

USGA Green Section **RECORD**

September/October 1992

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



Looking at Maintenance Pitfalls



EDITOR: James T. Snow
ASSISTANT EDITOR: Dr. Kimberly S. Erusha
ART EDITOR: Diane Chrenko Becker

DIRECTOR OF COMMUNICATIONS:
Mark Carlson

USGA PRESIDENT:
Stuart F. Bloch

GREEN SECTION COMMITTEE CHAIRMAN:
Raymond B. Anderson
1506 Park Avenue, River Forest, IL 60305

NATIONAL OFFICES:
United States Golf Association, Golf House
P.O. Box 708, Far Hills, NJ 07931 • (908) 234-2300
James T. Snow, *National Director*
Dr. Kimberly S. Erusha, *Manager, Technical Communications*
Nancy P. Sadlon, *Environmental Specialist*
P.O. Box 2227, Stillwater, OK 74076 • (405) 743-3900
Dr. Michael P. Kenna, *Director, Green Section Research*

GREEN SECTION AGRONOMISTS AND OFFICES:

Northeastern Region:
United States Golf Association, Golf House
P.O. Box 708, Far Hills, NJ 07931 • (908) 234-2300
David A. Oatis, *Director*
James E. Skorulski, *Agronomist*
186 Prospect Street, Willimantic, CT 06226 • (203) 456-4537
James E. Connolly, *Agronomist*

Mid-Atlantic Region:
P.O. Box 2105, West Chester, PA 19380 • (215) 696-4747
Stanley J. Zontek, *Director*
Robert A. Brame, *Agronomist*
Michael T. Saffel, *Agronomist*

Southeastern Region:
P.O. Box 95, Griffin, GA 30224-0095 • (404) 229-8125
Patrick M. O'Brien, *Director*

Florida Region:
P.O. Box 1087, Hobe Sound, FL 33475-1087 • (407) 546-2620
John H. Foy, *Director*
Chuck Gast, *Agronomist*

Great Lakes Region:
11431 North Port Washington Rd., Suite 203
Mequon, WI 53092 • (414) 241-8742
James M. Latham, *Director*
Robert C. Vavrek, Jr., *Agronomist*

Mid-Continent Region:
300 Sharron Drive, Waco, TX 76712 • (817) 776-0765
James F. Moore, *Director*
George B. Manuel, *Agronomist*

Western Region:
22792 Centre Drive, Suite 290
Lake Forest, CA 92630 • (714) 457-9464
Larry W. Gilhuly, *Director*
Paul H. Vermeulen, *Agronomist*
Patrick J. Gross, *Agronomist*

Turfgrass Information File (TGIF) • (517) 353-7209

Green Section RECORD

**1 The Ten Pitfalls of
Golf Course Maintenance**
by Robert A. Brame

7 A Little Summer Project
by Mike Bailey

11 Planning for Irrigation Improvements
by Dan Farrier

**15 "To Pre or Not to Pre" —
Summer Annual Grass
Weed Control Strategies**
by Dr. Frank S. Rossi

**18 The Golf Course Mechanic —
A Changing Image**
by Robert C. Vavrek, Jr.

20 Landscaping the Golf Course for Wildlife
by Ron Dodson

**21 All Things Considered
Employment Contracts: The Missing Link!**
by Robert A. Brame

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



Cover Photo:

*Too many trees can be a pitfall in the
maintenance of top-quality turf.*

©1992 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, NJ 07931. Postmaster: Send address changes to the USGA Green Section Record, P.O. Box 708, Golf House, Far Hills, NJ 07931-0708. Subscriptions, articles, photographs, and correspondence relevant to published material should be addressed to: United States Golf Association Green Section, Golf House, Far Hills, NJ 07931. Second-class postage paid at Far Hills, NJ, and other locations. Office of Publication, Golf House, Far Hills, NJ 07931. **Subscriptions \$12 a year. Foreign subscriptions \$15 a year (surface mail) or \$24 a year (air mail).**



It is not just a matter of how good your irrigation system is. Hand watering critical areas sometimes will be necessary, especially with putting green maintenance.

The Ten Pitfalls of Golf Course Maintenance

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

WOULD'N'T YOU be interested in knowing the most common golf course maintenance problems identified by agronomists who visit nearly 1700 different golf courses each year and whose combined experience in professional turfgrass maintenance exceeds 150 years? If so, read on! A December, 1990, survey

of the USGA Green Section staff revealed "The Ten Pitfalls of Golf Course Maintenance."

A pitfall, by definition, is "a hidden or not easily recognized danger or difficulty." Exposing the top ten hidden dangers in golf course maintenance and recognizing them for what they are should help us avoid

these traps or point us toward strategies for improvement.

1. Communication and Public Relations

The number-one rated pitfall in golf course maintenance isn't even agronomic in nature! As a matter of fact, good communication is



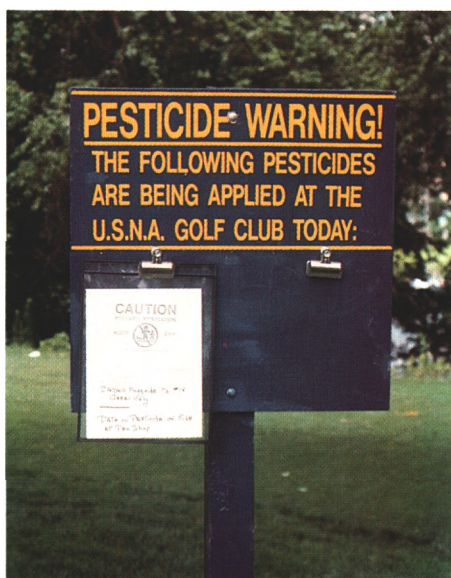
(Above) Attempts to communicate don't always work the way we would like! Good communications are a critically important area in every aspect of golf course maintenance.

(Right) Competent, well-trained employees are a must. An understanding of the expected maintenance standards and how to properly accomplish the job must come from the superintendent.



a critically important area in every industry and in life in general. While this has always been true, the importance of good communication and public relations in golf course maintenance has grown with each passing year. Environmental concerns, demands for better playing conditions, concern about expenditures, and employee relations, just to name a few, are all issues that emphasize the importance of communication and public relations.

More golf course superintendents lose their jobs for falling short in this area than any other. Conversely, a variety of agronomic problems can be present and if players and officials are kept well informed, jobs



Signs are a good method of communicating about the use of pesticides to those playing the golf course.

usually remain secure. Everyone wants to know what is going on. We all like to be informed. If positive and informative communication does not come from course officials, owners and/or golf course superintendents, then players and/or local residents will decide how to view particular situations on their own. This can easily result in an inaccurate interpretation and a poor understanding of the situation.

To maintain a successful operation, positive communication must be present on a variety of fronts, and the golf course superintendent is not the only one responsible for establishing and maintaining good lines of communication. Course officials or owners also must take an active role in communicating with the superintendent, players, community, news media, peers, and other staff members. Sometimes taken for granted is the need for course officials to communicate their desires about course conditioning to the superintendent. Without a clear job

description, incorrect assumptions can be made.

In addition, good communication with spouse and family members is of supreme importance. Problems on the home front *always* overflow into the workplace and vice versa.

Effective, positive communication can be accomplished in many different ways. Letters, memos, reports, and newsletters all have their place. The use of signs and information boards also can be advantageous. Verbal presentations at meetings and conferences, as well as informal question-and-answer sessions on the golf course, are part of the package. The clothes you wear and the manner in which you handle yourself either contribute to or detract from the spoken word. The staff you hire and their ability to do the job communicate a clear message without a word being spoken.

Is a soil probe used when explaining the importance of proper timing of pre-emergence herbicide applications? Is a camera being used to provide visual documentation? The means of effective and positive communication are limited only by individual creativity.

Communication and public relations are vitally important to the ongoing maintenance of any golf course. Volumes have been written on the importance of communication, yet it is amazing how often we forget this fundamental truth. Communication is something we all do whether we are consciously thinking about it or not. The key is to make sure we communicate in a positive and informative manner. Evaluate your operation and develop a strategy for improving your communication and public relations efforts.

2. Overwatering

No doubt about it, when a putting green is overwatered, a sculled 7-iron shot will hold better. But sculling a shot that still holds the green is a good indication of poor playing conditions. Thus, there are few benefits from overwatering, but there are quite a few problems which inevitably occur.

An over-wet rootzone prevents the grass from producing deep, healthy roots and makes the soil more prone to compaction effects. Shallow, weak roots cause the grass to be more prone to stress, and when tough summer weather conditions set in, the grass plants simply do not have the reserves needed to maintain strong and healthy growth. Weakening continues and is intensified by traffic, disease and/or a poor growing environment (shade and/or poor air circulation). At the very least, overwatering usually results in greater fungicide use to counteract heavy disease pressure. Further, mowing, topdressing, aerification, and main-

tenance in general are more difficult with overwatered turf. The interaction of all these negatives (weakened and thinned turf, disease, reduced maintenance efficiency, and increased costs) creates poor and inconsistent playing conditions. Overwatering must be avoided.

Good water management involves both irrigation and drainage. Therefore, when considering this second pitfall in golf course maintenance, both systems must be evaluated. Irrigation programs must be compatible with existing drainage. In many instances the first step in moving away from overwatered turf is to improve a poorly drained rootzone. The installation of drainage lines may be needed. Positive surface drainage (no bird baths) is also very important. Deep aeration has proven very helpful in some situations, but severe drainage problems may necessitate reconstruction. There is no substitute for good drainage.

