.*

A COMMON PROBLEM among golf course superintendents each growing season is tall grass and weeds around the trunks of trees. Common solutions include hand mowing, string trimming, or spraying with a non-selective herbicide. Unfortunately, this mundane task can take up much of the work-week of one or two members of the maintenance crew. Through some innovative engineering, Tim Norris, CGCS of Golfcrest Country Club, in Pearland, Texas, has made this time-consuming job much more efficient. Norris and his mechanic, Bob Flanders, can transform their out-front rotary mower into a highly specialized spray rig at the flick of a switch. The following is an explanation of how the system works.

Two canisters are mounted (one on each side) on the back of the out-front rotary mower body. When filled with a herbicide mixture, they are pressured to 35 psi (the canisters and hoses are safe at pressures exceeding 125 psi) by a small air compressor. This particular compressor was taken from a 1986 Cadillac El Dorado, where it was used to fill shock absorbers. The pressure generated from the compressor is kept in check by a regulator. As the mixture becomes pressurized, it moves through a hose to a solenoid valve located on the deck of the mower. On the other side of the valve is a small brass screen and spray nozzle. When the operator hits an electrical switch, the valve opens and the mixture is sprayed.

While the machine can be used on a daily basis for routine mowing, it is used approximately once a month for its unique spraying capability. After the herbicide is carefully mixed with water, it is added to the canisters. The lids are closed and locked, and the modified spray rig is ready to go. Normal procedures could include mowing around a tree with the rotary blades engaged. Another pass is then made around the tree, and as the operator hits the switch, any remaining vegetation is sprayed with the non-selective herbicide mixture. Glyphosate is most commonly used, as it is not hazardous to most species of trees if not sprayed directly on the foliage. (Glyphosate also can be absorbed through the thin bark of very young trees.) To prevent grassy weeds from re-sprouting, a pre-emergent herbicide also can be added. As always, read and follow label directions for best results.

Benefits include saving the club time and labor that is normally required to hand-trim around trees. Also, the trees are protected from employees who have a tendency to be overly aggressive with a string trimmer or rotary push mower. With a few simple modifications to your current equipment, you too can enjoy the many benefits of this innovative idea.

# Issues in Golf in the 1990s

**by STUART F. BLOCH**
President, United States Golf Association

WHEN I WAS A BOY, I started working on my grandfather's farm during the summer and apparently I became infected with an outdoor interest. When you add my love for the game of golf to my interest in the outdoors, it was a natural that I eventually became part of our club's green committee.

I had the luxury of serving as chairman of the committee and also as its only member. I decided that it was clearly going to be more than I could handle to have a committee of four or five members. After all, it was all I could do to learn about the job, working in conjunction with our golf course superintendent, without worrying about four or five other people. So I convinced the board that I would serve only under the condition that I would be the committee and I would resign every fall; if they didn't like the way it was going, then they could start another program. I finally got fired after 18 years, but it was a lot of fun while I was doing it.

We're all very well aware of the steady growth in golf that's expected to continue through the decade, and I think it really speaks well for your profession. My hat is off to you for the continuing sophistication in golf course maintenance that is clearly growing by leaps and bounds.

The environment in which the game of golf is played is really becoming more and more pleasing to the senses. The USGA is taking the lead, along with the Audubon Society of New York, to help you establish wildlife sanctuaries and conservation programs which will surely, over the next few years, draw support from environmentalists concerning the beautiful green space you're maintaining. I began a bluebird program at our club this past year. I kept emptying those boxes of the competitive species throughout the summer and finally, during the last nesting season, we got one set of bluebirds. I was thrilled by that and look forward to finding more there next year. It takes patience, but Nancy Sadlon, the USGA environmental specialist, will be glad to answer any questions you have about starting a bluebird nestbox program yourself. I can assure you that it's worthwhile.

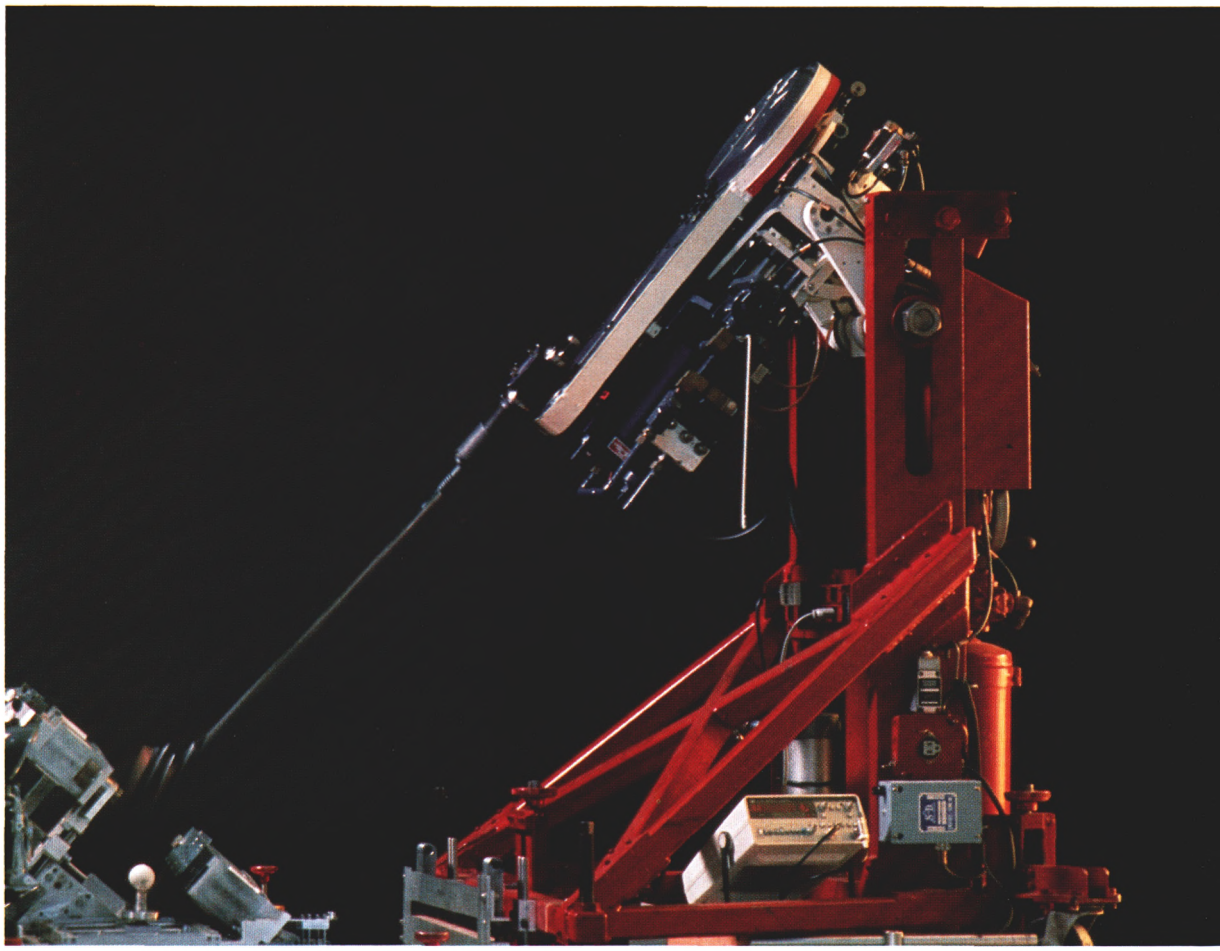
*Stuart F. Bloch*

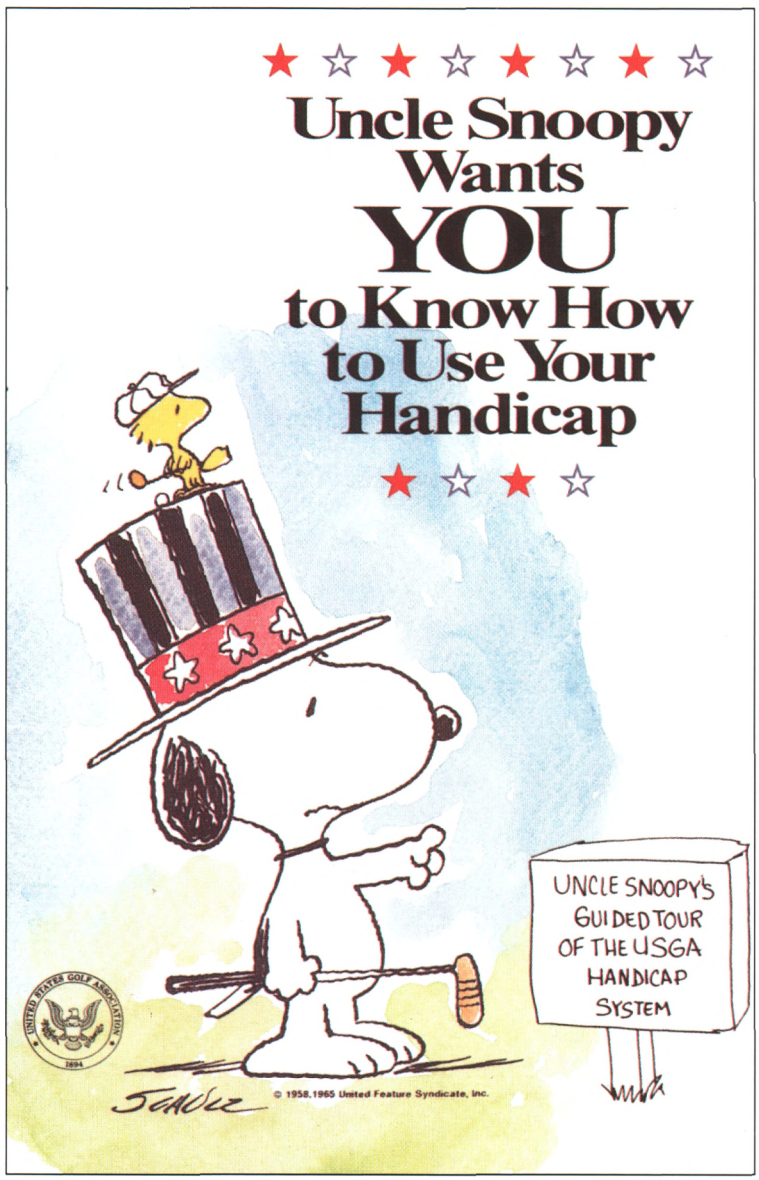
We are all concerned about the shotgun criticism toward golf courses damaging and changing the environment. It is one of the major threats to golf of the 1990s, not only for courses that are already in place but for the extensive period of time that's being added to receive permits to build new golf courses. You are all well aware of the National Golf Foundation's estimate of the number of courses that are needed to satisfy the demand for golf in the future. Four hundred golf courses a year from now until the year 2000 is obviously an impossible number to achieve, but I'm confident with the work that our environmental programs are doing now, it will help speed up the process. Over $3 million has been committed by the USGA to fund environmental research for the period 1991-1993, and this presents a good start. The 900-page book *Golf Course Management and Construction: Environmental Issues* will provide a benchmark for the work that has been done to date. Maybe you weren't aware that until this project was completed, nobody really knew just how much scientific work has been done relating to golf and the environment. People were waving their arms and claiming all kinds of things, and I hope this book will provide information not only for our industry, but also for those who question the golf industry. I also want to thank the GCSAA for the $50,000 you have contributed annually to the USGA Research Program.

