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# 1963

Philip Scott

Charles Amorim

Hal Haskell

James F. Gilligan

Leonard Mailloux

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STOCKBRIDGE SCHOOL

# TURF CLIPPINGS

CONFERENCE PROCEEDINGS

G.C.S.A. SCHOLARSHIPS AWARDED TO THREE TURF SENIORS

G.C.S.A. scholarship certificates awarded to C. Robert Phipps, George Thompson, and William R. Handrich, Jr. by Sherwood Moore, second left, former President G.C.S.A. Certificate presentation was made at the Annual Turf Conference—1963—at the University of Massachusetts.

## OUTSTANDING STUDENT AND ATHLETE

James Gilligan, a senior in this year's turf class, was honored at the Stockbridge School of Agriculture's Progress Banquet as the outstanding basketball player for the 1962-63 season. Giving him the award is Coach Dick Bergquist.

Jim is a real hustler on the basketball court, and classroom too. He was recently voted by his classmates and professors an outstanding student among the turf management majors in the class of 1963. This is an annual award and his name will be placed on a permanent plaque in the Stockbridge Hall Building.

# 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. 1 No. 8 Turf Management Club
Agronomy Department
University of Massachusetts
Amherst, Massachusetts

Co-editors
B. Fanlon & J. Reidy
Advisor
Prof. Joseph Troll

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Contents

# Trees for a Beautiful Golf Course

Philip Scott

Picture a spacious eighteen hole golf course with an immaculate turf-but not a tree in sight. In my estimation the course would be a pretty dismal one; not conducive to building a good club. Yet, many many courses that have been constructed do not even consider the value of a tree.

What I shall do is suggest some trees, for your course; trees that are adapted to our Northeastern climate, and which would greatly aid in the beautification of a course-not forgetting their practicality.

First, let us start at the clubhouse. The ideal tree for use around a low contemporary clubhouse should be the flowering Dogwood. The Dogwood has various characteristics that make it a standout during the different seasons of the year. In the spring it develops beautiful white or pinkish petal-like bracts; the summer it displays a dark waxy-green foliage; in the fall it boasts scarlet foliage and bright red berries. There are other trees that might prove suited for this location such as, the flowering Crabapple or the Japanese lilac.

Next let us look at the tee area. I feel that every tee should have at least one shade tree adjoining it to provide a shaded resting spot for the weary player. My choice of trees for this location would be the Amur Corktree because it has wide spreading branches and an intriguing bark that is corky and deeply fissured. Here also would be a good spot for the Katsura tree; it is small has banana shaped fruit, a golden-yellow fall foliage, and a regular columnar crown.

Along the fairways there are many species of trees that can be used. However, the first consideration should be the type of soils available for along the fairways one may have quite a variance as to choice. In wet areas the Willow seems to be the old standby, but I feel that a cleaner substitute could be found. For example, the Larch has a lot to offer in this location; it has light green graceful branches that turn a golden yellow in the fall. On the sandy soils perhaps the Red Pines might be readily acceptable, then again maybe Ginkgoes might be desired. The latter has high branches, and casts a shade that is narrow enough to allow grass growth under it to be unaffected.

Sweet Gum trees, with an underplanting of Japanese Maple make a good background planting; especially in the fall with the Sweet Gum's pinkish-purple color blending into the scarlet-orange of the Japanese Maple.

There are, of course, many more desirable trees for golf courses but be wise in your selection. I feel that when a club is purchasing trees for its course it should look for more than just green leafed trees it should be thinking in terms of all year round beauty, and how can the beauty of the tree be utilized to the best advantage of the surroundings. Keep in mind you do not have to keep your selection in the Maples, Willows, etc., but perhaps you should be thinking in terms of Ginkgoes, Dogwoods, and Sweet Gum's.

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## The Golf Course's Worst Enemy

Charles Amorim
Malcolm Haskell

Is it insects, drought, poor management or mismanagement of funds? No, we think it is the two legged monster who invades the golf course, the careless golfer.

Whether rain or shine the hacker or duffer is out trying to improve his finesse with his weapon or what is called a golf club.

Some golfers are like insects, they infect the whole course in some way. They often take a divot about the size of a small elephant out of the first tee without replacing it and go on to dig enormous shell holes or what would appear to be, in freshly raked sand traps. Often a sign "Keep off Seeded" is turned into "Keep Swinging and Dig Up as Much Turf as Possible."

Often when mowing greens in the early morning you may see tracks on the greens, they usually are from a golf cart driven very haphazardly over the green on top of the cup and through a sand trap. Many golfers feel that when they pay their greens fee they own a part of the golf course and can renovate it in any way they see fit.

One of their best ways to renovate is by making furrows with their golf spikes. Some of these furrows are big enough for tulip bulbs, while others are about the size of a six inch earthworm.

After the golfer has assaulted the course, he rests in the clubhouse and complains about the bad condition of the course. You, as the superintendent, take the abuse with a grain of salt. As you get to know these golfers, you find that they are just like women, you can't understand them but you can't get along without them.

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## Message from the President

James F. Gilligan
Turf Management Club

Today in this fast rising field of golf course management the need for qualified men is greatly increasing. With greater emphasis placed on newer methods of management such as the use of new and better chemicals, improved equipment, and training of the labor force, a man with practical experience combined with a background of theoretical experience is the man who is needed today to meet the demand for qualified men.

As a student with some experience, there were many things that I wondered about before coming to school. Now after discussing them with professors and fellow students, I have a better understanding of them and of the other that it takes to successfully maintain a fine golf course. Education in the turf field today is of primary importance along with practical experience.

In my own opinion I feel that any young man thinking about entering the turf management field should consider attending a course in turf management after having sufficient experience. The turf maintenance course at the Stockbridge School of Agriculture has greatly increased my knowledge of the many aspects of growing fine turf and the other related duties that are encountered throughout the lifetime of turf management.

I do not think that too much emphasis can be placed on education in this turf field. The students themselves and the superintendents for whom they work benefit from the education. Due to the increased interest in golf we should be seeking new and better means to maintain fine golf courses.

