

USGA GREEN SECTION RECORD

A Publication on Turf Management
by the United States Golf Association

MAY/JUNE 1978



Public Golf Deserves Better Turf



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COVER PHOTO: *Kayak Point Golf Course, Washington. A dramatic beginning hole for a new county-owned golf course.*

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A typical first tee at a municipal golf course.

The Public Parks Golfer Deserves Something More Than Mediocre Golfing Turf!

by WM. H. BENGLEYFIELD, Western Director and Publications Editor

FOR THE MILLIONS of America's public parks golfers, playing the local municipal course this year once again will be fraught with frustration, disillusionment, and in some cases, right onto entrapment. Television has shown us the magnificent green and well-groomed courses of the U.S. Open, the Masters, and the PGA Championship. Magazines have enticed us with full-color spreads of golf equipment and clothing. And so the butcher, the baker, the candlestick maker — the public parks golfer of America — heads for his own municipal golf course this summer with head held high and equal hopes.

What does he find? More often than not, dusty tees, rock-hard fairways, bone-dry creeks, boulder-infested bunkers, disease-plagued greens and weeds galore! He deserves something better. Indeed, it is a tribute to the public golfer and the haunting, beckoning qualities of the game itself that public golf continues to grow in these days of fierce competition for recreational attention.

The public parks golfer deserves more than mediocre golfing turf. Today's golf course super-

intendent can produce exceptionally high-quality turf if he is given the proper support. The problem is not one of turfgrass science (although the course superintendent is the first to be blamed for poor conditions). The problem is not one of heavy, continuous play (there are too many topnotch resort courses playing over 200 rounds of golf a day, seven days a week that still remain in excellent condition). The problem is not even one of economics (just look at some municipal golf course maintenance budgets).

The problem is one of golf course administration!

NOT ECONOMICS?

How can that be? Many municipal golf course maintenance budgets today are equal to or in excess of those at most private golf clubs in the same geographical area, yet there is no comparing the turfgrass quality or playing conditions. Further, if a metropolitan 18-hole municipal course plays 30,000 to 40,000 rounds of golf a year (a fairly conservative figure), and if the green fee averages

\$5 a round (not unreasonable by today's standards), the course generates an income of \$150,000 to \$200,000 a year. This seems quite adequate for the production of good golfing turf over 18 holes. It seems especially adequate if property and other taxes (as well as water rates) are minimal. If there is an outstanding indebtedness, higher green fees may be justified. Certainly the clubhouse, pro shop, cart rentals, etc. should be self-sustaining if not actually adding to the total income of the golf course operation.

But how can a golf maintenance budget of \$200,000 a year be adequate when equipment, operating costs and municipal worker benefits push the actual operating figure to \$250,000 or more a year? In plain and simple terms, IT CAN-NOT. The best management in the world cannot overcome unreasonable and everescalating costs imposed by civil service or other type municipal unions. The City of San Francisco proved this two years ago (see "The Strike at the San Francisco Municipal Golf Courses," September, 1976, *USGA Green Section Record*). The union demanded and went on strike to gain wages of over \$17,000 a year, plus other benefits, for each golf course laborer. Inevitably, the house of cards had to collapse and it did. The municipal golf courses in San Francisco suffered unbelievable damage in a senseless, wasteful loss of a public recreational facility. There were no winners.

POLITICAL JUGGLING

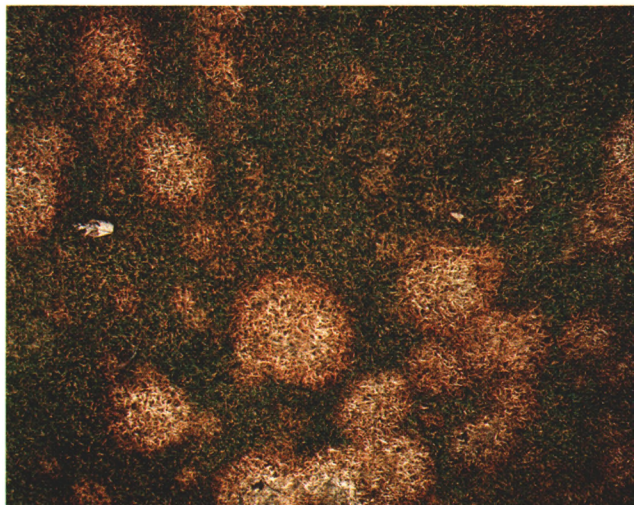
A few years ago, another major western city faced similar civil service demands. Since the treasury was already bare and the taxpayers near revolt, the City Council found a solution, at least from their point of view. Although they could not meet the monetary demand, they could offer an additional 15 days "sick leave" to the employee's benefit schedule. Thus the annual "paid non-work days" added up as follows:

- 21 Paid days vacation (5 years service)
- 12 Paid holidays
- 10 Paid days sick leave
- 15 Paid days additional sick leave
- 58 Paid non-working days

It is virtually impossible to operate any golf course, let alone those with an already minimal crew, under such circumstances. Of course, the 58 paid non-work days were in addition to medical and retirement benefits already in place.

