JANUARY 1965

USGA GREEN SECTION RECORD

A Publication on Turf Management
by the United States Golf Association

Good drainage is one of the foremost requirements in growing good turf. Here, a seepage problem at Congressional Country Club, Washington, D.C., is being corrected just prior to the 1964 Open Championship.

USGA GREEN SECTION RECORD

Published by the United States Golf Association

VOL. 2, No. 5 ***January 1965***

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: 30¢. 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, Texas A&M University, College Station, Texas. Second class postage paid at Rutherford, N. J. Office of Publication: 315 Railroad Avenue, East Rutherford, N. J.

Editor: Dr. Marvin H. Ferguson **Managing Editor: Don Weiss**

THE GREEN SECTION OF THE UNITED STATES GOLF ASSOCIATION

Green Section Committee

CHAIRMAN: Henry H. Russell, P.O. Box 57-697, Miami 57, Fla.
DISTRICT CHAIRMEN: Northeastern: John P. English, Williamstown, Mass.; **Mid-Atlantic:** Martin F. McCarthy, Chevy Chase, Md.; **Southeastern:** Elbert S. Jemison, Jr., Birmingham, Ala.; **Mid-Western:** Charles N. Eckstein, Chicago, Ill.; **Southwestern:** L. A. Stemmons, Jr., Dallas, Texas; **Pacific Northwest:** Edward A. Dunn, Seattle, Wash.; **California:** Lynn A. Smith, Pasadena, Calif. **Rocky Mountain:** J. W. Richardson, Magna, Utah.

Green Section Agronomists and Offices

EASTERN REGION
Northeastern Office: P. O. Box 1237 Highland Park, N. J.
Alexander M. Radko, Director, Eastern Region
Holman M. Griffin, Northeastern Agronomist
Raymond E. Harman, Northeastern Agronomist
Lee Record, Northeastern Agronomist

Southeastern Office: P.O. Box 4213, Campus Station, Athens, Ga.
James B. Moncrief, Southeastern Agronomist

MID-CONTINENT REGION
Southwestern Office: Texas A&M University, College Station, Texas
Dr. Marvin H. Ferguson, Director, Mid-Continent Region and National Research Coordinator

Mid-Western Office: Room 221, LaSalle Hotel, Chicago 2, Ill.
James L. Holmes, Mid-Western Agronomist

WESTERN REGION
Western Office: P.O. Box 567, Garden Grove, Calif.
William H. Bengeyfield, Director, Western Region

USGA OFFICERS AND EXECUTIVE COMMITTEE

PRESIDENT: Clarence W. Benedict, White Plains, N. Y.
VICE-PRESIDENTS: Wm. Ward Foshay, New York, N. Y. Hord W. Hardin, St. Louis, Mo.
SECRETARY: Philip H. Strubing, Philadelphia.
TREASURER: Robert K. Howse, Wichita, Kan.
EXECUTIVE COMMITTEE: The above officers and: Fred Brand, Jr., Pittsburgh, Pa.; William C. Campbell, Huntington, W. Va.; Robert F. Dwyer, Portland, Ore.; Edward L. Emerson, Boston, Mass.; Edwin R. Foley, San Francisco; J. W. McLean, Houston, Tex.; Eugene S. Pulliam, Indianapolis, Ind.; Henry H. Russell, Miami, Fla.; Charles P. Stevenson, Buffalo, N. Y.; Morrison Waud, Chicago, Ill.
GENERAL COUNSEL: Lynford Lardner, Jr., Milwaukee, Wis.
EXECUTIVE DIRECTOR: Joseph C. Dey, Jr.
ASSISTANT DIRECTOR: P. J. Boatwright, Jr.

USGA HEADQUARTERS: "Golf House", 40 East 38th Street, New York, N. Y. 10016

Tiles are being placed to effect rapid removal of water seeping into the trench. Note the strips of tar paper which were to be used to cover the joints, thus keeping gravel or soil from falling into the tile line. Note also the abundance of tree roots growing out from the sides of the ditch.

An Open Championship And A Problem

By **ALEXANDER M. RADKO,** Eastern Director, USGA Green Section

Every club that entertains an Open Championship strives to condition its course as nearly perfectly as possible so that members will be proud to display it to competitors, spectators, and the television audience. Officials at Congressional Country Club, Washington, D. C., worked diligently toward this end in preparation for the 1964 Open last June. Then, three weeks before the Open date, a serious seepage problem became evident across the drive zone on the 13th fairway.

