

USGA® GREEN SECTION

Record

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Communication & Golf Course Maintenance

A PUBLICATION ON TURFGRASS MANAGEMENT



BY THE UNITED STATES GOLF ASSOCIATION®

*Cover Photo:
Signs can be a very good
method of communicating
information and updating
golfers. Marion Country
Club, Marion, Ohio.*



JEAN PRIOR

Golf courses have gotten involved in efforts to incorporate more wildlife habitat into managed landscapes to promote bird diversity. See page 10.



A sign of the times for the recent trend on golf courses. See page 6.

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COMMUNICATION AND GOLF COURSE MAINTENANCE

Communication is ultimately more important than agronomics in the daily conditioning of a golf course!

by BOB BRAME

WE LIVE in a world of continual interaction with others. Contrary to the beliefs of some, it's not just winning or losing, but how you play the game. In other words, how we communicate is actually more important than the day-to-day, visual results of our work. This is as true in the golf course management industry as it is in other aspects of our lives. For example, how many times has a superintendent been fired even when the course was in good condition? Conversely, it's not uncommon for a course to experience significant turf loss/damage and the superintendent's employment remain secure. We've all seen or heard about both situations. The difference is communication. Good communications can bridge the gap when course conditioning falls off, but an immaculately maintained golf course does not protect a poor communicator. Most turf managers invest a significant amount of time on the agronomics of golf course maintenance. At the very least, equal time should be given to improving communication strategies and techniques.

Over the past few years the Green Section staff has been surveyed several times to draw on their expertise and field experience. In two previous surveys the top ten and ultimately the top 20 pitfalls of golf course maintenance were identified (Table 1). This listing, based upon Green Section staff consensus, unanimously identified *communications* as the number-one potential pitfall of golf course maintenance.

Unfortunately, communication is not given enough attention in most golf course maintenance operations. The focus of this article is a third staff survey, which identifies sub-headings (Table 2) under the number-one pitfall, communications. The purpose is to share some thoughts from the Green Section staff to help strengthen communications in golf course manage-



Hand-held communication radios enhance the speed and efficiency of golf course maintenance. Seeing the superintendent using the tools of the trade helps enhance the image golfers have of the superintendent and the entire operation.

ment. Regardless of how successful or inadequate your past communications efforts have been, staying innovative and positive is very important. Seven categories have been identified and prioritized under the heading "*How can golf course maintenance communication and public relations be improved?*" Specific ideas/thoughts are covered under each of the main headings.

Maintain a Professional Image

Every golfer has an image of the superintendent who maintains the course he/she plays. That image will directly affect their interactions with the superintendent. Do the players at your course have confidence in what is being done in the maintenance program? Or do they continually question and argue? In the final analysis it is the

responsibility of each superintendent to make sure his/her image is positive and professional. When the superintendent presents a professional image, players are more willing to discuss turf loss or general course conditioning needs from a calm, rational perspective. If the superintendent's image is weak, players often become emotional in their desire for improved conditioning.

How often have you heard, "Gee, my yard looks great; why doesn't the golf course? Our superintendent must not know what he's doing." Why not have a *home lawn improvement night*? Open the door for golfers/members to ask about their lawns. It's a perfect opportunity to discuss the differences between a home lawn and the golf course. Demonstration areas and/or test plots can help convey the message and gain support for needed resources.



At Westwood Country Club in Cleveland, Ohio, all golf course information is placed on large marker boards that are easily altered as needed. Golfing events are combined with course maintenance activities (i.e., aerification) to give golfers the complete picture.

Positive, effective communication will require an investment of time.

As the superintendent, make sure golfers see you on the course using tools of the trade (soil probe, hand lens, camera, disease detection kit, communication radios, outside consultants, etc.). Dress in a manner that reflects the position you hold. Provide the grounds staff with uniforms (or at least a shirt), to present a neat and united team appearance. Make sure employees understand their assignments and, as a result, stay busy. Keep the equipment, maintenance building, and surrounding area clean. Maintaining a project book or portfolio, containing pictures, can be an excellent tool for meetings or contract review time. Do not rely on golfers' memories of how it *was*. Be innovative and proactive in establishing and maintaining a professional image. What worked yesterday may not work tomorrow.

Post Information

We're past the days of providing only minimal information and trying to blend into the woodwork. Golfers want to know what's going on and be given the freedom of making their own decision about how it affects them. While it is true that some golfers will

not read information that is posted or sent to them, we have a responsibility to those who do want to know. Even those who don't appear to be interested often will respond if the right approach is used. Posting information can be done in a number of ways, but it boils down to getting information where it will be seen or heard.

Course maintenance information can be posted on bulletin boards, at the first and/or tenth tees, at the halfway house out on the course, in locker rooms, in the pro shop, in the clubhouse, and even on carts. Also, getting the information out can be done through mailings to players', neighbors', and/or employees' homes. A detailed annual calendar of maintenance activities may have greater impact if mailed. On the other hand, the condition of the course or products being used on a particular day would be best communicated on a prominent on-site bulletin board.

Maintenance work, such as aerification, should be posted in advance and on the actual day work is to be done. How about posting weekly or monthly maintenance summaries? As an exception, *do not* post Stimpmeter readings. The condition of a course cannot be distilled down to a number.

Concerns and/or problems should be spelled out clearly so rumors don't become the primary flow of information. Chemical applications, as well as pertinent integrated pest management (IPM) strategies should be posted. A picture and a short biography of the grounds employee of the month could be displayed. Occasionally, it may be helpful to post pictures and names of the entire grounds staff. On the other hand, pictures and names of green committee members could be posted in the employee lunch room.

Posting also can be done with a dedicated phone line and answering system. A course information hotline with frequently (several times a day) updated messages would allow players to call and hear the latest. Creative, fresh, and current posting of information can enhance golf course maintenance communication.

Participate in the Course Newsletter

Contributing to a course/club newsletter is similar to posting in that it is a valuable method of distributing information. However, information presented in a newsletter can be more comprehensive. A newsletter is a good format for dealing in detail with past and present issues and how they may

affect the future. It is also a good place to combine specific information pertinent to the course with general industry news/trends.

A course newsletter is a great format for discussing specific maintenance strategies like *no-mow* or natural areas. Environmental concerns and how they are being addressed should be included in the newsletter. Available resources like the Audubon Cooperative Sanctuary Program for Golf Courses can be discussed, both in concept and specific involvement. Pesticides being used on the course could be listed with explanations about their safety and purpose.

A newsletter is an excellent format to inform golfers about course setup details, like hole rotation and tee marker placement. Articles about different members of the staff can improve golfers' familiarity with the crew, while strengthening employee morale. Special interest articles, like the current movement away from metal spikes on shoes, will generate interest and can open discussion applicable to your course. The green committee chairperson also should contribute to a course maintenance newsletter. In many cases the superintendent's boss can discuss issues more candidly and from a different perspective.

Recognizing the value of a newsletter, the superintendent should contribute to each and every issue. If your course does not have a newsletter, start one. Maybe two or three times a year at first, expanding as time and money allow. Depending upon the actual structure and needs of your course, there may be value in having a dedicated golf course maintenance newsletter, especially if the existing one is for social and/or clubhouse information.

Schedule, Attend, and Speak at Meetings

This category of communication deals with the value of well-timed meetings, the importance of being at meetings that concern course maintenance, and getting involved in the presentation of information at such meetings. We have all sat through meetings that were a complete waste of time. Conversely, a well-organized gathering can be a valuable communication opportunity.

The golf course superintendent should attend any and every meeting that addresses course maintenance issues. The concerns of course maintenance should not be passed to a green committee chairperson, a general manager, or any other individual not in-

timately familiar with the day-to-day supervision of course conditioning. Unquestionably, the superintendent's boss should also attend key meetings related to course maintenance, but not as a substitute for the superintendent. This would include meetings with the green committee, board of directors, community/neighborhood associations, and various course golf groups/associations, like the ladies', men's, juniors', etc.

Green committee meetings provide the setting for detailed discussion on desired course conditioning and relevant budget, weather, and/or agronomic concerns. Oral and pictorial presentations can be combined with an occasional field trip to strengthen the decision-making process. These meetings should be scheduled frequently enough to keep members informed and to determine direction well in advance. Committee requests/desires should then be passed on to the board of directors by the superintendent *and* chairperson. The protocol can vary for privately owned courses and municipalities, but regular meetings with appropriate individuals are important.

The superintendent occasionally should volunteer to speak at general membership and golf group (ladies', men's, etc.) meetings. Opening day ladies' luncheons and/or stag days can be golden opportunities. Such gatherings provide a good opportunity to articulate concerns, accomplishments, and/or answer questions. Neighborhood association meetings offer another great opportunity to establish goodwill and a positive exchange of information. The organizers of these meetings will not always search out the course superintendent. Take the initiative with these and other groups; let them know you are available and willing to participate.

Have a Friendly Attitude

While this may seem a little simplistic, a friendly attitude is not always easy to remember when the grass is wilting or just after the hydraulic hose breaks. However, if we remember that positive communication will carry us further than healthy (or dead) grass, it may help bring our attitude back into perspective. Think about it — the only thing we have absolute control over is

Test plots make it possible to more accurately discuss maintenance strategies with committee members. An untreated area provides good information to help decide whether a product should or should not be used in the maintenance program.



our attitude. We cannot control much of what randomly happens in life, certainly not what Mother Nature and others may do. However, we can control our response. A friendly and sincere attitude is something people remember.

The superintendent should try to be visible and accessible on the course. When Mr. Jones starts driving toward you to ask another potentially dumb question, click on a friendly attitude. Sure it will take a little time, and you may need to answer a question that has already been answered many times. Nevertheless, a friendly attitude will pay dividends. Plan time when you can be available to players to answer questions. How about spending a little time at the first tee or practice green on Saturday morning, after the course work is done? Be available just before the ladies' shotgun. Following the golf professional's announcement of the play format over the public address system, jump in and give a quick overview of course conditions/concerns. Tell them why carts need to stay on paths. Remind them how important it is to fix ball marks immediately. Thank them, in advance, for replacing divots and raking bunkers. Explain why roughs are being treated with herbicide. Be proactive, using potentially negative issues, to establish positive communication.

Get to know the names of players. Nothing diffuses an explosive confrontation like calling a person by name. Think about the outbursts that occasionally occur, for many of us, when driving a car. If we knew the name of the guy who cut us off, wouldn't it temper some of the emotions?

A big part of a friendly attitude is the art of listening. When folks know you're really listening to them, it's a lot easier to disagree and still maintain mutual respect. This is true for players, the staff, and/or the boss. Listening means putting your agenda on hold, turning off all distractions, keeping your mouth shut, and concentrating on what's being said. It's easy to understand why most of us don't listen well. However, when we listen carefully it's amazing how much better our response becomes. Sometimes, good listening is the only response needed.

Involve Players and Officials

Take the green chairperson, president, golf professional, and/or manager to conferences. The more they know about course maintenance, the easier it will be to communicate with them. Regional conferences conducted by the Green Section are geared towards the different interests and needs of course department heads and officials. We need to know where others are coming from. Meet with key indi-

TABLE 1

The Top 20 Pitfalls of Golf Course Maintenance

1. Communication and Public Relations
2. Overwatering
3. Fast Green Speeds
4. Use of Pesticides
5. Continuity of Course Officials/ Green Chairperson
6. Pesticide Storage and/or Maintenance Buildings
7. Tree Management
8. Amount of Play
9. Labor: Not Enough and/or Under Qualified
10. Equipment: Not Enough and/or Poor Quality
11. Time on the Golf Course
12. Documentation
13. The Bandwagon Syndrome
14. The Rules of Golf and Marking the Course
15. Lack of Outside Interests
16. Test Plots
17. Staying Current with Technology
18. Long-Range Planning
19. Training and Delegation
20. Managing Carts and Cart Paths

"If they're not dangerous, why do you use so much protective equipment?" Take advantage of such questions to educate golfers about pesticides used on the golf course, their safety, and the impact on the environment.



viduals regularly; get to know their concerns and needs. Take them out on the course frequently so they can see the concerns of daily course conditioning. It takes time to get others involved, but it's time well invested.

The Audubon Cooperative Sanctuary Program for Golf Courses is an excellent tool for involving others. In fact, in order to become a certified site, community involvement is required. What a great opportunity to tell what is being done to enhance the environmental friendliness of the course and, as a result, the entire community. Whether neighbors or golfers, they will appreciate what is being done. This is a great opportunity to strengthen community relations.

