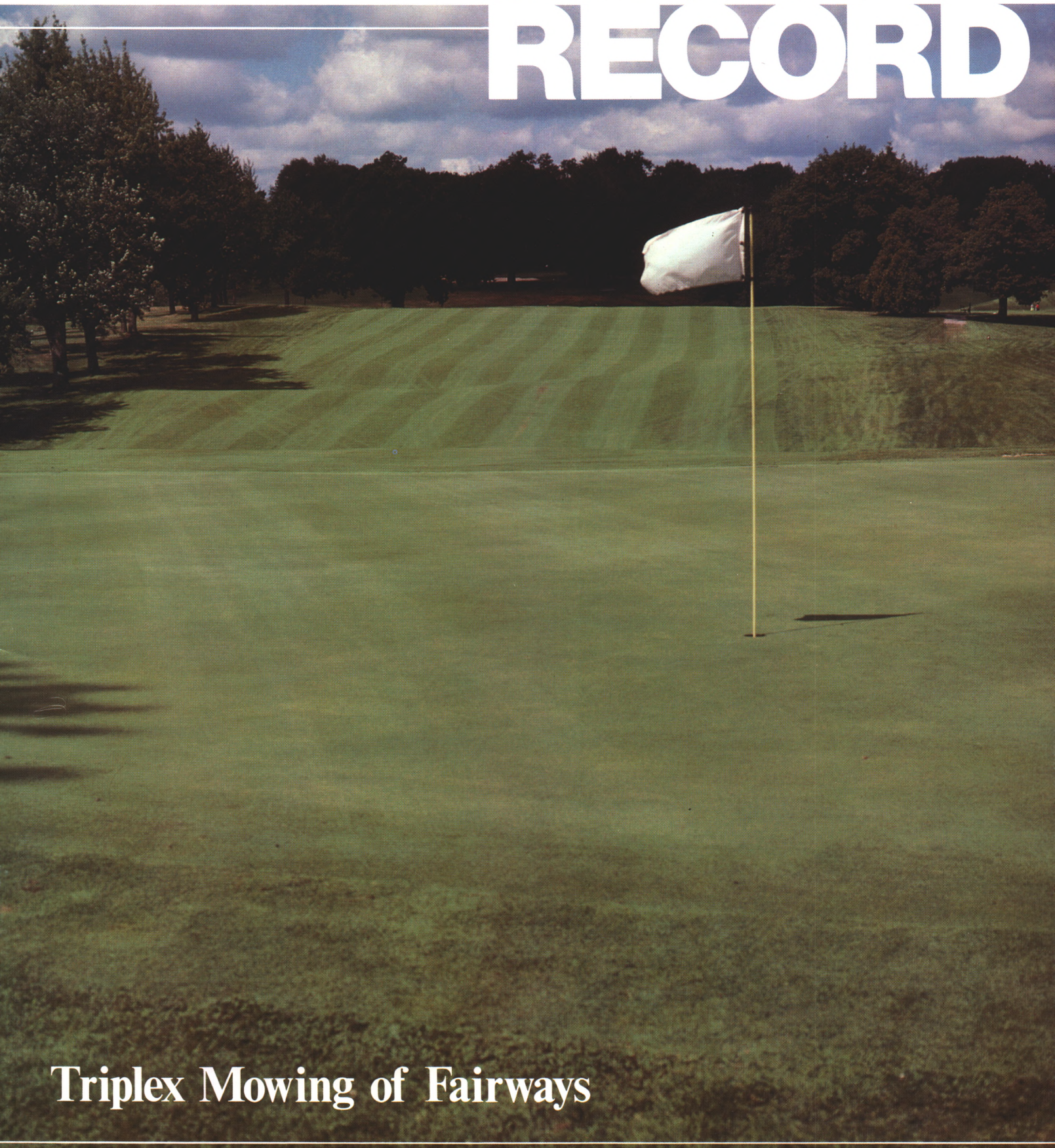


**USGA®**

# Green Section **RECORD**



**Triplex Mowing of Fairways**



**USGA®****EDITOR:**

William H. Bengeyfield

**MANAGING EDITOR:**

Robert Sommers

**ART EDITOR:**

Miss Janet Seagle

Vol. 21, No. 1

JANUARY/FEBRUARY 1983

# Green Section RECORD

**GREEN SECTION COMMITTEE CHAIRMAN:****Stephen J. Horrell**

3007 Dehesa Road, El Cajon, Calif. 92021

**NATIONAL DIRECTOR:****William H. Bengeyfield**

19461 Sierra Luna Drive,

Irvine, Calif. 92715

(714) 544-4416

**GREEN SECTION AGRONOMISTS AND OFFICES:****Northeastern Region:**

United States Golf Association, Golf House,

Far Hills, N.J. 07931 • (201) 766-7770

James T. Snow, *Director*

236 Goldthwaite Road,

Whitinsville, Mass. 01588 • (617) 234-6889

Brian M. Silva, *Agronomist***Mid-Atlantic Region:**

Suite B4, 9017 Forest Hill Avenue,

Richmond, Va. 23235 • (804) 272-5553

William G. Buchanan, *Director*Patrick M. O'Brien, *Agronomist***Southeastern Region:**

P.O. Box 4213, Campus Station,

Athens, Ga. 30602 • (404) 548-2741

Charles B. White, *Director*

5579 Adair Way,

Lake Worth, Fla. 33463 • (305) 968-8146

Steve M. Batten, *Agronomist***North-Central Region:**

P.O. Box 592, Crystal Lake, Ill. 60014 • (815) 459-3731

Stanley J. Zontek, *Director***Mid-Continent Region:**

17360 Coit Road, Dallas, Tx. 75252 • (214) 783-7125

Dr. Douglas T. Hawes, *Director***Western Region:**

Suite 107, 222 Fashion Lane,

Tustin, Calif. 92680 • (714) 544-4411

Donald D. Hoos, *Director*

2001 Main Street,

Vancouver, Wash. 98660 • (206) 695-2181

Timothy G. Ansett, *Agronomist*

1

**They Are Mowing Fairways with  
Triplex Mowers and  
Picking Up the Clippings, Too!**  
*by Stanley J. Zontek*

6

**Controlling Golf Course Maintenance  
Costs — An Owner's View**  
*by N. B. Giustina*

9

**Parasitic Nematode Found in  
Annual Bluegrass Greens**  
*by Larry Costello*

12

**A New Theme for the Green Section  
and Turf Advisory Service:  
"GOLF MAKES AMERICA BEAUTIFUL"**  
*by William H. Bengeyfield*

**Back  
Cover**

**Turf Twisters***Cover Photo:*

*Triplex mowing of fairways  
at Bloomfield Hills,  
Birmingham, Michigan.*

©1983 by United States Golf Association®. Permission to reproduce articles or material in the USGA GREEN SECTION RECORD is granted to publishers of newspapers and periodicals (unless specifically noted otherwise), provided credit is given the USGA and copyright protection is afforded. To reprint material in other media, written permission must be obtained from the USGA. In any case, neither articles nor other material may be copied or used for any advertising, promotion or commercial purposes.

