NOVEMBER 1970

USGA GREEN SECTION RECORD

A Publication on Turf Management
by the United States Golf Association

USGA GREEN SECTION RECORD

A Publication on Turf Management by the United States Golf Association

VOL. 8, NO. 5 NOVEMBER, 1970

COVER PHOTO:
A soils laboratory technician at Mississippi State University demonstrates one of the many procedures used in physically analyzing soils for putting green construction.

Published six times a year in January, March, May, July, September and November by the UNITED STATES GOLF ASSOCIATION, 40 EAST 38th ST., NEW YORK, N.Y. 10016. Subscription: $2 a year. Single copies: 35c. 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, P.O. Box 567, Garden Grove, Calif 92642. Second class postage paid at Hyattsville, Md. and New York, N.Y. Office of Publication: 40 East 38th Street, New York, N.Y. 10016.

Editor: William H. Bengeyfield **Managing Editor: Robert Sommers**

Art Editor: Miss Janet Seagle

Green Section Committee Chairman: Henry H. Russell, P.O. Box 697, Miami, Fla. 33157

Green Section Agronomists and Offices

EASTERN REGION
P.O. Box 1237
Highland Park, N. J. 08904
Alexander M. Radko, Director, Eastern Region and National Research Director
(201) 572-0440

MID-CONTINENT REGION
P.O. Box 592, Crystal Lake, Ill. 60014
F. Lee Record, Director, Mid-Continent Region
(815) 459-3731

SOUTHERN REGION
P.O. Box 4213
Campus Station, Athens, Ga. 30601
James B. Moncrief, Director, Southern Region
Holman M. Griffin, Southern Agronomist
(404) LI 8-2741

WESTERN REGION
P.O. Box 567
Garden Grove, Calif. 92642
William H. Bengeyfield, Director, Western Region and Publications Editor
G. Duane Orullian, Western Agronomist
(714) 638-0962

New Soil Testing Service Offered By Mississippi State and Green Section

We are pleased to announce that the Green Section of the USGA has entered into an agreement with Mississippi State University whereby the latter will test soils and make recommendations for putting green soil mixes based on the Green Section Specifications. Dr. Coleman Y. Ward will be in charge of the laboratory work. The opening of the laboratory again makes it possible for golf courses and golf architects throughout the country to utilize the latest information in putting green soils research.

The new laboratory is equipped to carry out a complete physical analysis within a week to ten days after receipt of the material. This includes a study of the sands, soils and organic materials received; the synthesis and testing of trial mixtures; and recommendations for a suitable mixture for putting green construction. For this complete study and recommendation, a charge of $100 is made and payable to Mississippi State University.

Some clubs may wish to have additional services. After materials are mixed on the site, it may be desirable to have samples of the mixture checked to determine uniformity of mix. Such samples may be checked at a cost of $25 each. Sieve analysis and other tests may also be obtained through the laboratory.

After the laboratory services are completed, the Green Section staff agronomist in the region concerned will be notified of the results.

WHAT IS NEEDED

A laboratory analysis will require a minimum of one gallon each of sand, soil and organic matter available to your club. If there is a choice of sands, soils, and organic materials, send samples of each together with a note indicating your preference based on cost, easy accessibility, etc. The laboratory will attempt to use your preferred materials in the recommended mixture.

All materials should be packaged separately and securely. Strong plastic bags inside cardboard cartons or metal cans are most satisfactory. Do not put moist soil or sand in a paper bag — it rarely arrives intact. When materials arrive broken and mixed, the laboratory simply must request more material. This sort of delay can be inconvenient, aggravating and time consuming.

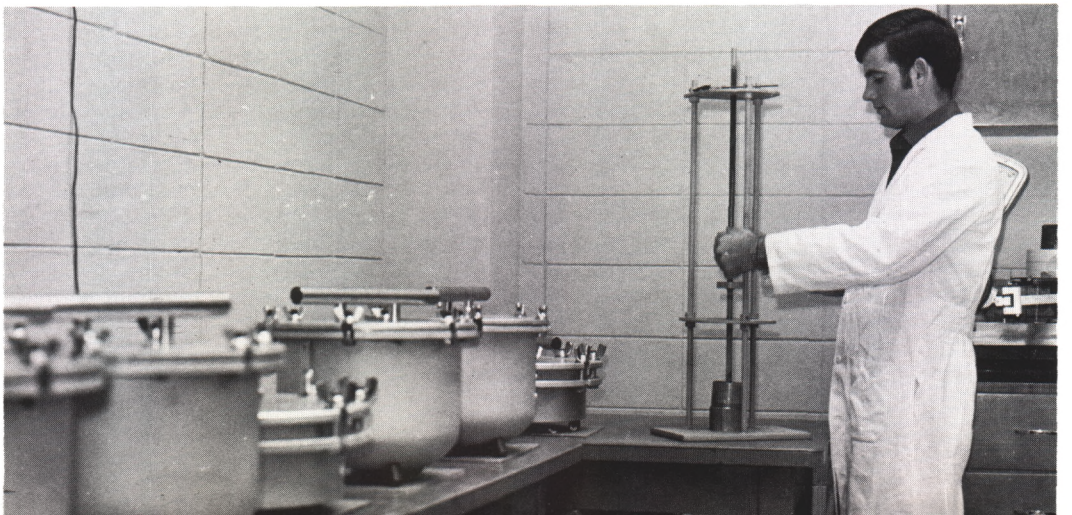
Paper labels packaged with moist materials deteriorate very rapidly. It is a good idea to use plastic labels inside the package and also to mark the outside of the packages. The more information you can send, the better.

WHERE TO SEND

Soil materials should be addressed to:

Attention — Dr. Coleman Y. Ward
Box 5248
State College,
Mississippi 39762

At the Mississippi State University Soils Laboratory, a technician demonstrates the impact-type compactor.



