

USGA®

Green Section **RECORD**



Managing Greens Under Stress

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Green Section RECORD

1 Managing Greens Under Stress
by Stanley J. Zontek

4 How to Make the Right Connections
by James Francis Moore

**6 Impressions of a Summer's Tour
with the Green Section**
by Sherwood A. Moore

9 A Revival of Hand Raking?
by James T. Snow

12 News Notes for Early Summer

13 All Things Considered: Snake Oils
by James Francis Moore

**Back
Cover Turf Twisters**



Cover Photo:

Managing greens under stress is certainly one of the most demanding tasks asked of the modern golf course superintendent. It is at times like these that we are put to the test, called to judgement, and forced to make it or break it. This is the time when the training and discipline pay off.

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Managing Greens Under Stress

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



The result of putting green turf cut too low while under stress. The longer grass in the depressed area of the wheel mark survived well.

AMONG THE responsibilities of today's golf course superintendent, the need to maintain a good stand of grass on putting greens is perhaps the most basic of all. Greens are the bread and butter of a golf course, and the reputation of a course and the superintendent who maintains it is often determined by the consistency of those greens. As long as the greens look good and putt well, golfers are inclined to overlook other weaknesses on the course. If this consistency fails for even a short time, though, the superintendent will be criticized — and golfers can be merciless in their criticism of even the least significant flaw.

Maintaining good putting green turf for most of the season is not as difficult as it once was. Science has given us a better understanding of how to maintain closely cut, heavily trafficked turf, and well-timed practices such as aeration, topdressing, fertilization, overseeding, and other renovation work can prepare the turf and the soil for the next period of stress. With the coming of the summer stress season, however, putting green management often takes on a meaning all its own: doing what is necessary to keep the grass alive under stress conditions.

Turfgrass stress can be defined in a number of different ways. By the book, stress is the "strain or pressure causing

a departure from the normal equilibrium." For the turf manager in the field, stress is what causes the grass to wilt and die right before his eyes, just like it did during the summer of 1987, the East's summer of despair. The turf on greens is exposed to many elements that can cause stress. The turf manager has little or no control over some of these factors, such as the amount of play a course receives, under what weather conditions this play occurs, and whether the players wear spiked or spikeless shoes. Other stress factors are imposed by the superintendent himself. These include extremely close mowing, the abrasion caused by turning heavy triplex mowers on the green perimeters and collars, deep vertical mowing, too much or too little irrigation, and misapplying certain chemicals. These stresses can be broadly grouped under mechanical stress.

The other category of stress the turf manager must deal with is given the name environmental stress. Temperature or humidity that is either too high or too low, rainfall that is too much or too little, and the presence of frost, are examples of environmental stress.

Generally speaking, any of these environmental or mechanical stress factors will not cause the loss of grass by themselves, but when a combination of stresses occurs at the same time (e.g.,

close mowing when it is too hot), the turf can be severely weakened, and may wilt and die. When this occurs on greens, it means an immediate public relations problem between the golf course superintendent and those who play the course.

Following is a listing of some of the management factors the golf course superintendent can control to some degree as he manages his turf under conditions of stress. Some may seem obvious, while others are less obvious, but all of them are worth considering in preparing for another period of heavy summer play and the accompanying stresses. After all, loss of turf on greens is something that every golf course superintendent and golfer wants to avoid.

Managing Mechanical Stress

- Raise the mowing height. Mowing the grass too close when temperatures and humidity are too great is a common cause of summer turfgrass failure. In many cases, the golf course superintendent feels pressured into sustaining low cutting heights for the sake of fast greens, resulting in thin, weak, or dead turf, and a mob of angry golfers.

What *should* be done? When the grass is under severe stress and is being cut less than 3/16ths of an inch, and where thinning and scalping damage is seen, raise the mowing height as quickly as

possible. Even a slight 1/64th- to 1/32nd-inch increase in cutting height can have a very beneficial effect. In contrast, lowering the cutting height by this small increment to increase green speed can have a disastrous effect. The old saying slow grass is better than no grass is so very true.

- Skip mowing. The physical act of cutting grass with a heavy machine is itself a significant stress. Common sense would suggest when the grass is under extreme heat stress (its rate of growth slows anyway) to skip a few days of mowing each week. The greens may lose a little speed, but again, slow grass is better than no grass.

- Avoid double-cutting greens. While double-cutting is one of the most useful techniques at the disposal of the golf course superintendent to achieve and maintain fast greens, it is, nevertheless, another form of mechanical stress. Therefore, when the grass is suffering from heat stress, defer double-cutting until conditions moderate.

- Use walk-behind mowers. Walk-behind units place less mechanical stress on the turf than triplex mowers. While it is true that triplex mowers are marvelously efficient machines, they do cause extra stress on the turf, especially on the clean-up cut around the greens. This mechanical wear is one of the most compelling reasons why more and more golf courses are going back to walk-

behind mowers during the summer stress season. The pleasing, traditional striping effect it causes is an added advantage of hand mowing. Finally, many superintendents feel that walk-behind units do a consistently better job of cutting, while minimizing wear stress at the same time.

- Watch out for grooved rollers. The Wiehle roller is an excellent grooming device for creating better putting green texture and quality, compared to mowers with other types of rollers. When the grass is tender and under stress, however, the extra abrasion these rollers cause, especially on the perimeter cut, can be a major source of stress. Thus, use grooved rollers religiously when mowing the grass during non-stress times, but consider replacing them with solid section or swedge rollers when the turf is under stress.