GREEN SECTION RECORD (ISSN 0041-5502) is published six times a year in January, March, May, July, September and November by the UNITED STATES GOLF ASSOCIATION®, Golf House, Far Hills, N.J. 07931. Subscriptions and address changes should be sent to the above address. Articles, photographs, and correspondence relevant to published material should be addressed to: United States Golf Association Green Section, Golf House, Far Hills, N.J. 07931. Second class postage paid at Far Hills, N.J., and other locations. Office of Publication, Golf House, Far Hills, N.J. 07931. **Subscriptions \$6 a year.**





Figure 1.



Figure 2.

# They Are Mowing Fairways with Triplex Mowers and Picking Up the Clippings, Too!

by **STANLEY J. ZONTEK**

Director, North-Central Region, USGA Green Section

**A**T FIRST it may sound ludicrous! On the other hand, it may be one of the most significant advances in fairway management since the invention of the aerifier. What everyone in the Northeast and Midwestern states is talking about these days is the mowing of bentgrass/*Poa annua* fairways with triplex mowers. Even more unlikely, some superintendents are actually catching and removing the clippings from the fairways! What was unheard of in past years became more and more commonplace during the summer of '82. Is there something to this idea after all?

Some golf courses used triplex mowers last summer and caught all clippings every time they mowed fairways. Others used these lighter-weight mowers continuously, but they removed clippings only on some holes or on certain occasions (to pick up *Poa annua* seedheads, etc.). Others used their traditional five- or seven- or nine-gang mowers on some holes and the triplex mowers on others. Members of neighboring courses saw what was going on and, more important, the results of this technique, and planned a similar program of their own for 1983. What started out as a good idea on a

modest scale on a few golf courses has now developed into a program for many others that maintain bentgrass/*Poa annua* fairways in the upper Midwest and Northeast.

**I**T IS DIFFICULT to say exactly where and when this idea of triplex mowing and clipping removal on fairway areas began. With the development of the triplex putting green mowers, the golf course superintendent had, for the first time, a precision piece of equipment to mow large areas of closely cut turf that was not possible with hand mowers or other multi-unit mowers.





Figure 3.

Then, as the equipment aged and normal turnover and replacement took place, many of these machines were available to maintain tees, collars, approaches and, in a few cases, small par-three fairways where traditional tractor-drawn multi-gang units simply could not operate in the confined spaces. The results were dramatic. Turf quality and reliability improved, especially in the difficult-to-maintain putting green approach areas.

Superintendents in the cool-season grass growing areas of this country have always had problems maintaining the approach areas to certain putting greens. These areas, so important to play, receive tremendous compaction and abrasion from the normal flow of traffic onto a green as well as enduring continuous turning of the fairway mowing equipment. Nothing is more disconcerting to a golfer than to see the approach to a green thin and poorly turfed with cuppy lies. It looks bad and it plays poorly.

Common sense and the availability of triplex mowers allows the golf course superintendent to alter fairway mowing patterns and maintain the approaches with less-stressful and less-compacting mowers. In addition, he also has the

option of removing clippings. The results have proven worth the extra effort! Areas treated in this manner improved the first year. They only got better the second and third years. Then, as time went by, something else became apparent. The percentage of bentgrass in these approach areas was increasing. It reached a point where the bentgrass began to predominate over *Poa annua*. It is difficult to explain why, but it actually happened. *Figure 1* illustrates this phenomenon. You can see the line between the triplex-maintained approach and the conventionally maintained and predominately *Poa annua* fairway. This is not an isolated instance. *Figure 2* illustrates a similar case. Simply by keeping the heavy mowing equipment and extra traffic off these areas, the turf is markedly better.

This scenario has been repeated over a great number of golf courses in the Northeast and Midwest during the past few years. What were once summer problem areas became vastly improved simply by controlling traffic, switching to lightweight mowing equipment and removing the clippings.

The observant and ingenious golf course superintendent realized something was happening that was good for

him (less turf loss, less *Poa annua* and more bentgrass), and the appearance and playability of these areas were dramatically improved. The next logical step was to do whole fairways. Generally, the weakest fairway was chosen. It became obvious that where triplexes with baskets were used to catch clippings, the grass, no matter what species, was healthier, much more playable, and showed an increasing percentage of bentgrass.

In the North-Central Region of the USGA Green Section, Cal Gruber, golf course superintendent at the Cold Stream Country Club, in Cincinnati, Ohio, is believed to be the first to mow all fairways with triplex mowers and pick up the clippings. Since he began this program, in 1980, the results have been outstanding. *Figure 3* shows Cold Stream Country Club's fairways during the heat of the summer stress period. Note the quality turf and excellent playing conditions on bentgrass fairways in a part of the country where summer turf stress can be extreme.

**F**OLLOWING THE SUCCESS of this program, plus parallel observations in other parts of the country, the majority of private golf courses in



Cincinnati that have combination bentgrass/*Poa annua* fairways are now triplex mowing all or part of their fairways. Courses such as Oakmont Country Club, in Oakmont, Pennsylvania, site of the 1983 U.S. Open Championship; Bloomfield Hills Country Club, in Birmingham, Michigan; Bob O'Link Country Club, in Highland Park, Illinois; The Country Club, in Cleveland, Ohio (*Figure 4*); and Inverness Club, in Toledo, Ohio, all are currently maintaining their golf courses in this way. Even smaller club-type courses, both nine and 18 holes, have adopted this program. It seems to work wherever it's tried.

The inevitable question of cost has a variable answer. Total fairway acres maintained, clippings removed all or part of the time, frequency of cut, clippings disposed of on site or commercially hauled away, number of

machines used, the cutting widths of the machines, are all important factors. The best information indicates that triplex mowing and clipping removal triples the cost of the physical fairway maintenance operation. This includes just about three times the labor, gasoline, manhours and equipment maintenance and repair costs. It does not include the purchase price for new equipment.

**M**OWING EQUIPMENT has been adapted recently that is more rugged, cuts a wider swath, and generally does a more efficient job than the original triplex putting green mowers. The ideal machine for this chore, however, is still to be developed. Some superintendents have modified current equipment. The adaptations include extra engine cooling vents, extra hydraulic oil coolers, rollers or caster wheels versus skids, engine speed or

cruise control (to reduce operator fatigue), conversion from air-cooled gasoline to water-cooled diesel.

Equipment manufacturers probably will recognize what the superintendents in the field have seen. This type of mowing works, and it is here to stay for many golf courses. The new equipment will require more efficient and reliable lightweight, three- or even five-gang hydraulically driven mowers, capable of clipping removal for those courses that want this option. There's no doubt, new mowers will be on the way.

Remember, we are talking about two different types of operations, plus the added step of clipping removal. Every golf course superintendent seems to have developed his own pattern or technique. There are no fixed standards. For example, some superintendents have their clipping trailers towed behind the machines, others park them

*Figure 4.*





at strategically located areas along the fairways (Figure 5), some collect them for removal in dumpster types of vehicles (Figure 6), others compost or discard the clippings in dump sites on the course. In many cases, the major part of the cost and inconvenience of this program is in clipping disposal. It is a problem, but the advantages realized by those courses that want tight bentgrass fairways with a minimum of *Poa annua* seem to be worth it.