---

## Turf Management Club News

### 1962-1963 Officers

President -- James Gilligan
Vice President -- David McCarthy
Secretary -- George Thompson
Treasurer -- John Traynor

### Guest Speakers

October 24, 1962 — Mr. Richard Blake, Superintendent
Mt. Pleasant Country Club
Boylston, Massachusetts
Topic - Installation of Various Drainage Systems

November 14, 1962 — Mr. Harold Smith
Clapper Company, Inc.
West Newton, Massachusetts
Topic - Turf Equipment

November 28, 1962
Topic - Business Meeting

December 12, 1962 — Mr. Narry Sperandio, Superintendent
Past President of the G. C. S. A.
Concord Country Club
Concord, Massachusetts
Topic - History of the New England Golf Course Superintendent Association

January 6, 1963 — Mr. Magovern
Magovern Company, Inc.
Windsor Locks, Connecticut
Topic - Slides were shown of Europe and the British Isles

February 13, 1963 — Mr. Robert Harper, District Manager
Aqua-dial, Company, Inc.
Topic - Installation of Irrigation Equipment for Fairways and Greens

February 20, 1963 — Mr. Winchell, Agronomist
Corenco Company, Inc.
Topic - Phosphorus

February 20, 1963 — Mr. Lawrence Dickinson, Retired Professor of Agrostology
Amherst, Massachusetts
Topic - Management Practices and the Status of the Golf Course Superintendent

March 6, 1963
Topic - Film on Water Movement Through the Soil
Compliments of Milwaukee Sewage Commission

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Quotes from 1962 Freshmen

Bruce Haworth --- "that's mine, and stop asking so many questions"
Jack Martin --- "and so on and so forth"
Roy Mackintosh --- "take your shoes off first, before you get into my new car"
John Madden --- "Have you seen my wife, she's supposed to pick me up here"
Jim Macdonald --- "O we've got a couple of those where I worked"
Malcolm Haskell --- "alright, who's got my pipe and remember Norton is the best"
Charles Amorim --- "I may be short but look out"
Pete Begley --- "I get that Woody as soon as I get done lifting those weights"
Woody Jefferson --- "I not scared, the record company will get me first"
Al Martin --- "how do you put the arc weld out"
Bill Byers --- "does that have the same effect on turf in the mid-west"
Dick Anderson --- "Curt, what did he say"
Curt Chase --- "I don't know, I don't understand Greek"
Bob Chalifour ---"Scheyhing never would have gotten my vote if he didn't beat me up"
George Machado --- "if I can't sit at the back of the class then I'm not going"
Pat Lucas --- "alright, who's got my boots and newspaper"
Lenny Mailloux --- "see those girls over there, they're warm for my form"
Jerry McCarthy --- "no I can't go, I'm going home this weekend"
Mark Kaplow --- "I haven't worked on a golf course before but I caddied for 7 years"
Art Moriarty --- S M T I P R winner - Spent Most Time In Pool Room -
John Traynor --- "who do you think is the best qualified for the position"

Dale Sandin --- Winner of the AGROS CLAM BAKE - low gross
Dick Gonyea --- Hope you take good care of Lenny this summer
Bob Coffey --- "I would like to say this about that"
James Rocha --- "did you see the eyes on that girl over there"
Don Daigle --- "don't be silly, us married men don't notice things like that"
George Gorton --- "speak for yourself please"
Steve Zoldak --- Runner up in the CLAM BAKE - low net
Fred Scheyhing --- Rumor has it that Fred has arranged for the Hatfield Barn to be open on both Wednesday and Thursday nights.
Gerry Peters --- "do they have a study lounge there"
Phill Scott --- Has promised to give a lecture on how Gerry Peters does it. Has practiced it himself and says it really works. STUDY
John Cronin --- "if it wasn't for just a couple of low marks in Plant Pathology my average would be right up there"
Wayne Zoppo --- We were wondering where he got the money to buy the new car, well we found out. He doesn't buy so many razor blades.
Al Wilson --- "does any one have Jack Martin's mailing address"
Dave Discenza --- Roch - abye - baby on the tree top **********

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When I Consider How my Night is Spent

Leonard S. Mailloux

To begin with, my name is Sarah. I live on the eighteenth fairway at the Duffer's Country Club, and I should like to relate a story that was significant in my life; perhaps in yours too, that is if you are a grass plant, or a lover of fine turf.

My story begins innocently enough although for me it did have some harrowing consequences. The whole picture came back in a flash when one day as I was fanning myself in a Southwest breeze a hand grasped me about my ligule and would not let go, that is not until I told him all about the sex life of a grass plant. I demurred at first but under constant pressure I relented. It may be difficult for the reader to comprehend why I was reluctant but who is willing to divulge, at anytime, our most cherished secrets.

My sex life was fascinating. Oh--to relive those days. Fred and I grew up together on the same fairway, and then it happened--I fell in love with him--madly. Even as little shavers we were always fond of one another, however, a day came when our childhood friendship grew into an affectionate, deep-pulsing love for one another.

At first, I was shy, but Fred was not. He taught me so many wonderful things. I didn't know the first thing about love-making until one night while Fred and I were fanning in the breeze. What a night--a clear mid-summer's evening with a full moon smiling down on our greens! Fred kept eyeing me, evidently he noticed what a full wholesome specimen I was. He just couldn't resist my rich green color and my succulent appearance,

of local high schools have used the same principle for the education of students.

In conclusion, the best solution lies in protective measures, good public relations and legal action against offenders.

---

## Safety - The Superintendents' Responsibility

Gerald Peters

Golf course maintenance in most sections of the country is seasonal. Many courses, because of limited budgets, lay off men by the end of November. Older reliable and capable men seek employment which is steady. Every spring the superintendent is forced to hire inexperienced teenagers. Most 15 and 16 year olds are happy-go-lucky, thinking only of enjoying the outdoors and running machinery.

It is the responsibility of the superintendent to instruct the new help about the basic hazards of golf course maintenance. They are machinery, chemicals and nature. Machinery runs from the biggest, most complicated fairway tractors down to the simple but dangerous rotary mowers. Every year you read of someone losing a finger or toe in a rotary mower. The superintendent should spend some time instructing the youngster on level ground before sending him out to cut difficult areas. By giving the youngster experience on rotary mowers he will then be capable of operating the more powerful tractors and trucks. Make sure he is a careful driver before letting him drive expensive equipment.

The second basic hazard is chemicals. The superintendent, through his education and experience, knows which chemicals are dangerous and which are not. By instructing his help and by making them wear rubber gloves when handling chemicals, many dangers can be avoided. The dust and spray of chemicals is another agent that causes trouble. This danger can be avoided by wearing goggles or face masks when mixing.

Nature is the last of these hazards.

The Sun -- By making the workers wear hats and shirts, cases of sun stroke and bad sunburns can be avoided.

Lightning -- During summer thunderstorms all outside work should cease. The workers should be instructed as to where to go if caught out on the course during a summer storm.

For the amount of time the superintendent will spend instructing his crew on the hazards of course maintenance he will be rewarded ten fold. He will then have a careful, healthy, experienced crew and their work will be his reflection.

