

1959

## Spring 1959

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# TURF *Clippings*

Annual Turfgrass Conference Proceedings



A PUBLICATION OF THE  
**Turf Management Club**



Spring 1959

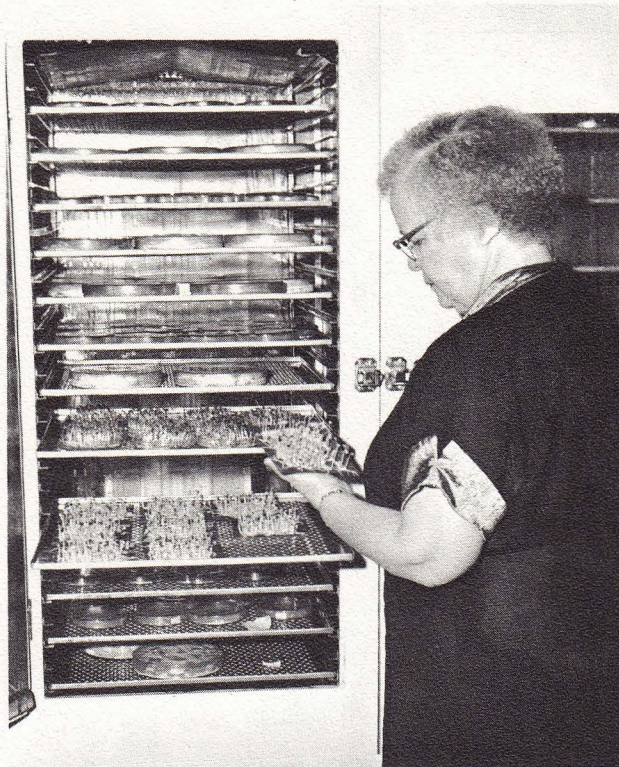


PHOTO BY POP BARRETT

### MISS JESSIE L. ANDERSON

The Stockbridge School Turf Management Club is proud to honor Miss Jessie L. Anderson of the Massachusetts State Seed Laboratory, University of Massachusetts, Amherst, Massachusetts.

Miss Anderson was taught seed analysis by Miss Louise M. Allen; who was known as the "Doctor Wiley" of seeds. Another of her teachers was Mr. F. H. Hillman; whom she later aided when he was making his famous plates of grass seed. She was in charge of the seed laboratory of the J. Bolgiano Seed Company of Baltimore, Maryland for a number of years; and later joined the staff of the International Seed Service of New York City, New York. In this later position her experience broadened and she learned a lot about imported seed from many parts of the world. In 1937 Miss Anderson came to the Massachusetts State Seed Laboratory to work with Mr. F. A. McLaughlin, then head of the laboratory. June 1958 the laboratory was placed in the Department of Entomology and Plant Pathology with Dr. John H. Lilly in charge.

It should be noted that Miss Anderson is an enthusiastic worker who is constantly making an effort to keep abreast of all research on seeds and to improve and expand the service of the laboratory for seedsmen and consumers of seed within the Commonwealth.

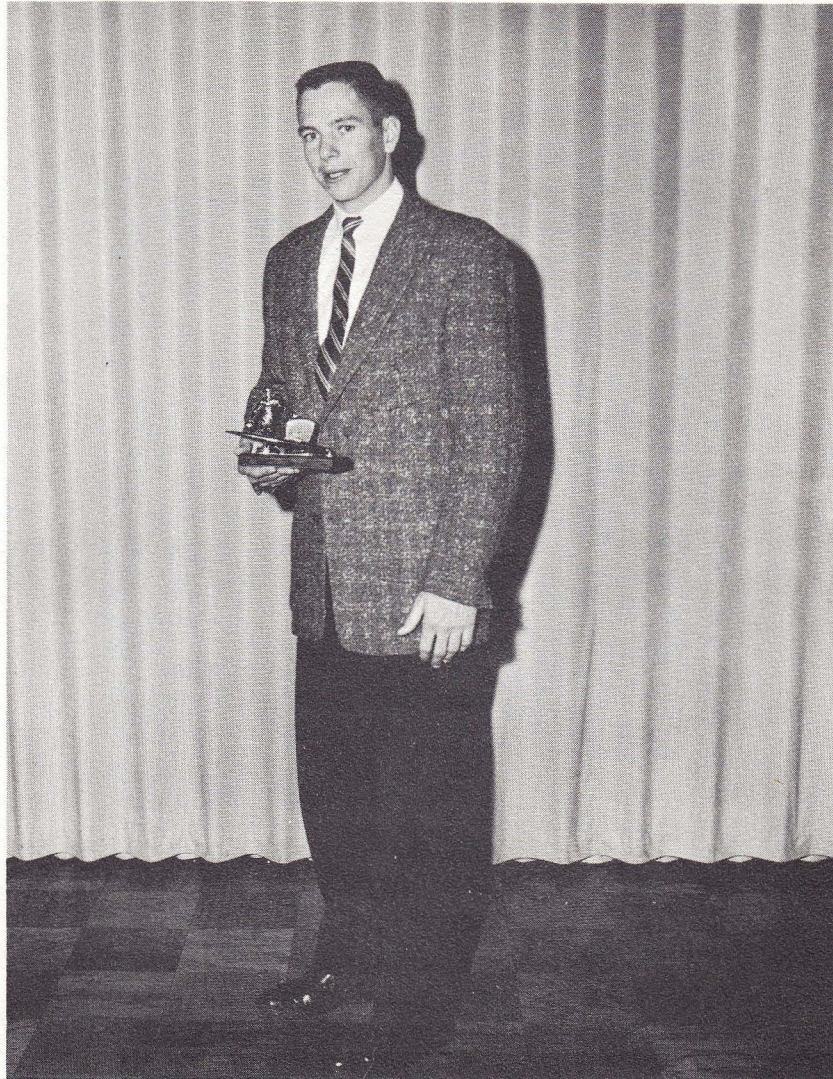


PHOTO BY POP BARRETT

### WALTER LEWIS BASKETBALL TROPHY WINNER

Walter Lewis, senior in this year's turf class was honored at Stockbridge School of Agriculture's Progress Banquet as the outstanding basketball player for the 1958-59 season.

Walt is a real hustler on the basketball court and also has the same good reputation at the Oyster Harbors Golf Club, Osterville, Massachusetts; where he works. He is very popular with his fellow classmates.

4 years ago such an award was made to Lawrence Garrier for his outstanding football playing; so this will make the second time in four years a turf man has won an Athletic Award, a great distinction for only two are given out a year.

# TURF CLIPPINGS

Published by

The Stockbridge Turf Management Club  
of the University of Massachusetts

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To form a bond of common interest between the Turf Management Club, the alumni of the Stockbridge and Winter School Turf Majors and all interested friends of the University of Massachusetts Turf program.

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Vol. I No. 4	Turf Management Club	Editor
	Agronomy Department	Douglas T. Hawes
	University of Mass.	Advisor
	Amherst, Massachusetts	Eliot C. Roberts

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## NEW TYPE GOLF COURSE

by

Phyllis Battelle

New York (UPI)

It is a known fact that it is becoming increasingly difficult to cheat at golf. This is not because one's competitors are more eagle-eyed than before, or because there is any less dishonesty in the soul of the average golfer.

It is purely a matter of time. Now that everybody and his grandchildren over seven have taken up the game, the public courses are so heavily trod that to pause--even long enough to nudge one's ball into a more opportune lie--is madness. It results not only in verbal abuse from the foursome in the rear, but like as not in the sting of a drive to the derriere.

A man named Luther Morris of Decatur, Ga., proposes to solve this problem, however. He has designed a new type of golf course which should greatly contribute to larceny on the links. The patent was granted in Washington recently.

Morris's invention, which he claims is designed to save acreage and money for the owner of the grounds is a golf course in which there are only three fairways. Each fairway has only one tee, but it serves three holes.

Thus, a player drives three balls from the tee of Fairway No. 1 toward three different greens--which are placed at varying distances from the tee. Cup No. 1 is closest; the No. 2 pin is located perhaps 100 yards farther, and to the right; No. 3 green is even farther down the line and to the right.

The inventor figures that after driving three balls, a player can move on-ward quickly to hole out each of them in succession. By the time he has sunk his ball in the closest hole, and has used one stroke on each of the other two balls in play, he is allegedly far enough along the course so that the next group could tee off safely.

Mr. Morris's contention is that this will cut the requirement for a nine-hole course from 60 acres to about 25; and that the average golfer can play a round with half the time, and one-third the effort.

These practical elements aside, the scoring opportunities on such a course are almost too enormous to contemplate. For erratic golfers, it is a dream course.

Since there is no rule requiring a "statement of intent" before making a drive, the player can conceivably spray his trio of blasts to all sides of the broad fairway--and still be in line for one green or another.

And when a foursome tees off, there will be 12 balls in play at one time. If, in the ensuing confusion and memory lapsing and bewilderment, a player cannot be profitably dishonest he just isn't trying.

## SEED TESTING - A Service for YOU

by

Miss Jessie L. Anderson

How many of you readers have ever visited a state seed laboratory and realized the kinds of work being done there to protect the consumers of seed - thereby protecting agriculture as a whole throughout our country?

Several thousands of samples of vegetables, agricultural seeds, lawn-grass mixtures, tree and flower seeds are sent voluntarily each year by seedsmen, farmers and growers to the seed laboratory for a purity analysis, germination test or noxious weed examination. Then, in the spring and fall state seed inspectors collect other thousands of samples for the official state inspection of seeds found in the open market. Each state in the United States has it's own individual seed law requiring certain information to be placed in a conspicuous place on every packet, box or bag of seed sold within the state. The Commonwealth of Massachusetts requires in part the following information to be placed on the label for all Agricultural Seeds and Lawngrass Mixtures:

1. The name and address of the person who labeled said seed, or who sells, offer or exposes said seed for sale within the Commonwealth.
2. The commonly accepted name of the kind and variety.
3. The lot number or other lot identification.
4. The origin, if known of alfalfa, red clover, white clover and field corn (except hybrid corn). If the origin is unknown, that fact must be stated.
5. The percentage by weight of all weed seeds.
6. The name and number of each kind of noxious weed seed per pound when present.
7. The percentage by weight of agricultural seeds other than those named on the label.
8. The percentage by weight of inert matter.
9. The percentage of germination, exclusive of hard seeds. The percentage of hard seeds, if present, and the calendar month and year the test was completed to determine such percentages. In Lawngrass Mixtures where more than one component is required to be named, the word "mixture" or the word "mixed" shall be shown conspicuously on the label. The commonly accepted name of the kind and variety of each agricultural seed component in excess of 5% of the whole must be shown on the label and the percentage by weight of each, in the order of it's predominance. The germination of each component, exclusive of hard seed must be stated. Also, the percentage of hard seed, if present and the calendar month and year the test was completed to determine such percentages.

The purity analysis of agricultural seed and grass seed mixtures is one of our most important services to the consumer of seed, for upon this analysis he will decide whether or not to buy or to plant the seed. He will understand just what he is getting for his money if the percentage of pure seed is low and the percentage of weed seeds is high, he should not buy or plant the seed. By so doing he will contaminate his



land with harmful weeds which will be costly to eradicate and will prove troublesome for many years to come. Fortunately, the quality of all seeds on the market today, has greatly improved over what it was a number of years ago. This is due to better methods and better machinery for cleaning weed seeds, "other crop seeds" and inert material out of field grown seed, more and better recommended varieties, more disease-resistant varieties, better techniques of seed germination (which reveal more accurately the true planting value of a lot of seed) and better seed-treating materials and better methods of application.

Seed submitted to the laboratory for a purity analysis is first examined with the aid of a hand lens or binocular to determine the amount of seed required by the Official Rules for Seed Testing for the purity analysis. The sample is then run through a mechanical mixer and divider several times in order to procure a small working sample, which is representative of the larger sample and on which the actual analysis is to be made. This working sample is then weighed in grams to the fourth decimal place and placed on our work board where with the aid of a hand lens and forceps it is separated into four parts.

1. The pure seed: all of the kind being tested.
2. The inert material: such as broken seeds one-half original size or less, sand, stems, etc.
3. Weed seed: seeds, bulblets, or tubers of plants recognized as weeds by laws, official regulations, or by general usage.
4. Other crop seeds, seeds of plants grown as crops (other than the kind or variety included in the pure seeds).

Each of the four component parts is weighed in grams to the fourth decimal place and the percentage of each by weight is ascertained. The weed seeds and other crop seeds are all numbered and identified as to the genera and species and included in the report. In mixtures of seed containing two to eight components, each component is separated from the others, weighted to the fourth decimal place and the percentage of each is obtained. Four hundred seeds from each component are counted out and germinated and the actual germination percentage of each recorded in the report. A noxious weed seed examination is made on a portion of the bulk, from 25 to 500 grams depending on the size of the seed and the approximate number of noxious weeds per pound figured. This information also is given on the report.

Here in the seed laboratory many kinds of seed are received for a germination test and it truly is a beautiful sight to see many thousands of young seedlings growing in different germinators at different temperatures, in daylight and darkness, on blotters, on filter paper, in petric dishes or plastic boxes, upright rolled towels or in sand. The germination test is made to determine the ability of seeds, when placed under favorable conditions to germinate and produce normal plants in the field. The seed is carefully mixed and four times one hundred seeds are counted out indiscriminately for the test. There are specific rules for the germination of each kind of seed, covering the substrata to be used, the temperatures at which seed must be kept during the germination period and the exact days upon which the preliminary and final counts

are to be made. These rules have been worked out by the Official Seed Analysis of North America and each state seed laboratory must follow them very closely for the sake of uniformity in seed testing throughout our country. All weak or malformed seedlings are discarded in the germination test and no seed is counted as germinated, unless the various parts of the seedling are perfectly normal and the seedling is considered capable of producing a strong plant in the field.

Then, there is the tetrazolium test. Tetrazolium is a colorless chemical which turns living tissues in a seed red due to a chemical reaction with the enzymes in live seed. When viable seeds of grains are placed in a water solution of tetrazolium the embryo will be stained a bright red, while the endosperm will show very little or no staining. Seed that is ageing is revealed by mottled tissue of white and red or by a dull, dirty, brownish red color which lacks the brilliance of a viable seed. Dead seed will not stain red. Seeds which require 10 to 28 days or longer for a complete germination test, according to the Official Rules for Seed Testing can be tested by the tetrazolium method and fairly reliable results obtained within a few hours. This test is not intended to supplant the official test for the viability of a lot of seed within a few hours or a day or two depending on the kind of seed. This quick test should be of value to buyers and sellers of seeds desiring a reasonably accurate estimation of the germination percentage of a lot of seed within a short period of time.

Another quick test, used especially with tree and shrub seeds where several months or even years are required for a complete germination test, is by embryo excision. These seeds are soaked in water for a day or longer until they soften up, then the embryo is removed. These embryos are placed on filter paper in a petric dish and kept at room temperature in indirect light until they turn green and show definite signs of being alive. This test does not reveal an accurate germination percentage because it does not take into account the abnormal seedlings, but it does give a fairly accurate estimation of the number of viable seeds in the test and this estimate is obtained within a week or two instead of several months or even years.

Any seedsman or consumer of seed is always welcomed to visit our laboratory and we are happy to be of service whenever possible. We have a very well equipped laboratory located on the campus of the University of Massachusetts, Amherst, Massachusetts.

Why not visit us or your own state seed laboratory and give us the opportunity of showing you some interesting things about seeds and what we are doing to further agriculture within the Commonwealth.

## INCREASED INTEREST IN TWO-YEAR TURF COURSE

by

Fred P. Jeffery

Director of Stockbridge School of Agriculture

During the past few years we have been observing an increased interest in our two-year course in Turf Maintenance. It is highly probable that this interest will continue in the future.

At the University of Massachusetts we are fortunate in having a well established Stockbridge School of Agriculture -- other Land-Grant universities are now beginning to see the advantages of this type of program. National interest in two-year colleges or schools is not restricted to Agriculture. For example, Dr. James B. Conant, former president of Harvard University, has proposed that we stop establishing additional four-year schools. Such schools could be, not only terminal in nature, but at the same time allow graduates who are academically talented to go and earn a bachelor science degree.

For the most part our Stockbridge graduates in Turf Maintenance have felt that a two-year program is sufficient. As a result most of them take jobs in their chosen profession following graduation. We think this is sound and expect it to continue in the future.

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FROM THE EDITOR

by

Douglas T. Hawes

The cover which shows changing styles in women's golf-wear reminds us that as styles in clothes change so do the methods of golf course maintenance. We feel, I speak for the Turf Club, that it is the job of this publication to keep the superintendent up to date on these improving technics of grass management.

Without the financial assistance from the Turf Conference the increased size of Turf Clippings would not have been possible. To show our appreciation we have tried to fill it with as much interesting and educational material as possible. However, there were two important items that had to be left out of this years issue because they failed to be ready for publication time. These are a Compatibility Chart, and second a list of books, publications, and magazines that would be of interest to everyone in the turf field. We will try to have these ready for next years publication.

I wish to thank all those individuals whose contributions of articles, time, and ideas made this printing possible. A great deal of the credit should go to Doctor Eliot Roberts who has given generously of all the forementioned. Turf Clippings is also indebted to Mrs. Van Predakis whose art work has provided attractive covers for this as well as the 1958 issue.

MESSAGE FROM WINTER SCHOOL PRESIDENT of 1959

by

Steve Garabedian  
Louis Quisset G.C.  
Providence, R.I.

In 1928 a man conceived an idea, a school with the philosophy not to teach greenskeeping, as they were called in those days, but a school for greenskeepers. The exchange of ideas and cultural practices in turf management was the birth of the Winter School at the University of Massachusetts.

In the 25 years of service, this school was attended by such men of recognition as Bob Williams, Beverly Country Club, Chicago; Kay Ovian, Woodmere Country Club, Long Island, New York; Arthur Anderson, Brae Burn Country Club, Boston and Fred Bove, Brentwood Country Club, Los Angeles. These are just a few of the many who attended this school.

Professor Dickinson, nearing his retirement, sought a man with outstanding qualifications to be his successor and to carry on the program of the Winter School. They found such a man in Dr. Roberts, however, due to illness they had to sacrifice the waiting of two years.

