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Tifton, Georgia

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Sponsored By

UNIVERSITY OF GEORGIA COASTAL PLAIN EXPERIMENT STATION

In Cooperation With

UNITED STATES GOLF ASSOCIATION GREEN SECTION

and

SOUTHERN GOLF ASSOCIATION

F O R E W O R D

This is the day of specialization. Grass breeders over the past few years have done an outstanding research job in the development of grasses especially designed to meet the requirements for fine turfs. The Eleventh Annual Turf Conference provided an opportunity to see the results of some of the good work and to get reports on a wide range of turf production and management problems. The Georgia Coastal Plain Experiment Station and its grass breeding department are always happy to be able to participate in this conference and we appreciate very much the splendid cooperation which many individuals and organizations have given to make the conferences successful. The U. S. Golf Association Green Section and the Southern Golf Association have always been very cooperative in this work and the success of the conferences has, in a large measure, been due to their splendid support. The Proceedings of the Eleventh Annual Conference were printed by the U. S. Golf Association under the direction of Mr. James M. Latham, Southeastern Agronomist. The acceptance of this responsibility by the U. S. G. A. has been a great help to this station. We would like to express our appreciation for the kind assistance of a large number of individual golf clubs as well as the Associations and to the large number of commercial concerns who, over a number of years, have supported the several phases of turf research work at this station.

Frank P. King, Director
Georgia Coastal Plain Experiment Station

C O N T E N T S

SOIL AND WATER REQUIREMENTS OF GOOD TURF

J. C. Harper II[1]

Desirable turfgrass growth in a given location is a function of the climatic conditions, soil properties and management practices.

Climate exerts its influence through temperature, rainfall, wind movement and sunlight. The choice of an individual species or strain of a warm or cool season turfgrass for a particular use is largely determined by its adaptation to climatic conditions.

Soil properties influence the kind and quality of turfgrass in a number of ways. There are certain basic requirements which soil must provide for satisfactory turfgrass growth. These include anchorage, moisture, air, nutrients and temperature. The ability of a soil to meet these requirements is dependent upon its physical, chemical and biological properties.

Management embodies the choice of grass, watering, mowing, aerating and fertilizing practices, choice and application of various chemicals and all other areas of turfgrass care requiring decisions by the superintendent. The good manager may be able to produce satisfactory turf under adverse conditions, but the poor manager will have difficulty under the most satisfactory conditions.

The scope of this paper permits only a brief discussion of those factors and practices which determine the soil and water requirements of good turfgrass.

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Soil Properties

There is a marked inter-relationship between the chemical, biological and physical properties of the soil. The alteration of any given class of soil properties influences the other classes of soil properties. Chemical and biological properties, although highly important, are more easily modified by man than are physical properties and will be discussed very briefly in this paper. Soil physical properties will be discussed in more detail.

Chemical Properties

Chemical properties of soils include the reaction (pH) and the fertility relationships. The addition of lime or sulphur to provide proper pH and the application of nutrients in the form of fertilizers to provide adequate plant food are common practices and need no further discussion here.

Biological Properties

Biological soil properties are a function of the micro and macro-plant and animal life. The population of these soil organisms may be beneficial or harmful. Soil micro-organisms are essential for the breakdown of organic matter and the conversion of nutrient materials to a form suitable for uptake by the plant. On the other hand, some soil inhabitants are the direct or indirect cause of many turf diseases. Proper watering and fertilization play a significant role in maintaining the proper biological populations in the soil. Applications of proper fungicides and insecticides are necessary to control the harmful soil organism populations.

Physical Properties

Physical properties such as texture, structure, porosity and aeration, to mention a few, govern the infiltration, retention and movement of moisture in the soil and control the air-water relationships vital to proper plant growth. Each of the soil physical properties exerts a direct effect on plant growth and each is dependent, one on the other, for the ultimate effects they produce on other soil properties and on turfgrass growth. A brief discussion of some of the more important physical properties and their effects on turfgrass growth follows:

Soil texture is a term used in reference to the size of the individual soil particles. It refers particularly to the proportions of sand, silt, and clay in a given soil. Terms like silt loam, clay loam, sandy clay loam, etc. indicate the predominance of the three soil separates. Texture is a most important characteristic of soils because it describes, in part, the physical qualities of soils with respect to porosity, coarseness or fineness, aeration, speed of water movement in the soil, moisture storage capacity and, in a general way, the inherent fertility of the soil. Sandy soils are often loose, porous, droughty, and low in fertility, whereas clay soils may be hard when dry or plastic when wet, poorly aerated, but possibly high in fertility. Between these extremes we find the soil classes that are most desirable for plant growth.

The term, "soil structure" refers to the arrangement or grouping of the individual particles into units. A structural unit may be defined as a group or groups of particles bound together in such a manner that they exhibit different physical properties from a corresponding mass of the individual particles. Such a structural unit is called an aggregate. The structural aggregation of soil is greatly influenced by the amount of organic matter present. The end matter of organic matter decay -- humus -- is an integral part of soil aggregates. Sometimes it is referred to as the cementing or binding agent in aggregates. Stability of aggregates is directly dependent upon the amount of organic matter present. The structural aggregation of a soil determines, to a large extent, the porosity, permeability and water holding capacity of soils.

Porosity may be defined as that percentage of the soil volume not occupied by solid particles. In a soil containing no moisture, the pore space will be filled with air. In a moist soil, the pores are filled with both air and water. The relative amounts of water and air present will depend largely upon the size of the pores. Two types of pores are recognized -- the capillary and the non-capillary pores. The small pores hold water by capillarity and are responsible for the water holding capacity of soils. The sum of the volumes of the small pores is called "capillary porosity." The large pores will not hold water tightly by capillarity. They are normally filled with air and are responsible for aeration and drainage. The sum of the volumes of the large pores is called "non-capillary porosity."

The total porosity of a soil is not as important as the relative distribution of the pore sizes. Total porosity is inversely related to the size of the particles and increases with their irregularity of form. Porosity also varies directly with the amount of organic matter present in the soil. Clays, for example, have a higher total porosity than sands. Clays have a large number of small pores which contribute to a high water-holding capacity and slow drainage. Sands, on the other hand, have a predominance of large pores which are responsible for a low water-holding capacity and rapid drainage.

The ideal soil for plant growth should have about 50% total porosity equally divided between large and small pores, or in other words, contain 25% water space and 25% air space.