1970 Down South — Disaster Hits Bermuda Grass

Spring deadspot is still a problem in bermuda but in most cases it lost its identity because of winterkill.

by JAMES B. MONCRIEF,
Southern Director, USGA Green Section

You have heard the adage that history repeats. During the winter and spring of 1969-70 we certainly had a repeat of loss of bermudagrass north of an imaginary line extending from Jackson, Miss., to Charleston, S.C. Eight years ago we lost grass in the same area; however, the 1970 winter was worse, and the loss extends from greens, into fairways, roughs, and tees.

There is no doubt that prolonged low temperature is the main culprit, and there are numerous variations in symptoms where grass was lost. However, other factors were involved.

According to the Georgia State Climatologist, January, 1970, had the longest prolonged period of freezing temperatures in the South since 1898. As a result, frost lines penetrated deeper than ever before. Ice skates were brought out and lakes at country clubs made excellent skating rinks covered with from four to eight inches of ice.

In some areas, the average temperature for January was 8.8° below normal and moisture was four inches below normal. Similar departure from normal temperature and moisture conditions existed in Birmingham, Memphis, Nashville, Charlotte, and Greensboro, N.C., and from four to six inches of ice covered greens in some locations.

Recovery from low temperatures was less where there was a heavy buildup of thatch which could be due to a reduction in radiant soil heat circulation. The thatch could promote circulation of cold air around the elevated crown tissue. Air temperature can be freezing, while below the soil surface is not freezing;

however, the longer the atmosphere is freezing, the deeper the frost line goes.

There is indication that traffic throughout golf courses played a very important part in loss of bermudagrass. If members insist on playing during adverse weather conditions, especially as they existed during January, 1970, and during an unusually cool spring, they can expect the worst — loss of grass. The bermudagrass did not make fast recovery where there was repeated use of better pin settings, and in some instances, in August and as late as September 15, some of these areas still had not recovered completely. Those that were replanted naturally recovered faster; however, many were slow in doing so.

It would be advisable to close the course for play when adverse weather conditions exist during periods of excessively low temperatures. Golf should not be played unless there are alternate greens.

Recent research shows Tifgreen bermuda clippings were decreased as compaction pressures were increased. After several months of compaction treatment, die back was evident in turf within the high compaction range (60 to 80 psi).

Spring dead spot was camouflaged in the winter kill patterns and we did not see as many definite round patterns normally observed which are usually termed spring dead spot. Some could have existed, however, since grass had not recovered before overseeding on September 25.

Drainage played a very important part in loss of bermuda, especially on greens. It appears that the better drained greens suffered less than poorly drained ones. Greens with good drainage had a deeper root system and survival was superior when compared to poorly drained greens. Drainage has certainly been brought to the attention of those who have not felt it important to construct greens or tees properly, and there is no doubt that the poorly drained greens and tees compact readily.

Shade should not extend over bermuda greens because these greens are usually the first ones to be in difficulty. Unless a tree is strategically located, or it is very important to the play of the hole, it would be advisable to trim or eliminate it if it shades the green. Although trees provide some protection from cold winds, the shade may cause loss of grass.

Height of mowing is a contributing factor to loss of grass, and a comparison of putting surface with the adjacent area is a classical example in height of mowing and loss of grass. The practices of mowing higher just prior to overseeding and topdressing heavily one week before overseeding both are practical.

Topdressing seems to protect the stolons and aids in grass recovery in the spring transition. Topdressing one week prior to overseeding and following with another very light topdressing after overseeding sandwiches the seed between the soil layers and insures a better stand of grass. At the same time, it protects the stolons and underground parts of the grass for assurance of regrowth in the spring.

If greens have been vertical mowed lightly at one to two week intervals, then there will be less grass to remove in preparation for overseeding. If they have not been vertical mowed regularly, then use of topdressing would be advisable. The use of brushes and combs will reduce the excess growth to allow seed to be in contact with the soil.

Fertilization may not be a major factor; however, composite chemical soil analysis indicated a low potash nutrient level where grass was lost. This has been very undesirable for survival of bermudagrass following harsh winter conditions. It is advisable to harden off grass in the early fall by proper application of P & K to

Compaction is one of the main factors resulting in loss of grass.

Greens were replanted rapidly where large equipment was utilized.

have a buildup of proper nutrients in the cells to assure energy for better transition in the spring.

It is not advisable to use excessive amounts of nitrogen during the early fall when you are trying to harden off the bermuda. However, when overseeding has been completed, continuous use of nitrogen is required to establish and maintain a putting surface with the cool season grasses being used for winter play. We are actually working against the survival of the bermudagrass and we must keep the P & K nutrient level adequate.

Overseeding **versus** not overseeding has been discussed for many years. Mulching of greens in the Memphis area is still a common practice, but improved green construction and improved modern techniques of growing grass with plant protectants are showing bermudagrass is able to survive with overseeding in the area where mulching has been practiced. In most cases where bermudagrass greens are mulched, alternate greens are used for winter play and the mulch is removed after the last frost, or about April 1. This spring, however, some grass was lost under the mulch, but greens were replanted and were back in play early. Greens that were dyed and played on in most cases had a severe loss of grass.

The modern method of planting stolons minimizes the period that greens were out of play. Large equipment was used and some greens were planted in 30 to 40 minutes with 10 or more bushels of sprigs per 1,000 square feet. In many instances they were back in play in four to seven weeks. Prior to planting, the putting surface was vertical mowed in three directions, debris removed, and the stolons pressed into the soil. Topdressing followed. Frequent syringing and weekly applications of plant protectants gave a high percentage of survival of new stolons.

There is no doubt that early aerification in March and early April and thinning of the cool season grasses encouraged better survival of bermudagrass. This hastened the transition and reduced competition so that bermudagrass could grow faster, but there was still much competition from the cool season grasses.

Frequent use of power disk spikers starting March 1 helps to counteract compaction created during the winter months and allows the bermuda to grow in the slits which can be seen in patterns on the putting surface. Do not

spike when the ground is frozen or when frost is on the greens. When there is excess traffic during the summer, it is advisable to aerify the bermuda greens once a month, ceasing to aerify about three to four weeks before overseeding.