With the philosophy of Professor Dickinson and the ability of Dr. Roberts and his associates, they have given us the basic understanding of turf culture.

This reminds me of a lecture, of absorption and adsorption (ad) of nutrients in grasses.

In a lecture of absorption and adsorption (ad) of nutrients in grass plants we can set up the same analogy applying to education and knowledge. In order to absorb, that is the taking in, we must first adsorb, that is the adhering to the surface. We say when something is adsorped, it's on the porch and a problem occurs, we need only to open the door to solve this problem.

And this is why we attend school such as this, conferences, and regional meetings. Many times there is repetition and this is how it remains on the porch.

In closing I would like to thank those Professors and classmates of mine for the knowledge and their experiences which I have adsorped.

TURF CLUB NEWS  
by  
Milton S. Brown, Jr.

The Turf Club enrolled its largest membership with a total of thirteen seniors and twenty four freshman for the 1958-1959 season. Many of the students are enrolling with more practical experience in turf grass problems than in the past years.

1958 - 1959 Officers

President -----Allyn Smith  
Vice President -----Sam Delmolino  
Secretary -----Milton S. Brown, Jr.  
Treasurer -----Karnig Ovia

Douglas Hawes was elected to edit the "Turf Clippings" for the 1959 Spring issue. Meetings during the 1958 season were to prepare all data necessary to produce this helpful publication.

Robert Ansaldo our special committee chairman selected a fine group of educational speakers for meetings with the winter school group.

GUEST SPEAKERS

October 8, 1958 --- Henry Homan  
Superintendent Lake Sunappe Country Club  
Subject: Turf Nurseries and Management

Ron Kirby  
Superintendent Petersham Country Club  
Subject: New Ideas and Improvements

January 14, 1959 -- Charles Mruk  
Nitroform Chemical Company  
Subject: Nitrogen Fertilizers and Comparisons in Cost

January 28, 1959 -- Professor L. S. Dickinson  
University of Massachusetts  
Subject: The Old and New Methods of Maintenance

February 4, 1959 -- Stan Boraski  
Superintendent Pittsfield Country Club  
Subject: Highlights at National Conference

February 11, 1959 - Major Lamphere  
Westover Air Force Base  
Subject: Use of Visual Aids and Sound Management

February 18, 1959 - John Riordon, John Schuhmann, Albert Pitt  
American Mutual Insurance Company  
Subject: Insurance on Golf Courses

February 25, 1959 - Robert Moore  
Aquatrois Corporation of America  
Subject: Wetting Agents and Their Uses

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Dr. Eliot C. Roberts was selected to be the advisor of the Turf Club for the fourth consecutive year.

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#### EXPERIMENTS UNDER PLAYING CONDITIONS

A new idea in experimental work was brought to life by Dr. Roberts, who acquired the Ashfield Community Golf Course to be used for experimental studies under actual playing conditions on turf. Many labor hours have already been put into use to accomplish the rebuilding and enlarging of the fifth and sixth greens. Other work by students include the building of a 10,000 sq. ft. nursery, enlarging tees and repairing all machinery.

All members of the Turf Club have had a hand in laying sod and construction at Ashfield. A different strain of bent grass will be used on each green and most of the fringes and approaches will be sodded to Merion Blue Grass.

Research work will go into full swing with the coming of Spring and the golfers at Ashfield should see many interesting experiments in process while they are playing golf, if they stay in the fairways.

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From all appearances the Turf Club is getting stronger each year with the enlargement of each new class. The top ranking student of Stockbridge School of Agriculture for the year 1959 is a Turf Club member - Douglas Hawes - this makes the third consecutive year a Turf Club member has received this award, with Bruce Silven for 1958, and Henry Homan for the year 1957. LOOK UP TO THE TURF MEN.

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The two year students and eight week Winter School students meet weekly to discuss problems on fine turf and many surprisingly helpful suggestions were obtained from both groups.

The future of turf will progress with the new men in the field of action today.

The Number One Graduate et al.

by

James E. Mills '59

For the third straight year the Turf Majors have come up with the "Number One Graduate" of the Stockbridge School of Agriculture. In 1957 Henry Homan Jr. was top man; in 1958 Bruce C. Silven of Cranston, Rhode Island, won the honor. Upon graduation Bruce took over the Superintendship of the Warwick Country Club in Warwick Neck, Rhode Island. The Turf Management Club wishes Bruce good luck in the future, and we are honored that he was a Turf Major.

In 1959 the honor is claimed by Douglas Hawes, who had a 3.9 average after three semesters; Peter D. Sullivan another Turf Major was close behind with a 3.7 average.

The freshmen class has a contender for the lead position; he is Sam Delmolino with a 3.9 grade after the first semester. Three other Turf freshmen are right behind him.

Keep your eyes open Greens Chairmen, there's an awful good crop of Superintendents coming your way.

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INSECT CONTROL at W.W.C.C.

by

Doodling Doug.

GREENS: Will be sprayed in May with chlordane for the control of fly larva, which becomes abundant at this time of year because of the high manure content in the topsoil. We will use a 6 $\frac{1}{2}$ % emulsion so as to give us 6 $\frac{1}{2}$  lb. of actual per acre when spread at the rate of 100 lb. per acre. 250 lb. needed for 100,000 sq. ft.

Will be sprayed with sugar in the months of June, July, and August. These applications will be for the control of sand fleas migrating from the sand traps.

TEES: Will be limed so as to encourage earthworm activity. This activity will allow the golfer to go out for nine without carrying a hammer to drive-in his tee with. Guaranteed a naturally made hole to place your tee in, no more pounding necessary.

FAIRWAYS: Will not be treated for insect control; for in previous years all insects have been killed by wildly swinging, idiot taking golfers. Imagine what an insect must go through; never knowing whether he will be squashed by a golf ball, cut in half by a 5-iron, or burned to death by the vile language of a mad-golfer.

## LIQUID FERTILIZATION

by

Anthony B. Longo

Golf Course Supt., Woodbridge Country Club, Woodbridge, Conn.

Liquid fertilization like every other method of fertilizing has its advantages and disadvantages, pros and cons and proponents and opponents. The term "liquid fertilization" is commonly used in reference to fertilizers applied in liquid form to differentiate from fertilizers applied in dry form. We shall soon see that this is not a complete definition of the term. Water is the common diluent or carrier of liquid fertilizers. Applications of insoluble fertilizers with water should not be classified as liquid feeding because, although the fertilizer is applied with water it is actually only in water suspension and the plant nutrients are not in solution. On the other hand, dry applications of water soluble fertilizers could actually be classified as liquid feeding. Liquid fertilizers are used for leaf feeding, root feeding or a combination of leaf and root feeding. The latter is the common method used on turf.

How does liquid feeding compare with dry feeding? Is there a sharp distinction between the two? Let us first consider one basic fact. Plants can assimilate plant foods only in a liquid form. We might say that all plants live on a liquid diet. The plant foods in water insoluble fertilizers are converted into a soluble form through chemical and biological action in the soil, which is commonly called the "breakdown process". From 30% to almost 100% of the plant foods contained in dry mixed fertilizers, such as the commercial 10-5-5-, 8-6-4, 5-10-5, etc., are in water soluble form. The soluble portions of these fertilizers go in solution with water in the soil and the plant foods become available to the plant. When we apply a liquid fertilizer we put the plant food in solution before applying it. Whether the plant foods are put in solution before or after applying the fertilizer, it is reasonable to assume that the plant does not know the difference. So when a dry mixed commercial fertilizer is applied to turf and watered-in, that turf is actually liquid fed with the water soluble nutrients contained in the fertilizer.

There are differences in materials used in formulating dry and liquid fertilizers. These differences may produce some different cultural effects. However, the major difference between liquid and dry feeding of soluble fertilizers lies in the METHOD OF APPLICATION.

There is a distinct difference between liquid or water soluble fertilizers and insoluble fertilizers. The major difference between these two types lies in the TIME AND RATE OF AVAILABILITY OF THE PLANT FOODS.

In the past decade the use of fertilizer solutions or "liquid fertilizers" on farms and golf courses has been steadily on the increase. The same is true in other related fields such as greenhouses and in shade tree maintenance. Liquid fertilization offers many economic and cultural advantages on golf courses that are equipped with adequate water supplies and large volume power sprayers. A popular use of liquid fertilizers on golf courses



is in the fertilization of putting greens during the summer. With liquid feeding the growth of putting green turf can be controlled with greater accuracy and simplicity during periods of critical weather conditions. Fertilizer can be applied with power sprayers and combined with almost all fungicides, insecticides and herbicides. This is easier, quicker, and much less hazardous than dry applications of chemical fertilizers.

Turf fertilized with the slowly available and long lasting insoluble fertilizers sometimes does not respond with the desired growth or color. In such cases, liquid fertilization is an excellent supplement to use during any part of the growing season, to help produce desired growth. Some golf course superintendents have had the experience of witnessing some wonderful growth results in Spring with a light application of liquid or water soluble fertilizer on turf that had received an adequate application of insoluble fertilizer but not showing good growth. In some cases a light application of liquid fertilizer ( $\frac{1}{4}$  to  $\frac{1}{2}$  lb. N per 1,000 sq. ft) seems to act like a fuse to set off the charge of insoluble fertilizer. The quickly available liquid plant foods probably stimulate bacterial activity to expedite breakdown of the insoluble fertilizer. This peculiar phenomena may have been the reason for some of the claims that have been made of fantastic growth results obtained with liquid fertilizers.

Fertilizers for liquid application are available in either liquid or dry form. In some parts of the country liquid fertilizers are widely used on farms. Turf managers in these areas can purchase liquid fertilizers at prices comparable to or lower than the equivalent dry mixtures. Liquid fertilizers are low priced where they can be handled in bulk. Packaging in small containers and transportation adds greatly to their cost.

Concentrated water soluble fertilizers are available in almost every part of the country. For application with power sprayers the refined grades should be used. These fertilizers are made for use in irrigation equipment and sprayers. Solutions will pass through spray nozzles and are not injurious to spray machinery.

The crude grades of water soluble fertilizers and also the commercial mixtures of soluble and insoluble fertilizers can be applied with water hose or "barrel" proportioners.

Liquid fertilizers are sometimes sold by the gallon, however, WEIGHT is the only OFFICIAL measure of fertilizer. To calculate costs and rates of application, the liquid measure must be converted to weight. The weight of the contents of a container of liquid fertilizer is usually stated on the label as required by law. One gallon of a 20 unit liquid fertilizer such as a 10-5-5, weights approximately 10 lbs. Here is something worth remembering -- the fertilizer manufacturer purchases fertilizer materials to make up his mixtures, only by WEIGHT of the ACTUAL PLANT FOODS, whether the fertilizer material is a gas liquid or a solid. It would be wise for the grower or consumer to use the same method.

The selection and use of numerous kinds of fertilizers and the many different methods of applying them can be grouped together and divided into two different methods of turf fertilization. Liquid fertilization -- the

use of liquid or water soluble fertilizers; and dry fertilization -- the use of insoluble fertilizers. These two methods are not competitive, but complimentary. A combination of both methods is better than using one or the other exclusively. At what ratio or to what extent each method should be used is something that each turf manager must necessarily decide for himself. By trying various fertilizers he alone can best determine which combination will give him the best results under his own particular conditions.

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### Ideas For Green Reconstruction and Care

by

Doodling Doug.

RECONSTRUCTION: All greens reconstructed in the near future will have:

- (a) Layer of highly polished glass (for a true putting surface).
- (b) 2" layer of sponge (for holding shots).

However, --- there is still one problem; that of knowing which layer to put first.

CARE: Greens should be vacuum cleaned Saturday, Sunday, and mornings of all tournaments to remove dust and other LARGE impediments.

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### DISEASE CONTROL at W.W.C.C.

by

Doodling Doug.

GREENS: Will be sprayed weekly from the first of June to the middle of September with 1 gallon of green paint per 100 gallons of water. Along with this will be sprayed 2 lb. of "Nothing" for the control of everything.

TEES: Will not be sprayed; the reason, --- no grass.

FAIRWAYS: Will be sprayed with P.N.A.S. at the rate of 3 oz. per 1000 sq. ft. for the control of Fusarium, Typhula, Pythium, and Rhizoctonia; plus any other latin that comes along.

## PUBLIC SCHOOL GROUNDS

by

James Woodhouse

Grounds Foreman

West Hartford, Conn.

The West Hartford Public school system comprises nineteen schools, with an additional school expected to be opened in September. The total site area including buildings and grounds approximates 270 acres.

I became associated with the system in 1952. At that time grounds maintenance was limited to mowing and trimming with minor repairs to the grounds. Under the guidance of Mr. James Barlow, Superintendent of the Buildings and Grounds Office, a ground program was initiated that included a weed control program, fertilizing and aerifying of the grounds. Modern equipment was purchased to do the mowing in a faster more efficient manner. Additional equipment purchased included (1) eight-foot fertilizer and seed spreader, (2) 100 gal. tank weed sprayer with a 21 ft. boom for weed control, (3) 200 gal. tank high pressure sprayer for root feeding and foliage feeding of trees and shrubs. This tank is also used for dormant and all-purpose sprays on trees and shrubs, (4) spike tooth harrow for renovation work, (5) a 3-gang roller and (6) a 6 ft. fairway aerifier. Recently a shop was set up to sharpen and repair this equipment.

Care of the grounds is shared by two groups, (1) the grounds staff working out of the buildings and the grounds office are responsible for the mowing, spraying, liming, fertilizing, aerifying, renovation and checking of grounds. Also the pruning, feeding and spraying of trees and shrubs. (2) The custodian staff at each school is responsible for trimming of lawns, removal of papers, and litter on the grounds. They also weed, and mulch the shrub beds, trim hedges, topdress and reseed bare spots in the lawn. Layout of lines in preparing athletic fields for game play is also their responsibility. Leaf removal and snow removal constitutes the outside jobs during the fall and winter months.

In addition to the regular mowing and trimming, our program consists of 2, 4-D spraying in the spring and spot treatments in the fall. By starting the spraying in the spring we find we are able to retard chickweed and knotweed. This program has eliminated a high percentage of the broadleaf weeds and has improved the overall appearance of the lawns.

The three gang tractor drawn rollers are used in the spring to press back turf upheaved by the frost. It also is employed in renovated lawn and playground areas. The six foot aerifier is used to good advantage in the spring and fall in conjunction with fertilizing the grounds. This machine helps to make the soil porous, turf springy, and allows the air, moisture, lime, and fertilizers to get to the grass root systems. In renovated lawns it prepares a good seedbed without

destroying the existing turf. We also topdress the grounds using a wire drag in back of the aerifier. The drag breaks up and scatters the cores of top soil.

Our big problem at the older schools is insufficient playground area. During the day the playgrounds are compacted by the feet of the students playing on them. In the after school hours the grounds are used by the town citizens and the recreational department of the town. During the soccer, football, and baseball seasons the grounds are dug up and mutilated by shoe cleats in long practice sessions. These areas never seem to get a chance to rest and recuperate. We manage to get a quick cover on these areas by aerifying and overseeding with domestic rye and fescue in the early spring.

This problem is not as serious at the newer schools because more thought went into the site planning. Adequate playground areas give the turf a fighting chance.

Soil tests are taken and analyzed to determine lime and fertilizer requirements. Our soils are low in phosphorous, making it necessary to buy a fertilizer with a high phosphorous ratio and a low potash ratio. Abundance of potash in the soil encourages the growth of clover, which is undesirable for playing fields.

Actually turf areas that receive the wear and tear of playgrounds should receive at least 3 lb. of nitrogen per 1000 sq. ft. a year, but our budget places limitations on what we can do. The most economical way of getting more nitrogen into the soil is using straight urea. We expect to make good use of urea this coming season. Soil tests indicate the need of calcitic limestone to improve the pH of the soils and to free the phosphorous fixed in the soil.

Kentucky bluegrass and chewings fescue dominate the turf in most areas. We find that a mowing height of 1½ in. in the spring, 2 in. during the summer and back to 1½ in. in the fall give us a good cultural mowing program.

In lawns areas which are completely renovated a seed mixture of 25% merion bluegrass with 75% chewings fescue are used. This combination produces a beautiful turf and at times looks better than the 100% merion test plots we have.

This past summer all lower branches interfering with mowing operations were removed from the trees. Trees up to 6" in diameter are fed by liquid fertilizer injected into the root system under pressure with a feeding rod. The hydraulic pump used has a pressure up to 400 P.S.I. and is also used for dormant and all purpose sprays on trees and shrubs. Spraying and care of large trees are contracted outside on bids.

West Hartford is a community that takes pride in its fine homes and grounds. We want the residents of the town to continue to take pride in its schools and grounds and we will continue to work towards that end.

COMMENTS on the 1959 WINTER SCHOOL

by

Dennis Snyder  
Saucon Valley C.C.  
Bethelam, Pa.

Cary Bryant  
Minnechaug Public G.C.  
Glastonbury, Conn.

January 12, 1959 was quite an occasion for the University of Massachusetts as that was the date that twenty-four greens superintendents arrived to take the eight week course for turf managers.

This year's crew represented nine different states to include eight from Massachusetts, two from Rhode Island, two from Connecticut, two from Illinois, four from New York, two from Pennsylvania, one from New Jersey and one from Wisconsin.

The course in the opinion of the co-authors was a great success and much was to be taken back to their respective courses. In the course of study, classes, discussion and all-out-arguments a few outstanding quotes by the instructors were noted.

Dr. Roberts "You have to get it on the porch before it can go into the house."

Prof. Pira "Since we are a little behind, we won't go into this in too much detail."

Albert Allen "At Kernwood I don't verti-cut half as much as I'd like to."

Prof. Troll "My wife did not give me this haircut."

Van Berdakis "Be patient, your mother waited nine months."

Prof. King "For pete's sake, don't trust these nurserymen, if in doubt call **your** county agent!"

Prof. Hanson "We may have a quiz next time."

Prof. Colby "This experiment should work, let's try it and find out."

Prof. Blundell "I'm sorry about forgetting you men on Tuesday last, I did remember you on Sunday however."

