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USGA GREEN SECTION RECORD

A Publication on Turf Management
by the United States Golf Association

GOLF COURSE TRAFFIC

"A curving path is more pleasing to the eye" and the grass. Note the traffic pattern as carts have left the path. No worn areas here in spite of heavy electric cart use.

USGA GREEN SECTION RECORD

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Can Grass Survive the Traffic?

By **WILLIAM H. BENGEYFIELD,** Western Director, USGA Green Section

If the Scots at the Links of Lieth had it to do all over again, they'd probably rewrite their Rule One of Golf:

"You must tee your ball within a club's length of the hole."

But this was in 1744 and they were engrossed in writing rules, not rolling wheels and practice swings. One might guess the evolution of Rule One started right after the first foursome. Pretty soon it was two club lengths, then three and so on, until finally someone decided that the tee and the green had better be two different places. And the game of golf has never been quite the same.

Even by today's USGA definition: **"The 'teeing ground' is the starting place for the hole to be played. It is a rectangular area two club lengths in depth, the front and sides of which are defined by the outside limits of two markers;"** the golf course superintendent will find little traffic relief in the Rules of Golf. He has indeed a problem, for the world has beat a path at his door.

One of the doors belongs to Max McMurry, Golf Director and Manager at the Alameda Municipal Golf Course, California. Over these 36 holes, 190,000 rounds of golf are played yearly, in all kinds of weather. Every step of the traffic must channel onto each tee, and off again. Max McMurry has spent the last nine years trying to cope with the traffic problem for he believes in grass tees.

"The cart more than doubles surface wear," says McMurry. "This is as true of hand carts as it is of motorized carts. In fact, the hand cart may be causing more damage simply because there are so many more of them in use. Forty years ago, when both types first appeared, there was little cause for alarm. But today, nearly everyone uses a golf cart of some type on our course and something had to be done to save our grass tees.

"Take a typical caddie cart case. As a player walks along pulling or pushing his cart and he approaches the location of his ball, he will inadvertently release his hand hold on the cart while the cart is still in motion and seeking its own balanced position. The base of the cart will scrape a portion of the turf. Repeat this occurrence in a concentrated area near a tee or green several hundred times a day, every day of the year for 190,000 rounds, you will soon have bare earth. Electric carts are not much better. Sudden starts, quick stops, confined parking and travel areas all take their toll in grass. No amount of resodding will ever solve the problem permanently. The answer lies in developing techniques of design that will disperse traffic wherever possible and control it as much as possible in unavoidably concentrated areas. We know we cannot depend on the conscious effort of the golfer. The last thing on his mind is traffic control. He's there for recreation, not regimentation. Therefore, we must 'think for the golfer' when it comes to traffic direction. 'Subtle guidance' might be a good choice of words.

"Finally, in all our scheming, the design technique employed should not substantially add to our everyday maintenance costs."

Fixed fences are a help in traffic control, but note worn area on the tee at the narrow fence opening. Entrance was purposely narrowed to keep hand carts off the tee.

Fixed fences also present a mowing problem. If the fence posts were set in a 'sleeve' and were moveable, mowing and entrance problems would be overcome.

"Thinking for the golfer" is easier said than done, but Max McCurry has been at it for some time and has come up with some interesting possibilities. Unfortunately there are no pat answers. No solution is going to work every time. But if we start with a few principles and juggle them around to fit particular cases, some satisfactory answers can usually be found.

A PLACE TO START

The condition of the first tee on any golf course is of utmost importance. Here the member and his guest receive their first impression of course conditions and it should be an inviting one. The first tee also receives the brunt of practice swings, warm ups and, when no one is looking, mulligans. Traffic, wear and tear is greatest here. It's the place to start your cart control work.

FENCE ME IN

Fencing of some kind is usually a good first thought, and a good second thought as well. Surely, some form of barrier is needed to keep the carts off and the golfers on the tee. Wooden railings, pipe or chain are effective barriers. However, when they are brought into use they create a new set of traffic problems. At entrance points through the fenced area, concentrated foot traffic soon wears the turf bare. Furthermore, long grass eventually engulfs the lower portion of the fence posts and many hours of hand labor are required to keep it trim and tidy. You wonder if any real improvement has been made.

