PROCEEDINGS

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GEORGIA COASTAL PLAIN EXPERIMENT STATION

and

ABRAHAM BALDWIN AGRICULTURAL COLLEGE
COOPERATING

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P R O C E E D I N G S

Eighteenth Annual

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UNIVERSITY OF GEORGIA COASTAL PLAIN EXPERIMENT STATION

In Cooperation With

ABRAHAM BALDWIN AGRICULTURAL COLLEGE

UNITED STATES GOLF ASSOCIATION GREEN SECTION

and

SOUTHERN GOLF ASSOCIATION

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FOREWORD

The basic needs of man seem to change only in degree. A few generations ago, very few people felt a great need for a daily or weekly period of recreation. The pace of modern living has produced a need for more frequent and longer recreational periods. Just as important, our way of life has created the means by which we can afford a wide variety of recreational activities. Depending on the amount of activity needed, or required, an individual's recreation may vary from the quietude of an afternoon in a comfortable chair on a restful lawn to the rough and tumble of a football game. For both these extremes and many levels in between, turf grasses have been developed.

When man's recreational needs involve the use of turf grasses, we feel that our work, with your continued support, can be of value in filling the needs. We feel that the most valuable turf grasses are those that provide both beauty and utility. For more and more turf-grass uses, the "Please do not walk on grass" sign is out of place. We are continually searching for those grasses which have the restful beauty of a rich carpet combined with the utility for whatever recreational purposes man needs them. Those who attended and supported this Eighteenth Turfgrass Conference have helped us make another step forward. We are grateful for your interest.

Frank P. King, Director
Coastal Plain Experiment Station

WEEDS AND THEIR IDENTIFICATION

James F. Miller
Extension Agronomist-Weed Control
University of Georgia, Athens, Ga.

Weeds are important to almost everyone, particularly to this group, since they create problems in a recreational area. With new emphasis, more leisure time (and the prospect of even more free time), an ever more rapidly expanding population, weeds will appear more important as they encroach upon and interfere with man's pursuit of pleasure and relaxation.

Weeds are estimated to cost more than $126 million loss in Georgia each year and to cost nearly $1.5 billion annually in 9 southeastern states (from SWC report - Economic Data on Losses Due to Weeds). In this report, conservative as it is, 5 out of 9 reporting states estimate that turf losses due to weeds amount to $45 million. This, of course, includes home lawns as well as recreational areas. But it is of interest to note that of 22 categories of weed loss reported, only losses in corn, cotton, pastures and hay crops, vegetables, and forestry exceed the values ($45 million) reported for turf areas.

Undoubtedly, weeds do offer serious competition and weed control is a big and serious business - and growing.

In order to control or kill a weed, it is well to know the weed. I'm here to briefly discuss "Weed Identification" with you. Then you can go home and practice. If you still get stumped, dig up the plant and send it to your weed specialist in the botany department at your state university for identification.

You received a copy of the <u>newest</u> Extension publication, "Weed Identification." This is as "hot off the press" as you can get.

I hope, in the next few minutes, to instruct you in the proper use of this bulletin, so that you can identify many weeds - if I can do it, anybody can.

What is a weed? Any plant growing where the man in charge doesn't want it. You may refine this is in your own terms, as we have done in the front of this publication, to illustrate how weeds grow, reproduce, spread and are classified.

This bulletin contains about 118 illustrations of the more common weeds. Weed identification of a wider range is more easily accomplished with Meunscher's book on "Weeds" which shows 331 different weeds, not all found in Georgia or the Southeast. So our publication is limited in range. We have illustrated only a few grasses, but many broadleaf weeds.

This publication differs from the usual Extension manual in that we (1) put in a vegetative key to common weeds. This key was developed by Dr. D. E. Davis and Sam B. Jones, at Auburn, for identification of Alabama weeds. This key is called "dichotomous"; that is, for every character or group of characters listed, an opposite or opposing set of characters is given, allowing only two choices for further progress through the key. Note that the key is paged to refer you to a family group. We'll come back to the key a little later.

(2) Another departure from the usual layout is that we have grouped weeds into the proper family, thinking that as you use this bulletin, you will see and learn the relationship of plant characters to certain family groups. Each family carries a general description of outstanding characters plus a floral code which indicates the range of differences found in the floral characters. For example, members of the sedge family can readily be identified by triangular, solid stems, while grasses have hollow rounded stems. The position of leaves (alternate or

opposite), sheathing stipules, square stems, milky juice, type of fruit - these and other characters, though not an infallible guide, can provide immediate recognition of a family group in many cases. Only use of a scheme with some order can provide you with these keys. We hope you can derive this ability to recognize plants by study and use of the bulletin in the same way that you recognize any of your friends in this room -- by association with certain features - long nose, gray hair, wrinkles, etc. coupled with a name.

Please note - the vegetative key is used, since plants do not always have flowers when we try to identify them. But floral characters are necessary for positive identification of plants. Be sure to include flowers for identification when submitting specimens.

Slides: Let's use a few slides to illustrate that 1-2 key characters of a vegetative nature can be used to help identify plants to a specific family. In other words, take a plant, observe grass characters, and try to determine if it "looks like" some other plant you know.

Not all of the family groups can be treated this way.

Monocots

Cyperaceae (Sedge)

Nutgrass

3-ranked leaves, basal, triangular stem, solid

Gramineae (Grass)

Alternate leaves, round hollow stems, nodes

Crabgrass

Liliaceae (Lily)

Wild garlic

Bulb, basal leaves, 2-ranked

Dicots

Amaranthaceae (Amaranth)

Pigweed - usually red succulent stems, large rough leaves

Anacardiaceae (Cashew)

Poison ivy - large green trifoliate leaves

Carophyllaceae (Pink)

Common chickweed - not hairy, opposite leaves, swollen nodes

Chenopodiaceae (Goosefoot)

Lamb's quarter - light green, appear dusted with flour

Cruciferae (Mustard)

Hare's ear mustard - strong smelling, fruit is unique (silique)

Geraniaceae (Geranium)

Cranesbill - dissected leaves, style elongated

Phytolaccaceae (Pokeweed)

Pokeweed

Polygonaceae (Buck wheat)

Curly dock - acid taste, 3-angled, achene, dark green color, sheathing stipules

Compositae (Composite)

Dandelion - compound flower head, with ray and disk flowers

Labiatae (Mint)

Henbit - square stem, opposite leaves, 4 nut-like seeds

Asclepiadaceae (Milkweed)

Butterfly weed

Convolvulaceae (Morning glory)

Morning glory, Dichondra

Plantaginaceae (Plantain)

Bottlebrush

Rosette (basal) leaves, spike flowers, bracted

Buckhorn

Umbelliferae (Parsley)

Wild carrot - leaf finely dissected, flowers in umbels

Hydrocotyle

Onagraceae (Evening primrose)

Evening primrose - flower bugle-shaped, plant prostrate, coarse, fruit a 4-lobed elongate capsule in leaf axil

Leguminosae (Legume)

Coffeeweed - two species - trifoliate or compound leaves, fruit a legume (pea, butterbean)

(3) The third divergence from the usual type of bulletin is the inclusion of a table listing weeds by family, and sensitivity to three phenoxy herbicides. We believe you will find this section especially useful, but - you must know the name of the weed, the primary purpose of the bulletin.