Now that we have made our instructors blush a little, I think that we should bring to light a few famous remarks by our over-studious classmates.

Art Vantangoli "Well I raise blueberries, and my pH is about 4.0."

Wes. White (scratching forehead) "Well I am partial to 100% fescue fairways."

Dennis Snyder "We only have one problem at Saucon Valley and that's spending all the money they give us."

Tom Rewinski "How the hell can I drain it off, I'm at sea level now."

Louis Colardo "I just throw some in a coffee can and put it in the spray rig."

Bob Thompson "You guys talk about putting one man weeding flower beds, all I have is one man."

Bill Hargrave "That Toro went right up that hill."

Harold Frederickson "All I need is a good cigar."

James Woodhouse "That's all right for you golf course characters, but I have football games on my fields."

Gene Tomacelli "What did he say?"  
Alex Manocchio "Be quiet and listen!"  
John Spodnik "Well the Merion versus the Kentucky was no comparison."  
John Ferreiro & Pat Gianfante Were both very impressed with the efficiency of the Amherst Police Department.  
Oren Mountain "Tell that Major to go to Omaha."  
Ed Heilman "I'll meet you down to Mike's after classes."  
Harry Lorence "I'd like to write a summary of the conference."  
James Messier "Boy, that reel grinder sure is tricky."  
Boleslaw Kielar "Sometimes I think I should go back to snow removal section."  
Tony Oteri "How much you guys say you were making in Pennsylvania?"  
Walter Stepanik "I often wondered how the soil got so red in Northern Wisconsin."  
Cornelius Wiseman "I can hardly wait to get back on that good old aerifier again."  
Gary Bryant "I don't give a dam what you say, you can't beat transite pipe."

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WEED CONTROL at W.W.C.C.  
 by  
 Doodling Doug.

GREENS: Will be sprayed with sodium arsenite at the rate of 1 lb. actual per 1000 sq. ft. for the control of chickweed. Needed 100 gallons and another job!

TEES: These are quite bare of everything, being only 100 sq. ft. in area.

FAIRWAYS: These have had everything previously killed with all-purpose P.N.A.S.

## BUSINESS MANAGEMENT AND CULTURAL PRACTICES

by

David Canavan  
Wahconah Country Club  
Dalton, Mass.

In a man's ability to correlate these two oft-time foes into a peaceful and workable co-existence will in the end be determined his ultimate position in life.

In the curve between these two is the economic point of maximum efficiency. It is this point that is the goal of all successful businessmen, and to be a golf course superintendent, one must be essentially a business man! This point of maximum efficiency is, in reality, impossible to reach in golf course work, but one must always strive to get as near to it as is possible. From the business management end, this point we speak of is to spend no more than is necessary to produce conditions which will bring in the maximum financial benefit without fighting the law of diminishing returns. While, from the cultural end, it is to make the conditions perfect for the grass plants and give the course the ultimate in golfing pleasure. It is this lofty peak that the successful men in this field will set his sights.

As a random pick, take the subject of disease control. It is the aim of the golf course superintendent to have no disease damage ever to mar his course. To do this is next to impossible; and to approach this goal one will spend a very large sum for the control of disease by a preventive method. It is here that the golf course superintendent proves his value to his club. With his knowledge and good judgement, he can in theory apply fungicide just when it is needed and save the club a large expense. It is here and on similar small points that the superintendent can save well over his salary, and still give the golfers the best possible conditions that his budget will allow.

It is possible to take all phases of golf course work and break them down. For each division there will be one or more sub-divisions which can in turn be broken down in an ever-expanding field of knowledge. For knowledge is like a giant factor sheet without ends. The more one knows, the greater his field of ignorance will grow.

All this shows that in reality there are no perfect golf courses and no perfect superintendents and no truly brilliant men. Only varying degrees of run-down and varying degrees of ignorance.

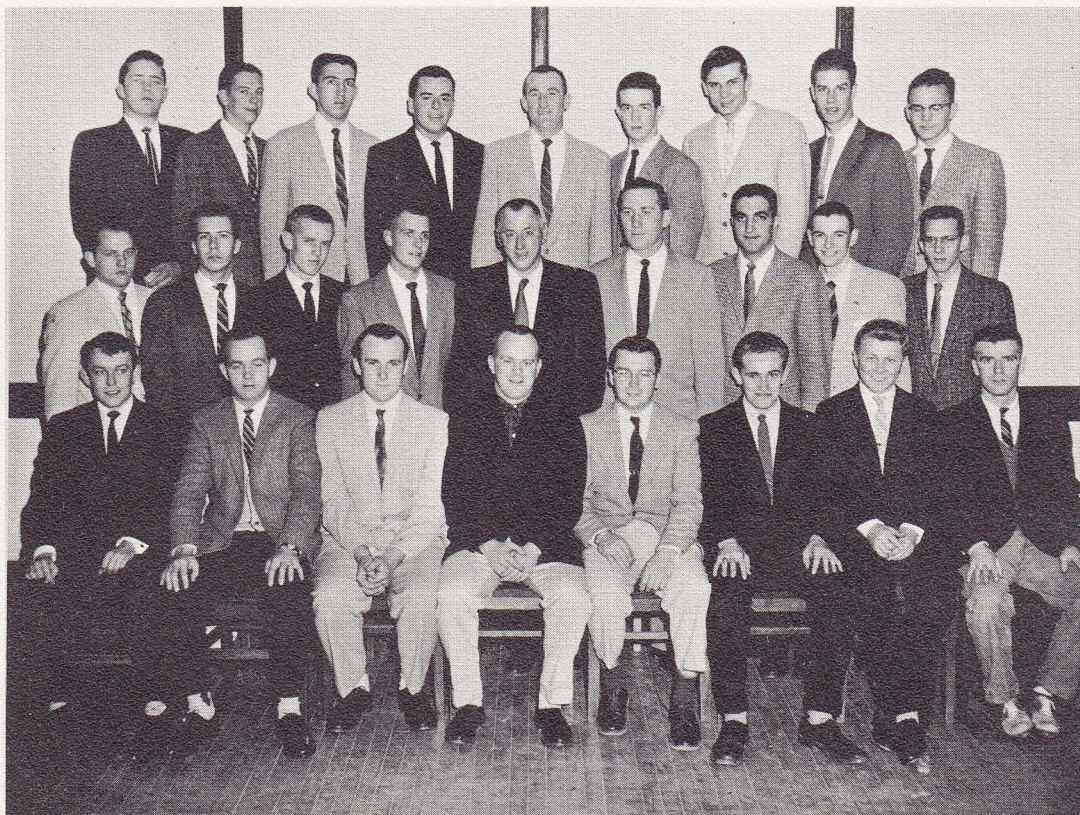


PHOTO BY POP BARRETT

### STOCKBRIDGE SCHOOL MAJORS IN TURF MANAGEMENT — 1959

Top row, left to right: D. Farrar, W. Lewis, J. Callahan, P. Pedrazzi, J. Mills, R. Holcomb, L. Schaefer, J. Lyon, W. Whitley.

Middle row: R. Ansaldo, D. Williams, D. Bergner, J. Zoppo, M. Brown, Secretary, S. Delmolino, Vice President, K. Ovian, Treasurer, D. Macora, J. O'Connell.

Front Row: R. Barrett, J. Smith, G. Cavanagh, A. Smith, President, D. Hawes, J. Diorio, D. Bevilacqua, L. Thompson.

Absent: P. Sullivan, V. Carbone, N. Fongalloz.





PHOTO BY POP BARRETT

#### OUTSTANDING PERSONS IN TURFGRASS FIELD HONORED

From left to right: O. J. Noer, Agronomist, Milwaukee Severage Commission; Miss Jessie L. Anderson, Seed Specialist, University of Massachusetts; Herb Graffis, Editor of *Golfdom*; Allyn Smith, President of the Turf Club.

Honorary Turf Management Club membership certificates were given out by Allyn Smith, President, to O. J. Noer for his aid given to superintendents throughout the whole United States. To Miss Anderson for her outstanding work in grass seed control, and to Herb Graffis for his publication, *Golfdom*, which is read by all in the golf field.

This is the second year such certificates have been awarded by the Turf Management Club.

Are the Chemicals you mix together in your spray-rig Compatible?

NEW YORK STATE COLLEGE OF AGRICULTURE  
AGRICULTURAL EXPERIMENT STATION  
CORNELL UNIVERSITY  
Ithaca, New York

Department of Agronomy

August 1, 1956

TO: County Agricultural Agents and Assistant Agents, Vo-Ag  
Teachers and Institute Agronomists

RE: Mixing of Herbicides with Insecticides, Pesticides or  
other Herbicides

We have received a number of telephone calls and letters concerning the above problem and the general answer has been NO. Some of you seem to feel that it would be a simple matter to get the answers as to which chemicals are or would be compatible so you would have it as a ready reference. We wish to list for you some of the problems involved in such an apparently simple problem.

1. The concentration of chemicals used may be a factor in whether they are compatible or not. Change one or both concentrations and you have a different problem.
2. The volume of water used may be a factor. In 30 gallons of water it works fine; in 10 gallons, something goes wrong.
3. Even though two particular chemicals may be compatible, it does not mean that the same two chemicals manufactured by different companies would be. This is due to the carriers or solvents used, wetting agents, emulsifiers, stabilizing agents, etc.
4. Even though two chemicals may be compatible as far as mixing is concerned, you may get inactivation of one or both chemicals by mixing.
5. It is known that when some chemicals are mixed you get increased activity of one or both compounds. This increase in activity may be different with different commercial products (based on point 3 above). The increased activity may be sufficient to cause severe injury on the crop.
6. The water used is certainly a factor to be considered. It has been suggested that possibly the County Agent or farmer could mix the particular chemicals he is using in a small amount the evening before he intends to spray. This may work, but suppose he uses tap or well water for the sample, but when added to the sprayer using different water he ends up with "gunk" which will not go through the sprayer. This has happened. Hard vs

soft water could cause real trouble. Also suppose he runs out of chemical and buys the same thing (chemical) but another brand. Are they compatible? Who knows?

7. Timing of the spray is another consideration. Many farmers will delay one job or the other by waiting for the insect, disease or weed to either show up or reach the proper treatment stage. Results: He loses susceptibility, specificity or increases damage on the crop.

The job of determining compatibility and resulting activity is a difficult and time-consuming one. We do not have the funds or the personnel to undertake it. We discussed it with industry personnel who attended a conference at Cornell last week. They are not particularly interested either. The points listed represent part of the discussion with that group.

In summary, our answer is still NO. You should not mix herbicides with insecticides or pesticides for use on crops.

Sincerely yours,

S.N. Fertig      George Gyrisco      R.D. Sweet      A.M.S. Pridham

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THE MOST OUTSTANDING TURF SENIOR FOR 1958

by

John H. Smith, Jr.

For the first time in the history of the Turf Management Club, an award was given to the senior who has done more for the Turf Management Club, than any other student. The winner of this award is chosen by his fellow classmates, and his immediate professors, basing their votes on his scholastic ability, activeness in club and class activities, and other accomplishments rating merit.

Bob Viera, who hails from New Bedford, Massachusetts, was the first recipient of this award. Bob has been a top honor student in the school, showing interest in all school and class activities. He has worked at the New Bedford Public Links for many years before attending the Turf Management course.

At present, Bob is Superintendent of the Watertown Golf Course, Watertown, Connecticut. This club is connected with the Taft School for boys, in that city. The members are very much satisfied with their new Superintendent, who has much to offer in experience and knowledge of fine turf management.

Our congratulations to Bob for a well earned reward.

## WHAT IT MEANS TO BE A TURF MANAGER

by  
Ross Russell (PGA) Pro Owner  
Leicester Country Club  
Leicester, Massachusetts

Scene: Eighteenth green at Middle Class Manor, a private 18-hole country club at Middletown, U.S.A.

Time: Approaching dusk

Purple shadows lengthen over the sward. A view from the clubhouse veranda is idyllic. Carefully manicured bentgrass green, surrounded by immaculate collars, well raked sandtraps setting off the green. A foursome attended by caddies approaches the green. The players close in around the cup until the drama comes to hang on the final shot of the day, a putt of let's say five feet. The putt at the last moment fails. There is anguished shouts, a scuffle of feet, and retreat to the clubhouse.

The match is replayed in the bar. The crucial putt was perfectly stroked as everyone could see.

It ran true. But at the last moment some blemish in the green, an unspecified pit, or variant in texture of turf, or perhaps mechanical scarring on the delicate grass blades, threw it off line.

Not too many years ago this dramatical failure would have been blamed on "rub of the green". But those days are gone along with the hand propelled greens mower, and before that, the faithful flocks of sheep who attended to mowing chores.

Today things are much different. Someone has to be responsible.

The one man clearing house for the multitude of complaints is the chairman of the greens committee, or, in the case of a privately owned golf course, the owner-operator. In the course of a season he becomes the target of an un-ending verbal barrage. Since he is rarely a turf man himself, he has one recourse. The blame is brought straight to the door of the golf course superintendent. Usually known as the greenskeeper, or head greenskeeper, this fellow is often no more than a shadowy figure around the golf course, a kind of demon who plots against the honest handicapper.

In any event he is now clearly to blame. As ridiculous as this situation may seem it has led to campaigns which have unseated more than one golf course superintendent.

Ridiculous, yes. But turf management has come a long way. At one time fungus was more or less allowed to run it's course. Greens sometimes "went out".

What has happened to change the picture? As measured by every statistic, golf play has increased enormously. From a rich man's sport, it has become the way of life of the middle class at private clubs, and the recreation of multitudes at public links.

Perhaps the newly privileged groups are trying to make like the idle old or idle rich in their free and frequently hypocritical grousing. Whatever the reason, the customer demands for turf conditions has undergone a radical change.

This change has created a demand for turf professionals who are able to satisfy this critical market. In the course of progress the green thumb has given way to scientific fine turf farming, the head greenskeeper to the golf course superintendent. And along with these changes have come more jobs, far higher wages and prestige.

Those then are the "rules of the game" according to present mid 20th century American useage.

No one goes (or should go) into turf work blind to the facts. Golf course maintenance is highly demanding. In turn it offers substantial rewards. In view of the requirements it would seem salaries require further upgrading. But they have come a long way. And they are certain to improve further.

There is however, an illusion common among those entering the first phases of turf work that may result in a percentage of personal failures. That is the normal human desire to take a short cut to the ultimate goal of full fledged, well paid Golf Course Superintendent.

Two major tools that can be acquired in turf school: (1) an all abiding respect for the little grass plant, as Prof. Dickinson has put it, and (2) a comprehensive grasp of the techniques of scientific farming that are applied to fine turf.

In themselves these are quite a bit. Both students and instructors have their work well cut out for them in shooting for this dual goal.

But this is just a start. And there remains a body of adjustment that cannot possibly be taught in the classroom. Men successfully completing the tough courses at our universities find themselves confronted with new learning demands once they start on the job.

The day when the "college learned feller" was at a psychological disadvantage among hostile workers is about gone. There is in turf work an almost universal respect for academic learning. Good cause, too. The green thumb boys have learned the hard way, that turf is unpredictable and that the test tube boys know some if not all of the answers, certainly more than they have been able to acquire through trial and error methods over the years.

But there remains two major drastic requirements that the new worker in

these green fields must face up to:

1. To learn how to work.
2. To acquire a mature sense of responsibility.

They smack of the still odious philosophies of those old-fashioned academies, the colleges of "hard knocks". For that reason they are easily dismissed. But they are quite real all the same. In fact, they are the two most important issues a turf man is going to face once he leaves college.

Unfortunately turf work, in the beginning, is apt to be just that -- work. Pushing a greens mower all day or even a half day is hard work. Yes, even a modern power mower. Raking traps, changing cups, mowing tees, and aprons and steep slopes, are all work, physical work. And yet, these chores make up a very high percentage of the total work on a golf course. Also, they are the jobs that are in the beginning apt to become most familiar. And well that they may, for they are fundamental and constant.

These grim facts have to be faced, along with the hypercritical golfer. They are all part of the same picture. They are there and they will remain there. No one should go into turf work that is not reconciled to the way things are in the field.

The employment outlook in this country has undergone radical change in the past ten or twenty years. The day of unreasonable demands on any workman are past. Employment opportunities are greater. Shoddy workmanship is more frequent and it is possible to "get by". But getting by doesn't mean progress towards the kind of position one eventually wants. Competition sees to that.

Out on the job turf work may begin with as regular assignment as commonplace and basic as greens mowing. Now, why a 22" greens mower should cost over \$400. new is a mystery to the writer. But it does. It's built to mow fine turf to the 16th part of an inch. It's rugged but doesn't take abuse. Since a greens mower is one of the basic all important tools of the trade a good man should understand it thoroughly. He should be able to take it apart in the dark practically, make every kind of an adjustment and repair that shop facilities permit.

There is a right way to mow a green. Such points as making the turns, avoidance of scalping, prevention of damage to grass by leaking fuel or lubricants, changing the directions of cut, avoidance of laying on the handles are among the points. They aren't difficult to learn. Though minor, they are all of lasting importance. Which means they should be learned once, and learned right. If the worker doesn't understand them his superior will be glad to show him.

The old saying "There's one way to do the job" holds true in turf work. A job well performed leaves it's trademark, one that the superintendent quickly recognizes.

That trademark is the surest way to recognition. And eventually, further

responsibility and up-grading. Upon small responsibilities is built the ladder of successful career in fine turf.

All this talk about the "right way" and responsibility smacks of the "same old story" of elders constantly telling their juniors "how to do it". But that's the way of the world.

Life is mainly a long journey of learning new things. Perhaps that is its greatest interest. One of the reasons for American superiority in many fields is the insatiable appetite for Americans for doing and learning.

There's always a right way to manage any job. Usually it's the easiest way in the long run.

The second major problem is one of responsibility. And this is the big \$64,000 one. Acceptance of responsibility is a personal business. It is big because this is the only measure of progress in a turf career.

This is something for the career man to paste in his cap and daily contemplate. It's what really counts.

Digging at core meanings of words is often enlightening. This one comes from common twin Latin sources: RE, meaning back or again, and SPONDERE, to promise or answer.