An important part of the environmental side, of course, is the wonderful success with drought-resistant buffalograss, seeded Sahara bermudagrass, three improved bentgrasses which will be available for testing this year, and the prospects for improved zoysiagrass. It is amazing how much progress has been made in the past ten years. Research is a slow process. Every time you cross two plants, you get 1,800 new little children that come out of that work. Then you have to figure out which of them are the best and then use them to create the next generation. I see us in this field for a long time. Not every project we are funding now will continue, but as we go forward, we are going to have more success which will result in better grasses for use on the golf course.

On another subject, golf equipment technology continues to produce more challenges. The USGA is working hard to learn everything we can about the clubs and the ball. Our objective is a simple one: to identify the elements of the player, club, and ball equation that really matter and to apply that knowledge to improving our oversight of the game. We want to do a better job of ensuring that a player's skills, and not his equipment, determine his success as a competitor and preserve the challenge of the game for all of us.

We are already realizing some benefits from our efforts. A recent Rules change stated that inserts are now allowed in iron clubs, metal clubs, and metal woods. We would not have been able to make that decision without the increased sophistication that has been developed at the USGA Test Center. We have expanded the building, added a new Iron Byron, added more staff, and have put together a group of specialists and technicians from industry who are serving as an advisory technical committee. It is a large goal to stay ahead of the manufacturers. I think the






*(Opposite page, top) The USGA is constantly trying to make the Rules of Golf more user-friendly.*

*(Opposite page, left) The USGA works hard to ensure that a player's skills, and not his equipment, determine his success as a competitor.*

*(Above) The USGA Handicap System is the best method to allow all golfers to compete fairly on any course.*

improvements and commitment of resources will allow us to be more active, rather than reactive, to equipment changes. At the same time, however, we want to allow innovations that only serve to make the game more pleasurable and broaden participation. For most of us this game is already hard enough. We have no intention of making it more so for the average player and, therefore, we're doing everything we can to understand every aspect of the equipment in order to preserve the game as you and I know it.

Finally, with all of the new players attracted to all the beautiful golf courses maintained by the golf course superintendents, the USGA is undertaking a major outreach program to educate golfers about some of the special pleasures that the game provides. The Associates' Membership Program has experienced a name change as of 1992 to the USGA Members Program. We anticipate its continued growth.

For the future the handicap system will continue to be a major focus of attention. How to obtain one and how to understand and use your handicap index when you play from different tees or different golf courses will be part of the education process. A new booklet featuring the Peanuts character Snoopy has already exhausted the first million printing, and the second million is on order. *Golf Digest* and *Golf Magazine* have established a 900 telephone number so that you can call, use your index, and find out what your handicap strokes will be when you go to another golf course.

The Rules of Golf are constantly being made more user-friendly. The current issue of *Golf Digest* features a marvelous special about how to play by the Rules, and they enclose a complete Rules book and challenge the reader to enter a Rules quiz. The Rules are more interesting to golfers around the country when controversy arises during major championships. The USGA holds Rules seminars during January, February, and March with the PGA of America, and they are quickly filled to capacity. There's not only a great interest, but the Rules are becoming more understandable both to old-time players and to new golfers who are enjoying the game.

The USGA wants to defend and improve the environment where we play the game. We want to develop turfgrasses which use less of our precious resources. We want to stand firm in the legal area when necessary. We want to stay on top of equipment and ball changes so that the game we love will still be a challenge for our grandchildren, and we want to reach out and communicate to our constituents about the many special elements our fascinating game has waiting for them.

We at the USGA are geared up for the 1990s, I believe, and we look forward to participating with the GCSAA in working for the good of the game.

# Tree Snags — A Tree Even an Agronomist Can Love!

**by NANCY P. SADLON**
Environmental Specialist, USGA Green Section

DURING the past year of travel with the USGA's regional agronomists, I've learned many turf tips! One that surprised me at first was this advice: "Create more air circulation and *cut* those trees down; we can't have tree roots competing with the turf, *nor* can we tolerate the shade created by those trees!"

As the USGA's environmental specialist, I work closely with the Audubon Cooperative Sanctuary Program for Golf Courses (ACSP), a program that encourages habitat preservation and enhancement. The above advice was not exactly music to my ears. However, I soon recognized, as do the specialists with the Audubon Cooperative Sanctuary Program for Golf Courses, that the pros and cons of any situation must be weighed. Removal of a tree to reduce pesticide applications in a particular area and the planting of a new tree in a more appropriate location may well represent the most environmentally responsible solution. Before you run out to the golf course and cut down those habitat-providing trees for the good of the turf, though, let me tell you about *tree snags* — a tree even my colleagues, the agronomists, can accept on the golf course.

### Tree Snags

Commonly referred to as dead trees, tree snags provide cavities for nesting birds and animals. More than one-third of all forest-dwelling birds and mammals require a hole or cavity in a tree for nesting and shelter.

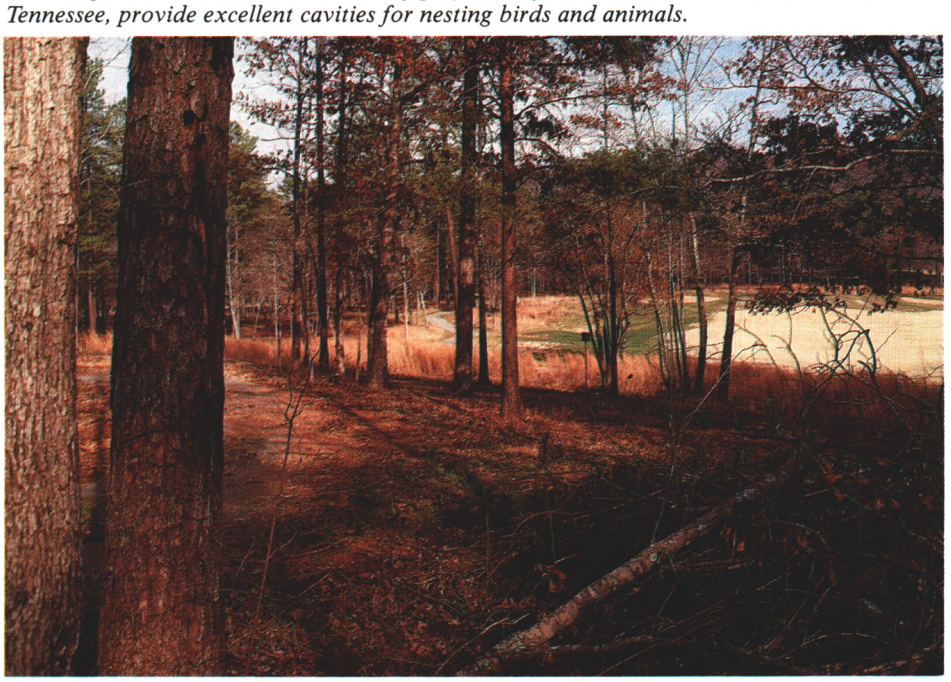
The scarcity of natural tree snags seriously limits the number of cavity nesters in some areas to the point of endangered status. Cavity nesters include wood ducks, bluebirds, woodpeckers, owls, chickadees, and titmice, to name a few, as well as cavity-dwelling mammals like flying squirrels, raccoons, and white-footed mice.

Most cavity-dwelling birds are insect eaters and can be beneficial to the golf course (such as the eastern bluebird, great crested flycatcher, white-breasted nuthatch), for their helpful efforts in pest control. Owls can be beneficial in rodent control. Some species, like the barn owl (family of eight) are estimated to consume 1,000 rodents in a single nesting season.