Inadequate soil aeration or insufficient large pores decreases the intake of water by plants directly through its effect on absorption and indirectly by reducing root growth. Drainage will be impeded in those soils and roots will suffer from lack of oxygen needed for their development. In such water-logged soils, anaerobic biological activity occurs and the accumulation of toxic materials such as methane, carbon dioxide, carbon monoxide and hydrogen sulphide may result. Toxic concentrations of nitrites, ammonia, ferrous compounds and manganous compounds may also build up in the soil.

In addition to the more or less direct influence of soil aeration, it also exerts an indirect effect as a factor in the occurrence and severity of certain plant diseases. Such effects are of two kinds: the lack of and/or excess of carbon dioxide on the growth and longevity of the pathogen and the increased susceptibility of the host plant when grown in poorly aerated soils. The importance of temperature, moisture and pH are widely recognized as factors affecting disease organisms.

Soil physical properties, especially the amount and type of porosity, have a marked influence on the entry and movement of water in the soil. The process of the downward entry of water into the soil is referred to as infiltration. For any given soil or soil condition there exists a maximum entry or infiltration rate dependent upon the porosity of that soil. When application rates, whether from rainfall or irrigation, exceed the infiltration rate, runoff or ponding occurs. When water is applied to soil at a rate faster than it can be taken in, the excess water is lost for all practical purposes.

The downward movement of water through the soil is termed percolation. When rainfall or irrigation stops the moisture gradually moves out of the large pores in a downward direction. This movement takes place primarily under the influence of gravity. According to Baver, the downward movement of water by gravitational forces in natural soils is related to the amount and continuity of the large pores as determined by (1) soil structure, texture, volume changes, and biological channels; (2) the hydration of the pores; (3) the resistance of entrapped air. With the recession of water in the large pores by drainage, air is drawn into these pores. It is within the large or non-capillary pores that the capillary water absorbs oxygen needed by the roots. This water, charged with oxygen, also contains the necessary nutrients required by the plant for root development and growth. Most of the water and nutrients which plant roots are able to take up are made available to those plant roots by the growth or extension of the roots into parts of the soil which have a sufficient amount of available moisture and a ready supply of nutrients. The plant root must seek out new supplies of moisture and nutrients, instead of those materials seeking the root. This is an excellent reason for developing and maintaining as desirable soil physical condition as possible under turf.

Water Requirements

The water requirements of plants can, in many ways, be closely tied to the soil physical properties. Few people realize the huge amounts of water required to produce a given weight of plant material and that the availability of this water is highly dependent on the soil physical condition. In addition to the water contained in the plant itself, huge quantities of water are continually escaping from the plant through a process known as transpiration.

Transpiration

The actual amount of water required by plants is far in excess of the amount of water used in its growth and development processes and is dependent on the amount transpired. Many plants transpire an amount of water equal to their own weight every twenty-four hours. The amount of water transpired by a given plant is governed by:

(1) Temperature -- High temperature increases, and low temperature retards transpiration.

(2) Humidity -- Low humidity increases transpiration.

(3) Air Movement - Air movement increases transpiration.

(4) Light Intensity -- Transpiration is higher in direct sunlight.

(5) Soil Fertility -- More transpiration takes place on poor soils than on fertile soils.

(6) Soil Moisture -- The more moisture in the soil, the greater is the transpiration rate.

Poor soil physical conditions which result in improper drainage and inadequate oxygen supply will reduce water absorption by the roots. At the same time transpiration continues. When the rate of transpiration exceeds the rate of water absorption, wilting occurs even though the soil contains an adequate supply of moisture.

The total water requirement of plants, therefore, depends on both growth and transpiration as influenced by management practices and environmental factors such as climate and soil properties.

Summary

Soil properties, particularly soil physical properties, govern the air and water movement and retention within the soil. The relative distribution of pore size, which is a function of texture and structure, is of greater importance than the total porosity of the soil. In order for turfgrass root development and growth to function properly, there should be an approximately equal distribution of large non-capillary and small capillary pores. The two classes of pores should occupy approximately fifty percent of the soil volume, the solid or mineral fraction making up the remaining 50% of the soil mass.

Inadequate porosity reduces the infiltration rate of the soil and impedes proper drainage. Poor aeration decreases the intake of water and nutrients by the plant through its effect on absorption and indirectly by reducing root growth. Anaerobic conditions result in the formation of toxic materials and may influence the occurrence and severity of certain plant diseases.

Plants require extremely large amount of water because of the tremendous loss of water by transpiration. The total water requirement of plants depends on both growth and transpiration as influenced by environment and management.

BUILDING AND PLANTING PUTTING GREENS -- A SUMMARY

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This subject is so broad that only a discussion may be held with little opportunity to draw concrete conclusions. Differences in grasses, topography, climate, soil sources, etc., mean that no two greens are alike. This discussion is to present the factors to be considered in the building of a putting green.

The costs involved in such a project make it necessary to do it right the first time. Some greens require rebuilding in a very short time -- not only because of an undesirable design but because of prior constuction.

The increase of interest in new grasses -- both Bermudas and bents -- is responsible for most changes occurring today. The changes to be made should last a lifetime.

Exterior Design

Putting green construction is first limited by the plans to be followed. The size and shape of the green is determined by the terrain, character of the golf hole, par of the hole, and the strategy of play. Beauty is, of course, a factor, along with the allowance for many different pin placements.

In contouring a green thought should be given to future surface drainage -- the type of turf to be used, and the type of approach shot to be played into the green. For the superintendent, future management is the key since it affects his entire management schedule.

Interior Design

The subsoil should be the same grade as that of the surface. This provides uniform topsoil depth to enable ready and uniform drainage. It also assures an adequate root zone for the grass.

The use of tile varies with soil condition and the grass used. In greens themselves, individual designs determine the usage of tile. Under some conditions tile throughout a green is necessary to carry off heavy rainfall, or to drain a wet area more efficiently. In this case the tile lines are spaced from 8 to 15 feet apart, depending on slope and other conditions. In other areas complete tiling of a green is not thought necessary if a gravel bed 8 to 10 inches deep under the topsoil is provided. In this instance only the bottom of the slope or grade is tiled. Gravel is used to backfill the tile ditches 3 to 4 inches.

Those greens built into a hillside and receive seepage water can usually be benefitted by an intercept tile between the hillside and the putting surface. A ditch is dug to a point below the water bearing strata, tiled, and then backfilled with a porous material.