In its best sense, responsibility means "answering back to".

Responsibility implies that someone is ultimately "in charge". In a military organization responsibility works down from the top brass through various changes of command to petty officer level. A golf course operation is somewhat less involved, but it is complicated nevertheless. Someone must be responsible. The operator or the chairman of the greens committee must face up to the complaints of players. He in turn must work out problems with his superintendent.

A turf school graduate does not and is not expected to begin his employment on the same level as the pick-up laborer with more know-how much is expected of him and he is usually given a measure of responsibility right straight off. From then on it's up to him. And his progress in turf work all the way from a beginning job as a job trainee to a position of superintendent, a target of say a superintendent of a large 18-hole operation with a dozen men and tens of thousands of dollars worth of equipment, not to mention a golf course representing hundreds or a good deal more, can be measured pretty much in terms of responsibility.

With the position of golf course Superintendent may go such advantages as an annual salary in the upper five or lower four figures, plus a house, utilities, an ideal setting in which to raise a family, security, expense budget for attendance at turf conferences. But these are not handed out for nothing. These are given neither grudgingly nor carelessly, but realistically, because those in charge understand they are a minimum required by the man they need.

They know that this man will have complete control of a large budget, and the activities of a dozen or more workmen. Under his supervision will be tens of thousands of dollars worth of machinery, not to mention a golf course worth many times that figure. They know that this is a job of responsibility as much as know how. They are willing to pay for it; their measurement is largely in terms of responsibility.

In fact, it might be said that a turf man's progress can be from the time he leaves school to the attainment of his target as can be measured almost entirely in the terms of responsibility.

The graduates who grasp this essential at the out-set are headed somewhere. The rest are kidding themselves. They are going into the wrong kind of work.

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### 10 STEPS TO A BETTER LAWN

by

Peter Pedrazzi

1. The lawn should be fertilized in the proper season, or when the grass becomes thin and unthrifty.
2. Soil tests are the basis upon which the need for lime should be determined.
3. Frequent mowing with a sharp, properly adjusted mower will keep a lawn looking neat.
4. Water a lawn by soaking the ground thoroughly at infrequent intervals. Watering lightly every day just to cool off the turf will produce a poor root growth.
5. Roll the lawn in the spring to firm the soil. Don't use too heavy a roller or you will produce compaction.
6. Good management and fertilizer practices will prevent weeds and produce a good thick turf.
7. Insects can be controlled by using chlordane or dieldrin.
8. A disease-control measure may be necessary on specialized lawn. For best results, you should consult a turf disease authority on how to combat your specific disease problem.
9. Avoid planting too many large shade trees, for too much shade will damage the turf.
10. Lastly, a drainage system for lawns having a clay base should be considered.



A SCENE TO REMEMBER  
by  
O'Connell, Fongelloz, and Whitley

As one entered the gym this year to see the Hort Show his eyes first saw the beauty of the theme, a European Village Square with the mayor's house in the background.

Walking around the square there was seen on the right many ten-by-tens well done by individual Stockbridge and University students, an exhibit by Smith College which showed a garden scene having a path in it leading to a mirror giving the effect of a path going a distance to another garden. There was a flower shop run by Mr. Jester and his floriculture majors, an old fashion smoke shop by the Agronomy Department, a cafe which had a terrace with sidewalk tables, a talking tree, and a wild life exhibit that drew a constant crowd. There were also floral displays around the square which were very impressive.

The Show was a marvelous piece of showmanship and arrangement, with the turf men contributing with an excellent job of laying the 5,000 sq. ft. of turf used. Also a group of turf freshmen were able to win third prize with a 10 x 10 displaying sod samples.

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1958 COURSE CONSTRUCTION AGAIN SETS RECORDS  
by  
Don Farrar

The complete 1958 figures released by Joe Graffis, President of the National Golf Foundation, show that records were set for golf course development in 1958, for the fifth consecutive year.

An investment of \$27 million in land, construction and maintenance equipment is represented in the 182 courses and additions that opened for play last year. These new facilities will account for nearly 3,000,000 rounds of play in their first year of operation. Figures also show some 293 courses under construction and nearly a 1000 in the planning stage.

1958 National Golf Foundation records show that there are now over 5700 regulation golf courses now in play in the U.S. This represents a gain of nearly 650 new courses in the last five years. Over 6000 courses are expected to be in operation in 1960; creating a great demand for qualified superintendents.

## I SWITCHED FROM HOTS TO COOLS

by

J. Spodnik  
Cleveland, Ohio

Cigarette Anyone? What! You can't decide between those "that are menthol fresh", and those "that have a thinking man's filter". Well regardless of the one you choose, I am **sure** it will be the one that satisfies - leaving a pleasant taste in your mouth.

This probably sounds like another unsolicited testimonial - right from the "doctor's mouth"; but is nothing more than the usual eye catcher. Cigarettes and turfgrass, what gives?

Recently I decided to make the "Switch" from the automobile industry to the golf course maintenance field. Why? Best reason I know. I sincerely liked the challenge the word turfgrass offers, and the feeling of self-satisfaction it gives watching a seed come to life, and grow into a quality grass plant under the proper maintenance program. In other words, it leaves me with a pleasant after-taste.

Not to discount the activities of big industry, but I cannot imagine how anyone could be content working thirty to forty years under a roof, once they have been exposed to wide-open golf course operation. Fresh-air, sunshine, and acres of cool, green grass are synonymous with the term "Golf Course". However, so are brown-patch, dollar spot, and wilt. Need I say more? If I may modify an old adage, "one's bed is only as comfortable as he makes it; but, first one must be careful as to where he lies his head".

Without a doubt, the most influential factor in my decision to enter the turfgrass field is the deep respect and admiration I have acquired for men who have been in "Greens Keeping".

I would like to take this opportunity to express my appreciation to these men who are true golf course superintendents in every sense of the word. They are rightly proud of their profession, and have gained recognition for their work in the local and national superintendent's associations. These superintendents also participate in and encourage turf research programs through maintaining experimental plots of their own, and in cooperation with the state extension service. But most of all; they are neighbors that welcome all problems, whether they be turfgrass or otherwise; - an outstanding member of any community.

It is the influence of these men that are responsible for many of us making the switch from "hot to cools".

## WHY ATTEND TURFGRASS CONFERENCES

The remarkable development of golf in the United States within the past ten years has led to an insistant demand for more knowledge of growing grass. Frankly it must be admitted that our knowledge of fine turf-culture is yet far from adequate, but if what is known is utilized intelligently, much needless waste of effort and money may be avoided. Indeed, in many cases there is positive knowledge that certain methods are not desirable in attempting to grow turf, while it may be less clear which one of other methods is most trustworthy.

The purpose of turfgrass conferences are to assemble all persons interested in turf production and maintenance, to exchange ideas, to give instruction at a professional level, and to discuss new developments in turf work and related fields.

At these conferences we are told about things that have been definitely learned. For example the larger broadleaved turf weeds and insects are now readily controlled by 2, 4D and the insecticides chlordan, dieldrin and malathion. We are told that a man working with turf should always ask himself four important questions whether his problem is an insect, a weed or the renovation of a turf area.

1. What is the cause?
2. How do I eliminate it?
3. When should I eliminate it?
4. Do I have the right equipment in workable order to eliminate it?

We are told the latest information concerning the control of Poa annua, clover, goosegrass, crabgrass, and other hard to eliminate weeds. We are told the latest information about ureaform fertilizers. But on many of these problems there is yet a need for much critical experimentation through more concentrated and intensified turf research programs by our universities.

The layman also has much to learn. Growing fine turf is not a simple matter, there is more to it than planting seeds, watering them and then cutting the resulting grass. The occupation of a Golf Course Superintendent is a highly technical profession. The Superintendent is, to name only a few, a landscaper, a chemist, a plumber, a mechanic, a bookkeeper, a timekeeper, a purchasing agent and a personnel manager. It is no longer a job for the local farmer just to cut the grass, as he did years ago. However, this is the attitude, which is still possessed by most layman.

The main problem is that most work on a golf course is finished before there is, or while there is not, any play on the course. The greens, fairways and tees have all been cut, treated and fertilized, and the cups, markers and towels have all been changed in the morning in order that the workers are out of the golfers way. The average golfer comes on the course in the late morning or afternoon. He will see the workers

raking traps, cleaning up brush or doing odd jobs out of the way of play. He naturally wonders what is hard about this; any one can do this. Why should we pay them more?

The golfer seem to forget that without the golf course there would not be a clubhouse. Yet they will pay the club manager a five figure income and pay the Superintendent four or five thousand dollars a year. Where in the business world today could you find a person, who is in charge of an annual budget anywhere from \$20,000 to \$100,000, making only \$5,000?

Another problem which the Superintendent has is keeping good dependable workers. Each year a Superintendent has to train new help because he can not pay sufficiently to hold employees for any length of time. Again where in the business world today could you find a good man working for only \$1.50 an hour? Thus a Superintendent has to depend on high school and college boys, but here again is a problem. The Superintendent needs men in the early spring to clean up and condition the course for the coming season; but these boys are not available until later. The golfer must be told the management problem, cultural and business, involved in running a golf course.

Therefore not only should the Superintendent attend turfgrass conferences but he should encourage his chairman to attend also. The Superintendent will help to advance his own position by attending these conferences. He will gain more knowledge and learn new ideas concerning fine turf culture with which he will maintain better turfgrass. The chairman through attendance at these conferences will become more familiar with turfgrass problems; he will more fully understand the Superintendent's problems and will be more sympathetic with him.

However, if the Superintendents do not support and attend these conferences and increase their knowledge of turfgrass culture, and if the layman is not informed of the problems involved in growing fine turf; the Superintendents' position will never advance.

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#### BARRELS FOR HOSE STORAGE

by  
Ron Kirby  
Petersham Country Club  
Petersham, Mass.

How many times have you put a round coil of hose in a square box? Wouldn't it be an easier problem if the puzzle pieces went together? This is what I asked myself everytime I put a sprinkler and hose away.

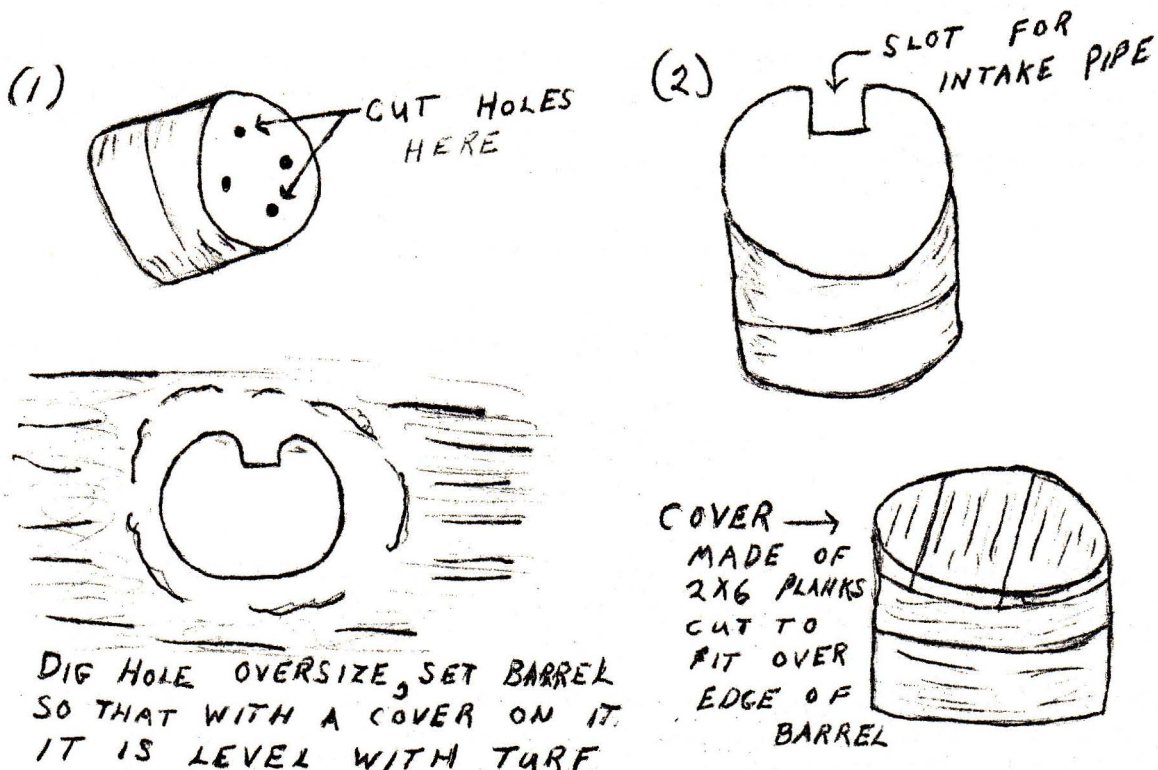
One day I visited Elinwood C.C. in Athol, Massachusetts; after a short period of time I asked about the round wood covers that were beside each green. The superintendent, Ted Andersen, explained that they

were hose boxes; for these he used 55 gallon drums cut in half and sunk them level with the turf. The idea impressed me very much and in a matter of weeks I had started my project to put barrels in beside each green and tee.

The advantages of this method are easier storage, neater appearance, less hose needed, and an increase in the efficiency of your water system. To elaborate on the advantages separately, the ease in storage is greatly noted as soon as you try to coil one length of hose. The neatness in appearance you achieve is an important factor. No longer will members complain about their ball being caught in the hose or the hose box. There is less hose needed because you can put the barrels on the edge of the approach. The previous factor itself explains the increase in the efficiency of your water system.

To install a barrel take the following steps:

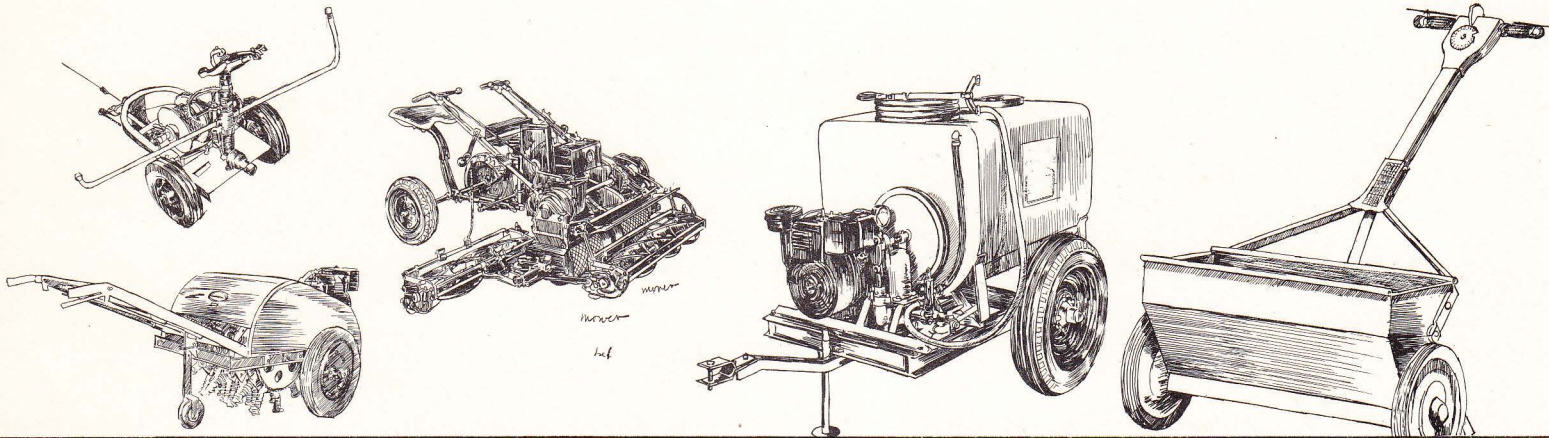
1. Cut holes in the bottoms of the barrels to allow for drainage.
2. Paint barrel with tar paint or any water proof paint.
3. Slot the side of the barrel to allow for the intake pipe and faucet.
4. Dig the hole oversized, then bring the barrel up almost level by using good sized rocks. This will aide in the drainage.
5. Fit so the pipe enters the barrel just enough for the valve to work properly.
6. The covers are best when made of 2 x 6 planks cut to the shape of the barrel with a little overhang.
7. In closing here are a few sketches that may help understand the steps in installing the barrels.





**STUDY**  
**TURFGRASS MANAGEMENT**  
**at the**  
**University of Massachusetts**

AMHERST, MASSACHUSETTS



Choose from three  
courses of study  
offered by the  
Department of Agronomy

An 8 week Short Course  
A 2 year Technical Course  
A 4 year Undergraduate Course

Each designed to  
prepare qualified men  
for careers in  
Large Acre Turfgrass Management



## WHY STUDY TURFGRASS MANAGEMENT

### Because of an Interest in Plant Science

If in high school you were interested in Biology, Chemistry, Mathematics and Physics and if you like working with ornamental plant material you should consider a career in Turfgrass Management. Those most successful in this field like: outdoor work, the challenge of creating and the responsibility of maintaining beautiful surroundings, the opportunity of working closely with nature and living plant material, and in some instances the close association with sports and sportsmen, particularly as applied to golf. Caddies and professional golfers, because of their close contact with fine turf frequently become interested in turfgrass management as a career. Many get into turfgrass work through summer employment on golf courses, parks, athletic fields, or perhaps cemeteries or industrial and municipal grounds.

### Because Opportunities are Good

There is an immediate need for skilled supervisors and assistants for parks, cemeteries and playgrounds. Municipal and private golf clubs are expecting their superintendents to be college trained in turf maintenance. Every city and large town and many industrial corporations offer splendid opportunities for men who are especially well trained in caring for lawns.

As the many proposed parks, play fields, public buildings and golf courses are being constructed and completed, the demand for specialists in turf maintenance will be increased and the number of replacements needed annually will be large. Those who have had a college training and sufficient practical experience will be sought after.

An eight week Winter Short Course in Turfgrass Management fits the needs of some. A two-year college course is best suited for others. Some will want to complete a college course for the Bachelor of Science degree or go on even further for the Master of Science and Doctor of Philosophy degrees. In all cases, opportunities for advancement are greatest for those who have had the most extensive training.