An important part of making a fairway triplex mowing program practical is the careful contouring and reduction in total acreage of fairway turf to be maintained. The majority of courses that use triplex mowers maintain 30 acres or less of total fairway area. Obviously, if one golf course has 50 acres of fairways and another 25 acres, this program is much less practical for the course with 50 acres. Thus, some type of fairway acreage reduction may be necessary on certain golf courses if they wish to adapt this program.

References have been made to the importance of removing the clippings from bentgrass/*Poa annua* fairways where there is a wish to increase bentgrass populations at the expense of *Poa annua*. Skeptics point to putting greens where, for years, they have been

mowed by triplex and/or hand mowers with clippings removed, and still *Poa annua* encroaches, proliferates and even dominates bentgrasses. Contrast this statement to the reality shown by Figure 1 and the field experience of so many superintendents who have seen the fairway triplex effect. One then begins to appreciate the complex agronomic factors that are at work. Remember, we are talking about two distinctly different, yet related, operations. Mowing fairways with lighter-weight equipment for less stress and summer turf loss (no matter what type of grass is involved) and the second step of clipping removal seems to have an effect on the bentgrass/*Poa annua* balance.

In the case of using lighter-weight mowing equipment, one can readily understand how less stress is placed on the grass, less abrasion and less soil compaction. This reduction of stress is particularly evident in all turn areas.

Improvement in fairway quality can also be linked to improved frequency of cut, narrower cutting units that follow the contours of the fairways better, variable reel speeds and the fact that fairways can be more easily angle- or cross-cut. All in all, the mowers, by their basic engineering and function,

improve turf quality for improved fairway playability.

What is *not* so clearly understood is why bentgrasses now compete so much more favorably in the approach and fairway areas and not necessarily so vigorously on greens, just a few yards away. Dr. James Watson, Vice-President of Toro Manufacturing Company, once said, after observing triplex-mown fairways, that probably at least three Ph.D. dissertations will be involved in determining exactly what is happening and why. Certainly, no conclusive explanation of what is occurring agronomically will be attempted here. Rather, an offering of some probable or possible reasons is made:

A. Less compaction. Shallow-rooted *Poa annua* is more competitive in compacted soils than deeper-rooted bentgrass. With less compaction, the bentgrass may be more competitive.

B. Bentgrass is more aggressive at lower fertility levels. With clippings removed, bentgrass can perhaps better assert itself over *Poa annua*.

C. Greater bentgrass aggressiveness at  $\frac{3}{8}$ " to  $\frac{5}{8}$ " cutting heights. Bentgrasses maintained at these heights may have a competitive edge over *Poa annua*. Seldom are turfgrasses grown at their

Figure 5.







Figure 6.

best and most adaptive heights, but rather at the lower end of the spectrum. Perhaps this is why, on a putting green, the bents may not be as competitive as *Poa annua*. They both are being cut closely, stressing both and, perhaps due to annual bluegrass's shallow rooting system, it may be as aggressive, if not more aggressive, than the creeping bentgrass at the closer heights. Thus, bentgrass cut nearer  $\frac{1}{2}$ " may be at its best and therefore more aggressive than *Poa annua*.

D. Lower water requirement. With lighter-weight equipment, the grass plants are put under less stress. This can mean less irrigation in general and less syringing in particular. Bentgrasses have a deeper rooting system and thus a deeper root zone from which to draw water.

E. *Poa annua* seedhead removal. Common sense would indicate that with *Poa annua* seedheads removed, there can be, with time, less seed in the soil to germinate.

F. Heat of clipping decomposition. Decomposing grass clippings generate

heat. Whether or not this heat of decomposition is a factor is open to conjecture.

G. The best weed control is a dense turf. Mowing the turf with lightweight equipment reduces stress regardless of clipping removal. Thus, with a tight sod, *Poa annua* may not have as great an opportunity to germinate.

**S**O FAR, the program has been reasonably easy to sell. Members generally want the best playing conditions possible within their means. By demonstrating this technique on several holes, the member can easily see the improvement on his own course. The impact is even greater when the poorest and most troublesome fairway is chosen and it improves in turf quality beyond expectations.

A field trip and visit to other courses that are or have been on this program for some time is most effective in selling the idea. In this way, influential members, like the Green Committee Chairman, club President, or Governing

Board members can see what the turf looks like, how it plays, and how much it costs. It is one thing to hear about a program of this sort and quite another to actually see it.

Perhaps the most important aspect of this program, at least for the golfer, is improved fairway playability. He is interested in a green turf that is alive, full, dense, and that properly supports the ball. This type of mowing seems to provide that kind of turf.

Surely this technique is not for every club. There are still areas for equipment improvement, and the management and logistics of it can be a headache for the golf course superintendent. It is not a panacea. All the agronomic answers are not in. There is a cost factor that must be considered, and perhaps even recontouring the fairway mowing patterns may be necessary. Nevertheless, a growing number of golf courses in the bentgrass/*Poa annua* fairway regions of this country have turned to this management technique. It has produced results. Those who have tried it have not been disappointed.





*Tokatee Golf Course, Blue River, Oregon.*

# Controlling Golf Course Maintenance Costs - An Owner's View

by **N. B. GIUSTINA**  
Owner, Tokatee Golf Course, Oregon

**M**Y FORMAL EDUCATION is in engineering, and, in the business world, my work has been running sawmills, plywood plants, logging operations, building roads, planting trees, financing the same and fighting the bureaucrats. Many of these experiences have been important to me as a background in operating a golf course. I know the importance of controlling costs. I know how to measure them. I know also that, just like in the lumber business, I must have a saleable product, and that translates into a well-maintained and well-operated course.

I was once an 8-handicapper and so I understand the conditions good golfers want. Because of my logging background, I also know the importance of good, well-maintained equipment. I know the importance of good, well-

taught labor. And I know the importance of good productivity and how to measure it.

In our golf operations at Tokatee, we never forget that we are running the course for the pleasure and enjoyment of our customers. Fulfilling their needs is the only reason for all the jobs on the course to exist. We are nothing without the customer and the member. This was one of the first things I wanted my course superintendent to understand. Another was to tell him in detail and in writing the condition I wanted and expected the golf course to be in. For example, we have a rule that no employee, including the superintendent, is ever to drive or walk past a beer can or piece of paper without picking it up. I require the superintendent to prepare annually a maintenance schedule, with

fertilizers, manhours, equipment, etc., to do the job as expected. Then, we stick with it.

One of our first needs was the development of a method to control costs. We came up with a work assignment sheet, time sheet, and time worked control sheet (see *Figure 1*). With this form, our superintendent develops his daily priorities and makes his daily job assignments. When a workman finishes an assignment, he marks down the time it has taken. These figures are tabulated weekly and eventually are totaled into a yearly report (see *Figure 2*). This permits me to keep track weekly and make comparisons with prior years as well.