(4) The bulletin is indexed in alphabetical order by common name, with references to illustration and to page number of susceptibility table.

We have also included a list describing different fruit types and a quick reference key to floral code shown in the bulletin, as well as a quick reference chart, using 4 pairs of key floral characters to family determination.

A glossary of terms is included, as well as a reference list to other books useful for plant identification.

We said we would refer to the key again. Let me quickly demonstrate for you how it works.

Our hope is that you will <u>use</u> this key and bulletin in your work.

HOW CHEMICALS CONTROL WEEDS

Harold C. Olson
Industrial and Biochemicals Department
Dupont Company, Wilmington, Delaware

It is a real pleasure to attend your annual Turf Conference and a special honor to be invited to participate in the program.

I note that the purpose of this Conference is stated as "better turf" for the southeastern United States. Better turf is a result of good management and a good manager, as you know, must solve a multitude of turf problems. How to control weeds in turf is one of the problems which must be handled successfully if you are to have fine turf. The importance and complexity of this problem is indicated by the portion of this Conference dedicated to the discussion of weed control.

A successful weed control program should use chemicals, but chemicals cannot do the job alone. If you have a high quality turf that is adapted to your area, and if you fertilize it properly and follow good cultural practices, then chemicals can be of use to help control weeds and give you better turf. A great deal of information about chemical weed control has been developed. As an example, in a recent book "Weed Control As a Science," by Dr. Glen Klingman, of North Carolina State College, about two thirds of the 400 pages are devoted to herbicides and their use. This book is an excellent source of information.

When we consider the subject of weed control, we are usually thinking about species selectivity, methods of application, and field behavior of herbicides. This is a practical aspect of the subject and I'm sure it will be discussed in considerable detail by some of the other speakers.

We know that herbicides control weeds by interfering with a number of physiological processes in plants. Physiological processes in plants are extremely sensitive, and any interference with these processes can alter the plant growth, often causing the plant to die. Scientists have spent many man-years of research in an effort to determine the mechanism of action of various herbicides and have identified many sites in the plant through which growth interference is expressed.

Weed-killing chemicals are classified into three types of herbicides, depending upon their effects on plants. These are: contact herbicides, growth regulators, and soil sterilants.

Contact herbicides kill the plant parts covered by the chemical. These herbicides are directly toxic to living cells, and there is little, or no, translocation of this type of herbicide through living cells. Contact herbicides are usually only effective against annual weeds. The contact herbicide quickly burns off the top of the plants. This usually causes the death of annual plants, but generally has little effect on perennial plants other than to "chemically mow" them.

Growth regulators are chemicals which are absorbed either by the roots or the aboveground parts of the plant and move, or are translocated, through the plant system. The chemicals upset the plant's growth and metabolic processes. Growth regulators do not act as quickly as contact herbicides and the full effects of growth regulators may not show up for a week to a month after treatments. A good example of a growth regulator is 2,4-D and I'm sure you have all used this chemical to control broadleafed weeds such as plantain and dandelion.

Soil sterilants are chemicals which, when present in the soil, prevent the growth of green plants. Soil sterilants may be temporary or semi-permanent,

depending upon the length of time that they remain in the soil and prevent growth. Generally, their use is limited to areas where we want all vegetation controlled. There are places where soil sterilants can be used, such as field edges and certain storage areas. There are also areas such as sand traps where, I am sure, you would like to use a soil sterilant if you could do so without injuring desirable turf or nearby trees. When we grow fine turf or various crops, we want to be able to use a herbicide in such a manner that the unwanted vegetation is controlled, while the desirable vegetation is allowed to grow.

This brings up an interesting question. How does a herbicide selectively kill the plants that don't belong? The choice of a herbicide to selectively control weeds in turf or crops is determined by several factors. The inherent qualities of the herbicide are important. In other words, we need to know how it acts. When we find various weed species growing in fine turf or in crops, we see that most weed species have characteristics which are different from the crop. By recognizing these differences, we can select specific herbicides and use them so that they will be active against the weed species, but not be particularly injurious to the plants that we want to protect and save.

One of the most important factors in chemical weed control is absorption or the movement of a material into a plant. It just seems logical that if a weed does not absorb the chemical, it can't be killed. Species vary in their absorption of herbicides. In fact, the absorption of herbicides is not even the same in all ages of the same species. This difference in absorption can be used in selective weed control. When a herbicide is absorbed through the leaves of a plant, it is absorbed

through the cuticle or the stomata or both. The cuticle is the waxy leaf surface. The thickness and nature of the cuticle varies between species and there will be variations in the same species, depending upon the age of the plant and the environmental conditions. The cuticle acts as a major barrier to the absorption of herbicides by the plant. Therefore, plants with a thin cuticle will normally absorb more herbicide than plants with a thick cuticle.

The number, size and location of the stomata will naturally influence the absorption rate of a herbicide. In many plants, stomata are located on both the upper and lower leaf surfaces; in others, only on the lower surface. The number of stomata per unit area varies as much as tenfold among species. Stomata size varies as much as five or sixfold among species. It is apparent that plants with many large stomata on both leaf surfaces may absorb enough herbicide to be killed while those with a few small stomata will survive.

Once a herbicide is absorbed by the plant, it usually must move throughout the plant in order to exert maximum effect. This factor is known as translocation. Translocation occurs both upward from the roots and downward from the leaves. The rate of translocation varies with different herbicides and among plant species. The rate will vary within a species under different environmental conditions.

Another factor that you want to consider is the leaf properties of plants. For example, think of the difference in the leaf properties of bluegrass and dandelion. The bluegrass with its narrow, upright leaves will intercept and retain much less spray than will the broad, flat leaves of the dandelion. So a contact herbicide or growth regulator will generally have more effect on a broadleaf plant than on a grass or narrow leaf plant.

A fourth factor to consider is the growing point of a plant. The growing point of a grass or cereal is located at the base of the plant and is protected from contact herbicides by the surrounding leaves. Broadleafed plants, in contrast, have exposed growing points at the tips of the shoots and in the leaf axils. Consequently, the contact herbicide can actually strike the growing point of a broadleafed plant.

The "growth habits" of a plant should also be taken into consideration. A perennial, such as Johnsongrass, has a deep extensive root system. These root systems will recover from moderate injury to parts aboveground, where the annual weeds having shallow roots will be killed.

A sixth factor is the rooting habits of plants. We often use herbicides that are not inherently selective to control weeds in crops because of the different rooting habits of the weed and the crop. Shallow-rooted weeds may be killed in a deep-rooted crop by a herbicide that remains near the surface of the soil. Many crop herbicides function in this manner. The weed seeds germinate in the upper one-half inch of soil, while the crop seed is planted an inch or more deep.

A seventh factor is "selective placement" of a herbicide. We use this technique in many crops by directing a spray for maximum contact with the weeds and a minimum contact with the crop. An example of this is the practice of directing a spray in cotton so the small weeds are covered but only a portion of the stem of the cotton plant is covered by the spray. The small weeds absorb sufficient herbicide to be killed, while little or no herbicide is absorbed by the cotton plant.