A good irrigation system and its proper use can help prevent overwatering. But whereas a well-designed system is a valuable tool, overwatering sometimes can be more severe on courses with automatic systems. Some owners, course officials, or superintendents say, in effect, "We've got this expensive system, so we'd better use it!" A computer is a wonderful tool, but it does not replace the use of a soil probe in determining soil moisture and sprinkler programming. When programming is performed, aim toward the dry side, and be prepared to hand water the dry areas. More water can always be added, but when too much has been applied, it is difficult to reverse the effects. Overwatering resulting from poor drainage and poor irrigation practices, will likely maintain a spot in the top ten for many years to come.

3. Fast Green Speeds

Actually, fast green speeds are not the problem. The problem is what you have to do to the turf to *keep* fast greens. Lowering cutting heights and holding back on nutrients are often part of the strategy in obtaining fast putting green speeds. But just remember, a golf ball will roll even faster on compacted, bare soil! This end of the continuum is not acceptable, so a balance between healthy grass and reasonable putting speeds is needed.

Excessively close mowing establishes a growing environment that encourages and enhances the growth and spread of *Poa annua* (especially in the regions of the country where cool-season grasses are grown). This grass is expert at establishing itself in areas where bentgrass has become thin and weak due to excessive mowing. When *Poa annua* is present in moderate to high percentages, maintaining a healthy and

consistent playing surface becomes even more difficult and expensive. Bentgrass is more economical and dependable when maintained at a reasonable mowing height of at least $\frac{1}{2}$ inch.

Low fertility levels reduce the recuperative ability of the turf, leading to increased disease and traffic-related problems. Therefore, a maintenance program must focus on doing what is best for the grass plant to maintain a consistent and healthy putting surface. Fertilize to achieve good density (both leaf and root density). Avoid getting hung up on numbers (pounds of nitrogen per 1,000 square feet); grow a strong, healthy turf and allow the numbers to fall where they may.

Light and frequent grooming and top-dressing can complement a sound fertility program and a reasonable mowing height in creating a good product. This combination will allow for reasonable putting green speeds, somewhere between 7.5 and 9.0 feet as measured with the Stimpmeter, depending upon weather conditions. Double mowing offers a safe option to increase putting green speeds for special events without over-stressing the grass plant. Additional mowings can add 3 to 4 inches to the speed. This strategy should be started several days before the event.

Rolling is another option for increasing green speeds that may be worth considering, depending upon the equipment used and the soil texture of the green. The increase in speed from rolling can be significant (12 to 18 inches), although it usually does not last more than a day or two.

Consistently ultra-fast green speeds are unrealistic, expensive, and bad for the grass. The Stimpmeter was developed as a tool to help golf course superintendents check putting green consistency and speed from hole-to-hole on a given golf course. It was never intended to be used as a yardstick to measure how close to the brink of disaster you can go. Grow a strong, healthy grass plant first, and then do what you can to safely enhance speed and consistently. **SPEED KILLS**, so avoid getting trapped in the fast lane.

4. Use of Pesticides

This pitfall specifically refers to the over-use or unnecessary use of pesticides. The increasing demand for perfection in golf course playing conditions has caused many to employ preventative spray programs; that is, spraying a pesticide before symptoms or signs of pest activity are actually observed.

The merits of a good preventative spray program are fairly obvious. Stopping a problem before it occurs can make a lot of sense. In some cases, preventative spray

programs have proven to be both efficient and economical. However, when a potential problem is treated before it occurs, it is never clear that the problem would have occurred at all. Pests rarely attack all 18 greens, tees, or fairways with the same intensity. Every golf course has indicator areas, or "hot spots," where certain pests are more likely to cause damage. Why not treat these "hot spots" preventatively and watch the rest of the golf course for indications of trouble? It is true that such an approach can be more risky and may increase labor costs initially, but in the long run, both labor and pesticide usage may decrease.

The growing popularity of the game of golf has left many courses packed with players. This has made it more difficult to perform routine maintenance work, especially when it comes to making chemical applications. Some are limited to spraying on Monday mornings, while others have decided to spray at night. When a golf course superintendent knows spraying can be done only on Monday, or on a rigidly set time frame, a preventative approach to pesticide applications becomes a necessity. A greater degree of flexibility in application times would allow for greater flexibility with respect to pesticide usage. In most cases, more leeway must come from owners or course officials and may involve restricting play at certain times to comply with product labels.

It is essential to know exactly what pest you are going after. When the proverbial "kitchen sink" is thrown at a particular problem, often through preventative spraying, it may be impossible to determine just what the pest was and what provided the best control. Careful diagnosis of the actual pest must occur before a good control strategy can be developed. The areas already discussed (water management, mowing heights, and fertility levels) are directly tied to the need for a pesticide and the amount that may be needed. As an example, raising the mowing height can greatly reduce the potential for summer patch disease on putting greens and should reduce, if not eliminate, the need for a fungicide for control of this disease.

5. Continuity of Course Officials/ Green Chairperson

It is very difficult to communicate efficiently and develop a solid working relationship with your boss if you have a new one every year. Unfortunately, this is the scenario that occurs at some courses, where a new Green Committee chairperson is elected or appointed each year. To further complicate the problem, short-term Green Committee members often want to "leave their mark."

This results in poor communication with the golf course superintendent and two completely different agendas for the maintenance and improvement of the course.

Lack of continuity in course officials and Green Committee chairpersons sometimes results in a quicker turnover of golf course superintendents. The superintendent's career is set back and so is the overall golf course maintenance program. The approaches taken to achieve good continuity are as unique and individual as each golf course operation. A longer term of office, overlapping officials, and a better understanding by all parties as to what is expected (written contract) should help enhance continuity. Avoid the tendency to play down the importance of continuity; it affects the entire maintenance operation.

6. Pesticide Storage and/or Maintenance Buildings

It is shocking how inadequate many golf course maintenance facilities are! Pesticides, equipment, and supplies worth hundreds of thousands of dollars often are stored and maintained in what could more accurately be called a barn. In some cases, no provisions have been made for employee restrooms or emergency wash stations.

The maintenance area is usually out of sight for those playing the golf course, and in too many instances it is out of mind as well. Course officials must understand that a modern, well-organized golf course maintenance facility is vitally important in operating a safe and efficient program. At many courses this would necessitate some degree of remodeling and modernizing of the existing facility. At other courses, the existing facility should be leveled and replaced with a new building.

7. Tree Management

Good tree management involves the wise planting of new trees and the trimming, root pruning, and selective removal of existing trees. Unfortunately, trees have become sacred at some golf courses, making it very difficult for the golf course superintendent to perform needed tree management work. This is unfortunate, because there are times when tree work needs to be done in the best interest of the grass plant.

Grass needs direct sunlight to grow, and air movement is important to reduce disease and traffic-related damage. Trees which are too close to important turf areas place the turf under a great deal of unnecessary stress. There is no doubt that a good tree management program is an integral part of maintaining top-quality turf on many courses today.

8. Amount of Play

This pitfall points to a variety of problems that can occur when too much play is allowed on a golf course. At many golf courses, maintenance work is not being done correctly or on a timely basis because of the high volume of golfers. As noted earlier, there are times when essential maintenance activities must come before the playing of the game. Aeration, top-dressing, and spray applications are a few examples of maintenance practices that are done much more safely and efficiently without player interference.

Perhaps the course should be closed for a half or even a full day each week. Winter play may need to be restricted. Some courses are establishing a yearly cap on the amount of play they will allow, and then working backwards to determine a daily limit. Maintenance work protects and preserves a golf course, and provisions for its proper scheduling must be made.

9. Labor: Not Enough and/or Under Qualified

Generally speaking, 60 to 75 percent of a golf course maintenance operating budget consists of salaries and wages. This represents a very important part of the superintendent's management responsibilities. Budgetary levels which are not consistent with expectations are felt most in this area. A mutual understanding of expected maintenance standards must be decided for a proper budget to be determined. Trying to achieve the work of 30 people with a budget that allows for only 15 sets the stage for a collision. Linked closely with adequate numbers is the need for experienced, well-compensated, and trained employees. Every employee is in a position to make the superintendent look like a clown or a genius. Competent, well-trained employees are a tremendous asset. Shortcuts in this area will affect all other aspects of the operation.

10. Equipment: Not Enough and/or Poor Quality

This tenth pitfall is very similar to the ninth. It does not matter how skilled the golf course superintendent is; without good tools, the work will not get done properly, and it may cost more to do. Here again, budget levels and maintenance expectations must be in balance.

Conclusion

Discussion of each pitfall could be an article unto itself. However, our intent was



Too much water will cause problems in every aspect of turf management, as well as golf course playability. Proper water management involves both irrigation and drainage.

As play continues to increase on most golf courses, controlling golf cart damage becomes more and more difficult.



to identify areas in which improvements can be made to golf course maintenance operations anywhere in the country. As with most aspects of golf course maintenance, these ten pitfalls are interrelated and, as such, success or failure in one area will ripple through the entire program. Every maintenance operation has its strengths and weak-

nesses, and it is hoped that this listing of pitfalls will help you identify yours. Amplify your strengths and develop an appropriate strategy for improving on your weaknesses. The alternative is to continue hitting your head on the same rock. "Failure to study and learn from the past leaves us doomed to repeat it!"