The Green Section Turf Advisory Service (TAS) is another excellent tool for involving players and officials. Inviting course officials to attend TAS visits can open the door for constructive dialogue about past, present, and future maintenance strategies. It's even possible to schedule full committee or membership meetings for a time of questions and answers following a TAS tour of the course.

A *home lawn night*, maintenance facility open house, and/or special improvement project work day are just a few examples of ways to involve others in ongoing course maintenance.

Play Golf with Others at the Course

It is amazing to me that there are superintendents who do not play golf at all. It is easy to understand why a superintendent doesn't want to play golf after being on the course all day (I've been there). Playing golf on the course you are responsible for maintaining is work. However, it does not change the fact that a working knowledge of the game is vital to proper course conditioning. A superintendent must be able to understand course conditioning desires from a golfer's perspective. The only way this can occur is through regular playing.

It seems very reasonable to expect the course superintendent to play the course he/she maintains at least every other week. Weekly would be much better. Playing the course you're responsible for conditioning should be considered part of the workday responsibilities. In other words, a superintendent should play during regular weekday work hours and not be expected to work a full day and play in the evening.

It's possible to combine the importance of the superintendent playing golf regularly with involving others and general communication. Why not establish a weekly tee time with the golf professional, manager, and one course official — a great opportunity to see the course in detail and discuss playability. A superintendent may also find value in having a regular tee

time with three openings. This would allow others to occasionally play a round of golf with their course superintendent. Clearly, this needs to be custom-fitted to the personality and policies of your course. Nevertheless, a superintendent should play the game regularly, and involving others can strengthen communication efforts and credibility.

The Audubon Cooperative Sanctuary Program for Golf Courses (ACSP) is an invaluable tool for improving the golf course while involving others in the process. ACSP involvement is an excellent topic for an ongoing column in the course newsletter. Schuyler Meadows Club, Loudonville, New York.



TABLE 2

The Top Seven Ways Golf Course Maintenance Communication and Public Relations Can Be Improved

1. Maintain a Professional Image
2. Post Information
3. Participate in the Course Newsletter
4. Schedule, Attend, and Speak at Meetings
5. Have a Friendly Attitude
6. Involve Players and Officials
7. Play Golf with Others at the Course

Conclusion

Be creative, positive, and proactive with golf course maintenance communication. At the very least, invest as much time towards improving communication as you're investing in staying current with agronomics. When agronomics falls short, and it occasionally will for us all, good communication is the vehicle that holds it all together. When all is going well agronomically, communication is what allows us to share the moment with others. How we communicate is the core of who we are. Think about it — it's not about grass!

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



A group of public golf course operators in the greater Tulsa, Oklahoma, area got together to promote the idea of public golf courses adopting a spikeless policy at area courses. A promotional day was held at Forest Ridge Golf Club to help inform area media.

Taking Spikeless Shoes Public

Why not for the public player?

by SAM MEREDITH

MANY CONVERSATIONS have occurred in recent months regarding the spikeless golf shoe issue. In my opinion, there really isn't any legitimate argument for the continued use of metal spikes in and on our golf facilities. Even so, there are still those who are resistant to moving forward with a spikeless program.

Today, many private golf clubs all over the country have spikeless policies, and members and their guests are beginning to see the benefits of using spikeless shoes. The most obvious benefits are the increased quality in the appearance and playability of the putting surfaces and greater comfort to the golfer.

Most golfers, however, fail to recognize the enormous costs attributable directly to metal spike damage. The damage occurs in all areas of the golf course operation. For example, when a piece of mowing equipment hits a loose metal spike on the course, the cutting unit must be taken out of service and repaired or replaced. In addition to the cost involved (a single reel can exceed \$500, not including labor costs), the downtime can have

an immediate impact on the quality of golf course conditioning.

Golf cart fleets sustain considerable amounts of damage as a result of steel spikes. Worn and scratched floor mats, brake pedals, dash areas, fenders, and windshields are the result of spike wear. For facilities that own golf cart fleets, this damage translates into lost value at the time of trade-in. According to Chip Cutler, president of Justice Golf Car (the Oklahoma distributor for Club Car), trade-in value could be increased by \$50 to \$100 per cart for vehicles without spike damage. Since many public operations have 100 carts or more, the savings are significant, to say the least.

The areas in and around the clubhouse also are victims of spike wear. Carpeting, tile, and other floor coverings take a beating from spikes. Also consider the damage done to dining and locker room furniture as a result of steel spikes. The rationale for *spikeless* is apparent!

Nonetheless, the idea of public golf courses adopting a spikeless policy might seem highly unlikely. To mandate and enforce a spikeless policy in the

public arena can be much more difficult than at private clubs. Despite the fact that most public facilities receive far more play, and therefore suffer much greater damage from steel spikes, the common response is, "You can't mandate a spikeless policy at a public course!"

It would seem that the challenges confronting the operators of public facilities to adopt a spikeless policy would be insurmountable. As a result, public golf operators and public course golfers would be unable to enjoy the many benefits being realized by their private club counterparts. Surely no operators could implement a spikeless policy at public facilities, could they?

Recently, a group of public golf course operators in the greater Tulsa, Oklahoma, area got together and said, "Why not?!" The movement started to unfold this way: After many weeks of telephone conversations and meetings of the golf course operators concerning spikeless golf at the public facilities, it was agreed that if all the area public facilities worked together in this common effort, the spikeless campaign could be successful. A wide variety of

information and support materials were presented at these meetings. Reports, including agronomic impact studies that showed the effects of spike damage to the plant, cost analysis that indicated real dollars spent each year on repairs to course property and equipment, and the fact that all of the private clubs in the area have already implemented mandatory spikeless policies, would be used in support of the city-wide ban of steel spikes.

This information would also be used to convince the owners, parks commissioners, boards of directors, and the management personnel of these public facilities that a spikeless policy could be placed into effect without adversely affecting the number of rounds played and, ultimately, revenues.

The next step was to address the debatable issues surrounding a mandatory metal spike ban. What about cost? The cost to convert the players from steel spikes to a spike replacement alternative could be justified by savings in facility repairs. Also, local golf tournaments would be conducted, not only to generate funds to offset expenses for the purchase of steel spike substitutes and to change them out, but also to create greater public awareness and acceptance.

Would a course be at risk from a liability standpoint by mandating a spikeless policy? Common sense dictates that any steep slopes or uneven terrain might foster insecure footing. Under certain turf conditions the potential exists to lose traction, no matter what type of spike or spikeless system is used. Therefore, it was recommended that all courses post warnings, regardless of the footwear policy that is in place. It just might be that the element of risk is higher by allowing steel spikes

to be worn while walking on slick tile floors and concrete walkways than by disallowing the use of metal spikes on the turf.

The next question addressed during the planning meetings was whether or not it would be possible to implement and successfully administer a spikeless program, given the perceived image of the public golf course consumer. After the discussions, the general consensus was that it could be done through a well-planned educational effort.

By the end of the meetings, those present felt that the idea of a city-wide spikeless shoe policy was feasible and worth pursuing. This coalition of public course operators would now seek the approval of their respective leaderships to go forward with the adoption of a spikeless referendum.

Next, a plan was developed for an extensive education and awareness program, leading up to a target date when steel spikes would no longer be accepted. This cutoff date would be set far enough in advance to facilitate the completion of the education process. How much lead time would be necessary to make the transition and be effective in getting this information to the golfing public? After several discussions with a university professor of sociology, it was determined that nearly a year would be needed to accomplish these goals, depending on the size and scope of the education process and public awareness campaign.

We are currently in the midst of the education phase. During the period prior to the cutoff date, each facility will take advantage of every opportunity to get the word out. By dividing the practice putting area and allowing only spikeless traffic on one half, the players have been able to see the

difference between the putting green surface exposed to metal spikes and the surface used by spikeless golfers. The automated tee-time system at the various golf courses will automatically notify those requesting tee times of the upcoming cutoff date. Also, by utilizing various vehicles of exposure, such as local print and broadcast media, on-site signage, press releases, newsletter articles, men's and women's golf association involvement, and videos and posters provided by the manufacturers of alternative spikes, the objectives of this phase of the plan will be met.

The announcement of the city-wide ban on metal spikes, beginning May 1, 1997, was made at a press conference and was followed by a spike-free day of golf on August 28, 1996, at Forest Ridge Golf Club in Tulsa, Oklahoma. The promotional day was attended by the area's golf course superintendents, golf professionals, and a number of media representatives. The result was a number of positive news stories in print, radio, and on television news. Having seen the positive effects of spikeless golf at the local country clubs, most players in this area of the country are excited about the idea of spikeless golf going public. As a result of the cooperation between the public golf operators in our community, we will soon provide better putting quality to our players, while at the same time reduce repair costs to our facilities. These efforts result in a positive benefit for all of us.

SAM MEREDITH is director of golf for Forest Ridge Golf Club in Tulsa, Oklahoma. He has served in this capacity since 1989, when this privately owned, public course was opened.



The sight of golf course personnel changing shoe spikes is becoming a more frequent occurrence as the spikeless golf issue becomes more prevalent around the country.



Metal spikes can cause significant damage to non-turf areas. The counter-sunk bolts on this bridge have been exposed as metal spikes have worn away the wood on the trafficked portion of the bridge.

KEEP YOUR EDGE

Grinding techniques can strengthen a turf maintenance program.

by KEITH HAPP

ASK ANY turf manager to name important management strategies, and arguably one of those mentioned will be using good mowers. Good mowers do not have to be new mowers, however. To support sound agronomics, good mowers can be defined as functional units that provide a good-quality cut. And regardless of the budget a course has to work with, sharp mowers are a critical component of a good turf maintenance program.

Using sharp mowers to maintain turf is not new. Grinding equipment has always been integral to proper mower maintenance because sharp mowers can help to minimize many problems. First and foremost, the grass is cut cleanly, helping to produce the top-quality playing conditions today's golfers enjoy. Secondly, the potential for disease or other stress-related problems is diminished. When the turf is cut with sharp mowers, the grass blades are not torn, twisted, or bruised. There are fewer infection sites; therefore, disease incidence is culturally reduced and surface performance enhanced. Finally, sharp mowers are energy efficient, saving up to 50% in fuel costs compared to dull mowers.

For reel-type cutting units to function well, two primary surfaces must be adjusted and maintained. These components consist of the bedknife, which is stationary, and the reel, which spins to create the scissors or cutting action. In addition, when the sharpening process is performed, new bearings

and other working parts are adjusted or replaced. Everything is put in order so that when the machines are used for the first time, they perform like new equipment.

Grinding Techniques

Relief grinding has been a standard grinding practice for many years. This technique creates a very sharp leading edge, but on rough terrain the blades of the reel as well as the bedknife are more likely to be damaged. To create this edge, more metal is removed from both reel blades and bedknives, making the cutting unit more susceptible to damage from tree roots, rocks, or other debris. If this occurs, the sharpening process must be repeated, and to do so, the cutting unit must be disassembled. Basically, it takes more time to relief grind, but an advantage is that the mowers tend to stay sharper for a longer period of time. The relief grind technique is still utilized by many golf course mechanics, and the results can be quite good.

Spin grinding provides the option to grind reels quickly, even during the season. It allows a reel to be ground into a true cylinder, which minimizes bearing wear and reduces drag (unnecessary metal-to-metal contact), and it can be performed without completely disassembling the cutting unit. Also, the bedknife does not have to be removed. Nevertheless, it is recognized that spin-ground mowers tend to become dull more quickly.

There are many elements of this grinding technique that save time and money. For example, the need for backlapping (a honing process by which the tolerance between the cutting surfaces is matched) is greatly reduced. No longer do units have to sit, spinning endlessly, on the shop floor to create a sharp cutting surface. Sharpening can be implemented and completed in very little time, significantly less when compared with relief grinding. Thus, in-season grinding can be performed without compromising the turf manager's ability to prepare the course.

Spin grinding actually creates approximately 2 to 3 degrees of relief grind. What is more important, if the reel is ground correctly and the bedknife equally well, the final tolerance between the cutting surfaces is reduced to about .002 inches. This provides a very sharp cutting unit that performs well, even under wet, saturated conditions. For example, during heavy spring turf growth, reduction of turf tearing and twisting results in stronger turf prior to the onset of stressful (high heat and humidity) summer weather.

Once the reel is sharpened, creating a sharp edge on the bedknife is equally important. There are two surfaces that are ground on the bedknife: the face grind and the surface grind. The face grind is the most important edge because it is the first surface that comes into contact with the turf. A special grinding machine is needed to accu-



A dull mower blade results in a poor quality of cut that can lead to many turf problems. Wounds created on the leaves are potential infection sites for disease development.

rately grind these important surfaces, and initially it requires that the mower be disassembled. New bedknives must be ground separately prior to being installed on the cutting unit, but during the season, the practice of removing the bedknives is not necessary unless serious damage has occurred.