The seven factors I have mentioned are most important and by using the knowledge of their influence on herbicide activity, a good manager can get maximum results from herbicide applications. These factors are most important in determining the degree to which a plant will tolerate a herbicide. In addition to these factors, we find that certain species of plants have an inherent tolerance for certain herbicides. This is obviously the most desirable manner in which to achieve selectivity.

There are many desirable plants which have a tolerance to certain herbicides, at least they will tolerate rates of application of a herbicide that will control the competing weeds. Generally, we don't know why certain species tolerate a herbicide and we have no way of determining tolerance other than by trial. In fact, we are not able to determine if a new chemical compound will have herbicidal activity except by trying it. This is the manner in which new herbicides are discovered. New chemicals are applied to plants and the plant response is noted. If the plant dies, the chemical has herbicidal activity. We then test the chemical on a large variety of plants to see what the degree of tolerance might be for each species. Some surprising results often appear.

Sometime ago in the Du Pont Research Laboratories in Wilmington, Delaware, a unique chemical was discovered. It was noted that the chemical could be applied to soil and it would prevent crabgrass from germinating. It was also quite effective against other annual grasses such as foxtail and barnyardgrass. It had very little effect on the seeds of broadleafed plants. The chemical was then tested in turf to see if it would affect established bluegrass--it didn't. Next, a test was conducted where bluegrass seed and crabgrass seed were mixed together and sown.

The chemical was sprayed on the soil surface at the time of seeding. The bluegrass germinated perfectly, but the crabgrass did not.

We had found a chemical that bluegrass and many other fine turf grasses would tolerate, but crabgrass and certain other weed grasses would not. This chemical has just been released to investigators and I'm sure you will hear a great deal about it in the future.

To summarize the factors that determine herbicidal selectivity, I would like to show you some slides to illustrate "How Chemicals Control Weeds."

The science of chemical weed control is new and there is no doubt that the future holds some real surprises for us. We can expect new chemicals, new techniques for using chemicals and, best of all, better and more efficient control of weeds. Increased understanding of "How Chemicals Control Weeds" will make your job easier and you will be able to have that "better turf" in the southeastern United States.

CHEMICAL WEED CONTROL IN TURF

Jack T. Thompson
Assistant Agronomist
Georgia Experiment Station

The development of highly active organic chemicals as herbicides in the mid-1940's offered a new approach to the solution of the old problem of weeds in turf areas. While these new materials are still just an adjunct to good turf management practices, they do promise effective weed control at a reasonable cost not only for home lawns but for turf in parks, golf courses, playgrounds, athletic fields, and business lawns.

While initial emphasis was placed on the development of these new herbicides for application in agriculture, consideration of their use in specialized areas such as turf followed quickly. In 1962, a total of 47 research workers in state and federal stations across the United States were listed as working on turf weed problems in one form or another.

This interest in turf has not been limited to research personnel. As the market potential for these newer materials in turf became apparent, herbicide manufacturers began to include turf as a routine segment of their screening program for potential herbicides. This trend has developed to the point that several companies now direct their major effort toward developing materials for use in turf and similar areas. As a result of this effort, a number of new products have found their way into turf weed-control programs.

After the establishment phase, weed problems are usually the result of poor management. They occur in unthrifty turf, which has not received proper fertilizer or water application or in turf which has been damaged by disease or improper mowing practices. Herbicides should be used only after provisions for correction of

these other conditions have been made.

Weed problems in turf are seldom the product of a single species. They generally consist of both broadleaf and grass weeds and often both annuals and perennials are represented. Nut sedge is often a problem and other sedges and smaller rushes sometimes are troublesome. Various onion species also present special problems in lawns.

Few chemicals presently available are effective for both annual and perennial broadleaf and grass weed control. Each problem should be evaluated individually and chemical selection should be made on this basis. Perennial weeds should receive first consideration, since a program for their control should also be effective for many of the annual weeds present.

Broadleaf weeds usually respond to 2,4-D, 2,4,5-T, silvex, MCPA, dicamba, or like materials. Repeat applications may be necessary for effective control of some species and treatments for more than one year may be required for effective control of specific problem weeds. Combinations of materials such as dicamba and 2,4-D are often more effective than either material used alone for hard-to-kill species.

Annual grasses such as crabgrass can be effectively controlled by pre-emergence application of dacthal, zytron, and some of the triazines such as atrazine. Post-emergence control of crabgrass has been good following application of DMA plus surfactant, DMA plus 2,4-D, or DMA plus dicryl. This last combination also gives good control of dallisgrass. Annual bluegrass is one of the most troublesome weeds in turf; for its control, some golf-course managers

report that metalic arsenic salts, such as lead arsenate and sodium arsenite have been effective.

Dalapon is effective for non-selective control of grasses. It can be used to edge around beds, walks, or trees. It can also be used to remove spot infestations of undesirable grass or on large areas prior to planting another turf species.

Nitrogen, when applied at high rates, has been effective as a contact spray for control of seedling weeds. Nutsedge is one problem weed, which has not been effectively controlled by any of the commonly used chemicals. The only reasonably effective method of nutsedge control is by fumigation with a material such as methyl bromide. These materials are difficult to apply and rates required make the treatments expensive.

USE AND MISUSE OF CHEMICALS FOR WEED CONTROL

Tom Mascaro
West Point Products Corp., West Point, Pennsylvania

Before we begin a discussion on the use and misuse of chemicals for weed control, we should consider two factors. They are:

1. How weeds take over a turf grass area
2. Analyzing the basic problems

Weeds take over a turf grass area by robbing the good grasses of sunlight. If we were to establish an area into grass and then turn it over to nature, we would find that the grass plants would compete with each other for sunlight. The weaker of these grasses would be shaded out by the stronger plants and they would die. Broadleaf weeds would then begin to grow in the weakened areas and again by the simple process of shading, would kill the finer-leafed grasses. The broadleaf plants would, in turn, give way to the taller weeds, which would shade the low-growing broadleaf weeds. The tall weeds would eventually give way to the bush. The bushes would then shade the area and kill most of the vegetation beneath. The bush, in time, would then give way to the tree, who becomes king of all plants. The tree, through the simple process of robbing all the sunlight and shading the area beneath its branches, prevents all plants from growing. There are, of course, other factors that determine the survival of each plant. However, sunlight and shade are basic concepts of nature and these are primarily what we are dealing with when we talk about weed control. A weed-control program should be initiated before weeds can shade out the desirable grasses. The longer one waits, the more difficult it will be to fill the voids left by the eliminated weeds.

The second factor that I would like to discuss is that of analyzing the basic problems in turf grass areas. A weed to a turf grass man should be looked upon as a red flag, telling him that something is basically wrong. Weed control is relatively useless unless the plant that is being eliminated can be replaced by good turf grass.

There are five basic things that must be considered when initiating a weed-control program. They are:

1. The soil
2. The grass
3. The nutrition
4. The water
5. The management

Any one or a combination of these basic things, when something is wrong, can cause a weed problem. Weeds cannot grow in good turf. Something is basically wrong when weeds are present. One should systematically analyze each of these five basic factors and, if possible and practical, correct what is wrong. Only after the basic problems are corrected can we be reasonably sure of continued success with a weed-control program.