But all is not lost. If the fence posts and railings are movable, then the above problems are easily overcome. Entrance points may be changed as

Just a reminder.

The first tee without an entrance. Also the first tee without worn paths.

often as necessary and mowing accomplished whenever posts are moved. Preset sleeves in the ground for the posts allow for easy change—a simple technique that is both effective and practical.

A TEE WITHOUT AN ENTRANCE

Have you ever seen a tee without an entrance? Do you think it possible to develop such a tee, i.e. one protected from cart traffic by some type of barrier but still accessible to the golfer? Since there would be no specific entrance ways, there would be no worn areas to worry about. Sound impossible? Well, not to Max McMurry who has found just such an arrangement to be a most effective device, particularly on a heavy play public course.

At Alameda, a 10-inch concrete curbing has been installed on three sides of all raised tees. The 10-inch curbing allows for maximum golfer entry area (the entire tee is available to foot traffic; there are no entrance ways as such) while also allowing mechanized equipment to be used for maintenance all along the curb. If necessary, the curb may be painted a bright color with a notice "No Carts on Tees" stenciled along the side. No one can miss the sign and few will go to the trouble of lifting their hand cart onto the tee. Motorized carts simply cannot climb a 10-inch curb.

For the private club where aesthetic values would discourage concrete curbing, the same principle, i.e. no specific entrance way, may still be used. Orville Suttles, Superintendent-Manager at Woodbridge Country Club, Lodi, Calif., has modified the technique by developing a low growing, attractive and continuous hedge around three sides of the first tee. The hedge is no higher than 10 inches and is approximately eight inches wide. It can be easily stepped over by

any golfer. Boxwood, Barberry, Privet or any number of different plant materials would lend themselves to this use.

The practice putting green at Woodbridge also has a low hedge completely surrounding it. Of course, there is a small opening in a far off corner for mowing equipment to gain entrance, but that is the only break in the hedge row. The rest of it must be dense enough to discourage "cutting through" by the golfer. If a gap is allowed to develop, there will soon be an ever widening path, the barrier effect is lost and unsightly traffic conditions result. A solid, dense hedge however, effectively disperses the traffic along the entire path.

The problem of trimming is easily solved by the use of electric clipping shears. It is not a big job nor particularly time consuming.

CART PATH TRICKS

It's strange, but one of today's status symbols in country club golf is not to have hard or soft surfaced cart paths and tee parking areas throughout the course.

Like a childhood disease, cart paths are to be avoided as long as possible. But the day eventually comes, even in this age of miracles, when something must be done about the mud and worn turf near each tee. Some type of prepared surface is needed and finally accepted by the membership.

Unfortunately, a hard surfaced parking area near each tee does not necessarily eliminate the mud and wear problem. It often merely transfers it to the end of the cart path in front of the tee. To overcome this phenomenon, all sorts of circular path endings, heavy timbers blocking the way, etc. have been used to divert the traffic and with some degree of success. However, the best solution to date seems to be that of a subtly curving path from the tee, gradually leading the golfer *away* from his desired course. In fact, the path should gently lead him toward the rough, a group of trees or high ground or anywhere as long as it is *away* from his intended direction. Since we are all creatures of habit, there will be an unconscious tendency for the golfer to follow the path to some degree. At some undetermined point, he will realize that the path is not taking him where he wants to go. He will then strike out on his own and leave the path for the fairway. Fortunately, there is enough individuality left in us that some will discover the "misdirected path" sooner than others. The result is a dispersion of cart traffic. It is spread over the gradual arc of the path and mud holes are unlikely to develop.

There is another cart path trick that should be considered for broad, wide tees. By locating the paved surface directly in the middle of such a tee, wear caused by foot traffic is more evenly distributed over the entire teeing surface. All entries and departures are not concentrated on one side. This technique also gives the superintendent an opportunity to rest one side of a wide tee more effectively.