There are several strategies that can be used during the season to maintain the edge on the bedknife. A common strategy is to use a body grinder to *dress up* and create a clean face grind on the bedknife only. The mower does not have to be disassembled to use this technique. In the hands of an experienced operator, this sharpening process can be completed in a few minutes and provide excellent results. Caution must be exercised so as not to damage a reel blade. Once this procedure is complete, the newly sharpened leading edge provides a consistent, clean cut.

New tools now are available to maintain a consistent face grind for the entire season. Magnetically mounted grinders, for example, have been developed and have significantly reduced sharpening time while increasing the accuracy of this process. In as little as five minutes per unit, sharpening is complete, allowing this to be done on an as-needed basis and minimizing reliance on backlapping.

During the off-season, the time needed to perform this maintenance procedure is of little concern. However, during the playing season and particularly in sections of the country where golf is a year-round activity, taking equipment out of service to

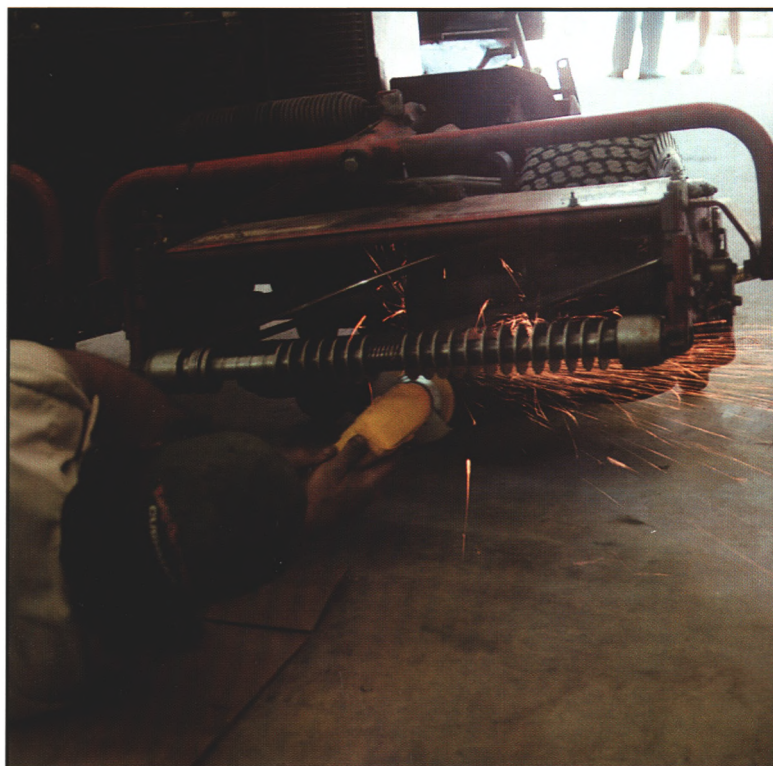
sharpen mowers can make it difficult to mow the course for daily play. Obviously, the more backup equipment you have, the easier it is to take a mower unit out of service to sharpen it.

Some golf courses have an abundance of equipment, which affords the opportunity to sharpen mowers frequently during the playing season. For most courses, however, and particularly those that function on a shoestring budget, the decision to perform mid-summer grinding is a difficult one. The logistics and time needed to complete this procedure are burdensome, and if mowers are down for an extended period of time, complaints from golfers can increase.

Fortunately, significant technological advancements have been realized in grinding tools and procedures, allowing for in-season sharpening with minimal equipment downtime. Course preparation can take place as scheduled and good surface quality can be maintained.

Proper Equipment

Grinding equipment is part of the infrastructure of the golf course operation. Shop equipment, particularly grinding tools, are often overlooked elements of an equipment replacement program. New mowers can be introduced into the equipment inventory on an annual basis, but if they cannot be sharpened properly, their value to the operation is reduced. If new grinding equip-



During the golf season, a body grinder can be used to maintain a sharp face on the bedknife. In the hands of an experienced mechanic, five minutes is all that's needed to make the mower ready to go!

ment cannot be purchased, an outside contractor can be utilized. In fact, mobile services are available to perform the necessary grinding procedures at the course.

There is an ever-increasing demand for accuracy in the game of golf and turfgrass management. The accuracy with which mowers are sharpened and adjusted is just as important as accurate fertility, pest management, and irrigation techniques. Furthermore, whether Integrated Pest Management (IPM) is practiced by choice or as a budgetary necessity, utilization of sharp mowers is an essential component of IPM. Mowers and the quality of performance they provide are the basis upon which other management practices are determined. If the quality of cut is compromised, the health of the turf also is compromised. Help keep your edge; investing in grinding equipment can provide long-lasting benefit and better playing conditions, which translates into happier golfers . . . something we all need more of.



Newer grinding equipment provides the flexibility to sharpen mowers during the season in a very short period of time.

KEITH HAPP is agronomist for the Mid-Atlantic Region of the USGA Green Section.



The extensive natural border areas on the golf course provide a natural buffer zone that separates the golf course from some of the nearby housing developments.

The Bird Communities of Prairie Dunes Country Club and Sand Hills State Park

IN THE WAKE of alarming declines in the populations of wild birds, wildlife experts and other concerned persons are calling for increased efforts to incorporate more wildlife habitat into managed landscapes. Many golf courses, both old and new, have incorporated wild areas into their designs. This is, in part, due to a desire to give the course more *character*, but more recently, to meet the growing public desire for environmentally responsible golf developments.

How effective are the habitats on a golf course in promoting bird diversity? One way to answer this question is to compare the birds using a naturalized golf course with a similar nearby natural area. While golf courses are not natural areas, this kind of study may inform us about what kinds of birds utilize golf courses and which do not. This in turn may lead to more informed decisions about how to promote a higher diversity of birds on human-dominated landscapes.

Study Areas and Methods

This article reports the results of a three-year study of the birds found on

“All wilderness areas, no matter how small or imperfect, have a large value to land-science.”

— Aldo Leopold, wildlife biologist

by MAX R. TERMAN, Ph.D.

TABLE 1
Site Descriptions and Overall Bird Census Numbers

	Prairie Dunes Country Club	Sand Hills State Park
Description	Naturalized, links-style golf course surrounded by a natural buffer zone and housing development	Natural prairie with public trails
Human use	35,000 rounds of golf/year highly maintained	Light-moderate use by hikers, horseback riders
Size of total area (hectares)	105 (260 acres)	455 (1,123 acres)
Size of survey area (hectares)	64.8 (160 acres)	56.7 (140 acres)
Transect surveyed (kilometers)	4.4 (4,812 yards)	3.5 (3,820 yards)
Number of bird species (10/93-10/95)	57	63
Species/hectare	0.88	1.11
Total number of birds	2,020	1,000
Birds/kilometer	459.1	285.7

the Prairie Dunes Country Club in Kansas and a nearby natural area, Sand Hills State Park. This study is part of an innovative cooperative arrangement between Prairie Dunes Country Club and Tabor College. Sponsored by the USGA Green Section, this unique team approach combines the resources of the academic and golf communities in the important endeavor to understand and preserve biodiversity on human-dominated landscapes.

Prairie Dunes and Sand Hills present an ideal situation for an ecological study of this type. With the exception of tees, fairways, greens, and buildings, Prairie Dunes is very similar to Sand Hills State Park in topography and vegetation. Both have native prairie plants and rolling dunes typical of the sand hills biotic region of Kansas. The public trail used for the bird census in the park is approximately the same shape and distance as a loop through both nine-hole layouts of the golf course.

Prairie Dunes is a highly regarded, intensively managed golf course that hosts more than 35,000 rounds of golf per year. Approximately 74 percent of the country club property is in a natural state, with native plants growing not only in the roughs and out-of-play areas, but also in a natural buffer zone that partially surrounds the course, separating it from some of the nearby housing developments. Under the leadership of superintendent P. Stan George, C.G.C.S., Prairie Dunes has achieved full certification in the Audubon Cooperative Sanctuary Program administered by Audubon International for its efforts to be environmentally responsible. Even prescribed burning of on-course grass areas is carried out when conditions allow.

Sand Hills State Park is a valuable natural area under the control of the Kansas Department of Wildlife and Parks. To control woody plant invasions and maintain the dominant herbs and grasses, the park is burned periodically. Local residents treasure the natural beauty of the sand dunes, grasslands, wetlands, and woodlands. Located approximately four miles from Prairie Dunes, its 1,123 acres contain public walking trails accessible only to walkers and permitted horseback riders. Compared to the golf course, the park is a low-impact area with minimal human disturbance to the wildlife.

Birds were censused in good weather on transects (paths) located on the

TABLE 2
Numbers (birds/kilometer) and Relative Abundance (percent of total)
for Birds at Prairie Dunes Country Club (PD) and Sand Hills State Park (SH)
Arranged in Descending Order of Prairie Dunes Bird Numbers

Species	Birds/Kilometer		Relative Abundance	
	PD	SH	PD	SH
American robin	91.6	26.0	20.0%	9.1%
European starling	70.5	2.6	15.3%	0.9%
American tree sparrow	51.1	8.0	11.1%	2.8%
House sparrow	23.9	0.0	5.2%	0.0%
Harris sparrow	21.8	10.6	4.8%	3.7%
Barn swallow	17.0	0.9	3.7%	0.3%
Eastern kingbird	16.8	12.0	3.7%	4.2%
Common grackle	15.5	4.6	3.4%	1.6%
Mourning dove	12.7	8.3	2.8%	2.9%
Northern cardinal	12.7	12.6	2.8%	4.4%
Blue jay	12.5	8.9	2.7%	3.1%
Black-capped chickadee	9.3	20.3	2.0%	7.1%
Dark-eyed junco	8.0	8.9	1.7%	3.1%
House wren	7.7	10.3	1.7%	3.6%
American goldfinch	7.0	15.1	1.5%	5.3%
Northern oriole	7.0	5.4	1.5%	1.9%
Bell's vireo	6.8	4.3	1.5%	1.5%
Field sparrow	6.1	4.0	1.3%	1.4%
Western kingbird	6.1	1.1	1.3%	0.4%
Northern flicker	5.2	16.6	1.1%	5.8%
Brown-headed cowbird	4.1	2.6	0.9%	0.9%
Cattle egret	3.4	0.3	0.7%	0.1%
Northern bobwhite	3.4	9.4	0.7%	3.3%
Eastern meadowlark	3.2	4.3	0.7%	1.5%
Red-winged blackbird	3.0	11.7	0.6%	4.1%
Canada goose	2.7	1.4	0.6%	0.5%
Killdeer	2.5	0.3	0.5%	0.1%
Chimney swift	2.3	0.3	0.5%	0.1%
Gray catbird	2.3	5.7	0.5%	2.0%
Brown thrasher	2.0	3.7	0.4%	1.3%
Song sparrow	2.0	0.6	0.4%	0.2%
American crow	1.8	13.4	0.4%	4.7%
Franklin's gull	1.8	0.0	0.4%	0.0%
Red-headed woodpecker	1.6	2.9	0.3%	1.0%
Wild turkey	1.4	0.0	0.3%	0.0%
Common yellowthroat	1.1	6.0	0.2%	2.1%
Eastern bluebird	1.1	1.7	0.2%	0.6%
Grasshopper sparrow	0.9	5.1	0.2%	1.8%
Orchard oriole	0.9	0.3	0.2%	0.1%
Red-tailed hawk	0.9	4.3	0.2%	1.5%
Yellow-rumped warbler	0.9	0.6	0.2%	0.2%
Downy woodpecker	0.7	1.7	0.1%	0.6%
Great blue heron	0.7	0.6	0.1%	0.2%
Upland sandpiper	0.7	0.0	0.1%	0.0%
American kestrel	0.5	0.0	0.1%	0.0%
Belted kingfisher	0.5	0.0	0.1%	0.0%
Mississippi kite	0.5	0.9	0.1%	0.3%
Ring-necked pheasant	0.5	0.0	0.1%	0.0%
Yellow-billed cuckoo	0.5	0.6	0.1%	0.2%
Chipping sparrow	0.2	0.0	0.0%	0.0%
Dickcissel	0.2	9.4	0.0%	3.3%
Great crested flycatcher	0.2	1.1	0.0%	0.4%
House finch	0.2	0.0	0.0%	0.0%
Northern harrier	0.2	0.6	0.0%	0.2%
Northern mockingbird	0.2	0.3	0.0%	0.1%
Red-bellied woodpecker	0.2	2.3	0.0%	0.8%
Turkey vulture	0.2	2.0	0.0%	0.7%
Bewick's wren	0.0	0.3	0.0%	0.1%
Blue grosbeak	0.0	0.3	0.0%	0.1%
Carolina wren	0.0	0.6	0.0%	0.2%
Rufous-sided towhee	0.0	3.1	0.0%	1.1%
Eastern wood-peewee	0.0	0.6	0.0%	0.2%
Hairy woodpecker	0.0	0.6	0.0%	0.2%
Indigo bunting	0.0	0.3	0.0%	0.1%
Lark sparrow	0.0	0.3	0.0%	0.1%
Least flycatcher	0.0	0.6	0.0%	0.2%
Rose-breasted grosbeak	0.0	0.6	0.0%	0.2%
N. rough-winged swallow	0.0	0.3	0.0%	0.1%
Vesper sparrow	0.0	0.9	0.0%	0.3%
White-breasted nuthatch	0.0	0.3	0.0%	0.1%
White-throated sparrow	0.0	2.3	0.0%	0.8%
Yellow-breasted chat	0.0	0.6	0.0%	0.2%
TOTALS	459.1	285.7	100.0%	100.0%

public trail in Sand Hills and on the golf course proper at Prairie Dunes. Another trained observer, Paul Jantzen, and I counted and recorded by species all birds seen along the public trail in the park and near the tees, fairways, roughs, and greens on the golf course proper. To adequately sample all birds using the areas in different seasons, we performed a total of 12 censuses over three years, with five censuses occurring during the autumn, one during winter, two during spring, and four during summer.

