USGA® GREEN SECTION

Record

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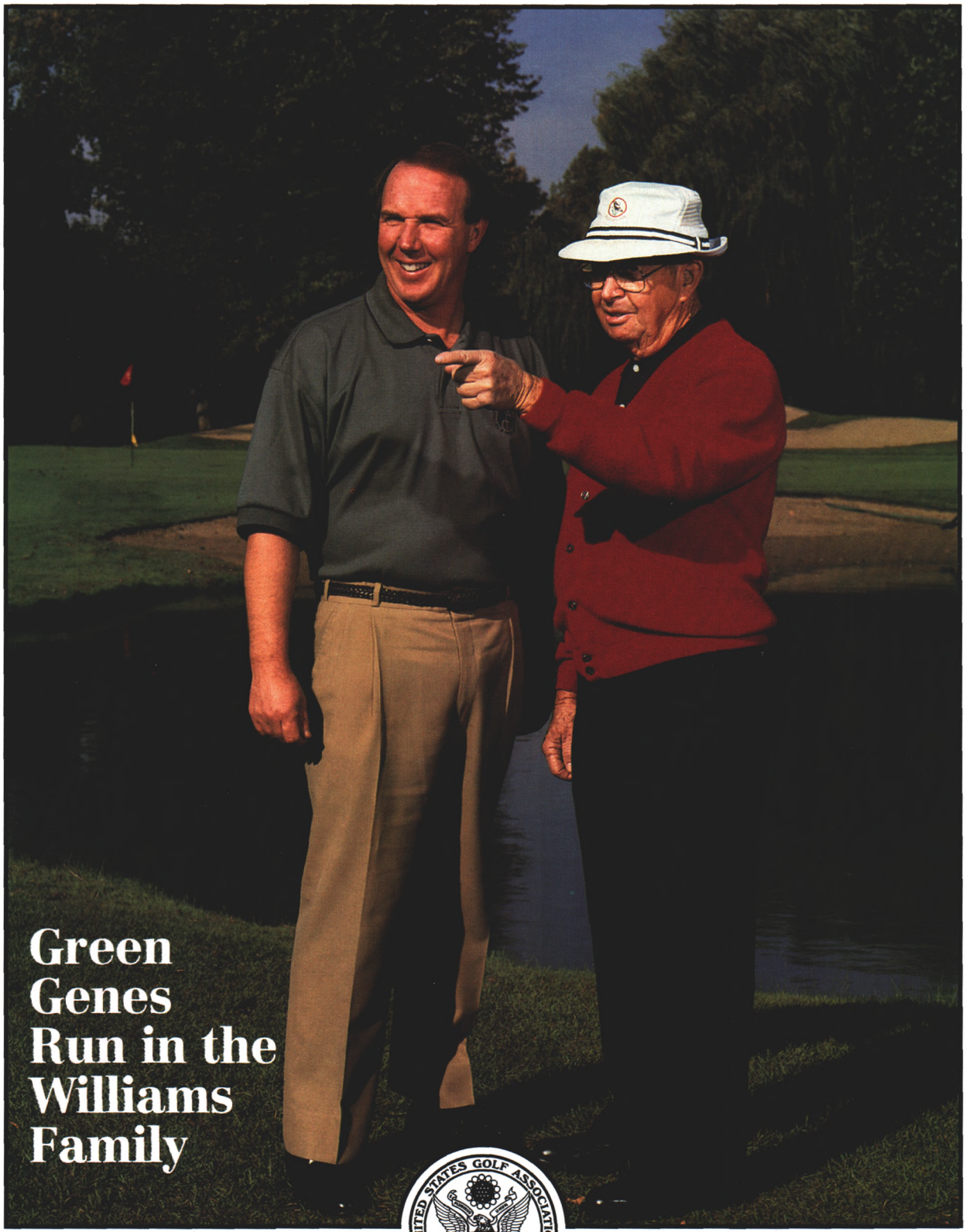


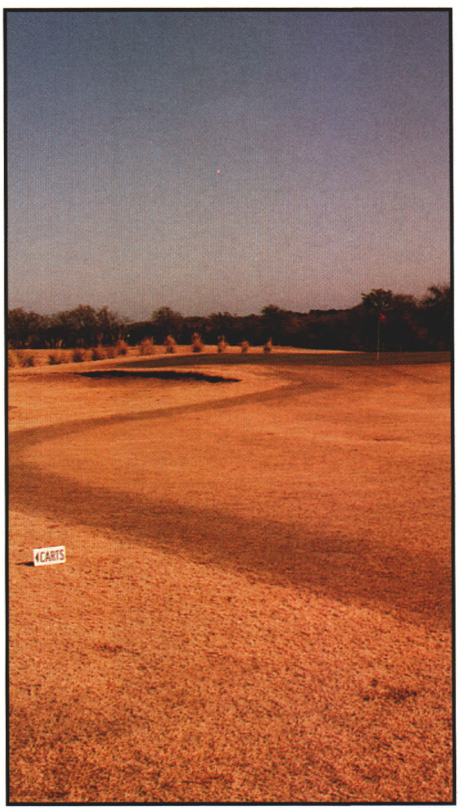
Green Genes Run in the Williams Family

A PUBLICATION ON TURFGRASS MANAGEMENT BY THE UNITED STATES GOLF ASSOCIATION®

MAY/JUNE 1996
Volume 34, Number 3

Cover Photo: Bob Williams (right) served as a mentor for many golf course superintendents, including his son Bruce, current president of the Golf Course Superintendents Association of America.
PHOTO COURTESY OF GCSAA

Bob Williams, 1996 Green Section Award Recipient.



Using dye is one method to help define dormant fairways during the winter (page 30).

USGA® GREEN SECTION
Record

ROBERT M. WILLIAMS — 1996 Green Section Award Recipient

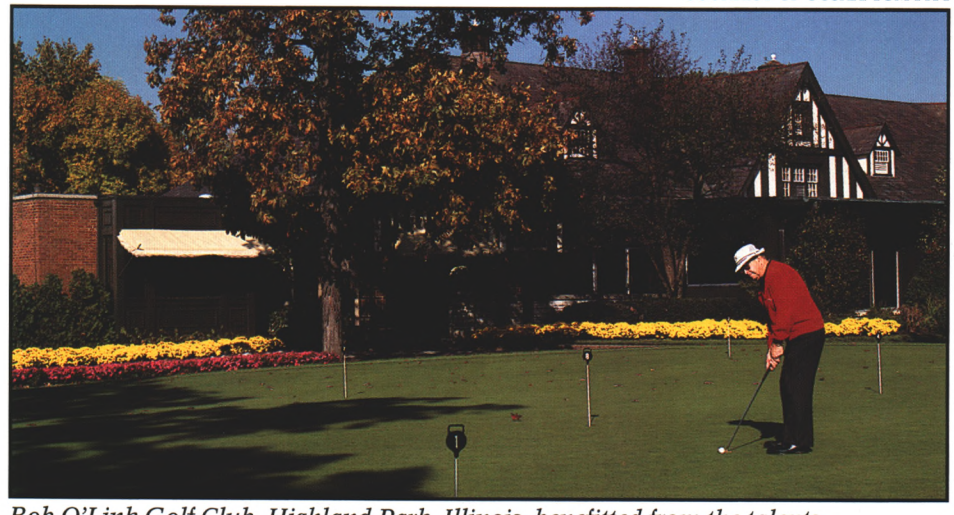
Robert M. (Bob) Williams, retired golf course superintendent of the Bob O'Link Golf Club in Highland Park, Illinois, has been selected as the recipient of the 1996 USGA Green Section Award. Granted by a distinguished panel of experts, this annual award recognizes persons for distinguished contributions to golf through work with turfgrass. Williams received the award in February during the Golf Course Superintendents Association of America (GCSAA) Conference in Orlando, Florida.

"This is truly the ultimate recognition from the ultimate body in all of golf. I only hope I have given as much to golf as golf has meant to me," Williams said during his acceptance speech. "This award, originating in 1961, has recognized 36 individuals. Ten of these recipients are golf course superintendents. Now considering that 1995 was surely the most difficult turfgrass growing year of all time, I feel that every one of my fellow superintendents has earned a piece of this plaque. Thus, I want to share this recognition with all superintendents and express our combined gratitude to the USGA Green Section."

Williams' professional career began back in 1926 at just 12 years of age. That year, he became a student trainee at Bellaire Country Club in Wauconda, Illinois. His hard work propelled him to become the club's superintendent by the time he turned 18. He remained in the post until becoming the assistant superintendent at Medinah Country Club in Chicago in 1938, then later at The Ohio State University golf courses in 1941.

World War II interrupted his stint at Ohio State. Williams entered the army as a private in 1942, and received his discharge as a full captain in 1945 after service in the combat engineering corps in the European theater. After the war, he rejoined the Ohio State courses, then departed in 1947 to become superintendent at the Beverly Country Club in Chicago. He held that position until undertaking a similar role at Bob O'Link Golf Club in 1958. He remained at Bob O'Link until his retirement in 1979, when he was succeeded by his son, Bruce.

COURTESY OF GCSAA/TOM PITT



Bob O'Link Golf Club, Highland Park, Illinois, benefitted from the talents of Bob Williams beginning in 1958 until his retirement in 1979, when he was succeeded by his son, Bruce.

Throughout these years, Williams assumed leadership positions in local, state, and national industry associations. His service culminated with his election as president of GCSAA in 1958. He implemented many programs during his GCSAA tenure, including several promotional activities that led to wider recognition of the organization.

These activities did not preclude Williams from initiating other innovations in the turfgrass field. Among these efforts were his design and construction of one of the first customized, automatic irrigation systems at Bob O'Link; his formulation of one of the first three-nozzle, tractor-mounted boom sprayers for golf courses; his service as a teacher and mentor to more than 90 students and apprentice superintendents who have gone on to become professional leaders; and his preparation and delivery of many articles and speeches around the world as a tireless spokesman on behalf of golf course maintenance.

Williams has actively supported a number of USGA Green Section initiatives. He has contributed many articles to the *Green Section Record*; served on the review committee for the first edition of *Turf Management for Golf Courses*, the definitive text on the subject by Dr. James B. Beard and the staff of the USGA Green Section; and remained an early and enthusiastic proponent of the Green Section's Turf Advisory Service.

The nomination of Bob Williams for the 1996 Green Section Award received widespread and enthusiastic support from many people in the industry. Gary T. Grigg, immediate past president of the GCSAA, wrote: "Bob Williams truly exemplifies the spirit of the USGA Green Section Award. His lifetime contributions, particularly his commitment to professionalism, put him first among many you could consider for the 1996 award."

Perhaps the most heartfelt tribute came from his son and successor, Bruce, who has also followed in his father's footsteps to become the current president of GCSAA during the Orlando meeting. Bruce wrote: "I realize that I am perhaps more than a little biased, but I, too, believe he is a very deserving recipient. As one of many young superintendents who learned at his feet, I can attest to his skills, his commitment, and his love for the game of golf and the profession. He's also one heck of a dad."

Golf Course Management: Past, Present, and Future

February 11, 1996, Orlando, Florida

FOR THE 15TH 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 750 people attended the Green Section's program on Sunday, February 11, at the Orange County Convention Center. Thomas W. Chisholm, Chairman of the Green Section and member of the USGA Executive Committee, welcomed the group, and James T. Snow, National Director of the USGA Green Section, served as moderator for the afternoon's program of 13 speakers who addressed this year's theme, "Golf Course Management: Past, Present, and Future."

BACK TO BASICS

A brief look through history confirms that many things have stayed the same.

by JAMES M. LATHAM

FIFTY years ago, some professional golfers threatened to boycott the United States Open Championship because the total purse was to be only $8,000, while $100,000 of the anticipated $150,000 gate receipts was earmarked for turf research. They just couldn't understand the need. The Open prizes are significantly higher this year, but so is the fund for turfgrass and environmental research — nearly $1.4 million to support 42 projects at 22 universities, and that does not include expenditures by the GCSAA and state and regional organizations.

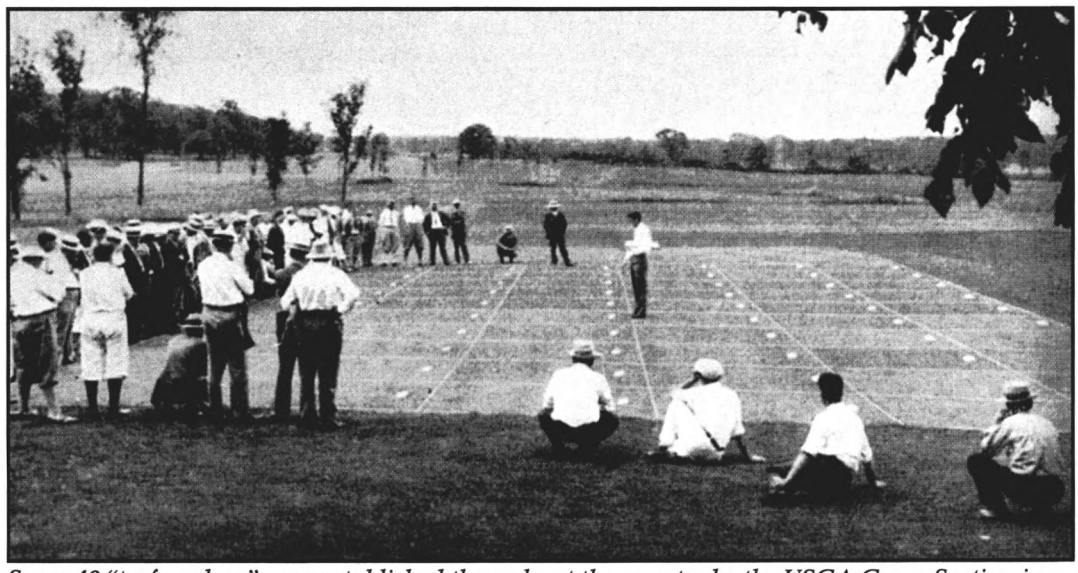
The correspondence, publications, and reports in the USGA Green Section files show that very few of our concerns today are truly new. For example, in the spring of 1921 the Brae Burn Country Club of Massachusetts sent notices to its members, asking them to "discontinue the use of the old hob-nailed golfing shoe, which injures both the greens and the clubhouse floors" and recommended "the use of rubber soles and pads." This note was contained in a newspaper article announcing the formation of a Green Section Committee of the Massachusetts Golf Association, following the lead of the USGA.

James M. Latham

The recent clamor about space-age technology in golf equipment is not exactly a new concern, either. A book published in England by M.H.F. Sutton in about 1912 deplored the development of the rubber golf ball, because its increased distance might make golf courses of the day obsolete. By 1919, someone suggested that golf balls be submitted to the U.S. Bureau of Standards for testing, but that's about as far as that idea went.

The Olcott turf garden in Connecticut, established about 1885, was the first collection of high-quality fescues and bentgrasses in the U.S. The garden was moved to Philadelphia by Fred Taylor in the early teens. Many other overlooked turfgrass investigations were underway in the South at about the same time. Correspondence between Leonard Tufts of Pinehurst and Dr. C. V. Piper of the U.S. Department of Agriculture indicates that a "German experimenter" had been hired before 1900,

at the suggestion of landscape architect Frederick Law Olmstead, to study grasses and plants suited to the Pinehurst area. He stayed "a good number of years," but achieved few positive results as far as turfgrasses were concerned. He found that bermudagrass and Texas bluegrass were the only species that would survive the summers, provided that they were watered and fertilized. Survival did not equate to golf turf quality, though, for Mr. Tufts commented, "Well-known golfers said that it would be better to keep the fairways clear of grass and just keep the sand smooth by use of a roller." Some observations on turf-type grasses were made at USDA stations in Biloxi, Mississippi, and New London, Ohio, about 1910, through the efforts of Drs. C. V. Piper and R. A. Oakley. The Ohio test included limed and unlimed plots.