LINES AND SIGNS

"How effective are lime lines in guiding traffic?" A survey shows that you might expect about 50% cooperation from the golfer. Some green chairmen and superintendents feel that any diversion of traffic is worth the effort while others have found that the golfers complying with the lines soon create a path immediately

outside the lined area. This can be partially overcome by moving the line with each application of lime or gypsum. These materials usually last about a week before renewal is necessary.

A red vegetable dye, Rhodamine, has been used for several years at Brookside Park Municipal Golf Course, Pasadena, Calif. Max Weeks, Assistant Park Director, reports this technique more effective than lime or gypsum. In addition, no residue build-up occurs as with other materials. Furthermore, there's something about a red dye on green grass that catches the eye and jolts the conscience. The color holds for about a week to ten days before mowing or irrigation obliterates it. The dye is readily water soluble and easily applied with a small spray tank.

The use of directional signs are met with mixed emotions by many superintendents. Signs are often tried and almost as often discarded as ineffective means of controlling traffic. It seems their value depends on the attitude and receptiveness of the golfer. A small sign is an awfully easy thing to overlook or ignore. A large sign has no place on the golf course proper.

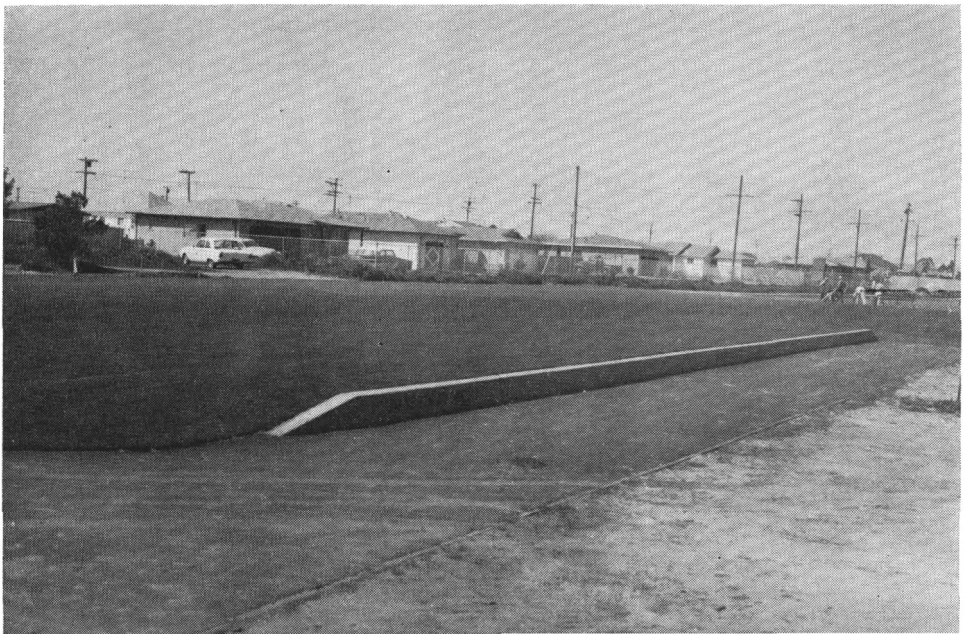
ARE LARGE TEES THE ANSWER?

Within recent years, extraordinarily large tees have become the architectural rage. Some ranged up to 100 yards in length and they are beautiful in appearance and great conversational pieces. From a practical and maintenance viewpoint, however, excessively large tees have not helped the superintendents and have not necessarily solved the traffic problem. They require tremendous man hours for mowing and additional expenditures for extra fertilization, irrigation, etc. and much of the tee area is never used.

Perhaps the best rule of thumb regarding tee size was presented in A. M. Radko's article "Tees and the Golf Course" in the May 1964 issue of the GREEN SECTION RECORD. Radko states:

"A minimum of 100 square feet of usable tee space is suggested for each

In some situations, the curbing is only needed on the side golfers will approach the tee.



1,000 rounds of golf per year on par-4 and par-5 holes. A minimum of 200 square feet per 1,000 rounds of golf per year on par-3 holes subjected to iron play is suggested. For tees on par-3 holes played with a wood, the same rule of thumb applies as is suggested for tees on par-4 and par-5 holes."