These are problems of golf course administration, not those of turfgrass culture or science. They are self-inflicted political problems and therefore receive political solutions. The difficulty for the golfer and the course superintendent is that golf courses do not respond to political solutions. Sound turfgrass management principles cannot overcome unsound political judgment. The result: mediocre turf!

Most municipal golf courses come under the jurisdiction of city park and/or recreation depart-



Must the municipal golfer endure disease-plagued greens?

ments. For golf, this may not always be the best arrangement. Granted, there are many examples of good municipal courses organized in this manner. However, it appears to depend largely on the philosophy and orientation of the director of the department. For example, if the director is dedicated to zoological gardens, it seems unlikely to expect much improvement in golf facilities.

Universities are turning out more and more park and recreation graduates with a new and different orientation from past years. Their mission is toward mass participation, the so-called broader aspects of public recreation; i.e., bike trails (frequently along the right side of very busy highways), lighted ball fields, jogging trails, outdoor basketball and volleyball courts, picnic areas, etc. These facilities are justly deserved. Nevertheless, they do not produce a revenue. Golf is not only a revenue producer, but it also continues to grow (up 5 percent nationwide in 1977) in popularity. Unfortunately for municipal golf, golf revenue is frequently lost in the General Fund.

"OVERADMINISTRATION"

Overadministration is another malady of municipal operations. It may be the result of the modern business school syndrome. The theory is that middle management will be more efficient, costs will be reduced and everything will come up roses if everyone is cross-trained in his or her department. This administrative concept was put to its full test recently in another major city. The city golf courses, a few years earlier, had been transferred to the Department of Public Works. Believing in progress, efficiency and business school techniques, the Department Head decreed all foremen will be "cross-trained." This called for the golf course foreman to spend six months in charge of a street repair crew while his counterpart moved over to the golf course! Knowing nothing of grasses,

diseases, pesticides or golf (and caring less), one can imagine how well he performed and how the golf course fared that summer.

Overadministration has also come into play through elected officials or new City Managers. In one actual incident, a new City Manager determined the golf course would no longer buy potable water for irrigation but use instead effluent water from the City treatment plant. Furthermore, the golf course would continue to pay the same price for the effluent water. Great idea! Buying the effluent would reduce the sewerage department's operating cost and the golf course would lose nothing. It would be a feather in a hat of city management. Right? — Wrong! Just a little research or a willingness to listen to the protests of the golf

superintendent would have shown otherwise. The same idea had been tried several years earlier and the golf course nearly went out of business. It seems the effluent water from this treatment plant has extremely high salts and is totally unsatisfactory for golf course use. Nevertheless, the new City Manager prevailed and the effluent was used. The loser, once again, was the golf course and the public parks golfer.

"THERE AIN'T NO SUCH THING AS FREE GOLF"

Surprisingly, some share of responsibility for golf course red ink must be placed with the golfer himself. The philosophy of the Depression still exists at too many courses. "Giveaway golf" has not lost

A new municipal golf course and a poor irrigation system.



its appeal. Special rates remain in effect for certain age groups, time of the day or week. Monthly and seasonal tickets are available at tremendous savings. In some cities it is possible to buy a season ticket and play 18 holes of golf every day for 75¢ or less a round! Try to raise or eliminate the special rates and you will soon incur the wrath of the same people demanding a better golf course.

Does it seem unreasonable, in this age, for municipal golf courses to charge a fair green fee for a course in good condition? Privately owned but public fee courses must do so to survive. Junior

and senior citizen rates may still be offered, but these rates should be available only during slow periods of the week. If the public golfer is to have better municipal courses, he must be willing to pay something more than 75¢ a round. There is no such thing as a cheap palace.

PREREQUISITES FOR PROGRESS

What, then, can be done if better turfgrass conditions are to come to our city golf courses? Is contract maintenance the answer? What are the alternatives?



A neglected bunker or a grass bunker?





A thundering herd played a wet golf course.

Number One: Municipal golf course administration must be improved. It must be removed from politics and placed in the hands of those who understand the requirements and business of golf. The investment in the facility is too great today to turn its administration over to anyone else.

One sound approach may be through appointment of a totally independent and dedicated long-range board of golf commissioners or a similar structure — in effect, a non-paid board of directors for public golf. Their numbers should be few. Ultimately, they become responsible (to the city fathers) for the entire golf course operation. If not completely separate from the Parks and Recreation Department, golf operations should at least be a distinct entity within that department. Golf is a business and, to be successful, must be managed as a business. This type of structure would also lend itself to contract maintenance arrangements.

CONTRACT MAINTENANCE

Contract maintenance (i.e., the maintenance and/or operation of the course by private enterprise under contract to the city) surely has distinct advantages. It has been talked about for years and gradually the bugs are being worked out of the idea. The city is relieved of increasing operational costs and political pressures. Private enterprise can do the job better if given a fair, open chance,

and the golfer and the general public are the final benefactors.