There has been much discussion of the survival of particular strains of bermuda, but at this time there does not appear to be any significant difference in cold hardiness of Tifgreen over Tifdwarf. It appears that the major differences are conditions that exist on individual golf courses and turf cultural practices.

Research shows better survival and faster recovery where bermuda was treated with fungicides. These plant protectants were applied during the summer of 1969 and in February and March 1970 and watered into the root zone. At the present time, we do not have a superior winter hardy bermudagrass. More stress will have to be placed on the ability of the turf manager for better survival of bermudagrass he is maintaining under adverse winter low temperatures.

Where bermudagrass greens are overseeded eight to nine months of each year, some turf managers are converting to bent. Changing from bermuda to bent on greens has been done to avoid several undesirable features of bermuda. Overseeding each year is time-consuming, and loss of bermuda in the spring is very discouraging. At the present time, bent is being maintained about 100 miles south of Atlanta, and it has been in play for two years. This is no doubt the furthest south bent is being grown year round in the southeast.

The greens must have good surface drainage, good internal drainage, and good sub-drainage for best results, and you cannot make a mistake during the hot summer or the bent may be lost.

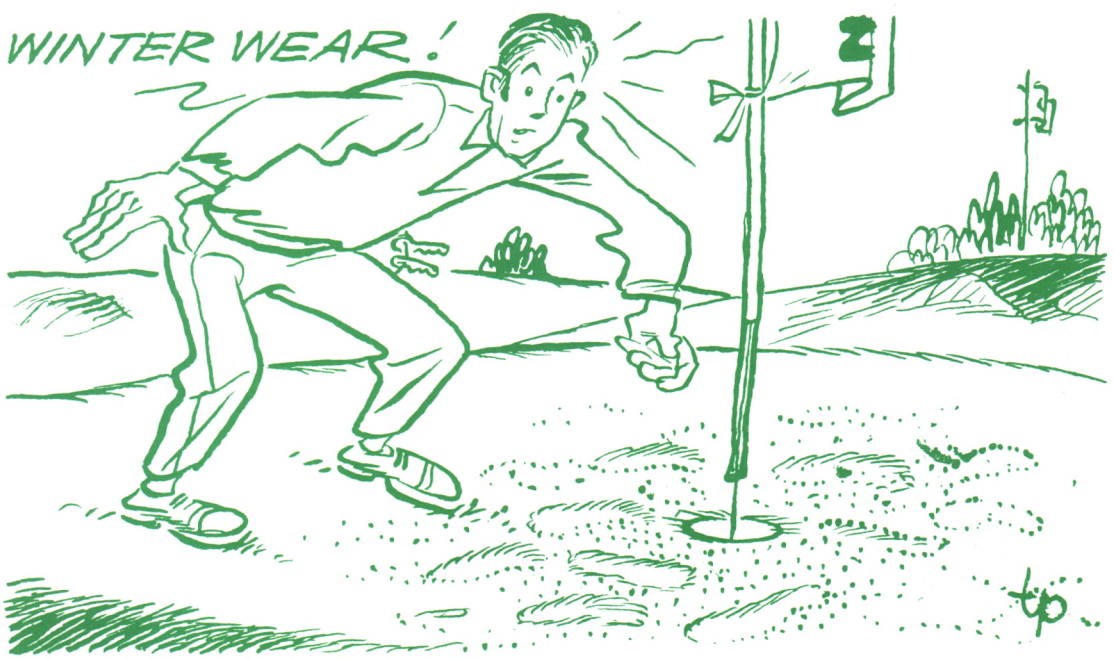
Changing grass alone will not solve the problem, but where greens have been built properly, they can be converted to bent without taking them out of play. In 1970, Charlie Danner, superintendent of the Capital City Country Club, Atlanta, has converted 12 bermudagrass greens to bent by applying Siduron at 13 ounces per 1,000 square feet just prior to overseeding the bermuda (Tifgreen 328). Danner applied two pounds of Penncross per 1,000 square feet in September, 1969. Application of Siduron was repeated in March, 1970.

So far, Tifgreen survival has been less than 1 per cent. Siduron will be applied again the latter part of September, 1970, and in March, 1971. Siduron (Tupersan) is not recommended for use on bermuda unless you want to retard or kill the grass. This chemical also shows much promise in keeping bermuda from invading edges of bent greens.

Unless we can reduce the loss of bermuda each spring, more clubs will be converting to bent; however, if you make a mistake during June, July, and August, you can lose bent.

SUPER SAM by Paprocki

"Wish these greens could go south for the winter."



How I Get The Most From My Triplex Green Mowers

by **STAN CLARKE,** Property Manager, La Gorce Country Club, Miami Beach

Having operated two triplex putting green mowers for almost a year, I feel I can now make some appraisals of how to get the most from them. Perhaps some readers will gain from our experiences, especially if they are just starting or contemplating the use of these machines.

La Gorce Country Club in south Florida is open year round, and our Tifgreen bermudagrass greens (overseeded with bentgrass during the winter) are mowed every day. Weather and certain maintenance practices may require a few days when the greens will not be cut, but at other times we will mow them twice daily. So, for all practical purposes we cut the greens 365 days a year with the triplex putting green mowers.

When the mowers first arrived, I was no better informed than anyone else about techniques in their use. At our monthly superintendents association meeting, fellow superintendents had had their triplex mowers for only a very short time as well, and we exchanged questions and answers as to how they may best be used.

First, let me say that I was using the same manufacturers regular putting green mower and had changed the front roller from a solid one to one I had designed and believe to be an improvement over the solid roller. I am now using the 'improved type' roller on the triplex machine. Figure I illustrates the roller modification.

A) Contains ball bearing and seal at each end with proper clearance inside for shaft and grease.

B) Shaft with one hole open to the inside of the grooved roller so that from "end seal" to "end seal" the inside is completely filled with grease and cannot leak out.

C) Snap ring to hold roller in position on shaft.