Topsoil Mixture

This is the place the grass must grow. The topsoil must drain quickly, resist compaction, be resilient, smooth, firm, and puttable. For optimum growth it should provide 50% solids, 25% air, 25% water. Experimental work in California and in Texas indicates a high percentage of sand with very little clay and organic matter is the best mixture to resist compaction and provide good drainage. The superintendent must work with materials nearby. Since these materials differ widely from place to place, a great variation is noted between soils used on different golf courses. Among panel members the following mixtures were used:

60% sharp sand, 25% loam, 15% peat
50% sharp sand, 50% good topsoil
60% sharp sand, 35% loam soil, 5% peat and sawdust.

The decision of the final mixture should be made after consideration is given to the materials at hand. If an architect is used, he and the superintendent should discuss all possibilities so that the best result will be obtained.

Planting

The type of grass to be used often determines the method of planting. Vegetative bentgrasses should be planted by broadcasting 10 bushels of chopped stolons per 1,000 square feet, rolled, topdressed, then rolled again.

Bermudagrass offers a very wide selection of planting methods. There is no "best" way since one method may fit into the operation better than another.

Sprigging, either in rows or aeration holes, requires less planting material but more labor to place the sprigs than the broadcast method. Broadcasting chopped planting material at a rate of 5 or more bushels per 1,000 square feet is usually the fastest, requires less labor, and gives the most rapid coverage. This method requires the most planting material, and a large quantity of topdressing to assure a good stand.

Fertilization should begin a few days before planting so that the required nutritional elements are in the soil and being broken down for the growing plants' use. Proper liming is also necessary. Both of these additions should be made according to soil test.

Subsequent fertilizations vary with conditions, but generally should average about 1/2-pound of actual nitrogen per 1,000 square feet per week, beginning 2 or 3 weeks after planting. This can be made in bi-weekly applications. This can be a nitrogen source alone or in a complete fertilizer, depending on the fertilization previous to planting.

Soil sterilization is a necessary part of the planting procedure. If the soil is weed and nematode free before planting, the control of these factors will not be required during establishment. Sterilization of topdressing soil also eliminates the necessity of weed control. A substantial saving is made on weed control alone.

With good weather and management a Bermudagrass green can be in play within 4 to 6 weeks after planting. This depends on the amount of smoothing required and the method of planting.

HUMAN RELATIONS ON THE GOLF COURSE

Fred V. Grau[1]

A Summary

Golf Clubs are built and maintained for the enjoyment of people.

Successful operation of a club is possible only when people work together harmoniously. Harmony is developed when the "Human Climate" is rendered favorable for all concerned.

Human relations are advanced when:

1. Lines of Communication are established and kept flowing freely at all levels through verbal and written reports; through frank and open discussions on problems as they arise.
2. The Rights, Problems and Responsibilities of others are recognized and thoroughly understood. People are more important than "anybody". Be interested in what the other fellow is doing, respect his position, know enough about his job that you can discuss it intelligently.
3. The Dignity of a Job Well Done is given consistent recognition regardless of the level of that job.
4. Authority is delegated and respected. Give a person a job to do -- and the tools to do it with -- then let him do it without interference.
5. Performance is rewarded by a salary increase, a bonus, a congratulatory letter or other suitable recognition. "Flowers for the living".

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6. <u>Sound business management</u> is used as the basis for all dealings and operations. This includes surveys, inventories, reports and budgets, and an understanding of money, as well as men and machines.

Golf Course Superintendents may improve their position and better fit themselves for the job of improving Human Relations in several ways:

1. Belong to local and National associations.
2. Attend Conferences to gain knowledge, to meet new people, to get fresh ideas, to keep abreast of research developments, to raise your standards, to help others.
3. Seize every opportunity to improve your ability to express yourself in writing and in speech.
4. Constantly remind yourself that you are producing turf to <u>please others</u> -- that the quality of the turf must meet the requirements of the game. Your personal preferences are secondary to the pleasures of the players.
5. Be available to members as the local authority on <u>their</u> grass problems - their lawns. This may be done through periodic bulletins or through the furnishing of their specialized needs in improved grasses or fertilizers. Give a lawn story to the local garden editor now and then.
6. Develop and maintain an experimental and demonstration turf garden which can be used as a main reference point for local lawn recommendations.

Green Chairmen are in a very responsible position regarding Human Relations. A few reminders may be in order here:

1. Encourage close cooperation with and between superintendent, pro and manager.
2. Keep members informed, particularly regarding operations that tend to

interfere with their pleasure.

3. Give superintendents full responsibility for course maintenance and for labor relations with adequate equipment, fertilizer, materials and tools.

4. Encourage the superintendents to locate and train a capable assistant. ("If you would know anything thoroughly, teach it to others" -- Tryon Edwards). See that there is a permanent item in the budget for training a new man. It is the only sound basis for the future success of golf course management.

5. Maintain close liason between the superintendent and the board.

6. Help to abolish the practice of changing Chairman of the Green Committee each year.

7. Maintain a sense of humor.

Reference Reading: "An Introduction" -- A brief brochure published by Golf Course Superintendents Association of America, P. O. Box 106, St. Charles, Illinois.

SOUTHERN TURFGRASS DISEASE CONTROL 1/

Homer D. Wells 2/

Introduction

Diseases of Northern turfgrasses inflict heavy losses each year. If diseases were adequately controlled with fungicides, we could use the cost of protection as a measure of damage. Since diseases are rarely controlled completely, we must estimate losses from turfgrass diseases in relationship to establishment and maintenance costs. Small dead areas or discolorations from numerous leaf spots in a turf established from erosion control do not materally reduce the value of the turf; whereas, if the same condition exists in a home lawn, parkway, or golf course, the unsightliness and general reduction in turf value brought about by disease on an otherwise improved area can reduce its value comparable to that of an unimproved area. Thus, it becomes impossible to evaluate in dollars and cents damage from turfgrass diseases at this time. We can, however, discuss some of our more important and frequently encountered diseases, the grasses they attack, and control measures recommended.

In the following pages, diseases will be: (a) discussed in detail; (b) presented in a key form for identification in table 1; (c) summarized in relation to hosts they attack in table 2; and (d) summarized in relation to disease control in table 3.

1/ Cooperative investigations at Tifton, Georgia, of the Crops Research Division, Agricultural Research Service, United States Department of Agriculture, and the University of Georgia College of Agriculture, Agricultural Experiment Stations, Tifton, Georgia.

2/ Pathologist, Crops Research Division, Agricultural Research Service, United States Department of Agriculture, Tifton, Georgia.