Various cavity-nesting birds and mammals have different preferences for tree snag size, location (height of nest), and territory size. Downy woodpeckers, seen most often at backyard feeders, require only 10 acres for territory size, prefer an 8″ DBH (diameter at breast height) tree for nesting, and prefer their nest to be approximately 20′ above ground. In contrast, the pileated woodpecker, much more of a rarity, requires 35-175 acres territory size, prefers a tree of 22″ DBH, and a nest height location of 60′. The Georgia Department of Natural Resources recommends at least eight tree snags per acre or more, if possible, to satisfy cavity-nesting needs. For a 20-acre woodlot, the U.S. Forest

*Cavity nesting species (screech owl), a resident at the Rumson Country Club, Rumson, New Jersey.*

*Tree snags located in the wooded out-of-play area of The Honors Course, Ooltewah, Tennessee, provide excellent cavities for nesting birds and animals.*



Service recommends four or five snags of 18″ DBH, 30 to 40 snags over 14″ DBH, and 50 to 60 snags over 6″ DBH. Recognizing this need and the scarcity of cavities remaining in our forests, no cavity or tree snag should ever be cut *unless* it is a safety hazard. If a live or dead tree must go because of safety reasons or because the negatives outweight the benefits, and there is a limited number of natural tree snags on the golf course, supplement with a variety of artificial nest boxes. This effort can partially compensate for the loss of natural tree snags.

A golf course has tremendous potential to help compensate for the scarcity of cavities elsewhere. Golf course superintendents and course officials can take an active role in conservation by recognizing the value of tree snags and by preserving them. Trees of various types and sizes make for fine cavity nests. No tree should be considered too small or too insignificant. Suitable trees for cavity excavation should have rotten heartwood (interior wood) at the appropriate height for desired species. Those with rotten heartwood are easily excavated by the primary excavators, the woodpeckers. A live tree that has rotten heartwood is ideal, since the excavation is easy but the outer tough sapwood provides excellent defense from predators. The least desirable tree snags are those that have outer sapwood rot with healthy interior heartwood, resulting in a difficult excavation and shallow nests that are vulnerable to predators.

*Artificial nest boxes, including this wood duck box, can help compensate for the scarcity of natural tree snag cavities.*

From a turf standpoint, the tree snag is the perfect tree; it *does not* have growing root systems that compete with the turf, it *does not* have a dense, shade-producing canopy, it *does not* have dense branching that reduces air circulation, *and* there is the added benefit that it provides habitat for and welcomes those insect-eating birds that can help with pest-control efforts!

# Fire in the Hole

**by JAMES FRANCIS MOORE**
Director, Mid-Continent Region, USGA Green Section

THE FILE CABINETS of each Green Section office contain reports written to golf courses for the past 40 years. Even the earliest of these reports frequently contain recommendations urging the pruning or complete removal of trees that prevent the growth of healthy turf. But recommendations are the easy part. Unfortunately, convincing club officials to allow such work is often next to impossible.

Of all the clubs visited in the Mid-Continent Region over the past seven years, the most successful tree program I have witnessed has been instituted by Southern Hills Country Club, in Tulsa, Oklahoma, under the direction of the superintendent, Bob Randquist, CGCS. The key points to Bob's success in obtaining the support of the membership have included:

1. Preparing a comprehensive tree resource inventory which identified and cataloged all the trees on the property. This included identifying trees that should be removed to ensure good species variety, overall tree health, and proper spacing for the benefit of the remaining specimens. In addition to providing direction for future tree work from an arboricultural viewpoint, the survey added a great deal of credibility to Bob's plans in the eyes of the membership.

2. Soliciting outside opinions concerning the need to accomplish tree work for the sake of the turf. Dr. Joe Duich and I independently emphasized that the greens and other turf areas would continue to suffer at Southern Hills until tree work was accomplished to provide vital light and air movement, and reduce root competition.

3. Acquiring the necessary equipment to prune and remove the appropriate trees. The most important of the equipment was a "cherry picker" or bucket truck that allowed much of the work to be accomplished rapidly and safely.

The final step, and the subject of this "turf tip," was the construction of a tool to dispose of the tremendous amount of refuse resulting from the pruning of every tree on the golf course and the complete removal of over 80 trees over a two-year period. Contract hauling from the property easily would have been the most expensive aspect of this job. Open burning on a course located near the middle of Tulsa seemed out of the question — until Bob contacted the EPA Air Quality Board and obtained the plans for constructing a forced-air incinerator for burning brush.

The device itself was constructed by Bob's staff and consisted of a motor-driven fan, a long metal casing or tube, and a manifold for directing air into the hole. Since the EPA directed that the

device must be portable, a trailer was built for easy movement. Bob estimated the cost of the entire unit to be approximately $2,500. Fortunately for Southern Hills, the motor (rated at approximately 15 horsepower) was salvaged from an old chipper, which further saved on the construction expense.

The unit has proven very effective. A two-ton truck is used to haul trash to the burn site. Approximately 25 to 30 truckloads can be disposed of per day; otherwise it would have to be hauled by contractor to a landfill. The device burns extremely clean, saves Southern Hills money, and helps to conserve landfill space. Equally important, it has played a key role in a successful tree care program that has resulted in the steady improvement of one of the country's best golf courses.

*Constructing a forced-air incinerator for burning brush solved Southern Hills Country Club's problem of what to do with an overabundance of tree brush after an extensive tree improvement program was implemented.*

*The incinerator was constructed by the golf maintenance staff and consisted of a motor-driven fan, a long metal tube, and a manifold for directing heat into the hole. By salvaging a 15 hp motor from an old chipper, the entire unit cost about $2,500 to construct.*

# Are Your Greens Running a Fever?

**by PAUL H. VERMEULEN**
Agronomist, Western Region, USGA Green Section

ONE OF THE FIRST questions a physician asks when examining an ill patient is, "Have you been running a fever?" Based on the patient's reply and the results of other tests, the physician can offer the patient appropriate medical advice. In the field of turfgrass science, a similar approach also can be used to help diagnose an ailing putting green during the summer season. Specifically, knowing whether the surface temperature of an ailing putting green is above normal can help superintendents determine if it will require additional ventilation for recovery.

To make an accurate determination of surface temperature, using the appropriate thermometer is essential. Conventional analog thermometers are acceptable for measuring soil temperature, but their poor accuracy and slow response are serious drawbacks when using them to measure the surface temperature of a putting green.

As an alternative, there are several models of digital thermometers available from specialty electronic stores throughout the country. The advantages of these thermometers include instantaneous readout to 0.1 degrees, accuracy to 0.01 degrees, and a separated probe that can be placed just above, yet level to the putting surface.

To determine whether the surface temperature of an ailing putting green is above normal, a reference temperature first must be calculated. This can be done by measuring the surface temperature of well-ventilated, healthy putting greens on the course and dividing the sum total of measurements by the number of putting greens measured. After calculating the reference temperature, it can then be used as a standard against which the ailing green can be compared.

For example, on a clear summer afternoon when the air temperature is reported at 96 degrees Fahrenheit, the reference temperature for several well-ventilated, healthy putting greens can be measured at about 106 degrees Fahrenheit. In comparison, the surface temperature of an unventilated, ailing putting green can be as high as 121 degrees Fahrenheit. Based on such comparisons, it would be reasonable to assume that the high surface temperature of the ailing putting green is the result of poor ventilation, and that this is contributing to poor turfgrass performance.

The next step is to install large fans around the perimeter of the green to improve ventilation. Based on the available power supply, various stationary or oscillating models can be installed on either a temporary or permanent basis.

By collecting as much valuable information as possible, superintendents, like physicians, can then formulate a prescription to promote the recovery of an ailing "patient."

Are your greens running a fever? Measuring the surface temperature with a digital thermometer can provide some much-needed information.


*Digital thermometers, available through large electronic equipment suppliers, work well for monitoring surface temperatures because of their accuracy and mobile probe that can be placed directly on the surface.*

# News and Views on the USGA Specifications

**by DR. NORMAN H. HUMMEL, JR.**
Cornell University

IT HAS BEEN SAID that there's more than one way to build a green. This fact has been well established through the years as different "systems" of green construction have been used. While some systems have been very successful, others have not. Promises of lower construction costs often have compromised agronomic soundness. Certain systems have even been outright irresponsible from an environmental viewpoint.

The USGA specifications for green construction are the most widely accepted in the industry, the standard to which other methods are often compared. Many years of experience and research went into the original specs that were developed by Dr. Marvin Ferguson and his associates 30 years ago. Revisions in 1973 and 1989 incorporated new research, technology, and materials. Such is the case now, as a new version of the specs is expected soon. In fact, the USGA has just completed its most thorough review of the specifications since they were first published in 1961.

The goal of the USGA in supporting this review was to provide practical construction specifications that not only assure success, but are flexible enough to accommodate conditions inherent to a particular site or climate. All sections of the specifications have been reviewed and revised, with input provided by soil and turfgrass scientists, architects, contractors, and superintendents in the United States and abroad.

The following are some pending changes in the specifications. Please realize that these changes are preliminary as of this writing, and the published specifications will be the final word.

### The Subgrade and Drainage

One of the outstanding qualities of a USGA green is its ability to provide excellent surface and subsurface drainage. Minor changes in the specifications should make subsurface drainage foolproof, regardless of the contours in the green above.

Among the changes in this section are slightly different procedures for contouring the subgrade and placing the drainage tiles. The new specifications will describe a system better able to intercept and remove subsurface water. For example, one change will call for the placement of a perimeter tile at the low end of the gradient to prevent a wet spot from developing at that point. Several other changes have been added, including:

- Geotextile fabrics will be allowed in USGA specification greens, but only *under* the gravel blanket to prevent settling of gravel into unstable subsoils.
- Poor-quality stone, such as soft limestones, sandstones, and shales, will not be acceptable.
- Tips on selecting stone will be added. Angular stone (¼ to ⅜ inches) will be suggested since it is more stable and easier to shape than rounded pea gravel.

*Avoid the cost and disruption of reconstruction by building it right the first time.*

### Intermediate Coarse Sand Layer

Current USGA specifications call for the placement of a 2- to 4-inch layer of very coarse sand between the gravel and rootzone mix. The original purpose of this layer was to prevent the rootzone mix from migrating into the sand layer. Its presence in the green profile also forms a perched water table in the rootzone, a trait that conserves water.

