

USGA®

Green Section RECORD



1987 USGA Green Section
Education Conference Issue

USGA®



EDITOR:

William H. Bengeyfield

MANAGING EDITOR:

Robert Sommers

ART EDITOR:

Diane Chrenko

Vol. 25, No. 2

MARCH/APRIL 1987

GREEN SECTION COMMITTEE CHAIRMAN:

Marion B. Farmer

10633 Kinnard Avenue, Apt. F14
Los Angeles, Calif. 90024

NATIONAL DIRECTOR:

William H. Bengeyfield

P.O. Box 3375
Tustin, Calif. 92681
(714) 544-4411

GREEN SECTION AGRONOMISTS AND OFFICES:

Northeastern Region:

United States Golf Association, Golf House
Far Hills, N.J. 07931 • (201) 234-2300
James T. Snow, *Director*
Tim P. Moraghan, *Agronomist*
Gary A. Watschke, *Agronomist*

Mid-Atlantic Region:

P.O. Box 2105
West Chester, Pa. 19380 • (215) 696-4747
Stanley J. Zontek, *Director*

Southeastern Region:

P.O. Box 4213, Campus Station
Athens, Ga. 30605 • (404) 548-2741
Patrick M. O'Brien, *Director*
8908 S.E. Colony Street
Hobe Sound, Fla. 33455
John H. Foy, *Agronomist*

Great Lakes Region:

8727 W. Deerwood Drive
Brown Deer, Wis. 53209 • (414) 354-2203
James M. Latham, Jr., *Director*

Mid-Continent Region:

300 Sharron Drive, Waco, Texas 76710 • (817) 776-0765
James F. Moore, *Director*

Western Region:

P.O. Box 3375
Tustin, Calif. 92681 • (714) 544-4411
Larry W. Gilhuly, *Director*

Green Section RECORD

1 **Sherwood A. Moore, USGA Green Section
1987 Award Recipient**

2 **One Business In Which Success Is Not
Always Found At The Bottom Line
BEST TURF TIPS OF 1986 — PART I
Of Sprays and Sparks, by Gary A. Watschke**

4 **Chips 'N' Dips, by Larry W. Gilhuly**

5 **Seeing The Unseen, by John H. Foy**

6 **BASIC OPINIONS — BUT NOT NECESSARILY
THOSE OF TODAY'S MANAGEMENT
So You Think You Understand Automatic Irrigation
by Clifford A. Wagoner**

7 **The Golf Course Superintendent and The Environmentalist:
Friends or Foes?, by Monroe S. Miller**

9 **The Forgotten Magic of Lime, by William H. Bengeyfield**

11 **Let's See — My Rules of Golf Must Be Here, Somewhere . . .
It's in the Bag, by George Eberl**

13 **The Honor Roll**

17 **Biotechnology And Turfgrass Research:
A Glimpse Into The Future, by Cyrus M. McKell**

21 **THE BEST TURF TIPS OF 1986 — PART II
Helping The Blind To See, by James T. Snow**

23 **Oh Traffic: Oh Clippings: Oh Stumps!, by Charles B. White**

24 **The C - S - T - M Factor, by Stanley J. Zontek**

26 **For the Golf Course Superintendent There's a
Time to Hold — and a Time to Fold, by Riley Stottern**

27 **The Trials and Tribulations of a Green
Committee Chairman, by Howard Keel**

30 **A Few Minutes with Frank Hannigan**

33 **THE BEST TURF TIPS OF 1986 — PART III
Rooting Depth and Soil Sampling, by James F. Moore**

34 **A Supplemental Irrigation System for Putting Greens
by Patrick M. O'Brien**

35 **Topdressing Operations That Vibrate, by James T. Latham**

37 **Mid-Winter News Notes**

**Back
Cover** **Turf Twisters**

©1987 by United States Golf Association®. Permission to reproduce articles or material in the USGA GREEN SECTION RECORD is granted to publishers of newspapers and periodicals (unless specifically noted otherwise), provided credit is given the USGA and copyright protection is afforded. To reprint material in other media, written permission must be obtained from the USGA. In any case, neither articles nor other material may be copied or used for any advertising, promotion or commercial purposes.

GREEN SECTION RECORD (ISSN 0041-5502) is published six times a year in January, March, May, July, September and November by the UNITED STATES GOLF ASSOCIATION®, Golf House, Far Hills, N.J. 07931. Subscriptions and address changes should be sent to the above address. Articles, photographs, and correspondence relevant to published material should be addressed to: United States Golf Association Green Section, Golf House, Far Hills, N.J. 07931. Second class postage paid at Far Hills, N.J., and other locations. Office of Publication, Golf House, Far Hills, N.J. 07931. **Subscriptions \$9 a year. Foreign subscriptions \$11 a year.**



Cover Photo

*Sherwood A. Moore receives the
1987 USGA Green Section Award
from Montford T. Johnson,
Treasurer of the USGA.*

Sherwood A. Moore

USGA Green Section

1987 Award Recipient

NO GOLF COURSE superintendent is more qualified or deserving of the Green Section Award, presented annually for distinguished service to golf through work with turfgrass, than Sherwood A. Moore. He exemplifies the modern professional and his contributions to the game. On February 2, 1987, in Phoenix, Arizona, Moore became the 27th recipient of the highest recognition the USGA bestows in the field of turfgrass management.

Before 1,000 guests, the Award was presented by Montford T. Johnson, of Amarillo, Texas, the USGA Treasurer, at the Golf Course Superintendents Association of America Annual Turfgrass Conference. The Annual Green Section Educational Program was held earlier in the day, the sixth consecutive year it has been held in conjunction with the GCSAA International Turfgrass Conference and Show. Over 1,100 superintendents and club and golf association officials from throughout the world attended.

A native of West Hanover, Connecticut, Moore began his career in golf in 1939. Holding an associate's degree, from the Stockbridge School of Agriculture of the University of Massachusetts, he applied his expertise at Lake Mohawk Golf Club and Hollywood Golf Club, both in New Jersey; Woodway Country Club, in Darien, Connecticut; and during two tenures at Winged Foot Golf Club, in Mamaroneck, New York. While he was at Winged Foot, he was responsible for preparing the course for three USGA Championships — the 1959 and 1984 U.S. Opens and the 1980 U.S. Senior Open.

He has been an enthusiastic and articulate spokesman for the turf management industry as both an author and lec-



Sherwood Moore (right) with John Schilling, Executive Director of the Golf Course Superintendents Association of America, during preparations for the 1984 U.S. Open at Winged Foot.

turer. He has participated in hundreds of educational conferences, and served as an instructor at Short Courses for turfgrass students at Rutgers University. In a career that has spanned four decades, including combat service with the Eighth Air Force during the Second World War, he has provided guidance, training, help, and encouragement to young people in turfgrass management and golf.

AN INNOVATOR, he was one of the first superintendents to use arsenicals for wide-scale control of *Poa annua* on fairways and rough areas. He pioneered fairway contour mowing and using triplex green mowers on fairways. Sherwood worked closely with researchers and manufacturers in the use of new equipment and chemicals and their application techniques to actual golf course situations.

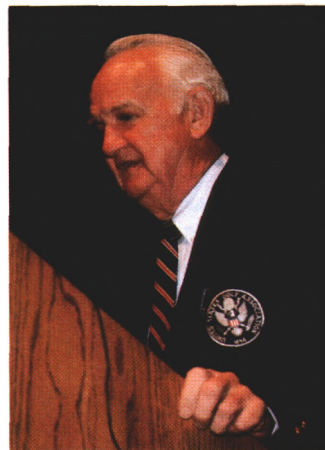
In 1939 he became a member of the Golf Course Superintendents Association of America, rising to President, in

1962. He has been a member of the USGA Green Section Committee for 15 years and on the Review Board for the James B. Beard book *Turf Management for Golf Courses*, a USGA publication. He has also served as President of the New Jersey GCSA, in 1953 and 1954, and the New York Metropolitan GCSA, in 1965 and 1966. He continues to be active in many associations in the Northeast, as well as with the O. J. Noer Turfgrass Research Foundation.

As he accepted the Award, Moore said, "To work with nature, to travel, to see the progress we have all made in the care of golf courses in these years has been an exciting and rewarding experience to me. To my wife, Marie, to all my friends, I share this recognition with you."

Sherwood Moore has led the way to greater professionalism within the ranks of the golf course superintendent. He has led the way in dedication and service to golf. He honors the Award, and is eminently deserving of it.

One Business In Which Success Is Not Always Found At The Bottom Line



Marion B. Farmer

February 2, 1987, Phoenix Civic Plaza,
Phoenix, Arizona

FOR THE SIXTH consecutive year, the Annual Green Section Education Conference was again held in conjunction with the Golf Course Superintendents Association of America International Turfgrass Conference and Show. Marion B. Farmer, of Los Angeles, California, Chairman of the USGA Green Section Committee, introduced the morning's speakers before an audience of 1,100 at the Phoenix Civic Plaza's Symphony Hall. The proceedings of the program are presented in this issue of the GREEN SECTION RECORD.

BEST TURF TIPS OF 1986 — PART I

Having completed one of their most successful Turf Advisory Service Visiting Service seasons ever, consulting with 1,200 USGA Member clubs and courses and their superintendents in 1986, the nine Green Section Agronomists offer a new edition of "Best Turf Tips of 1986 — Part I." Parts II and III will be found later in this issue.

Of Sprays and Sparks

by **GARY A. WATSCHKE**

Agronomist, Northeastern Region, USGA Green Section

YIPES! STRIPES! How many of us in the past have seen the sometimes startling appearance of turf caused by errors in applying various chemicals? Stripes and other geometric patterns are often caused by clogged nozzles, skips, overlaps, and undulating terrain, and by "boomless" spray techniques.

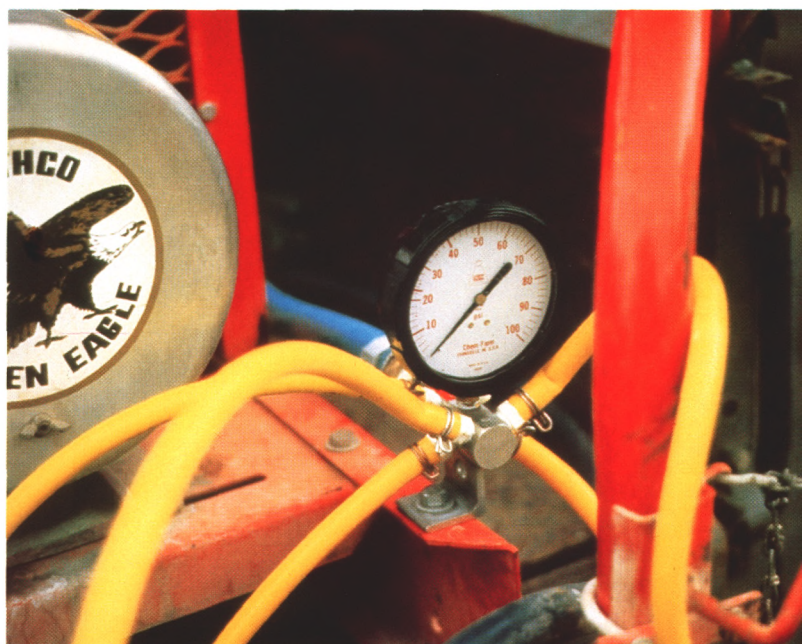
The poor results created by these problems can become magnified when using some of the newer turfgrass chemicals that come in highly concentrated formulations. Several plant growth regulators, a few herbicides, and some fungicides employ recommended

rates of only a few ounces of product per acre. Mechanical problems associated with the misapplication of such potent products can be significantly reduced.

Scott Niven, superintendent at Stanwich Golf Club, in Greenwich, Connecticut, has found a spray system that provides near perfect results. The heart of the system is a manifold device that allows each nozzle to have its own delivery hose. This insures that all nozzles will receive the same volume of spray mix at the same pressure. Terminal hardware consists of individual petcocks, no-drip check valves, and hollow cone stainless steel nozzles. The pet-

cocks can provide sectional operation, and the no-drip check valves provide instant shut-off.

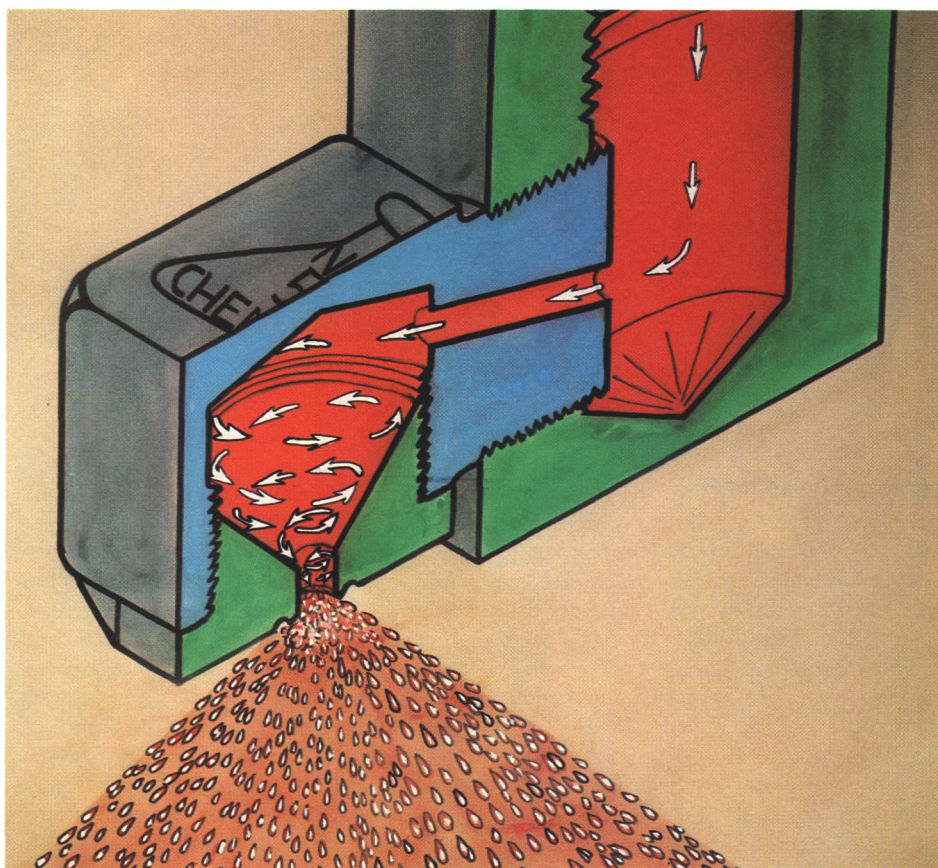
The metercone nozzles are similar to Whirljet and Delevan Rain Drop nozzles. Consisting of a whirl chamber, sometimes a stator, and always a large orifice, these nozzles combine to produce a large spray droplet in a hollow cone pattern. They are spaced 20 to 40 inches apart on a boom that can be fixed anywhere from 20 to 40 inches above the ground. The height doesn't seem to be critical, because the nozzles are attached at a 45 degree angle to the ground, and the spray pattern will actually resemble



a waterfall. Drift has not been a problem even in 15-mile-per-hour breezes, because spray fines are minimized by the large droplet size.

Scott located this equipment at Chem Farm Inc. of Evansville, Indiana, and has produced picture perfect results using such sensitive products as Cutless, Embark, and Paraquat for *Poa annua* control.

Another turf tip was discovered at the Haverhill Golf and Country Club, in Massachusetts, where Mark Taylor is superintendent. Mark's mechanic grew tired of the perpetual problem part-time workers had in jump-starting equipment. Many of them were afraid of electric shock, and on occasion the polarity was reversed. To simplify matters, the alligator clips on the jump cables were replaced with the male plug commonly found on electric golf cart chargers. All equipment has been fitted with the matching female receptacle found on electric carts. Now the employees have only to plug one vehicle into another. No more crossed wires. No more sparks.



(Top, left) Individual petcocks, no-drip check valves and stainless steel nozzles make up the terminal hardware.

(Top, right) Each nozzle has its own hose from the spray distribution manifold.

(Above) The nozzle with whirl chamber and large orifice.

Chips 'N' Dips

by LARRY W. GILHULY

Director, Western Region, USGA Green Section

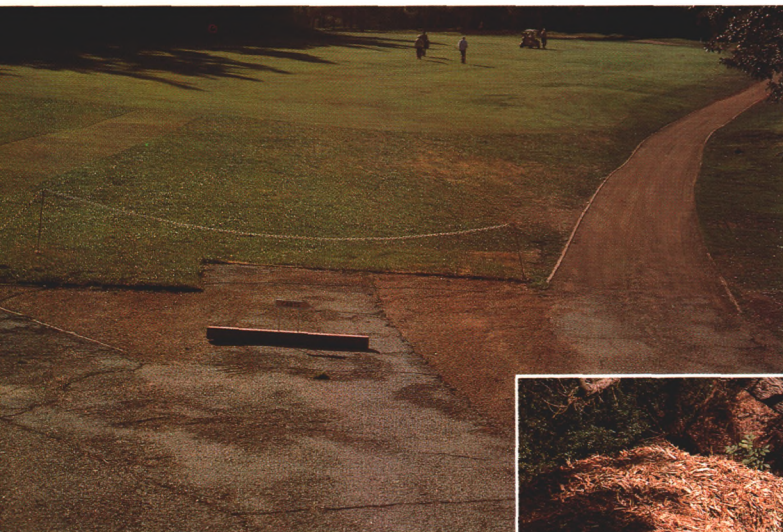


Figure 1.