1. Brown Patch

The disease: This turf-disease producing fungus (*Rhizoctonia solani*) grows from an infected blade to healthy blades and completely kills all aerial portions of the grass in affected areas. On bentgrass, bluegrass, and in some instances Bermudagrass, the infected leaves become water-soaked, collapse, dry, and turn light to dark brown. Diseased areas are usually circular and range in diameter from a few inches up to a foot or more. They may run together. The center of a diseased area is usually brown with a darkened and wilted margin that has an abundance of the grayish-black fungus growth, which gives the so-called, "smoke ring" appearance. On fescues, bromegrasses and St. Augustine grass, the disease symptoms differ somewhat following water-soaking. The grass blades bleach out and develop a white or light colored turfspot rather than the characteristic brown patch.

Control: A number of fungicides have been advertised for the control of the brown patch fungus. These include: Tersan, Kromad, and Terraclor, in addition to the many mercury-containing fungicides. Tersan and Kromad have not consistently given adequate control when applied at recommended rates and heavier dosages may be required. Terraclor has shown promise for controlling *Rhizoctonia solani* on other crops; but, if the disease of turfgrass is improperly diagnosed and the difficulty happened to be caused by a *Pythium* species, applying Terraclor may increase rather than decrease disease activity. Most consistent control has been obtained by using mercury-containing fungicides. If turf is infested with the brown patch organism, fungicides should be applied every ten to fourteen days while temperatures are above 70°F. at rates recommended by the manufacturer. During extremely hot and humid weather, applications may have to be made more frequently in order to obtain complete control.

Research reported by Dr. F. L. Howard at Rhode Island has shown that the fungicide is more effective when applied several hours after watering the turf. Removing clippings from infected turf is also effective in reducing disease damage.

2. Cottony Blight and Other Pythium Diseases

The disease: Cottony blight is a warm weather seedling disease of ryegrass caused by a fungus (Pythium aphanidermatum). In early stages, this disease is characterized by the presence of numerous small white spots in the turf. As the disease progresses, the small white spots become more pronounced and take on a definite "cottony" appearance. The disease develops very rapidly during periods of high humidity and high temperature. The same organism causes similar symptoms on bentgrass as well as the symptoms called grease spot or spot blight (in which case the greasy blackened glass blades are more conspicuous than the cottony growth of mycelium). This organism has been observed on a number of other grasses including Bermuda.

In addition to Pythium aphanidermatum, eighteen other species of Pythium attack grasses and cause seed rots, seedling blight, damping-off, root rots, and culm roots. Only meager information is available on the role these organisms play in damaging turf.

Control: Replicated plot tests have shown that Actidione ≠ Captan is the most effective control for cottony blight. The first application should consist of 600 mg. of Actidione plus one pound of Captan 50-W per 1,000 square feet. Additional applications of 600 mg. of Actidione and one-half pound of Captan 50-W per 1,000 square feet should be applied as often as necessary for disease control. Captan alone at these same rates has been far superior to other fungicides for the control of cottony blight. Small pot tests in the greenhouse have indicated that omadine disulfide and omadine zinc salt (at same rates as for Captan 50-W) are highly effective against this organism. Phygon XL and Zineb (at same rates as Captan) have also shown some promise. Malachite green has been reported to be specific for the control of Pythium, however, it has not performed satisfactorily in tests at Tifton.

In a fertilizer test designed to study different sources of nitrogen, ryegrass plots receiving heavy rates of Milorganite showed significantly less damage from cottony blight than plots receiving other sources of organic and inorganic nitrogen. An earlier observation in which the incidence of cottony blight was associated with Milorganite fertilization had led to the conclusion that Milorganite possibly stimulated the cottony blight disease. However, evidence to the contrary suggests that the role Milorganite plays in development of Pythium is conditioned by the presence or absence in the soil of organisms antagonistic to Pythium. It is assumed that if antagonistic organisms are present, heavy applications of Milorganite increase their prevalence and suppress the Pythium; however, if antagonistic organisms are not present, heavy applications of Milorganite may increase prevalence of Pythium. This problem needs additional study.

It has been shown that sterilization with methyl bromide removes the cottony blight organism from infested soil. Thus, if a new green is built, sterilization with methyl bromide should guarantee a start with cottony blight-free turf. Likewise, treating topsoil with methyl bromide should prevent introduction of the organism.

3. Helminthosporium Leaf Spots and Turfspots

The disease: Helminthosporium leaf spots, (caused by approximately 50 different species of Helminthosporium) occur on most grass species, including practically all of those used for turf purposes. The leaf spots vary in color from light gray to dark brown and they may range in size from minute flecks to large, round or reticulate lesions in which a single lesion often girdles a leaf sheath or leaf blade. Spores of fungi that cause these diseases are usually spread from one area to another by wind or other conditions. However, in dense turf during extremely humid weather, the fungus mycelium frequently grows from one leaf blade to the next and completely kills the turf in spots. Well-defined, small, circular (dollar-spot-like) dead areas, or irregular discolored and thinned-out areas develop in affected turf.

Control: Reports indicate that Actidione, Tersan, Vancide 51, Zineb, and Kromad, as well as the mercury-containing fungicides, will control the Helminthosporium diseases of turf. Actidione should be applied as often as every seven days for best control. Tersan 75, Vancide 51, Zineb, and Kromad should be applied at the rate of four to six (preferably six) ounces per 1,000 square feet every ten days for the most effective control of the disease. The mercury-containing fungicides have consistently given good control of Helminthosporium disease when applied at the recommended rate every ten to fourteen days.

4. Curvularia Leaf Blight and Melting-out

The disease: Curvularia leaf blight and melting-out diseases are primarily active during warm, humid weather. The fungi attack a wide range of grass species causing seed rots, seedling blights, leaf molds, leaf blights, culm rots, and general dying out of turf. This organism is most serious as a causal agent of melting-out of bent grass.

Control: The Curvularia organisms usually respond to the same treatments that control the Helminthosporium diseases (see control of Helminthosporium leaf spots and turfspots).

5. Rusts

The disease: Rust fungi produce elongate, orange, reddish, or dark brown pustules on the leaf sheath and stem. Rust pustules may be large and very conspicuous (as in the case of crown rust of ryegrass) or minute (requiring the aid of magnification to distinguish the pustules as in the case of the Bermuda rust). Since infection takes place only from spores and the disease is not evident until seven to fourteen days after infection, rusts are no problem on golf greens. The rusts, however, may produce very serious affects on taller turf. Merion bluegrass and ryegrass are frequently damaged by rusts.