Let's consider the soil first:

Does it drain properly? This includes both internal and surface drainage. Can the texture be altered to improve drainage? Should tile lines be installed? Is the area subjected to so much traffic that compaction is the basic problem?

The next step is to analyze the grass. Is it the proper grass for the use to

which it is subjected? Is it the right grass for the climate in which it is growing? Would a hybrid selection be easier and cheaper to maintain to resist weed invasion?

The third step would be to determine the nutritional requirements of the grass. Is it being fed enough fertilizer or too little --or too much? Is it the right formula to meet the requirements of the grass? Is the fertilizer being applied to the surface or is it being worked into the root bed through aerification? Is the fertilizer being applied at the right time to stimulate plant growth when it is needed?

Fourth, analyze the watering practices. Is too much or too little water being applied? Is the water being applied in light, frequent sprinklings or good, deep periodic soakings? Is the water being applied faster than the soil will absorb it? Is the water supply contaminated?

Fifth, is management. Management can destroy a lot of turf, making way for weed invasion. Is the turfgrass area being used so hard that turf cannot recover? Is there such a build-up of thatch that the area harbors disease and insects? Does the thatch prevent water, air, and fertilizer from penetrating into the soil? Is the mowing equipment in good condition, sharp and properly adjusted? Is the turf being cut at the height best suited to the grass or is it being cut to suit the players? Is the turf being mowed by the calendar or mowed on an as-needed basis? Is the air drainage good or is the grass being grown in a pocket?

These and many other questions should be answered. One can readily see that it is very necessary to study all of these basic factors before beginning a

weed-control program. If these basic problems are eliminated, then a weed-control program will be successful. This, then is the first step in a weed-control program.

The second step is to adhere to the manufacturer's recommendations of the chemical being used. Many times, people experiment with different rates and find that their weed-control program is a failure. The manufacturer invests a great deal of money to determine the proper rates for his product. These rates are carefully checked so that the material will do everything that the label states. Remember: "If all else fails, read the label."

The third step in a weed-control program is procedure. This would include: (a) good equipment, (b) the correct mixture, (c) proper application, and (d) proper rate. Good equipment is an absolute necessity for a successful weed-control program. The equipment should deliver material evenly and uniformly. The correct mixture is also important. Materials should be weighed or measured and blended with the proper amount of carrier. Proper application is important. Uniform distribution by an experienced applicator will insure the best results from the material. Proper rate of application will also determine the success of a weed-control program. We see many instances of people applying materials over a turf grass area and then go over it the second time. If the label states that materials should be applied at a certain rate, this should be adhered to. The next step in a good weed-control program is to keep records. This should include material, rates, time, and other details which may prove invaluable in an over-all program. The last factor which should be considered in a weed-control program is the follow-

up of a sound management program. Here again, many weed-control programs are complete failures because there was no follow-up. A sound management program is extremely important in order to keep good turf.

CULTURAL CONTROL OF WEEDS

Panel Discussion

Moderator: Dr. Glenn W. Burton, Principal Geneticist
Georgia Coastal Plain Experiment Station
and Member, USGA Green Section Committee

Panel Members: Mr. Hugh Inglis, Seed Certification
Georgia Crop Improvement Association

Mr. T. M. Baumgardner, Member
USGA Green Section Committee

Mr. E. Ray Jensen, Agronomist-Turf
Southern Turf Nurseries, Tifton, Georgia

Resume of Panel Discussion by Glenn W. Burton

This discussion has, in no way, been designed to imply that chemical herbicides are not needed in weed control in turf. Rather it was developed to remind us that cultural methods used for weed control before chemicals were available may still have a place as we strive to grow weed-free turf at a minimum cost. Some cultural practices that have been effective in controlling or reducing weed populations are briefly described below.

It has long been recognized that grass species differ in their weed resistance. Generally, the turf grass best adapted to a particular soil situation will be most weed-free when managed properly. Differences between species in weed resistance are now known to occur between varieties within the same species. Tiflawn and Tifway bermudagrasses, for example, produce turf that contains a small fraction of the weeds found in common bermuda turf managed in exactly the same way. Thus, the choice of a superior variety of a turf grass can greatly reduce weed-control problems and the need for chemical herbicides.

Management practices that favor the turf grass help control weeds. Adequate quantities of lime, nitrogen, phosphorus, potassium, and other elements as needed to give a dense sod greatly reduce weed infestations. Fertilizer should be applied when it will feed the grass and not feed the weeds. Clover can usually be controlled or eliminated from turfed areas by reducing phosphorus and potash fertilization to the point where only the needs of the grass are supplied. Clover requires more phosphorus and potash than most turf grasses. Turf grasses usually can stand more frequent and closer mowing than most turf weeds. Cutting heights that give the maximum turf density usually give the minimum weed populations. Watering must favor the grass species used for turf. Bermudagrasses that require good drainage are unable to effectively compete with the weeds on poorly drained soils. Improving the drainage usually reduces weed problems.

Many weed problems can best be solved by prevention. Fallowing the soil to reduce the weed population before the grass is planted will help. Applying weed-free top-dressing to golf greens is one of the best ways of keeping weeds off greens. Before chemicals like methyl bromide, some golf courses use steam-sterilized soil for top-dressing golf greens and reduced materially the amount of hand weeding that was necessary on the greens. New areas to be established in turf should be planted with seed or planting stock free of weed seeds. Many weeds get started in this way. Many of the weeds on a golf course are there because seeds blow in, are

carried in on mowers and other equipment, or are washed in from nearby areas where weeds are allowed to produce seed. The old adage, "An ounce of prevention is worth a pound of cure", applies to the weed problems in turf, just as it does to many other problems in life. Until there are selective chemicals to remove all weeds from turf, hand weeding may be necessary to eliminate certain species. The current high cost of labor requires that such weeding be kept to a minimum.

Fortunately, there are now a number of chemicals that will control most of the weeds in turf if used properly in conjunction with good cultural control practices. To use such herbicides without good cultural practices calls for more frequent treatment, increased costs, and usually results in less satisfactory turf.

Resume of Panel Discussion by Hugh Inglis

Land requirements by the Georgia Crop Improvement Association:

A field to be eligible for the production of certified (blue tag) stock must have been thoroughly inspected twice at approximately six-week intervals, and must have been found free of all other perennial grasses, noxious and objectionable weeds. Plowing, harrowing, and fallowing for several seasons will help clean the land.

Field Inspections:

Handling the crop prior to inspection - A field must be rogued sufficiently during the growing season to remove any other perennial grasses or other undesirable plant mixtures.

Roguing:

Growers of certified turf grasses must have the temperament to go over their turf nurseries continuously and pull out or dig out any unwanted plants of other grasses and noxious weeds.

Isolation:

A field, to be eligible for the production of certified plantings of vegetatively propagated turf grasses, must be isolated from any other perennial grass by a strip at least six feet wide to preclude any possibility of mixing planting material during the digging operations.