This problem had reared its ugly head off and on in years past at Congressional, but in the maze of other Open preparation detail, all concerned were taken by complete surprise when, despite a very dry Spring of '64, water again ebbed to the surface. In no time the soil and the turf became sopping wet! Now a perfect drive on this hole could become embedded or an otherwise unfair lie could occur. Of course, a ground-under-repair area could be marked off, but this would have broken

The job at Congressional is nearly complete. Tile has been installed, the gravel backfill is in place. Now a small amount of soil will be replaced and the sod laid back and tamped smooth, ready for the Open.

the hearts of everyone concerned with conditioning the course—to have the drive zone of one hole marked under repair when all else looked to be shaping up perfectly. What a dilemma! What to do?

Without hesitation, the officials responsible decided to drain it! There wasn't a moment to lose and they well knew it. This was May 25, three weeks before the Open was to begin.

Fate was on Congressional's side for when officials contacted the local Soil Conservation Service branch of the U. S. Department of Agriculture someone was available and could immediately come to assess the situation and draw up the plan for effective drainage. After studying the situation Soil Conservationist Lewis Williams and Conservation Technicians Jim Cole and Bill Knill decided that a double line extending across the entire fairway was required to harness the fresh water spring and by means of tile direct it so that it would drain into the pond to the right of No. 10 green.

The material and equipment required were: 60 tons of ¾ inch gravel, 60 feet of transite, 600 feet of drain tile, a back hoe, a front end loader, a power sod cutter, polyethylene tarps, and tar paper.

The technique employed was as follows:

(1) Approximately 300 square yards of sod were removed to the drainage pattern; it was rolled and set aside for replacement when the job was finished.

(2) Soil then was removed from a

depth of 9 to 48 inches, and was placed on the polyethylene tarps laid to either side of the ditch to minimize damage to the established turf.

(3) The tiles were carefully installed and each joint was wrapped with tar paper as shown in the accompanying photographs.

(4) Tiles then were covered with 8 inches of gravel, and the soil was carefully replaced and tamped.

(5) The lifted sod was relaid.

All was done so well that hardly anyone realized the fairway had been touched. How long did it take? Being in on preliminary conversations, I was amused at the "pop-eyed" reaction of the Soil Conservation representatives when Walter Gallagher, Frank Murphy, Otie Reed, and John Henley — club officials and superintendent, respectively—said, "We'll get the job done tomorrow!" They couldn't believe that Congressional's representatives were serious. Didn't they realize the magnitude of the project? Well, it took two tomorrows, but the job was beautifully done, and the USDA men went away convinced that to get beautiful grass to grow underfoot the Congressional officials would stop at nothing!

Turf Management at Brae Burn

By **ARTHUR E. ANDERSON,** Golf Course Superintendent

This article is a description of the turf management program at Brae Burn Country Club, Newton, Mass., beginning in the 1930s and developing from recommendations, observations, experiments and results. Help from other superintendents, the USGA Green Section, university turf specialists and commercial men in formulating this program was very considerable and is gratefully acknowledged by the writer. Use of the word "experiment" is misleading because these "experiments" were very roughly qualitative; there were no control plots, and treated areas were later obliterated by what was determined to be the best management program, as the area was part of an operational golf course rather than a turf research field station. Readers are cautioned to interpret this report in terms of the results obtained with the reservation that specifically how and why this program succeeded cannot be pinpointed closely.

The present course evolved during the period from 1897 to 1928 with several greens remaining unmodified since the beginning. It is located on an area of fine sandy loam except for two holes that are on a former peat bog. In early days manures were used as fertilizers, bringing in many weeds, and commercial fertilizers had rations like 4-8-4 or 8-6-6. In 1934 limestone at one ton per acre was applied to greens, tees, and fairways and repeated the next year at one-half this rate. By the late 1930s the pH reading of soils ran from 5.0 to 5.5, and phosphorus and potassium levels were reported to be very high. Basic grasses in fairways were Kentucky bluegrass and bentgrass, but they did not predominate because of the abundance of broadleafed weeds, annual bluegrass, and crabgrass. In 1937 grubs greatly reduced the amount of basic grasses, leaving essentially clover and annual bluegrass with severe summer infesta-

tions of knotweed and crabgrass. Tees and greens especially were covered with annual bluegrass.

The "modern" program began generally in 1938 with adoption of modified or new practices. Several observations seemed pertinent with respect to improvement of turf. One was that roughs, unfertilized, unlimed and cut at two inches, comprised a good stand of basic grasses. Further, paths through rough made by fairway mowers, which traveled between fairways and cut at fairway height, also had a good proportion of basic grasses, especially bentgrass. Near approaches to some greens the limit of travel by the fairway fertilizer spreader was marked by a distinct line. On the fairway side turf was poor, while on the other side, where fertilizer applications had not been extended to the approach sufficiently, turf was good. A similar condition existed where fairways were constricted by the intrusion of bunkers. Here the fertilizer spreader passed over a given area within the constriction twice or more, giving a much larger dose of fertilizer than was intended. Turf in these areas was especially poor and, indeed, was the last to be improved in recent times by the present program. My tentative conclusion was that too much fertilizer had been used on the course.