Control: The best control for rusts is to rely on turf varieties resistant to rust. Actidione, Zineb, Maneb, and Phygon XL have been reported to be very effective in controlling rust on Kentucky blue grass. Heavy fertilization and adequate watering stimulate ryegrass growth to the extent that new growth can be mowed off more frequently than the rust develops, thus, controlling the disease.

6. Gray Leafspot of St. Augustine

The disease: Gray leafspot is caused by a fungus called Piricularia grisea and it is omnipresent on St. Augustine throughout the South. During warm, humid weather, this disease causes small circular, gray, dirty-yellow, or ash-colored spots with brown, purple, or water-soaked borders on practically every St. Augustine leaf. It also causes numerous stem cankers. Heavy infection results in an extremely unsightly turf which is likely to be more susceptible to drought and other kinds of damage. This same disease is responsible for leaf spotting observed on crabgrass during late summer and early fall. Other commonly grown turf grasses appear to be resistant to this disease.

Control: Replicated tests have not been conducted on the control of this disease. However, good control has consistently been obtained by using two or three consecutive applications of mercury-containing fungicides at recommended dosages at two-day intervals as needed during the summer months.

7. *Fusarium* Rots

The disease: *Fusarium* snow mold, caused by *Fusarium nivale*, has been found on bentgrass turf in the South. Contrary to popular belief, this fungus does not require snow for development, but it may be active at any time the turf becomes water-logged during cool weather. Spots are first small, but rapidly increase to at least one foot in diameter. Masses of salmon-pink spores cover dying leaves and dead areas. Various species of *Fusarium* have been associated with rust and culm rots and isolated from most of the Southern turf grasses. The most frequently observed species on Southern turf grasses is *Fusarium moniliforme*. In some cases (Meyer Zoysia, for example) this organism is the only one that has been isolated from culm rots. In other instances *Fusarium moniliforme* is found in diseased tissue in association with a number of other organisms. This group of organisms needs to be studied more carefully in relation to turf diseases.

Control: Heavy rates of mercury-containing fungicides prevent the

Fusarium diseases from building up on greens during periods favorable for their development.

8. Nematodes

The disease: Plant parasitic nematodes are microscopic webworms, which feed on and damage grass roots. Root systems, damaged by nematodes, may appear coarse, stubby, shallow, swollen, and blackened, whereas normal grass roots are much branched, fibrous, long and deep, and white. The aboveground growth of the grass may develop tip burn, appear stunted, or it may appear normal except for the fact that the turf requires frequent watering (soil appears droughty) and does not respond well to fertilization. Severity of symptoms varies in infested areas, depending upon the population density and kind of nematodes. Variation in severity frequently seems to follow the water drainage contours of the turf. In some instances, where the turf has been watered and fertilized frequently, a severe infestation of nematodes may be present and restrict the root system without the turf showing obvious signs of nematode damage. When this condition results, a very slight change in environment, such as a hot, dry wind removing moisture rapidly from the soil may result in the turf drying beyond recovery and dying out in large areas.

Control: At present, none of the soil fumigants, at recommended rates, completely eliminate nematodes. Thus, even though the soil is treated prior to establishing a turf, the nematode population may build up again in a few years. On an established turf, the recently developed low-phytotoxic nematocides, such as Nemagon and VC-13, can be used if the cost is not prohibitive.

Many of our most desirable turfgrasses in the South are propagated vegetatively, which, in itself, is an unfortunate method for moving plant-parasitic nematodes from one location to another. As yet, techniques for chemically decontaminating infected planting stocks have not been developed. However, thoroughly washing all soil particles from the roots with a stream of water (bare-root washing) will significantly reduce, if not completely eliminate, most of the ectoparasitic nematodes.

9. Slime Molds

Slime molds are non-parasitic organisms which feed on decaying organic matter in the soil or on the surface of the soil. They spread over the grass blades and produce small blue-gray, or slate-colored fruiting bodies. These microscopic fruiting bodies may be produced in sufficient masses to completely engulf grass blades over a considerable area during warm, humid weather. The only damage to the turf is temporary unsightliness, shading, and smothering.

Control: A heavy stream of water breaks up and washes away the spore masses. If new spore masses are still produced, an application of any of the recommended turf fungicides will prevent further development.

10. Algae

Algae are small, primitive plants, which require sunlight and free moisture for growth and development. In frequently watered, well-fertilized, bare areas, where for some reason the turf has disappeared, as frequently occurs when ryegrass goes out in the spring, algae may form a greenish scum, or crust on the soil and among the few grass plants present.

Control: The best control for algae is to maintain a good dense turf which will keep the algae shaded. Infrequent, but thorough watering, permitting the surface of the soil to dry between waterings, will also help prevent algae from growing. Two to five pounds of hydrated lime per 1,000 square feet or copper fungicides may be used for control.

11. Chlorosis

Chlorosis is a deficiency symptom of grasses in which one of the elements (most frequently, iron) necessary for producing chlorophyll is deficient, resulting in a yellowing of the foliage. This condition is especially noticeable on Centipede grass during early spring. The yellowing symptoms are frequently most severe where susceptible grasses have been over-limed or grown close to masonry.

Control: The chlorosis can be corrected by spraying the foliage with ferrous sulphate or chelated iron.

Table 1. A Key to the More Common Turf Diseases

I. Leaf Spots

A. Orange, reddish, or brown to black pustules erupting from leaf surface during late spring and summer....................RUSTS

B. Gray, dirty-yellow, or ash-colored lesions with brown, purple or water-soaked borders during warm season......GRAY LEAF SPOT

C. Leaf spots varying in color from light gray to dark brown and ranging in size from small flecks to large, circular to reticulate lesions during all seasons of year while grass is growing..........................<u>HELMINTHOSPORIUM</u> LEAF SPOTS

II. Turfspots

A. Small, white, cottony patches of water-soaked, blackish to brown areas with white cottony margins. Spreads very rapidly during warm foggy weather..............................COTTONY BLIGHT

B. Well defined, small circular dead areas or irregular, discolored, and thinned-out areas with margin showing typical <u>Helminthosporium</u> leafspots during all seasons of the year while grass is growing.............<u>HELMINTHOSPORIUM</u> TURFSPOTS

C. Circular to irregularly circular patches (brown in bentgrass, bluegrass, ryegrass, and Bermuda grass and white in tall fescue and St. Augustine) varying in diameter from a few inches to a foot or more and bordered with a smoke-colored mat of fungus mycelium extending into the living turf during any season while temperatures are above 70°F.................BROWN PATCH