D) The roller itself is made on a lathe from a steel tube.

E) The outside edges of the roller are rounded so that the triplex machine can turn with a short radius and not cut or mark the putting green surface.

These rollers will outlast conventional rollers by about 3 to 1. The reason for designing rollers in this manner is that, in my opinion, the solid roller mashes down the grass blade and the cutting unit does not have a chance to cut properly. Under these conditions, thatch builds up.

Due to the cutting width of the triplex

FIGURE I

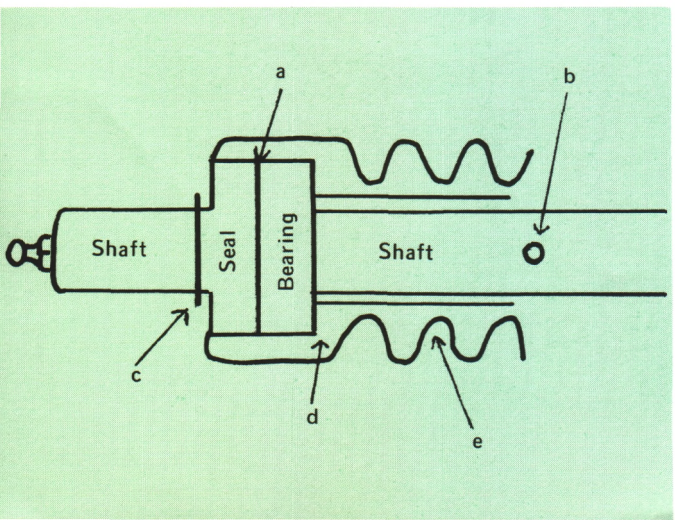
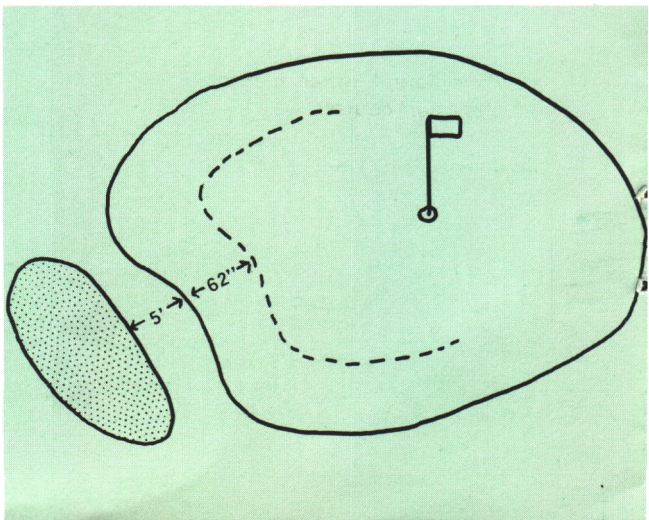


FIGURE II



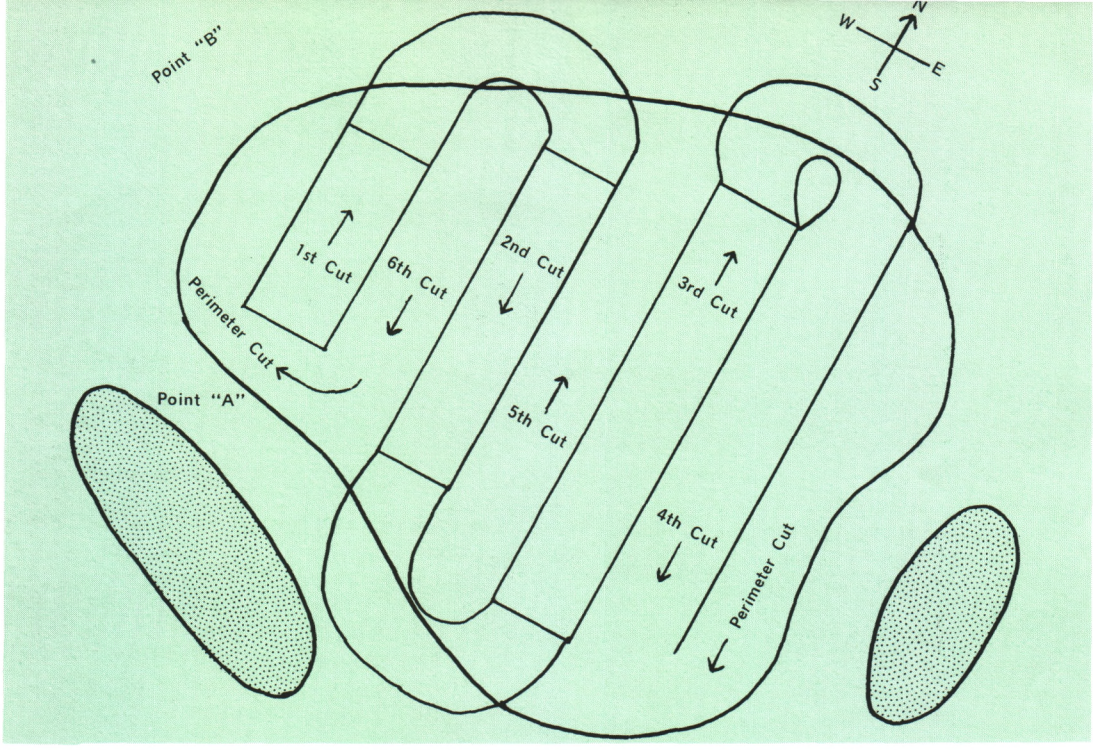


FIGURE III

machine and also its required turning radius, I decided to reshape the aprons of the greens so that they could accommodate the high operating speed.

Experimentation showed us that the apron needed to be a minimum of 5 feet and, with the additional space gained by a perimeter cut of 62 inches around the green, I could turn the triplex machine at any given location on the putting green perimeter. Thus, we would not have to back up or turn on the green itself. Any square footage lost in relocating the apron was made up by enlarging the green and our total putting surface remained the same. I understand that other manufacturers will soon present new models of triplex putting green mowers capable of carrying the "apron cut" much closer to sand traps, trees and other objects around greens.