New Fertilizer Program

The high phosphorus and potassium fertilizers were abandoned and we began to use a natural organic product as our source of nitrogen. On fairways the fertilizer was usually applied in the spring and early fall at rates giving one pound of nitrogen per 1,000 square feet per application. With the advent of fairway watering from 1946 to 1950 it appeared that turf became too lush. The total fertilizer amount was cut in half, and this amount was applied in four or five applications per season, giving a total dose of nitrogen at one pound per 1,000 square feet. In recent years the organic nitrogen has been used less, and there has been a tendency to reduce or omit application of phosphorus and potassium. Sometimes urea alone has been applied several times per season with a rotary fertilizer spreader. Since 1935 limestone has been applied once—during the mid-1950s—at the rate of one ton per acre. The pH levels remain about 5.5 throughout.

There is a different program, of course, for greens. Generally the total nitrogen dosage is two to three pounds per 1,000 square feet for the season by means of 15 to 20 applications of such materials as ammonium sulfate, diammonium phosphate, urea, sludge and cottonseed meal. It is my belief that excessive uncontrolled thatch formation is in part caused by single heavy fertilizer applications, and for this reason light, frequent applications are employed. Potassium and phosphorus total about a pound per 1,000 square feet for the season with muriate of potash supplemented in the fall. Each green is considered by itself with respect to fertilizer dosage and some receive different amounts than others. This is rather easy when proportioners are used. Limestone is added every other year at the rate of 10 to 15 pounds per 1,000 square feet.

In 1937 lead arsenate at 350 pounds per acre was applied to greens, fairways and most tees, except a few in

Arthur Anderson is one of the many dedicated golf course superintendents who has devoted all his adult life to the golf course profession. He began at Oak Hill Country Club in Fitchburg, Mass., went to Brae Burn in the early 1930s. His course at Brae Burn is unique in that it has none of the Poa annua problems that plague so many other Northeastern courses. Mr. Anderson's story is bound to create controversy but no one will argue with the success of his result. Mr. Anderson, a graduate of the first University of Massachusetts turf class, followed Prof. Dickinson's philosophy all through his superintendent years . . . "Let the little grass plant grow!—Don't force it to grow!"

shady locations where annual bluegrass is deliberately cultivated. It was applied dry on fairways and tees and with a proportioner onto greens. Applications were repeated in 1940, 1944, 1947, 1951, 1955, 1959, and one is projected for this year. In addition, sodium arsenite was sprayed in the spring on fairways four times at one pound in seven gallons of water per acre.

Over a period of years, bentgrass, which had been present in small quantities, began gradually to become distinct and crowd out other plants. Weeds such as knotweed and crabgrass disappeared quickly. Annual bluegrass also diminished but tended to re-invade when fairway watering was installed. Yet, on the other hand, the take-over by bentgrass was accelerated rapidly with fairway watering. Even dandelion and plantain disappeared even though phenoxy acids have never been used. Today, greens, fairways and large sunny tees are covered with superior clones of bentgrass that have coalesced virtually into a solid carpet. These clones are mostly Colonial bentgrass, although some creeping and velvet bentgrasses and probable hybrids are present among all three species. They are superior individuals that have been given their chance to push everything else out of existence, even annual bluegrass, which is hard to find even on narrow aprons that bear the heaviest traffic.

With the presence of such vigorous bentgrass, which forms thatch readily, aeration has been a necessary part of the program. Aerating our fairways with a thatch spoon rather than with the open type has proved better since it tears less and reduces the chance for annual bluegrass to re-invade. Also, aerating at the same time that lead arsenate is applied helps check annual bluegrass. Thinning out bentgrass with vertical slicing machines has been beneficial on greens, and it would appear that fairways could use thinning now that there are machines developed for this purpose.

Control of Algae on Bentgrass Greens with a Coordination Product of Zinc Ion and Maneb

By **R. V. STURGEON**, Plant Pathologist, **H. C. YOUNG, JR.**, Project Leader, and **JOSEPH M. VARGAS, JR.**, Graduate Research Assistant, Botany and Plant Pathology Department, Oklahoma State University

An almost continuous application of water is required during the summer months to maintain the growth of bentgrass on golf greens in Oklahoma. Under these conditions, whenever the grass becomes thin due to attacks of diseases or insects or some other cause and light is admitted to the soil surface, small single-celled plants called algae begin to grow. A slimy green scum soon forms and when this scum dries out during the day a hard crust develops which is almost impervious to water. It then becomes impossible for the grass to reestablish itself in these areas. There is a need, therefore, for a chemical which will control the growth of algae, but which will not be toxic to the grass.