---

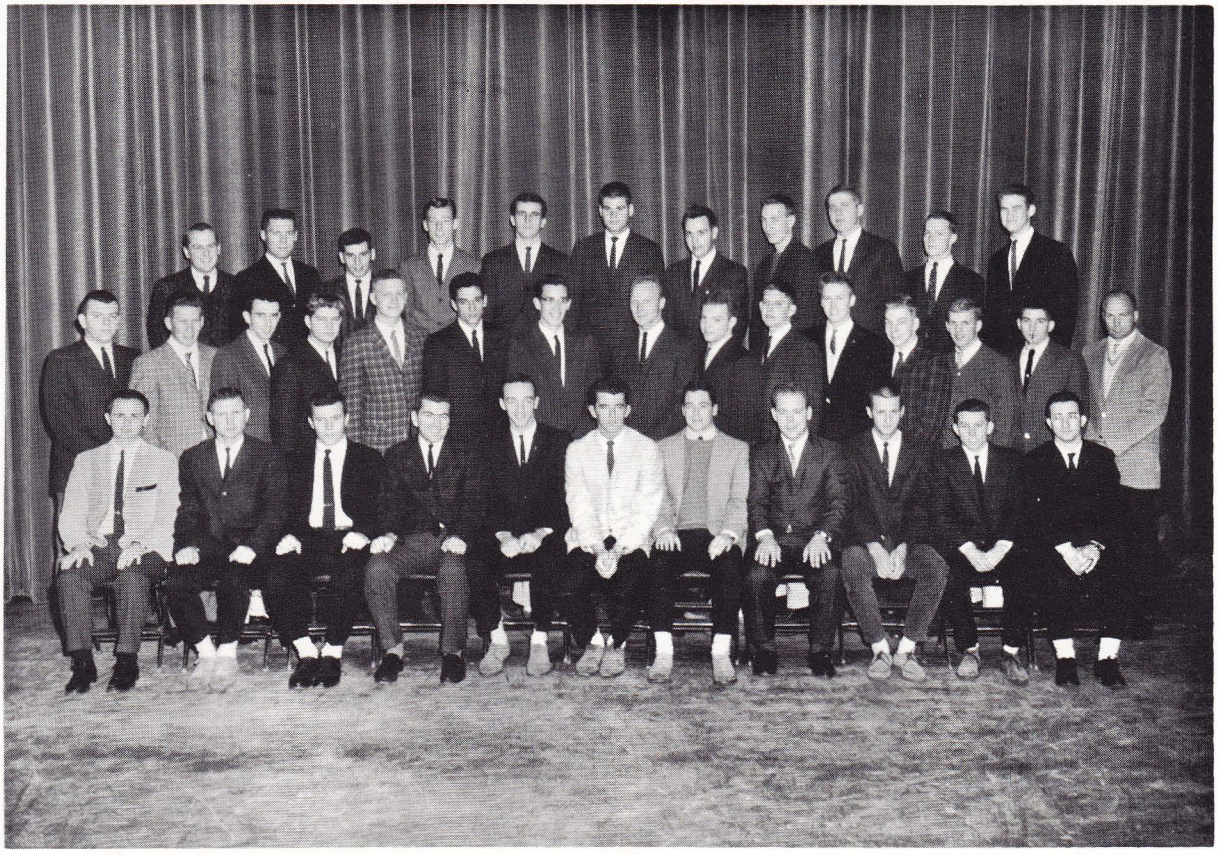
GRADUATING CLASS—1963

STOCKBRIDGE SCHOOL—MAJORS IN TURF MANAGEMENT

Front row, left to right: J. Serleto, Jr., D. Stimson, J. Gilligan, E. Kennedy, E. Fufaro, Jr., A. E. Wilczunski, D. Vibber, J. Sperandio, W. Church.

Back row, left to right: D. Lumsden, W. Handrich, Jr., D. Quast, E. Zenisky, Jr., C. R. Phipps, G. Thompson, K. Kelliher, R. Westner, J. Cipriano, B. Hanlon, A. Kruckas, Jr., J. Merski, Jr.

Absent: J. Reidy.



FRESHMAN CLASS—STOCKBRIDGE TURF MAJORS

First row, left to right: C. Wilson, J. MacDonald, A. Lapham, J. Martin, D. McCarthy, J. Cronin, J. Traynor, D. Sandin, L. Mailloix, R. Chalifour, C. Amorin.

Second row: D. Discenza, M. Kaplow, P. Scott, G. Zoppo, P. Lucas, G. Machado, B. Haworth, F. Scheyhing, W. Jefferson, P. Begley, C. Chase, R. Anderson, W. Byers, J. Rocha, D. Daigle.

Back row: M. Haskell, R. Gonyea, G. Peters, R. Coffey, A. Moriarey, A. Macintosh, J. Madden, G. Gorton, S. Zoldak, D. Hickey, R. Sears.

## Kansas - In the Transition Zone

Carl Beer

The transition zone can best be described as the area in which bents and Bermudas can be grown, both with some degree of satisfaction.

Average rainfall is about 40 inches per year, temperature fluctuations can be from -20° F. to 110°F. The growing season usually starts around the first part of April and ends in late October or early November.

Cohansey, Seaside and Penncross are the most commonly used bents. Cohansey seems to be the favored, partly because of its light green color to reflect sun-rays, its vigorous growth and its ability to recover quickly from drought injury. Cohansey will mat very quickly unless it is properly maintained. It is very susceptible to Brown Patch and Dollar Spot. A weekly preventative fungicide program is used, usually starting in early May and ending in late September.

Bermuda is used for fairways and tees. The only bermuda that can withstand the severe winters is U-3. It is imported into our area and planted into the fairways by sprigging. Tees are usually planted by stolonizing or sodding.

The biggest problem on Bermuda is Spring Dead Spot. Spring Dead Spot can best be described as circular-shaped dead areas resembling snow mold injury. It cannot be detected until the unaffected area greens up in the spring. It is not known whether it is caused by an insect or fungus. It is non-selective as far as location. It can be found on slopes, valleys and flat areas. The grass around the dead spots seems to be unable to grow into the affected area so the only solution to date is plugging or re-sprigging.

Bermuda can withstand heavy herbicide applications so weeds are not a major problem in bermuda turf.

The most common turf insects in this area are the sod-webworms, cutworms and the frit-fly. The frit-fly is a very small fly about 1/16 of an inch long. It works in the crowns of the grass plant and causes turf to have a chlorotic and weak appearance as though suffering from drought or disease. Most commonly used insecticides are chlorodane, DDT, Arsenate of Lead and dieldrin.

Major weed problems are with Poa annua and crabgrass which seem to crop up in every bare area. Dacthal and chlordane have given good pre-emergence control of crabgrass. Post-emergence treatment of crabgrass is usually sodium arsenate. Lead arsenate is used for control of Poa annua.

Sometimes the grass seems greener on the other side of the fence, but each individual area has its own particular problems. The problems listed above are but a few of the Transition Zone in Kansas.

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## Seeds

Don Daigle

Seeds are borne by two different classes of plants. One group, not as highly developed as the other, produces "naked" seeds that develop from "naked" ovules. In the larger of the two main classes, the ovule and the seed develop within an ovary i.e., the seed vessel. The ovule contains the ovary with its egg, or female sex cell, and in time the ovary becomes a fruit with the developed ovule or seeds enclosed. This group of seed-bearing plants are called angiosperms, or the group that has vessels for seeds. The other group of plants, the gymnosperms, are the "naked" seed producing plants; they have no ovaries, no flowers, and no fruits but will usually produce seeds. A prime example of the gymnosperm class are the conifers many of which are of the cone-bearing type and have their seeds borne, in pairs, at the bases of the scales of the cones.

Within the ovary of the mother flower, or between the scales of a seed cone, lies the ovule which contains an embryo sac and its tiny egg; this egg must be fertilized by a sperm cell from a pollen tube before it can begin its development into an embryo from which the parent or adult seed emerges.