At the end of each year, my superintendent and I go through these manhours, one year compared to the next, in detail. When I see an increase of



hours in one area, I ask for an explanation. Sometimes the explanation is satisfactory and the increase is allowed to stand. Such a case happened with us when our electric cart maintenance costs increased. When we found that they increased not only because the usage of the carts had increased but also because we had more of them, the increase was logical. Another benefit of this kind of control is actually having a record of the number of manhours devoted to each function. Take tee slopes. Last year we spent 257 manhours doing this job. At \$10 per manhour, our cost was \$2,570 for the year. With this figure, we can decide whether to continue the same level of maintenance or cut it back, and how much we can save.

**W**E USE ABOUT 11,000 manhours per year, not counting the superintendent, but this does count golf cart maintenance and service hours. This compares, to my knowledge, with other courses that run from this up to 20,000 manhours per year, and courses that are really not any better maintained, as far as playability is concerned, than Tokatee. This, I realize, is a serious criticism of the golf course maintenance industry, but I'm afraid it's true. Most of these courses I am referring to are private clubs.

I don't know the reason for this for sure, but I have noticed, having served on the boards of several private clubs and on green committees of three different clubs, that it seems it's always easier to spend, unwisely, somebody else's money than to spend your own, and I think herein lies the secret. Also, too often I hear the comment, "Money will solve the problem." This is not necessarily true. The problem in most instances is not the green superintendent; rather, it is the green committee or the board, which change from year to year, and whose members are doctors, lawyers, CPAs, salesmen, etc. These people, who work primarily with professional people, are not acquainted with the blue-collar worker. They really don't know what the word "productivity" means, and they believe that if they spend \$200,000 to \$250,000 a year, they must have a course in top condition. They equate spending with good. On top of that, most of these people — and I do say this advisedly — don't really know when a golf course is in good condition.

While it is true I am speaking in generalities, I hope to stimulate your thinking by some examples of my own. To repeat, one must definitely specify,

in writing, the condition in which the course is to be maintained. Then, by keeping proper records, one can keep track of costs. If it takes Joe four hours to mow nine holes of fairway, and when Joe quits you hire Bill, and Bill takes four-and-a-half hours, you, the superintendent, must do something about it. Then, when Bill quits and you get Frank, and Frank takes five hours to do the job, your manhour costs have increased 20 percent. This can happen

and happen very easily. And it does happen!

Let me give you an example. I watched a tee being mowed recently. The operator drove the mower onto the tee, got off, took a walk around the tee picking up the tee markers and placing them about 12 inches out in the rough. The trip around the tee took him a minute and a half. He then mowed the tee. This I did not time. When he was finished, he got off, again walked around

FIGURE 1

# **TOKATEE GOLF CLUB**

# **WORKMAN'S DAILY TIME SHEET**

| Name                  |                         | Date                         |
|-----------------------|-------------------------|------------------------------|
| HRS. OPERATION        | HRS. OPERATION          | HRS. OPERATION               |
| <b>GREENS</b>         | <b>TEES</b>             | <b>NURSERY - Grass</b>       |
| _____ Mowing          | _____ Mowing            | _____ Planting               |
| _____ Poling          | _____ Irrigating        | _____ Mowing                 |
| _____ Irrigating      | _____ Fertilizing       | _____ Trimming               |
| _____ Change Cups     | _____ Repair            | _____ Spraying               |
| _____ Fertilizing     | _____ Cultivating       | _____ Irrigating             |
| _____ Cultivating     | _____ Spraying          | _____ Fertilizing            |
| _____ Vertical Mowing | _____ Ball Washers      | _____ Other                  |
| _____ Topdressing     | _____ Other             |                              |
| _____ Spraying        |                         |                              |
| _____ Brushing        | <b>TEE SLOPES</b>       | <b>NURSERY - Trees, etc.</b> |
| _____ Other           | _____ Mowing            | _____ Planting               |
|                       | _____ Fertilizing       | _____ Spraying               |
| <b>GREEN COLLARS</b>  | _____ Spraying          | _____ Irrigating             |
| _____ Mowing          | _____ Cultivating       | _____ Fertilizing            |
| _____ Fertilizing     | _____ Other             | _____ Cultivating            |
| _____ Spraying        |                         | _____ Other                  |
| _____ Cultivating     |                         |                              |
| _____ Other           | <b>WATER HAZARDS</b>    | <b>MISC. MAINTENANCE</b>     |
|                       | _____ Trimming          | _____ Irrigation System      |
| <b>GREEN APRONS</b>   | _____ Weed Control      | _____ Equipment              |
| _____ Mowing          | _____ Other             | _____ Roads                  |
| _____ Irrigating      |                         | _____ Service Buildings      |
| _____ Cultivating     | <b>BUNKERS - Sand</b>   | _____ Benches, etc.          |
| _____ Spraying        | _____ Raking            | _____ Topdressing prep.      |
| _____ Fertilizing     | _____ Weed Control      | _____ Paths                  |
| _____ Other           | _____ Trimming & Edging | _____ Electric Carts         |
|                       | _____ Other             | _____ Other                  |
| <b>FAIRWAYS</b>       | <b>BUNKERS - Grass</b>  | <b>TREES</b>                 |
| _____ Mowing          | _____ Mowing            | _____ Pruning                |
| _____ Irrigating      | _____ Other             | _____ Leaf Pickup            |
| _____ Fertilizing     |                         | _____ Planting               |
| _____ Cultivating     | <b>WOODLAND</b>         |                              |
| _____ Spraying        | _____ Brush Control     |                              |
| _____ Weed Control    | _____ Tree Care         |                              |
| _____ Dew Removal     | _____ Mowing            |                              |
| _____ Other           | _____ Other             |                              |
| <b>ROUGH</b>          | <b>SWAMPLAND OR BOG</b> | <b>PRO SHOP</b>              |
| _____ Mowing          | _____ Drainage          | _____ Garbage Removal        |
| _____ Trimming        | _____ Weed Control      | _____ Clean Up               |
| _____ Weed Control    | _____ Other             | _____ Gardening              |
| _____ Irrigating      |                         | _____ Maintenance            |
| _____ Other           |                         | _____ Other                  |



the tee, replacing the tee markers back on the tee surface, again in a minute and a half. Total of three minutes of what I call wasted time, times 18 tees, equals 56 minutes — almost one hour.

You may ask, how can that be solved? Let me tell you what we do at Tokatee. We have a person who goes around and specifically changes the tee markers each day. On the days that we are mowing tees, the tee markers are placed out in the rough, or just off the closely mowed tee surface. On the days we are mowing the sides of the tees, the tee markers are placed just at the edge of the tee. In either case, the mower operator does not have to get off the mower, and rarely do we have a conflict where we mow the sides of the tees and the tee itself on the same day.

**O**N A GOLF COURSE, almost without exception, every job is dependent upon the method, the speed, and the desire of the individual. He first must be taught, and then he must be super-

vised, and then he must be taught again to make sure the job is done properly and in proper sequence and in the proper length of time. Your teaching job, as a superintendent, never ends.