Some 40 "turf gardens" were established throughout the country by the USGA Green Section in the 1920s to test grasses and fertilizers in every climatic zone. They provided excellent learning experiences for local greenkeepers and course officials. This is a summer meeting of green committeemen and greenkeepers at the Midwest setup on the Lasker estate, north of Chicago, in 1931.

At least 10 years before the birth of the Green Section in 1920, Drs. Piper and Oakley were engaged in trying to help produce satisfactory golf course turf. They responded to inquiries on turf-type grasses and soils even though their primary duties involved forage crops. There was considerable communication in 1911 between Piper and Hugh I. Wilson during the construction of the golf courses at the Merion Cricket Club. Construction costs, incidentally, were $30,000 for the West Course and $45,000 for the East Course. Loss of turf on several greens in 1913 was originally blamed on poor drainage, but in later years Piper thought the real cause was brown patch, aggravated by poor drainage.

Most of the bentgrass greens of that era were planted with seed imported from Germany. While only about 2½% of the seed produced creeping types, they became predominant in a few years, crowding out the less vigorous or poorly adapted colonial and velvet bentgrass plants. Piper and Oakley began selecting attractive plants that showed some resistance to large brown patch (*Rhizoctonia solani*), a devastating plague during prime playing weather in the summer. From more than 100 selections, four showed resistance — not immunity — and were named Washington, Virginia, Metropolitan, and Revere.

Resistance was narrow, however, since small brown patch (now known as dollar spot), which had been identified as *Colletotrichum cereale*, in 1917 attacked the so-called resistant selections and continued to wreak havoc. This confirmed the need for cultural and/or chemical disease control procedures.

The only chemical treatment at the time was Bordeaux mixture, a blend of copper sulfate and lime. The lime helped to reduce the toxicity of copper, but the high frequency of application required for disease suppression eventually created problems. During brown patch weather, Bordeaux had to be applied after every rain or irrigation — daily, if necessary. It suppressed *Rhizoctonia* but had little effect on *Colletotrichum*.

Copper toxicity was aggravated by weed control procedures of that era. Soils having a pH level between 4.0 and 5.0 were essentially free of crabgrass, goosegrass, and some other weeds, but it also increased copper solubility. It was not until after heavy disease pressure during the hot, wet summer of 1928 that the Green Section recanted the acid soil theory of weed control.

Cultural suppression of brown patch included good surface and subsurface drainage, dew removal, and early morning irrigation. Topdressing with high-quality compost was a recommended practice, but it could not be linked with disease activity.

In 1924, the DuPont Corporation introduced Semesan, a chlorophenol mercury compound, which gave good control of both brown patch fungi but was quite expensive. Dr. John Monteith, a USDA plant pathologist working at the University of Wisconsin, began testing other forms of mercury and found that almost any formulation had fungicidal properties. From his work came an inexpensive combination of mercurous and mercuric chlorides that became the standard in turfgrass disease control that we came to know as Mallinckrodt's CaloClor or Woodbridge Mixture.

Strangely, mercuric chloride had been a useful tool on golf courses since 1921 or before, as an earthworm eradicant. In one test, Piper applied it at 4 oz. mixed with 25 lbs. of sand per 1,000 ft.^{2} and watered it in. He got 200 earthworms out of an 8 ft.^{2} plot. The fungicidal properties of mercuric chloride were not recognized until a few years later in research work by Monteith.

Grubs were another prime problem because of their root-feeding habit as well as the mounds of castings they produced. Until the discovery of lead arsenate's effectiveness by Leach in the late 1920s, the only controls dealt with treating individual holes with a kerosene emulsion, carbon disulfide, sodium cyanide, and even poking the hole with a steel rod. Often, grub control amounted to plowing the soil and picking the grubs by hand. Light traps, using one kerosene lantern per acre, was suggested, but tending some 150 or 200 of them every day was unthinkable.

Mole crickets were serious pests on southern golf courses and were so noted in Volume I of *The Bulletin of the USGA Green Section* in 1921. One control was to spread burlap bags on the grass in the afternoon and then pick up the crickets the next morning. Light traps were ineffective. Chemical control consisted of a bait composed of a 3% Paris green-wheat flour mixture.

Weed control efforts were equally difficult. Hand picking was common. The chemical method to get rid of dandelions and plantain was to dip a sharp stick into sulfuric acid and stab the weed right in the heart. Fred Grau's first employment with the USGA came in the late 1920s and early 1930s when he put out weed control plots while a graduate student at the University of Maryland. Unfortunately, his work and much other research were curtailed by lack of funds during the Depression. The research showed the value of sodium arsenate, sodium chlorate, and other chemicals as post-emergence herbicides. They were non-selective, but the desired species usually recovered. The grub killer, lead arsenate, became the first effective pre-emergence control for crabgrass, goosegrass, and *Poa annua*.

Much of the Green Section's basic research was conducted at the USDA's Arlington, Virginia, farm until 1939, when it was displaced by the Pentagon building. After that, the research work was done at Beltsville, Maryland. It was not until after 1950 that the Green Section phased out conducting research and began its broad program of funding research at state experiment stations.

The Green Section philosophy from the outset, however, has been to encourage research in every climatic zone in the U.S., and to a limited extent, in Canada. Soon after the USGA and USDA formalized their cooperation in 1923, a grant of $300 from the USGA was made to the University of Florida at Gainesville to study grass species adaptable to southern lawns and golf courses. This work was extended to closely cut turf about 1926, when a greens mower was sent to the university. The grant was increased to $900 and a graduate student was hired to tend the plots. The test involved three different soils, four water and fertilizer treatments, and six grasses. The student, A. S. Laird, wrote his master's thesis on the rooting depth of grasses under these treatments and became, perhaps, the first recorded student to receive an advanced degree under a USGA grant.

Other grants went to the University of Minnesota in 1924, Nebraska and Kansas in 1925, two grants to New Jersey in 1926, and Massachusetts and Stanford in 1928. Also in 1928, $1,000 was appropriated to establish a major project at the Lasker Estate near Chicago, with additional funding from the Chicago District Golf Association and the Chicago Green Section Committee. The Chicago plots had to be abandoned during the Depression despite the efforts of the Associations and Herb Graffis, editor of *Golfdom* magazine.

The predominant putting green grass in the South was called Atlanta bermudagrass. It was a fairly fine-leafed selection from common bermudagrass, propagated vegetatively. Information on its origin has not been found, but it was in use by 1923. Its true quality is questionable, though, since Bobby Jones once recommended that a golfer should never concede a 6-inch putt on bermudagrass greens.

Little thought was given (at least in writing) to fairway turf, except that fescues predominated in the Northeast, probably because little fertilizer or irrigation was used. Apparently, Kentucky bluegrass was used in the Midwest, and bermudagrass, carpetgrass, bahiagrass, and some centipedegrass was planted farther south.

Winter overseeding of greens in the South prompted tests at the University of Florida in 1927. The grasses used were redtop, Kentucky bluegrass, bulbous bluegrass, and English, Italian, and Westerworth's ryegrasses.

Bentgrass and bermudagrass were not the only species used on greens, either. Redtop was a component of most seed mixtures. Bluegrass was not uncommon, and at least one course in Wisconsin had greens planted to clover by a couple of Scots who built a private course for a lumber baron named Stout in 1920.

Experimentation in composting, soil mixtures, and fertility became more widespread in the 1920s. Each of the 40 experimental greens set out on golf courses and experiment stations by the Green Section compared nine grasses with an overlay of ten fertilizers across the different grass selections.

Technically, much of the early work was in the nature of observation and demonstration. Replicated field plot systems are not mentioned in early reports, but some greenhouse projects were replicated. Whether or not they were statistically analyzed is unknown.

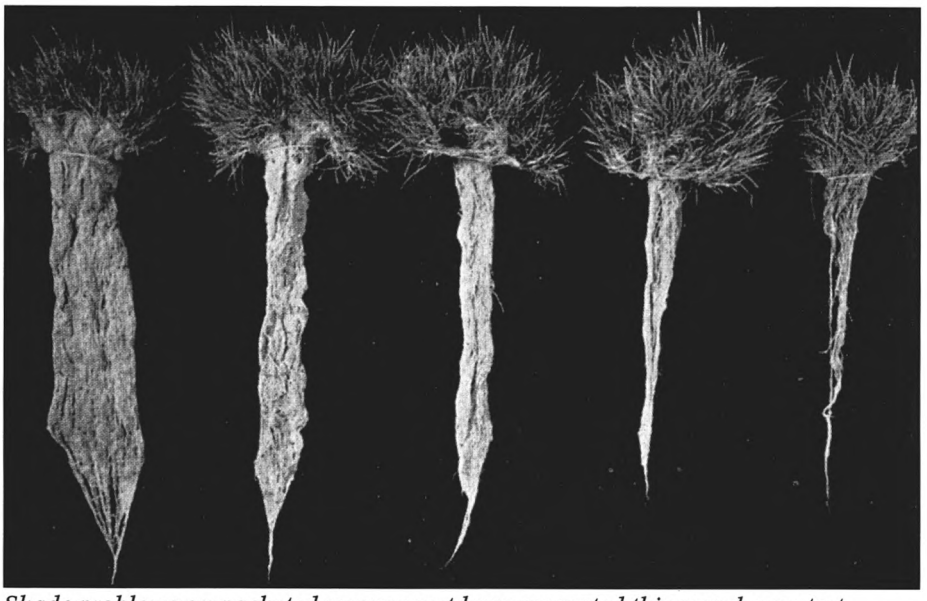
Perhaps the most far-reaching single piece of Green Section research was done in the early 1940s while plant pathologist Dr. Fannie Fern Davis was investigating the effect of plant growth hormones on turfgrasses. From her work came 2,4-D, which opened the door to a new chemistry in herbicide research. The popular press at the time hailed 2,4-D as a means of reducing hay fever distress caused by ragweed.

Emphasis on the environment is not new, either. The November 1921 *Bulletin* contains an article on attracting birds to golf courses by W. L. McAtee of the U.S. Biological Survey and Washington Golf and Country Club. In the October 1925 issue is an article entitled "Native Trees, Shrubs, and Flowers for Golf Courses," plus a list of publications on attracting birds to the golf course. McAtee also wrote a series of articles on individual bird species for *The Bulletin* in 1926, 1927, and 1928. The entire May 1930 issue was devoted to birds on golf courses, and included an excellent article by Arthur A. Allen of the National Audubon Society, who recommended reading their 64-page book entitled *Golf Clubs as Bird Sanctuaries*. He also announced that the Golf Club Bird-Sanctuary Committee of the National Audubon Societies had inaugurated its project that year in New York State.

There have been several side effects of turfgrass research. John Monteith's work on disease control went well beyond the use of mercurials, to include malachite green dye. It was used to produce green turf at Philadelphia Stadium for the Army-Navy football game in 1939. Everyone was pleasantly surprised that the player's uniforms retained their original color throughout the game.

There are other current practices and products that are not new or original. An article on the effect of rolling greens, written by Dr. W. S. Harban, appeared in *The Bulletin* in 1922. He determined that rolling to smooth putting surfaces applied less compactive force than a man's heel.

The localized dry spots we blame on sandy soil mixes and other factors were first publicized by Monteith on California greens in 1933. He believed localized dry spots were caused by a



Shade problems on pocketed greens must have prompted this greenhouse test on uncut velvet bentgrass in 1933. From left to right: Exposure to sunlight all day, sunlight in morning only, sunlight in afternoon only, speckled sunlight all day, and shade all day.

soil-inhabiting fungus that did not grow in a ring form.

Zoysiagrasses were often included in turf tests in the 1920s. One article in 1931 suggested that the Korean lawn grass, or *Zoysia matrella*, be called camel grass due to its humpy growth pattern.

Biological control efforts are not new. The bacterial control of Japanese beetle grub was marketed in 1939. At the same time, some research involved the use of nematodes as another means of controlling insects.

Post-World War II developments came rapidly. Fine-textured bermudagrasses were found in old evaluation plots at the Bayshore Country Club in Miami, Florida, which had not been maintained for several years, and were thought to be natural hybrids between *Cynodon transvaalensis* and *C. dactylon*. The Everglades, Bayshore, and Gene Tift selections were used on southern greens for many years. The Tifton hybrids came along by the mid-1950s, shortly before the official release of Penncross bentgrass by Penn State University. Meyer zoysiagrass became available during this period, as did Merion Kentucky bluegrass. These developments gave the Green Section staff the impetus to study blending the new cool- and warm-season grasses to produce year-round green turf in the mid-latitudes.

Decentralization of research was difficult to achieve. Golf course personnel were extremely interested, but could not be adequately controlled. They went beyond the bounds of specified procedure in an effort to keep *all* the plots looking good. Experiment station staff were just the opposite. Most of them worked in forage crops and simply were not interested in maintaining golf course or even lawn quality turf in the plots. Dr. Fred Grau became Director of the Green Section in 1945, and continued the effort to decentralize research. He followed the pattern of his predecessors, but his goal was to use the funds for scholarships to train scientists in turfgrass management. As a result, the first doctorate degree in turfgrass management was earned by Dr. Jim Watson at Penn State.

The resistance to turfgrass work at experiment stations was gradually eliminated beginning in 1946 by a two-man team of missionaries — Fred Grau of the Green Section and O. J. Noer, who was agronomist for Milorganite and a dedicated member of the Green Section Committee. Grau had the prestige of the USGA and state golf associations behind him, and Noer knew most of the leading superintendents all over the country, as well as the businessmen in the turf supply business, from the manufacturing level to the local distributor. This united front brought the turf industry's concerns to the directors of experiment stations as well as the scientists who would do the work. The key was to inform the administrations that any golf turf investigation would benefit anyone interested in better turf for lawns, athletic fields, highway roadsides, and airport runways, and anywhere sod-forming, erosion-resistant ground cover was needed.

This point was best said by sports editor George White in the January 26, 1947, issue of the *Dallas Morning News*: "One of these days, the plain citizen, your neighbor and mine here and all over the country who takes pride in the quality and beauty of his lawn, is going to owe a debt of gratitude to sport, particularly golf. The reason is that the gradually expanding program of . . . the United States Golf Association, is going to make turf better everywhere . . . you look whether in a small park, a school campus, football field, cemetery, or your own home lawn." He was reporting on the first Texas Turf Conference held in December 1946.

Putting Greens

Interest in the physical characteristics of putting green soil dates back as far as records go, but little scientific effort was put into it. Combinations of good topsoil, high-quality compost, and sand produced good, well-drained greens. The elevated height of cut used at that time permitted greater surface slope, so most of the drainage went off the surface, not through the profile.

It was not until the late 1940s that intensive research began on putting green soils. Preliminary work began with Gorman at Oklahoma A&M and Davis at Ohio State, who identified, among other things, the mechanical and physical differences in the soils of *good* and *bad* greens. The subsequent work at Texas A&M provided the necessary information on how to produce compaction-resistant growing media for greens.

Improvements in growing media have evolved over time, the same as in every phase of turfgrass maintenance — the fertilizers, the chemicals used for plant protection and the control of undesirable plants, the turf care equipment, the irrigation systems, *and* the knowledge of the people who manage all turfed areas today. While there are actually few new "discoveries," evolution in the industry will continue even though we are unlikely to achieve the perfection desired by those who use the product.

JIM LATHAM *retired in 1994 after ten years as director of the Great Lakes Region of the USGA Green Section.*

One of the most popular annual features of the Education Conference is the Best Turf Tips. This year, 10 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 1995. The Turf Tips appear throughout this issue.