Beside the embryo, there develops a special store of food, the embryo's own special formula or diet for its use after it is separated from the mother plant. Every seed contains carbohydrates, proteins, fats and minerals with which to sustain the embryo within. The nature and proportions of the stored food differs from plant to plant depending on conditions present at the time of development. In general, the corn seed will be found to be stored with a large amount of starchy material, the flax or sunflower seeds will contain great quantities of fats and oils; the pea will contain huge amounts of proteins.

Large seeds may contain a billion times more food than the smallest ones. Some kinds of seeds will have most of their reserve supplies packed inside their seed leaves; yet, others have the food packed in tissues, developed from the embryo sac, called endosperm, or from the cells of the ovule that surround the embryo sac.

The seed, in general, is well protected through its various stages from fertilization to maturity, and of necessity this protection varies from class to class. Usually, the ovary and the tissues that are attached to the seed become the fruit of the plant; and within the fruit, deeply encased, are the seeds. In time these well protected seeds under optimum conditions will be a mother plant. Where seeds are well protected from damage and are well encased one will find the gymnosperm type of seed and plant, in most cases the seed will have some form of protection. For example, the seeds of the pine tree are hidden at the bases of the scales of the cone, and as the cone scales separate the seeds are released.

I have tried in a small way to give the highlights of variances between the gymnosperm and the angiosperm seed development; of course, there are many exceptions and it was not my intention to be specific, but rather generalize to give you a better understanding of seeds, in general.

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LEADERS IN EXTENSION AND EDUCATION ATTEND
ANNUAL TURF CONFERENCE—1963

Left to right: Fred P. Jeffrey, Associate Dean, College of Agriculture, William G. Colby, Head, Department of Agronomy, J. Richard Beattie, Associate Director of Extension, College of Agriculture.

GRADUATES OF WINTER SCHOOL FOR TURF MANAGERS—1963

Front row, left to right: T. Friedley, K. Fuchs, R. Barnhart, J. Michalman, M. Leary, W. King, C. O'Leary, R. Kirkpatrick, J. Petrarca, M. Lucas.

Second row: J. McFarlane, J. Markham, S. Woodcock, K. Cody, R. Lussier, C. Beer, C. O'Lari, R. Welch, Prof. J. Troll.

Third row: L. Griffith, C. Biela, R. Dinnigan, B. Drummond, D. Casey, B. Furgess, E. Heath, Mr. A. Allen.

Back row: P. Trufant, D. Schurman, R. Schultz, Mr. D. Waddington, C. Spinoda.

ANNUAL TURFGRASS CONFERENCE PROCEEDINGS

1963

Conference Presentations Have Been Approved by The Individual Speakers

The various topics are presented for your information as follows:



Sponsored by Massachusetts Cooperative Extension Service, Massachusetts Turf and Lawngrass Council and Golf Course Superintendents Association of New England

# The Effect of Last Year's Weather Upon This Year's Incidence of Turf Insects

John C. Schread

The effect of weather upon the abundance of an insect species is only one of the complex natural conditions which determines an annual rise or fall in population. It is true that quite often one or more of the factors that are in a broad sense referred to as weather may determine the importance of a destructive insect species during part or all of a growing season. Quite frequently heavy rainfall during the critical development of an insect pest may limit or accelerate population density. Noteworthy in this respect is the Japanese beetle which does best during seasons of adequate or abnormal rainfall. On the other hand heavy rainfall will inhibit the survival of chinch bug during the summer months. Frequently certain combinations of weather conditions prevailing over a period of several years may result in variations and in unusual distribution of insect populations. This may result in an explosive type of response or in an almost complete disappearance of a species.

In addition to weather there are other factors which should be taken into consideration in forecasting insect abundance. Briefly some of them are parasites, predators, nematodes, bacteria, protozoa and predatory animals.

It is to be expected that the relationship between weather and these additional natural limitations on insect populations are quite often so involved that it is most difficult and sometimes impossible to separate one from the other. Hence to say one condition is the limiting factor in the population dynamics of an insect may be questionable.

The possibility of turf insect abundance during the 1963 season will be approached through a discussion of turf pests and their response to factors which may regulate their abundance.

So far as golf greens are concerned continuous care, principally fertilizing, watering and mowing, creates optimum environmental conditions for some turf inhabiting insects. Consequently local climate (which can follow a different pattern from year to year) may have very little influence on insect damage to specialized putting greens. With this in mind the golf course superintendent must be continually alert to the possibility of insect infestation and prepared to cope with a situation as needed.

In the following paragraphs an attempt will be made to relate various favorable and unfavorable climatic conditions and certain other factors to the presence or absence of turf insects on golf courses in the northeast.

## Natural Factors Limiting Japanese Beetle Abundance

A dry summer limits Japanese beetle abundance whereas wet seasons which are favorable to the beetle are usually followed by seasons of greater beetle population. Temperature and moisture requirements[1/] of

1/ Handbook #236. U.S.D.A.

the Japanese beetle indicate a response to these conditions which strongly govern the distribution and establishment of the pest. A temperature between 63° and 82° F. is needed for the grubs to hatch and reach maturity. Adult beetles present in an area where the mean soil temperature is lower may deposit eggs the embryos of which may develop to some extent but hatching does not normally occur.

Temperatures above 91°F. are fatal to early 1st instar grubs. However, older grubs appear to be more resistant and may survive temperatures as high as 95°F. No activity takes place at temperatures below 50°F. It has been shown that as the grub grows it becomes more resistant to cold. The lethal temperature for the 3rd instar grub is 15°F. Below this temperature all grubs die. A sudden change in temperature in the low range is more injurious to grubs than a slow change. The development of the insect in the high or low range may be assured but the adults are so weakened by the abnormal conditions that they fail to survive for any length of time and may not reproduce.

Ten inches of well-distributed summer rainfall is important for egg hatch and grub development. Eggs laid in dry soil dessicate quickly and do not hatch. If eggs do hatch in unfavorable moisture conditions the young grubs usually die. Furthermore, because of its delicate nature, they are unable to seek adequate moisture at a lower level.

Dry conditions during the summer of 1944 demonstrated a striking example of what may be expected from a dry summer in southern New England. Because of more favorable conditions during the previous year (1943) heavy adult beetle populations were present during 1944. Hard, dry turf was most unfavorable for egg laying during most of July and August of that year. Japanese beetles oviposited in depressions where there appeared to be a little more moisture than in surrounding turf areas. Quite often even these small depressions dried out resulting in loss of eggs and young grubs. Counts made in such areas indicated excessive egg laying whereas in nearby drier areas none or very few eggs could be found. As a result a reduction in adult beetle population during the following year 1945 was indicated.

In most areas in the northeast the winter temperature may drop considerably below 15°F. which is the lethal for Japanese beetle grubs. It would appear, however, that when the ground is covered with snow the soil temperature drops slowly and does not fluctuate much below 32°F. which is well within the safety range for the grubs. During a winter of average snowfall very little grub mortality occurs. In contrast an accumulation of ice without an underlying layer of snow is an excellent conductor of low temperatures. Hence when the air temperature drops below 15°F. the soil temperature does also, resulting in grub mortality. An examination of heavy grub populations during a twelve month period in 1943-44 in Connecticut showed that about 85% of the population hibernated within 4" of the surface. Only about 5% were found 7" to 8" below the surface and none deeper.