As a golf course gets more play, we have to try to figure out how we can do the maintenance when the play isn't as heavy. We at Tokatee, for instance, have split shifts. The employees come back in the late afternoon when the play is light, and they can mow without interruptions. (At least interruptions are minimal.) If the play gets to the point where it is really difficult, I have given my people the authority to actually stop the play on one nine for half an hour or so, and then with that vacant spot in the course the two mowers should be able to mow nine holes in two hours quite easily — the length of time it takes a group to play nine holes.

**A**NOTHER COST control area is equipment. It must be good and it must be kept in good shape. The super-

intendent must know what it can do and the length of time to do specific jobs. Example: we have an F-10 which mows the front side of Tokatee in four hours and 15 minutes. Our F-20 does it in three hours and 30 minutes. This is a seven-gang versus a nine-gang. Also, some equipment comes with several accessories that help immeasurably — the topdresser, aerator, and sprayer are examples. But good, well-maintained equipment makes for lower costs, because it sets the tone for your total maintenance program.

Another area which is perhaps a small point, but one I feel important, is that the shop be kept clean and orderly (not fancy), with every tool put away when finished and in its place *every night*. That has been a rule at Tokatee from day one. This helps from several standpoints: (1) when a person wants a tool, he spends a minimal amount of time looking for it, (2) when tools are found and hung up every night, I don't lose nearly as many tools, therefore my

(Continued on page 13)

FIGURE 2

TOKATEE GOLF CLUB - MANHOURS WORKED

|                         | 1970  | 1971  | 1972  | 1973  | 1974  | 1975  | 1976  | 1977    | 1978    | 1979    | 1980    | 1981    |
|-------------------------|-------|-------|-------|-------|-------|-------|-------|---------|---------|---------|---------|---------|
| Greens .....            | 1,953 | 1,867 | 1,933 | 3,452 | 2,057 | 1,988 | 2,175 | 1,975.5 | 1,812   | 1,791.5 | 1,882   | 1,813   |
| Mowing .....            | 751   | 813   | 909   | 1,084 | 874   | 790   | 824   | 785     | 828     | 849.5   | 873     | 848     |
| Irrigating .....        | 595   | 420   | 433   | 525   | 236   | 155   | 228   | 256     | 82.5    | 144     | 136.5   | 116.5   |
| Change Cups .....       | 195   | 270   | 251   | 436   | 498   | 399   | 397   | 431.5   | 473     | 354.5   | 370     | 382.5   |
| Green Collars .....     | 77    | 65    | 95    | 92    | 118   | 150   | 125   | 196     | 153     | 154.5   | 142     | 128     |
| Green Aprons .....      | 584   | 460   | 481   | 404   | 496   | 403   | 374   | 481     | 572     | 551     | 541.5   | 549     |
| Mowing .....            | 463   | 374   | 425   | 352   | 398   | 298   | 301   | 315     | 350     | 259     | 289.5   | 276     |
| Fairways .....          | 1,175 | 751   | 687   | 784   | 1,274 | 955   | 1,005 | 984     | 991     | 1,085   | 1,056.5 | 939     |
| Mowing .....            | 533   | 542   | 386   | 616   | 689   | 668   | 685   | 686     | 650     | 498.5   | 570     | 487.5   |
| Cultivating .....       | 104   | 16    | 58    | 74    | 155   | 111   | 161   | 152     | 153.5   | 185     | 222     | 167.5   |
| RGH .....               | 1,037 | 977   | 700   | 703   | 654   | 881   | 1,355 | 1,095   | 1,243   | 1,144   | 1,077   | 1,113   |
| Mowing .....            | 392   | 532   | 359   | 336   | 447   | 422   | 462   | 476     | 650     | 390.5   | 520.5   | 513.5   |
| Other .....             | 425   | 251   | 217   | 231   | 103   | 342   | 790   | 475     | 496     | 566     | 556.5   | 599.5   |
| Tees .....              | 425   | 447   | 488   | 446   | 484   | 469   | 622   | 691     | 649     | 772     | 706     | 694.5   |
| Mowing .....            | 235   | 230   | 302   | 300   | 273   | 218   | 220   | 257.5   | 260     | 276     | 269.5   | 294.5   |
| Tee Slopes .....        | 214   | 278   | 285   | 221   | 150   | 175   | 184   | 251     | 242     | 186.5   | 293     | 257     |
| Water Hazards .....     | 140   | 159   | 147   | 18    | 74    | 91    | 61    | 310     | 168.5   | 69.5    | 98.5    | 94      |
| Bunkers .....           | 559   | 331   | 469   | 569   | 421   | 514   | 482   | 432     | 724     | 849.5   | 509     | 600     |
| Raking .....            | 297   | 262   | 314   | 432   | 387   | 358   | 362   | 352     | 373     | 274.5   | 374.5   | 409.5   |
| Woodland .....          | 252   | 57    | 37    | 113   | 69    | 138   | 498   | 733.5   | 422.5   | 207     | 465     | 450     |
| Nursery - Grass .....   |       |       |       |       |       |       | 40    | 58      | 1.5     | 1       |         | 1       |
| Nursery - Trees .....   | 30    | 10    | 7     |       |       |       | 6     | 2.5     |         |         | 2       |         |
| Maintenance .....       | 1,980 | 2,060 | 2,418 | 2,788 | 3,433 | 2,908 | 2,577 | 2,911.5 | 4,334.5 | 3,985.5 | 3,832.5 | 3,922.5 |
| Irrigation System ..... | 188   | 118   | 149   | 175   | 127   | 174   | 101   | 119     | 171.5   | 260.5   | 294     | 212.5   |
| Equipment .....         | 990   | 886   | 1,155 | 1,115 | 928   | 989   | 735   | 948     | 1,330.5 | 1,298.5 | 1,030   | 1,176.5 |
| Roads .....             | 55    | 113   | 109   | 55    | 88    | 53    | 56    | 41.5    | 88.5    | 76      | 36      | 32      |
| Service Buildings ..... | 159   | 179   | 85    | 93    | 148   | 97    | 71    | 182     | 211.5   | 170.5   | 100     | 107.5   |
| Benches, etc. ....      | 65    | 163   | 189   | 132   | 167   | 106   | 90    | 196     | 170.5   | 326     | 123     | 145.5   |
| Topdress Prep. ....     | 28    | 5     | 5     | 10    | 5     |       |       |         |         |         | 5       |         |
| Paths .....             | 256   | 25    | 43    | 60    | 66    | 69    | 62    | 125     | 175.5   | 131     | 98.5    | 100     |
| Electric Carts .....    | 155   | 491   | 505   | 901   | 1,133 | 1,151 | 1,128 | 1,078.5 | 1,376.5 | 1,474.5 | 1,840   | 1,890.5 |
| Other .....             | 79    | 77    | 175   | 245   | 719   | 267   | 334   | 221     | 510     | 248.5   | 306     | 258     |
| Trees .....             | 667   | 413   | 279   | 300   | 754   | 472   | 405   | 448     | 347     | 539.5   | 586     | 495.5   |
| Prune & Remove .....    | 259   | 172   | 66    | 118   | 529   | 267   | 54    | 126     | 122     | 232.5   | 277.5   | 205     |
| Leaf Pickup .....       | 387   | 239   | 206   | 181   | 222   | 194   | 323   | 298     | 223     | 305     | 306.5   | 290.5   |
| Pro Shop .....          |       |       |       |       |       |       |       |         |         | 173.5   | 192     | 129     |
| Garbage & Maintenance   | 203   | 155   | 158   | 141   | 167   | 246   | 118   | 116     | 120     | 79      | 100.5   | 48      |