The coarse sand layer has for years been a controversial element in the specifications. Architects and contractors have frequently cited its high cost and difficulty in placement as reasons to eliminate it. Right or wrong, they frequently build greens without the coarse sand layer. As of this writing, the fate of the coarse sand intermediate layer has not been decided. It probably will remain, but the options for materials will be expanded and better defined.

## The Rootzone Mixture

The rootzone mix of a USGA green is composed of a mixture of sand with peat and/or soil. Past specifications have exactly defined the particle size of the sand to be used, but have been vague in defining the organic and soil components. It is in this area that the USGA felt there could be many improvements.

The new specifications will set limits on the amount of gravel and very coarse sand allowed in the rootzone mix. These limits should prevent doughty mixes from being allowed, mixes that may have met the 1989 specifications. Also, it is likely that the specifications will have greater allowances for fine sands, with tighter restrictions on very fine sands.

Where soil is used in a mix, the specifications will clearly define soil types acceptable to use.

Many times new greens do not perform to expectation. My experience has been that green failure often can be blamed on the poor quality of the organic source used in the mix. The new USGA specifications will include guidelines for organic matter selection that should help prevent failure. Only high-quality organic sources, meeting specific criteria in areas such as ash and fiber content, will be allowed in a USGA rootzone mix.

Rootzone mixtures meeting USGA specifications are required to meet a set of laboratory-measured physical parameters. Measured under a standard compaction treatment, the porosity, bulk density, and moisture retention values provide a sense of how well a rootzone mixture will support plant growth. In the new specifications, minor adjustments will be made in the acceptable ranges of these measurements to eliminate minor technical inconsistencies.

Infiltration rates, omitted from the 1989 specifications, provide a sense of how well a rootzone mix will drain. The desired infiltration rate for a mix will depend on conditions in which the green is grown. Fast-draining greens are needed where water quality is poor so that salts can be leached occasionally from the rootzone. Fast drainage also is needed where bentgrass is grown in tropical or subtropical climates.

On the basis of these needs, the USGA specifications will provide at least two desirable ranges of acceptable infiltration rates, one being a normal range, the other for situations where rapid drainage is needed. An intermediate range also may be included. A set of ranges such as these will provide flexibility so that rootzone mixes can be designed to match the needs of the site.


*An example of topmix construction materials: topmix sand, intermediate layer sand, and pea gravel. USGA specifications for green construction are the most widely accepted in the turfgrass industry.*

## Laboratory Standards

Imagine having your blood samples sent to two labs, with the reports varying in their outcome. Also, how stable would skyscrapers be if there were no standard test methods for the stability of underlying rock and soil? Standard test methods have been used for years in the medical, construction, and other industries.

No such standards have ever been invoked in the golf construction industry. This should at least partially explain why split rootzone mixes sent to different labs frequently come back with different results. Realizing this, and concerned because their specs are based on lab data, the USGA sought to correct it.

The turfgrass industry must first accept the fact that there is variability inherent to this entire process, from sampling (a major source) through testing, to the actual construction of the green. Results may differ by up to 10% for some values, such as infiltration rate. This inherent variability, however, could not explain the differences coming out of the labs.

How can this happen? Are there not written procedures for testing USGA mixes? There were procedures for testing USGA rootzone mixtures published in 1961 in the *USGA Journal* and *Turf Management*. While these procedures provided some guidance for compaction treatment, they were incomplete in many regards. Searching through other scientific publications, however, one can find accepted procedures for testing all the values required of a USGA rootzone mix.

Nine commercial laboratories willingly cooperated with the USGA on a project to correct these shortcomings in lab procedures. Potential sources of variation among the labs have been identified. Recently, standard test methods were written and then reviewed by several soil scientists. Quality assurance/quality control guidelines also have been written, and lab accreditation is being considered. While these standards are voluntary, all the lab directors expressed a willingness to conform.

Construction superintendents have enough to worry about without having to deal with the confusion of dissimilar lab data. Hopefully, this problem will be a thing of the past.

## Summary

No construction specification is perfect, and greens will continue to be built by many different means. The USGA, however, has gone to great lengths to improve the revised version of their construction specifications. They should continue to serve as the standard for the industry.

*Golf course superintendents will be further challenged in the future to continue to maintain high-quality golf courses while balancing the fragile environment in which we live and work. Metedeconk National Golf Club, Jackson, N.J.*

# Golf Course Management Standards and Practices for a Fragile Environment

**by STEPHEN G. CADENELLI, CGCS**
President, GCSAA

THANKS TO golfers' expectations and superintendents' performance, golf course standards have neared perfection. The wall-to-wall high-management philosophy common at many facilities has resulted in playing surfaces of a pristine and uniform color and double-digit green speeds. Tournament or near-tournament conditions are maintained day in and day out.

This drive for constant perfection has resulted in the adoption of maintenance practices that often do little to enhance the health and vigor of the grass plant. Green speed is maintained through extremely low mowing heights. Color and playability are maintained through irrigation and fertilization practices geared more for acceptable appearance of the course than for the agronomic needs of the plant.

The result of these extreme management practices is, more often than not, a surface that is highly playable, but balanced precariously on the edge of survival. To ensure that the turf does survive, increasing amounts of water, fertilizers, and pesticides are used.

Now this philosophy of management is being challenged more strongly by the realities of the fragile environment in which we live and work. We confront challenges daily in every phase of our operations.

One of these challenges is competition for a fair share of water resources.

As populations continue to grow and shift, water demands increase significantly. Water for irrigation becomes more and more scarce, and — however unfairly — golf courses are usually near the bottom of the regulatory priority list. Frequently, the available water is only of marginal quality, but priced at a premium.

Land for new golf course development is in short supply. The land that is available is often marginal for development or has other very limited potential, which can mean that it is an environmentally sensitive area, such as a wetland or other valuable wildlife habitat.

Irresponsible or excessive use of pesticides leads to concerns about the effects of exposure — not only the exposure of wildlife and those who play golf courses, but also those who maintain them.

Obviously, things must change. We can no longer afford to manage golf courses using the old standard. New standards must be developed that are more in tune with natural and agronomic realities.

Wall-to-wall management can no longer be considered acceptable. Natural or less-maintained areas must become a growing part of all golf courses.

Management practices must take into account the agronomic realities of the grasses being grown and not the desire to maintain tournament conditions on a daily basis. To this end, water and fertilization practices must meet the needs of the turfgrass plant, not some aesthetic standard. Green speeds must be based on the agronomic limitations of the turfgrass plant — not a standard established by a grooved stick.

Do these changes mean that golfers are going to have to accept lower-quality playing surfaces? One school of thought says that if current practices are changed, quality of the playing surface will suffer. But a closer look may reveal that this new standard will not result in a decrease in quality, but a continuation of excellent playing surfaces — with healthier turf.

The quality of a golf course can roughly be described by the following formula:

$Q = (S + EI + T)A$

Where:

Q = Quality

S = The species or cultivars being grown

EI = The sum of all inputs

$I_f$ = Fertilization

$I_w$ = Water

$I_m$ = Mowing

$I_c$ = Cultivation

$I_p$ = Pesticides

T = Technology available

A = Ability of the superintendent

Even in this simplified form, it is clear that a number of interrelated factors impact the quality of golf course turf. By reevaluating and manipulating these factors, we can provide high-quality playing surfaces within the framework of the new standards.

Turfgrass selection dictates the management practices required to maintain a quality playing surface. In the past, selection has too often been made based on the concept of the "ideal playing surface," instead of on the ability of the turfgrass to survive. Not surprisingly, these selections have frequently required intense management and increased chemical inputs to remain playable.

Today, turfgrass breeding programs are regularly developing and releasing new grasses, adapted for a variety of environmental conditions and more resistant to a number of diseases. These grasses can and do thrive under less intense management regimes — when properly selected.

The future promises an even wider selection of grasses. Varieties that maintain higher quality with fewer inputs of water and fertilizer and that extend areas of adaptation are already in test plots at a number of universities.

Species that are not thought of today as suitable for golf course use may be the grasses of the future. With the refinement of biotechnology and genetic engineering, combining the characteristics of several species into a single "super species" may someday be possible.

However, the conversion to new grasses will not be fast or universal. In the short term, economic realities will limit the use of new grasses to new developments and golf courses with extensive budgets. Over time, other conversions will occur more slowly, as the need arises.

Whether maintaining new grasses or existing varieties, it is generally accepted that, in the future, management inputs will change significantly. Much of this change will be caused by reductions in available resources, but some will result from alterations in management philosophies and strategies.

Irrigation practices will have to change significantly in the future because quality water for irrigation will be in short supply. While increases in effluent water use will offset some of the loss of potable water, it is unlikely that all courses will have access to such sources. As a result, superintendents will be forced to use available water more intelligently and judiciously.

Many of the pesticides in use today may one day be unavailable or have their use restricted. One result of this will be an increased emphasis on IPM techniques. Available pesticides will still be a part of pest management but will be used in conjunction with other management practices.

Losses in chemical and water resources need not result in a reduction in quality. Instead, compensatory changes in other management practices can optimize turf quality within the framework of a fragile environment.

One example of this principle is fertilization practices based on factors such as turf species, soil characteristics, and turf use, rather than aesthetic perceptions.

Mowing practices can be manipulated to reduce stress, and cultivation programs can be designed to improve rootzone characteristics — all to produce optimum turf quality.

A cause-and-effect relationship exists between individual cultural inputs and turfgrass response. The interaction between several cultural inputs, however, leads to a less direct and far more complex set of responses.

When we thoroughly understand these complex interactions, we can develop strategies to compensate for losses in available inputs or overcome other variances from best agronomic practices.