Figure 3.



Figure 2.

PERHAPS ONE of the most persistent and insidious problems encountered by golf course superintendents is the constant wear caused by golf carts, maintenance vehicles, and foot traffic. Many methods have been used to improve heavily worn areas, ranging from natural to artificial means, such as turf paving systems. While these artificial surfaces work to varying degrees, the golfer cannot play a shot directly off most of them. As an alternative to artificial cart paths, many clubs have used ropes or signs to restrict carts to paths, and various fanning techniques to distribute vehicular wear throughout a broader area when leaving and entering cart paths and green areas (Figure 1).

While the following idea may not work under every situation and climate, it has worked very well at El Caballero

Country Club, in Tarzana, California. Ray Lozano, the superintendent, has devised a means to use wood chips derived from limbs and trees on the golf course site to provide a natural means of controlling compaction on these heavily worn areas. The chips are comprised primarily of eucalyptus, pine, acacia, and other trees found throughout the golf course (Figure 2). The chips are basically stored for approximately one year before they are used. Approximately three inches of chips are placed on the desired area and covered by one-half to one inch of soil. The area is then seeded with the desired grass (bermuda in the summer and perennial ryegrass in the winter) and covered with a fine layer of steer manure. Depending on the growth of the seed, play is kept off the area from four to six weeks and then opened for regular wear patterns. In the past three years, certain areas have per-

formed exceptionally well on the exits and entries of cart paths under heavy play conditions.

The best response with this technique can be seen in the main exit and entry area next to the 16th green (Figure 3). No soil was used on this area, and the surrounding bermudagrass was allowed to encroach without overseeding. As can be seen, areas adjacent to this wood chip area suffer from severe compaction and turf loss. The wood chip area has lasted for over six years at this point with no turf loss and only a minor change in contour resulting from decomposition of the chips. It is felt that if you wish to try this idea on your golf course, it would be best to use as little soil as possible to reduce the possibility of compaction. The idea has also been used successfully when chips are covered by sod with little soil attached.

Seeing The Unseen

by JOHN H. FOY

Agronomist, Southeastern Region, USGA Green Section

AT LAST YEAR'S conference, Northeastern agronomist Gary Watschke presented the use of aerial photography to aid in the communication of plans and programs to superiors and staff. In Florida, over the past year, quite a number of superintendents have taken advantage of a new twist with their aerial photographs. They changed from regular black and white or color film to infra-red. Aerial infra-red photography (or remote sensing) was used during the Korean War, and since then, millions of acres have been photographed. Nevertheless, this technology has rarely been used on golf courses.

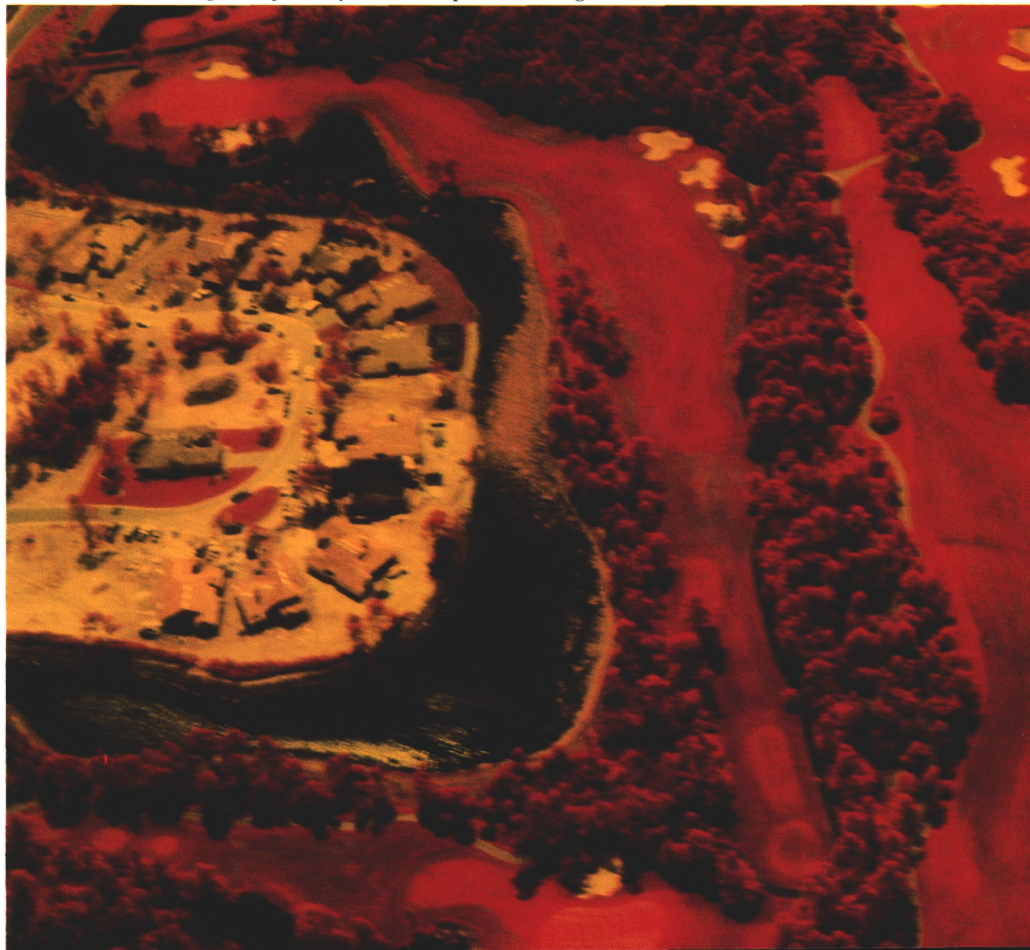
Jon Seid, of LaBelle, Florida, has been involved with the technology from its beginning and has worked with universities and state and federal agencies as a private business, photographing agricultural crops to locate and diagnose plant disease and insect infestations. Cary Lewis, director of golf course operations for the Vintage and Fiddlesticks Country Clubs, in Fort Myers, Florida, overheard a group of citrus growers discussing photographs of citrus canker plaguing the area. After discussing this work with the growers, Cary decided to use this technique on his courses, and he was impressed with the results. Cary and Seid were able to define problem areas and then graphically explain them to the membership. Not only was it easy to justify chemical and fertilizer expenditures, but drainage and irrigation problems also became very evident.

The reason why this technique makes these situations so visible is that infra-red film picks up the invisible rays reflected by the chlorophyll molecules during photosynthesis. Therefore, when anything affects the turf, there is a

reaction by the chlorophyll, and the reflectance changes. Every factor — diseases, nematodes, insects, environmental stress — produces very distinct identifiable patterns. From the first, subsurface lateral water flow patterns were very evident. This allowed for greatly improved efficiency in drainage work. Because of this one factor, almost every course that has been photographed has been able to justify the cost of the service.

While a great deal of work still has to be done as far as keying-in on the numerous pests that attack golf courses, there is a tremendous potential to reduce chemical cost by treating only infested areas rather than having to make blanket applications. With each additional golf course that is photographed, more insight is gained into the use of this new tool, which has already been extremely beneficial to superintendents throughout Florida.

Shaded areas through the fairways indicate poor drainage.

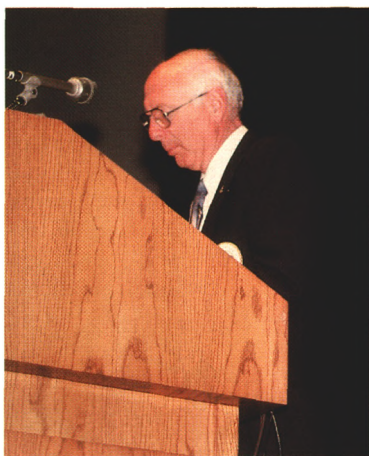


BASIC OPINIONS — BUT NOT NECESSARILY THOSE OF TODAY'S MANAGEMENT

This is our editorial page, a new feature added to the 1987 Green Section Education Program. Here are three editorials discussing Basics in turfgrass management for golf. But how can Basics become controversial? Decide for yourself.

So You Think You Understand Automatic Irrigation

by **CLIFFORD A. WAGONER**
Past President, GCSAA, Modesto, California



Clifford A. Wagoner

IS AUTOMATIC irrigation really automatic, or should it be called controlled or timed irrigation?

Since the name is questionable, how can we really understand automatic irrigation? Is it possible with all the sensors and computers to irrigate golf courses automatically? My experience in designing, installing, and managing a system for 25 years leads me to believe that even though more accuracy may be possible now, any irrigation system still must be very carefully managed. If we understand automatic irrigation, why, after 25 years, are the same problems evident?

Systems are still being installed with spacings exceeding the manufacturer's specifications, undersized piping, insufficient supply of water, and a large number of heads on one valve. Also, the heads on the same valve are on varying slopes that are not compatible. In a glaring misuse of technology, wires are connected in the field when using valve-in-head sprinklers. This eliminates the flexibility of individual controls. An

alternative may be to use terminal boxes so adjustments can be made as needed. In many installations, sprinkler heads are selected without giving any thought to water quality. Furthermore, some sprinklers are designed to turn one revolution in three minutes. This item needs to be taken into consideration if you plan to use the system for short cycles or syringing.

No one industry has done more to acquaint the user with its products than the irrigation industry. Just look at the number of exhibitors at every turf conference. The volume of available material is staggering. In spite of the tremendous amount of technical data, automatic irrigation remains a mystery to many people.

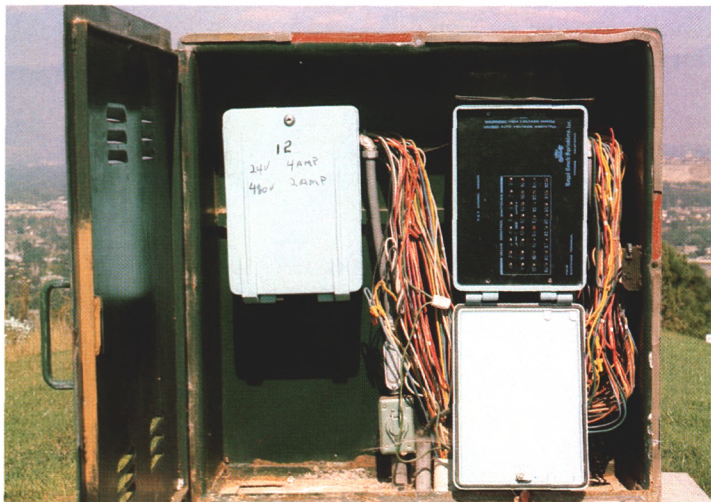
Even if a system is poorly designed, a fine-tuned management program may possibly overcome the shortcomings of poor installation or poorly designed systems. Heads should periodically be checked for worn nozzles and for height of head in relation to ground level. Revolutions per minute should be

constantly checked. Controllers should be frequently checked for accuracy in station timing and starting intervals. Pumps must be checked for volume, wear, and efficiency. Pumps and controllers must be synchronized.

Many clubs are on their second automatic systems, and some are on the third, and yet the golf course superintendent has elected not to become involved. Many excuses are given, but to me, there is no excuse. If a club begins the process of selecting a design engineer without the superintendent's being involved, the superintendent must assert himself enough to help make those important decisions.

Bart Starr and Art Holtz, keynote speakers at the GCSAA 1987 Conference, both said that perfection may be out of reach, but everyone must strive for excellence. Even though we may not fully understand automatic irrigation, if we assert ourselves during the planning and installation process and strive for excellence, golf course irrigation will certainly improve.

A field controller.



The Golf Course Superintendent and The Environmentalist: Friends or Foes?

by **MONROE S. MILLER**

Superintendent, Blackhawk Country Club, Wisconsin

THERE IS an irony in this title. I have been a golf course superintendent for 15 years. I grew up on a Wisconsin dairy farm and then became a student at one of our land-grant universities.

For all the time that I can recall, I have considered myself an environmentalist. I submit that you could consider almost all Americans environmentalists in the sense that we care about and are deeply concerned about the health of our citizens and the environment in this country. No sane person is anti-environment; all of us want to improve the quality of the lives we live.

Furthermore, many sincere Americans are especially and understandably vigilant about preserving our natural resources and our spectacular environmental assets. In the last 30 years or so however, a vocal and militant environmental faction has emerged that demands bannings, restrictions, and other regulations with no obvious or apparent regard for the risk/benefit equation. I consider this faction environmental extremists. I am most interested in those extremists who preach gloom and doom as a result of agricultural chemicals and pesticides. These people and their proposals can potentially damage, ruin, or even end much of what we do as managers of fine turf. To answer, early on, the question "Environmentalists — Friends or Foes?" is to respond that the fanatic and emotional group to which I refer could be nothing but an adversary of a professional golf course manager.

THOSE CHARGED with the responsibility of using agricultural pesticides are aware of the benefits of these products. On our golf courses in Wisconsin, in June, untreated bluegrass rough areas frequently are severely damaged by *helminthosporium* leaf spot. In August, the flowering ornamental crabapple that missed a preventive



Monroe S. Miller

dormant spray stands out because of its declining foliage. I recall vividly farm pastures not sprayed with 2, 4-D and a corn field that wasn't treated with atrazine. In both cases, decreased yields were obvious.

More than these, and nearly endless other and varied examples of the value of pesticides, was an experience I had almost 20 years ago. I served my Army tour of duty in an underdeveloped country that was steeped in severe poverty. It did not then, nor does it today, have the ability to feed and clothe itself. Those terrible scenes of poor people are repeated around the world, in Mexico, Central America, South America, Asia, Africa, and the Middle East. Populations in those countries have not experienced the contributions of science, technology, improving health, agriculture, food, clothing, energy, housing, transportation, industrial development, and, yes, even recreation. These factors all contribute to the high standards of living we Americans enjoy today and, unfortunately, that many of our brethren around the world do not. No amount of vituperative dia-

tribes from environmental extremists will change the fact that the use of agricultural pesticides has contributed mightily to our higher standard of living.

It seems to me that most Americans are relatively satisfied with the substantial, even formidable, improvement in our standard of living in the past 30 or 40 years. Yet the promoters of toxic terror seem to imply that we must go back to the methods of the 1930s — the good old days before pesticides, commercial fertilizers, and synthetic products. Believe me, one week of those good old days would create more havoc than this nation has seen in a lifetime. We would not enjoy life as it is today without the use of agricultural chemicals and pesticides. It is interesting to note that if we were to achieve 1980 agricultural production with 1940 technology, we would have to cultivate an estimated 430 million additional acres of land.

These environmentalists are a formidable opponent for many reasons. Despite their small numbers — which include a few scientists, politicians, bureaucrats and consumer advocates — they have been able to convince millions of Americans that there is nothing but bad news about the environment in this country. How are they able to do this even though evidence and logic almost never support their position?

FIRST, THEY use emotion and horror. Fear is an easy emotion to generate and a difficult one to dispel. We are all afraid of cancer, birth defects, infertility, and radiation burns — many of the things environmentalists warn us about. Secondly, as a group they are good communicators. They are able to give impassioned speeches that often have nothing to do with reality. Many are good writers — the list of anti-chemical and anti-industrial books and articles is endless. One of the best in this group is Rachel Carson, whose carefully crafted book *Silent Spring* is full of



undocumented “could”s, “seemingly”s, “possibly”s, and “apparently”s. In fact, she is most responsible for taking the environmental movement into the big time.

Environmental extremists are very effective in capturing the attention of the press, again most commonly by instilling fear of unknown disasters. And let's face it — fear makes news because fear is interesting. These environmentalists seem also to be keenly aware that bad news is big news and that good news is not only boring — it is seldom news. For example, statistics showing that American health has never been better seldom receive play in the press. In fact, statistics such as this are often reversed when they are presented as news stories — life expectancy is up and this creates more stress on an already shaky Social Security system. Good news is turned around and presented as bad news.

The same thing is done with increased agricultural efficiency because of agricultural chemicals; that good news of low food costs is cast as a problem with exports, surpluses, and the overall farm problem. The good news is portrayed as bad news, demonstrating once again that controversy and sensationalism are good for ratings on television and sell books and magazines.

Those on the extreme end of the environmental movement are usually on the offensive, making wild claims, exaggerating relatively small incidents, and quoting data out of context. It is far

easier, in my judgment, to present your case than it is to be on the defensive, stating no problem exists or pointing to the data that have no relevance in science. It is also almost impossible to prove a negative, which compounds the difficulty of the offensive/defensive situations.

A raft of other reasons are responsible for successes of environmental zealots. They are well funded because of the obvious appeal of their cause as it is perceived by the general public. They enlist the awesome support of government bureaucracies, and once the bureaucratic juggernaut has been set in motion, almost nothing can stop it. They have learned not to deal with specifics of an issue — they are generalists. They overcome, to some extent, their lack of scientific data by quoting, requoting, and quoting again and again the same few scientists within their relatively small group.

A good doomsayer never ever under any circumstances mentions any benefits of agricultural chemicals, no matter how substantial they might be, and he always stresses their *potential* disadvantages. You will never hear extremists discuss the cost of an environmental regulation; not only will they ignore what portion of our economic resources will have to be committed, but they won't address impacts on our standard of living and health. And finally, in their we-against-them approach, there is always the chemical industry, nuclear industry, agribusiness, or the industrial/

military complex. These are all easy targets for almost any criticism.