Resume of Panel Discussion by E. Ray Jensen

Chemicals are important for weed control in our nursery and I am glad we have them. But when we started producing certified turf grasses in 1951, such chemicals as 2,4-D, DMAS, and Di Nitro were just coming into use. For all practical purposes, we went through the first season without the use of herbicides and we produced weed-free turf. If we had known more about herbicides and had they been available, we could have produced our grasses more economically. The fact that we did produce some weed-free turf in land that had been under cultivation for years is proof that it can be done.

Some turf producers are growing grass and doing a good job of it without the use of herbicides. In fact, there are some very good golf courses that do not even own a sprayer and judging from Tom Mascaro's discussion on the use and misuse of chemicals, there are probably some who should not have sprayers. Also, there are a lot of golf-course superintendents who use their sprayers for insect and disease control only. They employ mechanical and biological means to control weeds.

We all know that weeds invade areas of weak or non-existent grass. Low fertility and drought are the two greatest contributors to weak turf. Slopes and shoulders are the step-children on the golf course. These areas are often neglected

when it comes time to irrigate and fertilize, so if you want to find weeds on the golf course, try these areas. Where the grass gets plenty of fertilizer and water though, it will dominate the weeds. Where the grass is neglected, weeds will come in and may even take over.

Mowing, verti-cutting, and aerifying are very effective in weed control. There are not many weeds that can tolerate close mowing with occasional verti-cutting. If greens are mowed at one-fourth inch, well fertilized, and verti-cut about once a month, all other things being equal, weed problems are at a minimum.

In this connection, thought needs to be given to the grass that is being mowed. If bermuda is mowed above 1/2 inch, weeds will come in more easily than if mowed lower. Zoysia resists weeds by making a better sod if it is mowed around 3/4 of an inch. Centipede should be mowed at 1 1/2 to 2 inches and St. Augustine even higher.

Nearly all of our soils have some viable weed seeds. Generally, they contain noxious weeds such as common bermuda and nutgrass. To reduce our weed problems, we try to establish our new plantings on new ground or land that has never been in cultivation. These areas rarely have nutgrass or common bermuda and the amount of general weed seeds is low. Where we do not have the new ground properly located or available, we fumigate with methyl bromide. We save in the long run if we are planting in weedy areas by fumigating. Post-planting herbicides do retard the growth of grasses to some extent, so where they can be avoided, we try to do so without them.

So in answer to your question, Dr. Burton, "How did we grow grass without chemicals when we first started in the grass business, and do we grow any now

without chemicals?", we did it in the early days with a lot of cultivation, hand roguing and hoeing, but we did produce some weed-free turf. In order to produce weed-free turf now without the benefit of chemicals, we plant in soil that has never been cultivated, pastured, or otherwise adulterated.

CONTROL OF CRABGRASS, GOOSEGRASS, POA ANNUA, CLOVER, SEDGES, SPOTTED SPURGE AND OTHERS

Panel Discussion

Moderator: Mr. James B. Moncrief, Agronomist
USGA Green Section

Panel Members: Mr. T. M. Baumgardner, Member
USGA Green Section Committee

Mr. Palmer Maples, Superintendent
Charlotte Country Club, Charlotte, N. C.

Mr. Harry Wright, Superintendent
Peachtree Country Club, Atlanta, Ga.

Mr. Charles Danner, Member
USGA Green Section

Talk by Mr. Moncrief:

When cultural practices are not good enough, chemicals have to be used to support turf to eliminate obnoxious weeds and grasses. This is one of the main concerns of golf courses in the Southeast. There are many weeds found on golf courses and some of the most undesirable ones will be listed below with a short history on a portion of them.

Goosegrass has many common names and this can be confusing. For instance, some of the names heard often are goosegrass, crowfoot, silver crab, hard crab, iron weed, yardgrass, crabgrass, wiregrass, doggrass, and I am sure you mutter a few names yourself sometimes.

The botanical name is Eleusine indica. It is found throughout North America, acting as an annual in most cases and it is a pest the year round in south Florida. In most cases, it is called crowfoot but according to the authorities, crowfoot is

an entirely separate genus--Dactyloctenium aegyptium. This is from a Greek word, daktulos, for finger. It was introduced from the Middle East. Regardless of what it is called, it is a pest for golf course superintendents.

Crabgrass is an annual or sometimes a perennial. There are about 60 species in the warmer parts of the world; 12 in the United States. The generic name for crabgrass is Digitaria, which is derived from the Latin word for finger, digitus, referring to the digitate inflorescence of the crabgrass.

Digitaria sanguinalis, large crabgrass or common crabgrass, is sometimes utilized for forage and also cut for hay. It grows from spring until fall and is more common in the eastern and southern part of the United States. It is also a native of Europe.

The other crabgrass so widely known is Digitaria ischaemum, smooth crabgrass. It resembles the large crabgrass mentioned, but is not so coarse or tall. The foliage is glabrous, bluish or purplish. It is found from Canada to Florida and from the Atlantic coast to the Pacific coast. It was introduced to the United States from the Middle East.

The grass that is discussed and cussed on golf courses is annual bluegrass or technically, Poa annua. It is grown all over North America and in the tropics at high altitudes. In all probability, this grass has had as much research for eradication as any grass. There must be a dozen chemicals that eliminate the grass, but it is still a problem at times on our courses. Palmer Maples, from the Charlotte Country Club, has been making a concentrated effort to reduce the Poa on his golf course. He has approached it from controlling the source of the seed and keeping it to a minimum in the greens. He uses sodium

arsenite to burn the Poa on the fairways and roughs while the bermuda is still dormant. He uses a slicing-type aerator rather than a spoon type. He feels the slicer type does not bring up additional seed.

There are several clovers in the Southeast, but we are fortunate that the 2,4-D's do an excellent job of controlling these pests on golf courses. The main clovers we are concerned with are as follows:

Trifolium repens, white clover, is a perennial. It probably originated in the Mediterranean countries or in western Asia. The Indians called it "White Man's foot". It adapts well to golf course conditions, but 2,4-5TP controls it very well with 1 pound of active material per acre.

Medicago arabica, spotted bur clover, sometimes referred to as medics, are native to the Mediterranean region. Some of the other bur clovers are spotted bur clover, California bur clover, small bur clover, button bur clover, and Tifton bur clover.

Melilotus officinalis, known as yellow biennial, Madrid, alba, or white annual, is native to temperate Europe and Asia as far east as Tibet. It was heard of as early as 1739 in the United States.

Other weedy pests found on golf courses are numerous and could not possibly be listed in this scope, but to name a few, we can start with sedges:

Cyperus rotundus, nutgrass or cocograss, is very common. There are about 600 sedge species in the world. Disodium methyl arsonate or amine methyl arsonate at frequent intervals has been very effective on some of the nutgrasses, but not all. Methyl bromide is best but all other turf is eliminated.

Euphorbia masculata, milk purslane or spotted spurge, is found throughout the United States and southern Canada and is hard to control under certain conditions. The use of Dicryl and DSMA at repeated applications of 4 to 5 day intervals is satisfactory. It is an annual or sometimes a perennial, often with a large taproot. The leaves are often blotchy.

These are just a few of the many weeds that have the ability to become established if the turf should become weak. When this happens, we can use herbicides, as either pre- or post-emergent and, in most cases, these will aid us in having a beautiful turf.