For contract maintenance to be successful, however, the contractor must be totally reputable, knowledgeable and experienced in golf. He must also be local. Long-distance contracting removes the personal touch and daily involvement so essential to success in any turf management operation. It is the sense of permanence, dedication and stability — i.e., the personal involvement — that adds up to better turf for golf. Low bidder will rarely succeed in this business. Indeed, the entire concept of contract maintenance pivots solely on the integrity of the contractor. Without it, the concept is doomed.

IS THIS A DREAM?

Can a plan actually be devised whereby a majority of our municipal golf courses actually provide good golf turf? Can dusty tees, rock-hard fairways and disease-plagued greens be eliminated? We do not need more turfgrass research to move the public golfer onto green fairways. The tools and knowledge are already at hand. We need more common sense; we need better administration of the millions of dollars municipalities now pour annually into their mediocre golf courses. With better administration, the butcher, the baker and the candlestick maker will enjoy golf more.

Soil Testing for Turfgrasses

by THOMAS R. TURNER, Graduate Research Assistant, Pennsylvania State University

SOIL TESTING is the primary tool in determining soil fertility status and nutrient requirements of turfgrass. In Pennsylvania alone, 7,083 soil samples from turfgrass areas were analyzed in 1976 and 1977. Despite the general emphasis placed on the use of soil testing for determining phosphorus, potassium, and lime requirements, little research has been done directly relating soil testing to turfgrass areas. Each phase of the turfgrass soil testing program — sampling, laboratory analysis, the correlation and calibration of soil test results — should be thoroughly investigated if meaningful fertilizer recommendations are to be made.

Research presently being conducted at several universities should provide some of the needed information regarding turfgrass soil testing. At Penn State, soil test research for turfgrass areas is being supported by grants from the O. J. Noer Research Foundation and The Pennsylvania Turfgrass Council. Recently completed efforts regarding turfgrass soil testing consisted of a study of soil sampling procedures and a survey of seven turfgrass soil testing laboratories to determine differences that currently existed in procedures and recommendations.

Obtaining a representative soil sample is essential if reliable fertilizer recommendations are to be made. Nevertheless, sampling has generally been recognized as the largest source of error in testing programs. Recommended soil sampling procedures for maintenance fertilization require samples two to four inches in depth, with any thatch material being discarded. Studies were therefore initiated to understand the effects of both sampling depth and thatch on soil test results.

Soil samples were taken from turfgrass areas with known fertility histories in 1.5- or 2.0-inch increments to a depth of six inches. Soil samples were also taken from these areas both with the thatch material and without it. All soil fertility values were affected by sampling depth in at least

one of the areas sampled. The magnitude of change and whether values increased or decreased with depth appeared to be dependent on the past management, with factors such as fertilization, irrigation, top-dressing, and level of soil modification having some influence.

Generally, nutrient levels tended to decrease with depth when the area had received maintenance applications of the respective nutrients, while pH tended to increase with depth (**Table 1**). These results were attributed to higher organic matter levels near the soil surface and to the slow downward movement through the soil of surface-applied nutrients.

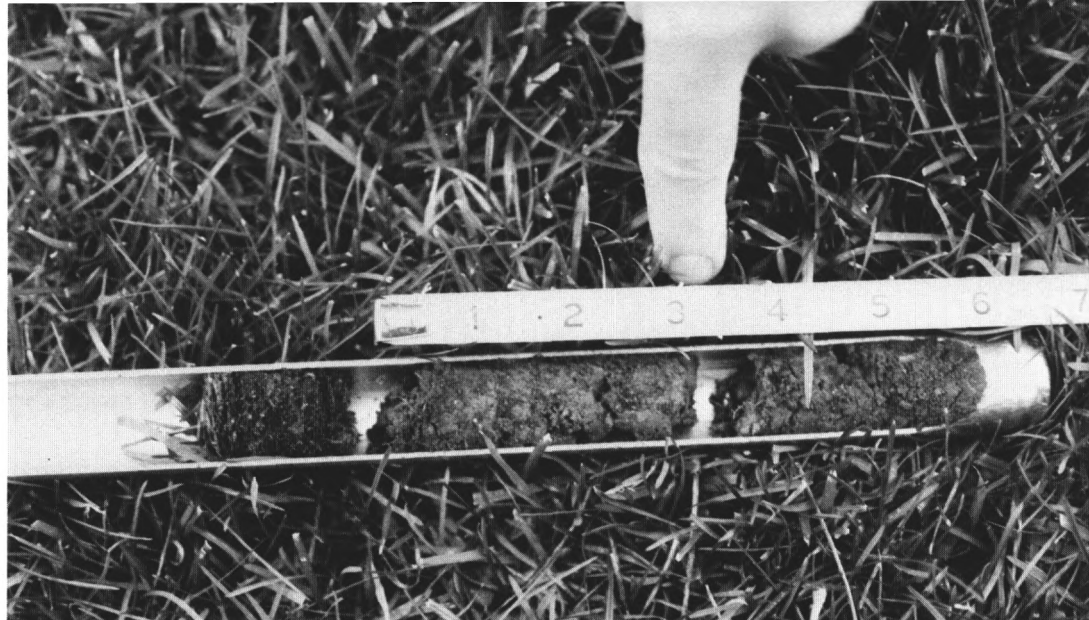
On bentgrass plots that had received different rates of phosphorus fertilization, however, soil phosphorus levels increased by 14 pounds per acre from the 0- to 2-inch to the 2- to 4-inch range where no phosphorus was applied. At the same time, values were lower by 65 pounds per acre in the 2- to 4-inch layer where 9.2 lb P_2O_5 /1000 ft² was surface-applied annually. Apparently nutrient removal by the turf was greatest in the surface two inches, resulting in a depletion of phosphorus near the surface when none was applied. When phosphorus was applied, it accumulated near the surface. This result indicates that a two- or three-inch sample is probably more representative than a deeper sample.