THE BUGABOO

We all wish the traffic problem would simply go away; solve itself. Sadly, should this ever happen, one can be sure other problems will develop. The first one will be that of finding gainful employment in another field.

Traffic is indeed a bugaboo for the golf course superintendent, but it is a challenge as well. Design changes and "thinking for the golfer" can make a major contribution to better traffic control and better turf. Worn paths and muddy areas are unsightly and reduce the enjoyment of the game. Ruts and pot holes are the visible signs of damage but there is the hidden damage of compaction as well. Extra aerification, fertilization and the introduction of grasses better able to withstand the pounding of traffic are all in the superintendents bag of tricks and all are needed.

More and more clubs are diverting at least a part of cart income to meet these costs. But not enough effort nor money has been devoted to design techniques to alleviate the traffic problem.

Grass tees will survive because of dedicated golf turf men like Max McMurry. All it takes is a great desire and a little study, imagination and ingenuity.

COMING EVENTS

September 22-24	Northwest Turfgrass Conference Coeur d'Alene Country Club Hayden Lake, Idaho
Oct. - Dec.	Turfgrass Management Winter Course Pennsylvania State University University Park, Pa.
October 5-6	Prairie Turfgrass Conference Mayfair Golf & Country Club Edmonton, Alberta, Canada
October 5-7	Florida Turfgrass Conference Ramada Inn Gainesville, Florida
October 7-8	New Mexico Turfgrass Conference Western Skies Motel Albuquerque, New Mexico
October 20-22	Central Plains Turfgrass Conference Kansas State University Manhattan, Kansas
October 31 - Nov. 4	Annual Meeting of the American Society of Agronomy Columbus, Ohio
November 17-18	Minnesota Turfgrass Conference Normandy Hotel Minneapolis, Minn.
December 6-8	Texas Turfgrass Conference Texas A&M University College Station, Texas

Long Term Effects of Herbicides

By **LEE RECORD,** Northeastern Agronomist, USGA Green Section
(Presented at Annual Turf Conference, University of Massachusetts)

In 1940 only 14 herbicides were registered in the United States. By 1963, 110 herbicides were registered and about 7,000 more were on file with the United States Department of Agriculture.

We have come a long way in this short period but we have only scratched the surface. There are many theories about why herbicides kill or injure plants. Observations of treated plants and plant parts provide some information. However, finding the "why" of herbicidal action is very difficult.

With post-emergence selective control of weeds, both physiological and morphological differences between the weed and turf crop are used. Physiological differences are differences in internal mechanisms of growth while morphology refers to outward differences in structure. Both systemic and contact chemicals are used for post-emergence spraying. Systemic chemicals make use of physiological differences for selectivity whereas contact chemicals make use of morphological differences. Systemic herbicides are most conveniently characterized as being readily translocated in living tissue as contrasted with contact herbicides which do not readily translocate in living tissue.

Even with systemic herbicides, whose selectivity is based on physiological differences between the weed and turf crop, selectivity is a matter of degree. We can cite numerous examples where the degree of tolerance to the turf crop in question has suffered. If 2,4-D is the herbicide in question, the amount of chemical necessary for damage is only two or three times that employed for weed control. Results of systemic herbicides are affected most by growing conditions of the plant, stage of plant development and weed variety.

Herbicides when properly used alter, inhibit or terminate the growth of weedy plants. Some herbicides kill all plants or at least the plant parts with which they come in contact. In general, however, the selective herbicides are of greatest interest. A study of the phenomena of absorption of herbicides by leaves and roots and their translocation within the plant helps in understanding their action.

A herbicide applied to leaves may penetrate the cuticle and stomata, move to the food or water conducting tissue and then to other parts of the plant. The pattern of translocation within the plant is influenced by the kind and stage and growth of the plant. Sometimes the herbicide is absorbed and inactivated by cells in the leaf, and sometimes it may remain on the leaf surface and never enter the plant. The herbicide 2,4-D appears to be absorbed and held more in the cell walls of grass than broad-leaved-type plants, a factor probably important in its selectivity.