THE MAGIC OF SULFUR

Water has more influence on golf turf than any other single factor.

by PATRICK M. O'BRIEN

THE OCEAN COURSE at Kiawah Island, famous for hosting the 1991 Ryder Cup matches, has something new — a sulfurous generator to help improve their irrigation water. The Ocean Course is located along a two-and-a-half-mile stretch of beachfront next to the Atlantic Ocean. The deep well water, which is supplemented by effluent and recycled water for irrigation, has a strong taste of the sea. The bicarbonates are more than 1,000 parts per million, the soluble salts are more than 1,500 parts per million, and the SAR is extremely high. George Frye, Director of Golf Course Maintenance, says, "It is a worst-case scenario to irrigate the turf with this poor-quality well water." The well water accounts for approximately 75% of the total irrigation water.

Effects of Poor Water Quality

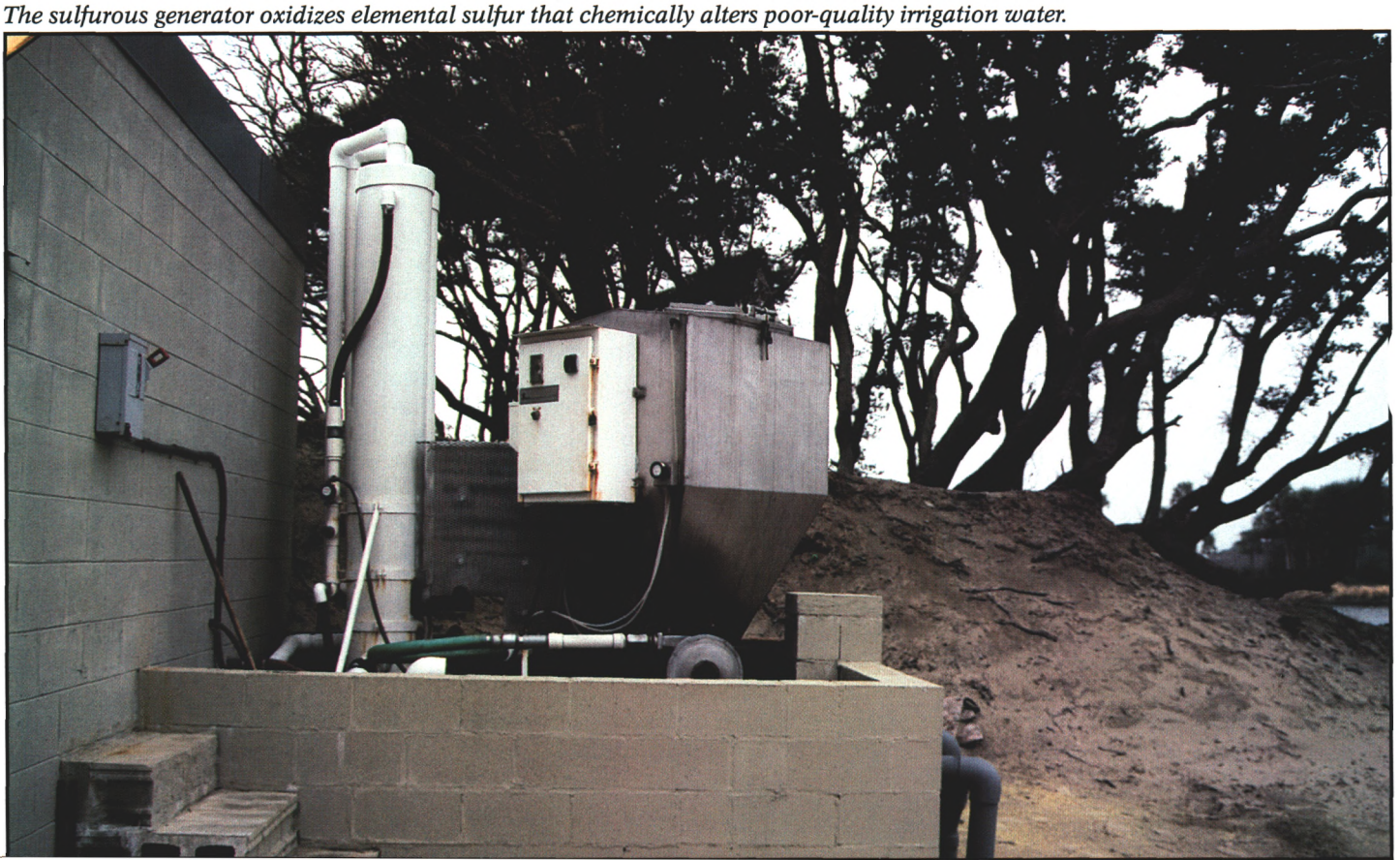
Before using the sulfurous generator, the turf at The Ocean Course was difficult to manage. To negate the effects of poor water, Frye relied on frequent applications of gypsum, sul-po-mag, ammonium sulfate, and other soil amendments. Despite this intensive soil amendment program, sodic soil conditions developed and turf quality suffered.

As time progressed, Frye's problems, and not his turf, continued to grow. Typically, elevated sodium levels in the soil restrict root uptake of water and nutrients and, if high enough, can cause direct injury to the roots. To complicate matters further, high sodium levels can displace mineral and organic colloids and can lead to anaerobic conditions.

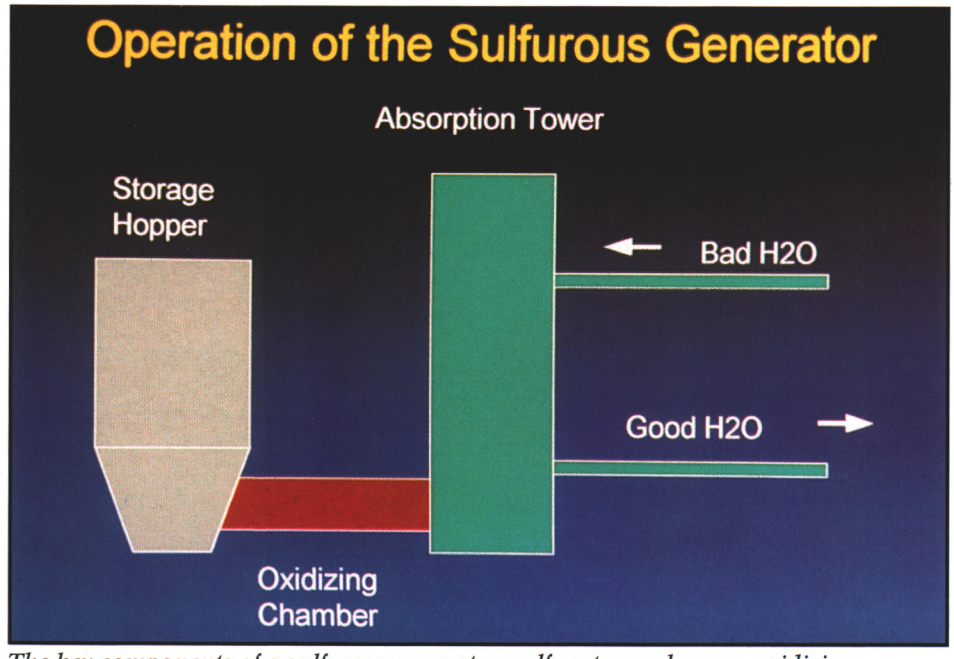
A Solution to Improve Water Quality: Use of the Sulfurous Generator

Always an innovator, Frye learned about a machine, the sulfurous generator, that was being used to improve water quality in agricultural situations and decided to try it at The Ocean Course. The key components of a sulfurous generator are a sulfur storage hopper, oxidizing chamber, blower, and absorption tower. Pure elemental sulfur flakes are burned between 950

The sulfurous generator oxidizes elemental sulfur that chemically alters poor-quality irrigation water.



and 1100 degrees Fahrenheit in an oxidizing chamber. As combustion occurs, sulfur dioxide gas is produced and is blown into the bottom of the absorption chamber to mix with the well water entering the top. A packing area in the middle of the absorption chamber is the site where the sulfurous acid production occurs. Once produced, the sulfurous acid flows into the lower section of the tower and is introduced back into the irrigation holding pond as an aqueous solution. Both the equipment and chemical processes of this technology are internationally patented. Frye's sulfurous generator model manufactures up to 70 gallons of product per minute.

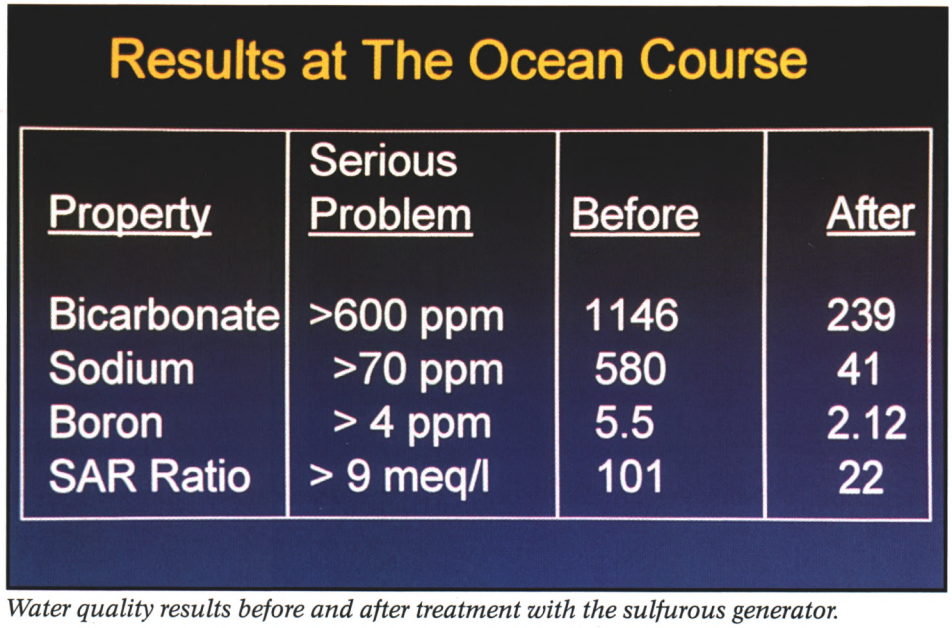


The key components of a sulfurous generator: sulfur storage hopper, oxidizing chamber, and absorption tower.

Safety and Costs

One main advantage of this technology is that the acidifying product is made on-site and no handling is required by any of the maintenance staff, except the loading of the elemental sulfur into the hopper. The only MSDS sheet that is necessary for OSHA requirements is for the 99.9% pure elemental sulfur itself. A dust mask and goggles are used by the worker when loading the flake sulfur into the hopper. Since the sulfurous generator creates heat at the oxidizing chamber, severe burns can occur if touched, but shields reduce this exposure. Sulfur dioxide gas fumes can cause eye, nose, and throat irritation upon direct exposure. Careful development by the inventors of the sulfurous generator, including research work carried out with NASA, Johnson Space Center, has led to a clean filtration process. Automatic controls are also available to maintain correct water pH ranges in the irrigation ponds.

The sulfurous generator is very economical to operate. During the growing season, approximately 850,000 gallons of water are pumped daily. With this well water, the sulfurous generator operates continuously and uses approximately 1.5 tons of elemental sulfur weekly. With elemental sulfur costs at $130 per ton, the elemental sulfur cost per day is about $32.50.



Water quality results before and after treatment with the sulfurous generator.

Effect of Treated Water on Turf and Soil

George Frye gives the sulfurous generator his highest praise after using it one full season. Fertilizer and pesticide costs have been reduced by 33 percent. The transformation of the elemental sulfur to sulfurous acid in the irrigation water is the key to better golf turf and soil conditions. The irrigation water quality at The Ocean Course has been improved significantly by this "sulfated" water, as bicarbonates have been reduced from more than 1,000 ppm to 239 ppm, sodium from 1,500 ppm to 410 ppm, and the SAR value from 100 meq/l to 22 meq/l. The pH of the irrigation water has also been reduced from 8.9 to a more desirable 7.0. Another benefit of this equipment is the reduction of algae and fungal growth in both the irrigation holding pond and turf.

George Frye continues to utilize his soil amendment program and careful irrigation practices, but at a reduced intensity. "With the improved water, I would estimate our water consumption has been reduced by 15% and our turf management efficiency has improved," a happy Frye says. George now no longer walks the fine line between disaster and success with his golf turf at The Ocean Course.

PATRICK O'BRIEN *is director of the USGA Green Section's Southeastern Region.*

A Float Above The Rest

Two simple and inexpensive ideas to improve mowing and irrigation programs at your golf course.

by JIM SKORULSKI

IT SEEMS THAT sand bunker restoration has become a popular practice at golf courses throughout the country. An often-seen trend with restoration work involves sodding banks that once were flashed with sand. The renovated banks typically are maintained with supplemental irrigation systems and fertilized to provide a manicured appearance and active turf growth throughout the season. The new banks often are steep, forcing mowing operations to be completed manually with rotary mowers, Flymo machines, or string trimmers, depending on the bank's severity.

A Flymo is modified with ⅝-inch vinyl tubing to elevate the machine for a greater height of cut.

Flymo machines are a popular choice for steeper banks and mounding due to their light weight and the quality of cut. However, mowing heights with the Flymo machines are fixed by the depth of the machine's deck and the air pressure developed by the motor. Often this mowing height is slightly below desired mowing heights for Kentucky bluegrass, tall fescue, and fine fescue turf growing on the steep banks.

Kip Tyler, CGCS at the Salem Country Club in Peabody, Massachusetts, has found a way to raise the height of cut on the Flymo machines that he uses to maintain the steeper sand bunker banks and mounding. He accomplishes this by retrofitting the machines with a piece of flexible vinyl tubing. The tubing is fastened to the bottom of the machine's deck using eight machine screws. The screws are inserted upward through the tubing and plastic mowing deck, and secured along the top of the deck using flat washers and nylon lock nuts.

This simple modification has proven effective for several years at the Salem Country Club for Tyler and his staff. The vinyl tubing used has ranged from ⅝- to ¾-inch outside diameter for the smaller 3-horsepower machines, and up to 1-inch diameter for the larger 5-horsepower machines. Tyler has found that the ¾-inch-diameter tubing seems to provide the ideal mowing height for his conditions. Expect the tubing to show wear midway through the season if the machines are heavily used. However, replacing the tubing requires little time and minimal cost.

This easy and inexpensive modification may make the Flymo machines a more effective and versatile option for maintaining the steep banks and mounding on the golf course, and ease the maintenance of newly grassed bunker faces. Give it a try!

A second tip is courtesy of Peter Salinetti, CGCS, General Manager at the Schuyler Meadows Club in Loudonville, New York. Schuyler Meadows Club also has the honorable distinction of being the first fully certified golf course in New York State in the Audubon Cooperative Sanctuary Program. Salinetti experienced ongoing problems with aquatic weeds and algae entering the irrigation system. The organic material would cause valves to stick and eventually block sprinklerhead nozzles.

The solution was simple and inexpensive, and was accomplished by pumping air through a ¾-inch garden hose that is submerged adjacent to the intake screens on the wet well. A small 1-horsepower electric air compressor operated out of the pump house is used to pump the air and create bubbles. The end of the hose is staked near the intake screen where the air keeps the organic material away from the wet well. The small compressor is usually operated 24 hours per day during the summer season, when the organic matter and the system's use are at their highest. Salinetti has found that the electricity requirements for the small motor are minimal, making the operation costs pennies per day.

This simple solution has resulted in uninterrupted use of the irrigation system, and has saved considerable labor that would be required to clean the intake screens and clogged irrigation components. It also has eliminated the need, at least thus far, to treat the irrigation pond with aquatic herbicides and algicides.