These relatively large changes in soil test values with sampling depth would indicate that sampling to an exact depth would be critical for obtaining reliable fertilizer recommendations. However, because of the wide range of soil test values associated with each prescribed rate of nutrient application, fertilizer recommendations were not greatly affected by sampling depth. Therefore, contrary to past warnings in the soil sampling procedure, small variations of from half an inch to one inch from the recommended sampling depth do not appear to be of great importance.

TABLE 1
The effect of sampling depth on the soil test results
of an area receiving phosphorus and potassium applications.

Depth	Soil Test Results					
	pH	P	K	Mg	Ca	CEC*
inches		lb/A		meq/100 g		
0-2	6.7	143	0.49	1.9	7.4	11.7
2-4	6.8	117	0.31	1.2	7.7	10.9
4-6	6.9	91	0.29	0.9	7.8	10.4

*CEC — cation exchange capacity



Thatch and sampling depth affect soil test results. Most labs recommend thatch removal and a sampling depth of 3 inches for established turf.

Although it is generally recommended that the thatch material be discarded from the soil sample, roots are present in the thatch layer and surface-applied nutrients must move through this layer before reaching the soil. Therefore, soil samples which contain the thatch layer may be more representative of an area than samples from which thatch is removed. Results from several test areas in this study showed that nutrient levels, especially potassium, were higher in samples which contained thatch, whereas the pH was generally lower (**Table 2**). Potassium fertilizer recommendations were lowered by as much as 3.0 lb K₂O/1000 ft² and limestone recommendations increased by as much as 50 lb/1000 ft² when thatch was included with the soil sample. It is apparent from these results that present recommendations regarding the handling of thatch when sampling the soil should be carefully followed; however, further studies need to be conducted on the availability and use of nutrients in the thatch layer and whether the inclusion of thatch with the soil sample would result in a more representative sample. Studies are presently being initiated that will hopefully answer some of these questions.

The survey of turfgrass soil testing laboratories, which consisted of sending soil samples

and a questionnaire concerning different aspects of turfgrass soil testing, showed that many differences existed among laboratories in procedures and recommendations. Although these differences occurred in several areas, the most important were found in the interpretation of soil test results and the resultant fertilizer recommendations. Each of the laboratories received subsamples of seven soil samples. They were requested to analyze each sample and report the test results and recommendations for the maintenance fertilization of a Merion Kentucky bluegrass tee.

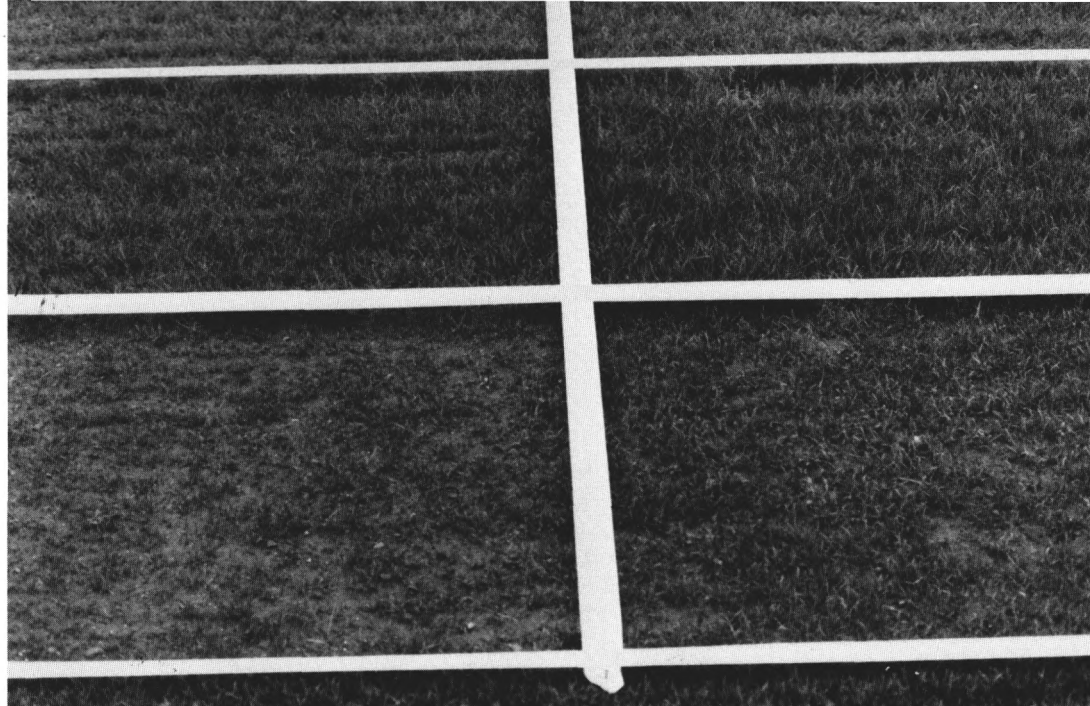
Recommendations among the laboratories for a given soil varied by as much as 5 lb P₂O₅/1000 ft², 6 lb K₂O/1000 ft², and 180 lb limestone/1000 ft². Recommendations for two of the soil samples are shown in **Table 3**. Although laboratories using the same chemical extractants usually reported similar soil test results, fertilizer recommendations still were often considerably different.