Turf Injury

Turf injury from 2,4-D, 2,4,5-T and silvex herbicides has been demonstrated on occasions. In a study nearing completion, silvex was injurious to both top and root growth of Colonial and creeping bentgrass. Injury to top growth occurred in most of the treatments, appearing as dis-

coloration and thinning. Root growth was reduced in total growth and extensiveness by most treatment rates. Other effects from silvex treatments were lower drought tolerance, decreased food reserves in roots, and tissue abnormalities of the roots.

Since silvex and related compounds are very effective herbicides, it is still logical to use these chemicals and assume the risk of injury on many turf areas. If this is done, careful consideration should be given to factors that will reduce the chance of serious injury. For instance, silvex, 2,4-D, 2,4,5-T, and other phenoxy compounds might be used only on those portions of the turf area where there is a significant quantity of weeds.

In some instances the location of a growing point of a plant influences the toxicity of a given herbicide. For example, the embryonic leaves and terminal meristem of many forage and turf grasses and cereals are well protected during certain growth stages, whereas in other plants they are brought into intimate contact with herbicides applied to the foliage.

Differences in shape, size, distribution and density of the roots of crop plants and weeds also partly determine the amount of soil applied herbicide that actually comes in contact with the plant. Thus, plants with different types of root systems growing in close association may respond quite differently to soil applied herbicides.

Leaves with waxy, hairy or variously sculptured leaf surfaces differentially retain and absorb herbicides.

Stomate size and distribution and nature of the cuticle probably determine the quantity of material that penetrates leaves. Cell membranes may act also as permeability barriers and further decrease the amount of chemical absorbed by individual cells.

Movement of soil applied herbicides into the plant and to other parts of the plant is with water and nutrients. Factors which favor growth also favor rapid absorption of herbicides. Most of the water conducting tissue of the plant is nonliving. Some absorption and translocation of phytotoxic chemicals may occur even after other root tissues have been killed by a herbicide.

Membranes of different plant species appear to be penetrated more rapidly by some compounds than others. The reasons are not understood. The differential permeabilities

TURF BOOK AVAILABLE

The book "Turf Management," a popular educational printing of all matters pertaining to turf, is available at $10.95 per copy from the USGA, 40 East 38th Street, New York, N. Y. 10016; the USGA Green Section Regional Offices; the McGraw-Hill Book Co., 330 West 42nd Street, New York, N. Y. 10036, or at local bookstores.

"Turf Management" is a complete and authoritative book written by Professor H. Burton Musser and sponsored by the USGA. The author is Professor Emeritus of Agronomy at Pennsylvania State University.

of membranes are considered important in determining whether a given compound will affect the plant.

Surfactants, solvents, and various other additives and formulation agents influence the external molecular environment of herbicidal sprays. Some of these substances increase toxicity of a herbicide several fold. In other instances, toxicity is unaffected. Under some conditions, toxicity on one herbicide may be increased by a given surfactant whereas the activity of another herbicide may be reduced by the same surfactant. The particular combination of formulation ingredients to use with a specific herbicide is critical.

What are other relationships we must consider when using a herbicide, not only for weed control alone, but in respect to the turf crop which is competing with the weed environment? What is the soil relationship to the herbicide? It is generally accepted that organic matter content has a direct influence on herbicide action. Soils high in organic matter retain 2,4-D in greater phyto-toxic quantities than those with less organic matter. Results of soil type and quality studies show that phytotoxicity of herbicides may be strongly modified by soil conditions.

Effect of Temperature

The importance of the effects of temperature upon the effectiveness of herbicides has been recognized almost from the beginning of the use of chemicals for weed control. Numerous studies have shown beyond question that temperature must be given prime consideration, both in evaluating herbicidal materials, and in making recommendations for their practical use.

The moisture factor also is important in determining the effectiveness of post-emergence treatments. Moisture relationships must receive major consideration in an evaluation of herbicidal effects.

We must not lose sight of the fact that herbicides in general will aid our turf management practices. New improved herbicides have shown great promise. However, a great deal of reservation is still warranted when dealing with new or old materials. We have a long way to go in interpreting the effectiveness of each herbicide against every different management program that is practiced.