A low temperature of 40°F. is lethal to Japanese beetle eggs when exposure continues for a week or longer. Consequently if eggs are deposited late in the season and do not hatch their chances of surviving the winter is negligible.

## Frit Fly

Indirectly weather may influence an increase in frit fly population and the ultimate injury caused by the insect to turf, especially golf course greens. Certain European forage crops have been injured more by frit fly when the grasses were in more attractive stages of growth and less in others. Furthermore the degree of moisture present in the soil not only influence the growth of the crop but indirectly the abundance of the insects and resultant injury.

Fertilization and moisture are needed in the maintenance of putting greens. The continuous use of these essential requirements encourages frit fly increase. Although only a few of the insects may survive the winter their increase is sufficiently accelerated by ideal turf conditions that adverse weather conditions during the growing seasons may make very little difference in their occurrence and injurious activity. At this time the use of insecticides appears to be the only solution to the pro-b lem on putting greens.

## Chinch Bug

The chinch bug is easily affected by certain weather conditions which is the greatest single influence on the presence or absence of this insect. A dry spring or early summer favors survival of the first annual generation of the pest. Heavy rain when eggs are hatching will destroy young chinch bugs but is less injurious to adults. This type of inclement weather may also prevent egg hatch and maximum egg laying by gravid females. Adequate rainfall (but not heavy drenching rain) in addition to high temperature and humidity favor the development of a white fungus disease which kills many individuals. A cold wet winter is more injurious to over-wintering adults than one of heavy snowfall.[1/] Sudden changes in winter temperature are also injurious. An accumulation of freezing water where the adults hibernate is deleterious to them. Furthermore a cold wet spring immobilizes the adults. When this is followed by hard driving rain in late June and early July turf injury by the first summer generation could be negligible.

Chinch bug outbreak in any year has usually followed periods of low rainfall. This appears to be the reason for serious chinch bug trouble during the past several summers. A break in this chain of events, such as heavy rain and lower temperatures will assure a lower population potential and none or very little injury to grass.

## Leaf Hoppers

Leaf hoppers may occur in great numbers during dry seasons. They have been more noticeable since 1960 than during the later nineteen-fifties. Some years ago Dr. Fred Grau, formerly director of the green section of the U.S. Golf Association indicated to me that serious outbreaks of leaf hoppers occurred on golf courses from Maine to Florida. We look forward to some trouble from this type of sucking insect during 1963.

1/ U.S.D.A. Farmer's Bull. 1780.

## Sodwebworms and Cutworms

Sodwebworms are not an uncommon pest on golf courses in the northeast. They are a perennial nuisance and quite often seem to resist efforts to control them. I recall an experience I had in southern California some years ago where I saw lawns and golf course turf completely ruined by sodwebworms. I was told at the time that a few of the many known species were as much of a nuisance to folks on the west coast as the Japanese beetle is to easterners. Their increase is influenced by moisture and normal or higher than normal temperatures. In extremely dry turf, a condition which may be expected to occur in unwatered fairways and rough in a drought year, very few if any sodwebworms may be found. Greens and watered fairways are another matter for here continuous infestations may occur from year to year. The summer of 1959 saw a heavier outbreak in the northeast than for years. The summers of 1955-56 came close to this record but nothing in my experience equalled the situation in 1959.

It is hardly necessary to say very much about cutworms. They usually occur in smaller numbers than sodwebworms, however the injury they cause may occasionally be considerable. Here again continuous good care of greens and fairways encourage their increase. They appear to enjoy making a home for themselves in aerifier holes in putting greens. Over-wintering appears to be no problem for the many species of cutworms. In reasonably well protected hibernation localities mortality is negligible. Hence continuous annual recurrence is assured.

## Earthworms

Earthworms are ever present but do not for the most part cause any great concern excepting on greens and sometimes on watered fairways. Unless controlled, castings accumulate nightly requiring their removal before play is resumed in the morning. The usual control measures will eliminate the pests from putting surfaces or where otherwise needed.

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## Labor-Management Relations

Mortimer H. Gavin, S.J.

The most recent government figures available indicate that the golf course and golf club business had total receipts of one hundred, thirty-three million dollars in 1958. Of this amount, forty-five million dollars represented payroll. The accompanying figures for employment in this business was fifteen thousand workers. This latter figure is very conservative -- perhaps unrepresentative -- because the employee survey was made in November of 1958. That was five years ago and in a month when many golf clubs and courses were past their regular season. At any rate, the figures are impressive enough to indicate that the managers of this program do well to incorporate some discussion of employee relations.

Of course, this audience here represents not merely golf course

people but many allied interests -- highway landscapers, park managers, cemetery people, and suppliers from many fields. Our remarks are directed, in keeping with the schedule, primarily toward our friends from the fairways.

Among many possible topics we might discuss together this morning it seems most worthwhile in this first session ever devoted to labor in these conferences to consider why men form labor unions. An understanding of employees' reasons and motivations will show the principal areas in which supervision and management must be most alert.

Two preliminary observations are in order by way of clearing the ground. In the first place many people entertain the idea that the securing of higher wages is the principal and primary reason why people start unions or join unions. The fact is that wages are away down the list among the motivating factors in the minds of workers who join unions. The primary reason for most workers is protection against unfair and arbitrary treatment. We will come back to this. In the second place, there is a common misconception on the part of many people that union leaders are continually prowling about searching for disgruntled workers to add to their rolls with the main idea in mind of swelling the dues income of the labor union. The fact of the matter is that union leaders are very busy men. They have not time for such missionary work among the general body of unorganized employees. In almost every instance where new groups form a union, or sign up with an established organization, it is because they are unhappy and frustrated and make appeal for help from experienced leaders in the established trade unions.

So it is important that supervisors and managers give thought to those things that make the average worker -- who is normally a run-of-the-mill American and a neighbor -- unhappy in his work situation.

The most basic offense is for the boss to fail to recognize the dignity of the man whose work he directs. This failure in respect for the worker's dignity takes many forms. We list and make comment on a few of the principal ones.

Near the head of the list is favoritism which discriminates unfairly among workers in the same classification. This shows up in the payment of variant wages to different people doing the same work, in the by-passing of senior employees in favor of younger ones, or in out-right nepotism where the boss installs nieces and nephews and in-laws in the more desirable jobs.

A second instance could be listed under the head of irregularity of employment, especially when it is due to poor management or careless planning. The normal man needs to be able to anticipate with some certainty the hour of quitting time, the holidays he will get, the vacation at the time promised, sick leave when it is needed. He expects, as not unreasonable, the payment of some premium rate when he is required to work beyond the normal schedule for the convenience of management.

A third area is that of a reasonable line of communication which will permit, as befits free men, the airing of grievances or representations with regard to working conditions. In the concrete this means

some established and mutually recognized machinery for the handling of proposals or complaints. And such machinery should also include arrangements for terminal adjudication by an impartial outside arbitrator, whenever the parties cannot reach agreement on their own.