Several factors, including differences in soils and climate in the region of the individual laboratories, may have contributed to the wide range of recommendations for a given soil sample. The primary reason for the differences, however, probably can be attributed to the lack of turfgrass soil testing research upon which recommenda-

TABLE 2
The effect of thatch on soil test results.

Type of soil sample	Soil Test Results					
	pH	P	K	Mg	Ca	CEC*
		lb/A				
				meq/100 g		
with thatch	6.7	125	0.20	2.1	7.9	12.2
without thatch	6.8	118	0.11	2.0	7.8	11.4

*CEC — cation exchange capacity



Turfgrass responses, such as seedling vigor, are useful in soil test calibration studies. Phosphorus application (right) increased seedling vigor and density of Kentucky bluegrass (bottom), perennial ryegrass (middle), and chewings fescue (top).

tions must be based. These wide differences in recommendations point to a critical need for turfgrass soil test calibration data, i.e., relating turfgrass response to the application of different rates of nutrients on soils with different initial fertility.

Unfortunately, most turfgrass fertility research in the past has not been designed to be of direct value to soil testing. Thus, one of the major efforts at Penn State in turfgrass fertility research will be to provide some of the much-needed information regarding turfgrass soil test calibration. Ten field calibration tests, including those for both establishment and maintenance fertilization, were started in 1977, with several more to begin early in 1978. Factors such as turfgrass quality, growth, disease incidence, recovery from injury, and rate

of establishment will be used to evaluate fertility treatments. Because of the differences that exist in soil and climatic conditions among and even within the major regions of the country, various states need to initiate turfgrass soil test calibration studies if significant improvements are to be made in existing soil test programs.

In a day where efficient use of fertilizer is required from both economic and environmental standpoints, these types of studies are of increasing importance. Hopefully, with the completion of new and current studies, turfgrass soil testing programs will have a more sound basis upon which to interpret soil test results, with the end product being more meaningful and reliable fertilizer recommendations.

TABLE 3
Phosphorus, potassium, and lime recommendations by different laboratories for the maintenance of a 'Merion' Kentucky bluegrass tee.

Laboratory	Fertilizer Recommendations					
	Soil #1			Soil #2		
	P ₂ O ₅	K ₂ O	Lime	P ₂ O ₅	K ₂ O	Lime
	lb/1000 ft ²			lb/1000 ft ²		
#1	5.5	4.0	50	5.5	3.0	125
2	3.0	2.0	0	2.1	2.0	0
3	5.1	4.0	100	4.1	7.0	100
4	2.1	3.0	0	2.1	3.0	80
5	2.5	2.4	30	2.3	2.4	165
6	0.9	1.0	35	0.9	1.0	70
7	6.0	1.5	40	2.5	1.5	80

Where Do We Go from Here?

MOST OF US know that the USGA Green Section, which was formed on November 30, 1920, has contributed a great service over the years toward improved grasses, materials and maintenance practices that are now standard on golf courses. The Green Section was born when E. J. Marshall, an attorney who was then Green Committee Chairman of Inverness Club in Toledo, Ohio, brought together the USGA and the United States Department of Agriculture. They have been collaborating ever since. From this relatively obscure beginning, the Green Section has developed into an impartial and authoritative golf turf research and advisory agency.

In more recent years golfers have demanded higher standards of maintenance for the golf course. To meet these demands the Green Section has attempted to bring to the course superintendent and club management the latest information and research regarding plant nutrition, plant pathology, entomology, weed control, watering techniques and plant life in general. Our most pressing concern, however, has been how to distribute this information and research to the maximum number of golf clubs and courses in the United States. A study undertaken by the USGA indicated that we must redirect our basic concepts and procedures. Given this conclusion, where does the Green Section go from here? Basically, the study determined that the Green Section should adopt new procedures. A plan was adopted.