A study of chemical sprays for the control of the diseases dollar spot, caused by the fungus *Sclerotinia homeocarpa*, and large brown patch, caused by *Rhizoctonia solani*, was made during the 1964 growing season. A prevention type schedule was used in which the chemicals were applied at weekly intervals throughout the summer beginning in early June and ending in late September. Each chemical was applied in 15 gallons of water per 1,000 square feet in plots replicated three times. The study, (Chemical Control of Diseases Affecting Turf; Prog-

Table 1. Algae Control in the Disease Prevention Program, Green No. 12, Lakeside Memorial Golf Course, Stillwater, Oklahoma

Fungicide & rate used in ounces per 1000 sq. ft.	Type	Disease Rating[a]
CHECK[b]		8[c]
1. MERCURAM ..... (6)	organic mercury + non-mercurial	9
2. DYRENE ..... (4)	non-mercurial	7
3. DYRENE .... (2) + VAPOR GUARD .... (32)	non-mercurial anti-transpirant latex	7
4. DITHANE M-45 ..... (6)	non-mercurial	2
5. PHENMAD ..... (1) + THIRAMAD (Iron fortified) (3)	organic mercury + non-mercurial	9

aThe disease rating was made September 15, each plot rated by a scale of 1 to 9 based on the amount of area infested with algae. The higher rating indicates a more severe infestation of algae.
bSmall untreated plot at each end of green.
cChecks were sprayed twice during season (8-1 & 9-5) with either treatments 4 or 5 (Dithane M-45 or Phenmad + Thiramad plus) for control of other turf diseases.

ress Report 1964) was made on a creeping bentgrass green at Lakeside Memorial Golf Course, Stillwater, Oklahoma. During July the grass became rather thin in spots over the green, probably due to extremely poor growing conditions, and algae developed in these thin areas. Early in August it was noted that one of the chemicals used in the test was giving excellent control of the growth of algae. This was a coordination product of the zinc ion with manganese ethylene bisdithiocarbamate (Dithane M-45) applied at 6 ounces per 1,000 square feet. None of the other chemicals used was effective in the control of algae. Control ratings were estimated and are given in Table 1. The plots treated with Dithane M-45 produced a tighter, more dense turf, and a better putting surface was maintained.

On the Plant Pathology Farm, Oklahoma State University, newly planted turf plots, consisting of Tifgreen (Tifton 328) Bermudagrass and Seaside Creeping Bentgrass, developed a heavy mat of algae under a constant watering program. Eradication of the algae followed a single application of Dithane M-45 at 6 ounces per 1,000 square feet.

Dithane M-45 was later applied on greens where algae had developed at the Hillcrest Country Club, Bartlesville, Oklahoma, and at the Quail Creek Country Club, Oklahoma City. Good control was obtained in both cases.

A preliminary summary of the data indicates that Dithane M-45 has given good control of both dollar spot and brown patch diseases as well. Final analysis of the entire study will be published at a later date.

COMING EVENTS

January-March
Winter School for Turf Managers
University of Massachusetts
Amherst, Mass.

January 4-March 12
Winter Course for Turfgrowers
Rutgers College of Agriculture
New Brunswick, N.J.

January 13-14
Nebraska Turfgrass Conference
Nebraska Center for Continuing Education
Lincoln, Neb.

January 20-22
Turfgrass Conference
Rutgers University
New Brunswick, N.J.

January 27-28
Virginia Annual Turfgrass Conference
John Marshall Hotel
Richmond, Va.

January 27-29
Agronomy Short Course
University of Maryland
Chevy Chase, Md.

January 29
United States Golf Association
Green Section Golf Course Management Conference
Biltmore Hotel
New York, N.Y.

February 1-3
Southern Branch of the American Society of Agronomy
Adolphus Hotel
Dallas, Texas

February 7-12
GCSAA Conference and Show
Sheraton-Cleveland Hotel
Cleveland, Ohio

February 22-23
Southern Turfgrass Association Conference
Peabody Hotel
Memphis, Tenn.

March 1-3
Midwest Regional Turf Conference
Purdue University
Lafayette, Ind.

March 11-12
Turfgrass Conference
Michigan State University
East Lansing, Mich.

March 11-12
Massachusetts Turf Conference
University of Massachusetts
Amherst, Mass.

March 22
USGA Golf Course Management Conference
Pittsburgh, Pa.

March 24
USGA Golf Course Management Conference
St. Louis, Missouri

March 24-26
Royal Canadian Golf Association Turfgrass Conference
Toronto, Canada

March 26
USGA Golf Course Management Conference
San Francisco, Calif.