- Defer routine maintenance operations like topdressing and vertical mowing of greens. While bermudagrass tolerates and may even thrive with an occasional summer topdressing and vertical mowing, cool-season grasses can be injured by such programs if poorly timed. This illustrates a significant difference which exists between the management of cool-season and warm-season grasses during the summer. Warm-season grasses flourish when temperatures are hot, while cool-season grasses can suffer heat stress when temperatures reach the high 80s.

In summary, do whatever is necessary to minimize mechanical stress to cool-season grasses when they are under prolonged heat stress. Putting green speed and quality may be sacrificed slightly during this time, but it is a small price to pay for avoiding the loss of turf and the turmoil which would accompany such a loss.

Managing Environmental Stress

Heat, moisture, disease, and nutrient stresses are key problems in maintaining healthy turf during the summer. Good management techniques can minimize these stresses, though sometimes the chemicals and materials used to prevent injury cause stresses of their own. Following is a checklist of management factors to consider for handling various environmental stresses.

- Syringe the turf occasionally to reduce heat and moisture stress. Applying the correct amount of water is the key to this program. Syringing is often overdone, causing wet wilt and disease. Syringing is best done by hand, using trained workers with some good judgment, and applying water only to those sections of the greens that require it. Hand syringing is time consuming during the summer, but it is necessary, given the demands of golfers today.

- Open up pocketed greens. Summer heat stress problems are always more severe on pocketed greens, those partly

A green cut with a triplex mower one season (left) and the same green cut with a walk-behind unit the next season (right).



enclosed by a dense stand of trees and underbrush. It is always hotter and more humid in these pocketed areas, and the grass is always weaker because of it. Air circulation can be improved by thinning out the extraneous trees and underbrush near the green and pruning up the lower branches of the remaining specimens. Without a doubt, good air circulation is critical in allowing the turf to transpire and cool itself by releasing moisture through its stomata. Providing good air circulation is also helpful in drying the green to minimize disease and algae problems. Therefore, anything that can be done to improve air drainage in the vicinity of golf greens should receive high priority by the green committee.

- Control diseases. Many turf diseases become active when the weather is hot and humid and the turf is under stress. A good example is Summer Patch (*Magnaporthe poae*), a disease of *Poa annua* and one where disease severity is directly related to the degree of stress experienced by the *Poa annua*. Controlling this and other diseases during the summer is particularly important, as turf lost from disease activity at this time of year will be slow to recover. To prevent this from occurring, compress your preventive fungicide spray schedule if necessary, be sure to make an accurate diagnosis of the disease if symptoms are observed, and use curative rates of the most effective yet least phytotoxic fungi-

cide labeled to control that disease. Also, be sure to alternate materials or tankmix contact and systemic fungicides when appropriate for broad spectrum disease control and to reduce the potential for fungal resistance problems.

- Do not apply pesticides, fertilizers, or combinations of products that have the potential to burn the turf. Cool-season grasses under heavy stress often react negatively to what are usually considered mild herbicides or moderate rates of certain types of fertilizers. If in doubt, spray during the cooler evening hours or defer treatments until temperatures moderate, when the turf can tolerate the applications better. If crabgrass or other weeds must be treated during the summer, consider hand picking rather than using herbicides. Though time consuming, it may be better than dealing with burned grass.

Misapplications can be especially devastating during stressful weather. Applying the wrong rates or allowing overlapping (which essentially doubles the intended rate) is a common cause of turf injury during hot weather. If you're not confident about important applications, consider using foam markers or application dyes for spray applications, or switch to granular formulations and drop spreaders if necessary.

- If fertilization is deemed necessary, keep rates in the light to ultra-light spoon-feeding range. Soluble fertilizer sources containing N-P-K plus micro-

nutrients seem to work well at rates as low as 1/16th or as high as one-quarter pound of actual nitrogen per 1,000 square feet per application. Non-burning, low-nitrogen-content natural organic fertilizers can also be used to good advantage, but keep the rates low, in the range of one-quarter pound of nitrogen per 1,000 square feet. Keep in mind that more fertilizer can always be added if it is needed. If excess fertilizer has been applied, though, nothing can be done but live with the consequences.

- If the greens begin to thin and you feel they are in trouble, consider aerating the turf. That's right, aerate. Though it may seem inconsistent to aerify while at the same time trying to avoid turf stress, there is usually more to gain than to lose. Aeration helps a soft, wet soil dry out, and allows oxygen back into the root zone where it is so badly needed. It also improves water infiltration into tight, compacted soils, and relieves the effects of isolated dry spots. Very often, the turf begins to improve within a few days after aerification. As a precaution, use small tines, and do not let the green dry out too much. Solid-tine aerification or deep spiking may also be of help in this situation.

- Consider applying hydrated lime when conditions warrant. For example, when algae becomes established on the surface of the greens and cannot be controlled with fungicides containing maneb, a light application of hydrated lime sometimes does the trick. Consider hydrated lime also when a green takes on an acidic, musty odor (ominously referred to as the smell of death), usually during periods of hot, humid weather. As with aerating greens under severe stress, something may be gained by sweetening the surface of the soil with a light application of not more than one pound of hydrated lime per 1,000 square feet. This is an old remedy that can still be used to good advantage. Be careful. While light rates of hydrated lime have little effect on the grass, heavier rates can burn.

- Finally, communicate with the people at your course. Discuss the situation with the green committee chairman, president, golf professional, course administrator, general manager, or anyone else who has a need to know. Begin the conversation by saying something like, "Gentlemen, we will have a problem if things continue as they are . . ." That should get their attention. No one likes a surprise, especially finding dead greens that only a few days before were fully turfed and in beautiful condition.