For example, when we understand the impact of reducing mowing height, we can change other cultural practices to counter these negative effects. By manipulating the whole set of inputs to optimize the health of the plant, we can reduce the need for some chemical applications, thereby softening the impact on the environment.

Many of the negative assumptions about the quality of future golf courses fail to take into account technological improvements. Changes in available inputs must lead to improvements in technology.

Human nature does not usually allow men to simply give up when faced with significant dilemmas. But rather, it is

*The future promises a wider selection of grasses available to the industry. Turfgrass breeding programs are developing grasses better adapted to a variety of environmental conditions.*

more in our nature to find new and better alternatives for what is no longer available, or better ways of using what is still available.

This technological evolution has always been an important part of golf course management. It has become even more important as we deal with the challenges of today and the future.

Where is changing technology taking golf course management? Seeing that available water supplies are shrinking, companies are developing new irrigation systems that offer more precise application. Computerized systems monitor water use and apply water when and where it is needed in more exacting amounts. The result is less water wasted, healthier turf, and no decline in playability.

In the future, these technologies will become even more exact and will be supplemented with new instrumentation. An array of new equipment and techniques — infrared reflectometry is just one example — is under development. Such methods will permit more exact measurement of the grass plant's need for water. Research with this equipment will also determine the exact requirements of specific turfgrass species and cultivars.

The future of pesticides may not be as bleak as many people portray it to be. Certainly, many of the pesticides in use today may not be available in the future. But in all likelihood, they will be replaced with new materials that, in most cases, will bear little similarity to those in use today.

Biological agents will become more important in the future. While the biologicals are still quite new and unproven, new techniques like genetic engineering will eventually lead to the creation of effective materials.

Biotechnology can lead to new agents for pest management. Growth hormones that prevent insect pests from maturing, or genetically engineered viruses that attack and destroy specific pests are only some of the possibilities this new technology offers.

Basic chemical research also offers promise for new pesticide technologies. New families of pesticides that are pest-specific, have extremely low non-target toxicities, and are used at rates measured in fractions of grams of active ingredient per acre will be available in the future.

Fertilizer technology will continue to change. Precision-release materials that more accurately match the growth characteristics of the grass plant will be developed. These materials will provide the plant nutrients directly when needed, allowing for more precise application and less concern about runoff and leaching.

Biotechnology may also play a role in the development of new fertilizers. The day may come when a nitrogen-fixing microorganism will be engineered to affix itself to the roots of the grass plant. These microorganisms will capture nitrogen and provide it to the plant in a usable form as it is needed.

As the need for improvement increases, technology will have a continuing impact on other cultural inputs. New cultivation equipment will allow for more frequent, deeper aerification without disrupting play and resulting in

better rootzones and healthier turf. Whether it involves lasers or new mulching techniques, new mowing equipment will be developed that will eliminate the need for dealing with clippings. The list of possibilities is endless.

New turfgrasses, changes in inputs, and improved technologies are all interrelated. In the extreme, new grasses lead to new input requirements, which in turn drive the search for new technologies. These relationships tend to be direct and additive.

But there is one variable in turfgrass management that is not additive — its impact is much stronger.

That is the role of the course manager. The course manager is the driving force that makes the interactions of species, inputs, and technology work.

Decisions made by a superintendent can have a profound and long-term effect on the quality of a golf course. Correct decisions will result in the development and implementation of the combinations of turfgrasses, practices, and technologies that optimize turf quality and have a positive impact on the environment. Incorrect decisions can result in a decline in playability and potential environmental disaster.

The decision-making process will become increasingly complex. New technologies often mean more complex and more expensive technologies.

Some examples: To understand and operate new, precise irrigation systems, the course manager must have and be comfortable with a computer. Failure to understand the workings of the system will waste, rather than preserve, water resources.

New pesticides will have a short residual life and be highly pest-specific. This means the course manager will have to be able to identify turf pest problems accurately and have a thorough understanding of the factors that affect pest management strategies to obtain satisfactory results.

One thing is certain about changing inputs and improving technologies: They will be more expensive. As a result, course managers will not be able to afford to make mistakes in selecting or using new technologies.

Today and in the future, golf has much to lose if the wrong management decisions are made. The course manager is the vital link between the playing field as a living thing and the game of golf.

The future of the game depends on the ability of course managers to make sound choices in the management of the playing surface. Golf cannot afford under-educated, uninformed turf managers. A commitment to continuing education is crucial to the success of course managers and the game of golf.

Future challenges will require a course manager who is a true professional.

A professional who understands not only the science, but the art of managing a golf course.

A professional who can interpret and use scientific data to make sound management decisions for the betterment of the golf course and the environment.

A professional who understands the beauty of the game and the nuances and the "feel" of the golf course.

A professional who avoids making senseless, irrational changes in a faddish attempt to alter required inputs.

A true professional — one who understands the art and science of golf course management — will be able to provide quality playing conditions within the limitations that will face him in the future.

The professional golf course manager must face the new world with new thinking.

*Innovative maintenance practices developed by golf course superintendents have improved turf quality and reduced pesticide and water use.*

# Getting the Seed Down Right

by JOHN H. FOY
Director, Florida Region, USGA Green Section

IN CENTRAL and South Florida, the use of bentgrasses for winter overseeding of bermudagrass greens has been practiced for the past 10 to 12 years. Also, over the past few years, *Poa trivialis*, either alone or in combination with bentgrass, has gained popularity as an overseeding material for greens on southern golf courses. The main reason for the increasing use of these varieties in overseeding programs throughout the South is the better quality putting surface they can provide.

Back in the "old" days, when perennial ryegrasses were the dominant overseeding material, high seeding rates of 30 to 50 lbs. per 1,000 sq. ft. were commonly practiced. These high rates and a large seed size made uniform application and development of a consistent turf cover relatively easy. However, with the use of much lower seeding rates (3 to 15 lbs. per 1,000 sq. ft.) and the smaller seed size of the bents and *Poa trivialis*, uniform application and stand development can be a problem.

At the Bay Hill Club, in Orlando, Florida, Dwight Kummer and his staff have attached paint guns to their spreaders to help them "see" their application patterns. Bicycle brake handles are located on the handlebar of the spreader so that dotted lines can be put down each time a pass is made across the green. I have observed the successful use of this simple setup at a number of courses in Florida.

A different approach for achieving uniform seed application is used by David Oliver and his staff at Martin Downs Country Club, in Stuart, Florida. They topdress the greens before applying the seed. The wheel tracks made in the sand are used as a guide for ensuring uniform overseeding application. Following seeding of each green, a brushing operation is conducted to work the seed and topdressing into the green surface.

*Paint guns mounted on a spreader with bicycle brake handles and cables provide a simple setup for marking where seed has been applied.*

While the seed application methods I have just described generally provide very good results, skips and overlaps can still occur. This is especially true when windy conditions prevail. This past fall, while on a TAS visit at Royal Oak Country Club, in Titusville, Florida, Superintendent Bob Snapp described a unique method of seed application that has been very successful for him. Mr. Snapp has been practicing a straight *Poa trivialis* overseeding program and has been hydroseeding his greens for the past several years.

The basic setup used is a Hahn sprayer with a centrifugal pump and a number 50 Floodjet nozzle. The only modifications made to the sprayer are removal of the jet agitation bar and screens inside the tank and any screens in the filter housing. Then, 100 to 120 gallons of water, a quart of surfactant, and the seed are put in the tank. Mr. Snapp has found that 60 lbs. of seed per tank is the maximum amount to use to maintain good seed suspension. After all the seed has been added, sufficient water is put in to fill the tank to the 150-gallon mark.

*(Top) At Martin Downs Country Club, in Stuart, Florida, the greens are topdressed first and the wheel tracks of the spreaders are used as guides to achieve uniform seed application. Note that two passes are made at 90-degree angles.*

*(Above) A number 50 Floodjet nozzle is used by Bob Snapp, golf course superintendent at Royal Oak Country Club, in Titusville, Florida, to apply* Poa trivialis *for winter overseeding of bermuda greens.*

Calibration is simply a matter of knowing the area of each green and multiplying that number by the desired seeding rate to determine the total amount of seed to apply. For example, if a seeding rate of 12 pounds per 1,000 sq. ft. is to be used and a 5,000 sq. ft. green is to be seeded, 60 pounds of seed is required. Once the sprayer is loaded with the desired amount of seed, the operator sprays the green surface. Typically, three to four replications are required to empty the sprayer and apply all of the seed.

While this method of application is not completely wind-proof, it is not as affected by the wind as seeding with conventional spreaders. Also, a problem can occur with this hydroseeding method when sharp lines are desired. If a wall-to-wall overseeding program is not practiced, a pre-emergent herbicide treatment must be made to produce sharp lines between the overseeded and non-overseeded areas.

If you have had a problem producing uniform overseeding stands, one of these application methods can be used to "get the seed down right."