Tifdwarf - A New Bermudagrass For Golf Greens[1]

GLENN W. BURTON and J. EARL ELSNER[2]

Tifdwarf bermudagrass, superior for golf greens, will be officially released to qualified nurserymen as a feature of the 19th Annual Southeastern Turfgrass Conference, Tifton, Ga., in April, 1965. Like other improved grasses developed jointly by the U.S. Department of Agriculture and the Georgia Coastal Plain Experiment Station, it will be released only under the Georgia Crop Improvement Association or similar certification programs in other states. This will protect buyers who want to be sure they do not get a substitute.

Tifdwarf has been tested for three years at the Georgia Coastal Plain Experiment Station, Tifton, Ga., in comparison with Tifgreen (Tifton 328). In these comparisons, it has been equal, or superior, to Tifgreen on nearly every score. For the modern golfer demanding fast greens, Tifdwarf will be a real improvement. Its tiny leaves hug the ground so closely that a number of them are never cut by the greens mower. This characteristic helps it to tolerate a 3/16-inch cutting height much better than Tifgreen. Its softer leaves and fewer seedheads also contribute to its superior putting qualities.

Tifdwarf has a darker green color than Tifgreen and requires less fertilizer to make a comparable degree of greenness. Its purple basic plant color, which helps to keep it looking dark green in the summertime, becomes very noticeable when temperatures drop in the fall. As a consequence, Tifdwarf turf takes on a purplish cast that may prove objectionable to some.

The winter-hardiness of Tifdwarf has been evaluated by Drs. A. A. Hanson and Felix Juska in the U.S. Department of Agriculture turf plots at Beltsville, Md. They found Tifdwarf a little more winter-hardy than Tifgreen.

When clipped daily except Sunday at 3/16-inch and 1/4-inch heights, Tifdwarf produced only about half as many clippings by weight as Tifgreen. These findings suggest that the amount of mowing could be less and, hence, labor costs might be reduced through the use of this variety.

A top-dressing experiment revealed that Tifdwarf will require much less top-dressing than Tifgreen to maintain an attractive, smooth putting surface. This could represent another substantial saving in maintenance.

Forms Sod Quickly

Tifdwarf, like most dwarfs, has smaller and shorter leaves, stems, internodes, and seedheads. As a consequence, Tifgreen will form a sod more quickly than Tifdwarf when both grasses are planted in 12-inch centers. A square yard of Tifdwarf sod, however, has many more stems and nodes than a square yard of Tifgreen sod. It is believed, therefore, that a square yard of Tifdwarf, shredded and broadcast on a given area, will form a sod as fast as a square yard of Tifgreen similarly planted on the same area. Once

[1]Cooperative investigations at Tifton, Ga., of the Crops Research Division, Agricultural Research Service, U.S. Department of Agriculture, and the University of Georgia, College of Agriculture Experiment Stations, Coastal Plain Experiment Station.

[2]Principal Geneticist, Crops Research Division, Agricultural Research Service, U.S. Department of Agriculture, and the University of Georgia, College of Agriculture Experiment Stations, Coastal Plain Experiment Station, Tifton, Ga., and Graduate Assistant, University of Georgia, Athens, Ga., respectively.

established, Tifdwarf has made a denser sod than Tifgreen in Tifton tests.

Tifdwarf appears to be equal to Tifgreen in disease resistance. Both are favorite food for insects, such as the sod webworm. But on golf greens with modern insecticides, insects can be easily controlled.

A fertilizer-factorial experiment currently under way suggests that a 4-1-2 ratio of N-P_2O_5-K_2O will satisfy the nutrient needs of Tifdwarf with a minimum waste of plant food.

How did Tifdwarf originate? No one will ever know for sure. Several years ago, T. M. Baumgardner and Marion McKendree noticed a small circle (about 18 inches in diameter) of a finer grass growing in one of the greens at Sea Island, Ga., first planted to Tifgreen obtained from the Georgia Coastal Plain Experiment Station as a part of the evaluation program before it was released. They told us about it and kindly gave us a cup-cutter plug of sod for testing. About the same time, James B. Moncrief, Southeastern Agronomist for the USGA Green Section, brought us a plug from a test green planted about the same time on the Country Club at Florence, S. C. Both were planted at Tifton in a replicated evaluation test with Tifgreen and two other grasses as checks. It is from this test that we obtained much of the information reported here.

Cytological investigations have proven that Tifdwarf has the same chromosome number as Tifgreen ($2n=27$). Both grasses have many of the same characteristics. The anthers, stigmas, racemes, and panicles appear to be identical except for size. Since Tifgreen is completely sterile and never sheds any pollen, Tifdwarf could not be a seedling of Tifgreen. The dwarf bermuda from Sea Island, Ga. and Florence, S.C. appear to be identical.