Doing a proper job of hand watering is one of the best means of limiting summer stress.





Turf loss during the summer caused by the overlap of a preemergence crabgrass herbicide applied during the spring.

Tell them the story in clear, concise terms. People tend to be understanding if they know the facts. After all, no matter how good a job a golf course superintendent does, he cannot control the weather. Without a doubt, weather extremes remain the number one stress factor on golf courses today.

When the Weather Breaks . . .

When the period of stress is over, assess the condition of your golf course. Count your losses and analyze what you think caused the problems your course experienced. After all, there is nothing like a prolonged period of stress to bring out whatever strengths and weaknesses exist on the course. You may determine the greens need more and deeper aeration, that a better irrigation system needs to be installed, or that trees need to be removed from around pocketed greens.

Also, use the experience in a positive way to determine which practices need to be altered and which programs should be implemented to better manage turf when it is under stress. Rest assured, summer heat, with its associated stress-related problems, will occur again.

How to Make the Right Connections

by **JAMES FRANCIS MOORE**

Director, Mid-Continent Region, USGA Green Section

AND YOU THOUGHT THAT the acronym "TGIF" stood for "Thank Goodness It's Friday."

In the world of turf, TGIF also stands for the USGA Turfgrass Information File, which is maintained and compiled by the Turfgrass Information Center, at the Michigan State University Library. Like doctors, lawyers, and other professionals, we now have access to a vast database devoted to turfgrass without ever having to leave our offices.

The TGIF is the largest and most comprehensive database in the world dedicated solely to turfgrass. It may well be the most valuable new tool ever made available to turf professionals since the introduction of the aerifier. It is effective, inexpensive, and available now. But as you might have guessed, there is one little catch. You are finally

going to have to learn how to use a personal computer.

For those who still have nightmares about the day your child came home with something called the new math — relax. Using a computer to access (computer jargon for "gain access to and use") the TGIF is really quite simple. All you need is a computer, a modem, and the proper software.

There are so many different computers with such a wide range of features that acquiring one will probably be your most difficult job. They range in price from \$700 to \$7,000 and beyond, depending on the power, speed, and capability of the machine.

For TGIF purposes, all that is required is that your machine be able to run software programs that run on the IBM

PC. It must have a minimum of 256K of RAM (random access memory). A color or monochrome monitor can be used. However, if you have the option, purchase a system with a color monitor and graphics ability, since you will find the system better suited for other golf course record keeping applications as well.

Your computer can be equipped with two floppy disk drives or one floppy and one hard disk. Again, if you have the option, buy a machine with a hard disk. You will soon appreciate the additional speed and ease of use that this accessory provides.

For those of you who need a starting point in your search for a computer, take a look at the following sample system. As of this writing you can purchase a clone, or IBM-compatible

machine, equipped with color monitor, graphics ability, 640K RAM, and a 20-megabyte hard disk for around \$2,500. Add a printer and you should still be able to come in under \$3,000 for your system.

A modem is nothing more than an electronic device that allows your computer to communicate by telephone with the computer that contains the Turfgrass Information File in the Michigan State University Library. Without getting too technical, modem means modulator/demodulator. The modem takes signals from the computer and converts them into a form that can be sent across the telephone lines. A modem at the MSU Library receives these signals and converts them back into a form the computer there can understand.

Modems come in two basic forms — internal and external. An internal modem slips into a slot provided inside the computer and is powered by the computer itself. Predictably, the external modem sits on the desk outside the machine and receives its power from the wall outlet. There are advantages and disadvantages to both. Although slightly more expensive, I personally like the external modem. Most external modems provide indicator lights that tell you the status of your call. External modems also have an on/off switch, which makes it easy to reset the modem or turn it off altogether.

The modem you purchase must meet several basic standards in order to use the TGIF. The modem must be compatible to the Hayes modem, which is

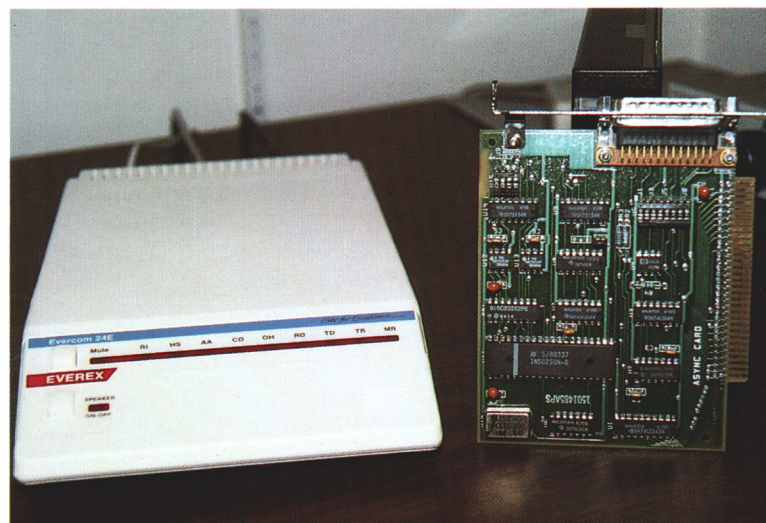
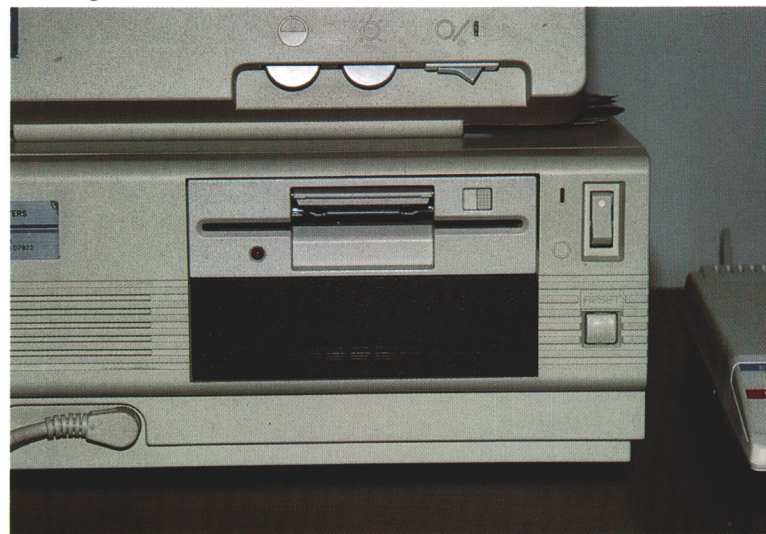
recognized as an industry standard. Hayes-compatible modems are usually advertised as such. The speed at which a modem sends and receives data is the baud rate. The modem you purchase must be capable of operating at a rate of at least 1,200 baud. If possible, acquire a modem that can operate at both 2,400 and 1,200 baud, since the modem at MSU will also have this ability in the future. When sending or receiving data from TGIF, or any other database, you will quickly learn to appreciate the significantly faster operation of the 2,400-baud modem.