The small compressor has also proven its worth to Salinetti and the Schuyler Meadows Club in the past, as it was used as the primary tool for remediation work on a contaminated aquifer. The compressor was used successfully to pump air into the aquifer and stimulate the microbial breakdown and vaporization of petroleum compounds. The contamination was reduced from 15,000 ppb to 0 ppb in an 18-month period. Not bad for pennies a day.

JIM SKORULSKI *is a seven-year veteran agronomist for the USGA Green Section's Northeastern Region.*

Having Your Morning Coffee Without Donuts

Custom sprinkler nozzles can improve irrigation distribution uniformity.

by MIKE HUCK

IN AN ARID CLIMATE, like that in Southern California, the inefficiencies of poor irrigation coverage are quick to surface. Occasionally, repetitive patterns such as donuts indicate to the turf manager that the problem is not related to soil or compaction, but is mechanical in nature. The condition is usually caused by poor distribution uniformity from the sprinkler nozzles.

This was exactly the situation that golf course superintendent John Martinez found himself facing at the Southern California Golf Association's Members Club in Murrieta, California. Throughout the property there were donuts along with unmanageable wet and dry areas. The problem was so bad that it affected germination of overseeded perennial ryegrass each season. The donuts only disappeared after substantial rainfall.

Originally, the entire sprinkler system was scheduled for replacement as part of a course expansion from 18 to 27 holes. When remodeling plans were delayed for an indefinite period, it was decided to investigate nozzle replacement to improve efficiency. The first step was a laboratory evaluation of the size of each factory replacement nozzle at the Center for Irrigation Technology (CIT), at Fresno State University, Fresno, California. CIT has the capability of testing a single sprinkler and projecting the uniformity of coverage at any selected spacing with a computer software program. Each available factory nozzle was tested based on *in-field spacings* of 88-foot equilateral triangles, a distance nearly 30% greater than normally specified for desert climates. Each test revealed a donut pattern around the head. The results were discouraging and it appeared that there was little hope for improving the existing system.

Then John discovered Full Coverage Irrigation (FCI), Incorporated, of Coarsegold, California. FCI had been manufacturing custom *high unifor-*

Donuts are caused by poor distribution of water near the sprinkler head.

The secret of the FCI nozzle is the patented stainless steel insert's notches.

The patented insert's notches strip a small amount of water from the main stream, placing it close to the sprinkler head, without affecting the distance water is thrown.

mity sprinkler irrigation nozzles for agriculture since 1980 and was now developing nozzles for a number of popular turf sprinklers. John learned the theory behind the FCI nozzle after contacting David Malcolm at FCI.

The FCI nozzle is machined from brass and contains plastic stream-straightening vanes. This creates a stream that does not distort and throws water a great distance, much like a fire hose nozzle. There is also a patented stainless steel insert with three tiny notches pressed into the nozzle's face. Each notch strips a small amount of water away from the main stream, depositing it in close proximity to the sprinkler head. This combination develops a very desirable wedge-shaped profile. When a wedge-shaped profile is overlapped on a triangular configuration, it produces the most uniform distribution of water possible — next to rain, that is.

The cost to retrofit all 1,500 sprinklers was estimated at $20,000, a reasonable figure when compared to the $1 million estimated for system replacement. To further warrant this investment, additional tests were performed at CIT with a sprinkler equipped with FCI nozzles. The projected data were remarkable; when based on the driest 5% area of the pattern (a 329-square-foot area), the Scheduling Coefficient (run time multiplier) improved 20%. When based upon the driest 1% of the pattern (a 59-square-foot area), there was a 50% improvement.

Keeping in mind the old adage "It looks good on paper, but will it work in the field?" a worst-case scenario field evaluation was performed. The fourth fairway was retrofitted with the custom nozzles and after one week results were obvious. The normally wet areas dried up, while dry spots and donuts disappeared. John said that he could not believe his eyes.

So, if you have a hydraulically sound design with uniformly spaced heads, these nozzles present an alternative to complete system replacement. For more information on FCI's nozzles, contact David Malcolm, Full Coverage Irrigation, P.O. Box 1540, Coarsegold, California 93614, (209) 683-3072.

MIKE HUCK *is in his second year as agronomist for the USGA Green Section's Western Region.*

PUBLIC PANIC OVER PESTICIDES?

How golf course superintendents communicate the safety of chemical treatments.

by JOHN PALING, Ph.D.

EVERYONE concerned about the game of golf should be aware that, if there was an accident involving chemicals on any golf course in America, the safety practices of the whole industry could immediately be brought into question. Within a couple of days, it is likely that superintendents across the country would be getting calls from the press. Quite possibly, before you could stop and think, a reporter could put you on the spot by asking you to justify whether your activities are really safe for your members and the surrounding community. What questions might you expect and how could you answer them?

This project arose from my invitation to give a keynote address on risk communication at the 1996 USGA Green Section Education Conference held at the GCSAA meeting in Orlando. To prepare for this task, I felt that I could help my audience best by surveying how golf course superintendents might answer problem press inquiries. This is a brief report of what I learned and what the industry might benefit from considering.

First, it is important to note that by its nature, this was an informal, unscientific survey carried out by phone. Our participants knew this was only a survey, and we explained that all identities would remain confidential when we tabulated the results. Stating our purpose and receiving permission to proceed, we asked questions in a journalistic style by interacting to the answers given. The questions were changed slightly on occasion and the answers were tabulated by a multiple-choice questionnaire designed for this purpose. The plan was to phone at least two golf course superintendents from each state.

John Paling

The first lesson we learned was that superintendents work very hard on their courses and that it was nearly impossible to get them on the phone! The second lesson we learned was that if we left a message explaining our purpose, many did not phone back! Our conclusion, therefore, was that golf course superintendents may view an approaching journalist in the same way that a water hydrant views an approaching dog!

Those we did reach were patient and helpful. Furthermore, they revealed a genuine love of their work and a dedication to doing their best, whatever it took. A sense of real commitment and pride in their work came across strongly to us. However, it did not take long to find people who could have been manipulated into making embarrassing statements by the *real press*.

In summary, we phoned a total of 118 people but achieved only 23 complete interviews. Our results, while not conclusive, do give valuable insight into the mind-set of some members of the profession. Here are the questions we asked, the responses we obtained, and lessons we drew from the replies.

Question 1

We've found that some people living around your course are worried about all the pesticides you have to use to keep the greens in such good shape. Since they are all poisons and they must all finally get into the water table, how do you answer your neighbors who are concerned about the health effects on their kids?

Reassurance was invariably forthcoming in the answers, and they broke down along the following lines:

- "Reassuring evidence from research sponsored by the USGA" — 43%.
- "We follow what the EPA/chemical companies tell us is safe" — 30%.
- "We have to pass special training to make sure we do the job" — 30%.
- "We only spray in small quantities and under carefully controlled conditions" — 17%.
- "We are more exposed than the public and we wouldn't do that if we were in any doubt about the safety" — 13%.
- "We are always concerned about safety" — 30%.

The Paling Perspective

I strongly suggest that all golf course superintendents take this opportunity to carefully think through how they would answer the above question. If they are personally convinced that their treatments do not present a

serious risk to the safety of their community, how confident are they about the care taken by other members of the profession? Remember that if a superintendent has been using chemicals for a long period, it is not impossible that the very familiarity with the process might have made them blasé regarding the undoubted risks that do exist.

As well as the *content* of the question, it is wise to pay attention to some of the *strategies* used by the questioner. Beware of the common practice of interviewers who make an introductory statement and then go on to ask you a specific question. Often the preliminary statement contains an unfavorable implication that you are not questioned about. If you don't pick up on it, it can be accepted by listeners as being true.

For example, in our question it was implied that large quantities of poisons were used, but the question was not directed to that. In such instances, it is important not to let the bad implication pass uncorrected. One possible way of responding to this could be, "Just let me start by saying that your question implies we use large quantities, but that would be incorrect. We only spray small amounts and then only under carefully controlled conditions. But you are correct in saying that a few members of the public are concerned and I am happy to have the chance to address their worries." Then go with your message. Never miss an opportunity to convey your constant concern for safety.

Question 2A

Didn't the experts all say DDT was OK once? Why should we trust you now? (Asked of 10 respondents.)

- "We now have new products that break down very quickly" — 60%.
- "Yes, but now scientists know far more" — 30%.
- One truthful, but unexpected reply: "Yes, I suppose we could be wrong now!"

The Paling Perspective

Concede that they may have a point! Don't try to override real objections by pretending you know better and you (or your organization) could never be wrong. That attitude only leads to immediate skepticism and anything else you say could be discounted.

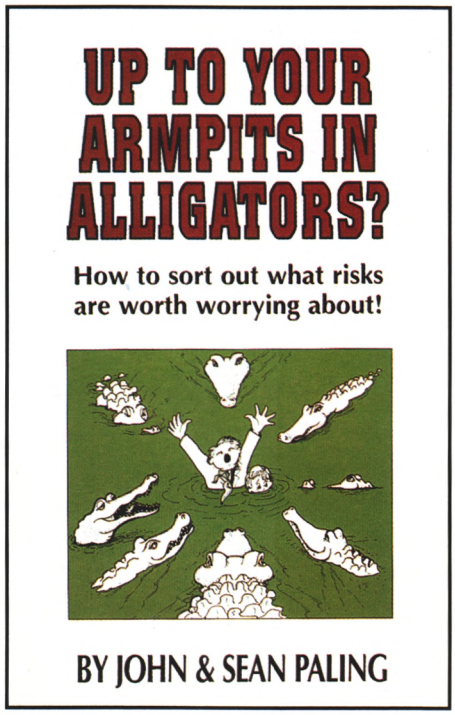
Question 2B

Why should we believe research sponsored by the USGA? That's like the tobacco companies telling me smoking is OK! (Asked of 8 respondents.)

- "This is independent research done in universities and agricultural colleges; it can be checked by others" — 63%.
- "It is not just the USGA; it is also what EPA/chemical companies' safety tests show" — 25%.
- One unexpected reply: "Yep, you're right — it doesn't look good!"

The Paling Perspective

In all interviews, remember to take such follow-up questions in good spirit. Don't get stressed out or mad at the interviewer (or beat him with a pesticide drum)! These are basic questions that a reporter could put to you as he/she tries to reflect some of the attitudes that his readers or viewers may have. Both of the above replies are excellent, but more important, they gain impact by being completely truthful (as all your replies should be).



Dr. Paling co-wrote a book in 1994 to offer a tool for reporting and discussing risks in our everyday lives.

Question 3

Are you saying that your spraying is 100% safe?

- "Yes, I can assure you it is absolutely safe" — 35%.
- "No, nothing is totally risk free" — 48%.
- "Yes, when used as directed" — 17%.

The Paling Perspective

I strongly believe the first is both incorrect and, what's more important, can be most unhelpful to the golfing community. Using pesticides is **NOT** *100% safe*, even when used according to the instructions. I suggest that many of the problems facing businesses in communicating risks have come from a fear of admitting that what they do does have some risk attached to it! In the anxiety over not being caught with legal or public relations consequences, businesses have moved onto thin ice by denying risks exist.

It is both truthful and helpful to agree that there are risks everywhere and that you are concerned and accept your responsibilities for those associated with your operation and **all of society's risks must be put into perspective**. Attention should be refocused on *relative risks*. Change the paradigm from declaring that what you do is 100% safe to saying, "Yes, it does represent a real but small risk. But when seen in relation to loads of other risks we are all at home with, the risks from our pesticide applications are effectively zero."

Don't let yourself be quoted as an expert on the risks involved. Understand that even though you may have been carrying out chemical treatments for many years, you are not an expert on the relative safety of chemicals.

To see how risks can be put into perspective for your golfers and community, see the article by Dr. Mike Kenna in the July/August 1995 *USGA Green Section Record*.

Question 4

We all know that some members of the public are hypersensitive to certain chemicals — whether it is bee stings or penicillin. Do you take full responsibility for any harm your pesticides may cause them?

- "Yes, I do take responsibility" — 17%.
- "No! No one can take responsibility for such hypersensitive people" — 39%.
- "Not me! It's the responsibility of the manufacturers and EPA" — 9%.
- "Compassion shown for the potential victims" — 30%.
- "We put signs up and notify the neighborhood — after that, it's their responsibility."
- "Yep, you've got me there! What should I answer?"
- "I'd ask my wife. She's a lawyer."

There's no substitute for developing lines of communication on the golf course.

The Paling Perspective

This is a tricky question. For your own information you should know that in practice, the professionals doing risk assessments add in safety factors at every step of the way. The final allowable doses in the regulations are actually *intended to be overprotective, even for hypersensitive people.* So it is very unlikely that, if you stick with the dose and procedures recommended, you or even the most hypersensitive person will be harmed. The best way to deal with tricky questions is to refer them to those trained to provide the information.

Conclusions

Even though this survey was unscientific in design, it did reveal some important points that lead me to the following strong recommendations.

Despite the dedication and outstanding professionalism of golf course superintendents, it is inevitable that an adversarial journalist could provoke embarrassing slips from a series of interviews. This would not be because the industry as a whole is irresponsible, but simply because of the large number of individuals involved with varying levels of education and language skills. For this reason, I believe it would be good for the game if the GCSAA and the USGA found a way to remind superintendents on an annual basis of the paramount importance of keeping a constant focus on safety procedures in their workplace.

One way of achieving this would be to arrange for confidential spot checks to be done on two golf courses in each state and the aggregated results announced at the annual meeting of the GCSAA. The checks could include a site visit and surface water sampling along with an examination of the chemical treatment records. This not only would give a base line for benchmarking the ongoing performance of the industry, but it would be an annual reminder of the importance of continuing care in this aspect of the profession. The purpose of the evaluation would not be to try to catch people, but instead to monitor ongoing performance in the industry.

After role playing the spiky journalist posing impertinent questions, I changed roles and chatted with the superintendents about risk communication, including my recommendations of annual spot checks. I found everyone was overwhelmingly in favor of the idea. As one man from Oregon observed, "I'm glad you're doing this survey. I'm always afraid that there are a few folks in this job who don't take their chemicals seriously enough! It only takes one person to screw up and it rubs off big-time on all the rest of us."

One final thought, as proposed by my office staff. What impressed us most during the survey was the care and dedication exhibited by the superintendents. In particular, newcomers to the practice of chemical applications were impressed by how decisions on how and when to spray were so carefully integrated with information about the weather and prevailing wind conditions. It occurred to us that lay people are not made aware of this aspect of the level of concern and commitment by the golf profession. Perhaps this message is worth communicating more forcefully!

DR. PALING *is President of John Paling & Co., Ltd., a risk communication consulting firm based in Gainesville, Florida.*

ERGONOMIC TEE DIVOT FILLING

Visible, convenient divot filling bottles equate to more usage.

by BOB BRAME

GOLFERS and turf managers alike recognize the value of quick divot damage recovery on tee surfaces. Smooth, uniform tees mean good playability to the golfer. Quick divot recovery to the turf manager means healthy, dense turf that improves the odds of coming through tough weather and/or heavy player traffic with a decent stand of grass. A key component in maintaining healthy, dense tee surfaces is divot filling. In a few cases, this work is done entirely by the maintenance staff. However, many courses encourage players to join the staff in working to fill tee divots.

Placing a mixture of topdressing and seed into divots immediately after they are made obviously will result in quicker turf recovery than what could be expected with weekly or even daily divot filling. This is the potential value of providing players with the resources needed to fill their tee divots immediately. Tom Zimmerman, golf course superintendent at the Elcona Country Club in Elkhart, Indiana, has developed a tee divot filling system that makes it easy for players to join the maintenance effort.