D. General leaf blight and dying out of turf during hot weather in mid-summer.........................<u>CURVULARIA</u> MELTING-OUT

E. Small patches that enlarge rapidly to 12-inches or more in diameter and become covered with a mass of salmon-pink fungus spores following cold, rainy weather during winter months.... ....<u>FUSARIUM</u> SNOW MOLD

III. Aboveground growth of turf generally spotty and unthrifty. Roots may be coarse, stubby, swollen, blackened and shallow. The damage is most pronounced during late summer..................NEMATODES

IV. Blue-gray or slate-colored spore masses covering the otherwise healthy turf during warm, rainy weather...............SLIME MOLDS

V. Greenish crust or scum on soil or thinned-out turf.........ALGAE

VI. Yellowing of turf, primarily during early spring.......CHLOROSIS

Table 2. Occurrence of Eight Common Turfgrass Diseases on Ten Common Turf Grasses

Disease / Grass	Centipede grass	Carpet grass	Bahia grass	St. Augustine grass	Tall fescue	Bermuda grass	Zoysia	Rye-grass	Kentucky bluegrass	Bent grass
1. Brown patch	0	+	0	++	++	+	++	++	++	++
2. Cottony blight and other *Pythium* diseases	0	0	0	0	+	+	0	++	+	++
3. *Helminthosporium* leaf spot and turf-spot	0	+	+	+	++	++	++	++	++	+
4. *Curvularia* leaf spot and melting-out	+	+	+	0	+	+	+	0	+	++
5. Rusts	0	0	0	+	0	+	0	++	++	+
6. *Piricularia* gray leaf spot	0	0	0	++	0	0	0	0	0	0
7. *Fusarium* rots	?	+	+	?	+	+	+	+	+	++
8. Nematodes	++	+	+	++	+	++	++	+	+	++

\+ occurs on indicated grass
++ occurs on indicated grass causing considerable damage
0 does not occur on indicated grass
? probably occurs on indicated grass

Table III. Suggested Practices for the Control of the More Troublesome Southern Turfgrass Diseases.

Diseases	Recommended Control
1. Brown Patch	Mercury-containing fungicides every ten to fourteen days while temperature is above 70°F.
2. Cottony blight	Captan 50-W + Actidione (one pound and 0.6 gram, respectively) per 1,000 sq. ft. at time of seeding and additional applications, reducing the Captan at $\frac{1}{2}$ this rate as required by disease activity. Captan, Phygon XL, omadine zinc salt, omadine disulfide, and Zineb are to be considered at rates recommended for Captan (one pound at time of seeding and subsequent applications of $\frac{1}{2}$ pound).
3. Helminthosporium leaf spot and turfspot	Mercury-containing fungicides; heavy rates of Tersan, Vancide 51, Zineb, and Kromad, also look good and may prove desirable. Use the latter compounds at 2 x recommended rate.
4. Curvularia leaf blight and melting-out	On bentgrass; Actidione and mercury-containing fungicides; on the strictly Southern grasses, we prefer to recommend only mercury-containing fungicides.
5. Rusts	Resistant varieties, or possibly Actidione or Phygon XL.
6. Gray leaf spot of St. Augustine	Mercury-containing fungicides as needed.
7. Fusarium rots	Mercury-containing fungicides.
8. Nematodes	The new low phytotoxic nematocides look promising.
Microorganisms which are troublesome, but aren't strictly disease producers	
9. Slime Mold	Remove with a heavy stream of water; any good fungicide will aid in control.
10. Algae	Good turf is best preventative; 2-5 lbs. of hydrated lime per 1,000 sq. ft. Any good cooper fungicide.
	Minor Element Deficiencies
11. Chlorosis or yellowing (Primarily Centipede)	Spray foliage with ferrous sulphate or chelated iron.

TURFGRASS WEED CONTROL

B. P. Robinson[1]

Agriculture Chemistry, through research and industry, has developed to the extent where there are many herbicides available for weed control in turfgrasses. Name the turfgrass and weed control problem and chances are there is a material or materials which will give the answer. In fact, the turfgrass producer has such an assortment of herbicides available which will perform that he may be considered at times a wizard in the eyes of laymen. The secret, however, lies in choosing the correct herbicide and using it properly.

The summary tables contained herein are based on past research and field performance at the University of Georgia Coastal Plain Experiment Station. Such data may be useful as a guide in selecting and applying an herbicide. Discrepancies in control may occur due to improper applications, temperature changes, soil properties, etc. The turfgrass producer may, however, decrease failures by:

1. Making sure that equipment is calibrated to supply a definite amount of herbicide to a given area.
2. Using additives such as 2,4-D and wetting agents.
3. Using sufficient spray solution for different herbicides -- potassium cyanate requires more water per acre than arsenic.
4. Making sufficient applications properly spaced.

In many cases problems of turfgrass weed control may be decreased by the use of improved grasses. Research and large-scale trials have definitely proven that the new Bermudas and Zoysias resist weed invasion. Thus, the first step in a weed control program is to choose the correct grass and manage it properly.

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[1]Kilgore-McRee Inc., Birmingham 8, Alabama

A SUMMARY OF HERBICIDES USED FOR TURFGRASS WEED CONTROL*

	Crabgrass, Crowfoot, Watergrass, Carpet weed, etc. CONTROL		Dallisgrass, Bull-grass, lemongrass, Carpetgrass, etc. control	Applications and Interral between Applications	Amount of Water	
	Rate per 1000 sq. ft.	Rate per Acre			Per 1000 sq. ft.	Per Acre
Organic Arsenates-						
Di-met 30% Liquid	3 oz.	1-2 gal.	1-2 gal.	2 Appl.-7 days	1-1½ gal.	40-60 gal.
Artox						
Methar						
Sodar (Weedone)						
Sodium Arsenite	½ - 2 oz.	3-5 lb.	5-7 lb.	2" - 7 days	1½-2½ gal.	60-100 gal.
Lead Arsenate	10-20 lb.	400 lb.	-	1 Appl.	-	
PMAS	2-4 oz.	3-6 qt.	-	2 Appl.-7 days	1-1½ gal.	40-60 gal.
Potassium Cyanate	3-4½ oz.	4-12 lb.	-	2 Appl.-2 days	2-4 gal.	40-150 gal.
Calcium Cyanamid	20-30 lb.	800-1300	-	1 Appl.	-	
Chorganic Nitrogens	1-3 lb.N	40-120	-	1-2 Appl.-7 days	?	?

* Use a wetting agent. Apply 2,4-D with first application to control crowfoot, carpet weed, watergrass, Dallisgrass, Bullgrass, Carpetgrass, etc.