Much like computers, the price of modems varies widely, depending on the equipment chosen. For an external modem, expect to spend from \$200 to \$400. An internal modem will likely

(Below left) A typical computer system as found in many golf course superintendents' offices.

(Below right) The software necessary to connect to the Turfgrass Information File can be run from a floppy drive or a hard disk. This unit contains both.

(Bottom right) Modems can be either internal or external. The internal modem, on the right, fits into one of the computer's expansion slots inside the machine. The external modem, on the left, sits next to the computer, and usually has indicator lights for easier monitoring.



range from \$100 to \$300. Be careful, though. Some of the bargain-basement-brand modems are not completely compatible to the Hayes standard.

The computer and modem (the hardware) cannot get you into the TGIF by themselves. You must also have the program or software that makes the modem dial and connect to the computer at MSU, and allows you to search and download information from the turfgrass file. The program that accomplishes all this is called Vueport. Vueport was written specifically for the Turfgrass Information File, and is the only communications program that will perform properly when using the TGIF. It can be run from a floppy disk or hard disk,

and is extremely easy to install on your machine.

Conclusion

As you can see, for a relatively small investment in hardware and software, the golf course superintendent can literally put this extremely powerful tool at his fingertips. Using the TGIF, his management decisions can be based on research and agronomic fact. In addition, a rapidly growing number of superintendents are using personal computers to help them schedule preventive maintenance of equipment, prepare and monitor budgets, and more accurately monitor their pesticide programs. Your club will find this new tool will pay for itself in a very short period of time.

The fee schedule for using the TGIF has not been determined, but it will be available shortly. It will be a nominal and reasonable charge, especially considering the size, power, and flexibility of the database. For additional information about the USGA Turfgrass Information File, contact one of the following:

1. Your regional USGA Green Section Agronomist (see the list on the inside cover of the GREEN SECTION RECORD).

2. The Turfgrass Information Center at Michigan State University: Phone (517) 353-7209.

3. The United States Golf Association, in Far Hills, New Jersey: Phone (201) 234-2300.

Impressions of a Summer's Tour with the Green Section

by SHERWOOD A. MOORE

WORK for the Green Section? What if I can't answer people's questions? How about the planes to catch, the miles to drive, and the reports to write, and what about finding all those golf courses and hotels? Can an old dog teach new tricks? Why would they want me?

These were just a few of my thoughts and apprehensions when I was approached by the USGA Green Section and asked if I would be interested in assisting them by calling on golf courses in 1987 as part of their Turf Advisory Service. After giving it some thought, though, I felt that my more than 50 years of experience in golf course management, along with having been the

superintendent at three U.S. Open Championships, would be of value to somebody along the way. It would also be an exciting challenge and a great way to climax my career.

So began a four-month adventure that took me to 60 golf courses in Massachusetts, New York, Pennsylvania, Ohio, Nevada, Utah, and California. I must admit that I approached every club nervously, wondering if I would be accepted as a representative of the Green Section. These apprehensions were quickly put to rest, however, as soon as I met with the superintendent and officials at each club, and we began to share our experiences in turfgrass management.

My respect for golf course superintendents and the job they do was reaffirmed from the beginning. From Massachusetts to California, regardless of their ages or the budgets they worked with, the superintendents with whom I visited were eager to learn, enthusiastic about their work, and knowledgeable. The same could be said about many of the superintendents in my generation, but it was apparent from my travels that today's superintendents are taking good

advantage of the many educational opportunities in turfgrass science and golf course management that weren't available when I was starting in the business. It was very gratifying to see how they're putting their knowledge to work, and how they've grown in stature at their clubs and in the game.

Golf itself appeared to be in good shape, based upon my observations. Many private clubs had full memberships and long waiting lists, and play was up at both private and public facilities. Correspondingly, the good financial health of the clubs was reflected in the steadily increasing budgets for the maintenance and upgrading of their golf courses. Despite this rosy appearance, though, I saw considerable rebuilding and remodeling of the clubhouse facilities at some clubs at the expense of much-needed golf course renovation work. I'll admit to a bias on the subject, but how can the board of directors at any club neglect golf course drainage, irrigation, and equipment in favor of mauve carpeting and designer lockers? Needless to say, in every such case I encountered, the urgent need to follow through with critical programs and

Sherwood A. Moore was superintendent at Winged Foot Golf Club during three U.S. Open Championships, in 1959, 1974, and 1984. He is a past President of the Golf Course Superintendents Association of America. In 1987, he received the USGA Green Section Award for distinguished service to golf through work with turfgrass.