A LITTLE SUMMER PROJECT

by **MIKE BAILEY**

Golf Course Superintendent, Boca Rio Golf Club, Boca Raton, Florida

AT WHAT POINT in time does a golf course become so old and outdated that a facelift is required? This is a very difficult question to answer, and there are no set guidelines to follow. While fine wines improve with age, the same scenario is not always the case for golf courses. This

is particularly true for bermudagrass golf courses in Florida.

South Florida golf courses are typically in the best condition during the first five to seven years after opening for play. Then the vigor of the bermuda gradually declines, excessive thatch builds up, and pest prob-

lems increase. Over time, "off-type" bermuda cultivars become established in the base turf of the greens. With each passing year, more work and money are required to produce the desired level of course quality.

Boca Rio Golf Club, in Boca Raton, Florida, was built in the mid-1960s. The

(Before) Bulldozers stripped the Ormond variety of bermudagrass before the fairway was fumigated and ultimately contoured.



course was designed by Robert Von Hagge and has long been known as one of the best, but often unheard of, golf courses in South Florida. Even with adherence to sound basic management programs, conditioning and course quality slipped over time, and the golf course essentially reached the bottom of the totem pole among its sister courses in Palm Beach County.

While Boca Rio was not in financial trouble, extensive course renovation was needed, and this is where my part of the story begins. In 1991 I was hired as the new golf course superintendent for the \$1.4 million reconstruction project. I had been responsible for the construction and grow-in of two 18-hole championship

country club courses in the past and really believed this project would not be difficult.

The main objectives included the reconstruction of the greens to USGA Specifications, conversion of the base turf of the tees, fairways, and roughs from Ormond bermuda to Tifway (419), and a thorough updating of the irrigation system to a computer-controlled system. Work was scheduled to commence during mid-April, be completed by mid-July, and the course opened for play by October 1st. As it turned out, the projected cost and time required for our little summer project were way off; a year's worth of work was squeezed into a six-month period.

The magnitude of this venture could never have been accomplished without the 100% cooperation of our team. The entire membership was patient during the delay and accepted the additional financial burden. The board of directors and the green committee also had the foresight to say, "Let's do it once and do it right so we don't have to reconstruct the course again for at least another 20 years."

The original architect, Robert Von Hagge, who designed the layout in 1965, was given the task of redesigning the course. The club wanted a total redesign, including more modern mounding and contours, lake modifications, the addition of interesting bulkheads, and the enlargement of bunkers.

(After) Tifway (419) provided a superior playing surface, and the architectural changes of the enlarged lake and addition of the bulkhead provided a finishing touch to the hole.



It was also important to consider the employees' point of view. The golf course superintendent and other key staff, including the assistant, the golf professional, the irrigation technician, and the mechanic all played a key role in the planning process. Their knowledge of past and expected future maintenance problems were critical in the planning process.

The construction contractor was included on the decision team. Who else had been in the trenches more? Their valuable input on various construction materials, types of machinery to perform the work, and all of their ideas to get the work done correctly helped produce a quality product.

Last, but not least, who should be your advisor? Answer: the USGA Green Section. John Foy, Director for the Florida Region, had been involved with the Boca Rio Golf Club for over seven years, gathering data and writing reports which ultimately helped this whole process come about.

With the entire team in place, work began on the 15th of April. With crews working 12 hours a day, six days a week, it soon

became evident that a lot had to be done within a short period of time.

No shortcuts were considered for the reconstruction of the greens. After all, improving the greens was what stimulated the initial project. USGA Specifications were used to the last detail: The materials were tested, layer depth was constantly supervised, and pea rock was used for the gravel base even though transportation costs to South Florida were high. The intermediate coarse sand layer has proven to be most effective.

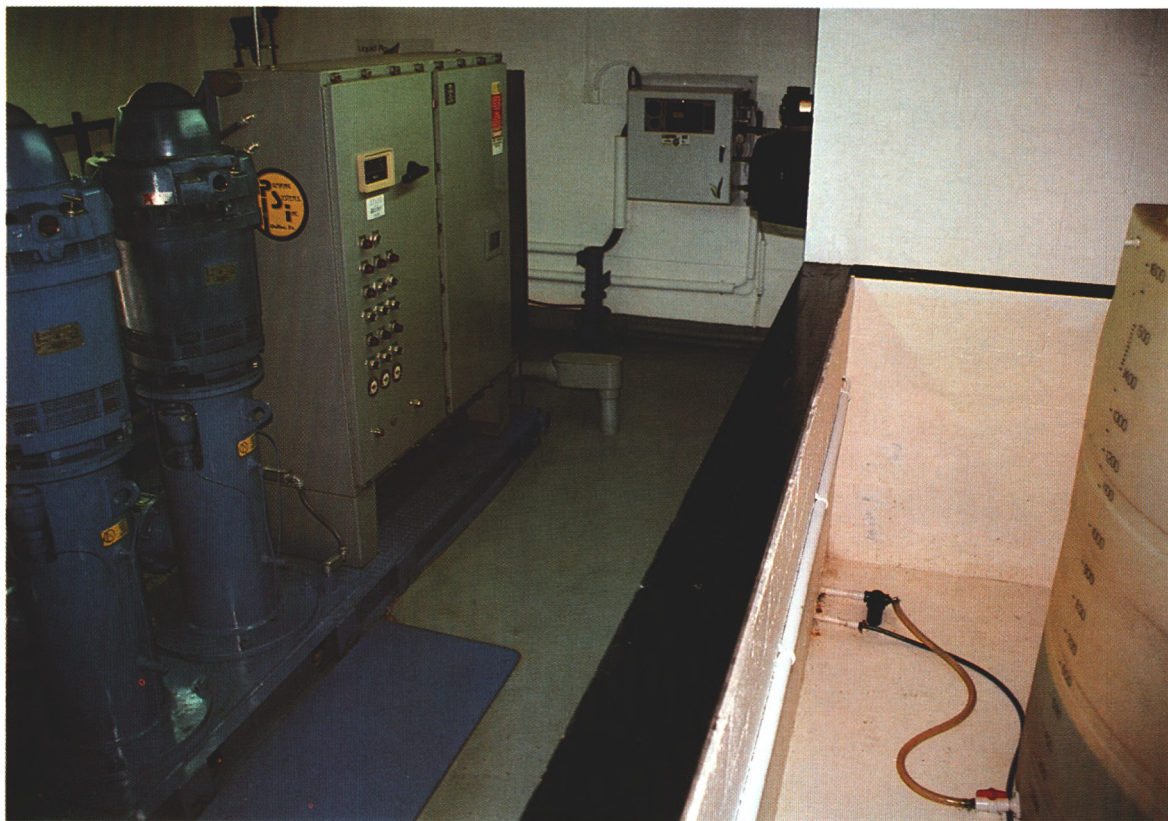
Most important, a dual irrigation system was installed! Two totally separate systems were employed — adjustable half-heads for the greens and adjustable half-heads to throw outward onto the green surrounds. A plastic side wall was placed around the edges to properly control moisture levels both in the greens mix and in the collar soil.

It is inconceivable to think of anything else but two separate systems. There are so many evenings when the collars and slopes require irrigation, while the root zone mix is perfectly moist. Proper irrigation has re-

sulted in greener slopes, yet no algae on the green surface. Often, I hear of superintendents complaining, "I've got to irrigate the greens because the slopes and collars are burning up." One local superintendent even told me that his crew hand syringes the collars because of dryness, yet his USGA greens are perfect. Given the proper soil medium with its respective irrigation head, the green surface can be visually compatible with surrounding areas even though the soils in the two areas may be completely different.

At Boca Rio, the native soil is not sandy like what most tourists might see at the beach. This soil holds water in low-lying fairways and rough areas, yet dries out on mounded areas such as green surrounds. So far, with eight months of irrigation knowledge tucked under our belt, we're finding irrigation is required every third night on the green surrounds, while the greens hold proper moisture for five to six days.

The length of irrigation cycles also needs to be discussed. Surrounds require small amounts of water on a frequent schedule,



(Left) The new variable frequency drive pump station, with a tank inside of the containment wall (right) to allow adjustment of water pH, now provides a computerized state-of-the-art irrigation pumphouse.

(Opposite page) Architectural markings provided a preview of the future changes.

with times averaging 10 to 15 minutes. The greens require more water, but less often, to establish field capacity and then hold that moisture for several nights. The greens versus the surrounds are as different as day and night and must be irrigated as such.

Even though we still have some bugs to work out on the new computerized irrigation system, it allows us to be more creative. Different programs are employed for the different times of the year. This past winter when ET (evapotranspiration) rates were low, we found the USGA greens holding proper soil moisture for up to nine days! The rocky green slopes, however, still required irrigation every fourth night. Learning the system and paying attention to respective moisture areas has created a drier and more playable golf course, yet greener and healthier turf for the golfers.

On top of the course renovation, a new pump station had to be installed only one month into the project. The old pump station was rusting away because the building lacked the proper roof structure and failed to provide any sort of weather protection or

security from legal liabilities. In addition, the old pumps were located directly in view of the clubhouse and, unfortunately, in the landing area of tee shots on the first hole. I suggested relocating the pumphouse to the other side of the fairway, behind the left fairway bunker, totally out of view and out of play.