# ICE AND SNOW

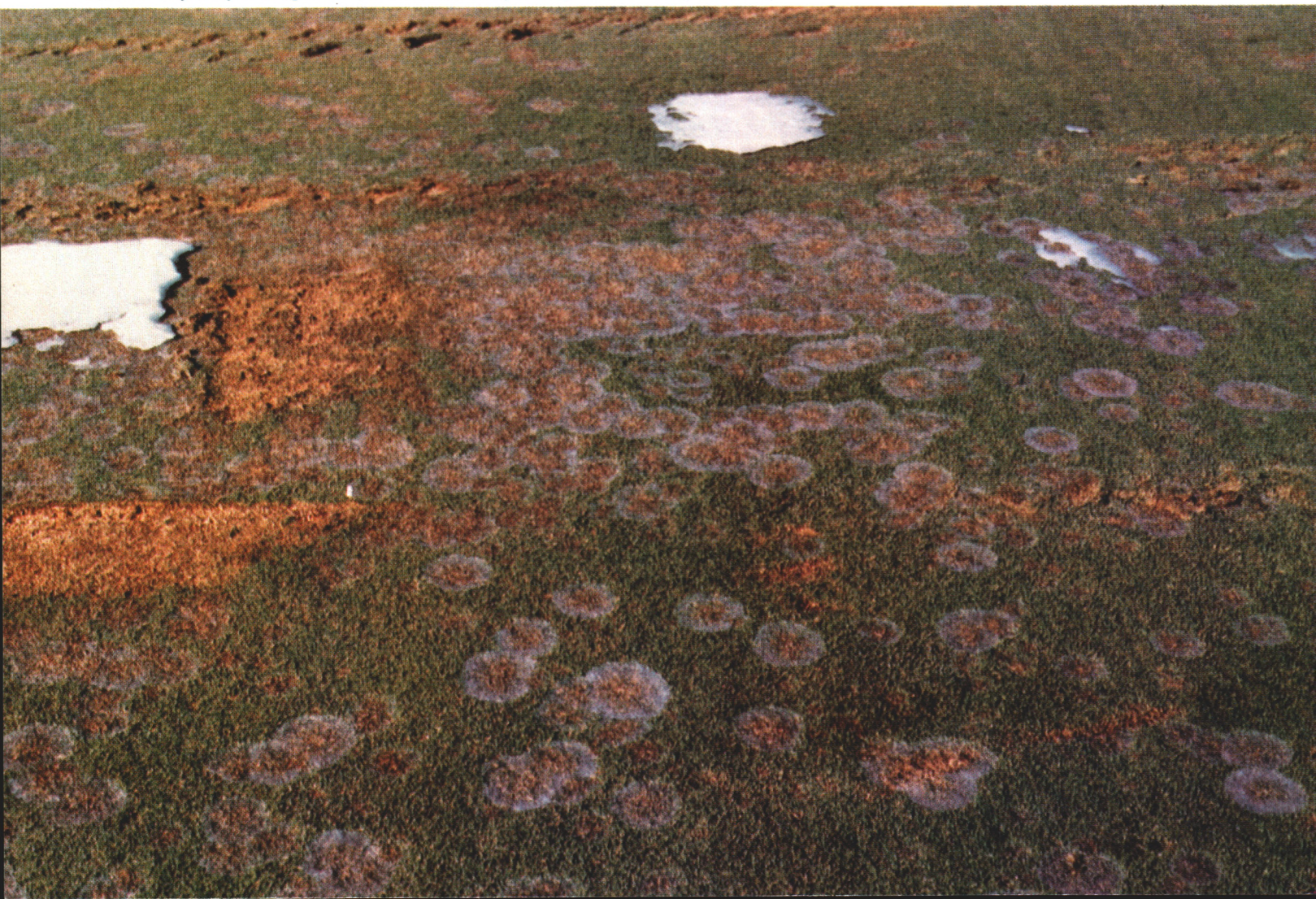
**by TIM P. MORAGHAN**
Agronomist for Championships, USGA Green Section

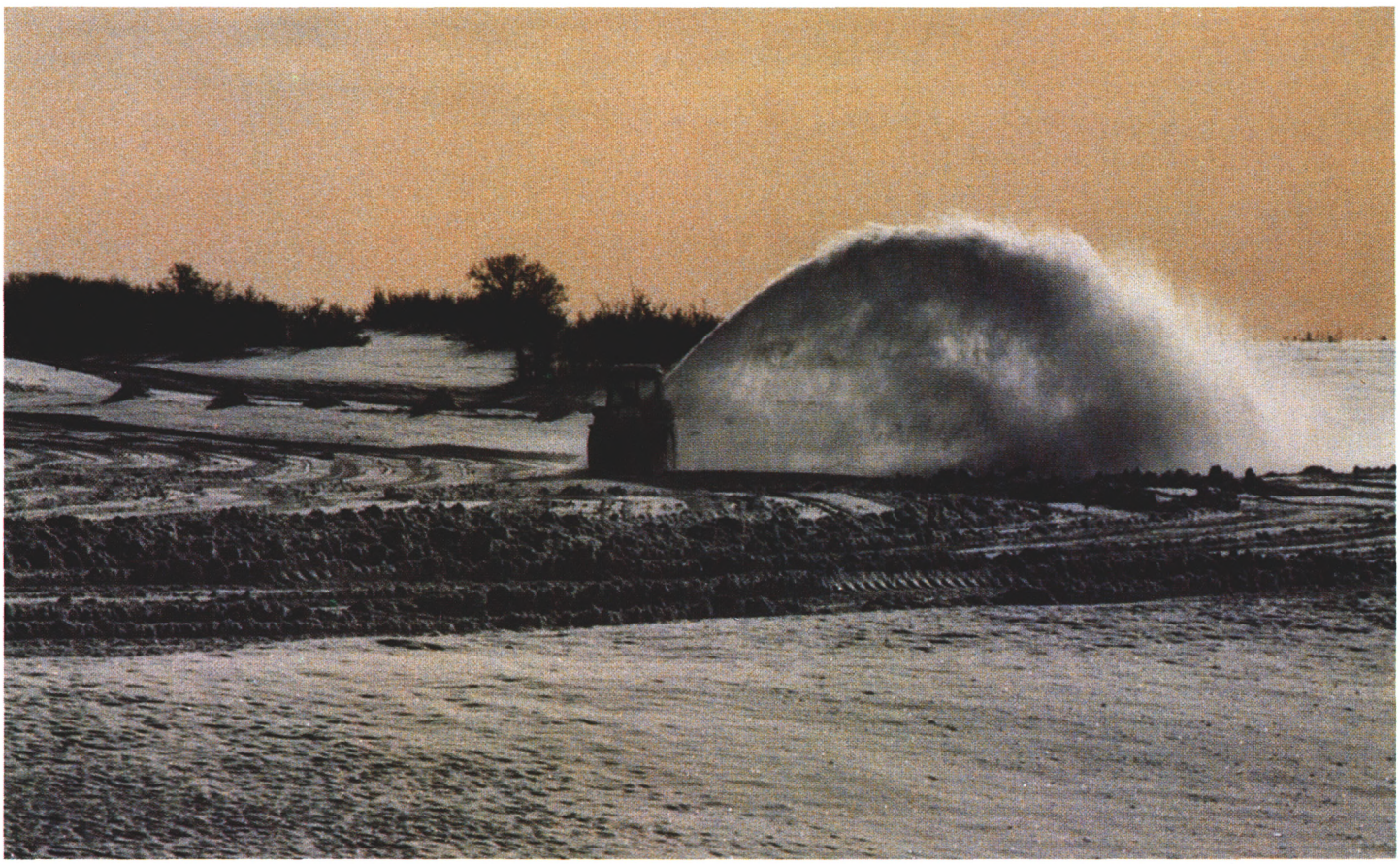
THE ABILITY to be innovative during times of duress is one of the finer attributes in the superintendent's personal arsenal. This character trait came to the forefront for Michael DiBlasi, of Plum Creek Country Club, in Castle Rock, Colorado, last winter. Plum Creek Country Club is an exposed prairie-style golf course with Penncross creeping bentgrass tees, greens, and fairways, surrounded by fine fescue roughgrass. Being an open course at high altitude, Plum Creek is often exposed to Mother Nature's changing temperament in regards to weather.

During November of 1991 the weather had been mild, with warm temperatures prolonging the growing season. Playing conditions were fine, and thoughts to winter disease protection for the turf were in the planning stage. The conditions on November 11 were clear, sunny and 71 degrees. Snow and cold weather seemed remote at this time, and the turf was growing and lush green in color. However, the next day produced a drastic change. An unexpected front moved in, the temperature dropped, and 11 inches of snow fell, covering the golf course with a thick winter blanket and catching Michael's golf course without its usual application of snow mold fungicide.

The hope was that warm temperatures would return and melt away the

*With no frost, no frozen turf, no protective fungicide, and plenty of succulent bentgrass under three feet of snow, pink snow mold had all of the right conditions for activity.*





*An early fall snowstorm in Colorado brought worry about the potential outbreak of snow mold. The quickest way to remove the snow was a snowblower set three inches above the turf.*

snow in short time, and that the preventative fungicide application could be made. But it wasn't to be. The cold temperatures never broke and by New Year's another foot of snow had fallen. The golf course was buried under three feet of snow. No frost, no frozen turf, but plenty of succulent bentgrass under snow without a protective fungicide.

Michael and his staff waited until they could wait no longer. Taking shovels, they proceeded to uncover areas throughout the course to see if disease activity was occurring. To their shock, the spread of pink snow mold was extensive. Not wanting to lose their fine fairway turf in the spring, Michael began to think of ways to remove the three feet of snow — not an easy task when you have 31 acres of fairway turf.

Evaluating the situation, Plum Creek had the advantage of being open and having relatively flat fairways. What would be the quickest way to remove the snow without causing any damage to the turf? Michael thought that if you could use a small snow blower and shovels to clear the putting greens, why not extend the operation to the fairways? Researching this idea, he located and purchased a six-foot-wide tractor-mounted snow blower, and the removal process was underway.

The snow blower was set three inches above turf level to avoid scraping and scalping the high points on the fairways. The operator started in the center of the fairway and moved outward to the edge. When he reached a point where the fairways bowled up, another tractor mounted with a box-blade moved away the remaining snow. The existing layer of snow and ice was made thin enough that the sun could melt it away. By removing the layer of snow, the turf was allowed to dry and freeze. The application of snow mold fungicide could then proceed without worry of additional snow cover.

Michael's innovative thinking saved Plum Creek lost revenue from a delayed opening in the spring and the time spent in renovating and regrassing the fairways. The snowblower was relatively inexpensive and is on hand for future use. To summarize his successful program:

Objective: To remove three feet of snow from 31 acres of fairway turf as quickly and economically as possible.