Tom has expanded the use of plastic divot filling bottles to a higher level. Long-neck plastic divot filling bottles and holders (readily available on the market) are purchased and then mounted on a uniquely designed elevated stand. These ergonomic stands are constructed with half-inch steel rod. Each stand requires two 24-inch and two 10-inch sections of steel rod. To secure the plastic bottle holders, a metal plate/disc (2- or 3-inch diameter) is welded on the top of the 24-inch rods. This makes it possible to fasten the bottle holders with bolts. The top cross support (10-inch rod) is welded perpendicular to the long rods, an inch or two below the bottle holders (see photo). The lower cross support is welded about 6 inches up from the bottom. The time and material needed to make the ergonomic holders has been minimal.

The long-neck plastic divot filling bottles make it easy to smooth over player damage. The uniquely designed, elevated stand allows the bottles, containing topdressing and seed, to be located close to the area where they will be used.

The stands can be pushed into the soil with the lower cross support and just as easily pulled out, for relocation, with the top cross support bar. This makes it easy to locate the stand with divot mix bottles next to the tee markers, where they will be needed. Since players can easily pick up a bottle with one hand, without bending over, they are used regularly. This system eliminates having to lay down a club, open a lid, or the potential for getting a glove wet. Tom reports a significant increase (triple) in players filling divots with the new ergonomic stands as compared to the previously used boxes located just off the tee surface. With increased usage comes healthier, more wear-tolerant turf.

At Elcona Country Club, the staff member assigned to move holes each day also services the tees. Markers are moved, the long-neck bottles are filled, and the ergonomic stands are strategically located next to the markers. The side opening on the long-neck bottles has prevented moisture contamination from being a problem. Should moisture get down in a bottle overnight (e.g., from sprinklers), adding fresh material the next morning eliminates the problem and insures good flow of mix out of the bottle. Tom is using an 80(sand)/20(peat moss) mixture with bentgrass seed. A 60(sand)/20(peat moss)/20(soil) mixture would also be a good possibility if the material is kept dry. Two completely full bottles at each tee have provided enough mix for one day's divot filling. Presently, the ergonomic tee divot filling stands are being used on par 3s at Elcona. However, due to player popularity, Tom is considering expanding the divot filling stations to include par 4s.

How is your tee divot filling program working? Give Tom's ergonomic approach some thought.

BOB BRAME *is director of the USGA Green Section's North-Central Region.*

COVERING YOUR TRACKS

How to sod a damaged green.

by PAUL VERMEULEN

EVERY NOW AND THEN, a green is damaged; vandals sneak onto the course at night and rip up a hole location, Mother Nature wields a quick blow, 300 golfers trample an area on a hot afternoon, hot oil from a piece of equipment spills on the turf. You name it — it happens.

If luck is on your side, the damage is minimal and with a little effort it can be repaired with a hole cutter, or perhaps the scars will simply heal on their own given a little patience. If your luck runs out, however, you have to take out the sod cutter and make repairs. On such occasions you can use the *Hood Method* of sodding to avoid leaving conspicuous scars in the putting surface that golfers might discuss at the 19th hole to add insult to turf injury.

The Hood Method was developed by Lee Hood, CGCS, superintendent of Coto De Caza Golf Course in Rancho Santa Margarita, California. The sodding method is a step-by-step procedure to replace damaged areas without losing subtle surface contours. One important requisite for sodding greens is having a sod nursery that is identical to the damaged green. If the nursery is established with a different turfgrass species (e.g., creeping bentgrass when the greens are dominated by *Poa annua*), then the mismatch in the appearance of the sod will highlight the damaged area for years. Another difference could be that the nursery has not been topdressed on a regular schedule to prevent an excessive thatch buildup. In this case, the condition of the putting surface would be inconsistent or the newly laid sod might scalp when mowed.

The basic steps for completing the Hood Method are as follows:

Step 1: Measure the damaged area to determine how many linear feet of sod will be required for the project. For example, if the sod cutter harvests strips that are 18" wide and the length of the damaged area is 20 feet, then a total of 120 linear feet of sod is required for the project. (See Diagram 1.)

To repair a damaged area, remove and replace one strip of sod at a time to preserve subtle surface contours. Do not readjust the cutting gauge on the sod cutter between harvesting sod from the nursery and removing damaged areas, so that the freshly harvested sod will fit into the green without the addition or removal of soil.

Step 2: Harvest and transport sod from the nursery to the work site, taking great care to prevent soil loss. Replace bent or worn sod cutter blades before sod harvesting to ensure uniform thickness. If a bent or worn blade is used to harvest sod, the repaired area will have corresponding waves on the surface that will provoke scalping during daily mowing.

Step 3: Remove the first strip of sod from the center of the damaged area. Do not readjust the cutting gauge on the sod cutter so that the freshly harvested sod will fit into the damaged area without the addition or removal of soil.

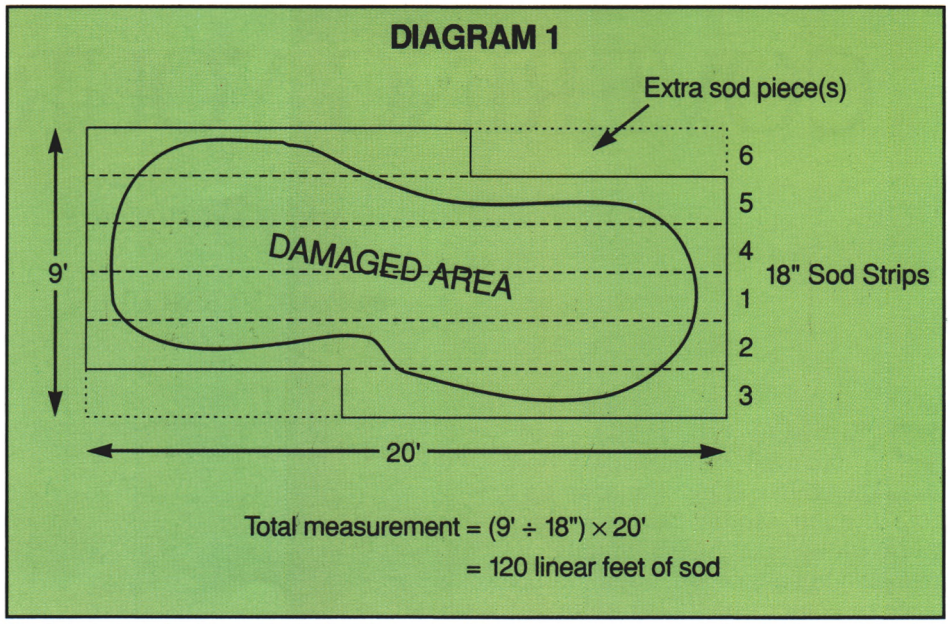
Step 4: Square off the ends of the strip with a sod knife or spade, and level the soil with a cement trowel. If necessary, use a small sheet of plywood to avoid heavy footprinting or kneeling marks in the putting surface.

Step 5: Carefully install the freshly harvested sod in the open strip.

Step 6: Remove the remaining strips of sod from the damaged area one at a time and repeat Steps 4 and 5 before moving on to the next strip.

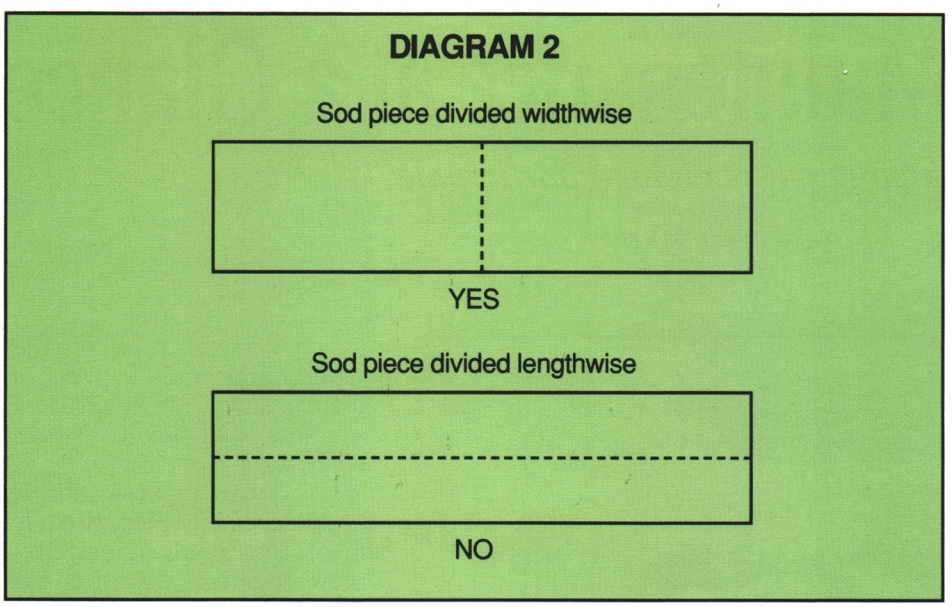
Step 7: Fill in the seams between each strip with a small amount of sand topdressing.

Step 8: Roll or tamp the fresh sod before mowing.



To determine the linear feet of sod required for repairing a green, divide the width of the damaged area by the width of the sod cutter blade and multiply by the length of the damaged area.

Square off the ends of the strip with a sod knife or spade, and level the soil with a cement trowel. If necessary, use a small sheet of plywood to avoid heavy footprinting or kneeling marks in the putting surface.



Avoid using sod pieces that have been divided lengthwise when repairing the outer edges of damaged areas using the Hood Method. If the outer edge of the damaged area only requires a thin strip of sod to complete the repairs, it is best to install pieces that have been divided widthwise.

When using the Hood Method for repairing damaged areas, try to work with sod pieces that have not been divided lengthwise to repair outer edges of damaged areas. (See Diagram 2.) If the outer edge of the damaged area requires only a thin strip of sod to complete the repairs, it is nonetheless best to install pieces that have been divided widthwise.

The next time your luck runs out and you have to take out the sod cutter and make repairs, remember that one of the best ways to avoid leaving conspicuous scars in the putting surface is to remove one strip at a time.

PAUL VERMEULEN *joined the USGA Green Section in 1988 as agronomist for the Western Region. In 1995, he transferred to the Mid-Continent Region.*

After completing the installation of each strip of sod, continue removing subsequent strips until the damaged area is repaired. Work with whole sod pieces along the outer edges of a damaged area to ensure a perfect fit.

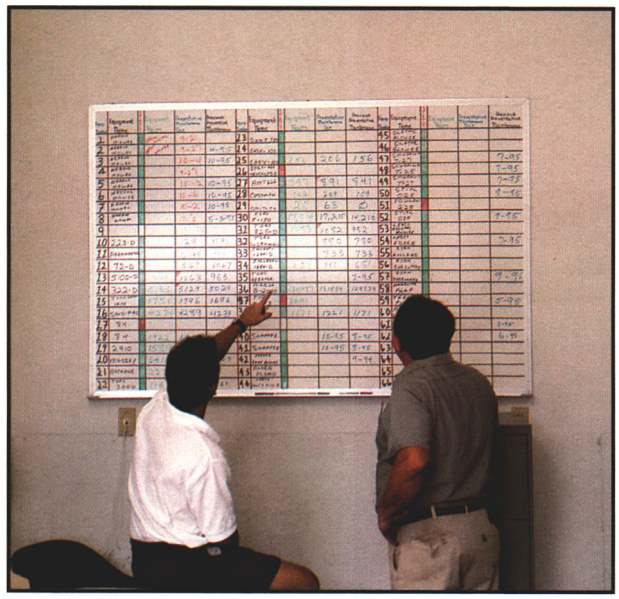
Preventative Maintenance at a Glance

Allowing the entire crew to participate.

by KEITH HAPP

A KEY COMPONENT of a turfgrass maintenance operation is the equipment available to perform both daily course preparation and, if needed, major renovations. Some courses are blessed with a large inventory of equipment, but it is the equipment that is serviced and ready for use that greatly influences the planning of turf care activities.

The superintendent relies heavily on the mechanic to maintain this equipment, no matter how old or new it may be. To some degree, the entire turf maintenance staff is responsible for the care of the equipment. It is a well-known fact that preventative maintenance programs can extend the useful life of a piece of equipment. To a turf manager, a more important aspect of preventative equipment maintenance is that it allows for effective and efficient flow of turf maintenance activities on the course.



Communication with the maintenance crew is important when scheduling turf maintenance activities.

This thought was in mind when Steve Geller, golf course superintendent, and his mechanic, Joseph Pope, designed a preventative maintenance system for the equipment at the Cedar Point Club in Suffolk, Virginia. The system allows the entire crew to participate and share responsibility for equipment upkeep. This strategy provides support for the superintendent and mechanic while fostering a team spirit among the crew.

Steve plans course grooming and maintenance activities well in advance of their occurrence. Prior to doing so, Steve consults with the mechanic and checks an equipment status board located in the shop area.

The board lists all of the equipment in inventory. Everything from greensmowers to string trimmers is scheduled for regular mechanical inspection. The date of scheduled maintenance is identified as well as the previous service date. A significant element of the status board is its simplicity. The maintenance aspects of each piece of equipment vary, but when the equipment (which is numbered) is ready for use, it is clearly identified as such with a green mark in the status column. A red mark means that the equipment is down or needs to be serviced. This marking system reduces the chances of equipment escaping regularly scheduled maintenance and causing unplanned downtime.

Crew involvement begins when their jobs are assigned. The plans for the day are placed on a job board located in the lunch/locker room. With job assignment in hand, crew members check on the status of the equipment needed to complete the day's activity. The status board is conveniently located so that a quick glance at the color code within the status column is easily facilitated. Crew members also examine the due date for upcoming maintenance to provide an additional check and balance for equipment status. The system is reinforced further by crew members when they report minor equipment performance flaws. Small problems are addressed before they become large.

No system is infallible. Granted, when a piece of equipment is severely damaged, a crew member will not mistakenly take it out on the course. There are times, however, when equipment problems go unnoticed and, needless to say, the most aggravating problems are those that could have been prevented. For example, due to busy golfing schedules at Cedar Point Club, a great deal of mowing takes place before daylight hours. A reel can be out of adjustment, causing a poor-quality cut, or even worse, a hydraulic hose may give way, resulting in a slow leak that does not immediately impair equipment performance. Both of these problems may go unnoticed until the sun begins to rise. Unplanned-for damage control strategies must then be implemented. Areas may have to be remowed and/or turf damage repaired.

Preventative maintenance on turf equipment can pay dividends. Encouraging crew participation in monitoring equipment performance and maintenance requirements minimizes potential breakdowns and equipment failures. Incorporating additional checks and balances expands an operation's ability to meet the requirements placed upon it. Projects and/or activities can be completed as scheduled with the tools purchased to minimize labor needs while maximizing efficiency.

Don't get caught with your pants down. Many equipment problems can be avoided. A strategy such as *Preventative Maintenance at a Glance* could help.

KEITH HAPP *is agronomist for the USGA Green Section's Mid-Atlantic Region.*

Lay Down Some Rubber

Using crumb rubber topdressing can reduce turf injury in high-traffic areas.

by CHRISTOPHER E. HARTWIGER

YOU HAVE probably seen them on your golf course: worn areas between bunkers, dirt paths on a tee slope, or damage from carts leaving the cart path. These high-traffic areas are characterized by a lack of turf, unsightly appearance, and a negative effect on playability. While the traditional remedy for these problems has been time consuming and labor intensive, research conducted at Michigan State University on crumb rubber topdressing may show the way for superintendents to become proactive and protect the turfgrass in these high-traffic areas. This turf tip will review this new technology and will focus on Mark Hoban's program at The Standard Club to effectively manage high-traffic areas.