Chemicals that give us better controls for specific weeds are being screened by experimental stations and by the companies which are producing them. So many chemicals are being released, that it has become a problem for the experiment stations to screen all the new ones and explore the possibilities of the old ones to the fullest extent. It is so important that superintendents keep alert and be aware of the various changes each year.

Report from the Greens Superintendent---
Palmer Maples

Our efforts in the past two years to control Poa annua in the fairways has had some success. We have been spraying with sodium arsenite at six pounds of acid per acre in February and March and four pounds of acid in April. We cut the fairways very close during April and fertilize with high nitrogen in late April to push the bermudagrass. In late May, we use a complete fertilizer, after soil test, to get our phosphorus and potash levels. We use just nitrogen

the remainder of the season, trying to get 200 pounds of nitrogen per acre for the season.

After rebuilding several greens this past year, we will start a program of lead arsenate, 10 to 15 pounds per 1,000 square feet on our greens. This is to be applied in the spring and early summer. The tees received the same treatment as the fairways.

With this plan, our hope is to knock out the seed crop and plants in the fairways and tees and hope to sterilize the seed that may be brought on the green.

Year before last, we used some MH-30 prior to overseeding. In these treated areas, there was a very noticeable lack of Poa annua seedheads. More work with other chemicals is in progress and I hope one day, a chemical will be developed that is selective for Poa annua in our Southern greens. Then we'll have it made!

Control of Silver Crabgrass or Crowfoot--
Harry Wright

My part of this panel will not deal with pre-emergence materials. As yet, I haven't had any luck with them, but we are still working with a Treflaw material.

At Peachtree, we have found that crowfoot is much harder to kill than regular crabgrass and even dallisgrass. I am sure this does not surprise anyone. However, we have gained on crowfoot with repeated applications of the materials I will discuss.

Disodium methyl arsenate - 30% + a 40% ester base 2,4-D - is what we are using. Rates are 1 gallon DSMA and 1 pint 2,4-D per acre. This mixture has been used successfully in 50 gallons of water per acre.

When we first started using this mixture some years ago, the manufacturer recommended 80 to 100 gallons of water per acre. Of course, we use a wetting agent, too. But this much water can cause problems because with a 300-gallon tank, you can only cover 3 acres. This means we are spending too much time filling our tank, so I tried 50 gallons per acre and had very good results. As you can see, we can get more done in a working day, thereby meeting our schedule on time. It is very important that we get the second application within 5 days---no later than 6. One, or even two, applications is not going to get crowfoot. Usually, it will take three or four. At least, this has been the case with us. Regular crabgrass can be handled with two applications, but not crowfoot. Of course, I am talking about Atlanta crowfoot, which is an awful mean joker. At this point, let me say this: Spraying for crowfoot is a yearly proposition; you can't spray this year and say that is it. Just as sure as the Lord made little green apples, it will be back next year, especially if you aerify.

Timing the start of your program can, in my opinion, be very important. On one course in Atlanta, a Superintendent started early and got wonderful results, but in July and August after aerifying, another beautiful crop came in. Everyone says get it when it is young, but when it is young, the bermuda is young, too. As you all know, any weed killer slows the growth of bermuda, especially some of the hybrids. I have had good results by waiting until about

the first week in July to start. By then, the bermuda will stand the shock or even stand a heavier dose.

Calibration plays an important part in any spraying program. It is very simple. Fill your tank, run over a measured acre at the desired speed, then measure what it takes to refill the tank. You then have how much water you're putting on an acre. If the amount is what you want, you know how many acres the tankful will cover, so you can add the correct amount of materials for that many acres. If there isn't enough water, nozzle sizes may have to be increased or speed slowed. Pressure should not be more than 90 pounds. Where increased pressure was used, I've seen some bad streaking because the material seems to be driven onto the blades, when the water should just fall down like a soft rain.

Another point on which I have heard two opinions is the moisture content at the time of spraying. Again, when we first started, everyone said it should be on the dry side. Now they say moisture should be high. Frankly, I don't know. I do know we had excellent results our first year and it was dry. Another point in my opinion---the materials should stay on two days, if possible, because of the slow acting. I have heard that six hours is enough. I like to see 24 to 48 hours myself before rain or watering. If rain comes within 3 to 4 hours, all is lost. Just forget that application and start again.

In conclusion, let me emphasize continuity. Spraying should stay on a very tight schedule if it is to accomplish the maximum.

Weed Control--
Charles Danner

Gentlemen, the problem of weed control has come a long way since my first introduction to weeds as a caddy at the old Albemarle Golf Club in Charlottesville, Virginia. Then, I thought weeds were my friends because I was paid 10¢ an hour for weeding greens, which was pretty good pay for an 11-year old kid back in 1916. Later on, after I became a professional and greens-keeper, I found weeds were a real enemy to my profession.

Back in those days, the only weed control we had was to grow a good turf of grass. If anything happened to thin the grass, all we had left was a good sharp knife. Growing a good turf of grass still holds true today.

When I moved to Tennessee, we found that on bermudagrass greens, we could burn off the weeds by applying sulfate ammonia at 200 to 300 pounds to a green. The theory was that bermuda, being deeper-rooted, would recover and the weeds would be gone. It worked, but we had bad greens while the bermuda was recovering.

Years ago, we used lead arsenate for worm control and found that it also helped check crabgrass and Poa annua.

Later on, when chlordane came on the market, we found that the combination of lead arsenate applied 5 pounds in the spring and 5 pounds in the fall, along with a heavy application of chlordane -- two pounds actual chlordane applied in late April -- was very effective as a pre-emergence control for crabgrass, crowfoot, and Poa annua. This was on bentgrass and it also works on bermuda. The above rates are for each 1,000 feet. We found the 40% wettable

powder chlordane sprayed on the green to be better than liquid chlordane, as the emulsion in the liquid tended to burn the grass.

After World War II, I began to attend turf conferences such as this and began to learn of chemicals such as phenyl mercury, sodium arsenite, 2,4-D, 2,4,5-T, DSMA and many others, which since have done wonders in controlling weeds. Crabgrass, crowfoot, dallisgrass, and many other weeds have ceased to be a problem.

One of the first was phenyl mercury, used as a fungicide. We found that it also prevented crabgrass.

Sodium arsenite has been a wonderful chemical for controlling both winter and summer weeds with a little 2,4-D added to increase the effectiveness of both chemicals. The low price of sodium arsenite makes this chemical more valuable today, when we are faced with increased demands on our budgets. Sodium arsenite still has a place in weed control today.

During the last few years, more and more chemicals have come on the market both for pre-emergence and post-emergence control of weeds. They must be good chemicals or they would not be on the market, but I do not intend to use any of these chemicals on a broad scale until I have had the opportunity to try them on a test area on my golf course. A burned child dreads the fire and I have had some sad experiences in the past using chemicals before trying them on a test area and have observed others who have also had disastrous results by using chemicals without testing.