The off-course natural areas at Prairie Dunes were not censused, and all Prairie Dunes bird observations are restricted to the golf course proper. Future studies will census the natural areas at Prairie Dunes.

Results

Tables 1, 2, and 3 provide an overall synopsis of important statistics and comparisons. Both the golf course and the natural area supported complex bird communities, sharing many species in common (Table 2). In terms of the number of species using the two areas (species richness), the golf course compared favorably to the natural area, and a statistical comparison indicated no significant differences in this measure of species diversity. However, there were significant differences in other measures. Statistical tests comparing indices of relative abundance (the specific kinds, numbers, and proportions of the total in each kind) revealed that the kinds of birds and the numbers per species were different between the two areas. Measures of community similarity and species diversity also indicated noticeable differences.

Sand Hills had more species of birds than Prairie Dunes, but fewer individuals. Figures 1 and 2 graphically illustrate the comparisons in species richness and relative abundance. Sand Hills had 15 species that did not occur on Prairie Dunes and 9 species occurred on the golf course but not in the park (Table 2). For the most part, birds with larger natural habitat requirements and perhaps less tolerance for disturbance (e.g., least flycatcher, yellow-breasted chat) occurred more frequently in the state park, while those with less restrictive habitat needs and higher tolerances for disturbance frequented the golf course (e.g., American robin, common grackle, eastern kingbird).



Native prairie vegetation lines the golf holes at Prairie Dunes Country Club in Hutchinson, Kansas.

TABLE 3
Summary of Statistics

Statistical Tests for Significant Differences

1. Chi-square contingency table analysis for differences in kinds and numbers of birds in the two sites. Chi-square value = 195.73, df = 27, $p < .001$ (statistically significant differences).
2. Chi-square contingency table analysis for differences in species richness between the two sites. Chi-square value = 13.286, df = 11, $p > .10$ (no statistically significant differences).

Community Similarity Indices (0 = no similarity, 1 = nearly the same)

Jaccard Coefficient	0.680
Horn Index	0.721
Morisita's Index	0.566
Proportional Similarity	0.504

Species Diversity Indices

	Prairie Dunes	Sand Hills
Species richness	57	63
Number of individuals/kilometer	459	286
Number of equally abundant species	19.59	34.12
Simpson diversity (range 0-1)	0.912	0.964
Sheldon evenness (range 0-1)	0.343	0.541

Summary

Are the areas the same regarding the bird communities?	Yes and no — There are no significant differences in the number of species in the two areas. However, they do differ in the specific kinds and relative abundance of the birds. The community similarity and species diversity indices indicate that the two areas are moderately similar.
How do they differ?	The golf course has different species and higher densities in fewer kinds. The natural area has fewer individuals but they are more evenly spread among more kinds. The natural area has 15 species that did not occur on the golf course. The golf course has 9 species that did not occur in the natural area.
How are they the same?	Because the golf course has natural habitat, it supports almost as many bird species as the natural area (but not the same kinds in the same proportions).

Discussion

Is it worthwhile to include natural habitat areas on golf courses? If providing a home for a significant number of birds is important, the answer is yes. Fifty-seven species of birds used Prairie Dunes in my survey, and knowledgeable observers have added 15 to 20 more species to the list. Some birds using Prairie Dunes, such as the grasshopper sparrow, yellow-billed cuckoo, and Mississippi kite, have experienced significant regional declines in their populations. My students have studied other golf courses (unpublished data) without wildlife habitat in the area, and seldom does the species count exceed 27, and rarely do we find as many sensitive species such as the yellow-billed cuckoo, grasshopper sparrow, and dickcissel. In truth, the bird community on Prairie Dunes differs from these conventional courses in

much the same way that Sand Hills differs from Prairie Dunes. On naturalized golf courses, the occurrence of sensitive species is much more frequent and the distribution of individuals among the species is more even and stable. Providing habitat on privately managed landscapes does attract an exceptional number of birds. Furthermore, these areas may be especially important to migratory birds needing a place to stop and refuel (yellow-rumped warbler) or to spend the winter (Harris sparrow).

Are naturalistic golf courses' natural areas the same in the kinds of bird communities they support? The answer here is no, since there are many birds that require the larger, less-fragmented and impacted habitats found in undisturbed areas away from human activities. The large amount of patchiness and edge habitat on golf courses is problematic for many birds that

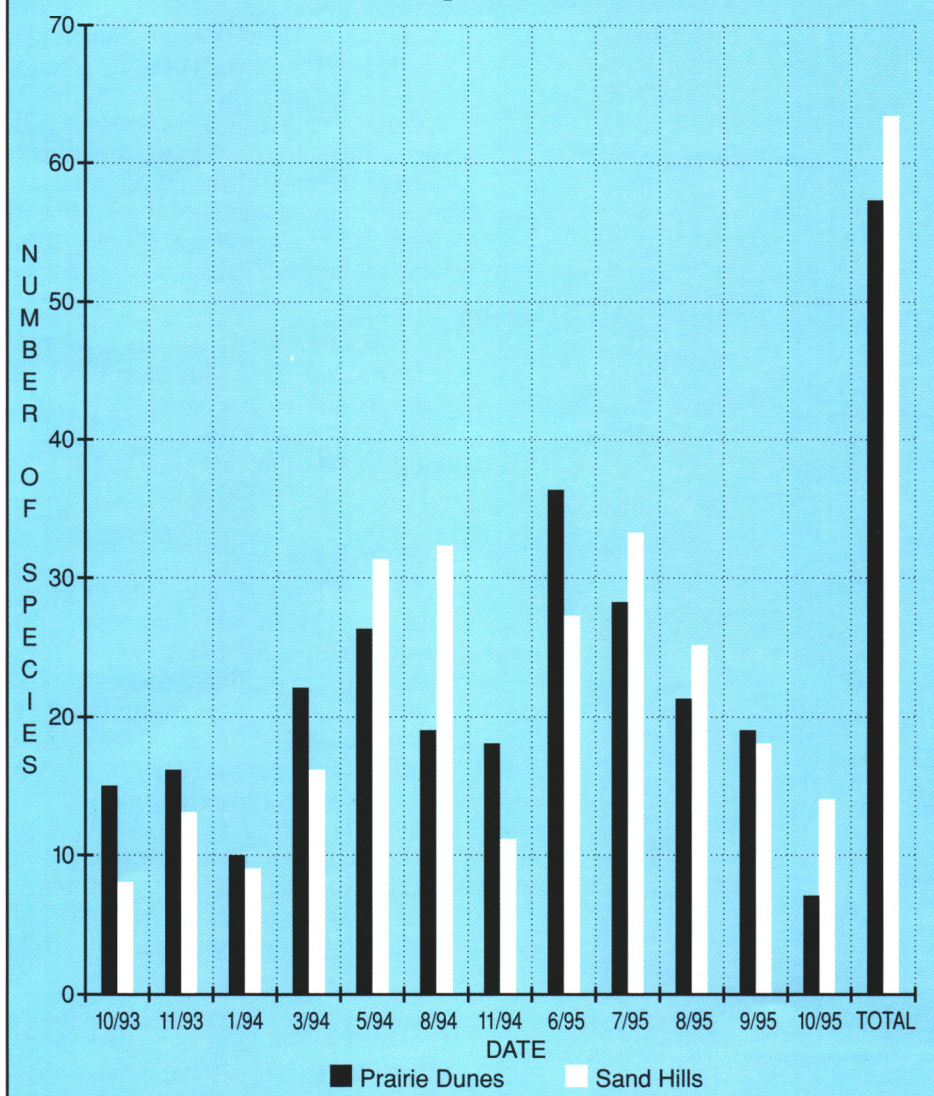
preferentially choose large, connected habitats. For this reason, natural areas may lose many species of birds, depending on the type of golf course constructed on the site. This is an important consideration in decisions regarding the siting of golf courses. It is unknown whether golf courses that include larger areas of undisturbed habitat (such as the approximately 100 acres of natural area on Prairie Dunes) will lose fewer numbers of bird species. Our future studies of these undisturbed areas on Prairie Dunes should provide more information in this regard.

Naturalistic golf courses (those using the natural environment of a region as a development template) offer much promise in the larger struggle to preserve plant, animal, and ecosystem diversity. If managed correctly, naturalistic courses fit well into the emerging new philosophy of ecosystem management that recognizes the immense potential of smaller parcels of public and private lands for preserving nature. With the involvement of ecologists, golf courses — commonly thought to be environmental problems — can now become ecological assets in the effort to increase the survival chances of many plants and animals. Especially attractive in this regard are the naturalized golf courses built on already disturbed land such as old mines, landfills, and highly eroded or otherwise negatively impacted landscapes.

In theory, the ecological role of golf courses and smaller habitat parcels may be to serve as *population sinks* for the *population sources* of natural areas. Larger natural areas such as Sand Hills State Park give a wide variety of species a chance to reproduce, and individuals spread out across the countryside from these reproductive *fountains*. Dominant individuals secure territories on the natural area and younger individuals then move out as the area fills up with offspring dispersing from the nests. Prairie Dunes then receives these dispersing individuals (like a sink) and provides them a home if they can adapt to the smaller habitat patches and human activity of the golf course. Not all the species can adapt, but a good number do find a home. How to increase this number is the critical question engaging ecologists. Answers await more ecological research. However, the stakes are high as the fate of many of our favorite birds and other wildlife hangs in the balance.