For further information on careers in Turfgrass Management write to: Eliot C. Roberts, Associate Professor of Agronomy, Room 202, Stockbridge Hall, University of Massachusetts, Amherst, Massachusetts.

## WINTER SCHOOL FOR TURF MANAGERS

The purpose of this eight week course is to furnish growers of fine turf with knowledge of all aspects of turfgrass culture. It is open to superintendents of golf courses, cemeteries, parks and playgrounds, industrial and municipal grounds and to their assistants. Landscape gardeners and maintenance personnel of airports and highway departments will also find this course of value.

Established in 1927 by Professor Lawrence S. Dickinson, this Winter School was the first of its kind and has made an outstanding contribution to practical Turfgrass Management. Many of the 500 graduates hold positions as superintendents of famous golf courses and fine turf areas all over the United States and Canada.

Enrollment is limited to 25 men annually. A high school education is usually required, except for mature and experienced men. A registration fee of \$80.00 and a Student Union fee of \$8.00 are charged. Room and board in Amherst are estimated at a cost of \$210.00 for the eight weeks. Four departments within the College of Agriculture of the University participate in the training program. Courses are offered by:

The Department of Agronomy -- in:

1. Turfgrass - Basic Factors
2. Turfgrass - Physiology and Maintenance
3. Turfgrass - Pest Control
4. Business Management of Turfgrass Areas
5. Soils and Fertilizers

The Department of Agricultural Engineering -- in:

1. Water Systems
2. Drainage
3. Equipment Shop

The Department of Entomology and Plant Pathology -- in:

1. Insects

The Department of Landscape Architecture -- in:

1. Trees and Shrubs

For a descriptive leaflet on this short course in Turf Management write to: Fred P. Jeffrey, Director of Short Courses, Room 212A, Stockbridge Hall, University of Massachusetts, Amherst, Massachusetts.



### STOCKBRIDGE MAJOR IN TURF MANAGEMENT

The two-year course in practical agriculture at the University of Massachusetts is known as the Stockbridge School of Agriculture. Among the twelve major courses of study offered is Turfgrass Management. This course is open particularly to young men who have had limited experience in turfgrass work. Older men with considerable on-the-job training have found this course of study valuable in providing a technical background for all maintenance operations. Laboratory and field exercises give experience in the handling of plant materials and of maintenance supplies and equipment. Besides courses in Agronomy on fine turfgrasses and on soils and fertilizers, supporting courses have been carefully chosen for their close alliance to the problems of turf maintenance and general estate work.

A six month placement training position which is a required part of the program takes into account the students' special interests, whether it be park, cemetery, golf course or private business. Courses are arranged and taught so that a student who has completed the work will be well qualified to accept a position as assistant or full superintendent of a large acre turfgrass establishment. It is recognized, of course, that the maturity of an individual, rather than age is the factor which when allied with technical competence determines ability to assume a superintendent's responsibility.

An estimate of expenses including tuition, room and board, books and supplies and student fees and taxes is between \$700.00 and \$800.00 per year for residents of Massachusetts. Nonresidents of Massachusetts are charged increased tuition amounting to about \$500.00 a year. Scholarships and student aid grants are available for individuals who can qualify.

Subject matter covered in course work is as follows:

#### First Year

<u>First Semester (16 weeks)</u>	<u>Second Semester (8 weeks)</u>
1. Soil Management	1. Repair of Equipment
2. Turfgrass Basic Factors	2. Fertilizers
3. Garden Materials	3. Turfgrass Construction and Maintenance
4. Tree Identification	4. Diseases of Trees and Shrubs
5. Public Speaking	5. Business English
6. Principles of Plant Growth Elective	6. Insects Elective
7. Football	7. Basketball

Six months on-the-job placement training (April-September).

Second Year

<u>First Semester (16 weeks)</u>	<u>Second Semester (16 weeks)</u>
1. Structures and Drainage	1. Irrigation & Soil Conservation
2. Business Management of Fine Turf	2. Practical Problems in Turfgrass Management
3. Shrubs	3. Shrubs
4. Business English	4. Herbaceous Plants
5. Plant Propagation	5. Landscape Construction Elective
6. Surveying & Mapping Elective	6. Basketball
7. Football	7. Baseball

For a copy of the Stockbridge Bulletin describing the school and the course in Turfgrass Management in more detail write to: Fred P. Jeffrey, Director of the Stockbridge School of Agriculture, Room 212A, Stockbridge Hall, University of Massachusetts, Amherst, Massachusetts.

**AGRONOMY MAJOR WITH AN OPTION IN TURFGRASS MANAGEMENT**

The University of Massachusetts provides a four-year course of study with as high a degree of proficiency in some particular branch of learning as is possible without sacrificing the breadth, knowledge and training which should characterize a well rounded college education. Agronomy is one of the departments within the University which offers a major course of study. Sufficient flexibility (within the Agronomy major) is allowed for students particularly interested in Turfgrass Management to concentrate on this phase of Agronomic specialization. The purpose of the four-year course in Turfgrass Management is to provide training in the science of turfgrass culture at such a level that the student may qualify for the Bachelor of Science degree. Graduates are considered qualified for positions as assistant superintendents and full superintendents of large acre turfgrass establishments. Openings are also available as turfgrass specialists in industrial corporations. Commercial concerns which make and distribute commodities used in turfgrass management rely on trained Agronomists to keep their products up-to-date and in popular demand. Students interested in teaching and research are prepared to enter graduate school for continued study.

The estimated cost per year for tuition, room and board, books and supplies and student fees and taxes is slightly under \$1000.00 for residents of Massachusetts. Out-of-state students pay about \$500.00 more as increased tuition. Scholarships and student grants in aid are available for those who can qualify.

Subject matter covered in course work is as follows:

Freshman Year -- 36\*

First Semester

1. English Composition
2. Speech
3. Algebra and Trigonometry
4. Inorganic Chemistry
5. General Botany
6. Geography of Worlds Agric.
7. Military
8. Physical Education

Second Semester

1. English Composition
2. History of Civilization
3. Algebra & Analytic Geometry
4. Inorganic Chemistry
5. General Zoology
6. Military
7. Physical Education

Sophomore Year -- 36\*

First Semester

1. English Literature
2. Economics
3. Physics
4. Elective\*\*
5. Elective
6. Military
7. Physical Education

Second Semester

1. English Literature
2. Psychology or Sociology
3. Physics
4. General Soils
5. Elective\*\*
6. Military
7. Physical Education

Junior Year -- 34\*

First Semester

1. Zoology - Genetics
2. Organic Chemistry
3. Soil Formation
4. Agricultural Engineering - Shop
5. Elective\*\*

Second Semester

1. Fertilizers
2. Insects
3. Garden Materials
4. Elective\*\*
5. Elective
6. Elective

\*\*Agronomy -- Turfgrass Basic Factors (first semester) and Agronomy -- Turfgrass Cultural and Business Management (second semester) are required in either the sophomore or junior year.

Senior Year -- 32\*

First Semester

1. Plant Ecology
2. Plant Materials used in Agric.
3. Elective
4. Elective
5. Elective

Second Semester

1. Drainage and Irrigation
2. Special Problems in Turfgrass Management
3. Soil Utilization
4. Elective
5. Elective
6. Elective

\*Credits

Advised Electives#

<u>First Semester</u>	<u>Second Semester</u>
1. Plant Physiology	1. Plant Physiology
2. Introductory Geology	2. Plant Breeding
3. Plant Pathology	3. Report Writing
4. Herbaceous Gardens & Borders	
5. Liberal Arts Courses according to individual interest.	

Desirable Electives

1. Plant Anatomy
2. Bacteriology - Introductory and Soils
3. Entomology - Evolution
4. Landscape Architecture - Plant Materials
5. Landscape Architecture - Planting Design
6. Accounting
7. Business Law

#To be taken in the general order listed

For a copy of the Undergraduate Bulletin of the University of Massachusetts write to: Marshall O. Lamphear, Registrar, South College, University of Massachusetts, Amherst, Massachusetts.

GRADUATE WORK AND RESEARCH

Turfgrass research projects may be carried out in the Department of Agronomy which lead to the Master of Science and Doctor of Philosophy degrees. For information on opportunities for advanced study and turfgrass research write to: Eliot C. Roberts, Associate Professor of Agronomy, Department of Agronomy, University of Massachusetts, Amherst, Massachusetts.

EXPERIMENT STATIONS ENGAGED IN TURF RESEARCH, EXTENSION AND EDUCATION

Arizona Agricultural Experiment Station,  
University of Arizona, Tucson, Arizona.

Beltsville Turf Gardens, U.S. Department of  
Agriculture, Plant Industry Station,  
Beltsville, Maryland.

California, University of, at Los Angeles,  
and at Davis, California.

Colorado Agricultural Experiment Station,  
Colorado A. & M. College, Fort Collins,  
Colorado.

Connecticut Agricultural Experiment Station,  
New Haven, Connecticut.

Florida Agricultural Experiment Station,  
University of Florida, Gainesville, Fla.

Georgia Coastal Plain Experiment Station,  
Tifton, Georgia.

Illinois Drug & Horticultural Experiment  
Station, University of Illinois, Chicago,  
Illinois.

Indiana Agricultural Experiment Station,  
Purdue University, Lafayette, Indiana.

Iowa Agricultural Experiment Station, Iowa  
State College of Agriculture and Mechanic  
Arts, Ames, Iowa.

Kansas Agricultural Experiment Station,  
Kansas State College, Manhattan, Kansas

Maryland Agricultural Experiment Station,  
University of Maryland, College Park,  
Maryland.

Massachusetts Agricultural Experiment Station,  
University of Massachusetts, Amherst,  
Massachusetts.

Michigan Agricultural Experiment Station,  
Michigan State College, East Lansing,  
Michigan.

New Jersey Agricultural Experiment Station,  
Rutgers University, New Brunswick,  
New Jersey.

New Mexico Agricultural Experiment Station,  
New Mexico College of Agriculture and  
Mechanic Arts, State College, New Mexico.

New York Agricultural Experiment Station,  
Cornell University, Ithaca, New York.

Ohio Agricultural Experiment Station,  
Wooster, Ohio.

Oklahoma Agricultural Experiment Station,  
Oklahoma A. & M. College, Stillwater, Okla.

Oregon Agricultural Experiment Station,  
Oregon State College, Corvallis, Oregon.

Pennsylvania Agricultural Experiment Station,  
Pennsylvania State University, University  
Park, Pennsylvania.

Rhode Island Agricultural Experiment Station,  
University of Rhode Island, Kingston,  
Rhode Island.

Texas Agricultural Experiment Station, Texas  
A. & M. College, College Station, Texas.

Texas Technological College, Department of  
Horticulture and Park Management, Lubbock,  
Texas.

Virginia Agricultural Experiment Station,  
Virginia Polytechnic Institute, Blacksburg,  
Virginia.

Washington Agricultural Experiment Station,  
State College of Washington, Pullman, Wash.



PHOTO BY KOLDY

#### GRADUATES OF WINTER SCHOOL FOR TURF MANAGERS—1959

Front row, left to right: W. Stepanik, D. Snyder, A. Vantangole, H. F. Frederickson, S. Garabedian, W. White, E. J. Tomaselli, J. S. Woodhouse, J. A. Messier, J. M. Ferreiro.

Second row: A. Manocchio, J. Gianferante, J. Sodnik, Edgar Heilman, W. Hargrave, K. Boleslaw, H. E. Lorence, C. Wiseman, G. S. Bryant.

Third row: A. R. Oteri, Jr., L. M. Colardo, T. Rewinski, O. W. Mountain, Dean F. P. Jeffery, Prof. G. King, Prof. L. Blundell, Prof. J. Hanson.

Back row: J. Troll, E. Pira, E. Bredakis, Prof. E. C. Roberts.



PHOTO BY POP BARRETT

### 325 ATTEND TURFGRASS CONFERENCE

Picture of University Personnel, Golf Course Superintendents, Students, Parkmen, Highway Superintendents, Guest Speakers, Cemeterymen, Company Representatives, and County Agents who attended this year's conference. A record group was present at this year's conference, and a great deal was learned and many new friends made by all.

ANNUAL TURFGRASS CONFERENCE PROCEEDINGS

1959

Tape recordings of all conference presentations have been summarized and this material approved by individual speaker.

The various topics are presented for your information as follows:

I	Principles of Turfgrass Fertilization	
	A - Organic Fertilizers by O. J. Noer .....	A- 1
	B - Inorganic Fertilizers by Charles Winchell .....	A- 1
	C - Urea Formaldehyde by G.F. Stewart .....	A- 2
	D - Phosphorus and Potash Fertilization by Ralph Donaldson .....	A- 3
	E - Questions on Fertilization to the Panel .....	A- 4
II	How to Grow Grass on a Limited Budget	
	A - Cemetery Maintenance by S.E. Robbins .....	A- 6
	B - Lime by Anson Brewer .....	A- 6
	C - Limited Budgets by R.W. Sharkey .....	A- 7
	D - Fertilization of Park Turf by E.J. Pyle .....	A- 7
	E - Disease and Insect Control by Orlando Capizzi .....	A- 8
	F - Cost of Establishing Turf by Victor Taricano .....	A- 9
	G - Questions and Answers .....	A-10
III	Control of Pests of Ornamentals and Turf Occurring on Golf Courses by John C. Schread .....	A-12
IV	Behind the Scenes in Soil Testing and What it Means to You by Bertram Gersten and Wm. G. Colby .....	A-19
V	Lessons Learned from the 1958 Season as Applied to Golf Course Maintenance by A. M. Radko .....	A-21
VI	The Outlook in Chemical Weed Control on Fine Turf by John Gallagher .....	A-24
VII	New Developments in Turfgrass Disease Diagnosis and Control by Frank Howard .....	A-26



## PRINCIPLES OF TURFGRASS FERTILIZATION

Speaker: O.J. Noer, Milwaukee Sewerage Commission

Subject: Organic Fertilizers

There is a place for both organics and inorganics. Examples of organic nitrogen carriers are sewage sludges, cotton seed meal, gluten meal, and castor pomace. These materials must undergo decay in the soil. Saprophytic microorganisms cause their breakdown, and release nitrogen in a form that plants can use. High nitrogen carriers such as blood, with 10 to 12% nitrogen release their nitrogen very rapidly, and give response almost as fast as inorganic sources of nitrogen. Those of 5 to 7% release nitrogen more slowly. The rate of release is influenced by temperature, soil reaction, and other factors. Organics have been blamed for disease in warm weather. Results of a project at Rutgers University shows less dollar spots on Milorganite plots than those fertilized with inorganic sources of nitrogen. Turf needs relatively constant supply of nitrogen. This can be obtained from any form of fertilizer if properly used. In hot weather and high humidity, one should use any form frequently, and at light rates, rather than produce soft growth with heavy rates of nitrogen. The place of the organics is to supply nitrogen over longer periods applied less frequently at moderate rates.

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Speaker: Charles Winchell, Consolidated Rendering Company

Subject: Inorganic Fertilizers

I consider urea to be in this group because it generally has the characteristics of the inorganics. All sources of nitrogen, natural organics, synthetic organics, and inorganics have a place in good turf programs. For convenience, these are usually combined in a package unit of mixed fertilizers providing immediate availability, delayed availability, and sustained availability. There are two disadvantages of inorganic and urea nitrogen. They can be very toxic when applied in excessive amounts, and will not maintain growth over extended periods of time. The following are some advantages of inorganics: Immediate availability over a wide variety of environmental conditions, no complicated breakdown involving soil temperature and exacting bacterial activity, therefore, quick green-up results without delay, and easy adjustments in soil nutrient content can be made depending on the demands of the turf. The user can obtain some control over soil pH. Most inorganic nitrogen materials are water-soluble, allowing foliar as well as root feeding. They are the cheapest sources of nitrogen. The following are some indirect advantages. The user can produce vigorous turf early in the season, thus reducing crabgrass, and they enable quick repair of turf.

This readily points out one major advantage of urea-formaldehyde nitrogen. If this quantity of nitrogen is not possible to apply, - for perhaps budget reasons, - it might be well to establish a demonstrational area of one or two fairways to determine the value of adequate fertilization with nitrogen. An outstanding demonstrational area may result in an increased budget for fertilizer materials in future years.

A word of caution, -- urea-formaldehyde nitrogen should not be used at application rates less than 5 lbs. per 1000 sq. ft. or 200 lbs. per acre of turf area. (2 lbs N/1000 sq. ft. or 80 lbs. N/acre) Urea-formaldehyde is for quality turf production and maintenance and quality turf cannot be produced without adequate amounts of nitrogen.

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Speaker: Ralph Donaldson, Hubbard-Hall Company

Subject: Phosphorous and Potash Fertilization

Phosphorous (P205) plant food does not move in the soil. A water soluble form in fertilizer, is soon changed when applied to soil into other forms. (a) In limed soil it fixes with Calcium and Magnesium; these are available forms of soil phosphorous. (b) In more acid soil reversion occurs with aluminum, manganese or iron, and as such is relatively unavailable. A soil pH 6.5 gives best availability.

Phosphorous aids root growth and is safe for plant contact. Its primary use is in the root zone worked into a limed soil when seeding. A fertilizer which provides 50-100 lbs. P205 per acre may suffice for an extensive seeding. For greens, a higher rate of 5-101 lbs. P205 per 1000 sq. ft., may be desirable at time of construction.

Maintenance need is based on amount removed in clippings. The removal of 100 lbs., clippings from a green per season contains about 2 lbs. P205 as replacement need. This amount can be supplied by your applications of complete fertilizer. If applied especially after aerifying or spiking the phosphorous can be placed deeper.

The benefit of phosphorous on root growth is most pronounced when N is not in excess supply. (Excess N overstimulates the top growth which uses the carbohydrates at the expense of the root system.)

On areas where the clippings are returned the need of other Phosphorous fertilization may be negligible where adequate initial seedbed treatment was made, and pH is maintained by occasional reliming.

Potash does move in the soil so it can be applied by surface application. Its function is mainly for a balance with N in nutrition for healthy growth of the leaf.