IT IS FAIRLY easy to define a problem and visit about it. Offering answers and solutions is a lot more complex and challenging. That difficulty is amplified when the problem is as pervasive as this one. How can we most effectively deal with the environmental extremists of the 1980s whose goal is the wide-scale restriction of man-made chemicals in *all* facets of society, not just the agricultural chemicals critical to the golf course industry?

1. The most important thing we can do is to recognize that we do have a serious responsibility — legal and moral — to use pesticides in the way and the purposes for which they were intended. Any action or program that lends itself to that end deserves our support and participation. Pesticide applicator training and registration programs, increased use of integrated pest management programs, in-house safety and awareness programs, are a few specific examples. Negligence of any kind cannot be accepted.

2. Education on all fronts is critical. Educate employees — as I've mentioned. Educate players on how essential pesticides are for good golf turf production. Educate friends and neighbors. We need to close the gap between the consensus in the scientific and medical communities on environmental issues and that which is presented in the popular media. This can best be done through educational opportunities, whenever and wherever they may come and without regard to how informal they may be.

3. I believe we need to organize. We have done that in Wisconsin and done it in a way that deserves to be a model for other states. In December 1983, the FORESTRY/ RIGHTS-OF-WAY/ TURF Coalition was formed. Today, FROWT — as we are given to call it — has 700 members. We have an executive director, an office and staff. The Coalition follows pesticide issues in turfgrass management, forestry and rights-of-way and makes certain that both sides of an issue are presented. Legislation is monitored, and members are kept abreast of proposals that might affect them. Public relations and education are key elements in all that FROWT does. Executive director Russ Weisensel is a tremendous resource for golf courses in Wisconsin.

4. On occasion we may have to legislate. The chance to do this directly doesn't come very often. Most frequently we can try to influence legislation that affects us through a lobbyist (such as FROWT), by attending committee hearings and giving testimony when possible and, finally, by voting for those individuals most likely to represent our interests.

5. There are times we have to litigate. This option makes me nervous, simply because I'm like the majority of people who'd rather not ever be involved in court proceedings, but in Wisconsin we faced a situation that offered no other options. The FROWT Coalition and a Christmas tree grower in the town of Casey, in Washburn County, are suing the town board of supervisors over an ordinance adopted in June 1983 that

prohibits the use of herbicides on public lands and roadways and on private lands subject to public use (such as golf courses) without town board approval. It also prohibited aerial application of herbicides on any land without approval. The key point of our lawsuit against the town of Casey is "whether or not local units of government have jurisdiction in regulating pesticides." It is clear that pesticide use has been the subject of extensive federal and state legislation. There are nearly 2,000 municipalities in Wisconsin; and if each one is allowed to enact its own set of regulations, it would essentially be impossible to conduct business in our state. We had to sue to try to prohibit a patchwork of conflicting regulations. We need to confirm the preemptive nature of federal and state pesticide laws and regulations.

6. Finally, there is good logic in trying to establish a dialogue with environmental extremists. If litigation is frightening, then this is frustrating. Too often I am guilty of arguing with them when a confrontation occurs. However, it is a wise person who establishes channels of communications; his position can only benefit.

Involvement may best express what I am trying to say. Logic is on our side. Science is on our side. The welfare of America and Americans is on our side. If we fail to serve these interests by not defending our right to use pesticides and agricultural chemicals, we will have failed our profession. We will deserve the consequences.

I am one environmentalist who believes golf courses are a vital part of our environment.

The Forgotten Magic of Lime

by **WILLIAM H. BENGEYFIELD**

National Director, USGA Green Section

THIS IS an editorial, and editorials are meant to stimulate thought; to introduce opinion relating to the facts. "The Forgotten Magic of Lime" is both the subject and the fact.

The fact is that many experienced men, men who have been studying and observing fine turf for over 70 years, have been convinced and can prove the value of lime — either calcium carbonate (ground limestone) or calcium hydroxide (hydrated lime) in managing fine golfing turf. There is no question of this.

Lime was one of the first chemicals used on turfgrasses in this country. Can you believe that lime, under certain soil conditions, can actually *cause* grass to grow? Ask any dairy farmer why he limes his pastures? He'll tell you lime grows more grass and that means more milk in the pail and that means more profit in the farmer's pocket. It is a basic fact.

When the U.S. Amateur was played at The Country Club, in Brookline, Massachusetts, in 1934 (just as the Open will be played there in 1988), lime was used for lines around every green to control the gallery of that day. Now we use



O. J. Noer, 1958. One of the earliest and best turfgrass consultants.

yellow ropes for the purpose. Twenty years later, in 1954, a very dry spring occurred in New England. Strikingly noticeable narrow, dark green grass growth lines appeared around every green, caused, naturally enough, by the lime application 20 years earlier. Pictures prove this phenomenal fact.

Last summer a young golf course superintendent asked what he could do to substantially reduce the deep accumulation of thatch on his greens. His membership was upset. Footprinting was very much in evidence on the greens, and this young fellow was under a lot of pressure.

I recalled a lesson taught many years ago by O. J. Noer, one of the pioneers of turfgrass management for golf. I was making a golf course visit with O. J. in Victorville, California, in 1954. The greens had a lot of thatch on them, and O. J. said, "You'd be smart to apply some hydrated lime to these greens two or three times a year for the next couple of years. Put on about two pounds per 1,000 square feet in the early spring, early summer, and again in the fall. In a year or two, you'll have a lot less thatch."

It worked. Two years later these greens were in great shape, and excess thatch no longer was a problem. I later learned this simple trick was widely used many years ago by the same men who founded the GCSAA, in 1927.

Hydrated lime immediately furnishes free calcium, slightly raises the pH level within the naturally acid thatch layer, and causes soil micro-organisms to work overtime, feed on the thatch and, in nature's own way, substantially reduce excess organic matter.

I told my young friend this story last summer. He showed considerable doubt, furrowed his brow but nodded in agreement and left.

About two weeks later he was back with another question. "You know," he said, "I've checked your story out about using hydrated lime with several other superintendents and university people. They've never heard of it. Who can you name in authority to substantiate what you have said?" I'd rather not say how I answered.

You see, we have forgotten the magic of lime. Even under alkaline conditions, as was the case at Victorville, California, thatch layers are just naturally acidic, and hydrated lime will work wonders. Oh yes, an 80-pound bag of lime costs about \$4.00.

Incidentally, back in the 1930s the University of Rhode Island proved one could control thatch accumulation in bentgrass turf just by manipulating lime applications. How short our memory.

Let me tell you another story about lime. It also works. When I first came to the Green Section in 1953, Tate Taylor was recognized as one of the outstanding golf course superintendents (greenkeepers) of his day; particularly in the Northeast. Tate was about 60 years old then, one of the first college graduates in our business, and had years of experience in Maryland, New Jersey, New York, and New England. He was the superintendent at Westchester Country Club for many years before the Second World War, and later became a member of the Green Section staff. He was not only college smart, but field smart as well.

During one of our many bull sessions Tate said, "You know, whenever you visit a golf course and the superintendent is having trouble with a couple



Poa annua will make thatch, even in pots. The magic of lime will help control it.

of his greens, and he has tried everything he knows, and nothing works, tell him to make an application of lime (either hydrated lime at two or three pounds per 1,000 square feet; or ground limestone at five or ten pounds per 1,000 square feet). Then, stand back. Nine times out of ten, within a day or two, the situation will improve or be totally solved."

I've told this story to at least a dozen superintendents who were in trouble and had tried everything. And in every case, the lime worked. When all else fails, try a little lime and remember Tate Taylor. *Lime applications can actually control some diseases.* And for a lot less money. It won't work with all diseases, and when there is an epidemic, fungicides are the answer. But give it a try on your nursery someday and see for yourself.

There's another use for lime. Frequently in the fall or even in the summer when putting green turf may become a little thin and open, algae will often form on some areas of the putting surface and even crust over. It may become black and start to flake. If this condition is allowed to go unchecked, it will smother the grass and inhibit recovery. Now it's true you can spend money on algicides and wetting agents and what have you, and they'll probably work. You can also dust a little hydrated lime, again about two pounds per 1,000, over the algae and it will disappear, and the grass will green up and recover. You can

repeat the treatment again and again, about every week or so, at this light rate without fear.

Now there is a word of caution. An application of hydrated lime should always be separated by a week or so from the application of any soluble nitrogen fertilizer. If the two materials are applied too close together, they could cause leaf burn.

We seem to live in an age of excesses. We tend to go overboard in one way or another. We like to follow trends. We are into fads. This isn't good turf management, and it isn't good for the turf manager or his future.

Low nitrogen levels have been in for several years and moss has become a problem. High nitrogen levels were all the rage ten years ago, and disease problems were rampant.

Very high potassium levels are in today, but even in the 1930s, we knew potassium was important to cell wall thickness, winter hardiness, and wear resistance.

Because of the Stimpmeter, golfers thought a green speed of 12 feet was the ultimate in golf just five years ago. Today, most golfers are happy with eight and one-half feet, and they enjoy their grass greens all summer long.

Slow-release fertilizers were all the rage 10 to 15 years ago. Now we know they have their place, but light and frequent soluble fertilizer applications cer-

tainly have their advantages too, particularly when concerned with nitrogen availability on summer greens.

USGA Specification greens are built with 80 percent or more of sand. They were supposed to drain no matter how much water applied. Right? Wrong. The Specifications as developed by Dr. Marvin Ferguson were designed and planned to reduce the effects of soil compaction, not excess irrigation. There seems a modern misunderstanding that water may be applied indiscriminately to greens, especially sandy

greens, at any time without concern. It simply isn't true.

And so we have come full circle. Moderation is the answer. We should use the knowledge we have properly. Lime in excess can certainly cause problems. But that doesn't mean we should forget the basic uses, techniques, and value of lime.

I plead with all of you not to overlook the wisdom and experiences of the past. They are rich and valuable. Let us guard against a headlong rush to invent something new when we already have an

answer, an effective and inexpensive answer from the past.

Oliver Wendell Holmes once said:

Science is a first rate piece of furniture for a man's upper story if he has common sense on the ground floor. But if a man hasn't got plenty of good common sense, the more science he has, the worse for his decisions and those he serves.

The Noers, the Taylors, and the Fergusons have already left us a treasure of knowledge. There's magic in lime. Let's use it.

Let's See — My Rules of Golf Must Be Here, Somewhere ... It's in the Bag

by **GEORGE EBERL**
Managing Editor, GOLF JOURNAL

THE TYPICAL golf bag may take on the character of a sophisticated Dempster Dumpster, a collecting point for things quaint and occasionally vile. Inside the zippered compartments you might find dried grass blades, wads of lint, and other lumps and pieces not so easy to identify, like a six-months-old half pack of crumpled cigarettes, a spike cleaner, a spike wrench, some ancient golf gloves that have attained the approximate texture of the Dead Sea Scrolls, ball-markers that were gifts from one business convention or another, and a fistful of broken or dull golf pencils (have you ever noticed that golf pencils rarely have an eraser end?). Less intense players may carry a medicinal flask, protection against inclement weather, bad scores, and/or the loneliness of life in the rough.

Of course, an assortment of wood and plastic tees are sprinkled among the

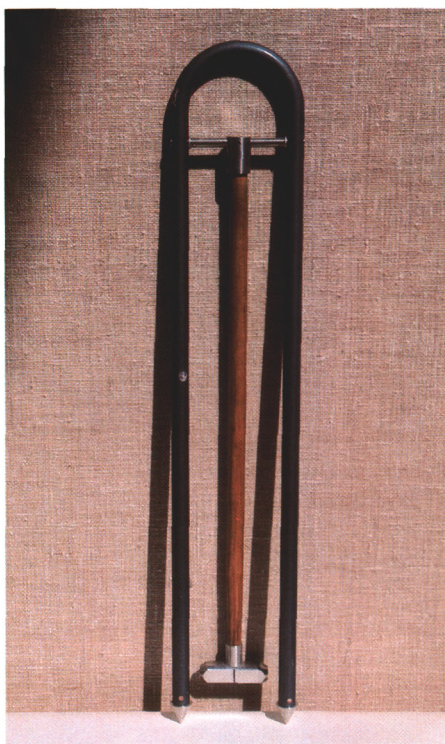


M. T. Johnson, USGA Executive Committee.

debris, including some that are broken (useful for par-3s, although one usually finds them only when preparing to hit off on a par-5, with driver in hand). For some mysterious reason, the best tees descend into the more remote crevices, just out of reach of blindly probing fingers.

The same is often true of golf balls; range balls, conspicuous by their red stripes, invariably rise to the top, leaving the player who is to tee off immediately fumbling futilely for a white, dimpled, sparkling lovely somewhere in the depths of his leather bin of unmentionables.

Old golf balls have a value, however; they are popular for teeing off where water hazards menace. It is ironic that often these same players, some of whom will pick up a sizable bill in the clubhouse without blinking an eye, carry a ball retriever in their overstuffed bag, and they will fish in a pond for a quarter



of an hour for a dilapidated ball that many would have consigned to their shagbags.

All of which brings us to the tools, the weapons of the trade. Golf clubs. Most of us, assisted by the quiet but firm intercession of the United States Golf Association and its standards of conformance for implements and balls, use clubs that differ little from each other. The underlying principle is to base performance differences between players on their abilities rather than on manufacturing.

Yet, among the largely unseen marvels that grace Golf House, USGA headquarters, in Far Hills, New Jersey, are the novel clubs that show up from time to time for possible approval and subsequent sale by their inventors. They are bizarre testimony to the golfers' tireless urge to find ways to shave

strokes off their scores; indeed, these players are a market that defies glutting.

Several of these monuments to man's ingenuity were center-stage in Phoenix, Arizona, in early February during the annual Turfgrass Conference, where M. T. Johnson, of Amarillo, Texas, talked about the odd things that show up in golf bags. A member of the USGA Executive Committee, Johnson served for a time as Chairman of the Implements and Ball Committee.

We were not on hand for his remarks, complete with slides picturing somewhat primitive sketches of peculiar, non-conforming clubs, but a sampling of clubs that failed to pass muster are even this moment within arm's reach, leaning against our wall. It is difficult to avoid furtive glances toward these weird devices; they give you the feeling that they are silently conspiring to sneak

up and do bodily harm if they're not watched closely.

If they could be measured from one to ten on an oddity scale, it is as difficult to rank them as it would be to rate human organs in a popularity poll. Where do you rank the pancreas, for example? Or the liver? Neither are terribly popular.

ALL THE CLUBS, incidentally, are putters. After all, putts comprise a large percentage of total strokes in any given round, so this element of the game is a natural target for inventive geniuses. Our favorite, probably, is an inverted "U" whose legs end in points to be bedded in the ground. Swinging from a crossbar in this inverted "U" is a putter shaft and blade that may be drawn back and released to strike the ball on a straight line.

A close second is an ingenious putter; an angled mirror is mounted atop its head. A black line is painted on the mirror. When the ball and the hole beyond are reflected directly on the line and the ball is struck on the line, the putt theoretically will fall. (We experimented, missing two of three from five feet. The ball obscured our view of the electric putting cup, which may have explained the forgettable effort.)

Yet another putter had a head that might have been an ideal eating utensil for E. T., or one of those grotesque Star Wars creatures. When the Thomas Edisons of golf clubs weren't tinkering with putter clubheads, they zeroed in on handles. One submission had a two-handed grip that resembled a tuning fork, and another had a grip that took a 90-degree turn at its apex, with the extension able to swivel freely so that one simply gripped the extension firmly and set the putter in motion.

Finally, one putter had a barrel head containing four small batteries, and, of all things, a tiny motor. According to the explanation (far too complicated to get into here), this apparatus constituted a gyroscope. The thing whirled inside the barrel head and a hammer at one end of the barrel struck the ball. It is unclear to us how the impact level was controlled according to distance from the hole. Details. If one contrives a flawless mousetrap, it is up to the trap's buyer to decide the brand of peanut butter to use as bait.

As it is, even with the decreed 14-club limit, what the world may demand one of these days is a bigger golf bag. They may already come equipped with drop-down seats, but after all, where does one put his tuna sandwiches and coolchest?

The Honor Roll



“FROM RESEARCH, knowledge flows unendingly.” Thus began a USGA Green Section brochure in 1951. The same truth remains 35 years later. The USGA/Golf Course Superintendents Association of America Turfgrass Research Program for Development of Minimal Maintenance Turfgrasses for Golf had a significant year of progress in 1986. The ultimate goal, of course, is a 50 percent reduction in water use and 50 percent lower maintenance costs for golf courses nationwide — based on 1982 figures. New knowledge does flow unendingly from research, and this has been a banner year for our 10-year major effort to help *Golf Keep America Beautiful*.

Only the contributors — individuals, golf clubs, corporations, foundations shown on the Honor Roll that follows — make it possible. They have invested in the future of golf. The clubs shown with an asterisk (*) followed by their golf course superintendents' names have specifically requested their gift, or a portion thereof, be restricted to turfgrass research. These clubs are contributing directly to the quest for better, more economically and environmentally superior turfgrasses for golf and for all who enjoy the beauty and recreation of the outdoors.

We are now in the fifth year of the 10-year research program. Investment in the project has reached \$1.25 million. The 1986 Annual Turfgrass Research Report detailing the expenditures and progress is available from the USGA.

If your name or club is on the following list, we sincerely thank you.

If your name or club is not on the list, we surely hope you will put it there next year. We need you. Research efforts of this magnitude are expensive, and they must continue. It usually takes from eight to 20 years to develop a new turfgrass variety. We need continuing annual support. The USGA and GCSAA can not possibly do it alone.