The plan is to provide a simple, economical package that concentrates solely on providing service to our constituency — USGA Member Clubs and Courses, and all of those persons interested and responsible for the proper conditioning and maintenance of golf courses. The plan embraces five basic concepts:

- Truly open the service to USGA Member Clubs and Courses on request.
- Realign the responsibilities of our agronomic staff to improve service.
- Establish a standard fee for Turf Advisory visits.
- Provide regional turf conferences to achieve broader exposure for the Green Section and its turf advisory role.
- Provide each Member Club with an additional copy of the *Green Section Record*.

The plan is to be put into effect in two phases. Phase I began on January 1, 1978. It consists of two features: the addition of a sixth regional office and the scheduling of 10 regional turf conferences, two in each of the five regions that existed in 1977.

All the turf conferences have been completed. They were informative and were well received. In

1979 we hope to increase the frequency of regional conferences and expand their content by covering such subjects as the proper procedures for marking a golf course for play, basic relationships between the Rules of Golf and the conditioning and marking of a course, and developments in the area of implements and ball. In addition to the regional conferences, each of our agronomists has been authorized to schedule informal conferences if a particularly serious turf problem exists over a reasonably wide area within his region. The purpose of the informal conference is to gather the maximum number of superintendents in one location to discuss the problem, its cause and solution.

The new Green Section region is known as the Mid-Continent Region. The former Mid-Continent Region is now the North-Central Region. The accompanying map illustrates each of the six regions.

The Mid-Continent office is in Dallas. Dr. Douglas T. Hawes, the Director, worked as a Green Section agronomist in the Northeastern Region in 1968 before he received his graduate degrees. Dr. Hawes is eminently qualified in agronomy and has experience with both cool- and warm-season grasses. His most recent position was with the University of Maryland.

Because the size of the Southeastern Region has been increased, a new agronomist, Donald D. Hoos, has been added to the staff to assist the Director, James B. Moncrief. Hoos received his masters degree in agronomy from Oklahoma State University.

The purpose of the reorganization is to permit the Green Section to provide closer contact with Member Clubs and Courses and to improve services. The goal is to give each regional director maximum consideration concerning his workload and to assign states to regions so that the regional office is as centrally located as possible, thus minimizing travel. These factors provide the potential for increased flexibility, easier and more efficient scheduling, less dilution of effort, and better service.

Consideration was given to some Member Clubs' reliance on a long-term relationship with a particular agronomist. In taking this into consideration, however, we decided that we would have to assume that risk and adopt the new program. We can only assure our Member Clubs that there will not be a diminution of service because of this change.

We also considered what impact the change would have upon those Member Clubs that consistently subscribed to the Turf Advisory Service over a period of years. We have appreciated their support, and we look forward to their continued association with the Green Section. They will continue to receive our individual attention under the new program. In fact, through our current invoicing

procedures, those members will again be given an early opportunity to request a continuation of the Turf Advisory Service at their course.

Additionally, because of the reorganization, Alexander M. Radko, the National Director of the Green Section, will be relieved of all extension responsibilities except those at the sites of some USGA Championships, and will be able to devote more time to his growing administrative and research responsibilities. He will move his office from Highland Park, New Jersey, to Golf House.

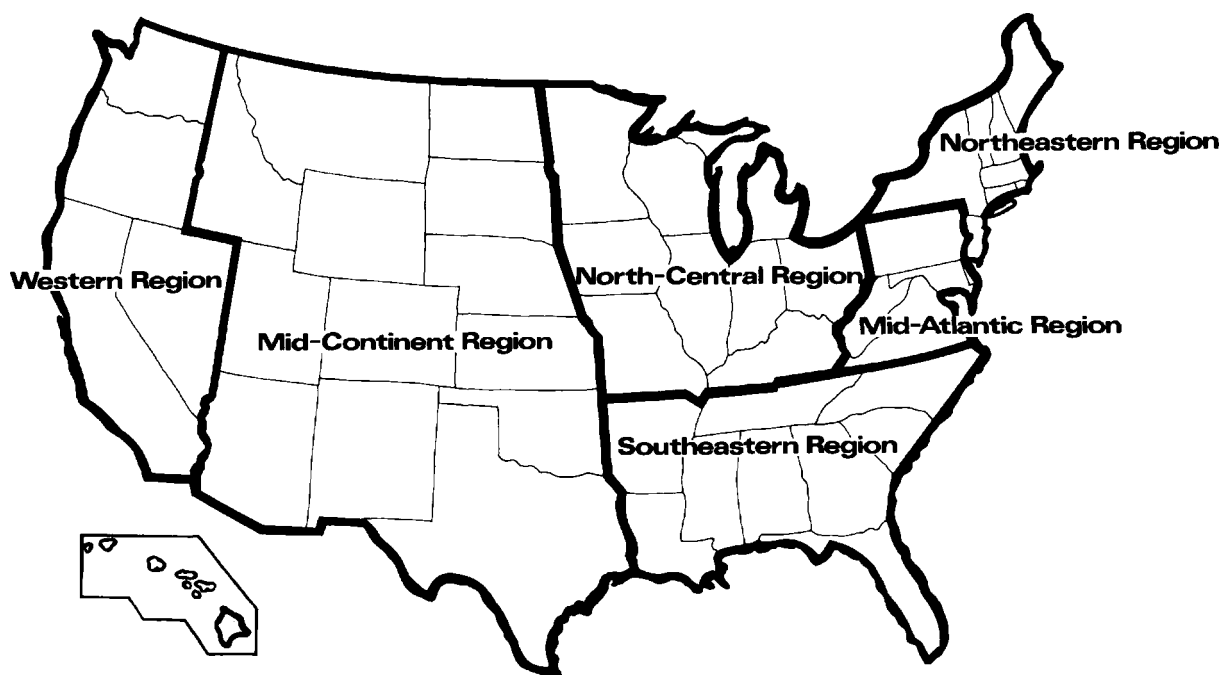
Phase II of the plan will become effective on January 1, 1979. Its implementation will be facilitated by the steps already taken this year. The principal goal of the plan is to open the service — make it more readily available to all USGA Member Clubs and Courses. As you might expect, most subscribers to the Turf Advisory Service have consistently been the private and semi-private clubs. We believe that the service should also be made attractive and easily obtainable for the smaller, less affluent golf course. To achieve this we will discontinue annual subscriptions to the Turf Advisory Service. Our agronomists will be available, on request by a USGA Member, for turf advisory visits for a standard fee of \$200. This is a one-half day on-the-site consultation and inspection. The addition of a sixth region and two more agronomists provides an improved base upon which to build if Phase II becomes as successful as we anticipate. In no instance will requests for visits be declined nor will the conduct of a visit be given less than the necessary attention. We are prepared to take on additional agronomists if necessary.