Herbicedes used for Pre-emergence Weed Control

MATERIALS	RATE PER 1000 Sq. Ft.
Sesone	1 to 2 oz.
PMAS	$1\frac{1}{2}$ to 2 oz.
CIPC	$\frac{1}{2}$ to 3/4 oz.
2,4-D	$\frac{1}{2}$ to 3/4 oz.

General Weed Control Herbicides

MATERIALS	RATE PER ACRE	TYPE WEEDS
2,4-D; 2,45-T	$\frac{1}{2}$ to $1\frac{1}{2}$ lb.	Broadleaf, clover, wild onion & garlic, brush
2,4-D ≠ 2,45-T	$\frac{1}{2}$ to $1\frac{1}{2}$ lb.	nutgrass, pennywort, carpet weed
MCP		
Maleic Hydragide (MH-40)	2 to 6 lbs.	Onions, garlic, prevent seed heads, retard growth
Radapon	10 to 30 lbs.	Grass killer, edging, cattails, reeds, etc.
Amino Triazol	16 to 24 lbs.	Grass killer, edging, cattails, reeds, poison oak & ivy.
TCA	60 to 120 lbs.	Grass killer, edging, soil sterilent, general vegetables control
Sodium Arsenite	7 ppm.	Weed & Algae in ponds

Temporary Soil Sterilents

MATERIALS	WAITING PERIOD	RATES
Vapam	14 days	1 qt. per 100 sq. ft.
Methyl Bromide	2 to 4 days	1 lb. per 100 sq. ft.
Milone	14 days	3/4 lb. per sq. ft.
Calcium Cyanamid	4 to 8 weeks	5 to 11 lbs. per sq. ft.

Summary

ELEVENTH ANNUAL SOUTHEASTERN TURFGRASS CONFERENCE

Tifton, Georgia
April 8 and 9, 1957

TOTAL REPRESENTATION FROM EACH STATE:

Alabama	13
Delaware	1
Florida	26
Georgia	60
Kentucky	1
Maine	1
Maryland	2
Minnesota	2
Mississippi	1
North Carolina	14
Ohio	1
Pennsylvania	3
South Carolina	9
Tennessee	6
Virginia	1
Wisconsin	1
Total	142

ATTENDANCE ROSTER

Name	Affiliation	City
ALABAMA		
Berdeaux, C. G.		Birmington
Booterbaugh, E. (Supt.)	Lakewood Golf Club	Point Clear
Boyd, Frank E. (Rep.)	V-C Chemical Corp.	Montgomery
Gilliespie, Josh		Montgomery
Hartwig, Lester H.	American Chemical Paint Co.	Union Springs
House, Lee	City of Birmingham	Birmingham
Kennedy, W. T. (Supt.)	Montgomery Country Club	Montgomery
Kilgore, W. G.	Kilgore-McRee, Inc.	Birmingham
Martin, Marlin P. (Maintenance Mech.)	City Hall	Birmingham
Nordan, William W.	Nordan's Grass Farm	Abbeville
Robinson, B. P. (Agron.)	Kilgore-McRee, Inc.	Birmingham
Scott, Milton	Stauffer Chemical Co.	Section
Tingdale, Don M.	DuPont Company	Montgomery
DELAWARE		
Rennie, W. W.	DuPont Company	Wilmington
FLORIDA		
Billett, Robert W.	O. E. Linck Co., Inc.	Hialeah
Blackledge, James L. (Equipment Dealer)		Lake Worth
Bryant, Al (Supt.)	Country Club of Orlando	Orlando
Burke, R. E.	DuPont Company	Winter Park
Cale, Ed. B.	Lawn & Golf Supply Co.	Jacksonville
Clifton, Lloyd (Supt.)	Daytona Beach Golf & Country Club	Daytona Beach
Cusick, Andy	Winter Park Country Club	Maitland
Edge, Ross (Supt.)	Eglin A.F.B. Golf Course	Niceville
Fenton, Tim	Par 3 Golf Club	Sarasota
Greene, Herbert E.	Brentwood Golf Course	Jacksonville
Hall, E. T. (Supt.)	Bobby Jones Golf Club	Sarasota
Hall, Joe M.		Clewiston
Hendry, David D.		Dunedin
Jackson, A. R.	Hyde Park Golf Course	Jacksonville
Johnson, Robert W.	Bradenton Country Club	Brandenton
Kelley, C. C. (Supt.)	Westview Country Club	Miami
Konwinski, Joe (Supt.)	City of Lake Worth	Lake Worth
Meyers, Robert V. (Co-owner)	Riviera Country Club	Daytona Beach
Newlands, Joseph (Supt.)	Ellinor Village Country Club	Daytona Beach

Name	Affiliation	City
FLORIDA (Cont.)		
Oliver, Bruce	Zaun Equipment Inc.	Jacksonville
Reemelin, Ben	Zaun Equipment Inc.	Jacksonville
Ritty, Paul M.	Dow Chemical Company	Fern Park
Shaw, C. C.	Hector Supply Company	Miami
Spaulding, A. R.	Spaulding's Inc.	St. Petersburg
Thomas, M. R.	City of Jacksonville	Jacksonville
Ward, Frank	Brandenton Country Club	Brandenton
GEORGIA		
Baumgardner, T. M. (V.P.)	Sea Island Company	Sea Island
Beckman, Richard	Valdosta Country Club	Valdosta
Beeland, B. P. (Manager)	Griffin Golf Club	Griffin
Bolton, Ed.	Georgia Tech. Athletic Ass'n.	Atlanta
Brown, D. P.	Spence Air Force Base Golf Club	Moultrie
Bryan, John P.	Mutual Fertilizer Company	Savannah
Burnam, J. W. (Supt.)	East Lake Country Club	Atlanta
Burton, G. W. (Prin. Gen.)	U.S.D.A., Experiment Station	Tifton
Bush, Don (Pro-Mgr.)	Tifton Country Club	Tifton
Chandler, W. E.	W. E. Chandler & Son	Tifton
Cline, Dick	Riverside Country Club	West Point
Crumpton, Fred	Toccoa Country Club	Toccoa
Darby, J. H.	Evans Implement Company	Atlanta
Dollar, C. A. (Supt.)	Glen Arven Country Club	Thomasville
Donaldson, George P. (Pres.)	Abraham Baldwin Agriculture College	Tifton
Doyle, Lawson E.	Augusta Golf Club	Augusta
Dudley, J. W.	Athens Country Club	Athens
Evans, Thurlow, Jr.		Avondale Estates
Fleming, Thos. E.	Georgia Crop Improvement Ass'n.	Athens
Forbes, Ian (Agron.)	U.S.D.A, Experiment Station	Tifton
Goldthwaite, Howard	Toro Turf Equipment Company	Atlanta
Hargraves, O. C.	Spence Air Force Base Golf Club	Moultrie
Haskins, Fred (Supt.)	Country Club of Columbus	Columbus
Higginbotham, W. A., Jr.	Armour Fertilizer Works	Albany
Holton, J. R.		Quitman
Inglis, Hugh	Georgia Crop Improvement Ass'n.	Athens
Jackson, James E.	U.S.D.A., Experiment Station	Tifton
Jensen, Ray	Southern Turf Nurseries	Tifton
Jones, J. Herbert	National Zoysia Grass Nurseries	Cartersville
Kepley, T. Alvin	V. A. Hospital	Dublin
King, Frank P. (Director)	U.S.D.A., Experiment Station	Tifton
Kraft, Arthur	Warm Springs Country Club	Warm Springs
Lambert, J. H.	Evans Implement Company	Atlanta