Three months and \$130,000 later, this task was completed and a new VFD (variable frequency drive) pump station was installed. The new VFD pumping system is like comparing a World War II Jeep to a new Cadillac. Everyone speaks of the VFD's electrical efficiency and the cost savings, but I emphasize the softness and the virtual elimination of typical line hammering. The VFD does not deviate more than 2 PSI downstream, so consistent water pressure allows for an extremely smooth operation. Knock on wood; we have not had a blow-out — a miracle considering the matching done of new irrigation pipe around the greens with the old pipe in the fairways.

Over 100,000 yards of clean soil material was trucked in from off-site locations. Previously non-porous, rocky fairways were

excavated and new soil material was installed to improve percolation. Mr. Von Hagge capitalized on the by-product to create additional mounding.

A new pH water monitoring device was installed at the pump station. The lake irrigation water, with a pH of 8.2, is neutralized to 7.0 by sulfuric acid injection. By flushing the high bicarbonates and sodium in the soil, wet spots are disappearing and percolation is improving further. This is another management tool that just a few years ago was not available in the golf course market.

The regrassing of the golf course also was a major project. Originally, Ormond bermudagrass was established throughout the course, except on the putting surfaces. This cultivar was a vegetative selection found in Ormond Beach, Florida, and was released by the University of Florida in 1962. It was a better fairway/rough turf than common bermuda, but it was inferior to Tifway (419). In particular, Ormond exhibited less wear and pest tolerance, as well as increased sensitivity to a number of the





Fairway excavation removed the coral rock and muck soil pockets that previously hindered water percolation through the soil.

newer, more effective pesticides. This turf conversion project made it possible to provide an improved playing surface with a more environmentally sensitive management program.

To start the conversion process, entire golf holes from tee to green were fumigated with methyl bromide to eradicate the old bermudagrasses and make way for the improved cultivars. Soil sterilization was necessary to ensure against regrowth of the old bermuda cultivars. Even with two to three applications of glyphosate, regrowth has occurred at other courses. Soil sterilization also reduced seed and nematode populations that had built up over the years.

Tifdwarf was planted on the greens and collars. Tifgreen (328) was planted halfway down the green slopes as an encroachment barrier to the Tifway (419) planted on the fairways and roughs. Tifgreen also was planted on the tee surfaces and slopes so that they could be maintained like the greens.

Another major project was the removal of noxious exotic Brazilian pepper trees. Twenty-three years of growth had allowed them to overtake the slash pines and cypress stands. Often, fairway bunkers were virtually obscured from view at the tee. A massive tree-clearing effort restored the overgrown 85 acres of turf back to 125 acres. The opening effect allowed for more fair play, not to mention revealing the majestic 125-year-old cypress trees. Over three months of heavy tree clearing created shredded wood piles the size of a two-story house. Mr. Von Hagge capitalized on the by-product to create additional fairway mounding that was capped off with excavated fairway soil.

The project list just keeps on going. This past summer, all 100 bunkers were excavated, reshaped, and enlarged. Drainage lines were installed, and grey Terra Bond cloth was lined in the floors and sidewalls, while DOT Trap 200 sand was installed.

The cloth liner is a must for any environment where rocks and contamination are prevalent.

If all this was not enough, various problems revealed that new cart paths were a must. The previous asphalt cart paths were originally going to be saved and used again. In some instances, paths were located on the wrong side of the green. Within two months of the project, \$200,000 worth of new paths and earthwork allowed the architect to truly redesign the course.

The entire golf course has taken on a totally new image. Mr. Von Hagge has created larger greens with an average increase from 5,400 to 8,100 square feet. The first hole now has a relocated pump station, a challenging bulkhead wall to the left of the green, and a new two-tier green protected by three ominous bunkers. This visual concept carries on for 18 new golf holes. Boca Rio is now back in the high life.



Even the best of irrigation designs will prove useless if adequate pressure is not maintained by the pumping station.

Planning for Irrigation Improvements

by Dan Farrier
Consulting Engineer

AT ONE TIME or another, club managers or management committees will be required to allocate major funds to modify, upgrade, or replace an existing irrigation system. Most will wish that more information was available to evaluate the necessity or desirability of making such an investment for the club. Management involves recognizing alternatives and making informed choices to provide direction toward future expectations. When alternative choices are not apparent, management is

undermined. Management often realizes that something needs to be done . . . "But what?" "Why now?" "Is that the only way?" "Isn't there something less expensive?" "What are the alternatives?" "Can we implement this in phases?" Complete answers don't seem to be available.

Years may go by. Each year the answers are not any better. The irrigation needs obviously are becoming more urgent. There is a need to confirm the necessity and appropriateness of such a project. More

than a roomful of board members and club managers have thought, "Surely there should be more information available."

One reason for the feeling of lack of control is the fact that so little information is documented. How does management know it will not perpetuate existing problems? No one has defined what the real problems are and how or if they will be corrected after the major expenditure. How long will it be before another modification is required? Many who have been given

the responsibility to make or recommend a major irrigation purchase have been given few options or cost-control features to consider.

Major modifications may be in order. The prospect of renovation or replacement of an old irrigation system is common. Irrigation systems do wear out. Increased turf expectations often require more advanced irrigation control. If major improvements are in order, and it's your turn in the saddle, it is only prudent of you to investigate all available options.

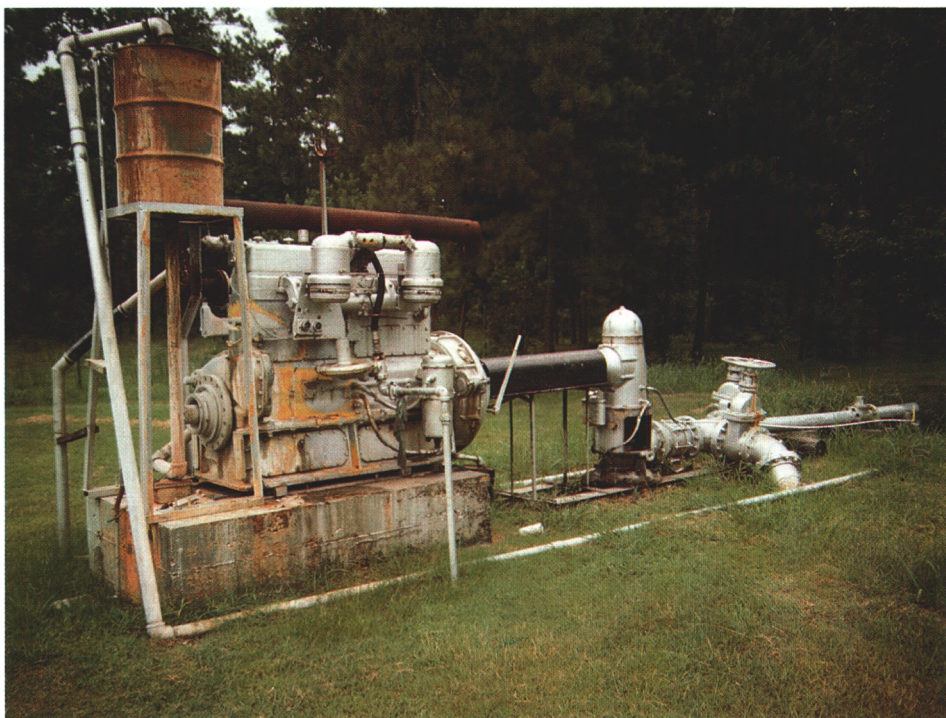
Planning Allows Participation

Planning is the process that puts the control back into management's hands. Planning is the process that provides fundamental assurance that all existing shortcomings and all alternatives are identified and evaluated. Your specific situation is investigated by an expert. A complete written evaluation with recommendations is documented, including a list of sequential steps to follow. Furthermore, planning establishes design standards that will assure that the irrigation system modification or replacement will have the most probability of meeting the club's expectations.

Some clubs skip the planning process and then struggle with picking among "free" layouts provided by those selling the products. Many committees struggle with the selection process. Two or more layouts are submitted; all have different advantages and operating features. Each has desirable features, but none are complete designs that assure any more success than in the past. How do you choose? Often the choice is based on relatively unimportant considerations, and the committee settles for whatever has been presented to them. When planning is skipped, real choices are few and far between.

Planning obviously comes before designing, so it should be obvious that any irrigation layout provided for consideration without any evidence of planning hasn't had any. Buyers beware. Planning provides a framework of system performance and limitations required if the design is to be customized to the club's specific desires. Most management decisions occur during the planning process. Planning decisions are incorporated in the system design. Skip the planning and you skip your opportunity to participate.

One thing I want to state clearly is that planning and designing are two separate events. Long-range planning includes an evaluation of the current impact of the existing system and its components on reliability and horticultural success. It involves a time for the club to evaluate the cost of



Antique pump stations can no longer meet the needs of today's irrigation systems and golf courses.

performance items desired, such as additional coverage. All of this is before the design is initiated. The evaluation, objectives, and decisions of the club are guideposts for the designer.

With the help of the consultant, management has an opportunity to participate directly in the decisions regarding cost/performance trade-offs. It is management's responsibility to balance the outcome to a satisfactory solution when faced with opposing weighted judgments concerning: 1) the quality of the golf course, 2) the expectations of club members, and 3) the members' willingness to pay.