(Top) Flowers add color to this tee at the Shawnee Country Club, in Lima, Ohio.

(Above) It's dry in July, but gabion work should stabilize the banks when water flow is heavy during winter and spring. Willow Creek Country Club, in Sandy, Utah.

projects was stressed in my written follow-up report. Operating, capital, and special project budgets cannot be ignored if a high-caliber course is to be maintained. Boards of directors should remember that the condition of the golf course has a direct impact on the success or failure of the clubhouse operation.

Despite the occasional difficult weather conditions, I was favorably impressed by the fine condition of the courses I visited. This is not to say that it was all a bed of roses, though. I saw disease, insect, drought, flood, and soil problems, and just as many concerns about *Poa annua* and what to do with it as ever. Something could always be changed, corrected, or improved upon. It seemed that my reports were just as long for the courses that were in immaculate condition as for those with a multitude of problems.

One problem that took me completely by surprise was the antiquated, inefficient irrigation systems at many courses — from the water source to the pump-house to the lines and heads. True, there were instances of golf courses with

excellent systems, but a great many more were deficient in one or more of these categories. In many cases the water source was simply too small to provide adequate reserves for periods of dry weather. One club had only two feet of water remaining in its small irrigation pond, with the better part of the summer yet to endure. All fairway irrigation had been curtailed so that the greens could be kept alive, and all that could be done was to hope that the drought would end soon. A similar episode had occurred several years ago, but all thoughts of enlarging the pond at that time had been washed away with the next heavy rainfall. Expanding ponds or seeking other sources of water is a costly and unpopular expense, but how many near-disasters does it take to get some action? My report to the club was to the point.

Other facets of irrigation systems were not much better. I was amazed at the number of systems that are not pressurized, and at the number of pumps that should have been retired long ago. Equally poor was the layout of many systems, including inefficient line location and poor spacing of the sprinkler heads and quick-coupler valves. These deficiencies could be found throughout the country and at courses that use fully automatic, quick coupler, or primitive hose-and-sprinkler systems.

One of the key prerequisites for growing fine turf is an efficiently designed

and installed irrigation system. It is difficult to maintain top-quality turf in the hot, humid, or droughty conditions of various parts of the country, and the problems multiply when they are coupled with the tremendous increase in play and golf cart use today. Add to this an inadequate, poorly designed irrigation system and you have the potential for some real difficulties. Thus, with demands for water for all purposes increasing each year, it is critical that golf courses place the modernizing of their irrigation systems high on their priority list.

Of course, a great irrigation system can't maintain good-quality turf all by itself. It takes the knowledge, judgement, and experience of a good superintendent to make the calls and push the right buttons. Though overwatering continues to be a major problem on many golf courses, I was happy to find that many superintendents are learning to refine their water management techniques.

The topic of budgets was a popular one during my travels, especially as it relates to some of the labor-intensive programs like triplex mowing of fairways and hand mowing of greens. One club official asked me what is going to happen to some of the modern superintendents accustomed to today's high maintenance operations if the economy dives and budgets are cut to the bone. My response was that they will adapt,

the same way and perhaps even better than my generation did during the years of lean budgets. I was amazed at the excellent turf conditions produced by some superintendents who worked with small budgets and a dearth of equipment.

My travels reaffirmed my view that there is an important place for the Green Section Turf Advisory Service visits in the field of turf management. One of the greatest benefits I see is the exchange of ideas and experiences.

After a few weeks on the road, I found myself telling superintendents and club officials about the successful practices and programs I had seen at other courses in previous weeks. Examples included various adaptations developed for fairway triplex mowing, the use of plant growth regulators, the wide use of perennial ryegrasses, and contour mowing — not just for fairways but for greens and tees as well.

These practical ideas and experiences, along with finding out what is new in turfgrass research and equipment development, were eagerly sought out by superintendents and officials alike, and will be incorporated into their maintenance programs as soon as feasible.

Another great benefit of the TAS visit is to help tip the scale in favor of capital expenditures, such as a new maintenance building, the purchase of new equipment, the installation of cart paths or drainage systems, or upgrading irrigation systems.

The job of the superintendent of the future is not going to be any easier, especially with environmental issues of such great concern. Pesticide controls and regulations are bound to increase, requiring more restraint and professionalism than ever before. Water restrictions and good water management will be even more important, so the superintendent had better learn to use it efficiently. Learning how to recruit and handle labor will be an important part of his training, and he must learn how to take advantage of computers in this information age. The next few decades will be exciting and challenging, but I know that the golf course superintendent will meet the challenge, and the Green Section will be there to help.

I greatly enjoyed the opportunity to travel the country for the Green Section, visiting so many fine golf courses and meeting so many nice people. It was a rewarding and fulfilling experience, as well as an educational one, for me. Indeed, I found out that an old dog *can* teach new tricks, and learn a few along the way, too.

In contrast to the tree-lined fairways of the East, golf courses in parts of the West take advantage of the beauty of their terrain and native vegetation. Jeremy Ranch Country Club, in Park City, Utah.



A Revival of Hand Raking?

by JAMES T. SNOW

Director, Northeastern Region, USGA Green Section



Careless use of the riding sand rake can eventually force sand over the bunker lip, requiring relocation of the sand and renovation of the lip.