However, with the exception of bona fide emergencies, we might not be able to accommodate requests for visits on specific dates.

The final aspect of the plan to become effective in 1979 provides each Member Club and Course with two subscriptions to the *Green Section Record* as part of its annual membership dues. The second subscription will no longer be contingent upon a subscription to the Turf Advisory Service. One copy of the *Record* will be sent to the club and the other to the course superintendent at the club address.

The Green Section's only mission is to serve the best interests of golf. It is a vast clearinghouse of knowledge and experience built up over the years. It is our responsibility to make this information more readily available to all USGA Member Clubs and Courses that are interested in maintaining the best possible golfing turf for their membership. It is the only agency in the country devoted solely to golf course turf, its playing conditions and its management. We bring experience, research and ideas developed by other courses directly to your superintendent.

The Turf Advisory Service is a balanced program of on-the-scene consultations followed by a detailed written report from the regional agronomist. It is a valuable management tool for the superintendent and club officials. If you are interested in knowing more about the Turf Advisory Service for your club or course, please contact the Green Section Director within your region. His address and telephone number may be found inside the front cover.



The new areas where the six Green Section offices are located.



An irreplaceable American elm, well worth the special treatment it receives at Winged Foot Golf Club; lightning protection, cabling, minor cavity work, fine pruning, annual insect spraying, and (if needed) systemic fungicide injection for DED control.

“A Thing of Beauty Is a Joy Forever”

by **WILLIAM S. BREWER, JR.**, Agronomist, USGA Green Section

CREDIT JOHN KEATS for writing, “A Thing of Beauty Is A Joy Forever.” His observation is surely accurate for many things, but there are exceptions. The realm of growing things is, regrettably, one of them. In order to have growth, there must be a time frame or aging. And injuries. And pestilence, too. It is as true for a tree as it is for you and me.

When trees are well placed and healthy, they add another dimension to a golf course. They

influence our feelings for the landscape, challenge us as we play the game, provide some welcome shady spots, break apart a forceful wind, and, more often than we like to admit, they become bruised and battered by wayward shots. But when they outgrow their space or become weakened in body or limb, trees demand attention.

Sometimes the golfer who fights to save a tree should win his case, because we have seen important trees cut down without justification. The

result is sometimes the ruin of a golf hole. However, since I was very nearly speared by a falling limb just behind a green some years ago, I have looked more critically at the problems and dangers of trees.

HAZARDOUS TREES

Broken limbs hanging in a tree are called "widow makers." Do not make the mistake, potentially fatal, of believing that limbs fall only during severe storms when no one will be on the golf course. Broken and obviously weakened limbs or trees must always be brought down intentionally, preferably by a professional crew, since this can be particularly hazardous work.

Cavity work and conks — one didn't stop the other.



Less obviously dangerous situations, which may be more difficult to appreciate but which will still usually require tree or limb removal, include trees with large open cavities and those with extensive but hidden wood rot. Although insects may be involved, the major weakening process in such cases are two general classes of fungi that colonize tree wounds. These fungi are specially adapted to utilize woody tissues for nourishment.

The first rule of tree care, therefore, is not to allow wounding. Another is to ensure that wounded trees receive adequate water and nutrition so that healthy new wood will be rapidly produced and offset weaknesses that surely will result from a wound infection. Unless the tree is wounded further, the new wood will not be subject to infection, because trees are able to compartmentalize or prevent the spread of organisms to newly formed tissues.