What we need is for you to urge your club to support and send the USGA Capital Fund Campaign (USGA Golf House, Far Hills, N.J. 07931) a check for the amount of \$2 per golf member at your club. Request that it be designated for Turfgrass Research. It will not then be spent for any other purpose. The funding should be generated on a continuing basis, so that the GCSAA and USGA, working together, can finance the basic, essential, coordinated, longer term research projects so desperately needed and so important to golf's future.

Won't you join with those already on the Honor Roll.

Memorial Turfgrass Donors

Mr. Robert L. Baker
In Memory of O. Sproule Baker & Family
Mr. & Mrs. William H. Bengeyfield
In Memory of Dr. Marvin H. Ferguson
Mrs. Floy Ferguson
In Memory of Dr. Marvin H. Ferguson
The Ohio Valley Seniors Golf Association
In Memory of J. Earle Nelson

Mr. Alexander M. Radko
In Memory of Dr. Marvin H. Ferguson
Mr. Charles Rainwater, Jr.
Mr. Brown Rainwater
Mr. Crawford Rainwater
For the Charles V. Rainwater Memorial Endowment
Mr. Russell Scarpelli
In Memory of James V. Kirwan
The Toro Company
In Memory of Dr. Marvin H. Ferguson
Dr. James R. Watson
In Memory of Dr. Marvin H. Ferguson

Foundation Turfgrass Donors

Frank E. & Seba B. Payne Foundation
Chicago, IL
The William Penn Foundation
Philadelphia, PA

Corporation Turfgrass Donors

Asahi Broadcasting Corp., Osaka, Japan
Bentgrass Research, Inc., Fort Worth, TX
Boulders Carefree Partners, Carefree, AZ
Draft Company, Mahtomedi, MN
City of Tucson Parks & Recreation
Department, Tucson, AZ
Forest Preserve District of Cook County,
River Forest, IL
Garden Services, Inc., Pine Mountain, GA
Greenwood Development Corp.,
Greenwood, SC
Hilton Head Company, Inc.,
Hilton Head Island, SC
Ico, Inc., Odessa, TX
John Knorr & Associates, Pittsburgh, PA
Lofts Seed, Inc., Bound Brook, NJ
Mobil Oil Corp., New York, NY
Piney Coking Coal Land Company,
Beckley, WV
Princeville Development Corp., Kauhi, HI
Royal Lawns of Monmouth, Inc.,
Freehold, NJ
Sentry Services, Inc., Stevens Point, WI
Toro Company, Minneapolis, MN
Xerox Corp., Stamford, CT

Association Turfgrass Donors

Alabama Golf Assn., Birmingham, AL
California Golf Writers Assn.,
Pebble Beach, CA
Connecticut State Golf Assn.,
New Haven, CT
Golf Course Superintendents Assn.
of America, Lawrence, KS
GCSA of New Jersey, New Brunswick, NJ
Hoosier Turfgrass Assn., Huntington, IN
Maine State Golf Assn., Lewiston, ME
Massachusetts Golf Assn., Weston, MA
Minnesota Golf Course Supt. Assn.,
Edina, MN
National Golf Fund, Inc.,
Palm Beach Gardens, FL
Oregon Golf Course Supt. Assn.,
Vancouver, WA
Southern Golf Assn., Birmingham, AL
West Virginia Golf Course Supt. Assn.,
Huntington, WV
Western New York GCSA,
Williamsville, NY
Wy-Mont Golf Course Supt. Assn.,
Bozeman, MT

Donor Clubs

Abeniqui Club, NH
 Alamance Country Club, NC
 Albuquerque Country Club, NM
 Alcoma Golf Club, PA
 *Algonquin Golf Club, MO
Don Zanzie, CGCS
 Allegheny Country Club, PA
 Alpine Country Club, NJ
 *Andover Country Club, MA
Antone DeBettencourt, Supt.
 *Annandale Golf Club, CA
Dave Allec, Supt.
 Apawamis Club, The, NY
 Arcola Country Club, NJ
 Ardsley Country Club, NY
 *Arizona Country Club, AZ
Tighue Shields, Supt.
 Aronimink Golf Club, PA
 Atlanta Athletic Club, GA
 Atlanta Country Club, GA
 Atlantic City Country Club, NJ
 *Augusta National Golf Club, GA
Paul Latshaw, Supt.
 Avon, Golf Club of, CT
 Baltimore Country Club, MD
 *Baltusrol Golf Club, NJ
Joseph Flaherty, CGCS
 Bangor Municipal Golf Course, ME
 Barrington Hills Country Club, IL
 Bay Hill Club & Lodge, FL
 Bayou Desaird Country Club, LA
 *Baywood Country Club, TX
Bill R. Dill, Supt.
 *Bedens Brook Club, The, NJ
James Gilligan, Supt.
 *Bedford Golf & Tennis Club, NY
Terry Boles, Supt.
 *Bel-Air Country Club, CA
Steve Badger, CGCS
 Belle Haven Country Club, VA
 Belle Meade Country Club, TN
 *Bellerive Country Club, MO
Tom Vande Walle, CGCS
 Bellevue Country Club, NY
 Belmont Country Club, MA
 Belmont Hills Country Club, OH
 Bel-Wood Country Club, OH
 *Bend Golf & Country Club, OR
Ken Johnson, Supt.
 Big Foot Country Club, WI
 *Biltmore Country Club, IL
Robert Wilkins, Supt.
 Biltmore Forest Country Club, NC
 Birmingham Country Club, MI
 Birnam Wood Golf Club, CA
 Black Hall Club, CT
 *Blackhawk Country Club, WI
Monroe Miller, Supt.
 *Blacksburg Women's Golf Club, VA
Roger Brizendine, Supt.
 Blind Brook Club, NY
 Bloomfield Hills Country Club, MI
 Bloomington Country Club, IL
 Blue Springs, Country Club of, MO
 *Bob O'Link Golf Club, IL
Bruce Williams, CGCS
 Boca West Club, FL
 Bodega Harbor Golf Club, CA
 Bogey Hills Country Club, MO
 Brae Burn Country Club, MA
 Braemar Men's Club, CA
 *Brandermill Country Club, VA
David Marshall, Supt.
 Brentwood Country Club, CA
 Briarwood Country Club, AZ
 Broadmoor Golf Club Women's Div., WA
 Broadmoor Golf Club, WA

Broadmoor Golf Club, CO
 Broadmore Country Club, ID
 Brook Hollow Golf Club, TX
 Brookfield Country Club, NY
 Brookhaven Country Club, TX
 Brookside Country Club, OH
 Brookside Golf & Country Club, OH
 Brookville Country Club, NY
 Brown's Run Country Club, OH
 Buffalo, Country Club of, NY
 Burlingame Country Club, CA
 Burlington Country Club, VT
 *Burning Tree Club, MD
Virgil Robinson Jr., CGCS
 *Butler National Golf Club, IL
Oscar Miles, CGCS
 Butterfield Country Club, IL
 Calabasas Park Country Club, CA
 California Golf Club of S.F., CA
 Calumet Country Club, IL
 Candlewood Country Club, CA
 Canoe Brook Country Club, NJ
 Canterbury Golf Club, OH
 *Canton Public Golf Course, CT
Walter W. Lowell, Supt.
 Capital City Club, GA
 Carmel Valley Golf & Country Club, CA
 Carmel Valley Ranch, CA
 Cary Country Club, IL
 *Castle Pines Golf Club, CO
Armen Suny, Supt.
 Cedar Rapids Country Club, IA
 *Cedar Ridge Country Club, OK
Mike Wooten, Supt.
 Cedars Golf Club, The, WA
 *Chagrin Valley Country Club, OH
Ronald L. French, Supt.
 Champaign Country Club, IL
 Champions Golf Club, TX
 Charles River Country Club, MA
 Charlotte Country Club, NC
 Chartiers Country Club, PA
 Cherokee Country Club, TN
 *Cherokee Town & Country Club, GA
Randy Nichols, Supt.
 *Cherry Hills Country Club, MO
Ray Morris, Supt.
 *Cherry Hills Country Club, CO
Dan Pierson, CGCS
 Chevy Chase Club, MD
 *Cheyenne Country Club, WY
Fredrick David, CGCS
 Chicago Golf Club, IL
 Chikaming Country Club, MI
 Churchill Valley Country Club, PA
 Claremont Country Club, CA
 Cohasset Golf Club, MA
 Cold Spring Country Club, NY
 Coldstream Country Club, OH
 *Collison Par 3, IA
Mark Collison, Supt.
 *Colonial Country Club, TN
Jim Thomas, Supt.
 Colonial Country Club, TX
 Colonial Golf & Country Club, LA
 Colony Creek Country Club, TX
 Columbia Country Club, MD
 Columbia Edgewater Country Club, OR
 *Columbus Country Club, OH
John E. Laake, CGCS
 Colwood National Golf Club, OR
 Concord Country Club, MA
 Congress Lake Club, OH
 *Congressional Country Club, MD
William Black, CGCS
 Contra Costa Country Club, CA
 Coral Ridge Country Club, FL
 Cordova Junior Golf, CA
 Corral De Tierra Country Club, CA

Country Club, The, MA
 Country Club, The, OH
 *Cove Cay Golf & Tennis Club, FL
Lynn Floper, Supt.
 Crag Burn Golf Club, NY
 Creek Club, The, NY
 Cress Creek Country Club, IL
 Crestview Country Club, MA
 Crestwicke Country Club, IL
 *Crystal Downs Country Club, MI
Mike Morris, Supt.
 Crystal Lake Country Club, IL
 *Cypress Point Club, CA
Manuel Cardoza, Supt.
 Cypress Run Golf Club, Inc., FL
 Dallas Athletic Club Country Club, TX
 Dallas Country Club, TX
 Dalles Country Club, OR
 Deal Golf & Country Club, NJ
 Dedham Country & Polo Club, MA
 Deepdale Golf Club, NY
 Del Paso Country Club, CA
 Del Rio Golf & Country Club, CA
 Delray Dunes Golf & Country Club, FL
 Denton Country Club, TX
 Denver Country Club, CO
 *Desert Forest Golf Club, AZ
Ed Miller, Supt.
 Desert Island Country Club, CA
 Detroit Golf Club, MI
 Detroit, Country Club of, MI
 Diablo Country Club, CA
 Dorset Hotel & Country Club, FL
 *Dorset Field Club, VT
Joseph Yoder, Supt.
 Druid Hills Golf Club, GA
 *Dunedin Country Club, The, FL
Peter Metcalf, Supt.
 Dunes Golf and Beach Club, SC
 Dupont Country Club, DE
 Echo Lake Country Club, NJ
 Edgewood Country Club, PA
 Ekwanok Country Club, VT
 El Dorado Country Club, TX
 El Niguel Country Club, CA
 Eldorado Country Club, CA
 Elgin Country Club, IL
 Elkins Lake Golf Club, TX
 Elyria Country Club, The, OH
 Engineers Country Club, NY
 Essex Country Club, MA
 Essex Fells Country Club, NJ
 Exmoor Country Club, IL
 Fairbanks Golf & Country Club, AK
 Fairlawn Country Club, OH
 Fairmount Country Club, NJ
 Fairview Country Club, CT
 Fargo Country Club, ND
 Farmington, The Country Club of, CT
 Feather Sound Country Club, FL
 Flossmoor Country Club, FL
 Forest Hills Country Club, MO
 Fox Chapel Golf Club, PA
 *Fox Den Country Club, TN
Dick Edger, Supt.
 Frankfort Country Club, KY
 Franklin Hills Country Club, MI
 Friendly Hills Country Club, CA
 Friends of College Golf, Inc., CA
 Garden City Golf Club, NY
 *Garland Golf Course, MI
David Longfield, Supt.
 Gaston Country Club, NC
 Glen Oak Country Club, IL
 Glen Ridge Country Club, NJ
 Glen View Club, IL
 Glenwood Golf Club, VA
 Grandfather Golf & Country Club, NC

*Green Hill Yacht and Country Club, MD
James R. Kelley, Supt.
 Green Hills Country Club, CA
 Green Island Country Club, GA
 *Green Oaks Country Club, PA
Edward Troutman, Supt.
 Green Valley, Country Club of, AZ
 Greensburg Country Club, PA
 Greenwich Country Club, CT
 *Gulf Stream Golf Club, FL
Stanley Carr, Supt.
 *Guyana Golf & Country Club, WV
Dean E. Watkins, CGCS
 Happy Hollow Country Club, NE
 Harmony Landing Country Club, KY
 Harrisburg, Country Club of, PA
 Hartford Golf Club, CT
 Hayden Lake Country Club, ID
 Hazeltine National Golf Club, MN
 Hempstead Golf & Country Club, The, NY
 Hermitage Country Club, VA
 Hershey Country Club, PA
 Hidden Hills Country Club, FL
 *Highland Country Club, PA
Clifford L. Gass, Jr., Supt.
 Hills of Lakeway, The, TX
 Hillcrest Country Club, CA
 Hillcrest Country Club, IL
 Hinsdale Golf Club, IL
 *Hole-in-the-Wall Golf Club, FL
Buddy Carmoliche, Supt.
 Holland Hills Country Club, NY
 Hollywood Golf Club, NJ
 Honors Course, The, TN
 Hope Valley Country Club, NC
 Houston Country Club, TX
 Huntingdon Valley Country Club, PA
 Hurstbourne Country Club, KY
 Hyde Park Golf & Country Club, OH
 Idle Hour Golf & Country Club, GA
 Idlewild Country Club, IL
 *Imperial Golf Club, FL
Jerry Redden, CGCS
 Indian Canyon Men's Golf Club, WA
 Indian Creek Country Club, FL
 Indian Creek Yacht & Country Club, VA
 Indian Hill Club, IL
 *Indian Hills Country Club, GA
Roger Cagle, Supt.
 Inglewood Country Club, WA
 Innis Arden Golf Club, CT
 Inverness Club, OH
 Inverness Country Club, AL
 Inverness Golf Club, IL
 Inwood Forest Golf Club, TX
 *Jackson, Country Club of, MI
William Madigan, CGCS
 Jupiter Hills Club, FL
 Kayak Point Golf Club, WA
 Kent Country Club, MI
 Kenwood Country Club, OH
 Kings River Golf & Country Club, CA
 Kirtland Country Club, OH
 *Kissing Camels Golf Club, CA
Pete Martinez, Supt.
 Kitsap Golf and Country Club, WA
 Kittansett Club, The, MA
 Knickerbocker Country Club, NJ
 Knollwood Club, IL
 Knollwood Country Club, MI
 La Grange Country Club, IL
 *La Jolla Country Club, CA
Carlos Gaines, Supt.
 La Quinta Country Club, CA
 *Lafayette Elks Country Club, IN
Donald Faffnach, Supt.
 Lake Merced Golf & Country Club, CA
 Lake Shore Country Club, IL

Lake Sunapee Country Club, NH
 Lakeside Golf Club of Hollywood, CA
 Lakewood Country Club, FL
 *Lakewood Country Club, TX
Howard Fisher, Supt.
 Lakewood Country Club, CO
 Lakewood Country Club, OH
 Lancaster Country Club, PA
 Las Colinas Sports Club, TX
 *Laurel Golf Club, MT
Joe Brinkel, Supt.
 Leawood South Country Club, KS
 Leewood Golf Club, NY
 Lochinvar Golf Club, TX
 Lockmoor Club, MI
 Lockhaven Country Club, IL
 *Long Cove Club, SC
Kent Stierer, Supt.
 Longmeadow Country Club, MA
 Longue Vue Club, PA
 *Los Altos Golf & Country Club, CA
Bob Ford, CGCS
 Los Angeles Country Club, The, CA
 Losantiville Country Club, OH
 Maketewah Country Club, OH
 Manasquan River Golf Club, NJ
 Manor Country Club, MD
 Manufacturer's Golf & Country Club, PA
 Maple Bluff Country Club, WI
 Mayfield Country Club, OH
 Meadow Club, CA
 Meadow Lark Country Club, MT
 Meadowbrook Country Club, VA
 Meadowbrook Country Club, MO
 Meadowbrook Country Club, MI
 Medinah Country Club, IL
 Meridian Hills Country Club, IN
 Merion Golf Club, PA
 Meriwether National Golf Course, OR
 Mid-Pacific Country Club, HI
 *Midland Country Club, IL
Dick Ainley, Supt.
 Midlothian Country Club, IL
 Midvale Golf & Country Club, NY
 Mill Creek Country Club, WA
 *Mill Quarter Plantation CC, VA
Bob Friend, Supt.
 Mill River Club, The, NY
 *Milwaukee Country Club, WI
Dan H. Quast, CGCS
 Minikahda Country Club, MN
 *Minneapolis Golf Club, MN
Dale Caldwell, Supt.
 Minnehaha Country Club, SD
 Missoula Country Club, MT
 Montclair Golf Club, NJ
 Montecito Country Club, CA
 Monterey Peninsula Country Club, CA
 Moon Brook Country Club, NY
 Moon Valley Country Club, AZ
 Moraga Country Club, CA
 Morningside, Club at, CA
 Moselem Springs Golf Club, PA
 Moss Creek Golf Club, SC
Stuart Tenda, Supt.
 Moss Creek Plantation, SC
 Mount Kisco Country Club, NY
 Mountain Lakes Country Club, NY
 Mountain Ridge Country Club, NJ
 *Myer's Park Country Club, NC
Dave Powell, Supt.
 Myopia Hunt Club, MA
 Naples, Country Club of, The, FL
 Navesink Country Club, NJ
 New Haven Country Club, CT
 New Orleans Country Club, LA
 Newport Country Club, TX
 North Carolina, Country Club of, NC
 North Hills Country Club, WI