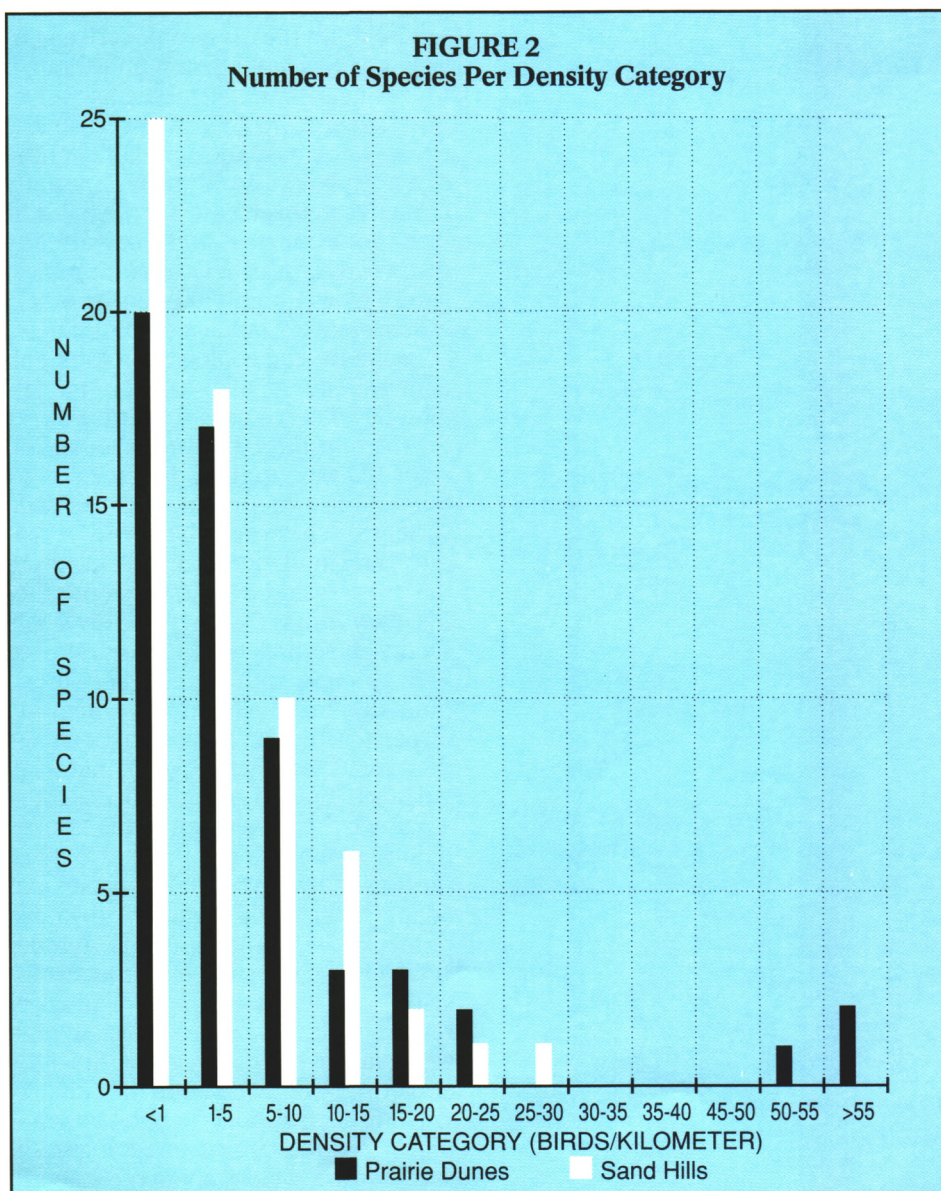
Undisturbed, pristine habitats commonly are the choice of ecologists in search of knowledge about the machin-

FIGURE 1
Number of Species Per Census





Sand Hills State Park is 1,223 acres of sand dunes, grasslands, wetlands, and woodlands. The habitat is very similar to Prairie Dunes Country Club.



ery of nature. However, with the spread of urbanization, it is time for ecological scientists to also study human-dominated landscapes such as golf courses. Many opportunities exist for helping the golf community make ecologically sound decisions. This present study is an example of one cooperative effort between a golf course and an academic institution, and a rewarding relationship has developed which benefits us both. Another cooperative effort supported by the USGA is the arrangement between Sienna College and Schuyler Meadows Country Club in New York.

For ecologists who happen to be golfers, the relationship between science and golf is quite natural. Both cultures have become intertwined in my life (see Terman, M. 1996, *Messages From An Owl*, Princeton University Press) to where ecology is more than just a career and golf more than just a game. Both activities bring to my life the best in human relationships — friendship, honesty, integrity, a respect for tradition, a sense of fair play, and decision-making based on objective evidence. With these shared ideals, the common ground between the science of ecology and the golf community becomes fertile soil for future cooperative efforts to protect our common natural heritage. In the final analysis, we are both stewards of the same gifts of creation — those special places for which John Muir so eloquently pleaded with these words:

“Man needs beauty as well as bread, places to play in and pray in where nature can heal and cheer and give strength to body and soul alike.”

— John Muir, naturalist

Acknowledgments

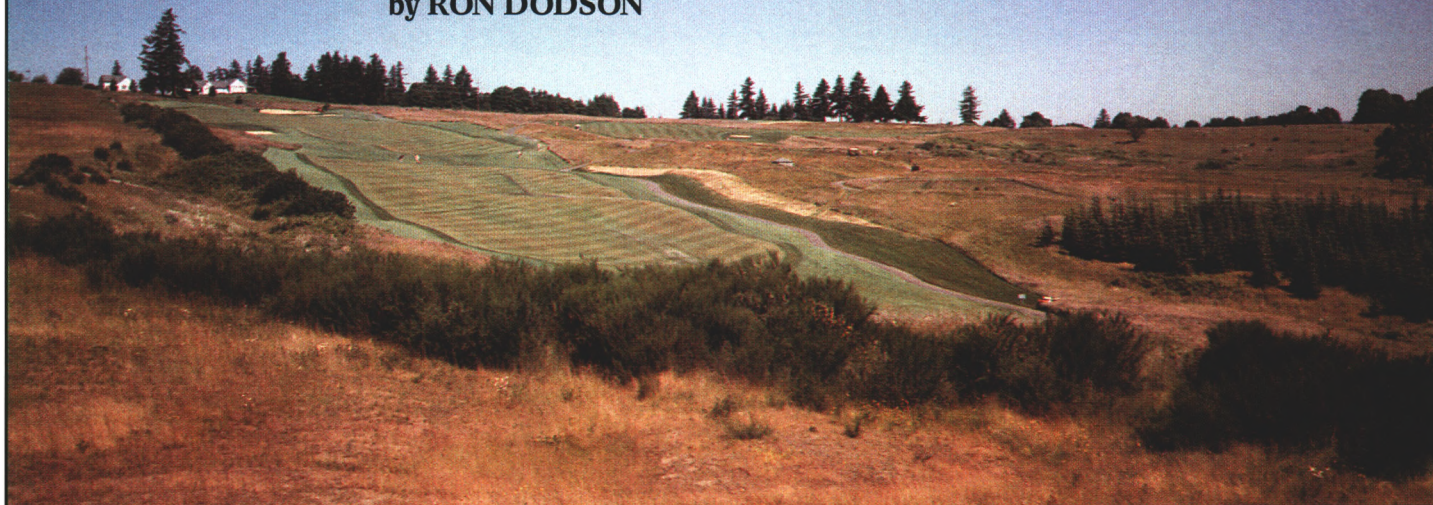
I would like to thank Tabor College and the USGA for supporting this study, which is part of a larger cooperative project to produce a book on *Golf Course Ecology* with Audubon International and Ann Arbor Press of Chelsea, Michigan. My thanks also go to P. Stan George, superintendent of Prairie Dunes Country Club; Paul Jantzen, friend and naturalist; and Brent Konen, wildlife technician, Kansas Department of Wildlife and Parks, for their assistance in this study.

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Integrated Pest Management For Land Managers

Looking at the Big Picture on a daily basis.

by RON DODSON



The Oregon Golf Club, in West Linn, Oregon, is blessed with a mild environment. This climate has allowed the golf course to make the commitment to not using insecticides, herbicides, or fungicides in their integrated pest management program.

INTEGRATED Pest Management (IPM) is a very common term used in the golf course management business. IPM strategies have been used by golf course superintendents and many other land managers for a long time. For example, IPM principles have been applied in agriculture for more than 30 years. Recently, the U.S. Department of Agriculture launched a plan that would implement IPM methods on 75% of the total crop acreage in the United States by the year 2000.

But what is IPM? The generally accepted definition is "A system of controlling pests in which pests are identified, action thresholds are established, all possible control options are evaluated, and selected controls are implemented. Control options that include biological, chemical, cultural, manual, and mechanical methods are used to prevent or remedy unacceptable pest activity or damage." Put simply, IPM is a land-management practice by which you assess and choose measures to control pest problems in order to maintain healthy turf.

The most effective IPM programs begin with an assessment of the prob-

lem, as well as appropriate control measures. To make this assessment, land managers should start by asking the following questions:

- How effective is the proposed control measure?
- What is the environmental impact?
- What are the site characteristics?
- What is the health and safety impact on people?
- What are the economic factors?

After you've considered these questions, the next step is to create your IPM program by using the following six basic components.

1. Monitoring. Establish a schedule to routinely check the course for pest populations and environmental conditions.

2. Determination. Find out the level of damage being created by the pests.

3. Decision Making. Develop and integrate all biological, cultural, and chemical control strategies.

4. Education. Continuously educate yourself and your personnel on all biological and chemical control strategies.

5. Timing and Spot Treatment. Apply all appropriate control measures

only when they are needed, where they are needed, and when the state of the environment is appropriate.

6. Evaluation. Monitor your efforts to determine success of the control measures taken to document any problems.

Now that you have the basics for a plan, you need to focus on the following components for protecting turf on a golf course through IPM.

1. Regulatory. Use only certified seed, sod, and sprigs to establish turf.

2. Genetic. Select only turfgrass cultivars that are adapted to the intended use and that are suited for the ecological region in which they will be used.

3. Cultural. Turf is able to resist attacks by pests when it is healthy and strong. Proper turfgrass cultural practices should always be used.

4. Physical. Isolate areas where pests are a problem.

5. Biological. When possible, favor the use of natural predators to control pests.

6. Chemical. Use selectively and only as labeled.



The Ivanhoe Club (Ivanhoe, Illinois) currently is working with Dr. Mike Cole from the University of Illinois and the Green Cycle Corporation to investigate the impacts of compost topdressing on pests and pesticide use.



Old Westbury Golf and Country Club (Old Westbury, New York) has an extensive composting facility on-site. A portion of the composted material is used as topdressing on the golf course to improve soil and turf health.

Audubon Cooperative Sanctuary Program for Golf Courses — Spotlight on IPM

Many fully certified Audubon Cooperative Sanctuaries have outstanding examples of IPM programs. Highlighted below are just a few of the fully certified golf courses that have made exemplary efforts to design and implement not only effective IPM programs, but ones that consider environmental impact an essential part of their plan.

The Oregon Golf Club (West Linn, Oregon)

The Oregon Golf Club has worked hard to show how far you can take a solid integrated pest management program — no pesticides, herbicides, or fungicides are used on the course. A variety of practices have led to this incredible reduction in chemical use at the course. A strong scouting and monitoring program, along with the use of biological controls, such as nematodes, were two key components. Daily scouting, with particular focus on indicator areas, and setting threshold

levels also helped in this reduction, leading to a savings of \$36,000. Finally, a comprehensive cultural program using soil and tissue samples to determine turf health and aerification, topdressing, vertical mowing, and overseeding programs to maintain good turf health further helped in the elimination of chemical use on the course. Certainly, climate plays a large role in disease and insect pressures at their site, but The Oregon Golf Club is committed to maximizing IPM in its golf course management programs.

Old Westbury Country Club (Old Westbury, New York)

Maintaining a healthy soil is the key to Old Westbury's 50% reduction in chemical use on the course and corresponding \$50,000-60,000 savings. Phil Anderson, superintendent at Old Westbury, strongly believes in the philosophy that a healthy, active soil makes it a lot easier to maintain healthy turf that is more pest resistant. A large part of his program focuses on using organic products to help infuse the

soil and turf with beneficial microbes. Using chemicals only upsets the natural balance of healthy soil, making the turfgrass system dependent on pesticides rather than stronger and independent of chemicals. Biological controls, such as milky spore and nematodes, are chosen over synthetic chemicals. Old Westbury further shows its commitment to managing in an environmentally sensitive manner through its participation in such programs as "Another Way to Be Green" and Phil's regular radio shows that focus on reducing the golf industry's reliance on pesticides. An extensive composting program is another highlight of Old Westbury's IPM efforts.

The Ivanhoe Club (Ivanhoe, Illinois)

Pete Leuzinger, superintendent at Ivanhoe, successfully reduced insecticide use at the course by 90%. This reduction was achieved by: 1) permitting some insect damage and 2) continually scouting turf conditions to make decisions on spot-spraying versus wholesale broad-spectrum dosages.

Pete gives an example: "If I were concerned about grub damage in my fairways, I would have to make a decision on spraying 45 acres of fairway ground to treat the grub problem. That is one choice. Another choice might be to ignore the problem and hope the damage is only minimal and the quality of the golf course is not sacrificed. My third option would be to find out exactly where the grubs are causing damage and treat those small areas in the fairways, thus reducing the treated area from 45 acres down to perhaps two or three acres. Cutworm damage on a green may occur several times a year. In most cases, the damage can be tolerated because the population of the insect is low enough that only an expert eye can find the damage. Some people like living on the edge. I like the challenge of saving money, saving work, and saving the insects for the birds. To me it's kind of like a game, and the less I mess with insecticides, the better off our golf course is going to be."

The course is also in the midst of researching the impacts of using compost instead of pesticides to reduce pest problems.

RON DODSON is president of Audubon International, based in Selkirk, New York. He coordinates the "On Course With Nature" feature for the USGA Green Section Record.