Is there a set rule of thumb for any particular practice . . . ? I think not. A general rule or two may work for most everyone, but often the rule that works for you turns out half-way for your assistant and doesn't work down the road at all.

However, one rule we can emphasize is that *you* have to know what you are applying, when it is going to be applied, and who is going to do the job for you. In general, the membership wants you to stay within the time allotted to do a particular job with a fixed number of men, and yet maintain good conditions.

With the limited turf growing weather we have had the past few seasons, more undesirable weed problems than ever are facing us. The time element of maintaining the course has brought the outside contractor to do your job. He has the proper equipment and the ability to produce. But he has to show results and will, many times at your cost; this cost can be very dear to many, it could mean a job and it has.

Last April was pretty wet, in many areas you couldn't get on the course to keep the turf cut let alone put into effect any herbicide program. To get the herbicide program done,

you contracted a custom spray outfit to do the job for you, which was all right, but in many instances it was already too late to begin a herbicide program. May was a dry month, you couldn't keep much moisture in the ground, yet the weeds flourished and they were an eyesore. By the time you got to work one morning the custom spray operator had already done the job and was gone. How much herbicide material had he applied? How much water did he use per acre with the herbicide material? Only one man knows.

I have talked to many superintendents who have had custom work of this sort done for them; the superintendent hadn't the equipment or the time to have the weed eradication done by his own crew so he did the next best thing. When you're talking turf you always ask, "What herbicide did you use?" And the reply nine times out of ten is, "I don't know! Take a look on the can over there."

We have mentioned the requirements which are necessary for proper use of herbicides. We have discussed the systemic and contact methods of spray application and how they effect the plant organisms. We know that effects to turf from the constant use of herbicides can destroy countless acres.

Have we overlooked something with our present herbicide management program? I feel that we have! We must ask ourselves these questions, "Has there been enough research on this herbicide to justify my using it? Should I use a herbicide this year to control my weed problem, or is there another cultural practice I might use? Does my weed problem warrant a herbicide? Have I tried my own research with this herbicide to see what it might do for my turf management program?"

We will continue to use herbicides and will understand them better as the years go along. But let's keep this mental note:

"Have I strengthened my turf population from the use of herbicides or has there been a decrease in permanent turf population from, LONG TERM EFFECTS OF HERBICIDES?"

The Troubles We've Seen

By **MARVIN H. FERGUSON,** Mid-Continent Director, USGA Green Section

Sunday morning, between the hours of 7 and 9:30, is the favorite time for calling a Green Section agronomist to discuss golf course troubles.

It is true that this is the time when he's most likely to be home. But it may not be the time when you'll find the agronomist in a humor to be greatly sympathetic to your problems, particularly when the club has encountered troubles through deliberate actions that could have been avoided.

Clubs could save themselves many troublesome and expensive situations if they asked questions *before* they took actions. It is a distressing fact that relatively few golf course problems we encounter are caused by uncontrollable factors. Rather, they are brought about by poor management, poor construction, or a misunderstanding of plant growth principles.

These points probably can be illustrated most vividly by reciting some of the trouble calls that have come to one Green Section office during the past year. To save possible embarrassment to the club, the accounts are fictionalized to some degree, but all are based on actual cases. If a club member should recognize his own

club's problem among those presented here, he may take comfort in the fact that there are very few original mistakes and there are members of other clubs who think it is *their* problem which is being aired.

Compound Errors

1. In early spring a golf professional called to ask if it would be possible for the agronomist to "casually drop in" within the next few days. The club needed help, the season was advanced to the point where the golf course should be beautiful, but several temporary greens were in use. Inasmuch as the regular visit to the club was scheduled later in the season, the gentleman was told that we would respond to an offiicial request for a special visit. The request was made and the course was visited.