While fresh wounds should be traced and newly broken limbs pruned to promote uneventful healing, infection of wounds cannot, as of now, be prevented, i.e., wound painting is primarily cosmetic. Neither can established infections be halted, except by complete limb or tree removal. Nor can they be excised entirely. Cavity work is usually for cosmetic purposes, but if it is done carelessly, it can even cause the infection to spread.

To detect the most severely weakened limbs and trees, look for the fruiting bodies, or conks, of the fungus that extend from the bark. These take many shapes and sizes, but they always indicate extensive weakening of the underlying wood. Open cavities, in the absence of conks, are more difficult to evaluate. Probing with a knife can be helpful in determining how much sound wood remains, and a new tool, the Shigometer, which some tree care companies may have, is used to resolve doubtful situations. Keep in mind that a tree with an infected trunk will generally fall away from the damaged side, using the healthy wooded side as a hinge. However, if the extent of rotten wood is this severe, the tree would best be removed.

INTERFERING TREES

Dangerously weakened trees are not the only ones which should come down. Quite frequently trees, or tree branches, interfere with either the normal play of the game or with the effective maintenance of turf areas important to the game. Spreading limbs may, for example, inhibit the golfer's use of the full teeing area by physically impeding his swing or by obstructing his vision or excessively narrowing the line of flight. Each situation involving this type of interference should receive careful evaluation, but pruning or complete removal should be seriously considered solutions.

Shade and tree root problems are too commonly endured, to the detriment of the turf on greens and tees in particular. In some cases root pruning can be effective without greatly injuring the tree, but usually the club membership will have



Into each life, may a limb not fall.

to choose between accepting the less than ideal turf conditions or sacrificing the offending tree(s).

Blockage of air circulation is perhaps the least-appreciated problem with trees. The lack of circulating air greatly extends the duration of extremely humid conditions in and near the turf, and this increases disease incidence and severity. Unfortunately, it may be necessary to remove several trees to effect significant improvement in air movement, although less drastic steps sometimes succeed.

GONERS

Both old age and specific diseases can also dictate a decision to remove a tree. While all trees will eventually show decline, some have a habit of quite quickly outliving their usefulness. Merely neglecting to put over-the-hill trees out of their misery will not restore their beauty or utility. With certain diseases, too, we know that the trees will probably be the losers, making it advisable to assess the value of each susceptible tree before taking heroic measures to save it.

Trees do great things for golf, but we must return the favor with concern and care, not only for the trees, but also for our turf, the play of the game and the safety of all those who use the golf course.

FOR FURTHER READING

1. Pirone, P. P. 1972
Tree Maintenance. Oxford University Press, N.Y. 574pp. \$15.
2. Shigo, A. L., and Marx, H. G. 1977
Compartmentalization Of Decay In Trees. Agriculture Information Bulletin #405. Superintendent of Documents. U.S. Government Printing Office. Washington, D.C. 20402. Stock #001-000-03671-8. 73pp. \$1.85.

It's gone — but which way will it go?



TURF TWISTERS

Ataenius spretulus; TEN ADULTS OR THIRTY GRUBS

Question: What materials can I use for control of the *Ataenius spretulus* beetle? (West Virginia)

Answer: In many states, only Proxal 80 SP is labeled for use against *Ataenius spretulus*. However, Diazinon, although not labeled specifically for *Ataenius spretulus*, may be used in some states if a recommendation for control is filed with the concerned State Department of Agriculture. In West Virginia, the 14G granular formulation has been somewhat more effective than the AG500 formulation. Further, West Virginia recommends no control be attempted unless there are at least 10 adults per square foot or at least 30 grubs per square foot.

EARTHWORMS; FORWARD TO THE PAST

Question: What can be done to discourage earthworms on our greens in the post chlordane era? (New York)

Answer: Carbaryl applied for sod webworm and cutworm control will work, but without the long residual effectiveness of the chlorinated hydrocarbons. Before the era of modern pesticides (pre World War II), greenkeepers had success with low-soil pH ranges. This fact has recently been supported by research at Washington State University, where sulfur applications discouraged earthworm activity.

NEW CAUSES OF OLD DISEASES

Question: Please shed some light on the "newly recognized causes of plant diseases." (California)

Answer: Scientists have only recently discovered that agents called "mycoplasma-like organisms (MLO)," viroids and novel bacteria cause plant diseases formerly attributed to viruses. The MLO group can infect both plants and animals, including man. In plants, their activity is restricted to the phloem or food-conducting cells. Leafhoppers carry them from plant to plant. They induce stunting, yellowing and various types of malformations.

Viroids are small, naked viruses. Although extremely minute and carrying very little genetic information, they are capable of causing diseases such as chrysanthemum chlorotic mottle.

Novel bacteria have only recently been implicated in diseases thought to be entirely due to viruses in the past. They do not fit the mold of other gram positive bacteria.