DON'T BE SHORTSIGHTED

IT IS AN understatement to say, "The game of golf has evolved a great deal." From the days of hickory shafts, we now have titanium and graphite. As this new equipment is developed, it is placed in pro shops and rapidly put to test on the course.

Along with the evolution of the playing equipment, course conditions have improved dramatically. Most courses today are maintained at a level that, not long ago, was thought to be obtainable by only a select few. In fact, today's courses are routinely maintained in a manner that would have been considered championship quality in the mid to late 1970s. Granted, resources play a key role in course conditioning, as does the level of expertise of the turf manager. And to meet the conditioning demands, surveys show that, on a cost-per-hole basis, a steady increase in the cost of course maintenance has occurred.

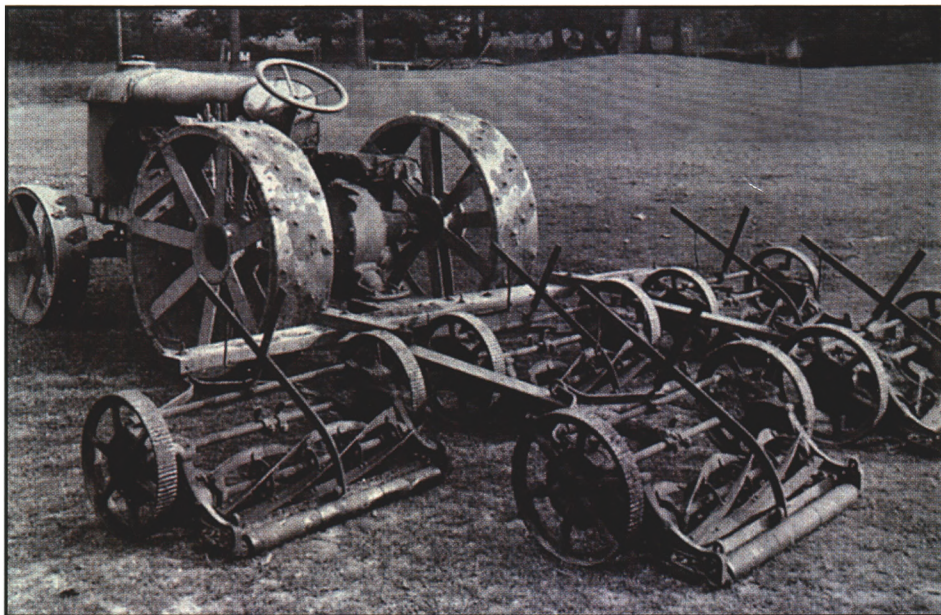
Many times, the level of turf management skill and the demands for perfection have increased at a greater rate than the purchase of equipment needed to meet the demands. Still, the superintendent will strive to produce more with less. Unfortunately, this level of effort often perpetuates an ongoing battle during budget meetings for capital improvement dollars.

In my travels, I encounter many golf course operations that produce tremendous turf conditions with equipment that is all but worn out and ready to be scrapped. However, when the request for new equipment is presented, the response is, "What do you need it for? The course looks great!" This type of shortsightedness can result in catastrophic consequences. If problems like scalping or hydraulic leaks develop, the faltering equipment will not be blamed for turf loss — the turf manager will bear the brunt of the complaints. Simply put, turf management equipment should be replaced at regular intervals, and the time frame should be determined by the level of intensity of equipment use.

Through the years, Green Section agronomists have promoted the development and implementation of long-range planning. The goal of a long-range plan is to identify, prioritize

Replacing equipment when necessary is an essential part of long-range planning for good turf conditions.

by KEITH HAPP



State-of-the-art in the early 1920s at Ashtabula Country Club (Ohio); it took 12 hours to cut 25 acres with this equipment.

and then fund projects or expenditures, on an annual basis, that allow for continued improvement in the condition of the golf course. I can't tell you how many times a superintendent prepares his or her budget for equipment replacement and is told that the funds aren't available. However, it is amazing how often carpeting, furniture, and clubhouse addition expenditures are approved by governing boards. The members come in contact with these things more frequently than they do with turf equipment, so it is easy to understand how they sometimes put their needs ahead of those of the golf course. When it comes to the course, the final product (turf conditions) is the main concern, and within reason, the methods and materials used to achieve the end result become secondary. This mind-set is frustrating to turf managers because, after all, the course is the main asset, isn't it?

Player demands have been a driving force behind the quest for both improved playing equipment and play-

ing conditions. Channeling these same demands into strategies that fuel regular equipment replacement programs could be equally beneficial for the game and the course. Mechanization with modern equipment can lead to a higher level of efficiency which, in turn, can help to control rising operating costs.

There is a saying, "Build it and they will come." I propose that, for turf management, the saying should be, "Maintain it and they will stay." In both cases, providing the proper tools is a must for player enjoyment and satisfaction. Don't be shortsighted and overlook the importance of replacing worn-out and tired equipment on a regular basis.

KEITH HAPP is agronomist for the five states comprising the Mid-Atlantic Region.

The opinions expressed in "All Things Considered" are those of the author and do not necessarily reflect those of the USGA Green Section.



In August 1996, research scientists from around the world gathered for a research workshop at Michigan State University, highlighting Recent Cellular and Molecular Genetic Approaches to Turfgrass Improvement. The workshop was co-sponsored by Michigan State University, the USGA Green Section, the Golf Course Superintendents Association of America, and the Michigan Turfgrass Foundation. Over the last decade, tremendous efforts have been made to improve turfgrass species by traditional breeding and cellular and molecular techniques. Many scientists conducting these studies have not had the opportunity to discuss their research results in a national or international workshop format, and little collaboration exists among scientists working on the different aspects of turfgrass improvement. The workshop was successful in bringing together experts for idea sharing, problem solving, networking, and the identification of research needs.

TGIF on the Web!

Many turf professionals have become familiar with the Turfgrass Information File (TGIF) since its genesis as a cooperative project of the USGA Turfgrass Research Program and the Michigan State University Libraries in 1984. TGIF was developed as a bibliographic database that would ultimately provide access to all published materials reporting on aspects of turfgrass and its maintenance. Since that time, TGIF has grown steadily in size and accessibility, beginning with dial-up modem access in 1988 and internet access in 1993. Now TGIF is even closer to your fingertips, through the World Wide Web! The full scope of the turfgrass research and management literature, from abscisic acid to zymograms, is now available with a more user-friendly face than ever. It's even possible to use your mouse to do an entire search without typing, or use several of the other available search options. Check out: <http://www.lib.msu.edu/tgif>.

Physical Soil Testing Laboratories*

The following laboratories are accredited by the American Association for Laboratory Accreditation (A2LA), having demonstrated ongoing competency in testing materials specified in the USGA's Recommendations for Putting Green Construction. The USGA recommends that only A2LA-accredited laboratories be used for testing and analyzing materials for building greens according to our guidelines.

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*Revised October 21, 1996. Please contact the USGA Green Section (908-234-2300) for an updated list of accredited laboratories.

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JAMES T. SNOW, Editor

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A Summer Assignment [resource inventory]	Skorulski, James E.	1995. May/June 33(3):23-24.
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Transport of Runoff and Nutrients from Fairway Turfs
A Method of Recycling: From Clippings to Compost
"Working" Bermudagrass Fairways
A Case for Bluegrass Fairways

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6. FERTILIZATION

Water Quality Monitoring at Queenstown Harbor
The Magic of Sulfur
A Practical Approach to Putting Green Fertilization
Acid — To Inject or Not to Inject
Maintenance on a Shoestring
Tissue Testing: Questions and Answers
Golf Course Construction: Grow-In Philosophies
Back to the Basics for Golf and the Environment

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Buchen, Terry 1993. Sept/Oct 31(5):11-14.
Manuel, George B. 1992. Mar/Apr 30(2):14-16.

7. GOLF COURSE MANAGEMENT AND BUDGETS

7A. EQUIPMENT AND BUILDINGS

Taking Spikeless Shoes Public
Keep Your Edge
Don't Be Shortsighted
The Ups and Downs of Rolling Putting Greens
Water Quality Monitoring at Queenstown Harbor
Optimizing the Turfgrass Canopy Environment with Fans
A Float Above The Rest
Shallow Aeration: Deeper Is Not Always Better
Preventative Maintenance at a Glance
Environmental Common Sense — A Sample "In-House" Audit
Aw Nuts! And Bolts, Too [inventory]
Maintenance on a Shoestring
Dry-Cleaning [equipment care]
Contain It, Store It, Recycle It
Cool, Clear Water (Without Electricity) No Problem!
Mr. Wizard Visits the Golf Course [soils, water quality]
Go Wireless [communication equipment]
Blockbuster Aerification
Getting the Word Out [communication techniques]
Have an "Ice" Day
Low-Cost Comfort at Deadwood [restroom facilities]
Seed Storage: Protect Your Investment
Every Picture Tells a Story
Mobile Office Trailers as Interim Offices
Equipment Replacement: Choosing a Path of "Leased" Resistance
What Do Club Managers Need to Know About
GolfCourse Management?
Tee Construction: Use of the Laser Grader
From Broken Shaft to Soil Probe
Catch the Drift [pesticide applications]

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O'Brien, Patrick M. 1996. July/Aug 34(4):9-12.
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Zontek, Stanley J. 1996. May/June 34(3):27-28.
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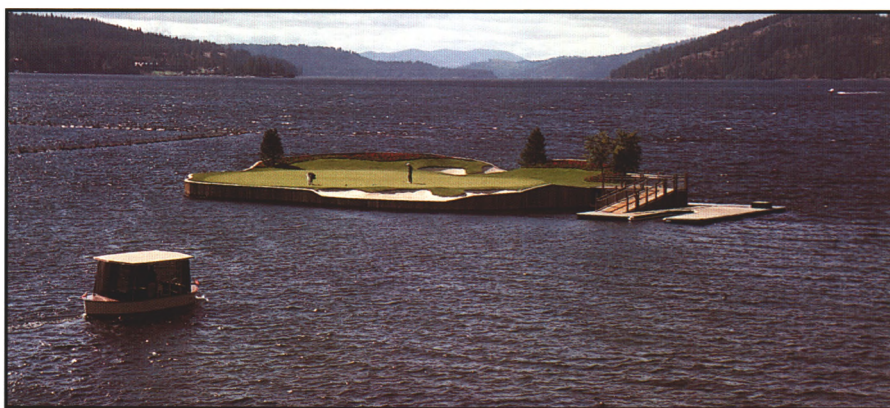
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Are Your Greens Running a Fever?	Vermeulen, Paul H.	1992. May/June 30(3):27.
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7E. MAINTENANCE PHILOSOPHY		
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7E. MAINTENANCE PHILOSOPHY (continued)		
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A Low-Impact Golf Course? Probably Not!	Happ, Keith A.	1995. Jan/Feb 33(1):52.
The Religion of Golf	Gilhuly, Larry	1994. July/Aug 32(4):17.
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Rationale for the Revisions of the USGA Green Construction Specifications	Hummel, Jr., Dr. Norman W.	1993. Mar/Apr 31(2):7-21.
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8B. MANAGEMENT

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Taking Spikeless Shoes Public	Meredith, Sam	1996. Nov/Dec 34(6):6-7.
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The Ups and Downs of Rolling Putting Greens	Hartwiger, Chris	1996. July/Aug 34(4):1-4.
Optimizing the Turfgrass Canopy Environment with Fans	O'Brien, Patrick M.	1996. July/Aug 34(4):9-12.
Hand Watering Greens	Gross, Pat	1996. July/Aug 34(4):17.
Sensible Choices	Vermeulen, Paul	1996. July/Aug 34(4):24.
Back to Basics	Latham, James M.	1996. May/June 34(3):2-5.
Covering Your Tracks	Vermeulen, Paul	1996. May/June 34(3):15-17.
Shallow Aeration: Deeper Is Not Always Better	Zontek, Stanley J.	1996. May/June 34(3):27-28.
Suck-cess [drainage]	Gross, Patrick J.	1996. May/June 34(3):29.
Control Those Shrinking Greens	Happ, Keith	1996. Mar/Apr 34(2):12-13.
A Practical Approach to Putting Green Fertilization	Brame, R. A.	1996. Mar/Apr 34(2):14-16.
S.P.E.E.D. — Consider What's Right For Your Course	Vermeulen, Paul	1995. Nov/Dec 33(6):1-5.
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How Dry I Am	Vavrek, Jr., Robert	1995. May/June 33(3):25-26.
Surround Your Greens With Quality [green surrounds]	Gilhuly, Larry	1995. Mar/Apr 33(2):10-12.
Herbicide-Resistant Creeping Bentgrass	Lee, Lisa, C.Hartman, C. Laramore, N. Tumer & P. Day	1995. Mar/Apr 33(2):16-18.
Turn Off the Faucet!	Gross, Patrick	1995. Mar/Apr 33(2):21.
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Leaching of Nitrate from Sand Putting Greens	Brauen, Dr. Stanton E. & Dr. G. K. Stahnke	1995. Jan/Feb 33(1):29-32.
For Heaven's Sake, Get Some Insurance	Oatis, David A.	1994. Sept/Oct 32(5):17.
Wet Greens — "Let's Try This First"	Carpenter, Les & D. A. Oatis	1994. July/Aug 32(4):5-8.
Armchair Architect	Gross, Patrick J.	1994. May/June 33(3):9-10.
Covering Up For Winter	Skorulski, Jim	1994. May/June 33(3):16-17.
Have an "Ice" Day	Vavrek, Jr., Robert C.	1994. May/June 33(3):17-18.