These notions when they are elaborated by organized workers in negotiations with management constitute the guts of a standard labor agreement. Every so called labor management contract will incorporate these elements as fundamental requirements for good order and the minimum of justice in the work relation. They set-up the "rules of the game" and guarantee their observance.

In another paper which follows, there will be discussion of the legal requirements that touch upon the employment relationship as it affects your field here in Massachusetts. But here we might note well that legal protections are usually minimal and frequently inadequate to assure justice and decency. Further, sound social policy should leave to groups, like your own and like the unions, the handling of matters of mutual interest such as wages and hours and working conditions. The more such problems are managed by the parties themselves, the less need there is for legislation and the less danger of unwise or inept government interference. A sound labor relations policy will anticipate needs like those we have mentioned and will meet them intramurally within the family.

All workers have, by the very fact that they are human beings, the right to organize into associations for self-help and good order in their work environment. American workers have this right guaranteed by law. It is true that some employers succeed in frustrating the exercise of the right but it is still there.

In addition there is working among every group of employees the natural tendency to organize their work. This is a natural and instinctive sentiment. It cannot be permanently frustrated. Often it is a tendency that lies dormant and does not result in actual organization. It will be activated by careless or unfair management. No one is this audience will take it amiss if we point out here that expert turf-masters are not always or necessarily good supervisors. So there is need for thought and planning. This care is most likely to be assured if it is the aim of management to commit themselves in written policies.

Labor unions already have organized under formal labor agreements in cemeteries, in parks, among highway landscape workers, and even on some golf courses. They will spread further into these areas in almost direct proportion to the failure and neglect by managements in meeting the basic expectations of free and dignified workers on their staffs.

Management would do well to recall that American workers every year bring to their work a higher level of educational attainment. They are smarter, more widely read, better informed. They are increasingly aware of competition in the over-all labor market for worthy workers. They know more about conditions and rewards in other lines

of work than the average worker used to know. They will not sit still or long continue in establishments where there might be serious disregard for fairness or justice.

To sum up, be assured that the greatest guarantee of a loyal and stable and interested workforce -- whether it is a half dozen men or six hundred -- is a constant consideration of the true dignity of your people. They are conscious of their own dignity. With few exceptions, American workers are happy to be cooperators and partners even when they work at the direction of others. Good management will be mindful of the fact.

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## Massachusetts Labor Laws

Andrew C. Sinclair

Thank you for your very kind invitation to appear here today and discuss with you some of the Massachusetts Labor Laws. I was especially pleased to accept your invitation when I learned that Father Gavin was scheduled to address this conference. I must confess, however, that this information was not received without some apprehension since it recalls to my mind the alibi which Milton Berle offered for his own poor Television rating after Bishop Fulton Sheen appeared on a rival network at the same time. You will recall that Berle when confronted with his diminished rating stated - "What do you expect - look at the sponsor he's got!"

The Massachusetts Department of Labor and Industries was established in 1869 then known as the Bureau of Labor Statistics which was the forerunner of the present Department of Labor and Industries which was created in 1920.

The Commissioner of Labor and Industries, John A. Callahan, is the executive and administrative head of the Department having complete responsibility for the administration and enforcement of all laws, rules and regulations which is the duty of the Department to administer and to enforce.

The Department is comprised of 10 Divisions, the largest of which is the Division I represent, the Division of Industrial Safety. The title of this Division is something of a misnomer inasmuch as the inspectional force is not concerned with industrial safety alone, but is, in fact, charged with the responsibility of the enforcement of over 3,000 laws, rules and regulations. While industrial safety is considered to be the prime purpose for the existence of this Division, other statutes regulating labor and industry, designed for the protection of both, have not been slighted despite a limited administrative and field staff.

The Division of Industrial Safety is responsible for the enforcement of the General Laws relative to the health and safety of employees in industrial establishments and on building construction projects. It is also responsible for the enforcement of regulations pertaining to the control of industrial homework, statutes regulating the weekly payment of wages, general employment statutes, wage rates, and competitive bidding

on public works. In addition, such matters as Veterans' and citizens preference and employment on public works, wage regulations relative to State Printing and Binding Contracts, public housing wage rates, and laws applicable to the employment of women and children.

The Inspectional Staff is comprised of 2 Supervising Inspectors, 1 Radiation Control Supervisor, 28 Industrial Inspectors, 5 Senior Industrial Inspectors attached to branch offices maintained in Fall River, Lawrence, Worcester, Springfield and Pittsfield, 11 Industrial Inspectors on Building Operations and 1 Wage Investigator.

A recent newspaper editorial posed the question as to what extent the State's regulatory agencies represent the public. The editorial suggested that perhaps it is inevitable that there may be a tendency of the regulated to identify themselves with the regulators., but it is greatly in the public interest that such agencies stick to the purpose for which they were set up, that is, protection of the public.

Speaking for the Division of Industrial Safety alone, the answer to this question is an unqualified "yes." It is not only our intent, but our daily practice, to administer and enforce the statutes with one purpose, to serve not only labor but to also serve industry. The name of the Department of Labor and Industries correctly implies that it is an agency particularly concerned with problems directly affecting both labor and industry. Management and employees alike are concerned with such matters as industrial safety, settlement of disputes and the impartial enforcement of all statutes, rules and regulations.

During the past several years technological progress in industry has resulted in additional responsibilities for this relatively small group of Inspectors, and when it is considered that there are approximately two and one-half million persons employed within the Commonwealth, if the Division's responsibilities were confined to health and safety of workers of the State, this alone would be a tremendous task.

It is, however, essential that Inspectors devote a major portion of their time to related statutes. For example, perhaps the most frequent questions both to the administrative and inspectional force are those pertaining to maximum hours for women and children, prohibited trades, non payment of wages, and numerous other provisions of Chapter 149 of the General Laws.

During the course of the year our Inspectors visit more than 50,000 establishments in which substantially more than a million workers are employed. It is not possible within a relatively short period of time to discuss all of the activities of the Division of Industrial Safety however, some of the sections of the General Laws are probably matters of greater interest to the representatives of this conference than others. For example, the provisions of Section 56 of Chapter 149 prohibit the employment of women and children over the age of 16 in excess of 9 hours in one day or in excess of 48 hours in one week. The same section requires that the 9 hours must be performed within a period of not exceeding 10 consecutive hours in any one day.

It has been said that most statutes were enacted as a result of an abuse by a minority. This is probably true when you consider the provisions of Section 56 to which I just referred. Were it not for the 10 consecutive hour employment, in the restaurant and other mercantile establishments, some employers would stagger the hours of women and children so that they would be employed 2 hours in the morning, 2 hours at noon time, 2 hours perhaps at supper time and two hours later in the evening. This would require the employee's presence in the immediate vicinity of the establishement for a matter of perhaps from 14 to 16 hours in order to earn 9 hours of actual pay.