As to the best method to use when cutting greens with triplex green mowers, I can only tell you of our experiences at La Gorce Country Club. No doubt, other superintendents have found other methods they feel best for their golf courses.

As the operator approaches the green, he must decide which direction to mow the green on this particular day. In this illustration, let's assume he will cut in a northerly direction. He will stop his machine at point "A" as this is the closest point from the last green and in line with today's line of cut. He dismounts, removes the flag and places it where it will be out of his way when cutting the green and will be close to where he will stop his machine before going on his route to cut the next green. Also while he is dismounted, he makes sure that bunker rakes are out of the way, automatic sprinkler heads are properly closed and checks the overall surface of the putting green for golf shoe spikes, coin markers and other unwanted objects. He now mows the green in the following manner:

His first cut is just far enough away from the perimeter of the green to allow a slight lap between the perimeter cut and the first cut. As he approaches the opposite edge of the green, he lifts the mowers at a point that will not leave a skip when he makes the perimeter cut. He now turns to his right (or east) and lines up to make his second cut. This position is approximately the same as two widths of the triplex putting green mower.

He now lowers the cutting units at a position that will not leave a skip for the perimeter cut, and also leaves an uncut width from the west side of the second cut that can be covered by the triplex mower at a later time.

The whole green is cut in the described manner with these uncut widths left until the operator is at the east side of the green. At this time, he will now turn and go back and cut the uncut widths that were left starting at the east end and cuts in a north-south — south-north direction until the entire green is cut. He now makes one final perimeter cut, stopping off the

A close up view of a triplex green mower.

green at point "B" to replace the flag and make a final inspection of his work.

By cutting the green in this manner, you have cut down on all unnecessary travel around the perimeter, and by cutting the perimeter last, I have found it cleans up grass clippings left by raising and lowering the cutting units. The operator now travels down the edge of a fairway when possible to the next green. He stops at different locations each day along the fairway to scatter the clippings.

At La Gorce we have a total of 124,000 square feet of putting surface consisting of 18 regular greens, a practice putting green and a chipping green. Two triplex units are used in the mowing operation. The time required to mow, clean up the machines and service for the following day is two hours for both machines. This time is exclusive of the mechanics' time to sharpen, adjust or perform other services that may be required.

Other observations we have made include:

Due to tracking of wheels when making the perimeter cut, it is sometimes necessary to cut the perimeter with a regular 22-inch walking green mower. Needed is a valve to cut wing units off, so when using triplex machines, you can vary the wheel pattern.

An automatic valve is needed to cut off cutting units when they are in a raised position.

More and improved attachments are needed to control thatch and grain.

Needed is a different type of fluid that will operate machines, and at the same time, not be detrimental to turf. The use of a colored fluid is also suggested so that leaks may be easy to spot.

Improvements in hose and hose connections are needed, as well as tubing and tubing connections.

There is some advantage gained in the quality of cut by using the rear roller nylon brush wiping assembly. This assembly is used to keep wet clippings from building up on the cutting units.

In conclusion, let me say that the triplex putting green mower now on the market and the two new ones to be released very soon must be considered as "first generation." I am confident that improvements will be continually made and in the future, all greens will be cut with some type of triplex mowing machine.

Reducing Winter Damage on Putting Greens

by F. B. LEDEBOER and C. R. SKOGLEY[1]
University of Rhode Island

Winter injury to turfgrasses often occurs in the northeastern United States, and particularly so on putting greens. Excessive frost heaving in soils of high silt content, and strong winds blowing over open turf combine in dehydrating the turf and surface layers of the soil.

These conditions produce injury referred to as desiccation.

Damage is generally more severe if the turf has been weakened during late summer and fall and if it is underlain by a moderate to heavy thatch layer. Excellent fall management to provide healthy turf for winter dormancy is important in preventing winter injury. This includes proper fertilization, insect and disease control, and frequent and judicial topdressing, combined with aerification and vertical mowing to prevent excessive thatch build-up.

Once heavy damage through desiccation has occurred, considerable time, effort, and, often, frustration are involved in returning damaged greens to acceptable playing conditions. At times even the professional life of the golf course superintendent may be in jeopardy. Superintendents and professional turf specialists are aware of this problem and have devised a number of counter measures.

[1]Contribution No. 1361, Former Research Assistant and Professor of Agronomy, University of Rhode Island, Kingston, Rhode Island.

Winter irrigation and antidesiccant sprays are used to retard transpirational water losses through the foliage. Excelsior, hay, straw or brush have been suggested as insulation against cold temperatures and to trap snow. However, most of these procedures have some serious drawbacks which are responsible for their limited acceptance.

In research work at the Rhode Island Agricultural Experiment Station a number of opaque polypropylene shade screens have been investigated for putting green winter protection. An earlier report[2] showed that dark-colored materials providing 45-55 per cent shade were effective. They provide protection for the grasses, not so much by trapping heat or preventing freezing, but by producing a modified micro-environment in the turf surface with a reduced amount of physical stress on the plants during the winter. These screens are apparently unaffected by weather and will last almost indefinitely if not willfully destroyed.

Further experiments were conducted on both Velvet and Penncross creeping bentgrass putting turf during the winters 1967-68 and 1968-69. In addition to a black polypropylene screen of 55 per cent shade, several nitrogenous fertilizers and snowmold fungicide treatments were employed to determine their effectiveness in conjunction with the protective cover. The

tests were started in mid-December of 1967 and late November of 1968.

Velvet Bentgrass Study: 1967-68

In a split plot field experiment, ureaform (Nitroform) and activated sewage sludge (Milorganite) were applied at two and four pounds of nitrogen per 1,000 square feet and compared against an unfertilized check treatment. Fungicide treatments consisted of Cadminate at two ounces per 1,000 square feet applied in 20 gallons of water and Calogran at 10 pounds per 1,000 square feet. Half of all plots were then covered with the polypropylene screens (55 per cent shade). Data were taken in the form of visual turf quality scores which reflected color, density, texture and vigor of the turf.