8B. MANAGEMENT (continued)

Overseeding: It Is A Challenge!
 From Broken Shaft to Soil Probe
 Ball Marks to Bentgrass
 Algae Busters
 'O Holey Night' [aerification]
 Filling Aerator Holes Completely The First Time
 Winter Covers: Are They For You?
 Paint 'em Green
 A Practical Guide to Analyzing the Soil Profile of the Green
 "Shake, Rattle, and Roll!"
 Let Mother Fix It! [maintenance philosophy]
 Time-Lapse Photography and Sunlight Penetration
 Are Your Greens Running a Fever?
 Excelsior Green Covers
 Drainage Improvement — Remedy Without Reconstruction
 in New Zealand
 Back to the Basics for Golf and the Environment

Gast, Chuck
 Brame, Robert A.
 Oatis, David A.
 Foy, John H.
 Connolly, James E.
 Zontek, Stanley J.
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 O'Brien, Patrick M.
 Mascaro, Tom
 Gilhuly, Larry
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 Brame, Robert A.
 Vermeulen, Paul H.
 Vavrek, Jr., Robert C.
 McAuliffe, Keith W.
 Manuel, George B.

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8C. TOPDRESSING

A Successful Topdressing Program Requires Consistency,
 Commitment, and Communication
 Managing Soil Water
 Aeration: Needed More Today Than Ever Before

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8D. STIMPMETER AND GREEN SPEED

The Metallic Mashers of Monocots — Golf Spikes!
 The Ups and Downs of Rolling Putting Greens
 The USGA: The First Hundred Years, The Next Hundred Years
 S.P.E.E.D. — Consider What's Right For Your Course
 "You've Gotta Know Your Limits"
 Stimpmeter® Available Through USGA
 Television Golf and the Golf Course Superintendent
 The Ten Pitfalls of Golf Course Maintenance
 "Shake, Rattle, and Roll!"

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 Hartwiger, Chris
 Fay, David B.
 Vermeulen, Paul
 Oatis, David A.
 Anonymous
 Pate, Jerry
 Brame, Robert A.
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9. GRASSES**9A. WARM-SEASON GRASSES**

TW-72: A Potential New Bermudagrass
 Sensible Choices
 The Environmentally Sound Turfgrass of the Future
 [seashore paspalum]
 FLoraTeX® — A Low-Maintenance Bermudagrass for the South
 The Perfect Grass
 "Working" Bermudagrass Fairways
 Overseeding: It Is A Challenge!
 Out of Africa — a New Look at "African" Bermudagrass
 The Best Choice May Not Always Be Your Favorite
 [turfgrass species selection]
 Introducing an Improved Native: '609' Buffalograss

Hanna, Dr. Wayne W.
 Vermeulen, Paul
 Duncan, Dr. Ronald R.
 Dudeck, Dr. Al E.
 O'Brien, Patrick M.
 Foy, John H.
 Gast, Chuck
 Taliaferro, Dr. Charles M.
 Vermeulen, Paul H.
 Bauer, Barbara

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9B. COOL-SEASON GRASSES		
Sensible Choices	Vermeulen, Paul	1996. July/Aug 34(4):24.
Herbicide-Resistant Creeping Bentgrass	Lee, Lisa, C. Hartman, C. Laramore, N. Tumer & P. Day	1995. Mar/Apr 33(2):16-18.
Fire as a Landscape Management Tool	Weston, John	1994. Jan/Feb 32(1):14-16.
To Seed or Not to Seed	Blomquist, Dave	1993. Nov/Dec 31(6):14-15.
Bentgrass Breeding — Texas Style	Engelke, Dr. Milt	1993. Nov/Dec 31(6):16-18.
Overseeding: It Is A Challenge!	Gast, Chuck	1993. Sept/Oct 31(5):1-5.
Survival of the Fittest [bentgrass nurseries]	O'Brien, Patrick M.	1993. May/June 31(3):22-23.
A Case for Bluegrass Fairways	Latham, James M.	1993. Jan/Feb 31(1):1-5.
"To Pre or Not to Pre" — Summer Annual Bluegrass	Rossi, Dr. Frank S.	1992. Sept/Oct 30(5):15-17.
Weed Control Strategies		
The Best Choice May Not Always Be Your Favorite	Vermeulen, Paul H.	1992. Jan/Feb 30(1):1-5.
[turfgrass species selection]		

10. GREEN SECTION INFORMATION AND AWARDS



Brian Maloy Joins the USGA Green Section	Anonymous	1996. Sept/Oct 34(5):15.
Vermeulen to Head Up Mid-Continent Region	Anonymous	1996. Sept/Oct 34(5):15.
James Moore Takes the Lead on New USGA Program	Anonymous	1996. Sept/Oct 34(5):15.
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Robert M. Williams — 1996 Green Section Award Recipient	Anonymous	1996. May/June 34(3):1.
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Matt Nelson Replaces Bob Senseman in the Northeast	Anonymous	1996. Mar/Apr 34(2):19.
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In Memoriam: Al Radko	Anonymous	1996. Jan/Feb 34(1):18.
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Huck Joins Green Section Staff	Anonymous	1995. Mar/Apr 33(2):20.
Several Green Section Regions are Reorganized for 1995	Anonymous	1995. Jan/Feb 33(1):50.
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Jim and Lois Latham Retire to Texas	Anonymous	1995. Jan/Feb 33(1):51.
Vermeulen Relocates to a Modified Mid-Continent Region	Anonymous	1995. Jan/Feb 33(1):51.
Brame Named Director of North-Central Region	Anonymous	1995. Jan/Feb 33(1):51.
George Manuel Leaves Green Section Staff	Anonymous	1995. Jan/Feb 33(1):51.
Turf Advisory Service Fee Changes for 1995	Anonymous	1995. Jan/Feb 33(1):52.

10. GREEN SECTION INFORMATION AND AWARDS (continued)

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 USGA 1995 Green Section National & Regional Conferences
 Additional Research Funding Approved
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 Turf Advisory Service Fee Changes for 1995
 In Memoriam [Dr. Kenyon T. Payne]
 Kenyon T. Payne — 1994 Green Section Award Recipient
 Green Section Staff Changes [J. Skorulski, R. Y. Senseman]
 USGA Responds to Heightened Environmental Awareness
 Thomas W. Chisholm Named Green Section Chairman
 Dr. Kimberly S. Erusha Named Director of Education
 New Book on Golf Course Irrigation
 In Memoriam — Howard E. Kaerwer
 GCSAA Turfgrass Research Donation
 Fall News Notes: *Landscape Restoration Handbook*
 USGA Research Summaries Available
 TAS Celebrates 40 Years of Service
Green Section Record Marks 30th Anniversary
 Keith Happ Joins Green Section Staff
 Five Golf Courses Cited as Certified
 Audubon Cooperative Sanctuaries
 Ralph E. Engel — 1993 USGA Green Section Award Recipient
 C. Richard Skogley Receives USGA Green Section Award for 1992
 Issues in Golf in the 1990s

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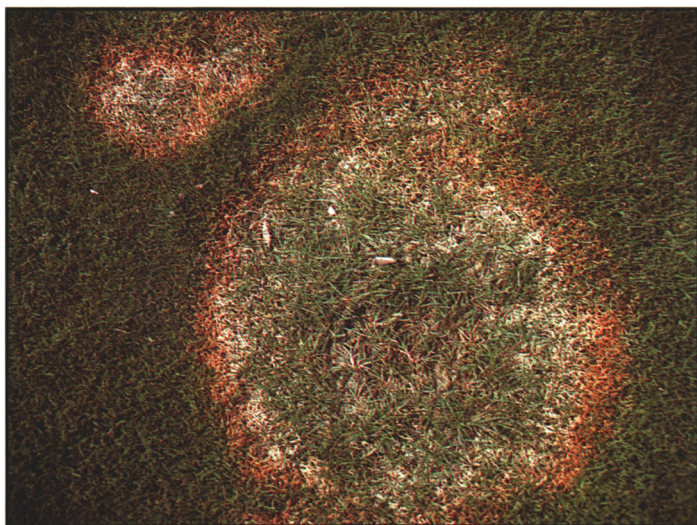
11. IRRIGATION



Hand Watering Greens
 The Magic of Sulfur
 Having Your Morning Coffee Without Donuts
 "For the Birds"
 How Dry I Am
 Managing Soil Water
 What Can You Do If Your Golf Course Has Gas
 [landfill golf courses]
 Rain Making
 New Book on Golf Course Irrigation
 Maps Can Improve Your Environmental Planning Initiatives
 Golf Course Construction: Grow-In Philosophies
 Does Construction Relate to Maintenance Costs:
 Don't Underestimate Irrigation, Drainage, and Soil Systems
 A Quality Control Checklist for Successful Greens Reconstruction
 Using Effluent On Your Golf Course
 Biting the Bullet: Greens Complex Reconstruction
 at the Country Club of Virginia
 From Broken Shaft to Soil Probe
 Applewood Golf Course: Reintroducing the Shortgrass
 Prairie and Links-Style Golf
 The Ten Pitfalls of Golf Course Maintenance
 Planning for Irrigation Improvements
 Sprinkler Head Testing Makes Dollars and Sense

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 Hess, Alan D. 1993. July/Aug 31(4):16-18.
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12. PEST CONTROL



12A. DISEASE

Physiological Management of *Bipolaris sorokiniana*
 Leaf Spot Symptom Expression by Kentucky Bluegrass
 Back to Basics
 Golf Course Construction: Grow-In Philosophies
 Ice and Snow [winter disease control]
 Biological Control of Diseases on Golf Course Turf

Hodges, Dr. Clinton F. 1996. July/Aug 34(4):13-16.
 Latham, James M. 1996. May/June 34(3):2-5.
 Buchen, Terry 1993. Sept/Oct 31(5):11-14.
 Moraghan, Tim P. 1992. May/June 30(3):36-37.
 Nelson, Dr. Eric B. 1992. Mar/Apr 30(2):11-14.