Old Tires, New Topdressing

Dr. Trey Rogers and Tim Vanini from Michigan State University identified crumb rubber (recycled tires) as a potential topdressing material to protect turfgrass plants from traffic stress commonly found on athletic fields. In their research, Rogers and Vanini discovered that certain amounts of crumb rubber will improve turfgrass wear tolerance, decrease soil compaction, and decrease turf system inputs.

The physical properties of crumb rubber differ from those of soil particles and provide the basis for improving turfgrass in high-traffic areas. Typical particle sizes for crumb rubber are ¼ inch in diameter or smaller, with rounded edges that are less abrasive

Areas prone to heavy cart traffic are ideal candidates for crumb rubber topdressing.

Crumb rubber topdressing protects the crown of the plant and decreases the potential for compaction.

than sand. Additionally, crumb rubber has a particle density approximately one half of a typical soil particle, and the crumb rubber does not migrate down into the soil profile. When a proper layer of crumb rubber topdressing accumulates on the soil surface, the crown of the plant is protected from traffic and abrasion, and the underlying soil becomes less susceptible to soil compaction.

A common concern with crumb rubber topdressing is the potential for toxicity to the plant or threat to the environment. To date, Rogers and Vanini have not reported any harmful effects to the plant or environment. Soil samples from the crumb rubber test plots have been taken since 1990 with no elements reaching levels of concern or posing a threat to water quality.

Rogers and Vanini reported that best results were obtained with a topdressing of 0.75 inches deep on cool-season turfgrasses mowed higher than 0.63 inches. Not more than 0.25 inches of the material should be applied at one time. Typical costs for the material alone when applied to a depth of 0.75 inches is $270 per 1,000 square feet.

Mark Hoban's Program

As superintendent at The Standard Club, Mark Hoban, CGCS, battles high-traffic areas around greens, tees, and cart paths. Upon hearing about crumb rubber topdressing, Hoban decided to do some experimenting with the material on some of his problem areas. Mark has taken two approaches with the crumb rubber, and both have achieved positive results.

Although crumb rubber topdressing has been shown to improve wear tolerance, it is not a means to help stimulate the recovery of a worn or injured turf area. Hoban had a number of worn areas on his golf course, and he found that adding crumb rubber topdressing to these areas can be unsightly and would not help regenerate the turf. Instead, Hoban made repeat topdressing applications of crumb rubber to an area of sod in his nursery. After the topdressing settled properly, he stripped the worn areas and resodded with the prepared sod from the nursery.

This approach provided Hoban with several advantages over direct application to the injured area. First, Hoban did not have to rope off the injured area and wait for it to recover. He could experiment with different application rates in the nursery to determine which would be most effective at his location. If the topdressing did not settle properly or if it was moved by water, the crumb rubber was so well integrated into the turf canopy that the material was only slightly visible to the golfer.

Hoban's second idea for the crumb rubber topdressing was to apply it directly to several shaded tees at The Standard Club. Typically, shaded bermudagrass lacks vigor and is more susceptible to stresses such as traffic. By applying the crumb rubber to the shaded tees, Mark hopes to improve the wear tolerance of these areas and improve the turf quality. Since resodding is not practical for these areas, Hoban is topdressing directly onto the tee surface and is dragging the material to incorporate it into the turf.

To date, Hoban has been pleased with the results of the crumb rubber topdressing and has seen dramatic improvement. Areas that typically receive a beating in the summer have never looked better going into the fall. Furthermore, Hoban is hoping the dark color of the material will increase soil temperatures in the spring and provide an earlier green-up. Based upon the results at The Standard Club, Mark Hoban's success at laying down some rubber is an idea that is sure to catch on.

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CHRISTOPHER E. HARTWIGER *joined the USGA Green Section in 1995 as agronomist for the Florida and Southeastern Regions.*

THE USGA: The First Hundred Years, The Next Hundred Years

The USGA after a century: What we've accomplished and our plans for the future.

by DAVID B. FAY

AT OUR 1996 Annual Meeting, your GCSAA president, Bruce Williams, and your CEO, Steven Mona, spoke before our executive committee, and their comments were very well received. Of course, Steve is an alum of the USGA staff, and it was especially nice to hear from Bruce, given that his dad, Bob, won the Green Section Award this year.

I hope it is clear how much we value our close relationship with the GCSAA. We look forward to a continuing partnership as we address issues and initiate research that will have enormous impact on the game and its future.

We are very grateful for the ongoing support the GCSAA has provided to the USGA. This support can be seen in many ways from your financial assistance, to the promotion of our Turf Advisory Service, and to the opportunity you've given USGA representatives to appear on your ESPN show, "Par For The Course."

Recently, I was in Chile and during a lull, I made my way to the health club. There were a few televisions on and the sound system was blasting Latin music. Halfway through my so-called workout, someone switched a TV to ESPN and who do I see but Duke Fry, host of the GCSAA show. So, you'll be happy to know that your organization is getting air time in South America.

As to the role of the superintendent, it would be impossible for me to overstate the respect the USGA has for your profession. After all, you are the guardians, the nurturers of the playing fields. And never were your talents put more to the test than in 1995, which, as Bob Williams has said, was the worst grass-growing season he could recall in his 60-plus years as a superintendent.

David B. Fay

My respect for your profession is borne from firsthand experience of the four summers I spent as a member of The Tuxedo (New York) Club grounds crew. I can only say that I managed to keep my scalping to a minimum with the rotaries, and I only had one instance where I failed to note a hydraulic oil spill before it had done a number on the green. Sadly, I probably excelled in only one area — hiding out in the woods on hot, humid afternoons in August when I was supposed to be syringing greens. But I certainly developed a strong appreciation for the nature of your work.

In 1995, we celebrated our first 100 years of service by throwing ourselves a year-long birthday bash. Some of our goals were to reach a large audience and promote our game through a wide assortment of activities and programs. And, since it was a birthday party, we wanted to have some fun. On balance, I think we did a pretty good job. Among the highlights was an elegant party at the Metropolitan Museum of Art in December 1994, which was a far cry from the small working dinner at the Calumet Club on December 22, 1894, where representatives from five golf clubs formed the USGA.

At the Museum dinner, we announced the establishment of the Ike Grainger Award for volunteers who have served the USGA for 25 years or longer. Seventy individuals received the award in 1995. This program will be ongoing because it's important to recognize the backbone of the USGA — the volunteer.

Last July and August, reunions of past USGA national champions were held at the Women's Open, Women's Amateur, and Amateur. All three were terrific — full of memories, fish stories, and laughs. The unanimous sentiment was that this type of gathering should take place more frequently than once a century.

In developing our centennial celebration, it was important to get our member clubs involved. To this end, a centennial kit was created that included medals, flags, and suggested events and was given, free of charge, to our clubs. About 200,000 golfers at nearly 3,000 clubs participated in USGA centennial events that ran the gamut from three-day member-guest tournaments to putting contests.

We produced a full-length film entitled *Golf, The Greatest Game,* and a coffee-table type book of the same name. We also produced 12 films honoring the heroes of the game — the likes of Jones, Hogan, Palmer, Zaharias, and Lopez. These films and the book are valuable historic resources and should have an extended shelflife — which is another way of saying that we have plenty of each left for sale.

When you celebrate a special birthday, it's expected that you'll do some out-of-character things — and we did. In conjunction with *GOLF* we held the modestly titled Auction of the Century in New York City during U.S. Open week. Such items as Arnold Palmer's wristwatch and a round of golf with Bill Murray fetched a total of nearly $500,000 for such non-golf related charities as disease research, hospitals, and aid to the disadvantaged.

We conducted a six-month-long nationwide search for a Centennial golf family, which drew quite a bit of media attention. The winning four-generation family, the Hornbecks from Logan, Iowa, ranged in age from 90 to 13. And contrary to the rumor circulating in the U.S. Open press tent, the four Hornbecks do not make up 25% of the inhabitants of Logan, Iowa.

We gave away thousands of packets of USGA red, white, and blue flower seeds, which I understand bloomed nicely just about everywhere except my yard.

Given that the only three things we did in 1895 were to conduct the Amateur, Open, and Women's Amateur (and by the way, note that women's competitions have been part of our charter right from the start), it was fitting that we would introduce a new competition, the State Team tournament, in 1995. Over 40 states sent both a men's and women's team to Orlando in late October. Both events were so successful that we plan to continue with this event on an biennial basis, in the odd-numbered years.

Lastly, in conjunction with *Golf Digest* magazine, we buried a time capsule containing an assortment of items representing the game of golf, circa 1995, on the Golf House grounds in October. This capsule will be reopened in 2095, so if nothing else, I guess that commits the USGA to stay at its Far Hills location for at least another 100 years.

Naturally, our first 100 years saw dramatic growth and change. I joined the USGA staff in 1978, and in my 17 years with the Association, the differences are extraordinary. Some numbers bear this out:

In 1978, we had one Regional Affairs manager criss-crossing the country like Johnny Appleseed. Today, we have a total of eight regional managers (five men and three women) operating from outside our Far Hills headquarters.

In 1978, we had six agronomists. Today, we have 15 agronomists. We also have Green Section heads of research, education, and communications.

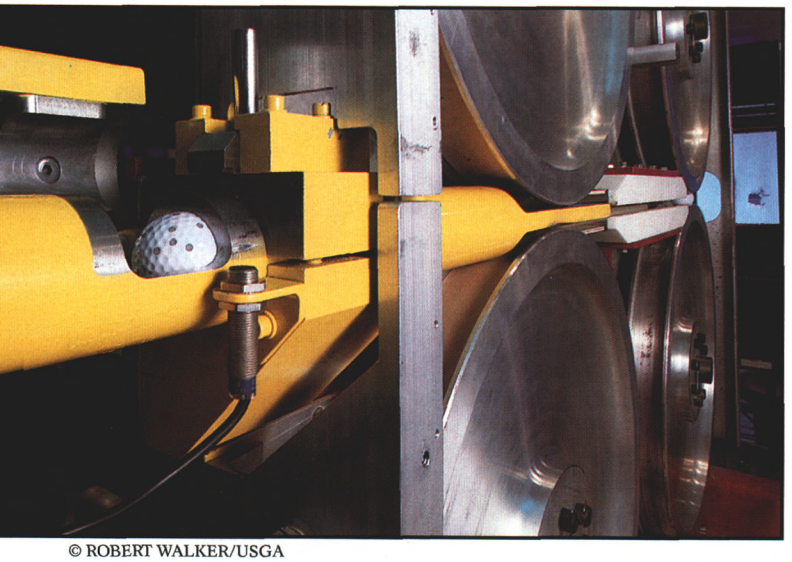
In 1978, we had 18 committees comprised of approximately 350 volunteers. Today, we have 38 committees consisting of 1,200 volunteers, all of whom donate their services and pay their own expenses.

In 1978, we had 30,000 individual members, then known as USGA Associates. Today, we have in excess of 630,000 and we are hopeful we'll reach the one-million mark by the end of the century.

In 1978, we had less than 5,000 member clubs, most of which were private. Today, we have about 9,000 member clubs, the majority of which are public in orientation.

In 1978, we treated handicapping much the same as we did the Rules of Golf. That is, we developed the system but left it up to clubs and golf associations to administer it. Today, as a result of an appeal from golf associations in the early 1980s for the USGA to compute handicaps, our GHIN handicapping computation service is the largest in the country, serving about 1.6 million golfers.

The burial of a time capsule at Golf House marked the end of the USGA's year-long Centennial celebration.



(Above) The USGA has supported the Audubon Cooperative Sanctuary Program for Golf Courses since its inception in 1990.

(Left) One of the many testing devices at the USGA's Research and Test Center.

© ROBERT WALKER/USGA

In 1978, our Implements and Ball test center was a tool shed that could barely accommodate a John Deere riding lawnmower. Today our test center is a state-of-the-art, 14,000-square-foot building complete with two mechanical robots, two golf-ball launching machines, high-tech aerodynamic and biomechanical laboratories, and several other testing machines.

In 1978, we had 14,000 entrants in 10 national championships. Today, we accept over 31,000 entrants in our 13 championships.

In 1978, our museum and library was housed in part of the first floor of Golf House. Today, the museum uses up all of Golf House. And we are taking the museum on the road through a series of traveling exhibits. Also, and I find this especially exciting, we plan to have on our Internet web site (which of course didn't exist in 1978) a virtual reality room dedicated to our museum. So we really will be taking our museum to the golfers on the Information Superhighway.

In 1978, we had a total staff of 45, the majority of whom worked out of the top two floors of Golf House. Today our staff numbers around 200, spread out over three buildings in New Jersey and 19 sites around the country.

But, as the saying goes, the more things change, the more they stay the same.

In 1978, the U.S. Open, including broadcast rights, accounted for the lion's share of our net revenue. Today, this remains the case.

That's hardly the same as saying the Open hasn't grown. Indeed, it has exploded in growth. One example would be the phenomenon called corporate tents. In 1978, there were no corporate tents at the Open; in 1996, we expect to have more than 40.

In fact, the Senior Open — which didn't even exist in 1978 — is just about at the same level as the Open was 17 years ago.

So, in addition to adding staff — always a suspicious act — what have we been doing with our time and our money?

It's pretty straightforward, really. As revenues have increased we have, as a service organization, put these funds back into the game through a variety of projects that complement our core responsibilities and programs.

As you in this audience know, we've spent well over $10 million in the past few years on assorted turfgrass and environmental research programs. There's no need for me to elaborate on these programs because I know that through our Green Section staff and publications, you are more versed in this area than I am. Two points I want to emphasize. One — this effort is ongoing and will likely expand in terms of commitment of time and resources. Second, as we — and here I mean all of us in golf — continue to communicate our findings, we will have to focus on the 215 million Americans who don't play golf. Let's face it, convincing golfers that their game is environmentally friendly is not the tough sell.

We need to focus our efforts on the non-golfers — and soon — before a few advocates full of wrong information and misleading conclusions get the upper hand.

Other programs that have received USGA funding include junior golf programs with a special emphasis on programs for the disadvantaged; caddie programs; a golf administrator program (PJBoatwright Interns); scholarship programs for agronomic and journalism students; and assorted programs for the physically challenged, including funding for Special Olympics golf.

And, as many of you know, the USGA has been the primary supporter of the Audubon Cooperative Sanctuary Program for Golf Courses, which is now in place in more than 1,900 courses.

What's remarkable is that not a single one of these special programs I've just mentioned even existed back in 1978.

One might be forgiven in thinking that the emphasis has shifted within

the USGA over the past 17 years. It hasn't.

Remember, the more things change, the more they stay the same.

Our core responsibilities are the same today as they were in 1978 — or 1928 or even 1895 for that matter. Conducting the game's national championships, writing and interpreting the game's playing rules, equipment rules, amateur status rules, and handicapping rules. And even though our Green Section was not formally established until 1920, our involvement and concern with playing conditions has been part of our mission statement right from the start in 1895.

Which gets us back — in a roundabout way — to the stated title of this rambling: the first 100 years — the next 100 years.

Perhaps some of you are familiar with the author Jack Finney, who's written a few wonderful novels dealing with time travel. Let's run with this and go back to the year 1895, the USGA's first full year of operation. It's doubtful if even someone like Jules Verne — who was very much alive at the time — could have envisioned what the planet would look like in 1996, what with all of the mind-boggling technological advances and, sadly, a fair share of unimaginable horrors that we've experienced in the 20th century.

However, even if a visionary like Jules Verne might have trouble fitting in to 1996 America, I doubt that our 1895 U.S. Amateur champion, Charles Blair Macdonald, would have problems. Indeed, he would not only easily recognize his sport, but he would excel at it — which is not the same as saying he'd approve of tree-lined, lush layouts.