1. Purchase of a six-foot-wide industrial snowblower — $2,400.
2. Tractor rental for one week — $1,850.
3. No additional labor required; all done in-house.
4. Damage done in the removal process — estimated at 3,100 square feet of sod. Repair to be accomplished in the spring.
5. Snow mold protection applied.
6. Further monitoring of disease progress following future snowfalls.
7. Peace of mind knowing that Plum Creek is prepared for the future.

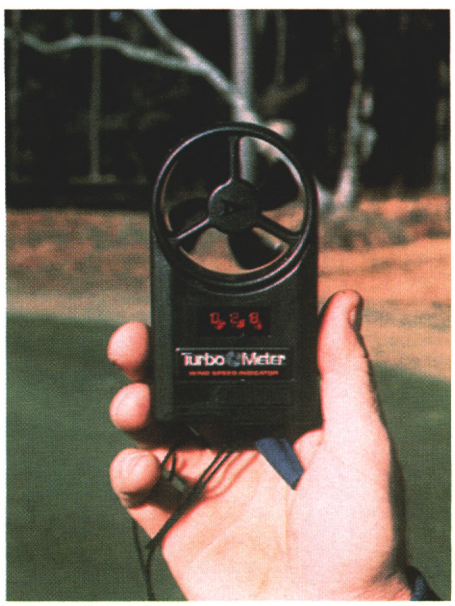
# Measuring Air Movement for Better Grass

**by STANLEY J. ZONTEK**
Director, Mid-Atlantic Region, USGA Green Section

IPM, IPM, IPM. Integrated Pest Management. We have all heard about it many times. Turf managers have practiced some phases of it for years, and more golf course superintendents want to know even more about it so they can grow better grass with fewer chemicals. It all sounds great, and it is, but sometimes IPM programs and practices are difficult for the layman to understand.

The following IPM-related turf tip is not difficult to understand, though. In fact, it is a very easy, inexpensive, explainable, and tangible expression of IPM at work for better turfgrass. What is it?

Let me begin by reminding you of the importance of providing good air circulation for producing less stress, less disease, and better-quality grass. Though air circulation is not so easy to see, it *is* something which is easy to feel.

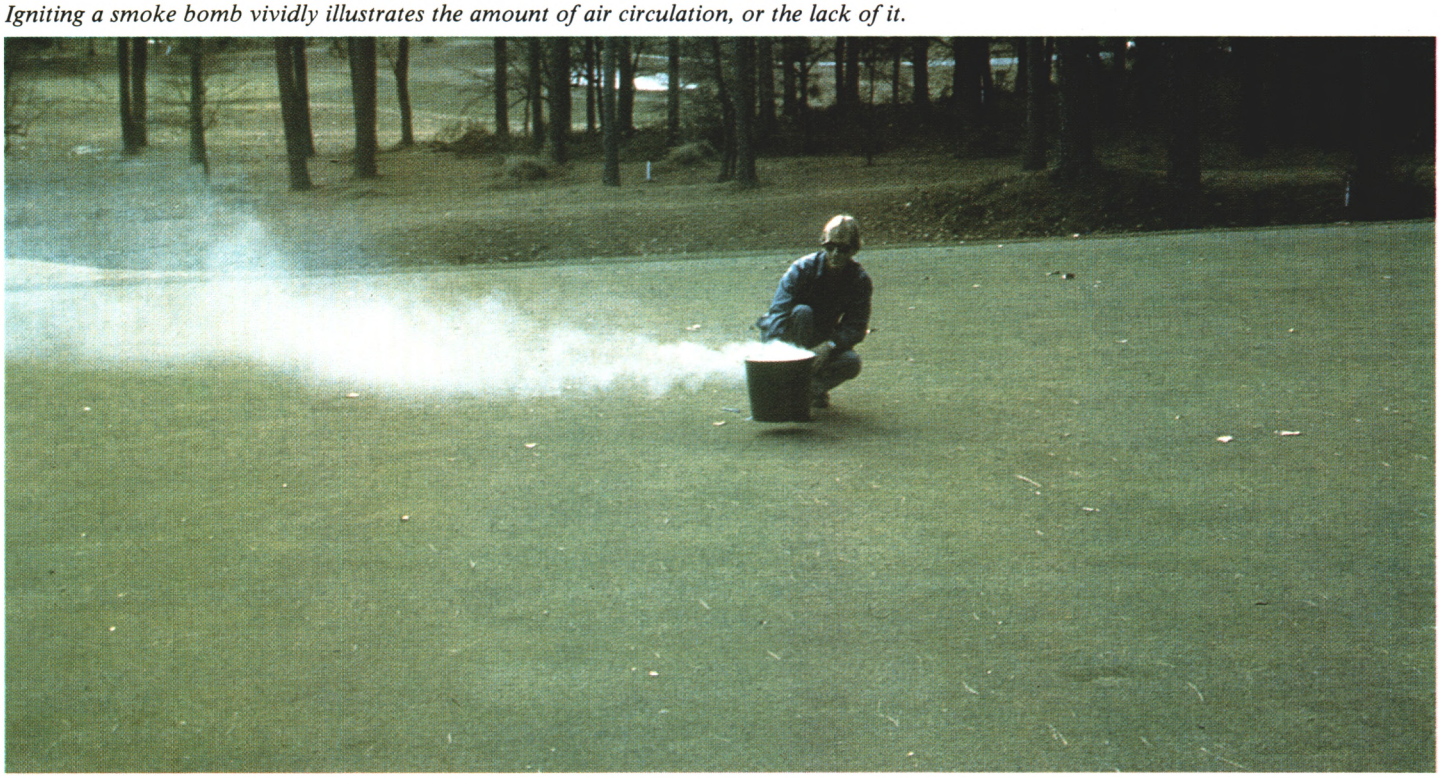



*The Turbo Meter, a handy tool to measure wind velocity. The wind speed is in an easy-to-read, digital format.*

When you walk onto a green or tee in an area with poor air circulation during hot, humid weather, you can feel your body become wet and clammy with perspiration. You start to sweat. Actually, your body may have been perspiring at the same rate before you entered the "pocket," but the cooling moisture your body was giving off was evaporating into the air without you really appreciating it. In a pocket of poor air circulation, this does not happen. You are uncomfortable, but how about the grass?

Actually, much the same is happening with the grass underfoot, but it is probably worse. Air circulation is usually much lower at ground level than it is six feet off the ground. It is hard to imagine a better place for diseases to develop than in a hot, humid pocket with poor air drainage. It is almost like having your own growth chamber —

*Igniting a smoke bomb vividly illustrates the amount of air circulation, or the lack of it.*



not for grass, but for fungi! Diseases such as *Pythium* and *Rhizoctonia* occur in these areas first, and tend to be more severe.

What does all of this mean and how can you use it for better grass on your golf course? My tip involves techniques for actually showing and measuring air circulation or the lack of it.

Several different techniques combine to produce the desired results. One is the Turbo Meter, from Spectrum Technologies of Plainfield, Illinois. Another, air circulation fans, are available from a number of different sources. The final element is the use of a smoke bomb (or similar device) to show actual air movement direction, rather than simply feeling the air movement on your face or measuring it with the Turbo Meter.

The Turbo Meter is often used by Bob Brame, Green Section agronomist, to illustrate air circulation problems during Turf Advisory Service visits in the Mid-Atlantic Region.

The Turbo Meter, air circulation fans, and smoke bombs are all used by the professional staff of the Resorts of Pinehurst, Pinehurst, North Carolina, to grow better grass. In fact, Brad Kocker, Director of Golf Course Maintenance, and Bob Farren, Assistant Director of Golf Course Maintenance, have been so impressed with the effects of fans around their pocketed greens that they will have 62 fans in operation for the 1992 season.

They use the Turbo Meter to help locate the fans so that sufficient air movement is achieved (at least 3 mph). It works. The goals of having better grass, which the golfers *can* see and appreciate, and less disease with less chemicals are achieved.