IS THE HAND RAKING of sand bunkers and the elimination of the mechanical rake the coming trend among golf courses? Perhaps not for most courses, but many golf course superintendents are taking a close look at some of the dubious benefits of the mechanical sand rake and deciding that a little more hand raking and a little less mechanical raking might actually save some time, money, and disruption in the long run.

Not so long ago, mowing greens and tees with walk-behind units and raking sand bunkers by hand was standard procedure. Large maintenance crews were necessary for such work, and costs grew as the cost of labor increased. The advent of triplex greensmowers, mechanical sand rakes, and huge fairway mowers ushered in a period of mechanization and labor savings in the 1960s and 1970s, and some predicted that by the 1980s golf course maintenance would be completely mechanized, resulting in smaller crews.

As we all know, the prediction has not yet materialized. Many clubs have gone back to walk-behind mowers on greens and tees, and the monster fairway

mowers have been abandoned in favor of lightweight units. Though these programs are more labor intensive and costly day-to-day, savings can result from reduced pesticide and water use, and less overseeding and renovation work. The improvements in playability and consistency are additional benefits of these programs, which are important but difficult to value in dollar terms.

The mechanical sand rake has enjoyed the greatest success and longevity among those tools that once seemed destined to transform labor-intensive golf courses into masterpieces of labor efficiency. In addition to the obvious benefit of being able to maintain well-groomed sand with a minimum of time and labor, compared to hand raking, the use of a mechanical rake offers the added advantage of controlling most weeds in bunkers without having to rely on hand labor or herbicides. Also, the mechanical rake does an excellent job of grooming and scarifying, allowing hard, contaminated sand to be kept in reasonably good playing condition for many years more than one might expect.

While there is no denying the advantages of using this machine, the mechani-

cal rake is not without its detractors. In fact, superintendents and golfers alike have recognized for many years that the appearance and playability of many bunkers is being compromised by the use and misuse of the mechanical rake. Only recently, however, has the long-term cost of using this machine been determined to be great enough to consider limiting its use and returning at least to a certain extent to hand raking.

MANY OF THE negatives concerning the mechanical rake are inherent in its use, while others can best be attributed to its misuse.

The rake does an excellent job of grooming hard sand to keep it in good playing condition, but on the other hand, it can actually keep new sand too soft, and encourage fried-egg lies. Complaints from golfers are especially common after a course has just replaced its old contaminated sand with new material. One course of action in this instance is to keep the mechanical rake out of the bunkers as much as possible, or at least remove its scarifying teeth to prevent deep cultivation. This helps



to improve playability while the sand has an opportunity to settle in the months ahead.

The mechanical rake has other drawbacks in new or soft sand. It creates ridges of sand as it makes its turns. A golfer unfortunate enough to find his ball on the wrong side of one of these ridges may have a tricky shot, to say the least. The problem is most severe when the operator is going too fast, but even a good operator will have difficulty avoiding ridges when the sand is quite soft. The only way to deal with this problem is to slow down the operator and have him touch up the ridges with a hand rake.

By the nature of the turning action of mechanical rakes in sand bunkers, sand is constantly being moved around. As the machine makes its turns, a lateral, downward force is exerted, which pushes the sand outward — a process that occurs more quickly with operators who go too fast.

Over a period of weeks and months, a bunker that may have started out with a uniform six-inch layer of sand may be found to have pockets with only a two-inch layer, and other areas with from eight to 10 inches. When the machine passes through the shallow areas, the scarifying teeth or blades often dig into the sub-base and con-

taminate the sand with soil and stones. In bunkers where plastic or geotextile liners are used, the teeth sometimes catch and rip the liner, often leading to its removal. Though it is a time-consuming solution, some clubs combat this problem by routinely monitoring the depth of sand in various locations within their bunkers, and sending out crews to reestablish a uniform sand depth. Nevertheless, inconsistent playing conditions and an increased rate of sand contamination is almost assured.

Human nature being what it is, most would agree that if a person had a choice of riding a machine or doing the work by hand, he would choose to ride. Therein lies the biggest problem with the mechanical sand rake; many operators spend too much time on it, and try to do too much with it. For example, trying to rake the sand on a steep slope or face with the machine leads to nothing but problems. Sand is pulled down the slope, leaving a very thin layer on the face, and the machine ultimately digs into the sub-base and hastens the contamination of the bunker with soil and stones. Also, operators often rake too close to the edge of the bunker trying to avoid having to touch up the perimeter by hand. In the process, contamination occurs as the machine catches the lip, and excess sand is pushed closer and

closer to the edge, until the lip is lost in a wash of sand. At this point, when good bunker definition is lost, the appearance and playing qualities of the bunker are greatly diminished. Many clubs try to compensate for the deterioration of the lips by edging the bunkers more often, but this only results in the loss of their original size and shape.

ONE OF THE most blatant attacks on the integrity of sand bunkers is in the area where the mechanical rake enters and exits. Due to habit or sometimes to design considerations, many operators always enter and leave a bunker at the same location, causing a gradual deterioration and loss of definition of the lip in that area. Worse still, due to haste and a loathing for getting off the machine, operators tend to drag some sand out over the edge of the lip as they leave. Over a period of weeks and months, many bunkers grow appendages that ultimately become integral parts of the hazard. It is not surprising, then, that mechanical sand rakes are the bane of golf course architects, who take pride in the bunkers they create.

Thus, it is apparent how the long-term costs of relying completely on the mechanical sand rake can add up:

- Soil and stone contamination can occur significantly faster with a mechani-



(Opposite page) Hand raking is making a comeback at some courses that find the mechanical rake causes as many problems as it solves.