North Shore Country Club, IL
 Northland Country Club, MN
 Northmoor Country Club, IL
 Northwood Club, TX
 Norwood Hills Country Club, MO
 Noyac Golf and Country Club, NY
 Oahu Country Club, HI
 *Oak Hill Country Club, NY
Joe Hahn, Supt.
 Oak Park Country Club, IL
 Oak Tree Golf Club, OK
 Oakland Hills Country Club, MI
 Oakmont Country Club, PA
 Oakmont Resident's Golf Club, CA
 Oakwood Club, OH
 *Odessa Country Club, TX
Robert Pearce, Supt.
 Old Oaks Country Club, NY
 *Old Town Club, NC
Tony G. Johnson, Supt.
 Old Warson Country Club, MO
 *Old Westbury Golf & Country Club, NY
Jack McCarthy, Supt.
 Onondaga Golf and Country Club, NY
 Ontario National Golf Club, CA
 Orchard Lake Country Club, MI
 Orchard Ridge Country Club, IN
 Orinda Country Club, CA
 *Orlando, Country Club of, FL
Fred Dickson, Supt.
 Overbrook Golf Club, PA
 Owl Creek Country Club, KY
 *Oyster Harbors Club, MA
Charles Gardner, CGCS
 Ozauxee Country Club, WI
 *Palo Alto Hills Golf & Country Club, CA
Mike Garvale, CGCS
 Panorama Country Club, TX
 *Paradise Valley Country Club, AZ
Bill Emerson, CGCS
 Park Country Club of Buffalo, The, NY
 Park Ridge Country Club, IL
 *Pasatiempo Golf Club, CA
Dean Gump, Supt.
 *Payson Golf Course, Inc., AZ
Harold Parsons, Jr., Supt.
 Payson Men's Golf Association, AZ
 Peach Tree Golf & Country Club, CA
 Peachtree Golf Club, GA
 *Pebble Beach Golf Company, CA
Larry Norman, Supt.
 Pelham Country Club, NY
 Penfield Country Club, NY
 Peninsula Golf & Country Club, CA
 Pepper Pike Club, OH
 Petersburg, Country Club of, VA
 *Philadelphia Country Club, PA
David J. Gabriel, Supt.
 *Phoenix Country Club, AZ
Leonard Marlow, Supt.
 Pine Brook Country Club, NC
 Pine Forest Country Club, TX
 Pine Lake Country Club, MI
 *Pine Tree Golf Club, FL
Harold Hicks, Supt.
 Pine Valley Golf Club, NJ
 *Pinetop Country Club, AZ
Ronald Powell, CGCS
 Pinewood Country Club, LA
 Piping Rock Club, NY
 Pittsburgh Field Club, PA
 Plainfield Country Club, NJ
 Plum Hollow Country Club, MI
 *Plymouth Country Club, MA
Ronald Sherman, Supt.
 Ponte Vedra Club & Inn, FL
 Portage Country Club, OH
 Portland Country Club, ME
 Prairie Dunes Country Club, KS

- Preakness Hills Country Club, NJ
 Presidio Army Golf Club, CA
 Preston Trail Golf Club, TX
 *Princeville Men's Golf Club, HI
Yoshi Harada, Supt.
 *Quail Creek Country Club, FL
Dick Blake, CGCS
 Quaker Ridge Golf Club, NY
 Raveneaux Country Club, TX
 Red Hill Country Club, CA
 Rehoboth Beach Country Club, DE
 Ridgemont Golf Club, NY
 *Ridgemoor Country Club, IL
Peter Hahn, Supt.
 Ridgewood Country Club, NJ
 *River Crest Country Club, TX
Ed Walsh, CGCS
 River Forest Golf Club, IL
 *River Oaks Country Club, TX
James Holub, CGCS
 *Riverbend Country Club, TX
George Cincotta, Supt.
 Riverside Golf Club, IL
 Riverton Country Club, The, NJ
 Riviera C.C. of Coral Gables, FL
 Rochester Golf and Country Club, MN
 *Rochester, Country Club, of, NY
Robert Feindt, Supt.
 *Rock Spring Club, NJ
Paul Kuehner, Supt.
 Rockville Links Co., NY
 Rolling Green Golf Club, PA
 Rolling Hills Golf Club, FL
 Rossmoor Golf Club, CA
 Round Hill Club, CT
 Round Hill Golf and Country Club, CA
 *Royal Poinciana Golf Club, FL
Clint Smallridge, CGCS
 Ruth Lake Country Club, FL
 *Rutland Country Club, VT
Karl Larsen, Supt.
 Saguaro Golf Club, AZ
 Sahalee Country Club, WA
 Salem Country Club, MA
 Salinas Golf and Country Club, CA
 *Salisbury Country Club, VA
A. Tildon Hankley, Supt.
 San Francisco Golf Club, CA
 San Gabriel Country Club, CA
 San Joaquin Country Club, CA
 *San Jose Country Club, FL
John Hayden, CGCS
 San Jose Country Club, CA
 San Mateo Golf Club, CA
 *Santa Ana Country Club, CA
Dave Zarhte, CGCS
 Santa Rosa Golf & Country Club, CA
 *Sapphire Valley, Country Club of, NC
Bo Alexander, Supt.
 Saucon Valley Country Club, PA
 Sawgrass Golf & Country Club, FL
 Scarsdale Golf Club, NY
 Sea Island Golf Club, GA
 Seattle Golf Club, WA
 Selva Marina Country Club, FL
 Seminole Golf Club, FL
 Sequoyah Country Club, CA
 7 Rivers Golf & Country Club, FL
 Shannopin Country Club, PA
 Sharon Heights Golf & Country Club, CA
 Shinnecock Hills Golf Club, NY
 Short Hills Country Club, IL
 *Shoal Creek Country Club, AL
Jim Simmons, Supt.
 *Silver Spring Country Club, CT
Peter Rappoccio, CGCS
 Silverado Country Club, CA
 *Singletree Golf Club, CO
Chip Ramsey, CGCS
 Siwanoy Country Club, NY
 Skokie Country Club, IL
 *Sleepy Hollow Country Club, NY
Joseph Camberato, Supt.
 Snee Farm Country Club, SC
 *Somerset Country Club, MN
Gerald M. Murphy, CGCS
 Somerset Hills Country Club, NJ
 Sonoma National Golf Club, CA
 South Hills Country Club, PA
 Southampton Golf Club, NY
 Southern Hills Country Club, OK
 *Southview Country Club, MN
Roger A. Kisch, Supt.
 Spokane Country Club, WA
 Spring Brook Country Club, NJ
 Spring Hill Country Club, OR
 Spring Lake Country Club, MI
 Spring Lake Golf Club, NJ
 Spring Valley Country Club, SC
 Springdale Golf Club, NJ
 *Springs Club, The, CA
Ross O'Fee, Supt.
 Spyglass Hill Golf Club, CA
 St. Andrew's Country Club, IL
 St. Andrew's Golf Club, NY
 *St. Charles Golf Course, MO
Jack Vogt, Supt.
 St. Clair Country Club, IL
 St. Clair Country Club, PA
 *St. Cloud Country Club, MN
Kerry Glader, CGCS
 *St. David's Golf Club, PA
Henry C. Wetzel, Supt.
 St. Louis Country Club, MO
 Steubenville Country Club, OH
 Stockbridge Golf Club, MA
 Stonehenge Golf & Country Club, VA
 Stono River Golf Club, SC
 *Suburban Golf Club, NJ
Dan McGlynn, Supt.
 *Sugar Creek Country Club, TX
Harry Yewens, Supt.
 *Summit Hills Country Club, KY
Pete Cahill, Supt.
 Sunningdale Country Club, NY
 Sunnybrook Golf Club, PA
 Sunnyside Country Club, CA
 *Sunrise Country Club, FL
Al Ross, Supt.
 Sunset Hills Country Club, IL
 *Tacoma Country and Golf Club, WA
John Ford, Supt.
 Tam O'Shanter Golf Club, NY
 *Tatnuck Country Club, MA
Steve Chiavaroli, CGCS
 Tedesco Country Club, MA
 Tequesta Country Club, FL
 Thunderbird Country Club, CA
 Town and Country Club, MN
 Towson Golf and Country Club, MD
 Transit Valley Country Club, NY
 *Trenton Country Club, NJ
Gerald B. Fountain, Supt.
 Tripoli Country Club, WI
 Tucson Country Club, AZ
 Tumble Brook Country Club, CT
 Turtle Creek Club, FL
 Tuscarora Golf Club, Inc., NY
 Tuxedo Club, The, NY
 Twin Lakes Golf & Country Club, WA
 Union Hills Country Club, AZ
 Uniontown Country Club, PA
 Upper Montclair Country Club, NJ
 Useless Bay Golf & Country Club, WA
 Vintage Club, The, CA
 Virginia Country Club, CA
 Virginia, Country Club of, VA
 *Waccabuc Country Club, NY
Alton R. Moores, Supt.
 *Waialae Country Club, HI
Robert Shouse, Supt.
 Wakonda Club, IA
 Walnut Hills Country Club, MI
 Wampanoag Country Club, CT
 Wanakah Country Club, NY
 *Warwick Country Club, RI
Don Silven, Supt.
 Waterbury, Country Club of, CT
 Waverley Country Club, OR
 Waynesborough Country Club, PA
 *Wayzata Country Club, MN
James Lindblad, CGCS
 Wellesley Country Club, MA
 Westborough Country Club, MO
 Westmoreland Country Club, PA
 Westmoreland Country Club, IL
 *Weston Golf Club, MA
Don Hearn, CGCS
 Westward Ho Country Club, SD
 Westwood Country Club, NY
 Westwood Country Club, MO
 *Westwood Country Club, OH
Bruce N. Wofner, Supt.
 *Wheatley Hills Golf Club, NY
Frank Galasso, Supt.
 White Bear Yacht Club, MN
 Wianno Club, MA
 Wigwam Country Club, AZ
 Wild Dunes Golf Club, SC
 *Wilderness Country Club, FL
Paul Frank, Supt.
 Wildwood Country Club, OH
 *Wildwood Golf & Country Club, NJ
Steve Malikowski, CGCS
 Willamette Valley Country Club, OR
 *Willow Oaks Country Club, VA
Tommy D. Blevins, Supt.
 Wilmington Country Club, DE
 Wilshire Country Club, The, CA
 Winchester Country Club, MA
 *Winged Foot Golf Club, NY
Bob Alonzi, CGCS
 Wolf Creek Golf Links, KS
 *Wolferts Roost Country Club, NY
Bill Stevens, Supt.
 Wollaston Golf Club, MA
 Woodbury Country Club, NJ
 Woodcreek, TX
 *Woodcrest Club, The, NY
Lynn O'Neil, Supt.
 Woodhill Country Club, MN
 *Woodland Country Club, IN
Lee Webb, Supt.
 Woodward Golf & Country Club, AL
 Woodway Country Club, CT
 Worcester Country Club, MA
 Wyantenuck Country Club, MA
 Wykagyl Country Club, NY
 *Wyndemere Golf & Country Club, FL
Mark Hampton, CGCS
 Wyoming Golf Club, OH
 Yacht & Country Club Inc., The, FL
 Yakima Country Club, WA
 Yolo Fliers Club, CA
 Youngstown Country Club, OH
 Zanesville Country Club, OH

*Clubs restricting their donations, or portions thereof, to Turfgrass Research.

Biotechnology And Turfgrass Research: A Glimpse Into The Future

by **CYRUS M. McKELL**

Vice President Research, NPI, Salt Lake City, Utah

USED IN GOLF course applications, biotechnology holds great promise for improving plants, especially turfgrass. Simply stated, plant biotechnology involves the interaction of various biological sciences to create technologies that can genetically improve plants, multiply superior genotypes, create new methods for plant pest control, and enhance plant nutrition.

Some of the more important problems of golf course turf are related to the available sites. The challenge is to develop superior turfgrasses that can be managed for quality condition even with adverse weather conditions, poor soil, subsurface problems, and low water quality. Turf varieties are needed that will perform well with minimal irrigation as well as adapt to the unique

topography created by the golf course design. Yet, turfgrasses must withstand the wear of golf carts and demanding conditions of play. These problems, coupled with high maintenance standards and the need to control operational costs, place a burden on the golf course superintendent and maintenance staff, as well as on golf course architects and green committees.

New approaches, made possible by scientific advances in plant biotechnology, provide opportunities to solve some of these problems. By maintaining healthy relations with the U.S. Golf Association and the Golf Course Superintendents Association of America, research scientists in biotechnology laboratories can better understand how to create the new plant materials and

products to improve golf course quality and management.

Tissue Culture Technology

Plants with superior genetic qualities can be multiplied by cloning to produce millions of plants of identical genetic constitution. *Figure 1* shows an elite red rose that has been multiplied *in vitro* to produce a potted plant capable of flowering just a few months after being initiated in the tissue culture process. Using the same cloning process, it is possible to multiply selected grass genotypes to produce a superior parental population for seed production.

Taking the technology one step further, it is possible to select somatic variants for stress tolerance in a cell-

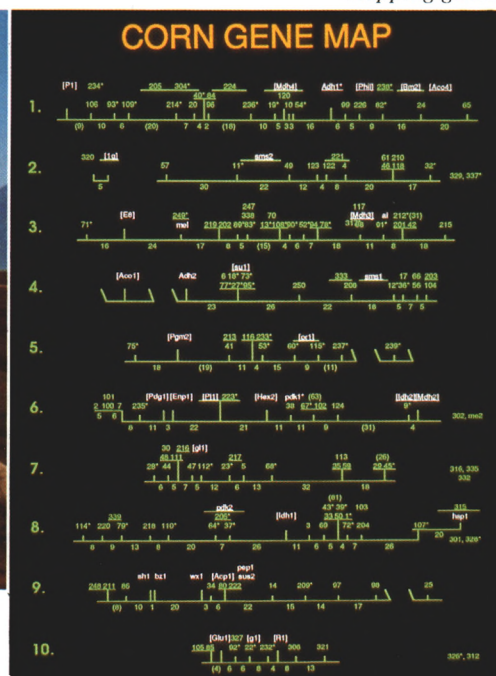


Cyrus M. McKell

This new golf course will be seeded to six different grasses. Tough sites need better plants.



Mapping genes.



suspension culture containing the appropriate balance of growth hormones, energy, and nutrient minerals. Somatic variants can be developed that are resistant to salinity, drought, and temperature stress. The *in vitro* selection process involves placing varying intensities of stress-creating materials into the growth-promoting culture solution to eliminate cells that are less tolerant to the stress factor and regenerating whole plants from the surviving cells.

Molecular Biology Technology

It is now possible to apply DNA restriction fragment length polymorphism (RFLP) technology to accelerate plant breeding by developing molecular markers for desired traits and using the markers to follow these traits in subsequent segregating generations. Selection of superior genetic combinations can be guided by laboratory research in combination with a computer data base and field observations. The RFLP patterns can also serve as a fingerprint to identify specific plant genotypes and thus protect patented turf varieties from infringement by those who would misrepresent them as their own, or substitute a lower quality

material in place of the patented variety. NPI has recently shown that the RFLP technology can be used to differentiate among Lofts Seed Company's perennial ryegrass proprietary varieties. Thus, the RFLP technology is a means of protecting patented turfgrass varieties as well as providing quality control to assure buyers that they will receive the quality features they expect when they buy a named turf variety. The RFLP technology also serves to locate the genes (DNA) for superior qualities to be transferred into desired plant varieties.

Chemicals are already on the market, and new ones are being developed to control plant growth and maturity as well as turf growth and color. However, with new techniques now being developed in biotechnology, many desired growth characteristics, such as dwarf size and stoloniferous habit, may be transferred to existing varieties by recombinant DNA methods.

Soil Inoculants and Biological Fertilizers

The plant biotechnology industry is looking forward to new methods of manipulating biological nitrogen fixation and phosphorus nutrition in turfgrass species as a means of reducing

(Below) *In-vitro* cloning of an elite rose. (Bottom, left) The final product — a living, potted rose in its own package. (Bottom, right) Tomato breeding for high solids, insect resistance and stress tolerance.