# Parasitic Nematode Found in Annual Bluegrass Greens

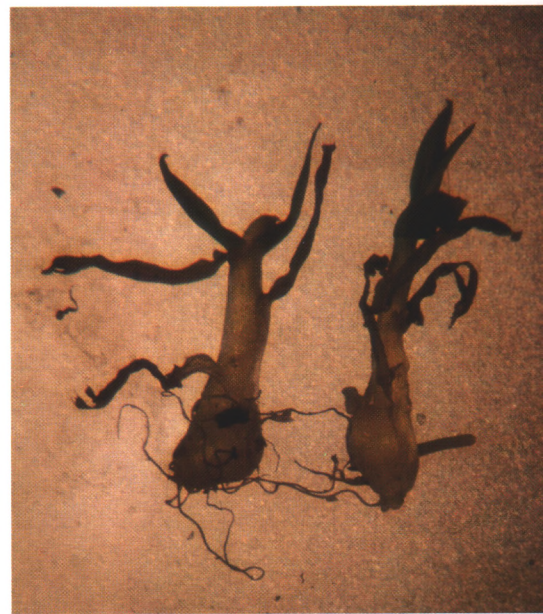
by LARRY COSTELLO,\* U.C. Cooperative Extension,  
San Mateo and San Francisco Counties, California

A PARASITIC NEMATODE, *Anguina radiculicola*,\*\* has caused considerable damage in annual bluegrass (*Poa annua*) greens at coastal courses in the San Francisco Bay and Monterey Bay areas of Northern California. Greens with a yellow, mottled appearance were found to have prominent swellings at the crowns of individual annual bluegrass plants, with less obvious swellings on roots. A close inspection of these swellings revealed microscopic nematodes, subsequently identified as *A. radiculicola*. This nematode has not previously been known as a pest in *Poa annua* greens. It does not appear to affect bentgrasses in infested greens.

*Anguina radiculicola* is an endoparasite, i.e., it feeds within the host plant. The juvenile stage bores into the stem of the host and subsequently matures within the crown, causing noticeable swellings. An infestation causes growth reduction and dieback in individual plants. Dieback is usually preceded by yellowing or chlorosis in the leaf blade. Roots

appear stunted and twisted with swellings (galls). Overall, greens exhibit a mottled appearance, somewhat similar to damage caused by water mold fungi, such as *Pythium* and *Rhizoctonia* species. Infestations do not always appear to be fatal. Often, the nematode seems to feed within the host for a time without causing death. Serious infestation stresses annual bluegrass turf and may predispose it to damage by pathogenic fungi.

*A. radiculicola* is found in Scandinavia, Europe, England, Canada, and along the California coast. Known hosts are all grasses: barley, rye, timothy, and Kentucky blue. Studies using barley have shown that larvae enter through roots and then pass through four molts to become adults in two to three weeks. Eggs are laid after 10 to 12 days, with the life cycle taking 56 to 64 days. Usually only one generation per year develops. Adults measure from 1.0 to 1.5 mm in length. Galls on barley roots measure from 0.5 to 6.00 mm. As many



Gall on *Poa annua* plant resulting from *Anguina radiculicola* infestation.

\*LARRY COSTELLO is the Farm Extension Advisor for San Mateo and San Francisco Counties, California. He received his Ph.D. in plant physiology from the University of California at Berkeley in 1980. He has also served as assistant professor in ornamental horticulture and lecturer in landscape architecture within the University of California system. With this article, Dr. Costello is unraveling one of the most current and perplexing problems some Northern California superintendents have had — mottled yellow greens.

\*\*Although most evidence indicates that the nematode isolated from *Poa annua* galls is *Anguina radiculicola*, there is still some question concerning this identification. It has been suggested that this nematode may be a biotype of *A. radiculicola*.





(Above, left) Annual bluegrass green at San Francisco Golf Club exhibiting damage from nematode infestation (August, 1982).

(Above, center) Annual bluegrass green at San Francisco Golf Club three weeks after treatment for nematodes (September, 1982).

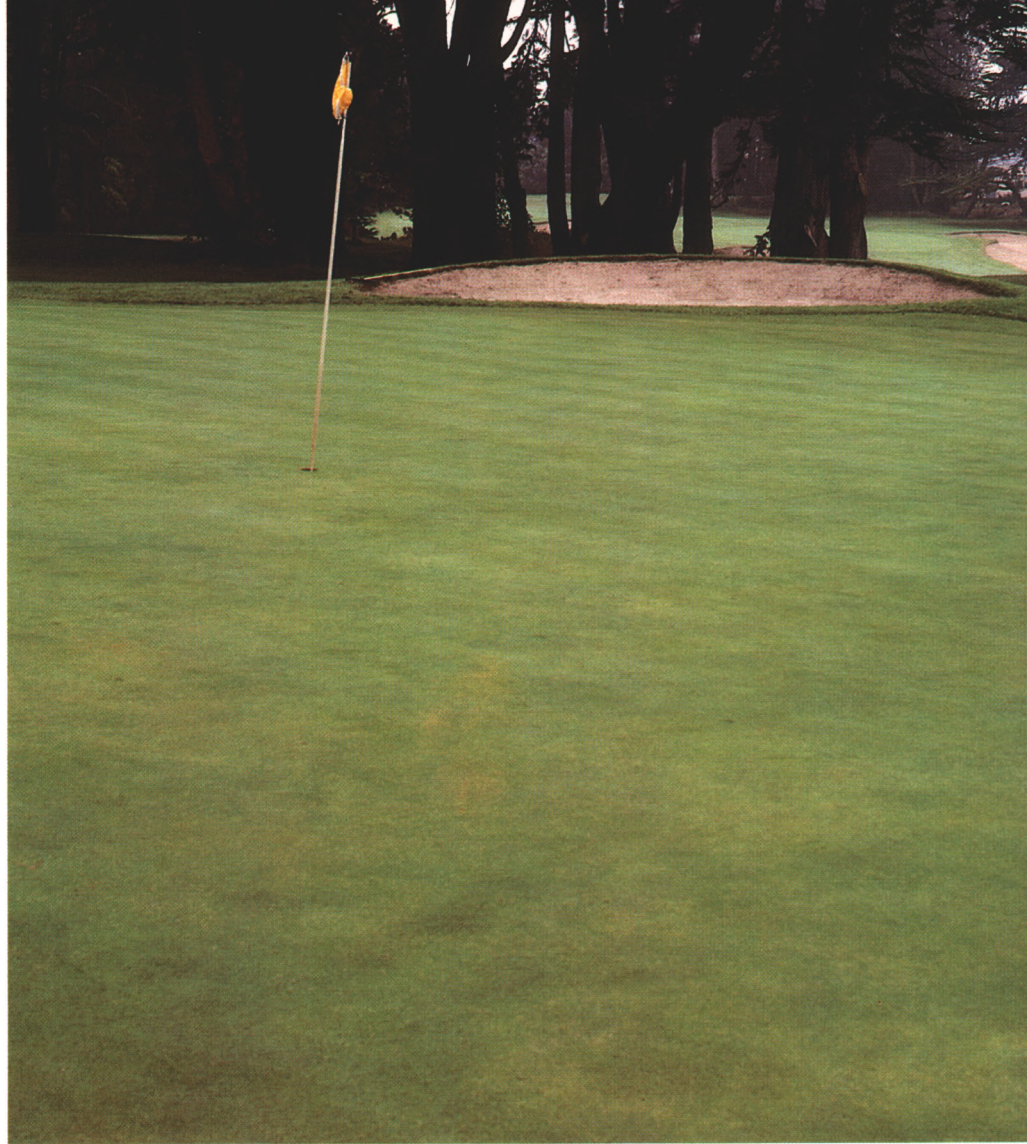
(Above, right) Annual bluegrass green at San Francisco Golf Club six weeks after treatment for nematodes (October, 1982).