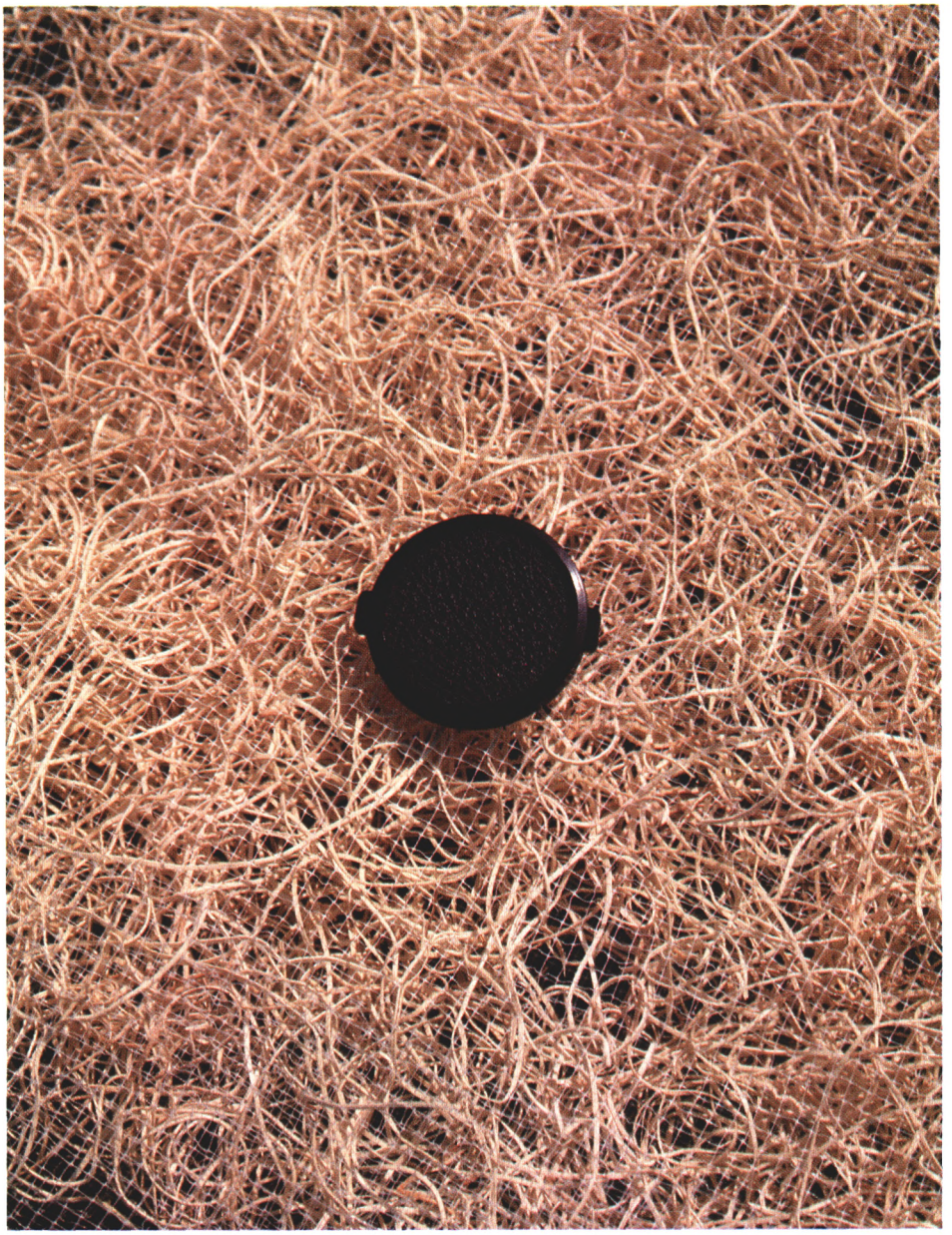
The Turbo Meter, fans, and smoke. It's better than licking your finger and sticking it up in the air!

# EXCELSIOR GREEN COVERS

**by ROBERT C. VAVREK, JR.**
Agronomist, Great Lakes Region,
USGA Green Section

EXCELSIOR is thin, curled wood shavings commonly used as a packing material before the days of bubble-wrap and styrofoam "popcorn." Curlex Greensavers are turf covers made from a layer of aspen wood excelsior loosely held together by fine netting. Similar products are used by landscape contractors as a mulch and to control erosion on new seedings. Excelsior mats are a common sight along steep banks adjacent to highways, sites especially prone to washouts and sheet erosion.

Several superintendents in the Minneapolis/St. Paul area have had good success using excelsior mats as green covers to minimize turf injury caused by wind desiccation and crown hydration during the long Minnesota winters. Unlike the thin geotextile fabrics, the aspen shavings swell when wet to provide a substantial layer of insulation. Once the greens freeze, they tend to remain frozen despite short freeze/thaw cycles that occur during the winter.



*Aspen wood excelsior mats swell when wet, which provides more protection during freeze/thaw cycles than geotextile fabrics.*

*(Above) Excelsior covers protect turf from desiccating winds and encourage early spring green-up.*

*(Right) Excelsior mats are more difficult to handle than geotextile fabrics and require a considerable amount of storage space.*

A potential problem with fabric covers is the greenhouse effect that occurs during the occasional sunny, 40-degree day in January or February. Even though the loose weave of a geotextile "breathes" sufficiently to allow movement of water and air through the cover, several superintendents have noticed that a slight amount of thawing occurs in the upper soil profile on sunny midwinter days.

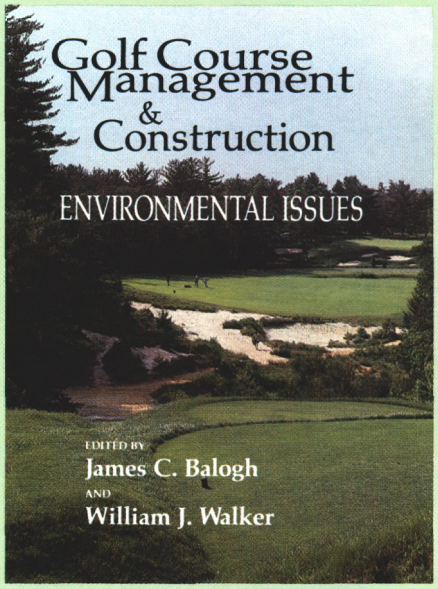
The effect of warming the turf during the day, then quickly cooling it at night is not known, but there is a good chance for turf injury from crown hydration where free water collects on low areas of a green. The crowns (growing points) of the turf absorb water and are severely injured or killed during a rapid drop in temperature. Ice crystals form inside plant cells and rupture cell membranes. *Poa annua* is much more susceptible to this type of winter injury than creeping bentgrass. Unfortunately, *Poa annua* usually dominates the stand of turf in poorly drained areas of the green.

Excelsior covers provide better thermal insulation for the putting surface. The surface of the cover may thaw, but the frost usually remains in the soil. This minimizes the occurrence of freeze/thaw cycles and protects the turf, especially *Poa annua*. This may be a two-edge sword, though. As the percentage of *Poa annua* increases on the greens, so does the potential for losing turf to anthracnose, summer patch, heat stress, etc., during the summer.

Fabric covers can be custom-cut to fit each green. Excelsior mats are supplied in 4 × 100 ft. rolls, so the task of installing and removing the covers is more time consuming and labor intensive. The wood fibers and the netting deteriorate over time and the average life expectancy of a mat is three to five years. Covers that are properly dried before being stored and are handled very carefully last up to seven years. On the other hand, they may only last a year or two if they are stored wet or handled roughly. Proper storage is a must and is a significant cost item to consider before making an investment. Rolled mats take up a considerable amount of space; one superintendent rents seven to nine semi-tractor trailers to store the mats used to cover tees and greens.

In summary, excelsior covers are items to consider in areas where freeze/thaw problems exist. The initial cost of the mats is relatively the same as custom-made fabric covers. They provide a bit more winter protection against crown-hydration winterkill of *Poa annua*. Both types of covers provide protection from desiccating winter wind and stimulate earlier green-up in spring. Whether or not excelsior mats are worth the trouble associated with installation, removal, and storage can only be determined by the superintendent at each golf course.

# NEWS NOTES FOR SPRING




### New Book on Golf Courses and the Environment Announced

*Golf Course Management and Construction: Environmental Issues* — available in May, 1992 — is a comprehensive reference book summarizing the scientific literature on the positive and potentially negative environmental effects of golf courses on surface and ground water quality, wildlife, and wetlands.

The book provides a scientific rather than emotional analysis of the environmental effects of golf courses and should prove invaluable to those debating golf courses and the environment. The book is based on Spectrum Research's (Duluth, Minnesota) review of pertinent scientific literature concerning several of the environmental issues facing golf courses and reported to the USGA's Turfgrass Research Committee two years ago.

The easy-to-read book is divided into chapters, such as wildlife, water use, and pesticide applications, and includes an extensive reference section at the end of each chapter. The book should prove invaluable to anyone interested in the environment and golf courses, including superintendents, architects, green committees, researchers, developers, and regulators.

*Golf Course Management and Construction: Environmental Issues* will be available in May, 1992, for $72.25 (includes shipping and handling) from Lewis Publishers, 2000 Corporate Blvd. NW, Boca Raton, FL 33431, 1-800-272-7737, or the USGA, 908-234-2300.

The book will also be available for review at the U.S. Open Championship at Pebble Beach, June 18-21.

### DONATION FOR TURFGRASS RESEARCH PROGRAM


*Rick Fredericksen (right), President of the Minnesota Golf Course Superintendents Association, presents a check for the benefit of turfgrass research to Jim Snow, National Director and Chairman of the USGA Turfgrass Research Committee. The donation marks the sixth year the MGCSA has contributed to the USGA/GCSAA Turfgrass Research Program. The presentation was made at the GCSAA Conference and Show in New Orleans, Louisiana, in February.*

USGA GREEN SECTION RECORD
MAY/JUNE 1992

# TURF TWISTERS

## FOR HEALTHY TURF

**Question:** We have experienced a very mild winter in the Northeast and the golfers have loved it! What does this mean for turf managers in terms of potential problems in 1992? (New Jersey)

**Answer:** The mild winter may well be a precursor to severe summer problems if the weather is stressful. The soil compaction and turf thinning that occur from winter play on dormant putting green turf tend to encourage establishment of *Poa annua*, crabgrass, and other weeds, and turf root growth will suffer unless corrective soil cultivation is carried out. Thus, with more *Poa annua* and weaker rooting, 1992 may be a tough year for golf course superintendents wherever winter play on dormant turf was heavy.

## INCREASE AIR MOVEMENT

**Question:** I continue to hear about the importance of air movement for the growth of strong, healthy golf course turf. How much air movement is needed to prevent stagnant air causing stress to the turf? (West Virginia)

**Answer:** Experience has shown that a 3 mph breeze is enough to reduce stress on the turf. Stress is more significant in stagnant, pocketed areas on the golf course. Selectively removing trees and clearing underbrush can help increase air movement in pocketed locations. In areas where the trees and underbrush cannot, or will not, be removed, fans are successfully being used to increase air movement.

## ACROSS GREENS

**Question:** During the peak of our summer season, the only green that fails to sustain complete turf cover is the practice putting green. Short of closing it every other day to reduce the amount of foot traffic, is there anything else we can do? (Arizona)

**Answer:** If the root of the problem is foot traffic, as opposed to a nutrient deficiency or fungal attack, encourage golfers to practice in soft-soled street shoes. As a point of reference, the practice greens at several USGA championships have been closed to all spiked golf shoes to preserve good quality putting conditions.