Generally, Section 95 requires Educational Certificates for children under the age of 18 and over the age of 16. To a greater extent, Section 86 of Chapter 149 requires Employment Permits for children between the ages of 14 and 16. Both certificates are commonly referred to as "Working Cards."

With reference to children under 18, the provisions of Section 62 of Chapter 149 lists the prohibited trades and it may be of interest to you that among the prohibited trades for children under 18 is the operation of a motor vehicle of any description, employment in that part of an establishment where intoxicating liquors are sold, and in the operation of an elevator other than a self-service elevator. Certainly there are other prohibited trades for children under 18, however, you will understand that we are restricted by time to some of the more common violations of this statute.

The employment of children under 16 is prohibited in, or about, or in connection with any factory, workshop, manufacturing or mechanical establishment at any time under the provisions of Section 60 of Chapter 149. Such children may be employed in mercantile establishments where machinery or hazardous electrical equipment is not involved, not more than 8 hours in any one day, not more than 48 hours in any one week, and the 8 hours must be performed within a period not exceeding 9 consecutive hours in one day. Such a child may not be employed before 6:30 AM or after 6 PM nor during the hours when the public schools are in session.

It is surprising to most people to learn that the Department receives over 2,000 non payment of wage complaints annually with $100,000.00 to $150,000.00 per year collected for employees filing such complaints. Many complaints are denied for various reasons and employers and employees are granted pre-court hearings upon request. Usually, such hearings result in satisfactory settlement of the complaint. In many instances, however, the case is presented to the court at which time the Inspectors or the Wage Investigator assumes responsibility for the prosecution of the case. While the provisions of Chapter 149 are in the criminal category, in routine matters, involving violations brought to the attention of the Department, an attempt is made to arrange for compliance in preference to punitive action.

Inasmuch as there is frequently misunderstanding of the provisions of the Weekly Payment of Wage Law, it may be well for me to explain the provisions of Section 148 of Chapter 149, which, incidentally, was amended

a few years ago. The statute requires that hourly employees must be paid weekly and the payment must be made to within six days of the date of the payment. In other words, if an employee on an hourly basis is employed Monday through Sunday, the payment for that period must be made, under the provisions of the statute, not later than Friday of the following week. The amendment referred to provides that a salaried worker may be paid on a bi-weekly or semi-monthly basis. However, this statute also requires that the employees must be paid to within six days of the end of the work week. It should be apparent, therefore, that it would be necessary for an employer arranging a bi-weekly or semi-monthly schedule of wage payments to salaried workers to pay part of the wages in advance in order to comply with that provision requiring payment to within six days of the end of the work week.

Having been in the field as an Inspector, sometimes I can sympathize when an Inspector complains that he has received the title "THAT SAFETY INSPECTOR", when he has occasion to interview employees or employers in connection with the investigation of an accident, or "THAT LABOR INSPECTOR", when checking a complaint relative to overtime employment or illegal employment of women and children. Unfortunately, a frequent complaint refers to insanitary and inadequate washing and toilet facilities. May I refer it to your imagination the colorful titles conferred on the Inspector following this type of investigation.

May I express my sincere appreciation on behalf of Commissioner John A. Callahan, and the Department, for this opportunity to briefly discuss with you the activities of the Division of Industrial Safety and I shall be most happy, in the time alloted, to answer any question which you may have.

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## Golf Course Budget

John Espey

What is the purpose of a budget ---
Are budgets necessary ---
What good is a budget ---

The term "budget" is derived from the French word (bougette) meaning a leather pouch in which funds for anticipated expenses are set aside. And that, in effect, is the purpose of a budget...to have funds on hand with which to meet expenses. A budget is one of the essential tools of any business. It is the first subject under discussion. A good budget sets a definite goal and gives the Superintendent a definite plan of action. The golf course budget is not much different than that of the National or the State. You know that somewhere along the line it will be cut by the Board so it is the job of the Superintendent to use the money on the most pressing projects of the course as we all know about 80% of any budget is for labor.

Maintenance of good quality on the golf course depends upon the

carefulness, interest and knowledge of each of your men. Training and supervision are the superintendent's responsibilities. They are two of his most important jobs. Because salary represents three-quarters of your budget, he must know the capabilities of his men and assign each to the duties for which he is best qualified, or can best be trained. It is difficult to set up a standard as to know how many men are needed to maintain an 18 hole golf course properly. Much depends upon the design and terrain of the course, also whether private or municipal. As we all know, the private courses are more exacting and this must be taken into consideration.

Budget is the cost of operation. There are no half-way measures where a budget is concerned ... either the Club has the money or it hasn't. Any Country Club or Golf Course which starts the year without a budget is like a captain of a ship about to commence a long and hazardous voyage without charting a course. A budget will not give you all the answers but will help considerably in "charting your course." At the beginning of each fiscal year a budget or proposed budget should be prepared and given to your Greens Chairman so he, in turn will be able to discuss it at the year's first Board Meeting. The purpose of the budget is to keep cost within club income and to allocate funds fairly among the various club activities, so that an even balance is maintained and no project prospers unduly at the expense of the others. A budget is a waste of time and money unless each month's operations are compared with the budget forecast, and all variations are carefully investigated. This will help you greatly in preparing next year's budget. The preparation of a budget is a must and a very important function for smooth operation.

All Courses vary in their needs and their problems. The Superintendent must be able to cope with all of these and maintain a pretty well balanced budget.

It would be wonderful and simple procedure if we could have printed forms with all categories and all we would have to do is just put a check mark or fill in the amounts and the monies but, unfortunately, this is not so. Most clubs rely on their Superintendents's judgment. All budgets start with three basic factors --SALARY, EQUIPMENT and SUPPLIES. From these three categories, the multitude of items are built. A budget program to achieve maximum results must be tailored to fit the needs of your Club, as no two clubs have the same needs or finances. For example, the budgets in the Albany area vary between twenty-five and fifty thousand dollars.

Always make several copies of the budget --one for the Greens Chairman, one for the Board of Directors, and one for the Controller. A complete budget system requires the preparation of a great number of separate items and you, as Superintendent, are the one familiar with the Club to know these necessities. You must always remember, a satisfied member becomes the satisfied boss. He in turn is the man who makes a good workable budget possible.

# Golf Course Budgets

Robert St. Thomas

A survey of maintenance costs on Westchester County and metropolitan New York golf courses was conducted recently by Charles (Chuck) Fatum, Superintendent at Hampshire Country Club, Mamaroneck, N.Y. Fifteen other Superintendents contributed the data required to compile a comprehensive analysis of golf course maintenance budgets in the metropolitan area. The sixteen clubs represented in this survey are roughly comparable in type of operation. They are all private clubs with a high-quality level of maintenance, all but one has watered fairways, and all but two use union labor in their maintenance crews.

In the survey, in order to keep the results comprehensible, certain variables were omitted. Bookkeeping systems tend to vary from one club to another, and a total budget at one club may include some items not charged to the greens budget at another club. Expenditures such as Superintendent's salary, educational expenses, USGA visits, employee's meals, etc., which are common to most clubs but not all, were not included in the survey. Other items which vary from club to club include tree spraying or other contracted services, rangers or night-watchman salary, architect's fees, stationary and printing, laundry, committee charges, and many others. An attempt was not made then, to compare total budgets, but rather to compare costs which are common to all clubs.