Sure, the clubs have improved — they're easier to hit. And today's golf ball lasts longer and flies longer than the gutta percha of 1895. The courses are longer and, thanks to the superintendent, are far better maintained. And the number of American golfers has gone from a handful to about 25 million.

But in a fundamental sense, the game has not changed. The object is the same, the Rules are essentially the same, and the experiences of the game — the fun, the challenge, and the passion — remain basically unchanged.

Now, what about the next 100 years? Will those folks who unearth our time capsule in Far Hills in the year 2095 have a clue as to its contents? Will they think the clubs and balls are rudimentary — the way we view 1895 equipment? Will they think our rules silly? Will a golf course look the same? Will there be golf courses? Will there be golfers?

It's sort of a free pass to answer these questions. Not because I'm Carnac Jr. but because I know I won't be around — and none of you will be either — to refute any of my long-term forecasts.

Actually, I believe that golf in the year 2095 will be closer to the 1995 game than is the 1995 version to 1895. In other words, as comfortable as Charles Blair Macdonald would be with today's game, I think our 1995 Amateur champion, Tiger Woods, would be even more comfortable with Golf - 2095.

Will clubs and balls experience the same type of change we've seen since 1895? I doubt it. After all, the golf ball has reached the speed limit — it cannot legally go any farther. And as far as clubs are concerned, there's only so much one can do with a clubhead and shaft before running up against the laws of physics. Much of the alleged improvement in clubs is more a matter of marketing than engineering anyway — and there's nothing wrong with this. I'm like most golfers — always in search of the magic bat. And sometimes I find something that works. But I hate it when I rave about some club or ball and someone asks if this new stuff is resulting in my shooting lower scores than, say, 10 years ago. That's hitting below the belt.

I doubt if the playing Rules will undergo substantial changes in the next 100 years. There's a natural desire to simplify the Rules, but this is tough to do, given the wide range of goofy things that can happen on 100 or more acres. Refinements to the Rules will continue, such as the new local rule that enables the committee to deal with environmentally sensitive areas.

I imagine championships will still be played in 2095. If today's entitlement attitude persists, there will be a demand for golf to become an age-category sport with championships for 30- and 40- and 50-year olds. This probably won't happen — thankfully — unless events are played on virtual reality courses since we're already finding it difficult to place all our qualifying rounds on high-quality courses. Golf can't grow unless there are enough facilities to satisfy demand. The location of new courses in the next century will be further and further away from population centers such that "afford-

Using a Stimpmeter to measure green speed at a USGA championship.

The USGA Green Section has helped ensure sound maintenance programs that benefit all living things.

CHUCK GAST

able" golf will in some ways resemble snow-skiing, where you have to travel a considerable distance to get to the mountains. It's likely that the game's fastest growth in the next century will be in other parts of the world — not the U.S. I believe we will see construction of more nine-hole courses. Why? First, I think there will be real limitations as to available land. And, I suspect that the amount of leisure time people will have will be pushed such that a two-hour sport will be the rule and that a four- to five-hour activity will be the exception. Personally, I don't subscribe to the notion that nine holes is half a loaf, anyway.

Here's a good one: Will golf be played other than on the planet Earth? Or let's roll the *Twilight Zone* music — is it already being played somewhere 100 million light-years away? Recently, astronaut Alan Shepard came to Golf House to commemorate the 25th anniversary of his golf shots on the moon and to be reunited with his Moon Club, which he gave to the USGA. Recalling how he had to hit the shot — one handed in a bulky space suit — and recalling the result of the shot — a 200-yard-long chilly dip — I don't think golf on the moon has much appeal. By the way, the Shepard visit was an enormous success. Among other things, he met and addressed nearly 400 sixth-grade students and asked for recruits for a manned flight to Mars. There were plenty of volunteers.

One thing I trust will survive the next 100 years in one form or another is the USGA Handicap System. Golf is fortunate in having the best handicap system of any sport — which is not the same as saying that it can be foolproof, or should I say cheat-proof. I imagine there will be sandbaggers in 2095.

I believe the most significant changes in the game in the next century will be in the areas that directly affect you folks — the superintendents.

The environmental issues will become more acute, not less. Maintenance practices may be more advanced in 2095 than they are today. On the other hand, courses could look more like they did at the turn of the century. After all, conditioning is dependent on that precious commodity called water — something that is already in scarce supply in parts of the country. And the maintenance of our courses depends heavily on equipment that is run on non-renewable sources of energy. I believe most of us can recall the oil embargo and long lines at the

gas station in the 1970s. Sometime in the 21st century, it may not be an embargo but rather a shortage that we will need to face.

Since I'm dealing with course maintenance, allow me my soapbox to speak of some conditioning issues that are more here and now. I personally believe the U.S. Open and other majors have done a disservice to American golf in the sense that we prepare — or should I say, ask the superintendent to prepare — the course for a one-week event in a manner that is either impossible or obscenely expensive to maintain for an extended period of time. Unfortunately, the golf fan sits at home watching events like the Open and wants the same conditions at his course, with little regard to the consequences, both financial and agronomic. You superintendents are a very talented group, but even for the best of you, there are limits. If we aren't going to change the manner in which we set up an Open course, we at least have an obligation to explain to the golf public the difference between course conditions for a national championship and everyday golf.

I also happen to believe that we've gone too far with respect to green speeds. Speeds of 11 feet put a terrible strain on the plant. Spikemarks have always been an issue but never, ever was it the issue that it's become today. Never were greens scalped so low and rolled so frequently in pursuit of speed. Equally important, I believe that green speeds have reached the point where, for the best players in the world, superfast greens require less skill. Let's face it, nerves for this group are not a problem. And, as putting guru Dave Pelz can confirm, the more hit you have to put into a stroke, the more likely it is that the putt will go off line. Just to be absolutely clear, I'm speaking of speed, not firmness. Firm greens are essential for championship golf — but I'd like to throttle back Stimpmeter readings to 9 or 10 feet, irrespective of grass type.

And speaking of grasses, it might surprise you to hear me suggest that you proceed cautiously before experimenting with new strains of grass that only have a few years of test results. While I'm not saying that turfgrass introductions have to be as conservative as new drug introductions (typically a 10-year process), I think we should all be a bit more guarded before committing to a product that doesn't have a proven track record. And I say this knowing full well that we've been, and will continue to be, a major player in encouraging and funding new strains of grasses that require less water, less maintenance, and are less susceptible to weather extremes.

Non-metal spikes are an issue to many people. A couple of observations: Alternatives to metal spikes are a long way from acceptance by players on the professional tours. Perhaps the best approach is to work with the NCAA golf committee to mandate non-metal spikes in college events. Also, just because non-metal spikes are not accepted by the Tours should not dissuade clubs from insisting on a non-metal spike policy. The damage caused by metal spikes may be more of a concern to the clubhouse manager than the superintendent. Think of the damage to floors and carpet. The legal-liability arguments I've heard against non-metal spikes are specious. Strapping on shoes of any kind doesn't mean you can gallop indiscriminately around the course and clubhouse without risk.

I hope the owners, course designers and architects, and course builders resist the urge to have a potpourri of turfgrasses on a golf course. For a short while, this practice seemed to be in vogue. And I hope we resist the urge to defy nature by using turfgrasses that basically have to be put on costly life support. As my predecessor Frank Hannigan once said, "If God intended to have pure bentgrass greens in the South, she would have made the climate a bit cooler."

One of the items we included in our time capsule was a copy of a talk that John Updike delivered at our Centennial dinner in New York in December 1994. Allow me to read his final paragraph:

"We have come a long way in American golf, but has it been a journey without a price? Amid the million-dollar tournaments and the five-million-dollar clubhouses, might we be losing the unassuming simplicity of the game itself? This out-of-doors simplicity, surely, lies at the heart of golfing bliss . . . . All it takes for a golfer to attain his happiness is a fence rail to throw his coat on, and a target somewhere over the rise."

If those who read Updike's comments in 2095 feel, as I do and I hope you do too, that his sentiments are right on the mark, then it's a good bet that golf survived quite nicely in the 21st century. So, let's hope that our golf brethren, in 2095, are not wanting for fence rails and targets, and will not have lost sight of the unassuming, out-of-doors simplicity that goes to the heart of why golf is the greatest game of all.

DAVID B. FAY *joined the USGA in 1978 and has served as the USGA's Executive Director since July 1989.*

David Fay echoes the sentiments of author John Updike: "All it takes for a golfer to attain his happiness is a fence rail to throw his coat on, and a target somewhere over the rise."

SHALLOW AERATION: *Deeper Is Not Always Better*

Another aeration technique for the golf course superintendent to employ.

by STANLEY J. ZONTEK

THE GENERAL philosophy of putting green aeration has been that deeper is usually better. Indeed, manufacturers have developed a long list of machines that give the golf course superintendent any number of options to choose from when aerating soils. High-pressure water, long tines of solid or hollow steel and/or deep drills are available to assist in managing soils. Each of these techniques has found its nitch, its own purpose.

The turf tip offered in this article provides another option, another use of aeration for the turf manager. It is tightly spaced, solid- or hollow-tine *shallow aeration*.

The primary purpose of deep aeration is soil modification, drainage improvement, and the defeating of zones of soil compaction and layers in the soil. Deep aeration, for all of its virtues, is incompatible with seedbed preparation; that is, the overseeding of greens in an attempt to establish new grass in old stands of turf. Figure 1 illustrates this point. A traditional coring hole has been made in the soil. The green has been overseeded and some of the seed has found its way to the bottom of the hole. A light layer of topdressing has been added to mulch the seed. As illustrated, the seed has germinated and has begun to grow, but it is far too deep in the soil for the new seedling to survive. The seedling will be smothered when the aeration hole closes.

Recent developments in aeration accessories and machinery now give the golf course superintendent the ability to aerate the surface of the green to a very shallow depth. The shallow, closely spaced holes allow for seed to be placed at a more appropriate depth for germination and establishment.

Seed can germinate in aerator holes, but if planted too deep the grass plant doesn't have much of a chance for survival.

Once cored or punched, the smaller holes are also less disruptive to the putting surface (which golfers like), yet a tremendous amount of surface area is opened for seedbed preparation, thatch control, and the stimulation of new roots. The small holes heal rapidly, another feature that golfers like.

(Above) Developments in aeration accessories, such as solid-tine aeration with the Job-Saver attachment, give the superintendent flexibility to accomplish various tasks. (Left) Shallow aeration can be accomplished using hollow tines on the Core Master.

This shallow aeration technique is also useful on modern, sand-based greens. One virtue of sand-based construction is that the topmix, if properly prepared, is very resistant to compaction. Yet, it is recognized that even new greens built to USGA guidelines periodically need aeration. It is equally recognized that deep aeration of a sand-based green is not as necessary as it may be for an old-style topsoil or clay-based push-up green. Shallow or surface aeration, which is designed only to pierce the thatch, is another good tool for the golf course superintendent to use to manage thatch, root development, drainage, and isolated dry spots on new sand-based greens.

This shallow aeration technology was used extensively in the Mid-Atlantic Region to help reestablish greens damaged from the winter of 1993-94 (see "Recipe for Rapid Recovery from Winter Injury," *USGA Green Section Record,* January/February 1996). This technique is gaining wider acceptance for overseeding purposes in general, be it as part of a program to establish new bentgrasses in old greens, and even as part of a putting green fumigation and regrassing program. Although specialized machines exist for surface aeration, existing putting green aerators can also be retrofitted for small-tine, shallow aeration.

Is shallow or surface aeration a replacement for deeper types of aeration? No. This form of aeration is another tool at the disposal of today's golf course superintendent to do a better job of managing putting green turfgrass under special circumstances. Deeper is not *always* better.

STANLEY ZONTEK, *a 25-year veteran of the USGA Green Section, is director of the Mid-Atlantic Region.*

SUCK-CESS

A turf vacuum can help solve difficult drainage problems on putting greens.

by PATRICK J. GROSS

WHAT does it take to achieve success? When it comes to putting green maintenance, most superintendents would agree it boils down to three factors — drainage, drainage, and more drainage. Good drainage is especially important along the Northern California coast where greens tend to stay wet throughout the fall and winter as a result of high precipitation, low evaporation, and low light intensity. Add to this equation soil compaction from continuous winter play, and you have the perfect formula for anaerobic soil conditions and black layer.

The 4-inch-diameter drain lines were inserted into the access ports on each side of the blower housing. After operating the turf vacuum for six hours, the staff had sufficiently dried the soil profile and alleviated the black layer.

Superintendent Mark Michaud and his assistant, Forrest Arthur, faced this problem on the No. 5 green at Pebble Beach Golf Links. The green sits in a hollow that stays cold and wet. Add the conditions of the winter of 1994-95, one of the wettest years on record in California, and it was even more difficult than usual to keep water moving through the soil profile and dry the green. Ultimately, a serious problem with black layer developed in the front portion of the green. Mark and Forrest had to find a way to keep the water moving and get some oxygen into the soil.

Their first attempt was to spot aerify the front of the green with ¼-inch solid tines. The aerification was only moderately successful and short-lived. The next step was to check the subsurface drainage and install a smile drain along the edge of the collar to catch any excess water at the low end of the subgrade. They extended the drain approximately 15 yards to the left of the green, leaving the end exposed (daylighted) at the soil surface. From there it was possible to see if water was actually draining from the green. The new smile drain helped, but they still needed something to remove the water more rapidly. They wondered if suctioning water out of the green would work. Through some innovative work, they came up with a system to speed drainage by connecting extra pipe to the drain line and attaching it to a large-volume turf vacuum.

By taking advantage of the suction action produced by the turf vacuum, Mark and Forrest hoped to draw the excess water out of the soil profile. To test their theory, they attached 4-inch-diameter flexible drain pipe to the access ports on each side of the blower housing. The two pipes were connected using a Y-fitting and then tied into the exit point of the putting green drain. A T-fitting was installed at the connection point to the putting green drain to let water escape before reaching the turf vacuum, and also to provide an observation point to monitor the progress of the vacuum.

The next step was to turn on the turf vacuum and see if any water came out of the drain pipe. Progress was slow at first, but Mark and Forrest found that if they kept a cap on the open end of the T-fitting and briefly removed the cap every one or two hours, they were able to get a slow but steady water flow through the pipe. After operating the turf vacuum for six hours, they had sufficiently dried the front of the green and alleviated the black layer.

Obviously, using the turf vacuum was only one part of the solution. Aerification and the installation of the smile drain were key elements of the project. The addition of the turf vacuum helped speed the process and possibly helped draw air into the root zone. So, if persistently wet conditions and slow drainage are causing a problem on your greens, consider using this turf vacuum arrangement to achieve "suck-cess."

A California native, PAT GROSS *joined the USGA in 1992 as agronomist for the USGA Green Section's Western Region.*

Drawing The Line on Winter Play

Marking fairways with borderlines of dye helps define fairways for "winter rules."

by JAMES F. MOORE

WHILE THE Rules of Golf call for everyone to *play the ball as it lies*, a great many golfers play courses on which good lies are as rare as double eagles. Bad lies are particularly frequent on southern courses when the bermudagrass enters dormancy following the first freeze. As a result, many golfers in the South adopt a vague set of *rules* for winter play that usually involve *bumping* the ball to a better place. Depending on the leniency of their playing partners (also known as opponents), the bump may be as little as six inches or as much as a club's length.

Since *winter rules* are an obvious direct violation of the Rules of Golf, the more scrupulous golf memberships attempt to retain some measure of compliance by stipulating the ball can only be bumped in the fairway. However, what seems like a reasonable requirement can become a source of hard feelings when players (especially opponents) cannot determine whether the ball that is to be bumped lies in the fairway or the rough. Making such a determination is often impossible on dormant bermudagrass, particularly on those golf courses where it is sometimes difficult to tell rough from fairway, even in the summer.