as 500 larvae have been found in a single gall. It is not known if the life cycle of *A. radicola* is precisely the same in annual bluegrass as that reported in barley.

**P**ROMINENT SWELLINGS at the crown of individual annual bluegrass plants are perhaps the best indicators of an infestation. Swellings, or galls, resemble miniature onion bulbs. Turf samples from suspected areas can be removed by using a knife and by carefully separating individual plants. Galls on infested plants can be seen easily without magnification. Young galls appear white, while old galls turn brown. Confirmation of the presence of *A. radicola* should be made by a qualified laboratory.

As yet there is no recommendation available from federal or state agencies for the control of *A. radicola* in annual bluegrass. Since this is the first find of this nematode in golf greens, we





have very little information that can be used for practical control. However, a number of considerations must be made when contemplating a control program:

1. Time of application must be considered. In native grasses, *A. radiculicola* is most active in the spring, usually April or May. When these grasses die in late spring or early summer, the nematode aestivates, or enters a dormant stage. There is usually only one generation per year. On golf greens, however, it is not known how many generations may occur. The continual renewal of turf on golf greens may lead to multiple generations. Preliminary evidence has suggested that several generations do occur in greens. As such, repeat applications for control should be necessary.

2. Since *A. radiculicola* is an endoparasite, a systemic nematicide would seem preferable to a contact nematicide. Adults feeding within the host could be controlled using a systemic material, while a contact material may only be

effective against larvae moving from galls to new plants.

3. A material selected for use should have some residual action. Highly soluble nematicides may leach out of the root zone before they reach their site of action. Considering the substantial amounts of water applied to golf greens, this would be an important consideration.

Thus far, Nematicur® and Dasanit® have been used to control *A. radiculicola* in greens at three golf courses in the San Francisco area. Both are highly toxic materials that require permits for use. Results have been encouraging using both materials. Recovery of treated greens occurred two to three weeks after application. Root and top growth have increased substantially. Treated greens appear to respond more readily to fertilizer and fungicide applications. Research on the life history and control of this nematode in golf greens is currently in progress at the University of California, Davis.





USGA

HARRY W. EASTERLY, JR.  
Senior Executive Director

222 Fashion Lane  
Suite 107  
Tustin, California 92680  
(714) 544-4411

# A New Theme for the Green Section and Turf Advisory Service:

A Green Section Turfgrass Service visit has been scheduled to your golf club on:

"GOLF MAKES  
AMERICA  
BEAUTIFUL"

Copies to:

In order that we may be of the greatest possible service to you, the below listed items relating to your programs and management practices will be discussed during our visit. This list has been prepared to encourage a more meaningful discussion of our entire turf program, which will help you obtain the maximum benefits from the service visit.

Areas of special concern or interest will be covered in detail in the written report following the visit.

|          |             |                 |             |            |
|----------|-------------|-----------------|-------------|------------|
| Greens   | Renovation  | Vertical Mowing | Herbicides  | Soils      |
| Tees     | Aeration    | Liming          | Nematicides | Irrigation |
| Fairways | Thatching   | Fertility       | Drainage    | Equipment  |
| Roughs   | Spiking     | Fungicides      | Topdressing | Budget     |
| Bunkers  | Overseeding | Insecticides    | Mowing      | General    |

by WILLIAM H. Bengeyfield  
National Director, USGA Green Section

**H**ERB GRAFFIS wrote those words in autumn, 1982. He then, typically, gave the thought to the USGA for use in developing and promoting Green Section services. But Herb Graffis has always believed in the USGA and its Green Section. He once said, "They have done more for the beauty, attractiveness and the environment of America than any other sports organization or sports activity." His words are not only a tribute to golf, but also to the decades of work of the golf course superintendent, the turfgrass researchers, and the green committees as well.

In this age of big government, businesses, and organizations endeavoring to be all things to all people, the Green Section's future is relatively simple. We plan to continue to do (and improve

wherever possible) what we've been doing best for over 60 years — identifying and supporting meaningful turfgrass research for golf. Then, Green Section agronomists take information directly to subscribing clubs by means of the Turf Advisory Service (TAS). After all, why change something having a 60-year record of success?

Now it is a new year and 1983 stretches before us. Almost every economist predicts uncertain times, and cost consciousness is once again a byword. How can the Turf Advisory Service prove its worth and, at the same time, hold the cost line? Just what can the Green Section do for USGA Member Clubs and their superintendents in times like these? These and similar tough questions have been posed to us over the years. They deserve an answer. Here are a few

of the toughest questions — with answers we trust their equal:

**Question:** Isn't \$450 a lot of money for one visit?

**Answer:** Over the years, many clubs have found one small bit of Green Section advice has saved them many times the cost of the service. In relation to the average golf course maintenance budget today, the annual TAS fee of \$450 (if paid by April 15, 1983; thereafter the fee becomes \$500) is less than 1/4 of 1 percent! And, actually, the \$450 covers more than just a walk in the park and on-site discussions. It also includes:

A. Each visit is followed by a written report, a permanent record of problems and progress.

B. Consultation by correspondence and telephone is always available.

C. All expenses (including travel, salaries, office work, etc.) are covered by the original fee.

D. By maintaining regional offices, Green Section agronomists are able to attend and participate in regional conferences and local meetings. They are able to keep up with turf problems and research station activities in their area.

The Green Section Service, like all USGA activities, is a nonprofit enterprise. By utilizing the services, any club can improve its golf course and its playing conditions. The \$450 fee is established to cover costs only.