A careful evaluation of all evidence indicates that Tifdwarf is a vegetative mutant that occurred in Tifgreen at Tifton before the first planting stock was sent out for early testing. The golf courses at Florence and Sea Island each got a sprig or two of this mutation. Its superiority to Tifgreen under golf-green maintenance allowed it to spread until it occupied an area about 18 inches in diameter on each green. Mr. Baumgardner reports that the tiny circle of grass on his course (that we are naming Tifdwarf) has, on several occasions, looked better than the Tifgreen around it, particularly when Tifgreen was in trouble.

Perhaps the exact origin of Tifdwarf is not too important. It has been isolated, purified, and named, and many of its superior traits have been established. Now the golf course superintendent and the golfer must determine if it is really better than Tifgreen. We think it is.

ACKNOWLEDGEMENTS: The authors gratefully acknowledge the assistance of the following people, who had a hand in the discovery and evaluation of Tifdwarf bermudagrass: T. M. Baumgardner, Vice-President, Sea Island Company, Sea Island, Ga.; Marion McKendree, Superintendent, Sea Island Golf Club, Sea Island, Ga.; James B. Moncrief, Southeastern Agronomist, USGA Green Section, Athens, Ga.; Dr. Jerrel B. Powell, Research Geneticist, U.S. Department of Agriculture, Georgia Coastal Plain Experiment Station, Tifton, Ga.; Dr. Homer D. Wells, Senior Research Plant Pathologist, U.S. Department of Agriculture, Georgia Coastal Plain Experiment Station, Tifton, Ga.; Dr. Bill B. Brodie, Nematologist, U.S. Department of Agriculture, Georgia Coastal Plain Experiment Station, Tifton, Ga.; Dr. A. A. Hanson, Research Leader, Grass and Turf Investigations, Plant Industry Station, Beltsville, Md.; Dr. Felix V. Juska, Turf-Research Agronomist, Grass and Turf Investigations, Plant Industry Station, Beltsville, Md.; Raymond B. Cooper, Agronomy Department, Virginia Polytechnic Institute, Blacksburg, Va.; Clarence Lance, Graduate Assistant, Agronomy Department, University of Georgia, Athens, Ga.; and Lee Clements, Research Technician, U.S. Department of Agriculture, Georgia Coastal Plain Experiment Station, Tifton, Ga.

We also wish to acknowledge support from the USGA Green Section, the Southern Golf Association, Georgia Golf Course Superintendents' Association, Golf Course Superintendents' Association of America, Evans Implement Company, Atlanta, Ga., Patten Seed and Turfgrass Company, Lakeland, Ga., and Southern Turf Nurseries, Tifton, Ga.

Adequate Drainage Key to Holding Courses During 1964 Heat and Humidity

(A Report from the Chicago District Golf Association)

A panel of turf authorities which included:

JAMES L. HOLMES	Mid-Western Agronomist, United States Golf Association
WARREN BIDWELL	President, Midwest Association of Golf Course Superintendents; Superintendent, Olympia Fields Country Club
DR. MIKE BRITTON	Turf Pathologist, University of Illinois
JACK D. BUTLER	Turf Pathologist, University of Illinois
DR. WILLIAM DANIEL	Professor of Agronomy, Purdue University
ROY NELSON	Past President, Golf Course Superintendents' Association of America; Superintendent, Ravisloe Country Club

arrived at the above truth during a seminar called by the Midwest Association of Golf Course Superintendents and the Chicago District Golf Association at the LaSalle Hotel on August 21, 1964. The meeting was attended by 212 people vitally interested in what happened to Midwest golf courses during the summer of 1964 and what can be done to avoid recurrence. They were welcomed by Charles N. Eckstein, Chicago District Golf Association Green Chairman, and the following is a distillation of the opinion represented.

It was established that two types of fairway turf are present in the Chicago area; *Poa annua*-bentgrass and Kentucky bluegrass-fescue. *Poa annua* is an annual bluegrass which will withstand short cut, has a shallow root system and requires frequent watering. It is a fair weather friend which exhibits extremely vigorous growth in cool weather but thins out during periods of extended heat and humidity. Bluegrass-fescue is a hardier turf with a deeper and more vigorous root system. It requires less water than *Poa annua*-bentgrass.

On heavily watered, short cut fairways *Poa annua* predominates and makes up the fairway turf, even though many people are under the impression that bentgrass is the primary cover. Therefore, it must be kept in mind that the culture of *Poa annua,* and not bentgrass, is the first concern. This is important because *Poa annua* will succumb to the vagaries of nature more quickly than will bentgrass.

Many clubs have attempted to establish and encourage a greater percentage of bentgrass in fairway areas. Results to date have not been heartening pri-

marily because *Poa annua* crowds out bentgrass during spring and fall when *Poa annua* is undergoing vigorous growth.

Equipment has been introduced which semi-tills the soil, thus presenting a more suitable seed-bed without greatly interfering with play. It is possible that through diligent and proper use of such equipment larger amounts of bentgrass can be encouraged in fairway areas. Current knowledge indicates this would be desirable. Even so, the absolute necessity of rapid surface drainage can never be overlooked.