The high-tech solution to this problem is to overseed bermudagrass fairways with perennial ryegrass in the fall. Brown, dormant bermudagrass, covered by a dense stand of ryegrass, provides some of the most beautiful scenes in golf. Unfortunately, overseeding is expensive. In addition to the cost of the seed (approximately $400 per acre), funds must be provided for year-round mowing, fertilization, and irrigation. However, the most significant *cost* may be damage to the bermudagrass. Low mowing of ryegrass fairways in the fall and winter predisposes the bermudagrass to winter injury. Then, competition between the ryegrass and bermudagrass in the spring limits the ability of the bermudagrass to recover quickly.

Bentgrass greens can be seriously affected by fairway overseeding as well. When bermudagrass fairways are overseeded, neither pre-emergence nor post-emergence herbicides can be used to control *Poa annua* in the overseeded acreage. As *Poa annua* flourishes in the fairways, some of the seed produced is invariably tracked into the greens.

Terry Stephenson, golf course superintendent of Western Oaks Country Club in Waco, Texas, uses a simple and inexpensive method to define winter fairways. Using his spray equipment, he outlines the fairways with green dye. The width of the band of green dye can be adjusted simply by turning off two or three booms. A further adjustment can be made by capping additional nozzles on the one functioning boom, leaving a single nozzle functional. Approximately 25 gallons of the water and dye mixture provides enough material to outline all 18 fairways. It takes less than two hours to treat the entire course, and the dyed areas remain well defined for two weeks or more, depending on how much rain is received.

In addition to eliminating the confusion over *winter rules*, this simple idea makes the course more enjoyable to play during the winter, since the fairways are so much better defined for the golfers hitting their tee shots. The dye also can be used to define target areas on the driving range (for ranges that do not have target greens).

One caution is in order. It is tempting to dye the entire fairway and provide green playing surfaces at a much-reduced cost when compared to the expense of overseeding. Unfortunately, today's dyes are much more colorfast than those used in the past, and golf shoes, early morning dew, and dye do not go well together. The money you saved on overseeding might well go into buying new shoes for your *dewsweepers* (the early morning players). By confining the dyed area to a small strip at the interface of the fairway and rough, damage to the player's shoes is extremely unlikely.

Sometimes the simplest and least-expensive ideas are the best. Give this one a try.

Using a sprayer with all but one nozzle closed, a green line can be painted around the edge of all fairway boundaries.

JIM MOORE, *based in Waco, Texas, is director of the USGA Green Section's Mid-Continent Region.*

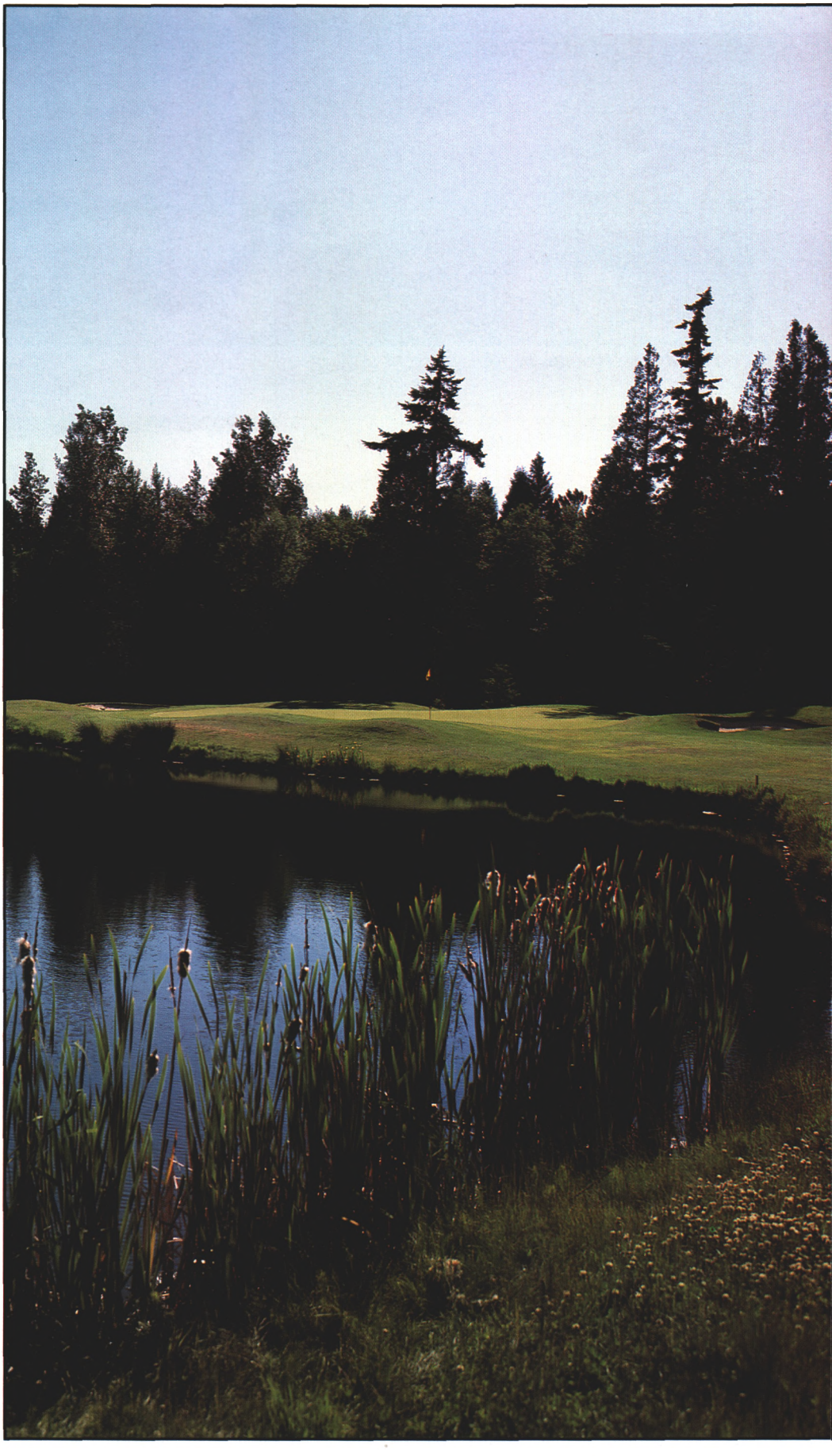
A VIEW FROM THE ROUGH

"Showin' is better than tellin'!" That well-worn cliché seems to get tossed around quite a bit in the game these days, even though its applicability to many facets of golf today is dubious at best. But one situation where this phrase remains apt entails the many benefits derived from spending time thumbing through a new volume published by Sleeping Bear Press entitled *A View From The Rough*. This book, probably more than any other ever published, literally illustrates golf's integral relationship with its surrounding environment through a series of splendid photographs, mostly culled from the collections of renowned golf photographer Mike Klemme.

The volume enables the reader to gather a new appreciation for and perspective on the game. Instead of limiting its vantage point to the more traditional role of the player, Klemme's images depict the golf course in its entirety. You'll see areas of restored natural vegetation, wetlands, and wildlife habitat that benefit the many creatures photographed on golf courses. Some of the more vivid examples show degraded and damaged landscapes such as quarries, landfills, and mines that have been transformed into vibrant golf course ecosystems that have helped communities turn eyesores into showcases.

While the book is composed predominantly of photographs, its text features quotes and statements from a variety of folks involved in both golf and the environment. They discuss the game's ability to serve as a model industry for sound environmental stewardship. Several of the USGA's programs, such as the Audubon Cooperative Sanctuary Program for Golf Courses and the Wildlife Links initiative, enjoy special and prominent mention.

Copies of *A View From The Rough* can be ordered by contacting Sleeping Bear Press, 121 South Main Street, P.O. Box 20, Chelsea, Michigan 48118, or by calling (313) 475-4411.



Semiahmoo, Blaine, Washington.

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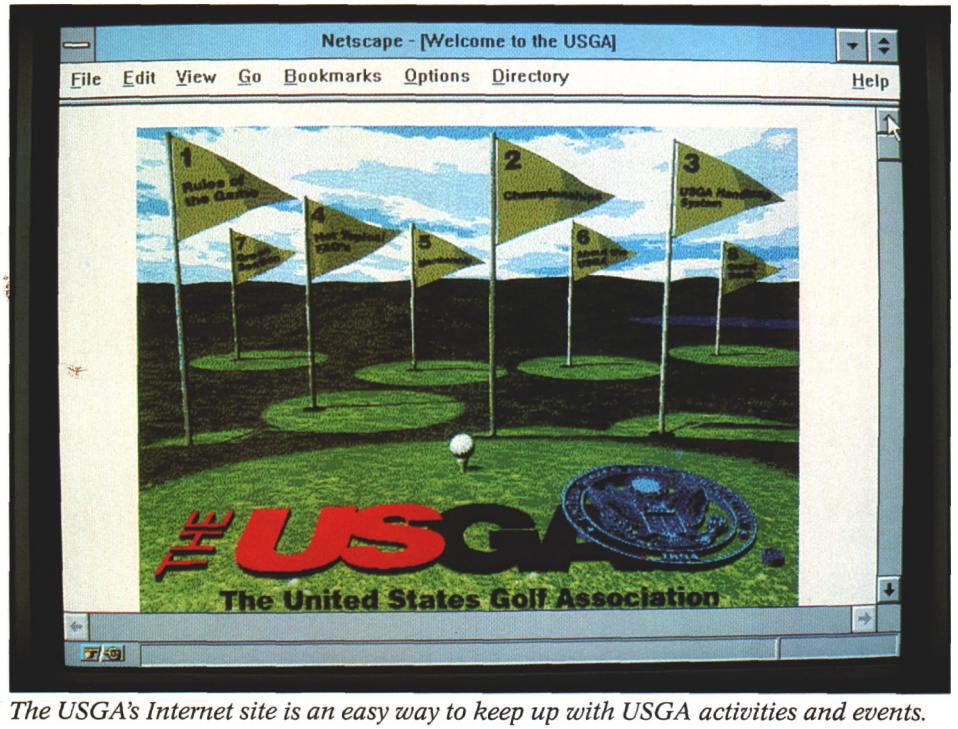

The USGA's Internet site is an easy way to keep up with USGA activities and events.

USGA ENTERS THE INTERNET AGE

Looking to check the 1996 schedule of USGA competitions? How about some friendly agronomic advice? Want to get a USGA Handicap Index but don't know where to start?

All these questions can now be answered by a few flicks of your fingertips by accessing the USGA's home page on the Internet. The address for the site is:

http://www.usga.org

Upon first entering the site, you'll see a series of eight flagsticks located on separate greens. Each one denotes a particular topic, such as Rules, Handicapping, Championships, etc.

The flag that will probably most interest the readers of this magazine is flag 7 for the USGA Green Section. A good deal of information is readily available, including basic information on programs as varied as the Turf Advisory Service, the Audubon Cooperative Sanctuary Program for Golf Courses, the Wildlife Links initiative, and all the USGA Environmental and Turfgrass Research Programs. A variety of other issues such as pesticides, spikeless alternatives, putting green speed, etc., are addressed as well.

All this information is intended for your use and can be easily retrieved. We only ask that you credit the USGA's Internet site as its source. So, the next time you're out surfin' on the Internet, cruise on into the USGA's site and take a look. You won't be disappointed.

The USGA received the 1996 President's Award for Environmental Leadership from the GCSAA on February 8th during the Environmental General Session of the GCSAA's 67th International Golf Course Conference and Show in Orlando. The recipient is chosen by the GCSAA board of directors based on exceptional environmental contributions to the game of golf. Created in 1991, the award previously recognized the USGA, The Audubon Society of New York State, and participating Audubon courses in 1993 for their role in helping create and popularize the Audubon Cooperative Sanctuary Program for Golf Courses.

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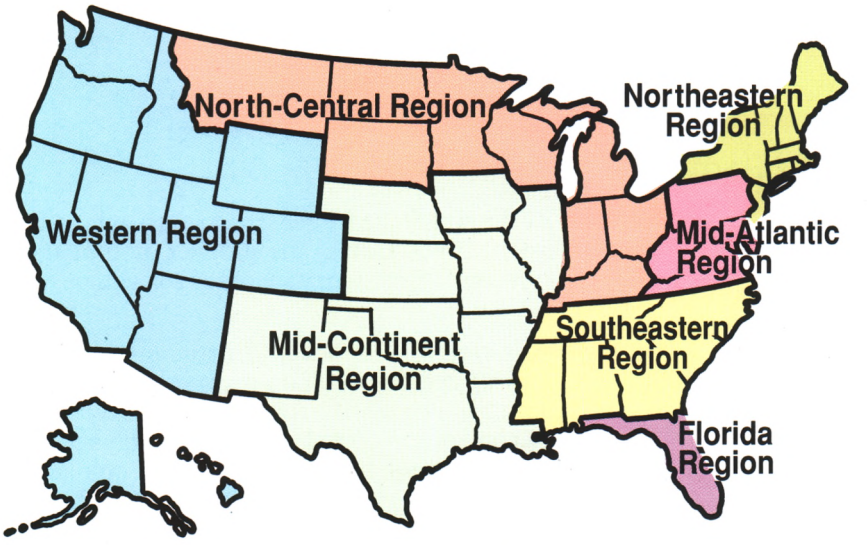

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MAINTAIN

Question: By the end of the winter season, our bermudagrass roughs exhibit a lot of traffic damage and inconsistent cover. During the summer months they recover, but we never seem to have a dense, smooth cover consistent with other golf course roughs. Any suggestions for improvement? (Florida)

Answer: To produce and maintain the top-quality conditioning expected at most Florida courses, similar programs must be applied to fairways and roughs. During the summer months, the rough should be on the same aerification program as the fairways to control soil compaction and thatch accumulation. Some type of surface grooming is also needed, but at most facilities, annual verticutting of the bermudagrass rough is cost prohibitive. An alternative strategy is to scalp the roughs to 0.75 - 1.0 inch in the early summer for about two weeks. Through the rest of the growing season, maintain the rough at 1.25 - 1.5 inches and mow approximately two times per week. This height of cut for roughs provides adequate fairway-to-rough definition, but is not an excessive penalty for high-handicap golfers. As the growth rate slows in the fall, gradually raise the mowing height to 1.7 - 2.0 inches to increase wear tolerance for the winter and to retain course definition.

ENVIRONMENTAL AWARENESS IN

Question: A local government ordinance has declared a portion of our golf course to be an environmentally sensitive area. How should we mark that area so that golfers and others will know it is an environmentally sensitive one? (New Jersey)

Answer: Ideally, any environmentally sensitive area should be physically protected by a fence and/or warning signs to deter players from entering. It should also be marked in accordance with the recommendations in the Rules of Golf (yellow or red stakes for water and lateral water hazards, white stakes for out of bounds, or blue stakes for ground under repair). It is advised that regardless of what color stakes are used, they should have green tops to designate the area as environmentally sensitive.

EVERYDAY GOLF PLAY

Question: We have an ongoing controversy here as to the accuracy of green speed measurements on our undulating greens. The speeds on the more undulating greens are never consistent with the speeds on our less severely contoured greens. Are our measurements accurate? (Rhode Island)

Answer: Stimpmeter measurements are not accurate when the average distances between the forward and reverse rolls vary by more than 18 inches. The following formula provides an accurate measurement for sloped areas where the variation occurs. It is as follows:

$$\text{Green speed corrected for slope} = \frac{2 \times S\uparrow \times S\downarrow}{S\uparrow + S\downarrow}$$

$S\uparrow$ = Measurement going up the slope

$S\downarrow$ = Measurement going down the slope