Results and Discussion

Very little response was observed during December and January, since the turf was dormant when the test was initiated. Some color development was noticed on covered plots by early February. It was most pronounced in combination with the activated sludge treatments. Effects continued to increase slowly during February and March. Progress was related to prevailing weather conditions as the season progressed. Early responses to cover and fertilization were evidenced by the appearance of new basal shoots near the surface. During freezing temperatures these tillers changed color from bright green to a purplish brown — a characteristic change of chlorophyll in plant tissues during cold weather. As long as frost periods were quite prevalent, this purplish color would predominate. As warmer temperatures prevailed (late March), the newly produced growth remained brilliant green. At first little vertical growth occurred. Early turf improvements were produced primarily by the cover but were strongly enhanced by both application rates of activated sludge.

Visual data were taken from late March through mid-May weekly, at first and later at biweekly intervals. Until April 19, the cover treatment was the predominant force in influencing turf quality. After the cover was removed on April 11, and the turf mowed on April 19, the cover effect diminished. Most of the early growth was removed by cutting, and open turf improved in color with normal spring recovery. The subsequent improvement in turf quality after mowing from May 15 to May 19 demonstrated that the cover was not detrimental to the grass since the effect of the cover treatment was still quite noticeable.

Fertilization with activated sludge at four pounds N/1,000 square feet under the cover produced the best turf on all reading dates during the test period, followed closely by the two pound rate. Ureaform treatments did not show significant benefits over the unfertilized check until May 17.

Fungicide evaluations were not made because **Tiphula** snowmold incidence was small. Both fungicides prevented snowmold completely in open as well as covered areas. The thought that the cover would provide better conditions for snowmold development could not be substantiated. Number and size of diseased areas in protected plots were not greater than in open turf of the untreated check areas. Nitrogen sources and rates apparently had no influence on snowmold incidence.

Penncross Study — 1968-69

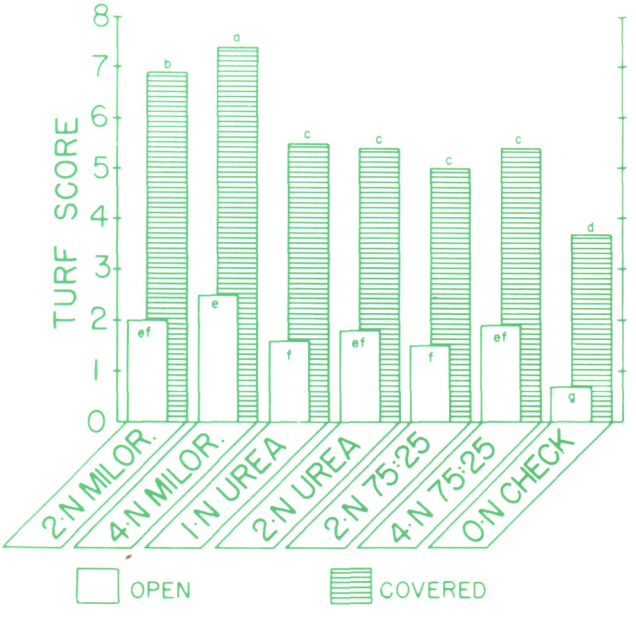
A test area of Penncross creeping bentgrass was selected for a similar study the following year. The site had been maintained as putting turf the previous summer and had received fertilization to produce acceptable growth, density, and color. The cutting height was one quarter inch.

Fertilizer treatments were made on November 22 as follows:

1. Activated sewage sludge at two and four pounds N/1,000 square feet.
2. Urea at one and two pounds N/1,000 square feet.
3. 75:25 Ureaform: Urea at two and four pounds N/1,000 square feet.
4. Check-no fertilization.

The test was laid out in a split plot design. Two snowmold fungicides were applied across

Figure 1. Response of Pencross putting turf on 4/4/69 to cover and fertilizer treatments applied during the winter.



[2] Ledeboer, F. B. and C. R. Skogley. 1967. The Golf Superintendent 35 (8): 22-32.

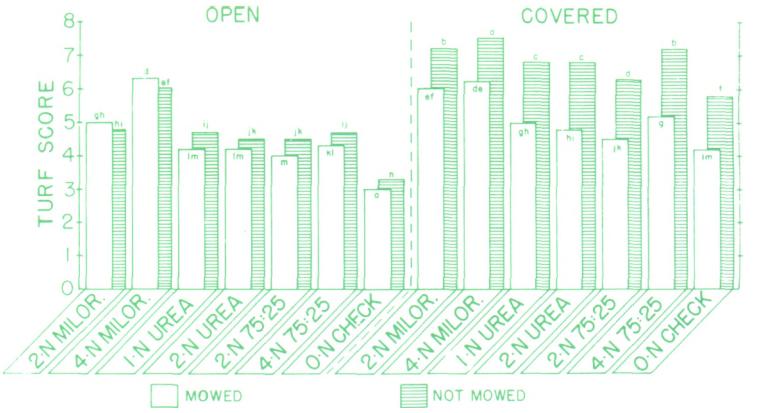


Figure II. Effect of mowing on Penncross turf quality at time of cover removal on 4/8/69 as influenced by cover and fertilizer treatments applied during the winter.

the fertilizer treatments on November 25, Calogran at eight pounds/1,000 square feet and Calochlor at four ounces/1,000 square feet. Half of all plots were covered with the polypropylene screen (55 per cent shade) on December 10. The cover remained in place until April 8, 1969, and half of all plots were mowed the first time on that day. All plots were mowed completely on April 15.

Because of a generally low incidence of snowmold in the test site, data on treatment effects again were omitted. As in the previous winter, the cover did not appear to increase snowmold incidence or damage.

Results and Discussion

Results obtained were quite comparable to the 1968 data. Turf quality was significantly increased by cover and fertilizer treatments.