If you realize a purchasing mistake regarding a single piece of equipment, its short lifetime or relatively small cost may permit early replacement without a detrimental impact on the quality of turf or the financial stability of the golf course. Mistakes in planning, designing, or installing a major irrigation system, though, are not easily corrected or replaced. Expenses that could have been avoided may continue for years.

An example of the wagon before the horse is the replacement of a pumping station when irrigation improvements are anticipated, yet undefined. Pumping equipment should be specified to satisfy the requirements of the irrigation system. Matching the pumping station to the new or modified irrigation system may lead to a reduction in pumping capacity because of the advanced irrigation

controller's ability to develop more efficient and consistent water demands during the irrigation cycle. The best opportunity to realize improved pumping efficiency is to delay the pump station purchase until after the design consultant has evaluated long-range requirements.

Obtain a Written Plan for Long-Range Improvements

Planning can be provided in the form of a long-range improvement plan. Planning for irrigation improvements not only will assure success, but is also necessary to gain the support of management and members. The absence of a detailed written improvement plan is the primary reason for lack of cohesive support. A written long-range improvement plan prepared by an independent consultant, with no ties to manufacturers or distributors, offers an objective expert opinion that club management and members are able to support.

Economical . . . How Can You Afford Not To?

Obtaining an irrigation improvement plan for your golf course is simple and inexpensive. It is an economical first step to system modification or replacement. You may know that you want more reliability, more

watering flexibility, and/or improved performance, but an efficient and practical approach to get there may not be so clear. The long-range improvement plan is a road map with budget and directions of how to proceed from your current system to a new or improved system.

The potential savings associated with developing a long-range improvement plan are great. Savings are readily available and result from reductions in installation cost, avoiding ineffective purchases, phasing in the most helpful improvements first, and in reductions in day-to-day operating expenses.

If efficiency and water management capabilities are not addressed in the planning of system improvements or replacement, there is little hope that they will exist in the completed project. In the early planning stages, it is helpful to review all potential or economic options that may be available. It is likely there are options to consider which you may not be aware of. Such questions as, "Is it possible to incorporate part of the existing piping into the new system?" can be effectively addressed. The expert's task is to help identify the most effective way to improve the irrigation system.

Common Irrigation Conditions Leading to Dissatisfaction

With the guidance of a long-range improvement plan, the professional consultant

can improve or eliminate existing conditions that contribute to poor performance. As an example, assume some areas of low pressure exist which contribute to poor coverage. A well-designed control system should be able to make two improvements. First, new controls may decrease the maximum flow required of the pumping station and allow the discharge pressure of the station to be increased. Secondly, new controls should improve the balance of water flow throughout the piping system, thereby reducing the pressure losses in the system.

Note the adjacent list of common irrigation faults. All of these shortcomings can be avoided. Planning the contents and standards of your system before having someone design the system will maximize your probability of obtaining the most value from your investment.

A Better Job

A qualified planning consultant will allow you to do a better job. The advantages and benefits of a well-planned irrigation system are obvious. An independent consultant is working for you to assist and make known viable alternatives. The independence of the consultant is a valuable contributor to an objective report. No one wants to make an informed decision more than the one faced with the responsibility.

A consultant helps define the cost/benefit situation. Without planning, there is no

assurance that your emphasis will be incorporated. If performance is not planned into the design, don't assume it will be in the installed system.

Performance includes:

- Area of coverage
- Pumping limitations
- Water resource restrictions
- Cost of installation
- Longevity
- Horticultural control
- Allowable watering time periods
- Water management
- Operating control flexibility
- Efficient use of pumping energy

Over the last few years, new irrigation products have become available that allow substantial improvements in turf care. New control systems are available for effective horticultural control and water management. The rising expectations of club members require increased irrigation control and effectiveness. The rising public awareness demanding responsible use of water will demand responsible water management practices. The rising cost of electricity encourages efficient watering schedules. The rising cost or decreasing availability of water often justifies the investment in modern control equipment to gain the ability to manage water consumption and application on a daily basis. New control systems can



Water quality must also be closely evaluated. The sediment in this water could ruin even the best green in a few short seasons.



Irrigation design must consider architecture as well as turf species. Very specialized designs are necessary for difficult-to-irrigate areas.

actually improve the watering of the course and use less water doing it. Due to lack of effective control, overwatering is often inherent in older control systems. For a number of reasons, substantial system changes may be in your future. Planning is a step toward responsible resource management.

Planning Makes a Difference

Operational costs are influenced significantly by the design. Defining and establishing design standards through irrigation planning may reduce the operating cost of the irrigation system by tens of thousands of dollars each year.

In one case, the club was presented with this scenario. They could spend \$40,000 more in water management control features and reduce their water purchase by an estimated \$10,000 to \$15,000 each year over the life of the system. Without adequate planning and informed choices, this club would have, by default, opted for the system with the smallest installation cost.

The consultant can assist in the evaluation of trade-offs between irrigation performance and available budget constraints. Value en-

gineering allows you to get the most from your investment in irrigation. The qualified consultant can define the short- and long-term impact of performance trade-offs. Most important, the independent consultant provides expert advice and confidential assistance.

Steps for Success

Don't overlook adequate planning. Look for objective advice. Obtain a long-range improvement plan as soon as practical when major work is anticipated within 12 to 24 months. Insist on a complete design with planned performance.

Where to Begin

Begin by looking for a qualified independent consultant. Ask your USGA Green Section representative for suggestions. The value of a professionally prepared long-range improvement plan cannot be overstated. Begin by knowing you have choices to make that will have a significant impact on the cost and performance of the irrigation system.

Mr. Farrier is a professional engineer and a nationally recognized consulting engineer for golf course irrigation systems.

Common Irrigation Conditions

- Poor irrigation coverage
- Low system reliability
- Premature equipment failure
- Insufficient watering control
- Excessive operating cost
- Inadequate pipe sizing
- Little, if any planning
- Lack of surge pressure control
- Excessive water velocities
- Incomplete designs

"TO PRE OR NOT TO PRE" — SUMMER ANNUAL GRASS WEED CONTROL STRATEGIES

by DR. FRANK S. ROSSI

Assistant Professor, Turfgrass Environmental Management, University of Wisconsin — Madison

AS A FORMER assistant superintendent and now as a university educator and researcher, I have had the unique opportunity to view golf course management from several perspectives. As a golf course manager, I recognized the importance of weed-free turf, especially free of weeds such as crabgrass (*Digitaria* spp.) and goosegrass (*Eleusine indica* (L.) Gaertn.). For instance, I remember having to restrict cup placement on a green because of a severe goosegrass infestation. As a university professional, I began to explore the concept of annual grass weed control and have come to realize that this is not a decision to take lightly. Weed management strategies must be founded in a thorough understanding of *weed biology, turfgrass physiology, and environmental impact*. Therefore, as the article title plays on Hamlet's famous soliloquy, does the application of a pre-emergence annual grass herbicide satisfy the criteria stated above, or are there other options?

Weed Biology

The biology of annual grass development is not a well-understood discipline in the literature. There have been very few studies which investigated the germination requirements, physiology, and morphology of weeds such as crabgrass and goosegrass. Germination timing has long been associated with phenological indicators such as forsythia or lilac bloom in the North or dogwood bloom in the South. More specifically, for crabgrass, soil temperatures generally must be between 57° and 62° F at a two-inch depth, while goosegrass prefers soil temperatures between 60° and 65° F, usually two weeks later than crabgrass. Strategically, this is very advantageous for the summer annual grasses, which establish at a time when cool-season turfgrasses are entering a period of reduced growth rate, often referred to as summer dormancy. Turfgrass root growth is less active at soil temperatures above 65° F,

while shoot growth rate decreases at air temperatures above 75° F, thereby reducing the turf's ability to compete for space, water, and nutrients. Compared to cool-season grasses, summer annual weeds are more photosynthetically efficient and begin to thrive at higher temperatures.

Once germination conditions are established and turf competition is reduced, the major limiting factor to infestation is the weed seedbank. This is of considerable importance during dry years, when moisture stress conditions prevail. For example, years in which there have been moisture deficits, several flushes of weed germination have occurred immediately following even the slightest amount of precipitation and have continued through late summer. Additionally, consider the effect of moisture stress on the competitive ability of non-irrigated or partially irrigated turf. Therefore, it is imperative to develop weed management strategies that efficiently exploit weed biology and enhance desirable turfgrass competitive ability.

Cultural Management

In general, a dense, well-maintained turf will minimize serious weed infestations. In many golf course situations the acceptable threshold level is zero — i.e., the turf must be 100% weed-free. Many superintendents don't like to hear it, and for many it may not be practical, but increasing the height of cut will enhance turf competition and reduce weed infestation. Irrigation that allows the soil surface to dry does less to encourage weed germination, and a well-rooted turf will not be detrimentally affected. Irrigation practices should be such that turf health is not compromised. From a fertility perspective, a properly timed late-fall fertilization will provide for extended root development in cooler soils in early winter and spring. Also, avoiding early spring fertility will minimize excessive topgrowth production,

thereby enhancing root growth during its most active period. Good root development improves drought tolerance during summer stress periods when the weeds are more competitive.

Pre-Emergence Control

The nature of golf course management oftentimes runs counter to optimum plant health management. Mowing below optimum cutting heights, non-refined irrigation practices, heavy play, and disease and insect pressure could result in physiological strain on the desirable plants. The result is a less-competitive turf, vulnerable to weed infestation. To minimize this weed pressure, pre-emergence herbicides are used to prevent weed establishment. Strategically, this can be an effective measure; however, it can be inconsistent based on application timing and environmental conditions, as well as possibly having an impact on turfgrass health.