(Left) An appendage often grows at the entrance/exit site of the mechanical rake.

cal rake than with hand rakes. All things being equal, the sand will have to be replaced more frequently. An alternative is to place several inches more sand in the bunkers to reduce the chances that the mechanical rake's scarifying teeth will dig into the soil. Regular sand depth monitoring and sand redistribution work is another possibility. The use of geotextile liners to minimize contamination is a calculated risk, and more often than not is unsuccessful. All of these accommodations of the mechanical rake are costly.

- Bunker lip deterioration occurs much more quickly with the use of the mechanical rake, requiring more frequent edging to maintain good definition. The design of the bunker is then compromised, calling for the redesign and rebuilding of the bunker lips. Much of the extensive bunker renovation work going on at hundreds of golf courses now and in recent years is in good part due to the effects of the mechanical rake.

So what's the solution? Some would argue that the mechanical rake should be abandoned and that hand raking be reinstituted. Certain courses, such as those with small bunkers and limited numbers of bunkers, would be wise to consider such a move. Courses with many large bunkers, however, would be hard pressed to give up the time saving,

weed control, and grooming benefits of the mechanical rake.

Perhaps the best way to enjoy the advantages of the mechanical rake while minimizing its long-term negative impact is to develop a strong program of training the operators to use the machine properly. Unless the design of the bunker limits its accessibility, operators should be directed to alter their entrance and exit points regularly to avoid excessive wear on the lips in any single location. The speed of the machine should be kept at a reasonably slow pace while raking the sand and should be allowed to move no closer than 12 to 18 inches from the bunker lip. The rake should be limited to the flat or mildly sloping ground within the bunker, avoiding the faces at all costs. To prevent sand from being dragged over the lip when leaving the bunker, the scarifying bar should be raised well ahead of time, preferably 12 to 18 inches before reaching the lip. Finally, the inside perimeter of the bunker and any unraked faces should be touched up with a hand rake, and weeds in this perimeter area should be pulled by hand or periodically treated with a non-selective herbicide.

HAND RAKING the edges of the bunkers according to these guidelines would greatly reduce the lips' rate

of deterioration. It would also minimize or eliminate the need to routinely power edge the bunkers (at least in areas of cool-season grasses), a practice that gradually destroys the original size, shape, and design of the bunker.

Another way to limit injury to bunkers by the mechanical rake is simply to use the machine less often. A club that normally rakes bunkers four times a week with the mechanical rake might instead send a small crew to touch up the bunkers by hand on two or three occasions, for example. If golfers would learn to accept this approach, the long-term appearance and playability of the bunkers would be enhanced in many instances.

It seems straightforward enough that workers can be taught how to operate a mechanical sand rake properly, but this is the exception rather than the rule. Only in recent years, though, have superintendents and course officials begun to recognize the sand replacement and renovation costs involved with the use and misuse of the mechanical sand rake. With this expensive work behind them, perhaps there will now be more emphasis on worker training, along with a renewed respect for and greater utilization of hand raking in the maintenance of sand bunkers.

News Notes for Early Summer



Iris at Cornell Plantations.

David Oatis Joins Green Section Staff

The Green Section is pleased to announce the appointment of David A. Oatis as Mid-Atlantic Region Agronomist. He will assist Stan Zontek, Mid-Atlantic Region Director, with responsibilities for visiting Turf Advisory Service courses in Pennsylvania, Maryland, Delaware, Virginia, West Virginia, Kentucky, and Ohio.

Dave comes to his new position from the Rio Hondo Country Club, in Downey, California, where he was the golf course superintendent for three years. Rio Hondo Country Club accommodates 300 golf tournaments and 115,000 rounds of golf annually, making Dave the Green Section's staff specialist for dealing with traffic effects on golf courses. Prior to his work at Rio Hondo, Dave was assistant superintendent at the Mesa Verde Country Club, Mesa, California, and the Pebble Brook Golf and Country Club, Noblesville, Indiana. He also served for two years as chief arborist at the Industry Hills Conference and Exhibit Center, City of Industry, California.

Dave is a native of Indiana, but he received his Bachelor of Science degree from the California Polytechnic Institute, majoring in ornamental horticulture, with a specialization in turfgrass science.

He began his duties with the Green Section on May 1, was married on May 14, and spent his honeymoon with his wife, Cindy, looking for housing in the West Chester, Pennsylvania, area. We are delighted to welcome to the Green Section staff an agronomist with Dave's broad experience and obvious dedication to his work.

Paul Vermeulen Becomes Western Region Agronomist

After an extensive season of travel in 1987, visiting golf courses from coast to coast with other Green Section staff members, Paul Vermeulen officially joined the staff on April 1, 1988, as Western Region Agronomist. He joins Larry Gilhuly, Western Region Director, serving Turf Advisory Service courses in Arizona, California, Nevada, Idaho, Utah, Oregon, and Washington.

Paul recently completed the requirements for a Master of Science degree from Texas A&M University, working under the guidance of Dr. James Beard. His thesis work involved the identification of 24 bermudagrass cultivars, using isoenzyme electrophoretic patterns. He received his undergraduate degree from Michigan State University, majoring in agronomy with a specialization in turfgrass science.

In addition to undergoing the most extensive in-house training experience

of anyone ever to join the Green Section staff, Paul brings significant golf course work experience to his new position. He spent two summers as a worker at the Olympia Fields Country Club, in Olympia Fields, Illinois, and was involved in an extensive course renovation program there. He also spent two seasons helping to build greens and performing other maintenance tasks at the Industry Hills Golf Course, City of Industry, California. The Green Section is pleased to have Paul Vermeulen as an addition to the staff.