The story that unfolded would have been comical except for the serious consequences. The superintendent the year before had topdressed greens late in the season and had burned them very badly with one of the topdressing components. He then resigned. When the new superintendent was hired he was under immediate pressure to get the greens in condition for an early spring tournament. By this time weather was too cold for any assurance that turf could be established by seeding. The only recourse appeared to be the use of sod. The club's nursery was limited but they were able to acquire sod from neighboring clubs. However, each lot of sod was grown on different soils and consequently when this was introduced into greens, the water requirement for each different piece of sod made it almost impossible to water greens properly.

When trouble occurs it appears that club members all begin to advise the superintendent and he frequently compounds his difficulties by trying to placate all his critics. In the foregoing case, there were many additional complications arising from such pressures.

To overcome the difficulties created, this club faces a rather costly and time consuming renovation procedure. Much of the difficulty could have been avoided had competent advice been secured after the original mistake.

Toxicity from Herbicides

2. Two clubs called at about the same time during the month of May with the same problem. Both had applied materials in the fall of 1964 which had been recommended for pre-emergence control of *Poa annua.* One club had used calcium arsenate and the other had used a relatively new experimental material. In both cases, grass was doing very poorly, and was extremely susceptible to traffic damage. These clubs were about 1,300 miles apart, one in arid country and the other in a humid area, one grew bermudagrass and the other bentgrass, and they used two entirely different products, yet the nature of their problems was essentially the same. Each had a toxic material in the root zone of the turf plants.

About the only treatment that can be suggested is to water very carefully and to distribute traffic as much as possible. Only by allowing time for dissipation of the toxic substance can the problem be solved.

The Green Section's standard advice about the use of herbicides is to use only those materials which have been thoroughly tested not only by experiment stations, but by *your* own superintendent, with *your* equipment, applied by *your* crew, on *your* turf nursery. In the case of calcium

arsenate, this is an old product which was first tested by Green Section scientists almost 30 years ago and reported to be erratic and unpredictable but highly effective when everything goes right. The Green Section does not recommend its use on putting greens.

Drainage by Theory

3. A new drainage theory was incorporated into the new greens established at one long established club in the Southwest. Essentially, the system involved the placement of a permeable seedbed mixture about 8 inches deep over a compacted, impermeable subgrade. Theoretically, water moves easily downward to the compacted soil and then moves outward to the edge of the green. The system works, except when water is applied too rapidly (as frequently happens in the case of rain) or when the slope is so long that water comes to the surface before it reaches the edge of the green.

It appears likely that these greens may need to be rebuilt again. The cost to the club for testing this theory will be considerable.

The Green Section has been involved with investigations of green construction methods for many years and has devised a construction procedure that has been proven to work well. We urge clubs to investigate thoroughly the merits of this procedure before undertaking to build greens on the basis of an idea that sounds attractive but which has not been tried.

Shallow Soil on Permeable Base

4. One relatively new golf course has experienced trouble from the day the course opened because greens are soft and they show footprints readily. We have been called to the club several times because greens were not doing well. Numerous minor problems have been presented, but the basic factor underlying the other difficulties is a false water table too near the surface. Consequently drainage is poor.

The greens were established on a very premeable coarse textured soil. It would appear that drainage could not possibly be a matter of concern. However, when the greens were built about six inches of good topsoil was used for the seedbed mixture. The great difference in texture between the topsoil and the subsoil causes the topsoil to hold more water by tension forces than it would hold if the texture were uniform. This principle is used to advantage where the seedbed is deeper. In this case, however, the top six inches stays too wet and the greens are always soft and shallow rooted. The solution to the problem would appear to lie in the creation of a deeper seedbed.

Can We Buy Short Cups?

5. At a golf course in the process of construction the green committee chairman greeted the agronomist with the question, "Do you know where we can buy shallow cups?" It developed that the club was running short of money; the golf course had been designed on a rather elaborate scale with large greens, tees, and bunkers. Much effort had gone into the development of costly ponds and other artificial beauty spots. Now, however, as the course neared completion, and as the money supply neared depletion, someone had suggested that a good many dollars could be saved by reducing the thickness of topsoil on greens from 12 to 6 inches.

There is no question that the quantity of topsoil needed on greens is an expensive item but it is our opinion

that it would be poor economy to save money by sacrificing quality of putting greens. The normal minimum recommendation for topsoil depth is 12 inches. Inasmuch as 20 to 25 percent shrinkage is common, the green eventually is covered with about a 9-inch depth.