**Question:** How can only one visit a year be effective?

**Answer:** The Green Section's purpose is not to tell anyone how to run his golf course on a daily or even monthly basis. Our purpose is not to tell anyone what products to buy, nor is it our intention to become super superintendents. Rather, our purpose is to bring to each club a vast storehouse of information and experience regarding grass plant requirements, how these requirements might best be met and what other golf courses have found to be beneficial and good. The TAS is concerned with efficiency of operation, in developing and maintaining high golf course standards and quality turf. Wastefulness has no place in golf course operations; neither does indiscriminate cost cutting. Emphasis is placed on getting the most for your money — better turf for your golf course. Emphasis is placed on "how good" rather than "how cheap." That's an important consideration in golf course management today! Besides, if a club wants more than one visit a year,



additional visits are possible, and many clubs already take advantage of them.

**Question:** There is so much free advice today (from state university specialists, commercial consultants, salesmen, turf conferences, magazines, etc.), why should we *pay* the Green Section for its advice?

**Answer:** All that you say is true and all of this is to the good. Indeed, the more *factual* information one has, the better he will perform. But there is also an old Scottish proverb that reads, "You get nothing for nothing — and very little for sixpence." Good advice is only as good as its source. "The source" is only as good as its background, experience, and actual performance. The USGA Green Section is the *only agency in the country* devoted solely to golf course turf, its playing conditions, and its management. It has nothing to sell. Each Green Section agronomist averages over 150 on-site golf course visits a year. The total service offered to a club cannot be matched by any individual or agency anywhere in the world!

**Question:** Our club has subscribed to the Turf Advisory Service in the past. However, we have found the visits too general and the reports really didn't tell it like it is. What say you?

**Answer:** We have occasionally heard such criticism from others as well. Believe it or not, we have also been criticized for being too critical and for expecting too much. The Green Section agronomist's training is to deal with agronomic fact; the clear purpose of a Green Section visit is to offer sound agronomic advice. Sometimes it may also be necessary to consider and deal fairly with other facts and circumstances as they affect a particular situation. Nevertheless, if a club or superintendent asks specific questions relating to turfgrass science, they deserve and can expect to receive specific answers from the Green Section scientist.

**Question:** Will the Turf Advisory Service save our club money?

**Answer:** Almost anyone can study a golf course maintenance budget and soon find ways of cutting costs and saving money. The real trick is to save money without impairing the long-range quality or condition of the golf course, i.e., to spend wisely what is available. Our knowledge of golf course budgets leads to the belief that considerable sums are frequently wasted. The waste comes in a variety of forms:

A. Membership whims and requests that add little to long-range improvements but much to the budget.

B. Unnecessary equipment purchases.

C. Not purchasing *needed* equipment and labor-saving items.

D. Purchasing high-cost supplies and materials because some outside agency promises *better growth, less water use, released locked soil nutrients, eliminate tile and drainage needs, reduce labor requirements* (but doesn't get the job done), *will eliminate compaction, etc.*

Yes, the Green Section can save your club money! It will do so by strengthening the hand of the golf course superintendent, the green committee and the entire turf management operation. It will assist your club in maintaining the best possible golfing turf at whatever expenditure level chosen.

The Turf Advisory Service is being used by the biggest and smallest golf courses in the land today. Day after day, year after year, the USGA Green Section has helped advance the cause of quality turf for golf. Write Golf House, Far Hills, New Jersey 07931, for the sake of your turf management program in 1983. Remember, **GOLF MAKES AMERICA BEAUTIFUL** — and the Green Section plays its role every day of every year.

---

## MAINTENANCE COSTS (Continued from page 8)

replacement cost is also minimal. I believe this further sets an example for the complete operation of a golf course, that is, neatness and cleanliness.

Another important item for control is gasoline. I am absolutely amazed at the sloppiness I have seen in this area. We keep track of every gallon pumped and where it goes. The tank is measured before and after gas is delivered, and is checked at the end of every month, and the inventory had better be in close balance.

Shop heat. Everyone should be using a wood stove to heat the maintenance shop, at least in the Northwest. First, you have your wood for free. You now do at least some cutting and hauling to the shop area. So, with a little more labor you can have your wood prepared on site.

I recently read an article in *American Forests*\* that analyzed cost of wood versus other fuels. It showed that oil, at \$1.20 per gallon (perhaps higher than ours), and wood, starting with the cutting down of the tree, cutting, hauling, and

stove tending, using \$6 per manhour for labor costs, had the same approximate cost per 1,000 BTUs. On most of our golf courses, the trees and the material are already down, or must be cut, and must also be cleaned up. And many must spend money to take or send this material to the dump. So by this analysis, our wood is cheaper than oil. This is another way to save costs, and controlling costs is the name of the game.

**T**O SUMMARIZE, I believe we must have everything orderly, neat, and clean. Budget manhours for all maintenance functions. We must be organized in the assignment of work. We do it in writing so there is no misunderstanding. There is no "make-work time" and our equipment is well maintained and as modern as we can get. We go through it every winter, and we get it ready for the growing season, and we are continually looking for ways to save wasted time, as well as looking for equipment that will do the job more efficiently, which

means doing the same job with a lower overall cost.

We are maintaining our golf course for the enjoyment of our customers, not to satisfy our personal ego. We are spending our money as if it is ours — or mine — which it is.

\*"Does It Really Pay to Heat with Wood?" by David E. White and G. Edward Wilson from the December, 1981, issue of *American Forests*.

### EDITOR'S NOTE:

We want to acknowledge and express thanks to Dr. John King, University of Arkansas, for his ideas and concepts in developing Tables 1 and 2 found in Charles B. White's article "Sand — The Building Block," in the September/October 1982 issue of *THE RECORD*.



# TURF TWISTERS

---

## NOT MUCH ACTION

**Question:** During the winter our bentgrass greens become excessively fast. What are your ideas of the cause and how best to correct the situation? (Texas)

**Answer:** It is our experience with these greens that the height of cut has to be raised slightly going into the winter to avoid excessive speed. The greens will also wear better during the winter at the higher cut. Probable causes include slower winter growth rates, lower soil moisture levels, tight or frozen soils, a tendency for the grass blade to lie down and the turf to become grainy. There's really not much action in nature's world during the winter.

## WITH SODIC SOILS

**Question:** What is a sodic soil? (Illinois)

**Answer:** Sodic soils are those containing sodium, mainly sodium chloride. The term is generally used to distinguish a soil having sodium problems from one having problems from other soluble salts.

## BUT LOTS OF COMPANY

**Question:** How much does water quality affect the pH of a soil? I'm going to be using a lower-quality water for irrigation in the future. (Missouri)

**Answer:** So are a lot of other turfgrass managers! Poorer water quality is on its way, and it is a factor whether you are using it for tank mixing pesticides, irrigating turf, or washing your car. Remember, when water is applied to the soil, it evaporates in the pure state, leaving behind its salts and minerals. Even when leaching through the soil, water tends to be purified, leaving behind residues that may be beneficial or detrimental to plant life. For this reason, testing irrigation water will be as important in the future as testing your soils — especially if it is of poor quality. The type of water used in irrigation has a very definite effect on turfgrass management plans.