12B. INSECTS AND NEMATODES

Back to Basics
 Black Cutworms: Where Are They Coming From?
 Natural Enemies Reduce Pest Populations in Turf

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12C. WEEDS

Fire as a Landscape Management Tool
 Algae Busters
 "To Pre or Not to Pre" — Summer Annual Bluegrass
 Weed Control Strategies
 Post-Emerge Crabgrass and Goosegrass Control:
 Roundup at the Circle Tree [weed control equipment]

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12D. INTEGRATED, ALTERNATIVE, AND OTHER

Back to Basics
 Mycorrhizal Fungi Benefit Putting Greens
 Canada Geese — Definitely No "Birdie"
 The Old Westbury Code of Environmental Conduct
 IPM, Monitoring, and Management Plans —
 A Mandate for the Future
 Developing Environmental Guidelines for Canadian Golf Courses
 Black Cutworms: Where Are They Coming From?
 Beyond Appearance and Playability: Golf and the Environment
 Fire as a Landscape Management Tool
 Developments in Canada Goose Repellents
 Treat the Symptom . . . or Correct the Cause?
 Simple Fences Minimize Goose Traffic
 Natural Enemies Reduce Pest Populations in Turf

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13. PONDS

Keeping An Eye Out
 Aquascaping: The Natural Approach to Water Features
 You Can Bank On It! [stream bank stabilization]
 Flotation Devices
 Squamish Valley — The Home to Birdies and Eagles
 Grass Carp: Are They Really the Perfect Solution?
 Soil Bioengineering: A Natural Approach to
 Stream Bank Stabilization
 Restoration of Potash Pond
 Concern for Surface Runoff — More on Water Quality

Dodson, Ron 1996. Sept/Oct 34(5):13-14.
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 Oatis, David A. 1995. May/June 33(3):15.
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 Banbury, David 1994. Mar/Apr 33(2):6.
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14. RESEARCH

The Bird Communities of Prairie Dunes Country Club
 and Sand Hills State Park
 TW-72: A Potential New Bermudagrass
 Wildlife Links Grants Announced
 USGA Research Summaries Available
 Physiological Management of *Bipolaris sorokiniana*
 Leaf Spot Symptom Expression by Kentucky Bluegrass
 Sensible Choices
 Back to Basics
 The Environmentally Sound Turfgrass of the Future
 [seashore paspalum]
 Using Common Cents! [research funding]
 Mycorrhizal Fungi Benefit Putting Greens
 FLoraTeX® — A Low-Maintenance Bermudagrass for the South
 The USGA's Environmental Strategies:
 What We've Got and What We Need
 Herbicide-Resistant Creeping Bentgrass
 What Happens to Pesticides Applied to Golf Courses?
 The Fate of Pesticides and Fertilizers in a Turfgrass Environment
 Potential Movement of Pesticides Following Application
 to Golf Courses
 Pesticide Mobility and Persistence in a High-Sand-Content Green
 Volatilization and Dislodgeable Residues Are Important
 Avenues of Pesticide Fate
 Nitrogen and Phosphorus Fate When Applied to Turfgrass
 in Golf Course Fairway Condition
 Pesticide Degradation Under Golf Course Fairway Conditions
 Leaching of Nitrate from Sand Putting Greens
 Potential Groundwater Contamination from Pesticides and
 Fertilizers Used on Golf Courses
 The Impact of Soil Type and Precipitation on Pesticide
 and Nutrient Leaching from Fairway Turf
 Transport of Runoff and Nutrients from Fairway Turfs
 The Effect of Salinity on Nitrate Leaching from Turfgrass

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Investigating the Options in the New USGA Green Construction Recommendations	Gaines, T. Powell	1993. Nov/Dec 31(6):7-10.
Bentgrass Breeding — Texas Style	Engelke, Dr. Milt	1993. Nov/Dec 31(6):16-18.
Developments in Canada Goose Repellents	Cummings, John	1993. Sept/Oct 31(5):6-7.
The Bird Community Found on British Columbia Golf Courses	Moul, Ian E. & J. E. Elliott	1993. July/Aug 31(4):13-15.
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Survival of the Fittest [bentgrass nurseries]	O'Brien, Patrick M.	1993. May/June 31(3):22-23.
Turfgrass and Golf Course Benefits — A Scientific Assessment	Beard, Dr. James B. & Dr. R. L. Green	1993. May/June 31(3):26-30.
Research Update: Potential for Natural Zeolite Uses on Golf Courses	Petrovic, A. Martin	1993. Jan/Feb 31(1):11-14.
Natural Enemies Reduce Pest Populations in Turf	Potter, Daniel A.	1992. Nov/Dec 30(6):6-10.
Out of Africa — A New Look at "African" Bermudagrass	Taliaferro, Dr. Charles M.	1992. July/Aug 30(4):10-12.
USGA/GCSAA Research Results You Can Use	Kenna, Dr. Michael P.	1992. May/June 30(3):6-9.
Biological Control of Diseases on Golf Course Turf	Nelson, Dr. Eric B.	1992. Mar/Apr 30(2):11-14.
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15. ROUGHS

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Wildflowers on Your Course?	Krouse, John M.	1996. Mar/Apr 34(2):8-11.
Managing Wildlife and Habitat	Dodson, Ron	1996. Mar/Apr 34(2):17-18.
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You Can Bank On It! [stream bank stabilization]	Oatis, David A.	1995. May/June 33(3):15.
Surround Your Greens With Quality [green surrounds]	Gilhuly, Larry	1995. Mar/Apr 33(2):10-12.
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16. SAND BUNKERS

A Float Above The Rest	Skorulski, Jim	1996. May/June 34(3):8.
Avoiding the Hazards of Golf Course Renovation	Manuel, George B.	1995. July/Aug 33(4):5-7.
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Ideas You Can Take to the Bunker	Gast, Chuck	1992. May/June 30(3):4-5.



17. SOILS

The Ups and Downs of Rolling Putting Greens	Hartwiger, Chris	1996. July/Aug 34(4):1-4.
The Magic of Sulfur	O'Brien, Patrick M.	1996. May/June 34(3):6-7.
Lay Down Some Rubber	Hartwiger, Christopher E.	1996. May/June 34(3):19-20.
Shallow Aeration: Deeper Is Not Always Better	Zontek, Stanley J.	1996. May/June 34(3):27-28.
Sampling for Results — The Methods Are Important	Happ, Keith A.	1995. Sept/Oct 33(5):1-4.
A Successful Topdressing Program Requires Consistency, Commitment, and Communication	Vavrek, Jr., Robert C.	1995. Sept/Oct 33(5):8-10.
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Composting: Turn Your Eyesore Into Black Gold	Senseman, Robert Y.	1995. May/June 33(3):8.
The Effect of Salinity on Nitrate Leaching from Turfgrass	Bowman, Dr. Daniel C., Dr. D. A. Devitt & W. M. Miller	1995. Jan/Feb 33(1):45-49.
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Mr. Wizard Visits the Golf Course [soils, water quality]	Moore, James F.	1994. May/June 33(3):6-7.
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Biting the Bullet: Greens Complex Reconstruction at the Country Club of Virginia	Hess, Alan D.	1993. July/Aug 31(4):16-18.
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Aeration: Needed More Today Than Ever Before	Vavrek, Jr., Robert C.	1992. Mar/Apr 30(2):1-5.
Drainage Improvement — Remedy Without Reconstruction in New Zealand	McAuliffe, Keith W.	1992. Mar/Apr 30(2):6-10.
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Communication and Golf Course Maintenance	Brame, Bob	1996. Nov/Dec 34(6):1-5.
Don't Kid Yourself	Brame, R. A.	1996. Sept/Oct 34(5):16.
Public Panic Over Pesticides?	Paling, John	1996. May/June 34(3):11-13.
Staying on Course [superintendent tenure]	Foy, John H.	1996. Jan/Feb 34(1):19.
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Evolving Roles in Golf	Roberts, William R.	1993. May/June 31(3):10-14.
TGIF — 'On Call' For You!	Moore, James Francis	1993. May/June 31(3):15.
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18. SUPERINTENDENT ISSUES (continued)

Employment Contracts: The Missing Link!
 Looking at a Bad Year in a Good Light [turf management]
 Is the Grass Always Greener on the Other Side?
 [golf course comparisons]

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1992. Sept/Oct 30(5):21.
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19. TEES

Ergonomic Tee Divot Filling
 Common Sense Cart Paths
 Golf Course Construction: Grow-In Philosophies
 Tee Construction: Use of the Laser Grader
 Warmed-Up But Not Worn Out [warm-up areas]

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 O'Brien, Patrick M.
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1996. May/June 34(3):14.
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20. TRAFFIC

New Zealand.

Taking Spikeless Shoes Public
 The Metallic Mashers of Monocots — Golf Spikes!
 Lay Down Some Rubber
 Surround Your Greens With Quality [green surrounds]
 Common Sense Cart Paths
 Trail Blazing [cart path edging]
 Guideposts for Good Drivers
 Wheels of Misfortune [golf carts]
 Search Your Sole — Remove Your Spikes!

Meredith, Sam
 Gilhuly, Larry
 Hartwiger, Christopher E.
 Gilhuly, Larry
 Oatis, David A.
 Vermeulen, Paul H.
 Latham, James M.
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21. TREES AND LANDSCAPE

The Bird Communities of Prairie Dunes Country Club
 and Sand Hills State Park
 Optimizing the Turfgrass Canopy Environment with Fans
 Developing a Tree Care Program
 Wildflowers on Your Course?
 Aquascaping: The Natural Approach to Water Features
 The Red-Cockaded Woodpecker: An Endangered Species
 in Golf Country
 Recycling for Habitat
 Blowing Your Top! [tree care for wildlife]
 Ozaukee Country Club's Audubon Stepping Stone
 to a Better Environment
 What Can You Do If Your Golf Course Has Gas?
 [landfill golf courses]
 A New Attitude: Audubon, Our Golf Course, and the Community
 Butterflies
 Fire as a Landscape Management Tool
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21. TREES AND LANDSCAPE (continued)

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 Time-Lapse Photography and Sunlight Penetration
 Tree Snags — A Tree Even an Agronomist Can Love!
 Fire in the Hole [tree program]
 Measuring Air Movement for Better Grass
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22. TURF MANAGEMENT RELATED TO THE GAME OF GOLF

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23. WINTER CONCERNS

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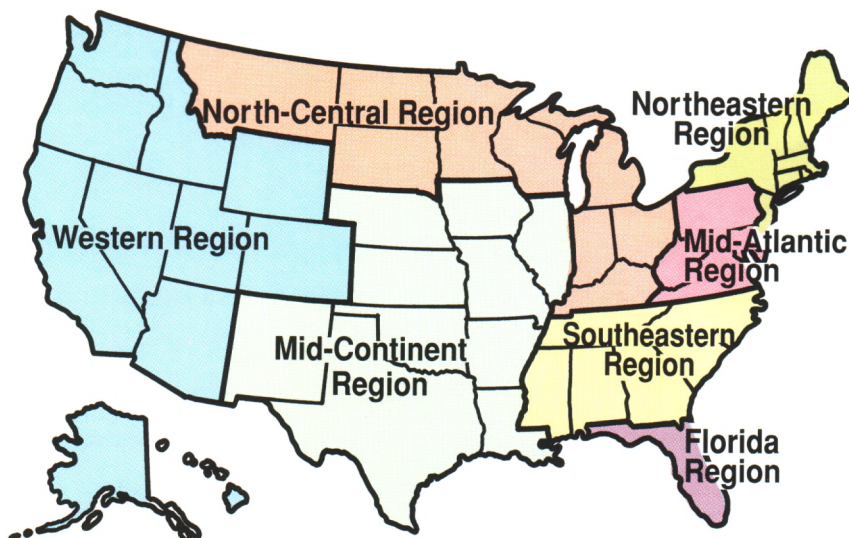
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TURF TWISTERS

ELIMINATE SEASONAL PROBLEMS

Question: I just started a new job at a course located at an elevation of 9,500 feet. When the snow melted I discovered that two of the greens on the back nine were seriously damaged by snow mold. I spoke with the staff members who applied the preventive fungicide application last fall, and they told me that the two greens were treated the same as the other 16 greens. The two greens have good sunlight exposure and apparently have had similar problems in the past. Is there something I am missing, assuming the fungicide treatment was applied correctly? (Colorado)

Answer: Due to the dramatic topography and poorly drained soils that are prevalent throughout the mountainous regions of the West, your fungicide application may have been washed away by running surface water during a midwinter thaw. If surface water from adjacent hillsides is moving across the two greens, try opening a trench around their perimeters in the late fall to divert the flow in another direction.

BY INSTALLING

Question: Almost every year a few of our greens suffer ice damage in the low-lying areas. The greens are soil based and do not drain well, but we cannot afford to rebuild them. Are there any steps that can be taken to reduce the damage? (Nebraska)

Answer: Ice damage on greens often occurs in low-lying, poorly drained areas as a result of the freezing and thawing of water that accumulates from rain or melted snow. Obviously, better drainage is the key. Drainage can be improved with deep aerification, either to the entire green with large equipment or to small portions of the green with pitchforks or drills. However, if the green is soil based, aerification will not provide complete relief. An alternative is to install a drain line into the green that extends into the low-lying area. Prior to the onset of winter conditions, install a riser that extends from the drainage tube to the surface of the green. Cap the riser with a plastic grating that is low enough that it can be mowed over if necessary. Leave the grating in place for the winter. Although it might come into play occasionally, the improved drainage will be worth the inconvenience. Remove the grating and riser the following spring, taking care to mark the end of the drainage tube with a piece of metal. Next winter, the drain line can be found with a metal detector and the riser reinstalled.

IMPROVED EQUIPMENT

Question: Is there an inexpensive method of tracking the cost of maintaining our equipment? (Oklahoma)

Answer: The hour-meters on equipment seldom last as long as the equipment itself and are expensive to replace. An inexpensive substitute can be the time clock used by employees to punch in and out each day. Make a time card for each major piece of equipment. The card should be punched whenever the equipment is taken out and again when it returns. The mechanic can use the back side of the card to record the time spent working on the equipment. At the end of the week, you will have a good record of usage and maintenance hours.