Here are some characteristics of four of the most commonly used inorganic salts. First, ammonium nitrate. This is the most soluble, and will be rated 100% ... Toxicity, intermediate...Affect on pH, slight...Use, \*one to three pounds. Second, urea. Solubility...55%...Toxicity, low...Affect on pH, slight...Use, \*one to two pounds. Third, sodium nitrate. Solubility, 46%...Toxicity, high...Affect on pH, basic...\*Use three to five pounds. Fourth, ammonium sulphate. Solubility, 40%...Toxicity, highest...Affect on pH, most acid. Use, one to two pounds per 1000 sq. ft. In conclusion, these salts require thorough understanding on the part of the user, but once understood, they can add mightily to good turf everywhere.

\* per 1000 sq. ft.

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Speaker: G. F. Stewart, duPont Company

Subject: Urea Formaldehyde or Synthetic Organic Nitrogen

In any fertilization program, nitrogen, phosphorous, and potash requirements must be satisfied. All of these nutrients must be available in sufficient quantities to assure quality turf. Soil pH is extremely important also. It should be in the range best suited to turfgrass requirements i.e. 5.8 to 7.0. Efficiency of fertilizer materials, especially nitrogen, depends too upon a proper soil pH.

Putting greens fertilization with urea-formaldehyde nitrogen should be handled somewhat differently than originally thought. A base application of nitrogen from urea-formaldehyde will continue to supply nitrogen to the grass for an entire growing season. However, supplemental applications of soluble nitrogen should be applied as needed, perhaps three to eight times per season, to assure outstanding turf quality on a day to day basis. Soluble applications should not exceed 1/8 to 1/4 lb. of actual nitrogen per 1000 sq. ft. per application. Between 15 and 20 lbs. of urea-formaldehyde material per 1000 sq. ft. will establish an adequate nitrogen level on putting green soils in New England.

Our turfgrass authorities state that fairway and general purpose turf areas require 4 to 6 lbs. of actual nitrogen per 1000 sq. ft. per season. (160 - 240 lbs. / acre) Quality turf cannot be produced with less. Penn State (Musser) reports that any form of nitrogen will produce good turf if a total of 4 to 6 lbs. of nitrogen is applied per 1000 sq. ft. per season. 6 lbs. of nitrogen can advisably be applied to turfgrass as follows:

- a. 10 to 12 applications of soluble nitrogen.
- b. 6 to 8 applications of natural organic nitrogen.
- c. 1 to 2 applications of quality urea-formaldehyde nitrogen.

A maintenance need of potash is based on removal contained in clippings and the presence of clover. A normal for 100 lbs. clippings removed per 1000 sq. ft. of green a season is about 3½ lbs. K20. If clover is a serious problem use as little as 1 lb. K20 per 1000 sq. ft. for a season. If clover is not a problem try to apply the replacement need. That is, three pounds per season, applying one half to one pound per application. Potash also is consumed in luxury amounts: that is a plant can take up two to three times its actual need if potash is used in excess. Thus several small seasonal rates will not be wasted.

On areas where clippings remain and return this mineral plant food, potash treatment is seldom a limiting factor for moderate growth.

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#### QUESTIONS TO THE PANEL

Below, are listed the answers or the discussion of a question, rather than the questions themselves.

O.J. Noer, Milwaukee Sewerage Commission: How we use nitrogen, and how much is applied, may be more important than the source of the nitrogen. I would agree with rates of 240 to 360 pounds of nitrogen per acre, for use on Bermuda grass, fairways and greens. However, I believe that those rates are excessive with northern grasses. Some of the finest bluegrass fairways I know of, are being maintained with between 125 and 175 pounds of actual nitrogen per acre per year. These are un-watered fairways. Years ago, the practice on unwatered fairways, was to apply all the nitrogen at one time in the fall. Now the trend is for a split application. About 60 pounds of nitrogen is applied in the fall, then about 48 to 50 pounds more in June. The fairways hold color much better than when all of the nitrogen is applied in the fall. The trend with watered fairways is to use nitrogen liberally in the fall, then follow with moderate applications in June, July, and August. Although we can use nitrogen at 300 or more pounds per acre on Bermuda grass, and on some bent greens, we should not use more than 150 pounds on unwatered fairways, and up to 200 pounds per acre on watered fairways.

There are three sources of dried, activated sludge: Milwaukee, Chicago, and Houston. Do not include Los Angeles output because the activated sludge made there is further digested, so the nitrogen content is only 2 to 3%. The percent of nitrogen in activated sludge is determined by the nature of the waste produce that goes to make up the sludge. The Chicago output runs generally from about 4 to 5% of nitrogen. The nitrogen is very low from one Chicago plant on the south side because it receives a great deal of waste from the steel industry. The ash in this sludge is over 50 percent as compared with the 25 percent in Milorganite. The Chicago plant on the south west side receives mostly domestic waste, and the nitrogen is higher. Activated sludge from Milwaukee runs from 5½ to 6½% nitrogen. The plant in

Milwaukee uses a great deal of industrial waste from breweries, packing plants, and tanneries. Waste from these plants accounts for the higher nitrogen content of activated sludge from Milwaukee. The nitrogen content is higher in the winter than in the summer because of the difference in rate of oxidation.

Effect of soil pH on breakdown of organic fertilizers. In the range of high acidity, below pH5, the rate of breakdown of organic nitrogen is much slower. The ideal range for breakdown is pH from 6 to 6.5. The figure pH6.5 is a good one to tie to, because all of the elements are available to the plants. The velvet bents will survive in the soils that are too acid for the creeping bents, and the creeping bents will survive in soil that is too acid for the best performance of the bluegrass. On the other hand, bent grasses in the West perform beautifully on soils with pH of 7 to 8. Most of the greens in the Chicago area are in the range of 7 to 7.6 because the sand used in the top dressing mixture comes from glacial till, and contains from 20 to 30% limestone particles. If enough sulphate of ammonia were used to bring the pH down to 6.5 worse troubles would result. It is best to grow the grass at the higher pH, and handle the grass accordingly.

Charles Winchell, Consolidated Rendering Co. When I used the word toxic, I meant the actual wilting and burning of the plant. Foliar feeding is influenced somewhat by the pH of the solution, as the pH influences the opening of the stomata, there is indication that entrance of nitrogen and other nutrients is gained through the stomata, although entrance can also be made directly through the cell wall. Urea must be broken down, and the rate of breakdown is influenced by temperature, bacterial activity, and water supply. Urea breaks down to ammonium carbonate, and this makes it less leachable than some forms of inorganic nitrogen.

G. F. Stewart, duPont Company: When I spoke of 4 to 6 lbs. of nitrogen per 1000 sq. ft. per season as a need on general turf areas, I was referring to the nitrogen range necessary to produce top quality turfgrass. This amount is what we should be striving for in establishing fertilization programs. Four lbs. per 1000 sq. ft. per season would be satisfactory, and six lbs. per 1000 sq. ft. per season approaching an upper limit. The six lb. rate is only forty lbs. more than the upper limit of 200 lbs. per acre that Dr. Noer spoke of, -- i.e. six lbs. per 1000 sq. ft. vs five lbs. per 1000 sq. ft..

If you use urea-formaldehyde materials as you would natural organics, i.e. small applications through the season, results will probably be disappointing. At least two, and preferably four lbs., of actual nitrogen per 1000 sq. ft. should represent a minimum application rate.

## HOW TO GROW GRASS ON A LIMITED BUDGET

Panel: Joseph Troll, UofM Moderator

Mr. Stanley E. Robbins: Cemetery Superintendent on the subject  
'Maintenance in the Cemetery''

In the average old-line cemetery in New England, for every one dollar spent on materials, five dollars is spent on labor. The labor cost will be less on the more modern memorial type cemeteries. We try to control the cost of labor by having the most efficient labor possible, and by controlling the materials which we give our labor to use. It is probably not economical to pinch pennies in purchasing loam. Skimping on loam will only increase the cost of the maintenance later. A few pennies might be saved on grass seed by purchasing the second best rather than the top grade of grass seed. I'm afraid we tend to skimp on the cost of fertilizer. However, a poor fertilization program will show up in years to come, and will cost more to bring back. You can justify a considerable expenditure on equipment in order to save labor. For example, for mowers, we should purchase the widest piece of equipment that we can use satisfactorily. Mechanical grave diggers can be used for purposes other than digging graves. A mechanical tiller will soon pay for itself if you have development work. The new blowers will do the work of many men in getting rid of leaves in the fall. I would like to put in a plea for the development of satisfactory machinery to apply herbicides. We particularly need machinery satisfactory for use in cemeteries in order to go around obstacles. Other things can be done to help maintain a cemetery on a limited budget, such as, the elimination of obstacles on the grounds, the elimination of spotty plantings, properly spaced new memorials, so that large equipment can be used around them.

Mr. Anson Brewer: Cemetery Superintendent on the subject of "Lime"

In growing lawns on a limited budget, lime is one of the biggest helps. It is very inexpensive. We pay about 12 dollars a ton in bags. I dare say over one half the lawns in this area need lime. There are some observations that can be made to indicate whether a lawn needs lime. However, the only sure way is the acid test. I feel that any soil that tests lower than pH6 should be limed. Lime adds calcium and magnesium to the soil, and acts as a conditioner, but does not take the place of regular feeding of fertilizers. Hydrated lime, or the raw ground lime stone can be used. I prefer the latter. On established lawns, use 1 to 3 tons per acre, depending on the acid test. Late fall is the best time to apply, but early spring will do very well. Care should be taken to see that lime is spread evenly. Use a mechanical spreader if possible, spreading one half in one direction, and the other half in the other direction. On new lawns, use 3 to 5 tons per acre, and mix thoroughly in the upper six inches.

Then apply your fertilizer, and you are ready to seed. Lime works slowly, so do not expect results right away. It will take two to three months or longer for results. Some prefer to apply one half the amount of lime in one year, and the other half the next year. If the whole amount is used, I do not like to use lime again for four years unless the acid tests indicate that more lime is needed.

Mr. Robert W. Sharkey: Park Superintendent, on the subject of  
"Operating a Park on a Limited Budget"

First place, it is important that you have men that will produce. A big problem is cleaning the lawns in the spring. We have about thirty acres and 1800 trees. I have given up the use of the fan rake. I use brooms on the back of a tractor. I alternate the brooms between the stiff bristle and the soft bristle. I do a very good job, and can clean the entire lawn in one week. I am greatly in favor of aerifying. I did aerify two times a year; now, once a year. I use electric Stanley trimmers to trim around the trees. I do not use hand trimmers or hand mowers. I spray for weeds using a 25 gallon Dobbin sprayer with a six-foot boom. Using care, we do not get injury to flowers or shrubs. For crabgrass, I used PMAS. In 1949 in one area, and in 1950 in another area, and since then I spend about three mornings with two men, just pulling out the occasional plants. In the fall I have the problem of leaf removal. I push the leaves into the street, and bale them with a hay baler. With this method, I can clean my park of leaves in less than two weeks.

Mr. Everett J. Pyle: Park Superintendent, on the subject of  
"Fertilization of Park Turf"

After taking out all of the other expenses in our total budget, we come out with less than \$10.00 per acre for fertilization of the turf. We use this budget according to the following priority. First, new areas that we are going to seed. Second, golf courses. Third, the athletic fields, and fourth, the general park turf, and fifth, the cemetery turf. When fertilizing turf on a limited budget, we should consider the cost of the fertilizer? I have worked out a comparison of the unit cost of nitrogen in various materials. This is justified because nitrogen is probably the most important single element, and is the most expensive. Urea-form materials, they're all 38% nitrogen, costing \$400.00 per ton, makes the unit cost of nitrogen 53 cents. Now, take urea, which is 45% nitrogen which we can buy at \$115.00 per ton, we get a unit price of nitrogen of 13 cents. Then we take a 5-10-5 commercial mixture, and allow for the minimum value of the phosphorous and potash, we get a figure of 20 cents for the nitrogen. Milorganite is 53 cents per unit of nitrogen. I should point out that I have always considered the natural organics such as Milorganite and cotton seed meal have valuable properties other than the straight fertilization. They contain the minor elements. If we can use the natural organic fertilizers once in a while, we can stop worrying about the need for minor elements. Then we

have a soluble fertilizer, a 24-12-12. The unit cost of nitrogen there is 62 cents. Another way of comparing these fertilizers is to decide how much can we do with \$25.00 per acre. Here is the way it lines up: A thousand pounds of 5-10-5 fertilizer, this would give you 50 pounds of nitrogen on the acre. 125 pounds of urea form, which would give you 48 pounds of nitrogen. 400 pounds of Nugreen, or urea material would give you 180 pounds of nitrogen per acre. 300 pounds of Milorganite would give you 40 pounds of nitrogen per acre. I believe that these figures should be considered in fertilization of park turf. Now, we have, for a number of years, used on our general park turf, a 5-10-5 fertilizer because it is very simple to handle, does not burn readily, it is easily obtainable, and is used in all of our other fertilizing operations in the park. I have felt that we should be using a fertilizer with a higher percentage of nitrogen. We have not done so because of danger of burning. Now, with the advent of the urea-form fertilizers, I believe, provided one can afford it in his budget, he should be using a fertilizer such as a 20-6-4. We put on one application of fertilizer a year on whatever part of the turf we are able to fertilize. We apply in the late summer of the early fall. We do this because of the timing of the beginning of our fiscal year. In the spring we are busy doing other work, and we do not have time to apply fertilizer, plus the fact that the grass is growing vigorously anyway, and it takes all of our time to keep it mowed. Some areas take a long time to dry out in the spring. Labor to apply the fertilizer is readily available in the late summer or early fall. We feel that it is important to buy fertilizer on a bid. The specifications should be drawn up carefully. Here are our specifications for a 5-10-5 commercial grade of fertilizer. At least 20% of the nitrogen should be organic exclusive of the so-called synthetic organics. Mixture must be properly cured to prevent caking in storage. 100% must pass 8-mesh screen. 70% must pass 14-mesh screen. Bags must be moisture proof 80-pound paper bags. We are able to buy fertilizer delivered at our headquarters at \$45.00 a ton.

Mr. Orlando Capizzi; Landscaper, on the subject of  
"Disease of Insect Control and the Home Lawn"

We are not as concerned with these problems on the home lawn as you are on the golf course. However, they are becoming more and more important because with finer and finer lawns, we have more and more problems. From my experience, diseases are governed by four factors: fertilizer, water, temperature, and humidity. I think we can control the first three somewhat by our maintenance methods. Fertilization. I have found that by not over-feeding, we can stay away from some of the diseases. Organic fertilizers should be used moderately in the hot weather. We should balance our fertilizer program over the year, so that we do not at any one time, have a lush growth. Water. The basic problem is over-watering to the point of suffocation. Timing of watering is important also. I believe in morning and afternoon watering. Automatic sprinkling systems have caused a great deal of trouble with me. I think that the operator of a sprinkling system should study the system to know the output of the heads. Then, apply the necessary water once or twice a week, rather than every day. Tempera-



ture can be controlled somewhat by syringing. On a hot day, the temperature can be lowered somewhat at the grass level by a syringe. Humidity, I do not believe, we can control. These factors, along with fungicides used as preventatives, should help us a great deal. Large brown patch and dollar spot have been my two largest problems in turf. I have had good success with Tersan-75 for large brown patch. I do not use mercuries. For dollar spot, I have used cadminate and acti-dione, with better luck with the acti-dione. Dollar spot can be prevented by an even distribution of the feeding throughout the season rather than a heavy feeding, and then starvation. As far as insects are concerned, the grubs, the ants, and the chinchbugs are the three insects of problem. These have been controlled recently quite well with chlordane, dieldrin, and lead arsenate. I like lead arsenate because I also get some weed control with this material as well as insect control.

Victor Taricano: Landscaper, on the subject of  
"Cost of Establishing Turf"

We know that the most important thing for good turf is the soil. If we do not have good soil, we cannot hope to have good plants growing in it. The soil should be considered from the standpoint of the base with its good drainage. Good sub-soil is important because the roots of the grass penetrate 10 to 12 inches deep, and the top soil should be friable, conditioned, and able to retain the food for the plants. At the time that the seed bed is prepared, is a good time to consider the solving of weed problems in the future. We should consider the use of pre-emergence type of herbicides to kill of the weed seeds at this time. At the time of constructing the lawn is the best time to apply limestone for conditioning the soil, and also phosphorous such as super phosphate or bone meal. The cost of establishing a good lawn is from five cents to twenty-five cents per square foot, or even higher. Since the cost is relatively high it should be done properly. It is much more economical to do the preparation properly than to try to correct a bad condition later. We need fertilizer for the new lawn, and thanks to the research of the chemical companies, we now have some excellent fertilizers. We should remember, however, that fertilizers will not perform properly if the pH of the soil is not right. We should choose a seed which is tailored specifically for the type of lawn that we wish to establish. The kind of seed should be decided on the basis of what kind of lawn is wanted, and how much money the customer is willing to spend on maintenance later. Today we have several good sprinkler systems available. If an underground sprinkling system is to be put in it should be put in at the time of construction, if possible. After the seed is germinated, the remainder of the establishment of the turf is in the maintenance. Let us consider the mowing of the lawn. We should not set a definite pattern of cutting a lawn every seven, ten, or fourteen days, because the rate of the growth of the grass is different in the different seasons. It is better to cut when the grass is at a definite height, and cut down to a definite height.