Surface Drainage Answer

Surface drainage is the unequivocal answer to the perplexing problem of holding *Poa annua* during periods of high heat and humidity. Continued observation proves that turf in well-drained areas does not die. Conversely, turf in areas of poor drainage frequently shows 100% kill. A two-inch rain should (and CAN) be drained in 15 minutes to prevent death of turf. *Poa annua* cannot tolerate standing water.

An excellent case in point is the surface drainage work done by Roy Nelson, Superintendent of Ravisloe Country Club. Mr. Nelson developed a new system of drainage slit trenches filled with pea gravel, which, combined with proper tile installations, has afforded rapid surface run-off. The Ravisloe program to insure adequate drainage began in 1958. Prior to that date large fairway areas were frequently lost. Since the new drainage program has been completed, a minimal amount of turf is lost during extended periods of high heat and humidity—even during the summer of 1964.

This view is substantiated by the fact that courses built on inherently sandy soil which characteristically drain quickly suffered little or no "kill" in '64.

From conclusions drawn by the panel it can be stated that *Poa annua* turf in the Chicago area can be maintained in good playable condition even when under attack by the twin culprits—high heat and humidity—if rapid surface drainage is afforded. High heat, humidity and free moisture provide a perfect environment for turf diseases and are ideal to nurture fungi which can be pathogenic, such as *Pythium* sp.

An interesting concept is the exploration by the panel of chemical control of serious disease problems which developed on courses last summer. Invariably disease activity was most damaging in low, water-holding areas. Repeated applications of fungicides, even though the fungicide was reportedly a control for the disease present, gave a minimal amount of control. At the present time no truly effective fungicide is available to combat "kill" under severe weather conditions when excessive surface moisture is present.

The University of Illinois has initiated a program of experimental work with *Poa annua* because it is the predominant turf on watered fairways. Efforts will be made to delineate growth habits accurately to arrive at more effective disease controls. Turf work at Purdue University is directed, and has been for many years, toward practices which would enable the turf man to live better with and maintain various types of grasses suitable for use on golf courses.

Courses which have bluegrass-fescue fairways maintained excellent playing conditions throughout the 1964 playing season. Bluegrass-fescue fairways must be cut higher than *Poa annua* in order to maintain adequate turf cover but are not as severely affected by heat and humidity as is *Poa annua*. The only reason golf courses have short cut, watered fairways (*Poa annua*) is because better players demand this type of turf. They insist the ball must be "pinched" against the turf, thereby taking a divot, in order to execute an accurate shot. If fairways are cut higher as is necessary with bluegrass-fescue, it is difficult to "pinch" the ball against the turf.

Examples of short cut, watered, *Poa annua* fairways are Evanston Golf Club, Skokie, Sunset Ridge and Ravisloe Country Clubs. Bluegrass-fescue fairways are found at Chicago Golf Club, Silver Lake Golf Club, Knollwood Club, Rolling Green, Illini (Springfield), Danville and Rockford Country Clubs. The consensus of the panel was that courses with bluegrass-fescue fairways would continue with this grass and those which were dedicated to short cut, watered, *Poa annua* fairways would not go back to the higher cut.

Specific and detailed course management programs, tailored to the individual course, must be established by the superintendent, but successful course management cannot be effected until drainage is established which will rapidly remove standing water.

All golf should be grateful to the panel which met last August. They combined the best of academic research with practical and successful experience to produce a significant conclusion to help every chairman and superintendent achieve better turf and, ultimately, happier golfers.

The lower limbs of these tall, stately arborvitae were grazed by deer. Note the uniform shearing and subsequent umbrella effect. This view is taken across No. 5 on the lower course at Baltusrol Golf Club, Springfield, N. J.

Methods of Minimizing Winter Damage*

By **J. R. WATSON,** Toro Manufacturing Corporation, Minneapolis, Minn.

Methods of minimizing winter damage to turfgrass vary in accordance with geographic region, location with respect to nearby terrain features, soil, kind of grass, management practices and the extent of use during adverse or critical periods.

In the case of golf greens located in central and southern regions, damage caused by traffic on frosted grass or partially frozen soil may be avoided or reduced by washing off the frost, delaying play or diverting play to temporary or alternate greens.

In northern climes, efforts to minimize damage center around providing adequate soil moisture, erecting snow fence and piling brush to collect and hold snow and using organic mulches or polyethylene covers to insulate and conserve moisture. Such conditions favor disease development; therefore, it is necessary to treat with the appropriate fungicide to prevent or control winter disease.