Turfgrass Research Committee Meets at Golf House

The USGA Turfgrass Research Committee met at the USGA's headquarters in Far Hills, New Jersey, from March 21 through 24.

Activities during the three days of intensive work included a review of current research supported by the Committee and discussions concerning the proposals for future research work. The Committee is distributing \$450,000 this year to research projects designed to develop grasses significantly more drought tolerant and pest resistant than those used today.

Chairman Bill Bengeyfield announced the recent release of two improved grasses from breeding programs supported by the Committee. From the work of Dr. Arden Baltensperger, of New Mexico State University, comes a seeded bermudagrass that is superior in several ways to common bermudagrass. The other grass, a fine-textured strain of buffalograss, is the product of research by Dr. Terrance Riordan, of the University of Nebraska. Bengeyfield also noted that several exceptional *Poa annua* strains are being distributed to certain golf courses and experiment stations from the program of Dr. Don White, at the University of Minnesota. *Poa annua* may not be "that weed grass" much longer.

"All Things Considered," a New Editorial Forum, Debuts in the GREEN SECTION RECORD

With this issue the Green Section is initiating a new editorial column entitled "All Things Considered." It will feature



David Oatis



Paul Vermeulen

individuals on the Green Section staff expressing their views on a variety of topics concerned with turfgrass science and golf course management. The subject matter will be intentionally stimulating and controversial, popular or not. It is designed to provoke the reader to consider and analyze new ideas and approaches, or to reconsider old truths that may have been forgotten in our fast-paced, high-tech world. Opinions will be those of the authors and not necessarily reflective of those of the USGA or Green Section. Depending on reader reaction to the editorials, selected responses may be published in future issues.

All things considered, we believe that establishing this column offers an excellent opportunity to clear the air on issues heretofore considered too controversial for the written word (or nearly so).



Attending the USGA Turfgrass Research Committee meeting at Golf House — Back row, left to right: Dr. Howard Kaerwar, F. Morgan Taylor, Charles Smith, Dr. Victor Gibeault, Gerald Faubel. Middle row: Tom Burton, Stanley Zontek, William Bengeyfield, James Snow. Front row: Bill Roberts, Dr. Paul Rieke, Dr. James Watson, Dr. Michael Kenna, Gary Watschke.

ALL THINGS CONSIDERED

Snake Oils

by **JAMES FRANCIS MOORE**

Director, Mid-Continent Region, USGA Green Section

THEY USED to call them snake oil salesmen, gypsy-like peddlers who traveled the country hawking a magic elixir that could cure everything from saddle sores to tuberculosis. Most often, these compounds were either highly alcoholic or contained opium derivatives. The relief experienced by the gullible client was at best temporary, but always long enough to allow the snake oil salesman to move on to the next town full of suckers.

We believe times have certainly changed. But have they? Regretfully, a tremendous amount of snake oil is still being hawked to turfgrass managers. A catchy name and a glossy brochure always accompany the peddler's claim that the new product can eliminate disease, insects, and weeds, and at the same time make the bunkers drain. A favorite technique is to spread the word around a state turf conference that "although the product is not labeled for use on greens, old Joe over at the country



James Francis Moore

club reduced his *Poa annua* by 20 percent during the first year." Even if this claim is completely without merit, sales of the product will temporarily skyrocket — at least long enough for the peddler to pocket some quick cash and move on to the next conference.

How do we protect ourselves against snake oils without unfairly discouraging

the introduction of new and beneficial ideas and products? Easy. Do not buy any new product sold by individuals whose claims cannot be substantiated by extensive university research. Good research is expensive and time consuming. Manufacturers of products claiming mystical powers simply cannot afford to submit their elixir to testing if they know it will fail.

Demanding evidence of good university research, however, will not completely eliminate the snake oils or the unscrupulous peddlers who sell them. Unfortunately, they are kept in business by those superintendents looking for an easy chemical solution to all of their turf management problems. In the words of the comedian George Carlin, "If you nail two things together that have never been nailed together before, some fool will buy it." All things considered, P. T. Barnum was probably right when he said, "There's a sucker born every minute."

TURF TWISTERS

CAN COMPUTERS BE USED

Question: With all this talk about computers on the golf course, are there any precautions particular to the use of a computer in our shop? (Kansas)

Answer: Yes. Voltage surges and dust are the two biggest enemies of a computer in the maintenance building. Unless you have voltage problems, a simple surge protector should protect your machine. You should also insure the computer is on a separate circuit from the welder, air compressor, battery chargers, or any other high-amperage device. Dust covers, good housekeeping, and an occasional vacuuming of the chassis will keep the computer clean. As always, back up your valuable data regularly.

TO FINANCE EQUIPMENT

Question: I am the newly appointed finance chairman at my club. Is there a simple way for us to plan capital equipment expenditures on the golf course? (Vermont)

Answer: One simple method that has worked well for many clubs is to allocate an amount equal to 10% of the annual operating budget for new capital equipment expenditures. Repairs and maintenance should be different line items in the budget.

AND DETERMINE THE QUALITY OF OUR SAND

Question: We're starting a sand topdressing program for the greens at our course. If the sand falls roughly within the particle size range recommended for building a USGA green, can I assume it will be satisfactory for a sand topdressing program? (New York)

Answer: Not necessarily. Though most sands that fall within the particle size guidelines will be suitable, some may contain just the right combination of fine, medium, and coarse particles which can actually inhibit water infiltration. We recommend that a reputable soils laboratory be consulted before an unknown sand is used for topdressing or soil modification. The sand should also be checked for pH.