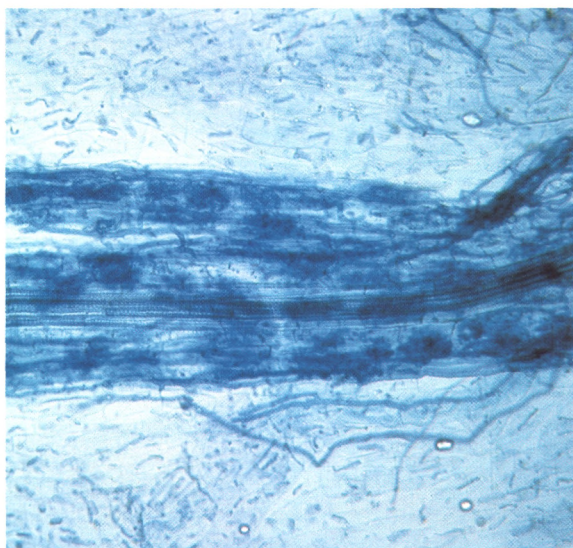
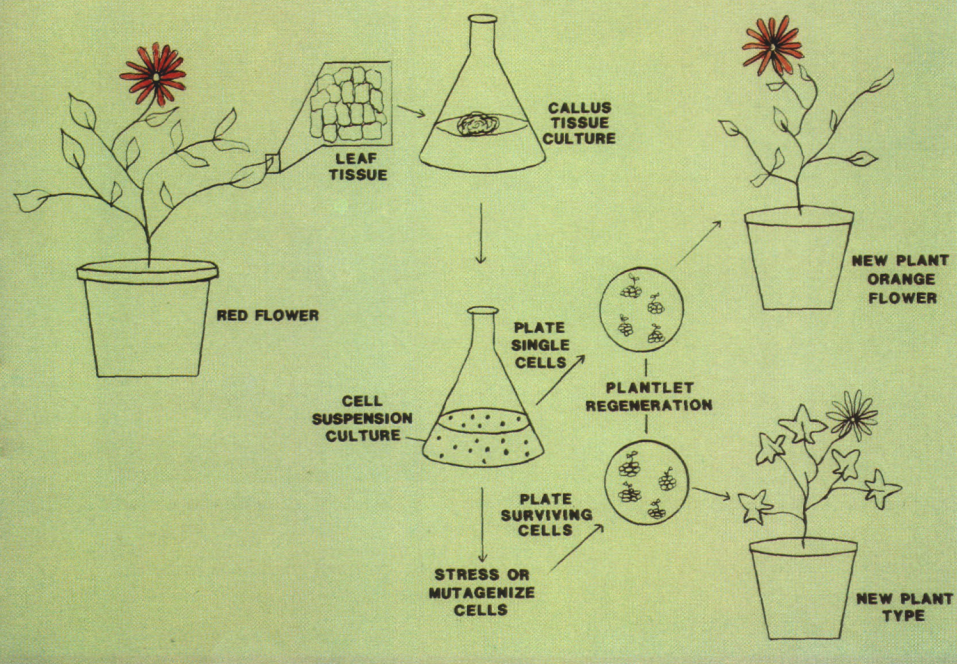
Opposite page: (Top, left) Genetic improvement via somatic variation and selection; how it's done. (Top, right) A chrysanthemum variant. (Center, left) A natural, high-salinity selection. *In-vitro* tissue culture does the same thing in less time. (Center, right) Mycorrhizae mycelium in the soil provides an additional system for water and nutrient uptake. (Bottom, left) A microscope view of root with mycelium growing into it. (Bottom, right) A citrus seedling bed showing non-inoculated versus inoculated plants.



Figure 1.



SOMOCLONAL VARIATION





(Above, left) Root system with and without mycorrhizae.

(Above, right) Natural chemicals in plants may give protection from insects.

(Left) A larva that has eaten a natural chemical has its ability to molt disrupted.



maintenance costs and improving turf quality. An inoculant of endomycorrhizae, a beneficial root symbiont that enhances phosphorus uptake, improves water use, and aids in disease resistance is just coming on the market. The extensive hyphae of endomycorrhizae proliferate in the soil in the immediate vicinity of most plant roots and grow into the cortex cells of the root system. Thus, the mycorrhizae serve as an adjunct to root hairs in providing an additional conduit system for nourishing a plant. Current tests with tree seedlings, shrubs, and herbaceous plants show that inoculation with the NPI mycorrhizal product, Nutri-Link™, produces a seedling plant twice the size and vigor of non-inoculated plants. Because turf grasses are also able to interact with endomycorrhizae, the new product should find application in selected golf course management situations where fungicides are not used in excess.

Biological Pesticides

New strategies will be available soon to control plant pests biologically with naturally-produced plant chemicals that are insect specific and pose no human safety problems. One example is azadirachtin, a chemical extracted from the neem tree, a native of India. Ingested in small quantities, the chemical serves as an antifeedant, but when it is eaten in larger quantities, the chemical disrupts the synthesis of chitin, the material used by the insect to produce its exoskeleton. The chemical functions, therefore, as an insecticide by preventing the insect from reaching its next stage of growth and stopping further consumption of plant material. It has no effect on human physiology and will be safe in human environments.

Research is underway in many commercial biotechnology laboratories to transfer genes from the bacteria

Bacillus thuringiensis (Bt) into plants that will prompt them to produce their own natural systemic insecticide.

Current research and development in plant biotechnology may sound like something out of the future, but each of these ideas is being developed in plant biotechnology laboratories here in the United States. In fact, many are subjects of research projects in NPI laboratories.

The question of applying biotechnology techniques to serve the needs of golf is a matter of priorities. At present the major agricultural crops provide a significant incentive for application of biotechnology to create improved plants and products that can reduce the costs of production. Although biotechnology research costs are high, many are being paid by investors in the biotechnology companies who believe new agricultural products will return a profit from their investments. In the future it will be possible to apply biotechnology techniques to the solution of turfgrass problems once the process of learning how to use them has gone through the first cycle. However, a few well-placed projects at the present time, costing no more than the price of irrigating a golf course in the Southwest, could immediately encourage research applications to develop plants and products useful for golf courses.

THE BEST TURF TIPS OF 1986 — PART II

Helping The Blind To See

by JAMES T. SNOW

Director, Northeastern Region, USGA Green Section

"There is ... a certain kind of fun to be got out of hitting a ball over a hill and running to the ridge top in order to see what chance has befallen the venture."

John L. Low, 1903

THOUGH DECRIED today as being old fashioned, unfair, and unsafe, blind golf shots are nevertheless an integral part of golf holes on many of the older, well-known golf courses in the United States and abroad. Before huge earth moving machines and multi-million dollar construction budgets, golf course architects had to make the best of the terrain they were given, and in the process a certain number of blind golf shots were inevitably created.

Taking nothing away from blind golf holes, for some are among the great holes of the game, blind shots admittedly are logistical problems in many instances. Not only can they contribute to slow play, more importantly they can be a source of safety concerns. Older golf courses with heavy play should be concerned about a group of golfers hitting into another group they can't see. The potential for an accident is always present under these circumstances.

Golf courses have dealt with blind golf holes in a variety of ways over the years, and yet many courses have never taken steps to ensure golfer safety. In 1986, the Montauk Downs Golf Course, in Montauk, New York, resolved a long-standing problem in this regard. For decades a lightly played private club

on the tip of eastern Long Island, Montauk Downs, was eventually purchased by the State of New York and has seen a tremendous increase in play in recent years. As play increased, concern about golfer safety on the blind seventh hole increased with it. Under the guidance of superintendent Hank Heddesheimer, the club built and installed a periscope and viewing platform on the seventh tee, all for the cost of a couple of hundred dollars worth of materials. With the periscope, golfers can now tee off without worrying about hitting into the group in front of them.

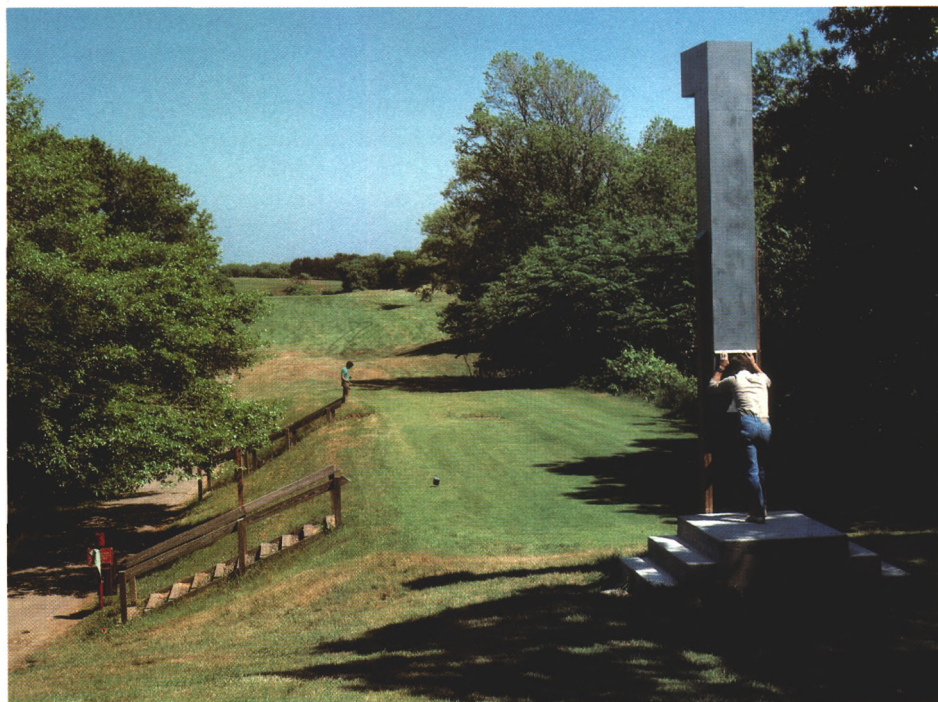
Other golf courses use other techniques for dealing with blind holes. The Sunken Meadow Golf Course, in Kings Park, New York, uses a simple elevated platform to provide just enough visibility of golfers already playing the hole. The tenth hole at the Taconic Golf Club, in Williamstown, Massachusetts, can be viewed from the tee by looking up at a polished steel mirror mounted in a large tree next to the tee. Where trees are not available, a mirror attached to a sturdy utility pole would certainly work just as well.

Providing visual evidence of golfers ahead is certainly desirable, but where this is not possible, a variety of audio signals are available. Bells or chimes are sometimes mounted in a convenient location just beyond the landing zone of the blind shot. As a group of golfers passes the installation, they are required to ring the bell to indicate to the following group that the area is now clear. Some courses actually use doorbell type buzzers, usually powered by battery, that send a signal from the fairway landing zone back to the tee.

Concerns about lost balls, slow play, and golfer safety on blind holes were probably never given much thought in the days of caddies, who were able to monitor shots and warn of golfers within range in blind shot situations. Today the golf cart, designated replace-

In other days, caddies climbed the hill and indicated line of play. The fourth hole at Pine Valley, New Jersey.





(Top, left) Some put mirrors in trees.

(Top, right) Superintendent John Piccolo, at St. Catharines, rings bells.

(Above) At Montauk Downs, New York, Superintendent Hank Heddesheimer designed and built a periscope and viewing platform on the seventh hole.

ment for the caddie, is sometimes the only available means of checking ahead on blind holes, requiring the golfer to take a quick trip to the top of the ridge and back again to play the shot. (According to one golf purist, this may be the only good use for carts on the golf course.) Perhaps the most drastic step that can be taken, and one that has been followed at many courses over the years, is to eliminate the visibility problem by way of a bulldozer.

In summary, a number of methods are available for making golfers aware of the presence of other golfers on blind holes. With the threat of lawsuits and rising insurance premiums a common occurrence on many courses, adopting one of these techniques for ensuring golfer safety would be worth considering.

Oh Traffic: Oh Clippings: Oh Stumps!

by CHARLES B. WHITE

Former Director, Southeastern Region, USGA Green Section

DOES WINTER CART traffic damage bermudagrass fairways? *Figure 1* depicts a fairway in the Southeast that was subjected to cart traffic throughout one winter. *Figure 2* shows the same fairway with traffic removed from November through April. The winter of 1985 (*Figure 2*) was actually more severe than the winter of 1984, but compare the winterkill of bermudagrass.

This fairway has no irrigation, and fertility is a level of two pounds nitrogen per 1,000 square feet per year with equal amounts of potash. Judge for yourself if winter traffic removal can improve your fairways the year around.

Another tip for 1987 involves handling clippings. A *lightweight* trailer pulled behind a triplex mower is an excellent means of getting clippings off the course. A large barrel or similar device works well if you are using walkers and pulling them with a cart.

Clipping collections actually save time by not going out of the way to dump. It also eliminates the unsightly mess as well as the odor they often cause. Clipping collection and disposal in a compost adds an extra degree of grooming and professionalism to golf course management. This is especially true at courses surrounded by residential communities (*Figure 3*).

Finally, I've seen: The Vermeer stump grinder used very successfully for root pruning. This machine can be pulled at a very slow speed around a green or tee with little damage to the turf. A scar of only two inches or less is left, which makes the cleanup and healing time much less severe. Owners of this equipment say this procedure is not detrimental and is up to five or six times faster than conventional trenching to root prune trees. Remember, this procedure must be done along the drip-line and not too close to the trunk of the tree (*Figure 4*).



Figure 1.



Figure 2.



Figure 3.



Figure 4.

The C - S - T - M Factor

by **STANLEY J. ZONTEK**

Director, Mid-Atlantic Region, USGA Green Section

WHAT WAS the best turf tip I saw this year? It was Common Sense Turfgrass Management. If there is one positive aspect to a difficult growing season, it is that whatever weaknesses or strengths exist on your course or in your programs, they will be brought into clear focus during tough times.

Good, strong, healthy, deep-rooted turfgrasses survive. *Figure 1* illustrates the point. The only healthy, thriving grass is alive in the aerator holes. This is significant. Any number of causes could have affected the grass on this green, but when you study the picture, the implication is clear. Strong, healthy, and deep-rooted grass tolerates extremes of weather, heat and humidity, wet and dry wilt, plus the ravages of insects, nematodes, disease, traffic, and compaction. Grass is weaker when it is grown under compacted/layered soil conditions, a thatchy environment, or where the surface or sub-surface has drainage problems, where an inadequate irrigation system exists (with poor water control), where nutrient and pH levels are out of balance, etc. All these factors are aggravated further by greens, tees, or fairways located in pockets of shade,

poor air circulation, or with tree roots sapping water and nutrients. It makes one wonder how grass survives at all. As the picture shows, sometimes it doesn't!

Look at your grass. Where has it grown and under what conditions? By properly diagnosing problems and situations, solutions come easier. If the soil is layered, aeration and filling the holes with a better material is the first step. It must be remembered that grass roots, as they extend down into the soil, must grow in between soil particles. *Figure 2* shows a typical situation of grass roots growing only in the aerator holes. This is a common occurrence on many golf courses. It should be one of the superintendent's goals to provide the grasses' roots with an opening, a space in which to grow. Aeration is a mechanical means of helping to modify the soil to grow better grass roots. This helps the grass to survive the summer stress period.

The second aspect for better healthier grass (and roots) is managing water and nutrients. Never overwater, especially during hot, humid weather. If it rains, good surface and sub-surface drainage must be achieved. If this does not exist, plan programs to solve the drainage

problems. Sometimes good surface drainage, the fastest way to remove excess water, is overlooked on putting greens.

There has been so much soil modification with sand topdressing on greens, that chemical tests should be run frequently on the upper soil layer to compare it with the old soil deeper in the profile. You may be surprised at the difference. *Then* manage your fertility program for where the grasses' roots are growing, generally in the upper modified zone.

Finally, consider how much to fertilize. Obviously a course that receives 40,000 to 60,000 rounds of golf per year must be fertilized differently from a course receiving 10,000 to 20,000 rounds. Also, greens built with high sand content require more fertility than old topsoil-based greens. Look at the turf on your greens. If it looks thin and weak with old cup holes and ball marks, is slow to heal, and shows excessive spike marking, some additional fertilizer may need to be applied. In our quest for putting green speed, it is sometimes easy to forget that differences exist from course to course. Balanced fertility and enough total fertilizer applied during

the year are important ingredients in growing good, strong, healthy, deep-rooted grass. Generally, light and frequent applications of $\frac{1}{8}$, $\frac{1}{4}$, or $\frac{1}{2}$ pound N/1,000 square feet as needed throughout the growing season works best. You can always add more fertilizer. Managing an excess is difficult.

Therefore, what is my turf tip? It is that the best management philosophy is one of common sense. Doing what is best for you and your course, not what someone else is doing down the road. Manage your soils, water, and turf to grow strong, healthy, deep-rooted grass, and you just may find that turf holds up better during periods of stress and that the grass is naturally more resistant to disease, nematodes, wilt, and traffic. The turf even looks good and plays well. Sometimes it is easy to rely on a chemical to pull the grass through a difficult time. We seem to be relying more and more on chemicals to grow healthy grass. This is a fallacy.

For good grass you must manage the soil in which the grass is growing as your first priority; chemical applications are a secondary solution. *Figure 3* illustrates the key. Common sense management of the grass growing in the soil with a good root system.



Figure 1.



Figure 2.



Figure 3.

For the Golf Course Superintendent There's a Time to Hold — and a Time to Fold

by **RILEY STOTTERN**

President GCSAA and CGCS, Park City, Utah

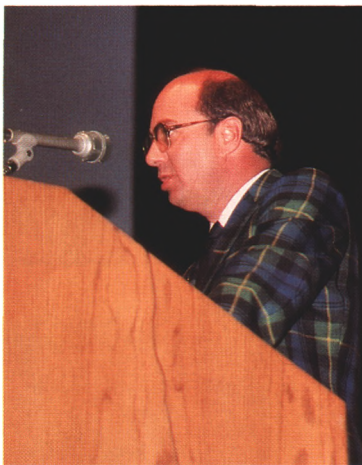
I'VE BEEN on and around golf courses — and around this profession — literally since childhood. My grandfather was a superintendent in Florida before moving out west, and I remember often being with him on the golf course. My father also was a golf course superintendent, and I worked with him many summers building and maintaining the golf course. So, as you now know, I am a third generation golf course superintendent, and I know that they have come a long way in the last 60 years — from laborers to professional managers.