Mistaken Identity

6. When the club manager-professional-superintendent called he said that a serious disease attack was damaging bermudagrass rather severely. Upon arriving at the club, we found weather conditions to be typical of the Southwest in the summertime. The temperature was high but humidity was extremely low. We were told that there had been no rain for several weeks. Under such conditions disease is rarely a problem.

Upon inspection of the "diseased" areas, it became apparent that the trouble was caused by some sort of chemical burn. There was a dead plant of dallisgrass in the very center of every one of the diseased spots. It developed that one of the workmen had been dispatched with a hand sprayer and a quantity of disodium methyl arsonate with instructions to spot spray the scattered dallisgrass plants. DSMA is quite selective and at normal rates does little to damage bermudagrass. In this case, the workman apparently had held the cone-shaped spray on one spot until he was sure the weed was thoroughly saturated and in the process the bermudagrass suffered substantial injury.

This kind of problem is easy to diagnose and prescribe for, but it cannot be done by phone or correspondence.

Wrong Diagnosis

7. Sod webworms are the larvae of a tiny moth and individually they are capable of eating only a minute quantity of grass. Collectively, they can denude a green in a few days.

It is easy to kill sod webworms if one recognizes that they are present. The difficulty is in detecting them. They are seldom seen during the day because they feed at night.

Our experience with webworms have been many and varied. Frequently they start to feed at a time when turf has been damaged by other agencies such as chemicals, fertilizers, or vertical mowing. The green is "off color" and the superintendent knows the reason for the situation. The perplexity arises when the green fails to recover as it normally should. Finally, it is discovered that sod webworms have invaded and are responsible for the green's failure to respond. Literally dozens of cases of this kind have come to our attention during the past decade. Because of their frequency of occurrence and their "sneaky" ways, sod webworms are always suspects whenever a subscriber starts to describe his problem by phone and a question about webworms is among the first that the agronomist asks.

At the beginning of this piece we said that clubs can very often avoid difficulties if they seek advice prior to taking steps that cause trouble. The Green Section staff members visit about 1,200 clubs each year and they have contacts with most of the investigators at state experiment stations and with most of the suppliers and purveyors of golf courses. Therefore if the agronomist cannot answer your question, he is quite likely to be able to refer you to competent people who can give you the proper advice. The essence of the matter is to call the Green Section before you get into trouble. It's much cheaper and less painful to all concerned.

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TURF TWISTERS

NIGHT MOWING

Question: Is night mowing healthier for the grass plant? (PENNSYLVANIA)

Answer: In hot summer months, it appears likely that mowing during the day may cause some damage. Damage to tissues normally results in increased respiration rates. It is believed that night mowing may help to alleviate these effects. However, where disease is a problem and dew is heavy, bruising the grass and then allowing it to stay wet all night may contribute to fungus activity.

With our present knowledge, an unqualified answer is not possible.

DALLISGRASS

Question: We are having trouble at our club with so-called dallisgrass. Can you give us information as to how to eradicate it? (ARKANSAS)

Answer: Dallisgrass can be controlled by spraying with 8 pounds per acre of disodium methyl arsonate. A second treatment three weeks later may be necessary to control a few plants which recover.

Dissolve the chemical in water so that you spray 8 pounds of DSMA and 80 gallons of water per acre. Bermudagrass will be discolored but it will recover promptly. Recovery is usually better if the soil is moist at the time of treatment.

SUMMER WEED CONTROL

Question: Our club is using a weed control material on greens that consists of small percentages of disodium methyl arsonate, trifluralin, and 2,4-D. This is primarily for crabgrass control. What is your opinion of this product? (KANSAS)

Answer: Generally, we do not recommend any kind of herbicide for use on bent greens in the summer months. The amounts of material you have applied will not likely do any harm. On the other hand these amounts are not likely to kill crabgrass. The margin between effectiveness and safety is very slight when one attempts to control crabgrass during its season of most vigorous growth in bentgrass turf during its season of least vigorous growth.