Pre-emergence herbicides do not inhibit germination; in fact, they require weed germination to be effective. Following germination, the seedling absorbs the herbicide resident in the top two inches of soil. The majority of pre-emergence herbicides (pendimethalin, benefin, trifluralin, oryzalin, bensulide, prodiamine, DCPA, napropamide, dithiopyr) act by inhibiting cell division, eventually exhausting the seed reserves before the weed can emerge and begin photosynthesizing. In contrast, oxadiazon is thought to inhibit other metabolic processes not directly related to cell division; still, it exhausts seed reserves before emergence. Except for siduron, these products do not distinguish between weed or turf seedlings, requiring the turfgrass manager to delay turf establishment or overseeding operations for the appropriate amount of time.

The effect of pre-emergence herbicides on rooting has focused on establishing Kentucky bluegrass sod and bermudagrass. However, the other major turfgrass species

have been investigated to a lesser extent. In general, pre-emergence herbicides are thought to be less injurious to established turf, though the ability to detect subtle differences in rooting remains a critical void in turfgrass research. It is possible that the influence of pre-emergence herbicides on rooting is not completely understood.

Turfgrass ecology and physiology could explain this further. Grass root tips are regions of active cell division (meristems). The root meristem could be affected if it contacts a pre-emergence herbicide that inhibits cell division. Ecologically, turfgrass rooting will be most active in the early spring when the soil is cool and topgrowth is yet to be initiated. This root development aids the turf's ability to withstand summer stress periods where evaporative demand is high and moisture is limiting. It follows, then, that an application of a pre-emergence herbicide that inhibits cell division could affect root production during a critical development stage. Delaying a pre-emergence application until soil temperatures warm, so that roots are through their active stage, would avoid injuring the new roots. Yet, if crabgrass has already emerged, most pre-emergence products will not provide post-emergence control; hence, proper timing remains critical.

Pre- and Post-Emergence Combinations

Providing weed-free playing surfaces requires an integrated strategy which maintains optimum plant health and incorporates properly timed herbicide applications. Utilizing a careful monitoring program, which includes soil temperature, growing degree days, and phenological indicators, in combination with a pre- and post-emergence application, could provide excellent control. As soil temperatures warm, these pre- and post-emergence applications could be made following emergence of weed seedlings and after the period of active turfgrass rooting. This strategy controls emerged plants and provides extended pre-emergence control during the season, while allowing for overseeding operations in the late summer and fall.

Research conducted at Cornell University from 1989 through 1991 identified various herbicides and herbicide combinations that are safe and effective on creeping bentgrass maintained as a $\frac{3}{16}$ " putting green and on $\frac{1}{2}$ " annual bluegrass/bentgrass fairway turf. In 1989, 30 days after treatment, dithiopyr (Dimension) applied to a bentgrass green at .5 lb ai/A produced slight reddening of leaf sheaths; however, injury was not considered to be objectionable, and on the fairway turf provided acceptable (>85%) season-long



Pre-emergent herbicides can work well when applied properly, but . . .

annual grass control. Oxadiazon (2G) injured all varieties at green height at 2.25 lb ai/A. Interestingly, oxadiazon applied alone as commercially formulated Ronstar 2G at 1.5 lb ai/A caused objectionable injury; however, the premix granular of 1.5 lb ai/A oxadiazon plus 6.0 lbs ai/A bensulide (Scott's Goosegrass/Crabgrass Control) did not cause injury to the bentgrass green. Research conducted in 1990 saw pre-emergence applications made under cooler temperatures than 1989, resulting in less phytotoxicity from all oxadiazon applications.

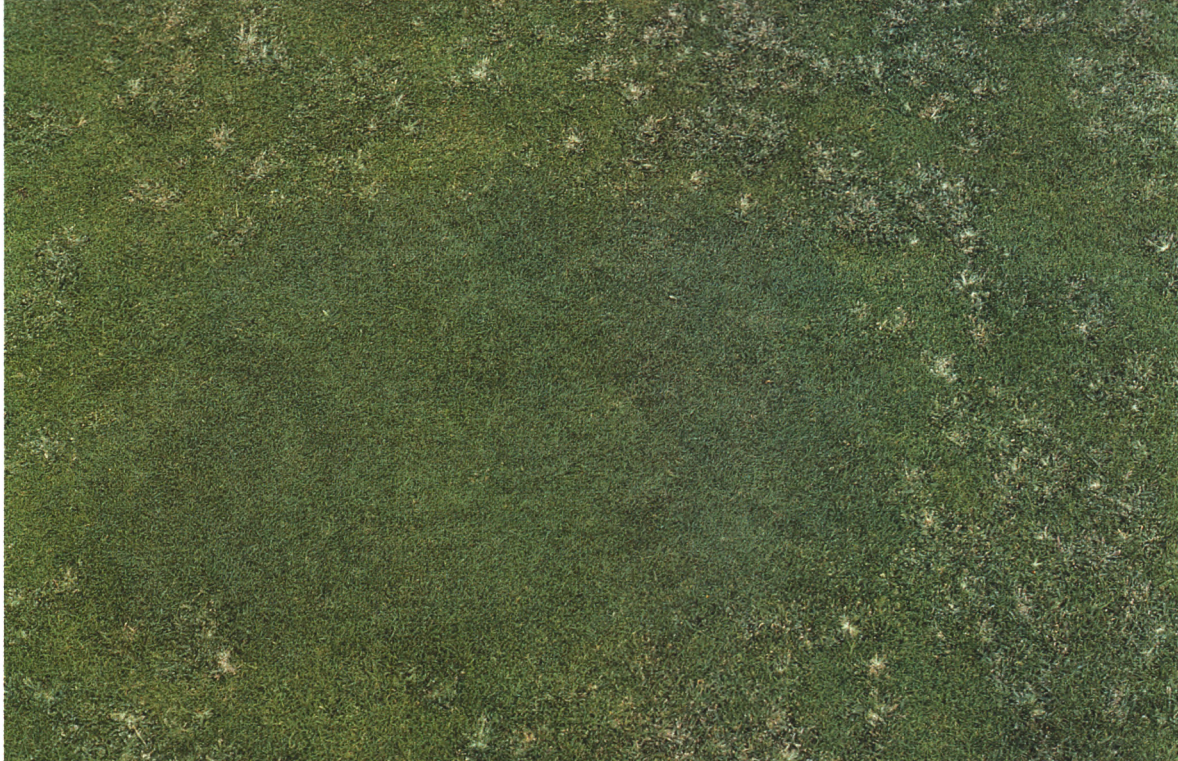
Post-emergence applications in all years were made at 14-day intervals and began when crabgrass reached the three-leaf stage in the fairway turf. The 1.0 lb ai/A rate of MSMA, applied with an iron chelate safener, did not produce injury, and the safener significantly reduced MSMA phytotoxicity at all rates. On fairway-height turf, annual grass control from MSMA was significantly reduced by an apparent antagonism between the safener and MSMA. Tank mix combinations of fenoxaprop (0.04 lb ai/A) and bensulide (6.0 lb ai/A at 100 gallons per acre) were safe at green height. Crabgrass efficacy was not investigated.

Fenoxaprop at 0.04 lb ai/A applied at 100 gallons per acre (gpa) slightly injured bentgrass mowed at $\frac{1}{2}$ ", but did not cause injury at $\frac{3}{16}$ ". Excellent crabgrass and goosegrass control was provided in the fairway turf. Additionally, one tank mix application of dithiopyr at 0.25 lb ai/A and fenoxaprop

at 0.04 lb ai/A afforded exceptional (>95%) season-long control; however, this combination even at higher-volume applications up to 100 gpa caused severe injury to the bentgrass maintained at green height. Previous research has indicated potential synergism between dithiopyr and fenoxaprop that could explain the exceptional control and the increased turf injury.

Dithiopyr (Dimension), from Monsanto, represents the next step in summer annual grass weed control with its pre- and post-emergence activity. The previous research regarding safety of dithiopyr on creeping bentgrass greens has been substantiated by several researchers throughout the country. Some precautions do apply, such as: Older creeping bentgrass varieties (Cohansey, Seaside, South German mixture) and colonial bentgrasses are more sensitive and have been injured from dithiopyr applications, and non-amended, high-clay-content, poorly drained greens have also been injured.

Finally, quinchlorac (Drive), a new post-emergence product from BASF Corporation (expected for the 1993 season), also represents an alternative strategy to traditional weed control programs. Quinchlorac is an excellent post-emergence grass herbicide that has activity on certain broadleaf weeds, especially white clover (*Trifolium repens* L.) and *Veronica filiformis*, one of the most difficult-to-control weeds in cool-season turf. Quinchlorac has demonstrated little pre-emergence activity and therefore would



A dense turf is still the best solution to controlling grassy weeds, as witnessed by this bentgrass strain.



The effect of a dinitroaniline pre-emergence herbicide applied as a post-emergence to goosegrass. In spite of the obvious club root injury typically associated with these herbicides, the plant was able to survive under well-watered conditions.

need to be applied in combination with a pre-emergence product for season-long control of germinants.