At Philadelphia and Knoxville, I learned of some new chemicals coming on the market such as MCPP and Banvel D, which can be used on bentgrass at 1 to 1 1/2 ounces to 1,000 feet. A word of caution: Do not use these on bentgrass in July or August. As 328 bermudagrass is not too tolerant to 2,4-D, perhaps 328 bermuda will be more tolerant to MCPP or Banvel D. We intend to try these chemicals on a test area of 328 this summer.

Also new pre-emergence chemicals are coming on the market such as Trifuralin and Azar. We have applied Trifuralin on test areas at Capital City at the rate of 3 quarts to the acre. We intend to try Azar as soon as it is available in Atlanta. I am looking forward with much interest to see the results this summer.

In the past, we have tried pre-emergence chemicals with poor results with one exception---Pax, manufactured by Pax Company, Salt Lake City, Utah. We have used Pax with very good results. We have found this chemical to last through two years. Apparently, the residue stays in the soil longer.

We now hear of fertilizers mixed with pre-emergence chemicals coming on the market. We look forward to trying these mixtures on test areas.

Recently, I subscribed to a magazine entitled "Weeds and Turf", address 1900 Euclid Avenue, Cleveland, Ohio, Zip No. 44115. This magazine publishes many good articles on weed control in detail. The cost of this magazine is $3.00 a year.

Gentlemen, I feel we have come a long way in weed control but much work remains to be done. I want to thank the chemists and manufacturers for the work they have done in giving us the tools for weed control.

I also want to thank the sponsors of Turf Conferences such as this that enable us to go back home better prepared to do our jobs. I, for one, have never attended a turf conference without learning something that helped me later on. Also, attending turf conferences helps remind me and to brush up on the things that I tend to forget.

GRASSES AROUND THE WORLD

Glenn W. Burton
Principal Geneticist
Georgia Coastal Plain Experiment Station
and Member, USGA Green Section Committee

The true grasses, scientifically called the Gramineae, are the most important family of plants in the world. Members of the 6,000 different species may be found growing wherever plants grow, from the Arctic Circle to the equator, from the desert to the rain forest. In the Arctic Circle where they have only a few days to mature seed, they may reach a height of no more than 2 to 3 inches. In the tropical rain forests, some of the largest grasses, the bamboos, may reach a height of 120 feet and have a stem diameter at the base of 10 inches.

Directly or indirectly, grasses furnish most of man's food. The world's bread and porridge are made from cereal grasses. Nearly half the people in the world live on rice, some eating over a pound a day and little else. Most of the meat and milk consumed by man are produced from green grass or the seeds from the cereal grasses——corn, sorghum, oats, barley, etc.

If one can believe current advertising, one of the most healthful oils for human food is extracted from corn, the seed of a grass. Some of the essential oils used in milady's favorite perfumes come from grass. Citronella, long used as an insect repellant, is an extract from a grass, Cymbopogon nardus. A large percentage of the brooms that clean our houses are made from the panicles of broom corn, a sorghum variety. Most of the world's sugar is extracted from sugar cane, a tropical grass.

Somewhere in the world, one may find such grasses as bamboo, wild sugar cane, and the Phragmites communis reeds doing the job that wood generally does here in the United States. People who cover their houses with grass-thatched roofs insist that they are the most satisfactory of all roof coverings, being cool in summer and warm in winter. In Colombia, I have seen houses built completely of bamboo and in India, I have sat in comfortable chairs made from the stalks of wild sugar cane. Some of the finest paper in the world is made from rice straw. Many clothing items such as hats, shoes and skirts are made from grass.

One of the first plants to start making soil from the lava that denudes volcanic mountains is fountain grass, Pennisetum rupellii. Grass is one of the most effective of all plants to protect soil from erosion.

It is difficult to imagine a beautiful home or public building around which there is not also a beautiful grass lawn. The world plays on grass and there is no way of placing a cash value on what it contributes to the peace of mind of those who play upon it. Finally, most of us wish to be laid to rest under a green blanket of it.

If all of the grasses were suddenly to be wiped from the face of the earth, most of the people would starve to death in a short time and those that were left would find themselves surviving in a much less attractive environment. Certainly, grass is the world's most important family of plants.

This talk was illustrated with Kodachrome slides taken of grasses growing and being used for many of the purposes suggested above in 27 countries around the world.

ATTENDANCE ROSTER

Name	Affiliation	City
ALABAMA		
Bergman, Charles	U. S. Air Force	Maxwell AFB
Bishop, Merrell	Willow Point Golf Course	Alexander City
Fisher, Albert I.	Chattahoochee Country Club	Abbeville
Ghioto, Telfair	Dothan Country Club	Dothan
Hartwig, Lester H.	Amchem Products, Inc.	Union Springs
Hill, Tommie	Birmingham Parks & Recreation	Birmingham
Kennedy, W. T.	Montgomery Country Club	Montgomery
Latta, J. D.	Birmingham Parks & Recreation	Birmingham
Lawrence, Doyle	Maxwell Golf Course	Montgomery
Ledbetter, Bob	Green Valley Country Club	Birmingham
Nelson, Bill	Green Valley Country Club	Birmingham
Nordan, William W.	Nordan Grass Farms	Abbeville
Roberts, James	Yeildings, Inc.	Birmingham
Rumore, Ross	Birmingham Parks Board	Birmingham
Sturkie, D. G.	Auburn University	Auburn
Tingdale, Don	Dupont Company	Montgomery
Yeilding, Fletcher	Yeilding's Farm Store	Birmingham
DELAWARE		
Olson, H. C.	Dupont Company	Wilmington
FLORIDA		
Allen, Paul E.	Paul E. Allen Company	Palm Harbor
Allen, Richard	Paul E. Allen Company	Palm Harbor
Arey, Phil	U. S. Rubber Company	Montverde
Bair, Roy A.	256 Alhambra Place	West Palm Beach
Berckemeyer, A. H.	Palmetto Country Club	Perrine
Billett, Robert W.	O. E. Linck Co., Inc.	Hialeah
Cabler, John F.	University of Florida	Gainesville
Cale, E. B.	Timuquana Country Club	Jacksonville
Clarke, Stanley E.	La Gorce Country Club	Miami Beach
Cook, E. E.	Ponte Vedra Club	Ponte Vedra Beach
Cunningham, H. E., Jr.	Seminole Lake Golf Course	Largo
Derzypolski, Marion S.	Capital City Country Club	Tallahassee
Edge, Ross	126 Second Street	Niceville
Gruis, Jake	O. M. Scott Company	Apopka
Hall, E. T.	4009 - 17th Street	Sarasota
Hines, Rube, Jr.	Sunset Golf Course	St. Petersburg
Horn, G. C.	University of Florida	Gainesville
Cunningham, L.E.	Seminole Lake Golf Course	Largo