QUESTIONS AND ANSWERS

- Q. Should I raise the height of cut of the lawn in the summer time?
- A. Mr. Taricano: It depends somewhat on the kind of maintenance you're willing to give the lawn. I would keep the cut at the same height if you are able to give it water in the summer time.
- Q. Why not lay sod on a lawn instead of seeding to be more certain of a good stand?
- A. Mr. Capizzi: Sod is a wonderful thing, but it is also very expensive. If we use the chemicals to kill the weed seeds before seeding we should not have any trouble getting a good stand. Also, sowing the seed at the proper season is important. I like from about the 20th of August through the latter part of September.
- Mr. Taricano: I should like to point that the preparation of the soil is the same whether you sow seed or put on sod. The difference is in the time that you have in order to have a finished lawn. If you need turf immediately, then sod is the best thing.
- Mr. Troll: As I recall at Rhode Island, they were able to grown and lift sod in four months with proper preparation and fertilization. If we can do this, then we should not have to use sod.
- Mr. Clapper: It was pointed out that in Rhode Island, the fertilizer rate was eight pounds of nitrogen per thousand feet.
- Q. What is the cost of sod?
- A. unidentified: Twenty cents a square foot. It was brought out that in the Middle West, sod is purchased laid at four cents a square foot.
- Mr. Taricano: If good sod is available at twenty cents a foot, I think more and more will be used, particularly, for quick repair work, for border strips and for slopes.
- Q. How good is old established sod for resodding?
- A. Mr. Mitchell: We like to use two year old sod. Old established sod does not handle well.
- Q. On an old established lawn, that is very uneven, do you suggest rolling?
- A. Rolling will not satisfactorily solve the problem. If an old established lawn is uneven, there must be a cause for it, and the best procedure is to find out what is causing the unevenness, and correct the basic difficulty.
- Q. Do you use sod in the cemetery?

- A. Mr. Robbins: We use sod a great deal, and we use old sod satisfactorily. In fact, on a lot that is in fairly poor condition, we will want to fix it up. We do not go out and get new sod, but we get old sod and bring it in, and then it does not look patchy. By application of fertilizer and top-dressing, it looks very well afterward. Considering sodding versus seeding, it makes a difference what your client wants. We find that in the spring time, we have a lot of winter graves to repair. We save time by sodding. Then the person comes in and looks at their lot and they are very happy. If we seed, it does not come along as fast as the owner would like, and they are unhappy.
- Q. In the use of fungicides and herbicides, do you ever have difficulty in staining the monuments in the cemetery?
- A. Mr. Robbins: So far, we have had no difficulty. We have been rather careful, however.
- Q. Does brown patch and dollar spot affect bluegrass and fescue lawns?
- A. Mr. Troll: The answer is yes, although bent grasses are more susceptible to both of these diseases. You can sometimes have brown patch in a home lawn, and not know it, because the height of cut is very high as compared to a golf course green. Brown patch would be more prevalent than dollar spot.
- Q. What steps should be taken to up-grade a poor lawn on a light sandy loam soil?
- A. Mr. Capizzi: Aerify and top-dress, and repeat the procedure to get a little heavier soil into the mixture.

Mr. Brewer: I suggest that if you have a turf situation in which you suspect that lime is needed, that you stake out a small area, and apply a considerable amount of lime, and see if it shows a marked improvement.

Mr. Taricano: I suggest that one carry a simple pH test in his pocket, and he can determine in three minutes whether the soil needs lime or not.

In conclusion, it was suggested that on large turf areas, with a limited budget, we should consider the greater use of the cheaper forms of nitrogen such as urea, and ammonium nitrate in order to feed all of the turf each year, rather than spend all of the limited budget on expensive forms of nitrogen, and be able to cover the area only every two or three years. We should purchase some used fertilizers on the basis of cost per unit of nutrient rather than the cost per ton or per bag.

## CONTROL OF PESTS OF ORNAMENTALS & TURF OCCURRING ON GOLF COURSES

John C. Schread, Entomologist  
Connecticut Agricultural Experiment Station

### Birch Leaf Miner

The birch leaf miner has been abundant and more injurious during the past few years than heretofore. The birch species most seriously damaged are the gray birch, native white birch, European white birch and many of the newer varieties of cutleaf birch. The insect passes the winter as a mature larva in the soil beneath the trees. In the spring it transforms to an adult sawfly. It is black in color and about 1/16 of an inch long. Eggs are deposited in young leaves only. As a result all of the leaves may be infested in the spring. Later in the season only the new leaves in the tops of the trees or on young sprouts are infested. There are several generations of sawflies during the growing season.

Lindane or malathion used at the rate of one to two teaspoons of emulsion in one gallon of water will destroy the miners. Treatment made between May 15 and 25 may be all that is necessary to control the first brood. Treatments made in late June or early July should control the second brood of miners.

### Boxwood Leaf Miner and Psyllid

Boxwoods are frequently damaged by leaf miner and Psyllid. The adult of the boxwood leaf miner is a delicate orange yellow midge or fly. It lays its eggs during late May and early June in boxwood foliage. As the miners develop they create blister-like swellings on the underside of the leaves. There is only one generation a year. The adult of the boxwood Psyllid is grayish-green in color. The first brood is active during May, causing a cupping of the terminal leaves of infested boxwoods. Later the greenish colored nymphs disperse throughout the plants.

DDT used at the rate of one teaspoon of emulsion or one tablespoon of wettable powder per gallon of water will control adults. Malathion or Lindane used at comparable doses may be used to control the miners and Psyllids. Treatments begin about mid-May and should be repeated several weeks later.

### Lace Bugs

Three species of lace bugs occur on Andromeda, Azalea and Rhododendron. It seems, however, that the most recently introduced one is the Andromeda lace bug. It restricts its feeding to Andromeda, but may sometimes be found on certain deciduous azaleas. The remaining two species occurs on rhododendron and azaleas.

The adults of the three species resemble one another. They are lacelike in appearance and usually whitish in color. The exception to this is the Andromeda lace bug, which has a much darker head and wing markings. The adults

and nymphs feed by sucking the sap from the underside of the leaves. This causes a mottling or blanching of the foliage.

There are several broods of the insects a year. They overwinter in the egg stage imbedded in the underside of the leaves.

Control of lace bugs should not be difficult so long as the lower surface of the foliage is sprayed or dusted with DDT or malathion. A thorough treatment made during early June will give good control. If a second one is required, it should be applied in early August.

#### Oystershell and Euonymus Scales

The oystershell scale and the euonymus scale are two of the most persistent and injurious of all of the scale insects attacking ornamentals. The former of the two species attacks more than 100 varieties of deciduous trees and shrubs. It feeds on all parts of infested plants excepting the leaves and roots. The female scale is brownish-gray in color, and shaped like a tiny oyster shell. Seriously infested plants may die. There is one brood a year in the northeast. The scales survive the winter in the egg stage. The second species infests both deciduous and evergreen euonymus. It is also found on pachysandra and bittersweet. When the insects are numerous they literally coat the leaves and stems with their bodies. Badly infested plants are weakened and may die.

Malathion emulsion or wettable powder used at the rate of two to three teaspoons per one gallon of water will control the crawling stages of both species of scales. Treatment should be made about June 15 for the oystershell scale and during the first week in July with a repeat treatment in early September for good control of the euonymus scale. A dormant treatment may be used to control both species.

#### Juniper Scale

The Juniper scale is one of the most annoying insect pests of ornamental evergreens. It occurs mostly on Juniper, but has been reported on red cedar, arborvitae and cypress. Badly infested plants become grayish in color and produce very little, if any, new growth.

The scales live through the winter in an immature stage and the adults appear in late April or early May.

Egg laying commences before the middle of May, and the first young appear later in the month or in early June. All or most of the eggs should have hatched by July 1. It is then time to spray with malathion at the rate of 2 teaspoons of emulsion or wettable powder per gallon of water. A second treatment 7 to 10 days later may be needed when an infestation is serious.

### Taxus Scale and Mealybug

Lecanium scale may sometimes become a serious pest of Taxus. Some varieties appear to be more susceptible to attack than others. Eggs begin to hatch in late June and continue to do so for about four weeks. The young scales feed on the new branches and foliage and develop very slowly until autumn. In the following spring feeding is resumed and continues until the scales reach maturity. Mealybugs may also infest Taxus. There are two generations of the pest a year. The crawling stages of the summer brood are present in late July and early August, whereas the young of the second or fall brood hatch during September. They may or may not disperse from the egg mass during the autumn. Growth however does not begin until the following year. On reaching maturity in late spring the females produce masses of pinkish eggs which are intermingled with waxy or cottony-like secretion. A week or ten days passes before they begin to hatch.

Control of both pests may be obtained through the use of several or more compounds. Horticultural dormant miscible oils applied in the spring after danger of freezing weather has passed will kill the overwintering scales and mealybugs. Later in the season newly hatched scales and mealybugs can be controlled with summer oils. Similar results may be achieved with malathion emulsion or wettable powder used at the rate of two to four teaspoons per gallon of water.

### Strawberry and Taxus Weevils

The strawberry root weevil and the black-vine or Taxus weevil are closely related species that may seriously injure or kill hemlock, arborvitae, Taxus and other broadleaf evergreens. The larvae of the first species destroys the roots of hemlocks, whereas the adults girdle the twigs of arborvitae. The foliage and roots of Taxus are damaged by the black-vine weevil. The latter type of injury is the most serious, resulting in complete loss of many valuable plants during the growing season. Each species has but one generation a year.

Dieldrin applied to the soil at the base of the trees as a 5% dust at the rate of 5 lbs. per 1000 sq. ft. of ground area should destroy the larvae and adults of both species. Spraying Taxus with DDT several times during June should prove helpful in controlling the pests.

### Mites

Spruce mite, two-spotted mite, clover mite, boxwood mite, azalea mite and others are often responsible for varying degrees of injury to arborvitae, hemlock, blue spruce, azalea, boxwood lawns, etc. Some of the unsightly damage caused by mites to trees and shrubs in recent years has developed as a result of the use of DDT and other related materials for the control of insect pests. The insecticides kill the pests but they also destroy the enemies of insects and mites. Because of this, injurious mites may become a more persistent threat to vegetation where insecticides are used

repeatedly.

The newer miticides Aramite, Mitox, Tedion, Ovotran, Dimite, Chlorobenzilate, Chem-Mite and others may be used to control mites occurring on ornamentals.

They may be used on mite infested trees and shrubs as emulsion at the rate of 1 to 2 teaspoons in one gallon of water; the lesser dosages for light infestations and the stronger dosages for heavy mite populations. Wettable powders may be substituted for emulsions.

In addition to killing the crawling stages some of them will also destroy mite eggs.

Miticides may be applied to trees and shrubs as required during the spring and summer. Occasionally a fall treatment may be necessary. When insecticides such as DDT are used to combat insect pests, one of the miticides discussed may be included in the spray program. Hence destructive insect populations are checked and injurious mites are kept under control.

#### Borers

There are several species of borers that cause dieback of branches and sometimes an entire plant. Three of the most common ones are the dogwood borer, the lilac borer and the Rhododendron borer. The adults of these species are clear-winged moths. They emerge during late spring and summer and lay their eggs on roughened or wounded places on the bark. In the case of the lilac borer the larvae tunnel under the bark and into the wood, whereas the larvae of the dogwood and Rhododendron borers make an irregular burrow under the bark on the trunk as well as the edges of wounds arising from mechanical injury; also around the base of limbs. There is but one generation of each species a year. The winter is passed in an immature stage. The dogwood borer infests pecan trees in addition to dogwood, while the lilac borer is also found attacking ash, mountain ash, and privet. Spraying or painting DDT or dieldrin (4 to 6 teaspoons per gallon) on the injured areas of plants about June 1 and again before July 10 and August 20, will help to control the pests. Another method of control is to cut out the borers and injured stems if possible and burn them. The wounds should be coated with tree paint, paraffin or DDT.

#### Insect Pests of Turf

Attractive and lasting turf, an important feature of the home, park and golf course, is becoming more and more an essential part of our every day life. Industries, city and civic groups in addition to private homeowners are becoming increasingly aware of the value of establishing attractive and permanent turf.

Control of insect pests is essential to the development and maintenance of good grass. Some years ago lawn insect problems were comparatively few; occasional chinch bug outbreak, infrequent appearance of localized native white grub infestation, ant invasion, sod webworms and now and then cutworms.

More recently the challenge to the golf course superintendent in combatting insect pests has been extremely trying at times. Notwithstanding, the satisfaction anticipated through the use of the newer pesticides for their successful control should be amply rewarding to all.

Until the middle of the 1940's the control of turf insects was achieved largely through the use of lead arsenate and nicotine in one form or another. In addition sabadilla was sometimes employed where chinch bug was a problem.

Since 1945 the newer insecticides, DDT, chlordane, dieldrin, heptachlor, aldrin, endrin, etc., have just about replaced the older materials.

Whereas lead arsenate controlled only chewing insects and nicotine formulations and sabadilla were used as contact insecticides, DDT, Chlordane and related compounds combined both stomach poisoning and contact action. Hence, they could be expected to kill turf insects of both the chewing and sucking species.

In addition some of the new materials produce insecticidal vapors which may under certain conditions be adversely effective on insect populations. Moreover, the newer insecticides are inherently faster in their lethal action and longer lived in protecting turf from reinfestation by subterranean insect pests.

#### Pre-Planting Treatments

Pre-planting treatments of soil intended for grass seeding, with chlordane, DDT, dieldrin, or one of the several additional insecticides available for grub proofing should be common practice in areas where white grubs and other soil-inhabiting turf-destroying insect pests prevail.

#### White Grubs

White grubs belonging to the family Scarabaeidae are among the most destructive pests of turf. Those occurring commonly are the one year life cycle Japanese beetle, the oriental beetle, the Asiatic garden beetle, the annual white grub, the green June beetle, and the native white grubs with 1 to 4 but most 3-year life cycles.

The larval or grub stage of these insects have one habit common to all; they feed on the roots of grasses and other plants. Depending on population density the damage caused by them may vary from complete destruction to almost no visible injury to infested turf. The first six species may occasionally be found together in a turf area at one time. However, the Japanese beetle and the Asiatic garden beetle are most apt to integrate in large numbers.

The adult beetles of these pests lay their eggs during the summer months, usually from late June through early September. In this respect the first three species are active over a longer period of time than the others.



Egg deposition may occur almost anywhere. Notwithstanding the Japanese and Asiatic garden beetles prefer to deposit theirs in lawns and park and golf course turf.

There appears to be a considerable variation in the number of grubs required to seriously injure or completely destroy a square yard of turf. A larger number of the smaller grub species seem necessary to achieve damage comparable to that attained by a few grubs of the larger species.

With the exception of the native white grubs which may be found in the soil during the winter in both the grub and adult forms all of the remaining species survive the winter as immature larvae.

Control of white grub may be obtained through the use of chlordane, DDT, or dieldrin. The granular formulations are now preferred for grub-proofing turf.

#### Leafhoppers

Noticeable injury to grass by leafhoppers may occur during a hot, dry summer. The several species responsible for the trouble are always present but seem not to be troublesome excepting when seasonal weather conditions favor their increase. Spraying with DDT when necessary should give good control of the pests.

#### Sod Webworm

Sod webworm or lawn moth is one of the most common turf pests in the United States today. It is perhaps the most troublesome of all grass insects on the West Coast. There, it creates a problem comparable to the Japanese beetle infestation on the East Coast. The insect is most often destructive in bent grasses, but likewise attacks bluegrass lawns, especially newly seeded ones.

Control of sod webworm is not a difficult problem. A choice of one of the newer insecticides such as chlordane, dieldrin or DDT will give desired control. For best results it may be necessary to repeat a treatment several times during the growing season. When the question arises relative to presence of the larval stage of the insect, pyrethrum used as a spray at about twice the strength recommended for aphid control, will force the insects out of the soil and up onto the grass foliage where they can be seen.

#### Ants

Ants frequently appear on golf greens where their craters or mounds constitute a putting hazard. The lawn or cornfield ant seems to be the species most often encountered. Chlordane used as an overall turf treatment will control the pests.

### Chinch Bugs

Several species of chinch bug are considered major pests of turf. The hairy chinch bug occurs most commonly in the eastern United States where extensive damage to grass may occur in years, when hot, dry weather prevails in late spring and early summer. Control of chinch bug may no longer be a problem when one of the newer pesticides is used.

### Cutworms and Armyworms

Occasionally armyworms strip grasses of leaves and heads during midsummer. When the insects are abundant, extensive damage may be expected unless the worms are controlled. In addition a great many one to two brood species of cutworms occur in all parts of the country. As a result repeated infestations may occur during the growing season.

The use of aerifying equipment since the mid 1940's has provided openings in the turf in which cutworms may hide during the day, coming out at night to feed. A serious infestation sometimes results in the development of a uniform pattern of circular, dead, brown grass areas with a diameter somewhat greater than that of the aerifier spoon. These areas indicate extensive injury by cutworm larvae that feed by extending the forepart of the body out of the holes at night. In addition, larvae may leave their hiding place and create shallow runways in the surrounding grass.

Control of cutworms and armyworms with DDT or chlordane and related compounds is assured. It has been demonstrated, however, that a treatment in early season may not prevent reinfestation. Consequently, later treatments are sometimes necessary for best results.

### Ground Moles

Field mice and ground moles are most often discouraged from entering greens by completely controlling insects and earthworms. Obviously, when invasion continues recourse must be had to the use of traps or poisons.

### Earthworms

Earthworm castings are a putting handicap on golf greens. In addition, repeated accumulations of castings may injure the grass and dull equipment. A number of species of earthworms are recognized. Control of earthworms with lead arsenate has been practiced for years. Dieldrin and chlordane have given complete and long lasting control of the pest.

### A New Turf Pest?

A new insect pest appeared in some abundance on golf course greens in the northeastern states during the summer of 1957. It is commonly called the

"frit fly" and is known to attack meadows and other grassland areas in addition to small grains. Perhaps under favorable conditions the insect could be expected to develop into a serious golf green pest. Nevertheless, control of "frit flies" may not be difficult with DDT. Treatment should be made only when necessary and not as a preventive measure.

In conclusion it may be said that the use of pesticides on golf courses should be attempted only when needed. All packages of insecticides whether in the emulsion, wettable powder, granular or dust form are usually labelled with information concerning their use, toxicity and precautions necessary in handling them. Hence, it is important that the labels be read carefully. Repeated careless use of pesticides could result in serious poisoning in humans. Most of the insecticides used on the golf course fall into this class. Consequently all show a high order of chronic toxicity. When used as directed, however, there will be no cause for worry.

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"BEHIND THE SCENES IN SOIL TESTING AND WHAT IT MEANS TO YOU"  
by Prof. Bertram Gersten and Dr. Wm. G. Colby U. of M.