Conclusions

The first step to an efficient weed management program is optimum plant health maintenance in combination with efficient use of herbicides. An integrated approach requires an understanding of the dynamics of the turfgrass ecosystem and how it might be affected by herbicides. Incorporating herbicides into the program involves understanding their potential impact on turfgrass health and the need for proper application timing to obtain effective weed control. Proper herbicide application procedures are

critical to the success of a weed control program and are often overlooked as a result of the *occasional* hectic nature of managing a golf course.

References

- Andersen, R. N. 1968. Germination and establishment of weeds for experimental purposes. John Wiley Co., NY.
- Ashton, F. H., and A. S. Crafts. 1973. Mode of action of herbicides. Wiley-Interscience, NY.
- Bhomik, P. C., and S. W. Bingham. 1990. Pre-emergence activity of dinitroaniline herbicides for weed control in cool-season turfgrasses. *Weed Tech.* 4:387-393.
- Demoeden, P. H., D. B. Davis, and J. D. Fry. 1988. Rooting and cover of three turf species as

influenced by pre-emergence herbicides. *Proc. 42nd Northeast. Weed Sci. Soc.* 42:169.

DiPaola, J. M., and J. B. Beard. 1992. Physiological effects of temperature stress in turfgrass. (ASA Monograph #32), eds. D. V. Waddington, R. N. Carrow, and R. C. Shearman. American Society of Agronomy, Madison, WI.

Rossi, F. S., and J. C. Neal. 1990. Evaluation of annual grass control strategies for creeping bentgrass putting green turf. *Agron. Abstr.* 82:151.

Rossi, F. S., and J. C. Neal. 1991. Annual grass control in fairway turf. *Proc. 45th Northeast. Weed Sci. Soc.* 45:143.

Williamson, D. R., S. J. Stehling, and J. E. Kaufmann. 1988. Enhancing post-emergence control of crabgrass with herbicide combinations containing MON 15100. *Agron. Abstr.* 80:158.

The Golf Course Mechanic — A Changing Image

by **ROBERT C. VAVREK, JR.**

Agronomist, Great Lakes Region, USGA Green Section

IT WASN'T SO LONG AGO that a knack for small engine repair qualified an individual for a job as a golf course mechanic. Specialized equipment was whatever the mechanic could jury-rig from old equipment and scrap iron. The pay was nothing to brag about, but unlike most of the other positions at the golf course, the work was steady throughout the year.

During the last 20 years or so, the expectations of average golfers have changed significantly. The demand for more consistent, higher-quality playing conditions has encouraged equipment companies to design a considerable amount of complicated, highly specialized equipment. The crude prototypes of today's equipment probably could have been found in yesterday's maintenance buildings, designed or "invented" by the superintendent and mechanic over the winter. After all, no one really believes the concept for turf groomers or motorized bunker rakes just popped into the mind of an engineer at an equipment manufacturer.

The availability of specialized equipment also parallels the surge in the popularity of golf. Small courses that were never designed to accommodate heavy play now receive 40,000 to 60,000 rounds of golf per season. Consequently, equipment has been designed for extreme efficiency while minimizing wear and compaction on the playing surfaces. Similarly, a new generation of heavy-duty aerifiers and more efficient slicer/seeder are now available to renovate and relieve compaction in worn areas. Much of the mowing equipment is being downsized to produce higher-quality playing surfaces — and that means more mowers requiring precision adjustment.

The knowledge and abilities of the mechanic have had to keep pace with the more sophisticated inventory of equipment found on the course. A mastery of two- or four-cycle engines is inadequate — add diesels and hydraulic systems to the list. The daily duties, such as checking or adjusting the height of a mower, have become complicated tasks on modern equipment,

such as five-plex mowers equipped with turf groomers.

Think about it — some high-capacity fairway/rough mowing equipment costs in excess of \$50,000. The value of the equipment inventory at some courses can easily exceed half a million dollars. The golf course mechanic often is responsible for more costly equipment than the local "automobile technician."

Until the golfers in this country will accept less than perfectly manicured conditions for day-to-day play, the expectations for flawless greens and fairways will continue to put more pressure on the mechanic. There is little room for a bench-setting error when the greens are routinely cut below $\frac{1}{8}$ inch. Similarly, the hydraulic fluid leak that damages a green or fairway was unknown to the golfer of yesterday — when green fees were a few dollars. That type of accident on an expensive golf course today can result in a terminated employee.

As regulations concerning pesticide applications on golf courses become more strict, the maintenance of spray equipment will become more important and more complicated. The documentation of calibration, proper nozzle selection, etc., will likely become mandatory. Today's top-of-the-line spray equipment is now memory-chip assisted — so the mechanic must expand his expertise to include at least a working understanding of computers. The importance of developing a sound preventative maintenance program for sprayers, spreaders, etc., cannot be overemphasized. The negative publicity and expense of a pesticide spill cleanup, if the application equipment fails on the course, should always be considered.

Public notice of pesticide applications, called "posting," is now mandatory in many states. Consequently, the maintenance facility is more likely to receive calls from concerned individuals requesting more detailed information about pesticides than ever before. Similarly, as superintendents strive to develop better lines of communication with golfers, more calls are likely

to be placed to the shop — and who is the most likely person to answer the phone? The mechanic. The golfer or neighbor develops a first impression of the operation as soon as the phone is answered, so proper phone answering technique is quite important. A professional response can mean the difference between defusing a potentially serious confrontation or escalating the problem. No one expects the mechanic to be a trained receptionist, but sometimes he may need to assume this role.

In response to their changing role on the golf course, mechanics have tried to change others' perceptions of themselves. Much like the "greenkeeper" of yesterday, mechanics are striving for professional recognition. A number of mechanics' associations have been organized around the country. The largest in the Great Lakes Region is the Chicagoland Golf Course Mechanics Association, with over 100 members. Monthly meetings are arranged where the mechanics get together to discuss common problems and share time- and labor-saving ideas. The Chicagoland Association also sponsors an educational session at the North Central Turfgrass Exposition each year. For information about the Chicagoland Association, call Patti Maguire, Secretary, at (708) 446-5268.

In the past, the opportunity to broaden the knowledge and experience of a mechanic was limited to attending the intensive training schools sponsored by the major equipment manufacturers, such as Jacobsen or Toro. During the past few years, many more options have become available. Monthly association meetings provide the opportunity for more formalized educational sessions; specific topics can be targeted for an afternoon seminar.

Other educational opportunities are now available from several universities. Lake City Community College, located in Lake City, Florida, offers a one-year turf equipment management certification program — two semesters of classes and summer internship. This program graduates 15 to 20 students per year, and most are offered em-

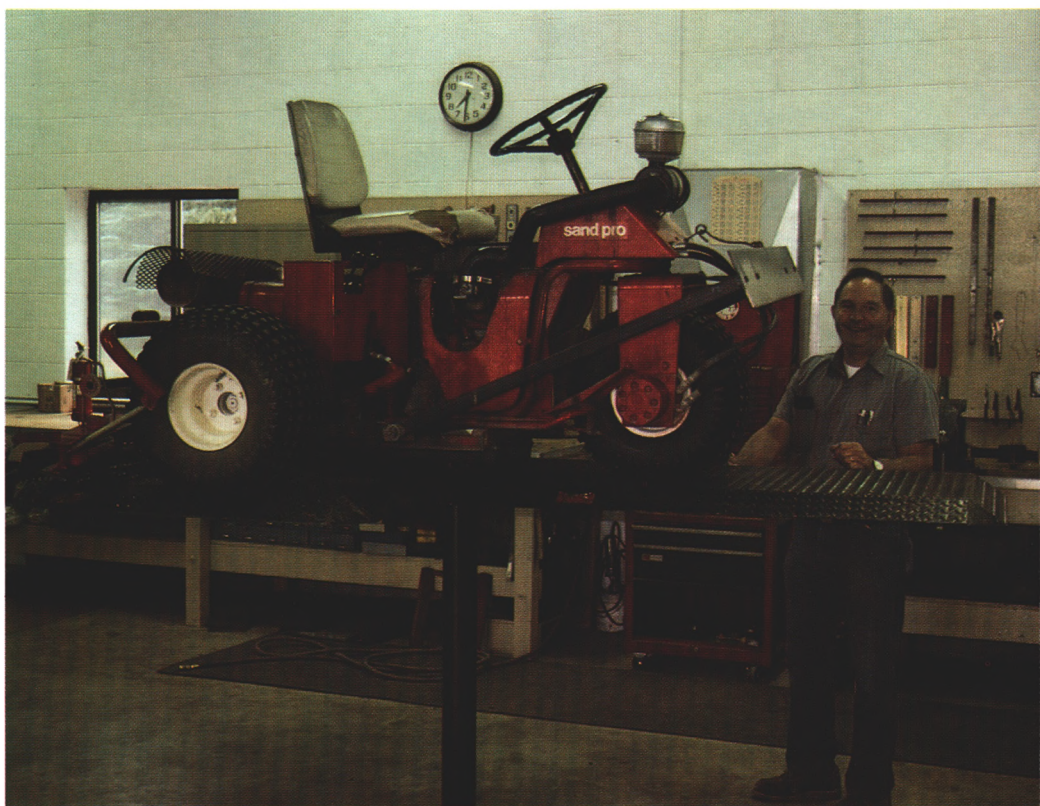
ployment even before they graduate. For more information, call John Piersol, (904) 752-1822, extension 225.