The cover treatment, again, strongly influenced spring recovery early in the year (through March). Turf score data in Figure I, on April 4, demonstrate this effect. Differences between fertilizer treatments on open turf were only small at this time but all were significantly better than the unfertilized check. Turf recovery under the cover was enhanced most by activated sludge treatments, producing excellent quality turf by early April. Both rates were clearly more effective than either urea of the 75:25 mixture.

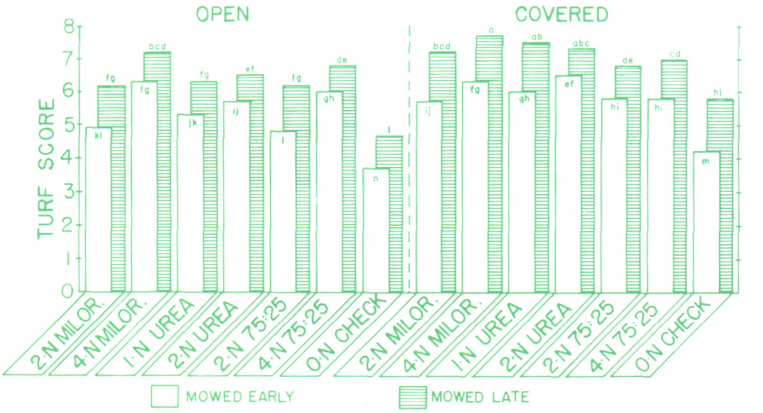
After the cover was removed on April 8, half of all plots were mowed at 3/8 inch. Mowing on the other half was delayed until April 15. This cutting schedule was used to detect if a delay in mowing after removal of the cover would prevent the severe color loss of turf encountered in earlier studies. Turf scores were taken one day after mowing in both cases. The data are shown in Figure II and IV for previously covered turf as well as open plots.

Early mowing resulted in loss of color, depressing turf scores more severely in covered plots than in open turf. Early mowing of open turf fertilized with activated sludge actually improved appearance slightly for a while because mowing removed primarily necrotic leaf tips and exposed new green foliage below (Figure II).

The setback produced in covered plots was quite severe for all fertilizer treatments regardless of rate or types, but it was no worse than that suffered by the check. The smallest reduction in turf scores occurred with the activated sludge treatments. This would indicate — and it was clear from the appearance of the turf — that new growth produced was bright green to the base of the plants and that this growth was not overly succulent at the time the cover was removed.

Data in Figure III represent turf quality of the test plots one week later after the entire plot area had been cut at 1/4 inch. Overall quality had increased slightly in numerical

Figure III. Effect of delayed mowing on Penncross turf quality on 4/16/69. One week after cover removal as influenced by cover and fertilizer treatments applied during the winter.



values as temperatures became more favorable. It is clearly evident, however, that the delay of mowing by one week did not adversely affect the turf in previously covered plots. The detrimental effect of earlier mowing on open plots on April 15 was similar to the reduction suffered by covered plots.

While significant differences still persisted between fertilizer treatments, relative differences became smaller as the season progressed. The effect of the cover also diminished with time.

Summary

Late fall nitrogen fertilization and protective covers strongly affected the time and intensiveness of spring recovery of bentgrass putting green turf in tests conducted in Rhode Island during the winters 1967-68 and 1968-69. Cover strongly enhanced turf quality early in the year, but the effect diminished slowly as the season progressed.

Fertilizer treatments variably intensified the cover effect depending on source and application rate. Of the fertilizer sources tested, activated sludge at four pounds N/1,000 square feet consistently gave the best results, especially early in the season. It was followed closely by the two pounds N rate, but urea at one and two pounds N/1,000 square feet gave similar results. A mixture of 75 per cent ureaform and 25 per cent urea at two and four pounds N/1,000 square feet gave somewhat poorer results. Ureaform (UF) alone, at the same rates, was ineffective in producing the desired early results. UF did not produce a significant response until the normal growing season was well under way.

Timing of cover removal was critical. Subsequent management requirements of the putting surface depended on proper timing. The cover should be removed early enough to avoid overstimulation of succulent foliage, yet late enough to escape cold weather injury. Removing the cover a few days too early is better than removing it too late!

Mowing should be delayed for several days following removal of the cover so that the turf can acclimate to the open environment (higher light intensity and greater moisture as well as temperature differentials). No apparent damage is sustained with delayed mowing, and the turf continues to develop normally.

Two winters of testing did not produce a clear picture relative to snowmold incidence in conjunction with late fall fertilization, protective cover and snowmold fungicides. What can be stated is that the cover has no apparent influence on snowmold occurrence. Preventive snowmold fungicides should be applied as usual prior to covering of the turf in fall or early winter.

The Two Year Turfgrass Management Program At Michigan State

by **JOHN W. KING**[1] Assistant Professor of Agronomy,
University of Arkansas.

QUESTION: Who needs college training in turfgrass management?

ANSWER: Young men preparing for responsible managerial or sales positions within the turfgrass industry.

The purpose of Michigan State University's Two-Year Turfgrass Management Program is to provide the fundamental technical knowledge and skills required to enter the turfgrass industry. Graduates are well qualified to serve as assistant golf course superintendents, superintendents of smaller golf courses or in other turf positions. Four-year degree programs offer a broader and deeper training in the sciences and humanities, but fewer specific skills. The choice of program depends on the individual. The specific occupational goal, academic interest and ability, and financial resources should be considered. Students who graduate with a B average or better may transfer to a four-year degree program if they wish.

MSU's Institute of Agricultural Technology and the Department of Crop and Soil Sciences administer the Two-Year Turfgrass Management Program with the cooperation of other subject matter departments. The program begins in mid-September with two terms of academic training. Six months of placement training begins in mid-March. The last two terms of classroom training are completed from mid-Sep-

[1] Formerly Graduate Teaching Assistant at Michigan State University, now Assistant Professor of Agronomy, University of Arkansas, Fayetteville, Arkansas

tember to mid-March.