Name	Affiliation	City
FLORIDA (Cont.)		
Jennewine, William L.	Evergreen Cemetery Association	Jacksonville
Kirkpatrick, Sidney	Kirk's Lawn Service	Ft. Lauderdale
Lazaroff, Ted	Sarasota Bay Country Club	Sarasota
Lidden, Gene	Gainesville City Hall	Gainesville
Lyerly, W. A., Jr.	American Agric. Chemical Company	Pierce
Mascaro, Charles G.	Hector Turf & Garden Supply	Miami
Nixon, Rufus	Route 1, Box 144	Crestview
Ousley, J. E., Sr.	Ousley Sod Company	Pompano Beach
Pearson, C. R.	Lakewood Country Club	St. Petersburg
Phillips, Leroy	Seminole Lake Golf Course	Largo
Reemelin, Ben	Zaun Equipment, Inc.	Jacksonville
Rettew, Chuck	1000 Solano Road	Naples
Schmeisser, Hans	6141 Jefferson Avenue	Hollywood
Schmeisser, Otto	Gulf Stream Golf Club	Delray Beach
Smith, Carl K.	9322 Military Trail	Lake Park
Sprogell, Frank T.	Paul E. Allen Company	Palm Harbor
Todd, Leamon W.	Sebring Golf Course	Sebring
Welch, Jack	O. M. Scott Company	Orlando
White, Ralph	Ousley Sod Company	Pompano Beach
Yuzzi, Joseph G.	Biltmore & Granada Golf Courses	West Hollywood
GEORGIA		
Barnhart, George E.	Cherokee Town & Country Club	Atlanta
Baumgardner, T. M.	Sea Island Company	Sea Island
Beck, Elmer W.	Ga. Coastal Plain Experiment Station	Tifton
Blasingame, W. E.	Getz Exterminating Company	Atlanta
Bullock, R. L.	1224 Hilltop Drive	Albany
Burgess, Sam	University of Georgia	Athens
Burton, Glenn W.	Ga. Coastal Plain Experiment Station	Tifton
Bynum, Gordon L.	Fort Benning Country Club	Columbus
Carter, R. L.	Ga. Coastal Plain Experiment Station	Tifton
Clements, Lee	Ga. Coastal Plain Experiment Station	Tifton
Cole, James B.	Ft. Benning Country Club	Columbus
Conway, James C.	Cushman Motor Sales	Atlanta
Cordell, Tom M.	Abraham Baldwin Agricultural College	Tifton
Crady, M. N.	Parker Plant Food Company	Atlanta
Culpepper, Sam H.	Georgia Institute of Technology	Atlanta
Cummings, Smith M.	Radium Country Club	Albany
Danner, Charlie	Capital City Country Club	Atlanta
Deal, Eldon	P. O. Box 178	Baxley

Name	Affiliation	City
GEORGIA (Cont.)		
Dembnicki, Edward	Green Hills Country Club	Athens
Douglas, L. E.	Augusta Golf Club	Augusta
Edwards, Neil	Highland Golf Club	Conyers
Elder, C. G.	Kiwanis Golf Club	Reynolds
Evans, Rufus	Dixie Turf Farms	Ty Ty
Evans, Thurlow, Jr.	Stovall and Company	Atlanta
Ferguson, John, Jr.	Briar Creek Country Club	Sylvania
Flanders, C. Dyson	Sea Island Company	Sea Island
Good, Joe M.	Ga. Coastal Plain Experiment Station	Tifton
Hart, Richard H.	Ga. Coastal Plain Experiment Station	Tifton
Haskins, Fred	Columbus Country Club	Columbus
Helm, Marshall S.	American Agric. Chemical Company	Tucker
House, Lee	Glen Arven Country Club	Thomasville
Iler, E. A.	Doublegate Country Club	Albany
Inglis, Hugh A.	Ga. Crop Improvement Association	Athens
Jensen, E. Ray	Southern Turf Nurseries	Tifton
Johnson, Dewey W.	Evans Implement Company	Atlanta
Kincaid, E. E.	Evans Implement Company	Tifton
King, Frank P.	Ga. Coastal Plain Experiment Station	Tifton
Kraft, Art	Forest Heights Country Club	Statesboro
Lambert, Jimmy	Evans Implement Company	Atlanta
Lambert, Paul W.	Stovall and Company	Atlanta
Lance, Clarence	Ga. Coastal Plain Experiment Station	Tifton
Land, Sam A.	Stovall and Company	Atlanta
McKendree, Marion	Sea Island Golf Club	St. Simons Island
Magee, George E.	Chokee Liquid Plant Foods, Inc.	DeSoto
Miller, James F.	Extension Service, Univ. of Georgia	Athens
Moncrief, James B.	USGA Green Section	Athens
Moore, Hugh	822 Residence Avenue	Albany
Neese, Jack	Columbus Country Club	Columbus
Newton, J. P.	Georgia Experiment Station	Experiment
Parke, Ted	Bainbridge Country Club	Bainbridge
Peets, Norman	Velsicol Chemical Corporation	Albany
Powell, Jerrel B.	Ga. Coastal Plain Experiment Station	Tifton
Prince, Larry	Stauffer Chemical Company	Tifton
Rhodes, R. L.	Augusta Golf Club	Augusta
Roquemore, W. A.	Patten Seed Company	Lakeland
Savage, Hurley	Augusta Country Club	Augusta
Shields, E. A.	Standard Club	Atlanta
Skinner, J. Albert	Ga. Coastal Plain Experiment Station	Tifton

Name	Affiliation	City
GEORGIA (Cont.)		
Sutton, Robert	Dupont Company	Atlanta
Thompson, J. T.	Georgia Experiment Station	Experiment
Wells, Homer D.	Ga. Coastal Plain Experiment Station	Tifton
Whatley, J. G.	John Deere Company	Albany
Wilson, Rex B.	Ga. Crop Improvement Association	Athens
Wright, Harry,	Peachtree Golf Club	Atlanta
Zink, Harold L.	Armed Forces Golf Club	Augusta
INDIANA		
Riddell, Homer	Elanco Division - Eli Lilly Company	Indianapolis
MARYLAND		
Deal, Elwyn E.	University of Maryland	College Park
NORTH CAROLINA		
James, Bryson L.	Hercules Powder Company	Raleigh
Lewis, W. M.	North Carolina State College	Raleigh
Lineberger, Abel R.	Gastonia Country Club	Gastonia
Maples, Palmer, Jr.	Charlotte Country Club	Charlotte
Sutton, W. C.	222 Hillcrest Drive	Goldsboro
PENNSYLVANIA		
Croom, Harold L.	Royer Foundry and Machine Company	Kingston
Mascaro, Tom	West Point Products Corporation	West Point
SOUTH CAROLINA		
Miller, Landon C.	141 Cherry Road	Clemson
Ready, E. L.	American Agric. Chemical Company	Johnston
Ripley, C. R.	Anderson Country Club	Anderson
Shirley, Jim	Oconee Country Club	Seneca
Wirwille, J.	Velsicol Chemical Corporation	Columbia
TENNESSEE		
De Locke, Henry D.	The Nashville Housing Authority	Nashville
WISCONSIN		
Latham, James M., Jr.	Milwaukee Sewerage Commission	Milwaukee

EIGHTEENTH ANNUAL
SOUTHEASTERN TURFGRASS CONFERENCE

Tifton, Georgia
April 13-15, 1964

TOTAL REPRESENTATION FROM EACH STATE:

Alabama	17
Delaware	1
Florida	38
Georgia	65
Indiana	1
Maryland	1
North Carolina	5
Pennsylvania	2
South Carolina	5
Tennessee	1
Wisconsin	1
TOTAL	137