MAKING THE SOIL TEST  
by Bertram Gersten

I suggest that the sample be taken with a soil probe to the depth of at least four inches. The soil probe is a hollow tube that extracts a sample of soil, and disturbs the surface to a minimum. A handmade probe can be made from an old golf club steel shaft. Take the sample from fifteen locations, and mix in a pail. Usually one composite sample is sufficient from each green. Dry the soil samples overnight at room temperature. Use a one pint ice cream container to carry the sample. Use simple labels. Send the history on separate sheets of paper. Send to the soil testing laboratory, University of Massachusetts, Amherst. After the soil is received in the laboratory, it is sifted. Then a measured amount of soil is extracted with the Morgan's Extracting Solution. Then filtered. Measured amounts of the filtrate is placed in small vials and spot plates to make tests for calcium, potassium, phosphorous, magnesium, nitrate nitrogen, and ammonium nitrogen. A quantitative estimate of each is obtained from the reaction of certain chemicals that are added. The estimate is made from the degree of cloudiness, or the color produced by the reaction. The pH of the soil is measured on a pH meter with an electrode. Our soils are mostly on the acid side of neutral, that is below pH7. We also use the Woodruff Lawn Requirement Test with buffer solution. The buffer is at pH7. When mixed with the soil, the amount of depression of the pH indicates directly, the pounds of lime that the soil requires to bring the pH to neutral, or pH7.

NOTES ON INTERPRETING SOIL TESTS  
by Wm. G. Colby

The Test for Soil Acidity.

This is the most important soil test that we make. A close check, perhaps once a year, should be made on all turf areas - especially here in the Northeast where our soils are naturally acid and many of our management practices, especially the use of Nitrogen fertilizers, make them more so. A simple pH testing kit is an extremely useful piece of equipment. Barring this, samples can be taken and sent to a central laboratory.

Time of Sampling for Soil Tests. (In order of priority)

1. Early Spring - most reliable (avoid wet areas)
2. Late Fall - except after long period of dry weather
3. After a soaking rain
4. Before making fertilizer applications

Test samples promptly or dry before storing. If attempting to diagnose cause of poor growth, sample both "good" and "poor" areas.

Tests for Soil Nutrients.

Testing soils from turf grass areas present difficulties not encountered with row crops.

1. Turf grasses occupy the soil the full twelve months of the year
2. Turf grasses produce a massive system of fine roots which penetrate into practically every cubic centimeter of soil for a depth of 15-20 centimeters. Leaching losses of even the most soluble nutrient elements are very low from turf covered soils.
3. New feeding roots are formed yearly and the old ones slough off. Decomposition of these sloughed off roots yield organic acids which play a vital role in making "fixed" phosphates available to growing plants.
4. Root growth begins very early in the Spring when soil temperatures reach 40 to 50 degrees F. and are active late into the Fall.
5. Turf grasses, especially the Bents, have a very high feeding power for soil potassium - even from slowly available forms in the soil.

The Test for Nitrogen.

The nitrogen test is difficult to interpret because there is no difference between a soil supplying just enough nitrogen to promote good growth and a soil actually deficient. Any free nitrates in the soil in both instances will be quickly taken up by the extensive system of grass roots and will not show up in a soil test. Further, the formation of soil nitrates from decomposing organic matter is a biological process. How important this source of soil nitrates is cannot be determined by a soil test.

### The Phosphorus Test.

Because of the large degree to which soluble phosphates are fixed in most soils, most samples will give a low to medium test for phosphorus except: (a) after fertilizing and (b) where a substantial quantity of soil organic matter is decomposing.

Grasses are very efficient users of soil phosphates even of "fixed" or difficultly available forms. Furthermore, the problem of "luxury" consumption does not exist with soil phosphates. Plants take up about what they need within a wide range of fertilization rates. This means that liberal quantities of superphosphates applied during seed bed preparation will meet plant phosphorus needs for considerable periods of time, particularly if clippings are not removed.

The phosphorus is unreliable for turf areas because (a) there is no measure of fixed phosphates and (b) the release of phosphate from fixed forms is a biological process which cannot be evaluated by soil test.

### The Potassium Test.

The potassium test on turf areas is usually a poor indicator of what the potassium needs of turf grasses really are. Kentucky Blue Grass and particularly the Bent grasses, can obtain adequate amounts of potassium when the measured level of available potassium in the soil is very low. This is because of the peculiar nature of the roots of both species. If large quantities of potassium fertilizers are used - enough to give a good soil test for potassium - the turf grasses will take up potassium in "luxury" amounts and the potassium level may be so high that invasions of white clover will be encouraged.

A constant yet relatively low level of soil potassium will maintain healthy growth of turf grasses.

### Conclusion.

Testing for soil nutrients can be helpful in diagnosing plant nutrition troubles but soil tests are not a substitute for a good balanced fertilization program carried out under the direction of a competent, experienced superintendent.

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LESSONS LEARNED FROM THE 1958 SEASON  
AS APPLIED TO GOLF COURSE MAINTENANCE  
A. M. Radko, U.S.G.A. Green Section

The 1958 season was abnormal in rainfall and temperature. Soils were fairly well filled to capacity from snows of the winter season, and spring rains added to the problem. As a result, we encountered a super-

saturation which accentuated turfgrass problems that accompany such conditions, and they lasted well into the summer season.

These problems were:

1. A tremendous increase in Poa annua growth. Poa annua seed infests most turf areas in the Northeast. It does best under very wet, cool conditions, and the early '58 season was ideal for Poa annua growth. The early vigor of Poa annua deterred the performance of permanent grasses.
2. Drainage problems were accenuated. Problems of drainage arose on areas never before troubled; many superintendents expressed amazement at areas where water showed up, attesting to the strange behavior of water under tension. It was a good year to map out areas for future drainage improvement.

For the first time in many years, early season grooming was not up to the usual good standards. Many areas were left uncut because of the difficulty of mowing operations at the time. Grasses in uncut areas unquestionably suffered physiological set-backs while excessively wet, and again when the shock of sudden close mowing was administered.

- Poor drainage retarded turfgrasses on all golf course areas but particularly on putting surfaces, which caused summer problems.
3. Turfgrass performance. Root systems were shallow and in many cases barely existent. Air space in soils were replaced by water and the needed supply of oxygen was cut off or severely reduced. Color and vigor of permanent grasses were impaired.

Wet soils are cold soils and there was little growth of permanent grasses in early season. Some experienced trouble because they tried to force the grasses at a time when little response was likely. There resulted a buildup of nutrient materials that exploded the first week of high temperatures -- oversucculence of the turfgrasses encouraged disease and sudden collapse of the turf. At a time when cool moist conditions prevail, it is advisable to try to force the grasses too quickly, and when little response to normal fertilization is obvious, it is a good practice to revert to careful liquid feeding. Iron sulphate, too, is a good material to help bring color to the putting surface. When soils are cool, micro-organisms are slow to work, hence the poor response to materials which require their help in breakdown.

4. Damage due to traffic and mechanical injury was greater in '58. The soft soils invited compaction particularly in the upper fraction of the soil surface. Scalping was also more pronounced because of the tendency of mowers to dray under soft soils. During the summer season, though soils were extremely wet beneath, the top fraction was quick to dry with high winds, and high temperatures caused wilt and increased mechanical injury as a result.
5. Diseases were more a problem due to high humidity and wet conditions. Brownpatch was more prevalent, and in cases where wilt

occured over brownpatch infested areas on greens, the loss of turf was pronounced. Over the season, Superintendents using mixtures of Thiram and mercury seemed to have less disease troubles. Hydrated lime also was used to excellent advantage on many greens. During wet, humid seasons, light applications of hydrated lime are most helpful in combatting disease infestation.

Dollarspot in fairways was a major problem in '58. Many courses were troubled, and Poa annua was particularly hard hit. The cup-iness of fairway turf due to these factors made for poorer fairway turf. Members learned that water was not the entire answer to good turf production -- also they became more aware of disease problems.

6. Wilt problems. The shallow rooted turf on greens particularly performed well as long as temperatures were low. During the second week of July, we suddenly changed from low to high temperature readings and the grasses wilted. "Wet wilt", scald, and algae were problems from mid-July on. Some of these troubles were compounded undoubtedly due to the lushness of turf growth.
7. Weeds generally did not become too troublesome in '58 with exception of a few isolated cases. The cool temperatures may have been a factor, but the heavy infestations of Poa annua and the vigor with which it grew left little room for strong growth of most other weeds.
8. Unwatered fairways fared better than watered fairways. This phase of problems cannot be attributed wholly to the 1958 season; it rather is a question of watering practices which caught up with golf courses in '58. This phase is unquestionably one of the most difficult to get across to a membership because of the seeming mania for green turf all year around. Secondly, because of the topography of the fairway areas, it is impossible in most cases to do a job of watering as you would like to do it. It is impossible not to overwater certain areas while other areas receive less than they should. As a result, weaknesses develop and the areas that were hardest hit were those that have been overwatered in prior years.

Lessons learned in '58 in summary are:

1. Permanent grasses are slow to respond in early season when temperatures are low and soils are cool. During such seasons, it is safer to keep grasses on hungry side. Try iron sulphate treatments to help provide color, and consider leaf feeding (liquid fertilizer) when soils are cool. Each must be light treatments.
2. Water is not the entire answer to color, nor good turfgrass production.
3. Good drainage is the foundation on which good permanent turf is produced.
4. In wet, cool seasons, normal fertilizer programs must be altered.
5. In wet, humid seasons, normal fungicide programs must be altered.
6. Micro-organisms do not operate efficiently in wet, cool soils.

7. Problems of fairway irrigation caught up with many courses -- unwatered fairways showed to advantage.
8. Observation and judgement on the part of the Superintendent is most important to a sound program of maintenance and management.

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THE OUTLOOK IN CHEMICAL WEED CONTROL ON FINE TURF  
by John Gallagher, Amchem Products Inc.

Efficient weed control practices must become part of the overall turf management program. The value of weed control when tied into a fertilization program is greatly increased.

Weed control chemicals should not be used haphazardly. Accuracy of measurement and application are often critical. Equipment must be calibrated and adjusted for accurate distribution. Selective weed control chemicals are useful on fine turf only if common sense is used to keep them safe.

Fine turf weeds can be grouped into several classes, the first are the broadleaf weeds susceptible to 2,4-D. The following weeds can be controlled at rates of one to two pound of 2,4-D per acre: dandelion, broadleaf and narrow leaf plantain, purslane, wild carrot and self heal. On bent grasses cut the rate to  $\frac{1}{4}$  or  $\frac{1}{2}$  lb/A and make multiple applications two or three week intervals.

Wild garlic and wild onion are the one group of 2,4-D sensitive weeds that require a specific formulation. Ester forms are recommended and a three season control program is required for complete eradication.

The following broadleaf weeds have, in the past few years, received a certain amount of research work which has produced a specific control chemical. The veronica species can be controlled by Endothal. Because of the mat forming growth habit of this weed renovation is usually suggested. Sheep sorrel seems to be susceptible to the benzoic materials.

The second class of weeds are those that are susceptible to 2,4,5-T Propionic. The rate of application of  $1\frac{1}{2}$  lb/A will control most of the following weed species. Chickweed, both perennial and annual, white dutch and other clover species, oxalis, ground ivy and spotted spurge. Caution is suggested when treating for spotted spurge because it is a summer annual and turfgrasses may be more susceptible. The others are winter active weeds and turf response is less critical. There is some preliminary data to indicate that yarrow is also susceptible to 2,4,5-T Propionic. One last broadleaf weed that is worth mentioning is knotweed. This is a weed that is characteristic of compacted soils. In a very young seedling stage it is susceptible to many chemicals. Timing can be critical once the plant becomes stemmy it is difficult to kill.



## Grass Weed Problems

The most common grass weed problem is that of crabgrass. Two general control methods are being used - pre-emergence and post-emergence.

The post-emergence control chemicals have not changed since the introduction of DSMA. Effective post-emergence control depends on timing of applications. Crabgrass is most easily controlled when it is in the seedling stage, at that time it is most susceptible to herbicides and the turf is most aggressive and resistant to turf injury. DSMA and PMA are standard materials for post-emergent crabgrass control. Sodium arsenite and potassium cyanate are still being used and where used correctly can do a good job. DSMA at  $3\frac{1}{2}$ /A for seedling treatments and 7 lb/A for mature crabgrass are recommended for control. At these same application rates other annual grasses such as foxtail, twitchgrass (*panicum* sp) and nutgrass are eradicated or controlled.

Pre-emergence crabgrass control has received considerable publicity and a fair amount of research over the past few years. I personally feel that if we could learn to accept 75% control of the potential crabgrass problem from a pre-emergence application we could easily handle the remaining 25 percent with fertilization and a single post-emergence application.

At the present time, calcium and lead arsenate, the commercial fertilizer-arsenic compounds, as well as chlordanes are being promoted for pre-emergence crabgrass control. Dr. Daniels has shown that calcium arsenate at 12-16 pound per 1000 sq. ft. has given good control. Spring applications of chlordanes at 60-80 lb has produced best results for Dr. Engel at Rutgers. There is some question in the mind of the entomologist as to the value of these high rates. They are concerned about the possible buildup of these materials in the soil.

This increased interest in pre-emergence control of crabgrass has stimulated research on the part of industry. Several companies have introduced possible materials which are undergoing extensive tests in the field this year. Diamond Alkali Co. has a material which provided satisfactory control at 16 lb/A. The Dow Company is testing a new product at 10 lb and 20 lb per acre which in addition to controlling crabgrass seems to have some specificity for *Muhlenbergia* (Nimbelwill).

AMCHEM is looking at Fenac. In our tests last year, Fenac provided 85% control at 3 lb/A with a single April application. We presently have out a series of tests in which this material was applied at three time periods; Fall, Winter, and Spring. Our interest here is to determine its residual effect on both crabgrass and fine turfgrass seed. We are very hopeful for this material. It is being tested at some 18 different turf research stations.

## Soil Sterilants

A final group of herbicides that should be mentioned are the temporary

soil sterilants. These can be used to provide a clean seed bed for the establishment of new plantings. The material most commonly used is methyl bromide. This is a poisonous gas and requires a complete airtight seal. Its advantage lies in the fact that you can plant within 48 hours after treatment. Two other materials quite similar in effect and chemical structure are Vapam and Mylone. These are short term sterilants requiring waiting a minimum of three weeks before seeding. Both materials need a water seal after application. The last material is one which has been used in the past. Granular cyanamid when used correctly can provide complete renovation of weedy turf.

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NEW DEVELOPMENTS IN TURFGRASS DISEASE DIAGNOSIS AND CONTROL  
by Frank Howard, U of Rhode Island

I would like to entitle my talk the micro community in the turf profile. The microbes down in the soil profile are important in the growth of grass. We need to become acquainted with the inner relationships between the microbe community and the grass plants with which it associates. The grass plant may be stimulated, retarded, diseased, or residues accumulate as thatch, depending on the life activities of the microbes of the turf profile. We grow microbes as well as grass. More micro-organisms are found in soil with plants than in the bare soil. Each type of grass favors its own society of micro-organisms. The plant tissues are attacked by both mechanical and chemical means. Some microbes, the saprophytes, attack only dead vegetation, and these are important in relation to thatch. You fertilize, not only for the grass, but also for the organisms that break down the thatch. An ounce of soil will contain about one million microbes. Some fungi kill only fungi with chemical antibiotics. Some fungi spear nematodes and help keep them down. Others capture nematodes with loops. A virus-like material has been found that kills fungi. The plant makes food for itself, and a limited number of free boarders as long as light, air, moisture, leaf surface are adequate. If one or more of these factors become limited, the free boarder takes over the host. The organisms have a greater advantage in conditions of low aeration such as underthatch, or in wet soil. Short periods of flooding can greatly increase rhizoctonia for this reason: Why is some grass resistant, and others susceptible to fusarium. Some plants give off exidate, it stimulates the fungi. The resistant species do not give off the exidate. Most organisms live in the upper two inches of the soil, and are saprophytic. When conditions are unfavorable for the grass, they become parasitic. Fusarium will grow in a wide range of temperatures from just above freezing to 90°. A condition of only rhizoctonia, or only fusarium may not cause much damage to the grass, but a combination of the two, or two or more species of fusarium, is likely to cause severe damage. One initiates the damage, the other follows through. Some organisms are purely saprophytic, and never become parasitic. They are helpful in breaking down thatch. Some check the growth of parasitic organisms by the production of antibiotics.

Ammonia is used mostly by microbes. Nitrates mostly by plants, so by applying ammonia, you can satisfy the micro-organisms, and you don't get disease in plants. You can apply ammonia or urea to prevent rust on Merion Bluegrass. Ammonia and urea can cut down on rhizoctonia also, unless you apply too much, and you get more disease from too succulent growth. The stemfilium organism attacks grass that is low in carbohydrate due to lack of sunlight following cloudy weather. Disease can also attack when grass wilts. Every night there is 100% relative humidity at the grass line. When we also have a few days of cloudy or rainy weather, then we get brown patch. Here is an example of how brown patch develops. The rhizoctonia grows up from the soil to the surface, then spreads out along the grass without causing visible damage. Then conditions such as two or three days of cloudy weather predisposes the grass to entrance by the fungus, and suddenly you see a large spot. If the sun then comes out, and dries the grass, or you apply fungicide that injure the fungus, then antagonistic organisms may attack and destroy the rhizoctonia. It is important to treat brown patch as soon as you see it because if allowed to develop, you get the formation of sclerotia, which are very hard to kill. Light may effect the formation of sclerotia of some races of fungi. Fungi are affected by the reaction of the soil. Generally, fungi thrive more under acid conditions. Bacteria thrive more under ackaline conditions. Fusarium is stimulated by the exidation of grass plants. Micro-organisms are protected from extremes of temperature by the insulating quality of soil. We are trying to find systemic fungicides that will move in plants and prevent diseases. Watering at night is more economical than in the daytime because less is lost from evaporation. If, after watering at night, the sun comes out bright the next day, and dries off the grass, everything is fine. If the next day is cloudy however, so that the grass remains wet, then you are in trouble because the fungi have had an opportunity to get a good start. Most organisms require liquid water to germinate spores, but mycelium grow at a high humidity. In conclusion, we are all agreed that proper moisture is one of the important single factors to growing good grass.