Things have changed since grandfather's day, much of it out of necessity. We must keep up with the masses who now clamor to play the game. That's good, but my grandfather would probably roll over in his grave if he could see the way we do things today. We put heavy equipment on our fine turfgrasses these days — greensmowers, aerifiers, and vehicles loaded with sand for top-dressing, grandfather wouldn't even put a wheelbarrow on a green without laying planks.

I had a delightful time recently reading passages from a "golf course superintendent's diary." It had highlights dating back to 1916. One of the earliest installments went like this: "May 22, 1916 — the machine for mowing greens arrived today. Everyone in the work crew wanted the job of pushing it over the greens. I have selected only those men who have an even stride and do not tire easily. An even cut is most important."

Does anybody remember actually pushing an old reel type mower to cut the backyard grass? I do. It was tough on a hot summer day!

Somewhere in the GCSAA archives is a fascinating 16mm film tracing the history of golf course management. Everyone should see it. To me, one of the most interesting scenes is a row of women on their hands and knees in a line across a green pulling weeds. Rather labor-intensive. Today, we must use chemicals. There's really not much other



Riley Stottern

choice, but we must use them carefully and discriminantly. And we do.

Lately, we've come under some fire about the use of chemicals on golf courses. We're doing a good job of application, but we must do a much better job of communication with the public in this controversy. To help us do this, GCSAA has created a new staff position of Manager of Governmental Relations. The position has been filled by Zachary Grant. He will work closely with Bob Still, our new Manager of Media Relations and with others in our communication and education programs. But back to our golf course superintendent's diary.

Elsewhere the author records part of his fertilizing program.

"I am using fresh peat moss, old, well-rotted, short-straw stable manure, and two ounces per square yard of Carter's Complete Grass Manure." That's the way it was.

Here's another installment dealing with the same general subject, dated March 21, 1921:

"Street sweepings were for many years an excellent source of fertilizer. With the advent of asphalt-paved streets

and the increase in horseless carriages, it appears that oil from the asphalt and from the automobile is being absorbed in the street sweepings. Mixed into the compost, the oil remains, and if it is applied to grass, will most likely kill it. Beware, and avoid street sweepings."

YOU CAN SEE, here was the beginning of progress, of professional growth and technological advancement.

Just as scientists have long done, golf course superintendents began to keep records. By keeping records and trying different methods, they could begin to see what worked and what didn't work.

Golf course superintendents had already seen the need for an organization or organizations to help them develop professionally. It was in 1920 when our journalist made this notation:

"I shall note in my greenkeeping record that today the United States Golf Association adopted a resolution to form a Green Section for the purpose of collecting and distributing information of value respecting the proper upkeep of golf courses. This is a great step forward, since we have so many problems with disease, insects and lack of general knowledge most important to growing good turf. I am looking forward to receiving the first bulletin of the Green Section."

Over the years the golf course superintendent, along with other members of a team that constitutes the game of golf as we know it, has striven to improve, in order to meet the needs and demands of those who play the game.

By 1925, a man named John Morley was making the rounds and talking about organizing a National Association of Greenkeepers. This organization would meet regularly and publish a periodical for educational purposes. Today, we can see very clearly what has come of that. From its humble beginnings at Sylvania Country Club, in 1926, in Ohio, that tiny band has grown into the 7,000 member Golf Course Superintendents Association of America.

We've come a long way since then in education. Continual training is required of all diligent golf course superintendents to keep abreast of rapidly changing conditions. The GCSAA certification program has been very significantly upgraded. Next year, for example, we go from an open-book to a closed-book examination. The year after that, at least one year, or 15 Division I continuing education units, will be required for certification. By 1994, you will need at least an associate's degree or the equivalent to be a GCSAA-certified golf course superintendent. By 1999, three years of college or the equivalent will be required, and by the year 2004, it will be necessary to have a bachelor's degree or the equivalent.

This is not to say that many golf course superintendents today aren't highly educated. Almost half of the golf course superintendents attending last year's GCSAA International Turfgrass Conference held bachelor's degrees. More than 25 percent held two-year degrees. Quite a few held master's degrees — and there was even a Ph.D. or two.

TODAY, it is not uncommon for golf course superintendents to work with annual budgets totaling half a million dollars. They are entrusted with the operation and maintenance of very

expensive modern machinery and equipment. They are the custodians of millions of dollars worth of precious land and other assets.

Not too long ago, Tom Watson compared the golf course of today with an artist's painting. "In the end," he said, "it is the golf course superintendent who has to finish the painting, and in addition, maintain it so the paint doesn't chip. Superintendents are the people most responsible for the players' having fun. If the golf course is not in good shape, it's not much fun to play. If it is in good shape, then it's very enjoyable, and superintendents have to work hard, be well educated, and enjoy what they're doing to achieve results."

And how about the club professionals, club managers, the architects, the builders, the owners? We're *all* important to golf. We're all part of the team. We are all playing, in more ways than one, what many of us believe is the best game ever invented.

As golf course superintendents, our technical knowledge and professionalism have reached new heights. We are experts now, and we usually know what's best for the golf course. But we must always communicate; especially when we are meeting with our green committees, our club owners, and so forth. After all, they are our employers. When you know you're right, it is your responsibility as a professional to hold

your cards just as long as you can — and that's as long as you think you have a chance of convincing them. One of the greatest problems we have in our personal relationships as golf course superintendents is that we sometimes have a tendency to be too idealistic when it comes to the golf courses we manage. Jobs are lost because of an inability to recognize that sometimes we just have to fold.

SOMETIMES WE can wisely fold and pass our hands to the next person. By that I mean bring in an expert. Everyone knows the definition of an expert. That's someone who comes in from more than five miles away carrying a briefcase. One of the most helpful assistants we have, at times, is the outside consultant, whether the occasion calls for an agronomist or an architect. After all, who really cares who plays the hand — who folds and who holds — as long as we get what we want, and that is what is best for the golf course.

I like to think that in some ways golf course superintendents are like the turfgrass on which golf is played. With proper care, turfgrass is constantly regenerating while the older turfgrass serves as a base. The game has been entrusted for now to our generation. May we continue to carry on in the best tradition of our predecessors!

The Trials and Tribulations of a Green Committee Chairman

by **HOWARD KEEL**, Former Green Committee Chairman,
Bel-Air Country Club, Los Angeles, California

AS A PROFESSIONAL actor and singer, I have traveled a lot and have had an opportunity to play some of the most wonderful golf courses in the world. I have been a member at Bel-Air Country Club since 1952, and my golf course is a very special place to me. I'm always glad to get back home and play golf on these wonderful acres with 18 great holes.

Over the years, I think golf has saved my sanity many times because, in my profession, you can have a lot of empty

time on your hands. You can study and try to improve your mind. You can drink or chase girls. You can exercise and try to keep yourself in shape in various ways, but I found golf real early, and it has been a godsend to me. I use my spare time playing and enjoying the golf course.

About three or four years ago, some friends came to me and asked if I would run for the board of directors at Bel-Air. I didn't know if this would be the prudent thing to do, but, nevertheless, I

agreed to try. As it turned out, I was elected, and Angie Pappas, the president, asked what I would like to do. "Green committee chairman," I blurted. I don't know exactly why. Lo and behold, he appointed me, along with some other people just to look after me.

I think they seriously doubted my ability as a green committee chairman, but I had one very good thing going for me. We had — and still have — a very fine superintendent — Steve Badger. I immediately got together with Steve to

let him know I knew nothing about grass, but that I loved golf. The first thing to do under these circumstances is to get into a golf cart and go around the course. I learned to pick his brains so he'd leave mine alone. We have had some wonderful tours around the course since, along with some real battles.

One of the first things that had to be done, I felt, was to develop better control of golf carts. I went to the board for approval (because you always have to go to the board for approval). As a matter of fact, you have to be a board member to be a green chairman, and I think that is ridiculous sometimes, but it is true. Now I am not a cart lover. I would rather walk, and there is no doubt golf carts hurt golf courses, but we have to live with them. We have at Bel-Air some pretty affluent and very successful people. I call them Indian Chiefs. They each have their own little wigwam and they run it. They built it themselves. When they get on the golf course, they want to run that too, and they do a pretty good job.

I have found one can drive a golf cart fairly sanely for a few holes, but as one starts to miss the two or three foot putts, insanity comes into your being, and it's a Meet your Maker flight going down some of those hills in golf carts. People start driving across tees and greens, or they throw clubs at carts, etc. I decided that, in order to try and save some of the turf, I'd put down a white line. I went to the board and got approval and wrote a little note saying that from now on you would not cross the white line as it were. And if you do, you will get a warning. And if you do it again, you'll walk for a while.

AS IT IS in all clubs, there are people you just don't get along with. I have a few, and I can understand why they don't get along with me. But this one person was the first one I saw, and I found him at the side of a hill too close to the green with his cart. And I thought, "I can't write this guy up. It won't do any good, so I am just going to take him out of the cart. He's red-lettered. He has had it." So I did. I left a little note with the caddiemaster and immediately got on an airplane and went to England. I no sooner got to my hotel room when I got a phone call. The other gentleman, who had been playing golf with this guy, wanted to know what I was doing.

"You can't take him out of a cart," he said. I asked, "Why not? He disobeyed the rules!" He said, "But he can't play if he is not in a cart." I replied, "That is just

tough! He can walk for a few holes." But he said, "He can't go 18." So I said, "So you lose a little money. You have been making a pigeon out of this guy for years."

Well, you can imagine, this raised quite an uproar for quite a while. I was called Hitler and a big overgrown unspeakable word and a lot of other things. I learned fast to use the term, "Write me a letter."

You get 10,000 suggestions from everybody, but in my three years as green chairman, I received exactly three letters. Two of them didn't make any sense at all, and one was sent to me by an old friend of mine. Old Smokey we called him.

He complained about the cart path on the right side of the 16th hole. He said it was just not fair. I talked with him and told him that there is one thing about golf. It is not fair! It is not meant to be fair. The only way to enjoy golf is to be a masochist. Go out and beat yourself to death. Most golfers do. I passed through that period in my life about 15 or 20 years ago. Finally, Old Smokey wrote me a letter to say something must be done about this golf cart path on the right side of No. 16 because a lot of errant golf balls hit the path and go out of bounds. It is just not fair. So I wrote him back a letter and said I understand your problem but you must understand our problem too. It is very expensive to change the route of this cart path, because right next to it are some very expensive homes, and it would be very costly, if not impossible, to change it. I suggested one thing however; "Smokey, just take your right hand and lay it a little more open - - - -."

At Bel-Air we have some great characters. Fred MacMurray is one. Fred has a reputation of being a little close with the buck. He has a lot of bucks. He has more bucks than Bob Hope has. When I was a young lad, I came to L. A. in 1936 and had a job in the parking lot at Paramount Studios. I parked cars six days a week from 7 a.m. until 7 p.m. with no time off for lunch and for \$9.00 a week. I would dust off cars, brush them up, anything I could do to pick up a dime or 15 cents. I did old Fred's car for a while but could never get a tip out of him. Never once. Years later we did a picture together called *Callaway Went Thataway*.

I had never met Fred since those early parking lot days. Paramount called a little meeting to introduce us all to Fred and Dorothy McGuire and the rest of the cast. They introduced me to Fred.

"Howard, this is Fred." I said, "Yes, sir, I've met Mr. MacMurray before. I used to park your car, at the Paramount Studios in 1936. I used to wipe it off, clean it off and you never tipped me one bloody dime." Then I said, "Thanks a lot," and walked away.

He started to "uh uh uh" and to this day, he comes up to me and says, "Howard, that story you tell about me" "Fred," I say, "I'm afraid it is true. You don't recognize me now because at that time I was 17 and stood 6' 3" and weighed 135 pounds and was in dire need of food."

There is also another story about Fred MacMurray. He was making a picture for Walt Disney once in London, and he was on expenses of \$1,000 a day. Walt came over to London to see how the picture was going, and on the set one day he said, "Fred, want to have dinner together tonight?" They went to a lovely restaurant, very expensive, and the check came and they sat there, and they sat there, and finally Disney picked up the check and paid it. But he was thinking, "How cheap can a guy be? At least he could pay for dinner on \$1,000 a day." Well, they finished the picture and Disney got a letter from Fred. In it was an itemized statement of all the monies he had spent in London and a check for the money he did not spend. That's our Fred, a wonderful, wonderful person.

ONE THING I do advise if you ever become a green chairman is, when you get on and you have a committee, fire the committee. It is not only a favor to yourself, but it is a favor to the golf superintendent. He only needs one boss. It's bad enough to have one dummy to put up with so why be surrounded by a bunch of dummies. That's one of the first things I did, and I got some real arguments.

I am not a very diplomatic person. Nothing like old Clayton Farlow on *Dallas*. He is just the nicest old boy I've ever known. But I am not really like that. I think that's really the only reason they made me green chairman. They figured anyone who could handle J. R. would make a good green chairman.

There are a few different sides to the people involved at Bel-Air, but probably not all that different from other clubs. I did bend a lot of noses with the cart issue, I sometimes get emotional. My father was a coal miner, and he could swear for ten minutes and never repeat a word. At times I can be a chip off the old block. Sometimes Marion Farmer, my good friend, golfing partner, and mem-



ber of the USGA Executive Committee, closes his eyes when he walks over to the golf cart. He never says anything to me but I know what he is thinking. One time I found a former club official parked in his cart alongside and right next to a tee with some friends. This is against our cart rules, and I pointed this out to him with a few choice words. They freely translated into "as a past-president, you are not setting a very good precedent for future members or others by breaking the rules." Sometimes you make good friends and sometimes you don't.

Being a good green chairman is helping your superintendent. If you have a good superintendent, you can be a good green chairman. Steve Badger and I get along very well. I love the game and the course. I have had a wonderful three years as green chairman, and I learned a great deal from Steve. We did a few things around the course that I think helped, but you have to be very careful with golf courses. You must not denigrate the course in any way.

You can have a great track, but only if you are willing to take care of it. I think part of the problem with our automobile industry today is that they keep hanging things on their automobiles, hanging things on until it doesn't look anything like it was. If they had taken all that money and spent it on improving the



(Top, left) Carts.

(Top, right) Cart paths.

(Above) Every Green Chairman's dream — good greens, a cleanly cut hole, a clean cup liner, and a clean flagpole.



Howard Keel

basic product, they would be much better off. I think it is the same with a golf course. You have to be very careful how you go about improving a course. I'm still on the long range planning committee and involved at times with the current green chairman. But don't ever have an ex-green chairman on your committee, because you are in big trouble.

I have tremendous respect for the golf course superintendent because of the wonderful things he is doing with golf courses in the United States and around the world. This gives us all the opportunity to enjoy life and have a wonderful time. So use the golf course. Don't abuse it.

A Few Minutes with Frank Hannigan

Senior Executive Director, USGA

FOR BETTER or worse, I find that I have been involved in the administration and management, in one way or the other, of the last 26 U.S. Opens. These have been the great years of Nicklaus, Trevino, of Arnold Palmer losing three playoffs in five years, and of Watson at the 17th at Pebble Beach. It has been a period when the game has gone international to the extent that no one will be surprised if this year's Open is won by an Australian, a German, a Japanese, or a Spaniard.

We spend a great deal of time thinking about television and what the Open will look like before an audience of 20 million people around the world. One reason the Open went to Shinnecock Hills last year was our clear understanding that Shinnecock would send a won-

derful message on television. The Open has changed as a spectacle.

The one constant in the U.S. Open is the courses on which it is played and how they are prepared. You have seen these conditions: fairways an average of about 30 yards wide; two cuts of rough, the first five to six feet wide at two inches, which we call intermediate rough, and the second notorious U.S. Open rough, which goes to about four or five inches. The greens are dry, firm, and fast, and is a nice Stimp-meter speed for Open greens. They were about the same speed 25 years ago but we didn't know it because the Stimp-meter hadn't been widely used yet.

Providing these conditions is not easy, since most Open courses are open to members for regular play right up to

Sunday night of Open week. It is a very hard job for the golf course superintendent. The hours are long, but he is used to long hours. Agronomically it is a little tricky, but he is accustomed to tricky agronomics. The real difficulty is in terms of emotional pressures.

The reputation of the USGA rides on the Open itself, and we watch it very, very carefully. Club members, who can age a superintendent inordinately in an ordinary year, get especially wrapped up when it comes to a U.S. Open. Their pride and their emotions can complicate things enormously. The players, the pros, very few of whom have ever done anything much at all except play golf, are now, all of a sudden, taken seriously as ultimate experts in the art of turfgrass management. Then the press is all over

*Preparing for
an Open.
"Stop with the stakes!"*





(Top) Brookline, Massachusetts, April, 1963. Nothing grew that spring. Nothing!

(Left) The roughs were the talk of the 1955 Open at The Olympic Club, California.

(Above) The 18th hole at The Olympic Club, 1955 U.S. Open.

the superintendent's golf course, and he is not a guy who has been trained to deal with reporters or television people. So out of this odd mix of circumstances you get some occasionally unforeseen consequences. I would like to share with you some of my memories of incidents involving golf courses and their management and superintendents that are quite apart from the play of golf shots.

First, at Oakland Hills, in Michigan, in 1961. I had just been hired by the USGA, and my experiences in golf had been primarily those of a player and someone who cut greens on the New York City public golf courses. I had never dreamed there was such a place as an Oakland Hills. I was given the job of supervising the installation of gallery stakes and ropes. We had had a late, late start and were in a sort of frenzy to finish, with me driving a tractor and Joe Dey driving in stakes with a sledge hammer. We were doing very well on a Sunday afternoon when a little man came running across the fairway yelling for us to get off the tractor and stop with the stakes! He was the shop steward of the crew at Oakland Hills. It never occurred to the USGA that there was such a thing as a union on a golf course, and that the union mattered more than the U.S. Open. This was Detroit in the early 1960s. I got off the tractor and Joe Dey stopped driving stakes.