Polyethylene covers produce a greenhouse effect in late winter-early spring. They stimulate early growth and minimize winter damage. This technique has proven to be of value in establishment of late planted greens and in stimulating early recovery of damaged sites. Tests show that clear four mil sheets are satisfactory.

*Reprinted courtesy Agronomy Abstracts, from papers prepared for the 1964 annual meetings of the American Society of Agronomy.

Statement of Ownership

STATEMENT OF OWNERSHIP, MANAGEMENT AND CIRCULATION (Act of October 23, 1962; Section 4369, Title 39, United States Code). 1. Date of Filing—October 1, 1964. 2. Title of Publication—USGA GREEN SECTION RECORD. 3. Frequency of issue—Six issues a year in January, March, May, July, September and November. 4. Location of known office of publication—315 Railroad Avenue, East Rutherford, N.J. 07073. 5. Location of the headquarters or general business offices of the publishers—40 E. 38th Street, New York. 6. Names and addresses of Publisher, Editor, and Managing Editor: Publisher—United States Golf Association, 40 E. 38th Street, New York, N.Y. 10016. Editor—Dr. Marvin H. Ferguson, 40 E. 38th Street, New York, N.Y. 10016. Managing Editor—Don Weiss, 40 E. 38th Street, New York, N.Y. 10016. 7. Owner (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual must be given.) Names and addresses—United States Golf Association, 40 E. 38th Street, New York, N.Y. 10016; President—Clarence W. Benedict, 40 E. 38th Street, New York, N.Y. 10016; Vice-Presidents—Wm. Ward Foshay and Hord W. Hardin, 40 E. 38th Street, New York, N.Y. 10016; Secretary—Philip H. Strubing, 40 E. 38th Street, New York, N.Y. 10016; Treasurer—Robert K. Howse, 40 E. 38th Street, New York, N.Y. 10016. 8. Known bondholders, mortgagees, and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages or other securities—None. 9. Paragraphs 7 and 8 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, also the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner. Names and addresses of individuals who are stockholders of a corporation which itself is a stockholder or holder of bonds, mortgages or other securities of the publishing corporation have been included in paragraphs 7 and 8 when the interests of such individuals are equivalent to 1 percent or more of the total amount of the stock or securities of the publishing corporation. 10. This item must be completed for all publications except those which do not carry advertising other than the publisher's own and which are named in sections 132.231, 132.232, and 132.233 Postal Manual (Sections 4355a, 4355b, and 4356 of Title 39, United States Code)

	Average No. Copies Each Issue During Preceding 12 Months	Single Issue Nearest to Filing Date
A. Total No. Copies Printed (Net Press Run)	5,250	5,200
B. Paid Circulation		
1. To Term Subscribers by Mail, Carrier, Delivery or by Other Means	3,820	3,976
2. Sales through Agents, News Dealers, or Otherwise	none	none
C. Free Distribution (including samples) by Mail, Carrier Delivery, or by Other Means	1,076	874
D. Total No. of Copies Distributed. (Sum of lines B1, B2 and C)	4,896	4,850

I certify that the statements made by me above are correct and complete.
Don Weiss, Managing Editor

USGA GREEN SECTION RECORD
40 East 38th Street, New York, N. Y. 10016

TURF TWISTERS

MOWING BERMUDAGRASS

Question: Would you give me your recommendations as to height for the cutting of solid bermuda fairways. I note from the instructions of the booklet for the qualifying rounds of the Open and Amateur Championship that the USGA recommends fairways be cut 1/2 inch to 3/4 inch. (ARKANSAS)

Answer: We believe that bermudagrass should be mowed just about as closely as possible without scalping. This will vary depending upon such things as roughness of the surface, the amount of fertilizer used, the frequency of mowing, etc. Infrequent mowing or exceptionally heavy fertilization will cause a large amount of clippings to be removed at one time. In such a case we believe the mowers should be raised to compensate. However, so long as the clippings will largely disappear in the turf, we think the closer the better.

MOWING GREENS

Question: The golf course superintendent at our club tells us that he mows greens at 1/4 inch. At a neighboring club, the greens are mowed at 5/16 inch, yet their greens seem faster than ours. Can you explain? (MISSOURI)

Answer: The true cutting height of a mower is established by placing a straight-edge across the caster wheels or the scalping roller and the drive roller. The height of the cutting edge above this line is the true cutting height.

Now the "effective cutting height" may be quite different. It is influenced by the amount of turf on the green — a dense turf will cause the mower to cut higher than will a thin turf. It is also influenced by the weight of the mower and even by the amount of clippings carried in the catcher.

Other things may also influence speed of putting greens. An upright grass will provide a slower surface than grass which tends to lie flat. Stiffer grass does not allow the ball to roll as freely as soft grass. Thus it is quite possible for a green cut with a mower set at 5/16 inch to be faster than another cut with a mower set at 1/4 inch.