Name	Affiliation	City
GEORGIA (Cont.)		
Land, Harold W.	Augusta Country Club	Augusta
Land, Sam	Toro Turf Equipment Company	Atlanta
Lawrence, Lester (Supt.)	Fort Benning Officers Club	Fort Benning
Lorey, Michael J.	Toccoa Country Club	Toccoa
Martin, J. F.	V. A. Hospital	Dublin
McKendree, Marion (Supt.)	Sea Island Golf Club	Sea Island
McLemore, J. R.	Ansley Park Golf Club	Atlanta
Mondy, Griffin	Athens Country Club	Athens
Moore, Hugh, Sr.		Albany
Morcock, Cooper	Allied Chemical & Dye Corp. (Nitrogen Divison)	Atlanta
Parker, Ed. M.	Spencer Chemical Company	Atlanta
Parks, E. R.	East Lake Country Club	Atlanta
Prince, Larry (Rep.)	Stauffer Chemical Company	Tifton
Pumbert, Dalton	Glen Arven Country Club	Thomasville
Rambo, Sam L.	Merrybrook Zoysia Farm	La Grange
Raynolds, Richard B., Jr.	Sea Island Nursery	Sea Island
Reed, J. F.	American Potash Institute	Atlanta
Roquemore, W. A.	Patten Seed Company	Lakeland
Sanders, Rodney (Eng.)	Custer Terrace, Inc.	Fort Benning
Skinner, Bob	Russell Daniel Irrigation Co.	Athens
Smith, Gerald E.	Agricultural Extension Service, Hoke Smith Annex	Athens
Thames, Don	Toro Turf Equipment Company	Atlanta
Wages, R. M. (Supt.)	Athens Country Club	Athens
Ward, Joe (Supt.)	Idle Hour Golf & Country Club	Macon
Watson, T. W.	Piedmont Golf Course	Atlanta
Wells, Homer D. (Path.)	U.S.D.A., Experiment Station	Tifton
Williams, James E., Jr.	Marietta Country Club	Marietta
KENTUCKY		
Fitch, William H.	Ft. Campbell Golf Club	Ft. Campbell
MAINE		
Evans, L. J.	American Cyanamid Company	Dover-Foxcroft
MARYLAND		
Grau, Fred V.	Nitroform Agricultural Chemicals, Inc.	College Park

Name	Affiliation	City
MARYLAND (Cont.)		
Latham, James M., Jr.	United States Golf Association Green Section	Beltsville
MINNESOTA		
Harper, John C. II	Toro Manufacturing Corporation	Minneapolis
McLaren, Scotty	Toro Manufacturing Corporation	Minneapolis
MISSISSIPPI		
Clayton, Ben T., Jr.	Northwood Country Club	Meridian
NORTH CAROLINA		
Baenen, E. L.	DuPont Company	Charlotte
Braun, Frank E., M/Sgt. USMC	USMC Golf Course	Cherry Point
Burgin, George (Supt.)	Alamance Country Club	Burlington
Cheek, Osborne	Hillandale Golf Course	Durham
Cochrane, Donald	E. T. Smith & Sons Company	Charlotte
Harkey, Walter (Supt.)	Charlotte Country Club	Charlotte
Jones, Herbert	Starmount Forest Country Club	Greensboro
Maples, Ellis	Pine Valley Country Club	Winston-Salem
Maples, Henson E.	Pinehurst Country Club	Pinehurst
Parks, Elvin R.	Starmount Forest Country Club	Greensboro
Sapp, Ralph B.	Old Town Club	Winston-Salem
Smith, Wayne B.	E. J. Smith & Sons Company	Charlotte
Spencer, Jim	E. J. Smith & Sons Company	Charlotte
White, R. L. (Rep.)	Mallinckrodt Chemical Works	Charlotte
OHIO		
Dew, R. M.		Dayton
PENNSYLVANIA		
Capas, H. J., Jr.	Worthington Mower Company	Stroudsburg
Mascaro, Tom	West Point Products Corporation	West Point
Roulette, W. U., Jr.	Worthington Mower Company	Stroudsburg

Name	Affiliation	City
SOUTH CAROLINA		
Cathcart, Robert S.	Titi Peat Humus	Charleston
Goss, Frank (Supt.)	Sweetwater Country Club	Barnwell
Hall, James A., M/Sgt.	Fort Jackson Golf Club	Fort Jackson
Jeffords, M. K., Jr. (Pres.)	Southern Golf Association	Orangeburg
Lachecotte, A. H., Jr.		Georgetown
Raffine, W. B.		Fort Jackson
Ripley, C. R. (Supt.)	Anderson Country Club	Anderson
Schotta, Joseph F.	Greenville Country Club	Greenville
Watson, John		Georgetown
TENNESSEE		
Boyd, Llewellyn	Southern Golf Association	Chattanooga
Boyd, Pollack	Southern Golf Association	Chattanooga
Danner, Charlie (Supt.)	Richland Country Club	Nashville
De Locke, Henry D.	The Nashville Housing Authority	Nashville
Grandison, Pete, (Pro-Supt.)	Woodmont Country Club	Nashville
Smelser, B. O.	Shady Shores Golf Course	Calderwood
VIRGINIA		
Savage, Hurley	James River Country Club	Newport News
WISCONSIN		
Wilson, Charlie	Milwaukee Sewerage Commission	Milwaukee