Academic Program

Three courses in turfgrass management are taught by the coordinator. In Turfgrasses and Their Use, the adaptation and culture of turfgrass species and varieties, vegetative identification, and weed control principles are taught. In Principles of Turf Culture the effects of light, water, temperature, and air are studied. In Turf Practices, cultural systems for golf courses and other types of turf are studied. Dr. James B. Beard and other outstanding turf men are invited to speak to the turf seminar class. The coordinator also serves as faculty advisor to the students.

Dr. Paul Rieke teaches Basic Soil Science and Turf Soils and Fertilizers. Soil texture, structure, moisture, temperature, modification and fertility are studied.

Courses in Agricultural Biochemistry, Basic Plant Science, Arboriculture, Insect Pests and Insecticides and Plant Diseases are required. Dr. Joe Vargas, turfgrass pathologist, teaches the plant diseases course.

Courses in Landscape Equipment, Small Engine Operation, Irrigation and Drainage, and Applied Mathematics are taught by Agricultural Engineering professors.

Business methods are taught in Accounting, Personnel Practices, and Business Management. Elective courses in business law, salesmanship, financial and credit practices, and psychology are available. Two writing and speaking courses aid in improving communications skills.

Maintenance of Gardens and Grounds is a popular elective. Courses in landscaping are also offered.

Placement Training

Carefully supervised work experience is important. One-third of the program is spent on placement training. The trainee should be taught to perform every turfgrass maintenance task. The reasons for the particular tasks or program should be explained and discussed. The trainee is a paid laborer and is expected to be an outstanding workman. Many trainees are given occasional opportunities to supervise small work crews. Approximately 90% of our students take their placement training on golf courses. The superintendent bears the major responsibility in providing good on-the-job training and in return gets satisfaction for helping a young man develop his talents.

The student decides on a placement training position after a few interviews and discussion with Dr. K. T. Payne, Coordinator of the program. The final decision on hiring is made by the employer. Monthly reports giving hours on each type of work and skills learned, plus a report describing the turfgrass management program for the season is required of the student. Placement training visits are made by the coordinator. Placement training may be taken outside of Michigan. Placement training at locations managed by close relatives is not allowed.

Entrance Requirements, Tuition, And Other Costs

High school graduation or successful work experience with a recommendation from the employer is the minimum requirement for admission. Most students enter after high school, but many have had some previous college training, or are veterans. Turf work experience before entering the program is strongly recommended. Encouragement from their employers is an important reason for most students entering the program.

Tuition is $13 per credit for Michigan residents ($31 for out-of-state residents) at this time. The average course load is 17 credits per term.

Room and Board in MSU dormitories costs $325 per term. Books and supplies cost about $60 per term. Entertainment, travel, and other expenses vary with the individual. The program meets requirements for Veterans Administration benefits.

Campus Life

Living on MSU's large, well-landscaped campus is a tremendous experience. Ag tech students are assigned throughout the various dormitories, which gives the students an opportunity to meet others with various interests and backgrounds. Most dormitory complexes are co-educational; that is, women in one wing and men in the other with central cafeterias, grills, and lounges. Many cultural and movie programs, intramural athletics, spectator sports events, Forest Akers Golf Course, the MSU Turfgrass Club, Associated Students of Ag Tech, and various other student clubs and activities are available to ag. tech students. Sometimes it is difficult for students to remember that studies deserve first priority.

Rewards

The average starting salary for graduates is over $7,500. Most graduates start as assistant superintendents or superintendents of small golf courses. Advancement can be rapid for the man who increases his managerial skills through good experience and continuing self-education.

The support that golf course superintendents and others in the turfgrass industry have given the program since it was initiated in 1966 is greatly appreciated. We expect the graduates will make outstanding contributions to the turfgrass industry in the years ahead.

TURF TWISTERS

A BLADE OF GRASS

Question: Recently on television and in several magazine ads, a mid-western company promoted the use of artificial turf for housing developments, apartments and buildings to replace God's "green earth" and nature's oxygen manufacturing plant.

It is my understanding that one reason for today's air pollution is the destruction of vegetation, trees, shrubs and grass in the path of paving and building. It seems strange to promote artificial vegetation when the world is gasping for breath. Any comments? (California)

Answer: Yes. Let's trust that good judgement and common sense will return to those who breathe. Plant a tree, a bush, a blade of grass!

CAN'T BE

Question: Can it not be true that artificial covers, such as polyethylene and the newer screening materials really reduce winter injury? (New York)

Answer: When utilizing covers of any type we are altering the microclimate. The micro-climate refers to the environmental conditions which exist in close proximity to the turfgrass plants. Covers and screens are effective in controlling moisture loss, restricting low temperatures and buffering against rapid temperature fluctuations and therefore can minimize or eliminate damaging effects of desiccation and low temperature injury. Tests at Rhode Island State University, Michigan State University, and in Canada all show reduced winter injury in severe winters and quicker green-up in the spring in mild winters. (See article "Reducing Winter Damage on Putting Greens" in this issue.)

Securing covers had been a difficulty in the past and care must be taken when covering a green so that high winds do not blow covers away. Boards, tires, and in the case of screens, roofing nails have proven effective in holding covers in place.

ALL BAD

Question: Can we build a golf course over an abandoned garbage disposal site? An architect says we can. (New York)

Answer: After our telephone coversation we talked with soils men at Rutgers University and they confirm our earlier conclusion that it would be extremely hazardous to construct a golf course on a garbage disposal site. There are too many possible pitfalls and future agronomic problems. It would therefore be worth your while to get expert advice from soils men at Cornell University before proceeding. Test borings would have to be made to study the possible rate of decomposition of the garbage, if not presently well composed.

Also, because of projected agronomic problems, two feet of topsoil at minimum would be required over the site. This would mean using 3,225 cubic yards of topsoil and fill per acre. If you have 100 acres in grass, this total comes to 322,500 cubic yards of soil. In our humble opinion this is all a bad and costly bet!