Michigan State University has structured an educational opportunity for the "working" mechanic called the Certified Turfgrass/Landscape Equipment Technology Program. The candidate attends a six-hour night session, once a week, for four semesters. Two schools are offered, one located in the eastern part of the state and the other in the west. An additional school will be offered in the north if enough interest is generated. The first group of mechanics recently completed the certification process and are working in the field. For information, call Dr. Cliff Jump, (517) 355-0190.

Kishwaukee College, in Malta, Illinois, now offers a course of study entitled Horticultural Equipment Technology. It is a four-semester (64 hours) program which includes basic plant science courses, management techniques, and even Spanish language terminology and applicable phrases heard in the workplace, as well as broad instruction in the repair and maintenance of golf course equipment. Two internship sessions are required. For more information, call Carol Quenett, (805) 825-2086.

Fortunately, the wages for an experienced mechanic have finally started to become commensurate with their value to the golf course. According to Dennis Wilson, CGCS, the additional compensation needed to keep a "good" mechanic at Sunset Ridge Country Club was more than offset by the decrease in the equipment maintenance budget, parts, service calls, etc. According to a survey of mechanics in the Chicago area, their average wages were \$30,000 in 1992, up from \$28,000 in 1990. So expect to pay a bit more for an experienced mechanic — if you can find one.

Many superintendents simply cannot find good mechanics with golf course experience. High school students are not aware of the opportunities in this field, so there are few "apprentices" working under the "lifetime employee" mechanics found at many courses. The image of the mechanic is changing — but more needs to be done to promote the profession in the future. "The goal of this association shall be to enhance the professionalism of the Golf Course Mechanic. To attain this goal, we will continually strive to seek better education. We will open, maintain, and expand the common lines of communication, first with our fellow members, then at our respective places of work, and finally throughout the golf course community. We seek to attain a common goal of better, more practical, and efficient management of our equipment." (Excerpt from the bylaws of the Chicagoland Golf Course Mechanics Association).



(Top) Tim Sobleskey, Egypt Valley Country Club, Ada, Michigan, was a member of the first class of students to complete Michigan State University's Certified Turfgrass/Landscape Equipment Technology Program. The classes are taught one night per week, for four semesters, to provide formal training to the "working mechanic."

(Above) Bill Martin, Blue Mound Golf and Country Club, Wauwatosa, Wisconsin, checks and adjusts the cutting height of the greensmowers. Attention to details provides consistent, high-quality playing conditions.

Landscaping the Golf Course for Wildlife

by **RON DODSON**

President, The Audubon Society of New York State, Inc.



Breckenridge Golf Club, Breckenridge, Colorado.

MANY golf course superintendents and officials have asked, "What constitutes good wildlife habitat?" Or, even more pointedly, "What do you mean when you say create habitat on our golf course?"

Quite simply, habitat is comprised of four general categories: food, cover, water, and adequate space. These four general requirements must be met for wildlife (all kinds of wildlife) to be present in an area and to be biologically productive. It is probably quite obvious that the requirements of a large mammal, such as a deer, would be much different from those of a small songbird, but, nonetheless, all four requisites must be met for either the deer or the songbird to be present.

Within those four broad categories there are special and specific requirements which will benefit certain kinds of wildlife — certain plant species, particular kinds of cover, or specific nest areas, for example. Also, there are special kinds of projects that the superintendent can undertake to enhance certain habitats and consequently benefit certain wildlife species. The "components of habitat" are divided into approximately 16 areas. To increase the effectiveness of one's efforts at enhancing wildlife habitat on a golf course, it is important to "mix" the habitat components throughout the property and throughout the year. The 16 components of wildlife habitat are:

- Conifers
- Grasses and legumes

- Butterfly, bee, and moth plants
- Hummingbird plants
- Summer plants
- Fall plants
- Winter plants
- Nut and acorn trees
- Feeders
- Water
- Dust beds and grit
- Salt
- Cut banks, cliffs, and caves
- Brush and rock piles
- Tree snags
- Nestboxes

The effective wildlife manager of a golf course will look for opportunities to establish or enhance any and all of these habitat components. Of course, each golf course will provide challenges for the manager because of factors such as the physical location, climatic conditions, altitude, lay of land, and even the politics of habitat enhancement. It is essential that the superintendent discuss potential changes in management practices with course supervisors. What may look nice to wildlife may not always be as pleasing to some human eyes.

Finally, many course managers have had to deal with "problem wildlife." Sometimes the problem is too many of a certain species on the course, or a species' use of a particular area of the golf course. The course manager should attempt to "step back from the problem" and look at it from the perspective of the wildlife. Has your management strategy created a perfect habitat for the problem wildlife? Are there subtle changes that you can make to alter the habitat in ways that will discourage use of a particular area by the species? Remember, all forms of wildlife require food, cover, water, and space. A golf course manager can use these facts to his advantage when attempting to create wildlife habitat or discouraging certain species from using a particular area.

Golf courses can play important roles in providing habitat for wildlife. In many of our urban areas, golf courses are the last remaining green space, and wildlife of all types will utilize the habitat made available by course management. In any part of the country, golf courses can help to enhance our awareness of nature, play a significant role in protecting our natural resources, and provide a useful and compatible habitat for both humans and wildlife.

ALL THINGS CONSIDERED

EMPLOYMENT CONTRACTS: THE MISSING LINK!

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

GOLF is an emotional game! When players do well, they feel good and all is right with the world. When they do poorly, they become frustrated and want to take their frustration out on someone else. Unfortunately, that someone often is the golf course superintendent. Some people seem to believe that poor play can't possibly be related to inferior equipment (clubs, balls, etc.), the skill level of the players, or weather conditions. Therefore, poor scores must be caused by the condition of the golf course. It's not their game; it's the condition of the golf course!

All golfers have good days and bad. Weather conditions will affect the condition of a golf course and a player's ability to score. Golf can be an emotional game, but that does not mean that golf course maintenance should be based on emotions. Quite the opposite, it points to the need for stability and consistency in course conditioning.

Golf course superintendents are expected to provide an attractive course that is consistent, fair, and challenging to play, while

being reasonably economical to maintain. This is a tall order that requires an experienced, well-trained professional. Expectations and working parameters should be carefully thought through by course officials and by the superintendent. Once determined, a mutually beneficial written employment contract should be executed.

A written contract provides the superintendent with the guidelines needed to do the job. Written agreements help bridge the communication gap that often occurs with a change in course officials. A contract also protects the superintendent from the occasional emotional outburst that is inevitable when people play an emotional game. An employment contract gives course officials some assurance about how the golf course will be conditioned. In addition, the contract establishes guidelines for an orderly and equitable change in superintendents, should a change occur.

If done correctly, a written contract can help establish a solid and unemotional working relationship. In the long run, a

contract may even help a course save money by maintaining consistency in expectations and objectives. Further, golf course superintendents with employment contracts tend to stay at one course longer, and this has the potential of benefiting the entire maintenance operation.

Very few golfers walk up to a 10-foot putt and hit the ball without stooping down to look at the line on which the ball will roll. Lining up a putt allows the player to decide on a direction in which the ball must travel to go into the hole. An employment contract is like lining up a putt. You might get lucky and achieve the desired results without developing a plan, but advance planning makes success much more likely.

Is the missing link in your golf course maintenance operation the lack of a mutual understanding between course officials and the superintendent? Quit relying on luck and take the emotions out of your golf course conditioning! A written employment contract will help you take a positive step toward a successful future.

TURF TWISTERS

PRACTICE

Question: Now that our fairways are predominantly creeping bentgrass with excellent sod density, some of our golfers are complaining that they are mowed too closely. Where does it stop? Please comment. (Wisconsin)

Answer: You have produced a fine playing surface highly favored by skilled golfers. A half-inch mowing height is proper, yet anything higher would be of little help to hackers and much more trouble for the maintenance staff in terms of thatch management and pest control programs. There is little that can be done for less skilled players other than to very diplomatically offer sympathy and suggest lessons and practice.

COMMON SENSE

Question: Many golfers at our course have the idea that it is okay to play from the tee plaques regardless of where the tee markers are placed. These areas are heavily worn and it is nearly impossible to reestablish turf. Any suggestions to help keep golfers off the tee plaques and allow the turf to recover? (Nevada)

Answer: One method is to install chicken wire or other type of netting horizontally across the tee on the heavily played areas. The wire can be anchored with metal pins on either side of the tee. This barrier forces the golfers to stay off of the worn area until the turf has fully recovered. Be sure to communicate to the golfers that efforts are made to make sure the golf course's playing length is approximately the same from day to day. Even though some tee markers are moved forward to distribute traffic on the tee, other tee markers have been moved back to compensate for the distance.

TO CONTROL PESTICIDE MOVEMENT

Question: I am aware of the tremendous amount of research that is being conducted concerning fertilizer and pesticide movement through soils on golf courses. Is anything being done to educate golf course maintenance staffs concerning the greatest potential problem, the wash rack area? (California)

Answer: While research has not been done specifically in this area, you are right in your assumption that wash racks provide a great potential for problems on a golf course. The golf industry has responded with self-contained recycling systems that provide total leachate control. You can expect that these will become a requirement in the future as environmental regulations continue to become stricter. In the meantime, it is in everyone's best interest to be aware of what happens to the rinsate and take preventative measures to properly dispose of the material.