The year 1963 was the one of the great winterkill at Brookline, Massachusetts. Nothing grew that spring. Nothing at all. Oh, we had some patchy rough, but by Memorial Day, three weeks before the event, we were commiserating with the superintendent at The Country Club. We said, "John, what a terrible thing to happen this particular year." He said, "Frank, enough of it. These tight Yankees are throwing money at you, and after you're gone the golf course will be better than it ever was before." He was absolutely right.

In 1965, in St. Louis, we had a golf course superintendent talk of resigning on Tuesday of the week of the Open. The pressure got to be too much. He was prevailed upon to stay through the Open, but it was very difficult for him as once again it was a late and cool spring, and this was a bermudagrass course. He was especially concerned because it was the first year of color television for the Open — and the course was going to be brown. We drove onto the course on

Thursday morning, and he had dyed the 17th fairway. He did this on his own, and it didn't come out too well — it looked like a rancid Easter egg.

AT MERION in 1971 we had a tough spring, too. Greens were bumpy and not good at all. The central figure at Merion then was Richie Valentine. He would work with his friend Al Radko, National Director of the USGA Green Section in New Jersey. They concluded that the prescription for better greens was an application of sand topdressing. Richie and Al concluded that Richie's father, Joe Valentine, would have done the same. So an application of sand went on early in June. We came in and looked at it, and since Richie was not a man for moderate applications, we had 18 bunkers! There was much raking, and the end result was a marvelous golf course. Richie Valentine gave us a pure golf course.

At Atlanta in 1976 was perhaps the most celebrated incident concerning the golf course superintendent in the history of the U.S. Open. In those days I had an interesting job with the U.S. Open. I was the person who sat in the little tent near the 18th green where the players returned their score cards. You become accustomed to people vilifying the USGA, but there was something very unusual at Atlanta on that Thursday. Players were coming in and crying about the long fairways and that the grass hadn't been cut. This was intensified and intensified. All they talked about was flyers, flyers, flyers. It got so bad that I communicated with the USGA Championship Committee. I said look, we all know the paranoia of these guys, but there is so much of it, we had better check on it. So there was an investigation.

The superintendent, it seems, wanted to have everything just right, and so he had fixed up a lot of his equipment and had everything new for the Open. Among other things, he had ordered new sets of wheels for his fairway units. These were put on Wednesday night. It turned out that the new wheels were fractionally larger than the ones he replaced. So when the fairways were cut on Thursday morning, nothing was really cut.

And so both sides were right. The fairways were cut, but the grass was still very long. There was a little printed statement prepared apologizing to the

players, telling them we would get it right the next day. Some did not believe the statement and felt it was a deliberate act on our part to humiliate them.

It was in 1977 at Southern Hills that Hubert Green went through the bizarre incident of a telephone death threat. He was accompanied around the course by State Troopers. But backstage at Southern Hills, for the golf course superintendent, it was the Great Gibberellic Acid Year. Again, it was a slow growth spring, and there was not enough rough, according to the USGA Committee. Monty Moncrief, our agronomist, told us there was a substance called gibberellic acid that could make a rain forest out of a desert. There was a frenzied search for it, a plane was dispatched, and it was brought to Southern Hills and applied on a Tuesday. Whether it grew any rough or not, I don't remember. But to this day, Jim McKay, of ABC Sports, asks us how goes our gibberellic acid?

In the last six or seven years, we have created a new role. We now have a specially assigned agronomist for USGA Championships. He is someone who makes not only Turf Advisory Service visits, but about half of his time overall is devoted to working with the golf course superintendents at our championships. His primary job, I think, is to shield the golf course superintendent; to keep us away from him and his green committee away from him. Let him do the job. For us, of course, the Open Championship is the most important thing in the world. We live off it in two critical ways. It is so prominent, it determines what the USGA reputation is, and it is a source of revenue that allows us to pay for many of our services, including the Green Section.

Whether or not the Open succeeds depends ultimately on the quality of the golf course. If the golf course isn't right, nothing else matters. So I would say, without hesitation, that it is the golf course superintendent at a U.S. Open who by miles matters more than anyone else. If he fails, we all fail. But he doesn't. It is his pride and his professionalism that invariably prevails.

This year we take the Open to San Francisco and the great Olympic Club. We expect that we will have a winner because John Fleming, superintendent at the Olympic Club won't let us down. So many of you have not let us down over the years!

THE BEST TURF TIPS OF 1986 — PART III

Rooting Depth and Soil Sampling

by JAMES F. MOORE

Director, Mid-Continent Region, USGA Green Section



Topdressing is an important practice, but the use of the wrong material can create layering problems.

SOIL LAYERS in greens greatly affect the turfgrass plant. Layers come about from a number of different management techniques other than simply changing topdressing materials. They can occur when the original construction materials are mixed on the site rather than off the site. It is impossible to achieve a homogeneous mix with a roto-tiller. Layers often occur when new sod is moved onto a green and grown on a different soil, and then buried by subsequent topdressings. On the other hand, a lack of topdressing and excessive fertility may also cause thatch layers.

On many courses, layer development stems from topdressing programs on old, poorly constructed greens, and where complete reconstruction is impossible for a variety of reasons. Superintendents are then faced with improving the rootzone through a long range topdressing program. Unless the topdressing program is very carefully carried out, soil layers could form.

Regardless of the reason, I see many courses with very sharply defined layers

in the greens' rootzone profile. Roger Null, superintendent of Old Warson Country Club, in St. Louis, realized that such radically different soil layers in a rootzone may have radically different nutrient levels and other effects on the turf as well. The root systems of turf vary in depth according to the time of year. For example, the roots of a cool season turf, such as bentgrass grown on a heavily layered green, will tend to connect to the lower soil layer during moderate weather but may be completely confined to the upper zone during times of stress. Warm season turf behaves the same way, but obviously at opposite times of the year. After seeing Roger's successful investigations, I asked a number of clubs with heavily layered greens to collect their soil cores for chemical sampling in two ways. One sample was composed of cores taken from the lower profile, while the other was taken from the upper layer.

The tests showed dramatic differences in the levels of phosphorous, iron, manganese, and potassium, as well as other nutrients. Cation exchange capa-



Distinctly different layers in a profile can inhibit root development and water movement.

city was significantly lower in the sandy, upper layer compared to the lower soil zone. The pH values varied greatly, sometimes swinging from mildly basic to strongly acidic over a range of just two or three inches in the profile!

The point is, if you have heavily layered greens, not only can you plan on problems, such as anerobic conditions, poor infiltration, and limited root-systems, but you may also have to adjust your fertility program based on the depth of the roots. This sampling technique can help you identify this need.

A Supplemental Irrigation System for Putting Greens

by **PATRICK M. O'BRIEN**

Director, Southeastern Region, USGA Green Section



(Top) Different heights of cut and different soils around greens make a supplemental irrigation system a worthwhile feature.

(Above) Bentgrass and Poa annua rough around greens can best be dealt with by resodding.

(Opposite page) The final product is playable.

HISTORICALLY, the rough grasses around putting greens generally receive low maintenance. In 1986, many clubs spent additional money to improve this area, not only to install a supplemental irrigation system, but also to lay new sod.

The importance of the rough surrounding greens is well documented. PGA Tour statistics show that John Mahaffey, who ranked first in hitting greens in regulation last year, hit 13 of 18 greens in his typical round. Obviously, the average golfer is chipping from these rough areas much more frequently. A good uniform turf here is highly desirable.

A supplemental irrigation system for the roughs adjacent to greens can be worthwhile. The sprinkler heads should be controlled individually, just as the putting green sprinklers. In the usual run of things, the rough grasses are generally irrigated along with the greens, but the two areas are mowed at different heights, and the soils of the two areas and their water requirements are frequently very different. This supplemental irrigation feature allows the superintendent to water the greens or roughs as necessary, helping to prevent overwatering. This means healthier turf in a critical area through irrigation flexibility and control.

At the same time, some clubs stripped off the old sod around their greens and resodded with better turfgrass species and varieties. This was especially true at older golf courses in the north and the transition zone, where *Poa annua* and bentgrasses have taken over the other, more desirable rough grasses. *Poa* and bentgrass at rough height present a difficult recovery shot for all golfers. Most clubs are resodding with a mixture of Kentucky bluegrass and one of the new turf-type tall fescues, which are quite good for roughs.



Topdressing Operations That Vibrate

by **JAMES T. LATHAM**

Director, Great Lakes Region, USGA Green Section

THE PROCESS of topdressing greens has gone through a slow evolution of single components and blends of materials since, I suppose, the practice began. While the composition of topdressing materials is a subject of great controversy, the operation itself is not. It is generally disliked by golfer, superintendent, and crewman. It requires handling heavy and bulky materials, to some degree by hand, and can be very labor intensive. The change in application procedures dates back some 30 years, to the time when some superintendents moved away from hand spreading and began using hand or motor propelled drop spreaders.

During his tenure at Old Warson Country Club, in St. Louis, Oscar Bowman was one of the first golf course superintendents to use broadcasting machines to spread topdressing. Stored inside a building, his mixture was rather dry, and because it did not flow freely, it

needed physical assistance to maintain flow to the spinner mechanism.

The widespread use of straight sand as topdressing has permitted newer broadcasting equipment to be used to speed up light, frequent applications throughout the growing season. Wet sand, however, presents a handling problem, since it does not flow uniformly and often needs someone to ride on the spreader and help feed the spinner mechanism, just like Bowman's operation. Today this is not only unsafe, it is also a rather unproductive use of labor.

Ted Thorn, superintendent at the Finkbine Golf Course, University of Iowa, has not only solved the safety problem, but through project organization and the use of a device he and his co-workers adapted for golf course use, he has also reduced the amount of labor needed to handle the materials. His setup involves a dump-truck funnel of boards to channel the sand onto a conveyor/

elevator to fill the spreader's hopper. It eliminates the potential lower back pain problems associated with shovelling the heavy, wet sand.

Eliminating the rider on the spreader took some imagination. Ted and company came up with an unusual vibrator to generate flow of the extremely wet, bridging sand. The device consists of a 12-volt starter motor connected by a V-belt to spin a heavy off-center or eccentric weight, which taps the side of the hopper. This sets up a strong vibration, which causes the sand to flow downward to the open throat of the hopper. Vibration is controlled by an on-off switch operated by the driver of the towing vehicle, and is used whenever the material flow to the spinner becomes inadequate. The operation is safe and fast, and requires no hand lifting. The efficiency of the operation was so impressive that I forgot to take an action photograph. Take my word for it, though, it does work, and it is very effective.



A vibrator is bolted to the broadcaster's hopper, which assures the flow of very wet sand to the spinner at a rate determined by the driver of the towing vehicle.



(Top) Topdressing materials handling at the Finkbine Golf Course of the University of Iowa minimizes hand work. Sand flows from dump truck to a belt elevator to the broadcaster hopper.

(Above) The vibrating mechanism is a heavy cylinder with an off-center shaft, powered by a 12-volt starter motor. In operation, the rotating weight taps the side of the steel plate-reinforced hopper to set up the sand-moving vibration.

Mid-Winter News Notes

James B. Moncrief

There will only be one "Mr. Bermooda Grass" among all who have traveled the country on behalf of better turfgrasses for golf. James Burton (Monty) Moncrief was that tireless teacher and ambassador of good will for the USGA Green Section from 1957 through his retirement, in 1982. Monty died suddenly on February 25, 1987, at his home, in Athens, Georgia.

Monty had criss-crossed our southern tier for 25 years, from Georgia to Arizona (and South America as well), making over 5,000 golf course visits, and along the way at least twice as many friends. He had much to do with the discovery of Tifdwarf bermudagrass. He was a member of the Oklahoma Turfgrass Hall of Fame, and recipient of the Texas Turfgrass Association's Diamond Award. He was a member of the American Society of Agronomy and the USGA Turfgrass Research Committee. In February of 1986 he received the coveted USGA Green Section Award for distinguished service to golf through work with turfgrass.

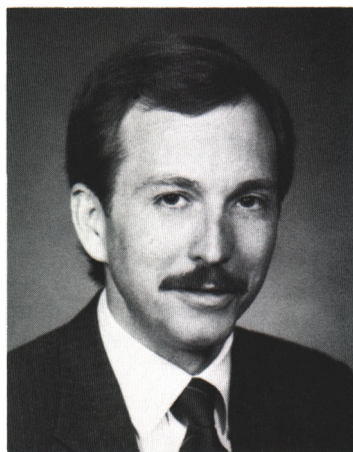
This is in tribute to James B. Moncrief. To his countless contributions, to his great knowledge, his experience, and the ready, wide smile he gave so freely to all who passed his way. These are and will be our timeless memories.

Timothy P. Moraghan Appointed Agronomist for USGA Championships

Timothy P. Moraghan has been appointed Green Section agronomist for USGA Championship Courses, effective March 1, 1987. A native of Connecticut with degrees in biology from Niagara University and in turf management from the University of Massachusetts, Tim has been in golf course turf work for 10 years, and was most recently regional golf course superintendent for the American Golf Corporation, in Miami. He has earlier experience at Myrtle Beach National Golf Club, in Myrtle Beach, South Carolina; Pinehurst Country Club, in Pinehurst, North Carolina; Tournament Players Club, Ponte Vedra, Florida; and Las Colinas Sports Club, Dallas, Texas. An experienced and personable young man, Moraghan will also assist in Green Section Turf Advisory Service visits when he is not on USGA championship assignments.



James B. Moncrief



James G. Prusa



Timothy P. Moraghan

Green Section Personnel Changes

Charles (Bud) White resigned from the Green Section staff, effective January 1, 1987. Bud was the Regional Director in the Southeastern states for the past five years, and served earlier as the Southeastern agronomist, under the late James B. Moncrief. He joined the Green Section staff in 1979. His many friends wish him continued success in his new position with the Lesco Corporation.

Patrick M. O'Brien, who has also been a staff agronomist since 1979 and visited USGA Member Clubs in the Mid-Atlantic Region, now becomes the Director for the Southeastern Region. Pat has broad field experience with both warm and cool season grasses, and has visited clubs throughout the Southeast for many years. The Southeastern Regional office remains at Box 4213, Campus Station, Athens, Georgia 30605 (404) 548-2741. John H. Foy, Southeastern agronomist, continues his Green Section work and club consultations out of Hobe Sound, Florida (305) 546-2620, and will be working with Pat O'Brien.

James G. Prusa resigns GCSAA Post

James G. Prusa, GCSAA associate executive director and director of education for the past five years, announced his resignation effective in early February. "Jim's ideas, his spirit, and his perseverance will be missed throughout our Association. In just a few years, he has helped advance the GCSAA significantly," said John M. Schilling, executive director.

"Jim's departure represents a great loss to us, but his accomplishments represent lasting gains for the Golf Course Superintendents Association of America," said outgoing president Riley L. Stottern.

The Green Section too will miss Jim Prusa. He brought dedication, innovation, and integrity to his post. Through his efforts, there developed a new era of understanding, cooperation, and mutual respect between the GCSAA, the USGA Green Section, and other organizations in golf. Everyone gained, the game most of all. Prusa will now enter private business. Nevertheless, he will continue as a member of the USGA Turfgrass Research Advisory Committee.

TURF TWISTERS

COARSE TOPDRESSING

Question: I would like to topdress my greens with a slightly coarser material than I am currently using. However, the sand I wish to use has too many large particles and literally destroys my mowers. Any ideas on this rocky problem? (Arizona)

Answer: The chief problem with large particles is that they tend to lie on the surface and interfere with mowing. If you drag greens with a steel mat following topdressing, rig a piece of canvas (the width of the drag mat and about three or four feet in length) as a trailer behind the mat. As you drag the green, the larger particles will tend to bounce up through the mat and collect on the canvas. They can then be discarded from the green. You may need to use something like a 2 x 4 at the back of the canvas to keep the large particles from falling off the "trailer" onto the turf.

CAN TIE-UP IRON

Question: I just received my latest soil analysis results. The pH was 7.3 and the Fe level was rated as very high. Would supplemental applications of Fe to bermudagrass have any effect? (Florida)

Answer: Yes, the available form of Fe tends to be tied up in the soil very quickly, especially when the pH is above 6.7. While the response to Fe is not as dramatic as it is with the cool season type grasses, recent research has shown supplemental Fe to be beneficial in reducing color loss from temperature stress, and it also promotes a faster green-up after stress exposure.

WITH A BITTER LEAF

Question: I continue to hear more and more amazing evidence of a plant's ability to defend itself against insects, parasites, and disease. What do you hear? (California)

Answer: This subject area is developing rapidly; the reason is biotechnology. With new techniques and instruments, scientists are now finding the so-called secondary chemicals, discovered in plants many years ago but believed to be unimportant, are, instead, of major importance. Sugar maples and oak trees, for example, are known to quickly change the chemical composition in their leaves within a day of or even a few hours after being attacked by pests. Toxins and other chemicals are increased, or important nutrients are lowered in varying degrees from leaf to leaf when they are under attack. Sugar maple leaves can raise tannic acid levels, which interferes with digestion in pests, by 300 percent. A chemical response system, similar to the immune system in animals, seems to be in plants, and science is going to find out more about it and, if it is possible, turn it to man's benefit.