The categorys listed in the survey are as follows: Labor cost (salaries of those men directly involved in maintenance, not including the Superintendent); Supplies (tee equipment, flags, poles, cups, etc.); Repairs and spare parts, Gas and oil, Chemicals, Fertilizer and lime, Soil and topdressing, Seed, Sand for traps, Irrigation and Electricity.

The averages for the sixteen clubs are as follows: Labor cost, $36,782; Supplies, $1740; Repairs and spare parts, $2672; Gas and oil, $1637; Chemicals, $2125; Fertilizer and lime, $3829; Soil and topdressing, $831; Seed, $923; Sand for traps, $702. It was found that because of the many different types of watering systems involving the use of well water and city water, it was impossible to average "Irrigation" and "Electricity", but combined they average approximately $4500 . The average total for the above mentioned categories is $53,868.00.

Four other categories were mentioned in the survey, but were kept separate from the others because they are not usually included in operational budgets. They are: New equipment, Construction, Trees and other plantings, and Clubhouse grounds. The average costs are as follows: New equipment, $5402.; Construction, $7636.; Trees and other plantings, $1796.; and Club grounds, $3657.

This will provide an idea of the maintenance costs in the metropolitan New York area. I would also like to mention some other aspects of budgeting which I feel are very important to any Superintendent. First of all, the public relations aspect. As Mr. Joseph Burger, who was a guest speaker at the national conference in San Diego said, we are all salesmen. If you want to have your budget approved in anything like its original form, you had better be a pretty good one.

One of the best ways to promote yourself and your budget, is to use every opportunity to express your views to your greens committee, finance committee, board of governors, or whoever is responsible for appropriating funds at your club. If you are not at the present time invited to attend the meetings of these bodies, ask your chairman if you could attend, so that you may present your views more clearly. If you depend on your chairman to present your views in your behalf, you may be disappointed. He may not understand the particular situation as well as you do, or may not be entirely convinced himself that a particular program is needed. With your intimate knowledge of the situation, you will be able to answer any questions that may arise. Therefore, I would urge all Superintendents to attend as many meetings as possible, where the maintenance of your club is to be discussed.

Another aspect of golf course maintenance which is related to budgets is record-keeping. Every Superintendent has his own ideas about the amount of record-keeping that is necessary to efficient management, but detailed records can be very helpful in backing up requests for additional expenditures, as well as avoiding unfair budget reductions. If you have records available which show the exact cost of every operation in your maintenance program, you are well-equipped to defend your budget against the onslaughts of an economy-minded committee or club officer. If you present these cost analyses to these club officers and let them have the responsibility of deleting some operation from your maintenance program, many times the realization that you have brought home to them that the condition of the golf course will suffer by their action, will prevent them from taking such action.

So, attend all the club meetings that you can, and be prepared to back up your position with detailed records and cost analyses, and your budget position will be improved, as well as your executive position in the eyes of your membership.

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## Purpose and Method of Budgeting

Leon St. Pierre

### Definition and Purpose of Golf Course Budgeting

To control any enterprise, careful plans must be laid for the future and those in charge held strictly accountable for the carrying out of those plans. This planning and controlling of future activities, is the basic principle of budgetary procedure.

### The Advantage of Budgeting

One of the chief advantages of budgeting, is that it tends to instill in the Chairman and the Superintendent, the habit of careful study before decision, as to action.

## Securing Cooperation of Entire Organization

When planning is undertaken in ample time, and on a regular schedule, there is full opportunity to enlist the assistance of your foreman, mechanic, and anyone in your organization that may be of some assistance. The final plans should represent the result of the consolidated judgment of the entire organization.

## Preventing Waste

A searching inquiry in advance of every contemplated expenditure, and the reason for such expenditures.

## Relation of Budget to Standards

Every golf course has some sort of standards in mind, and how they plan on achieving these standards. Are they looking for large greens and tees? Fairways that are cut at a half an inch? Irrigated or non-irrigated fairways? Greens and fairways that are mowed every day?

These are the questions that a Committee wants to know when a budget is draw-up.

As you know, golfers of today have come to expect high standards of perfection. Strive to learn the desires of your membership. Standards of perfection expected in 1948, cannot be produced on a 1955 budget. Budgets must be directly related to the standards of perfection that your members desire.

## Essential Requirements for Operation of Budget

There are five essential requirements for the successful operation of the budget. They are as follows:

1. Satisfactory Organization
2. Adequate Accounting Records
3. Research
4. Definite Responsibility for Budgeting Procedure
5. Support of the Green Chairman and Board of Governors

### 1. What Is Satisfactory Organization?

While one of the advantages of budgeting is that it will reveal weakness in organization, it is conversely true, that the budget cannot be operated successfully, until the Golf and Grounds Department, is properly organized. Eliminate the deadwood, and get the right man for the job.

### 2. What Are Adequate Accounting Records?

To a considerable extent, future plans must be guided by past experience. The accounting records, must be sufficiently complete to reveal past operations and provide basis for comparison.

3. How Do Research and Education Help The Budget?

Records of past performance are not enough. It must be known not only what has been attempted, and with what results, but also, what might be done, and with what probable results. What new products and services, and what new methods of producing better turf grasses are now available? The successful Superintendent, must be guided by the spirit of research. The determination to do the old tasks better, and to find new methods, products, and services which will get the job done as efficiently and economically, as possible.

4. Who Has The Definite Responsibility For Budgeting Procedure?

Someone must assume the responsibility of the budgeting procedure. No function of "Golf Course Operation" is more important, yet none is more likely to be neglected.

The Chairman of the "Green Committee" is the logical person to assume the responsibility for Budgeting Procedure.

5. Support of the Green Chairman and Board of Governors

No effective budget can be formulated without some dedicated effort of the Chairman and the Superintendent, with the full support of the "Board of Governors."

Intensive study, resulting decision, action, and responsibility for results, are not undertaken readily by most men. Unless the prod of interested leadership is applied, plans will not develop. Moreover, if the Chairman of the "Green Committee" himself is not willing to study the problems at hand, and make and defend the decisions, the machinery of budgeting will either stop entirely, or will develop into an empty, fruitless and meaningless formality.

Making The Budget Effective

Timely reports must be presented to the Chairman, showing any important variances of actual operations, from the budgeted program. These reports must reveal, as far as possible, the causes of and the responsibility for any adverse variances.

Budget Reports

Budget information is most useful when it is arranged and presented in summarized form, accompanied by whatever interpretations necessary to explain the program to be achieved. In designing and using budget reports, the two major objectives of budgeting should be continually kept in mind.

1. Formulation of plans, programs and schedules of operations

2. Enforcement of approved plans, programs and schedules. Budgets must be designed so that they are directly related to the expense accounting of the Club.

Limitation Of The Budget

While the budget is one of the most useful tools of management, it is only a tool. The budget in itself cannot control operations; at best, it is only a device by which management can control.

The term "budgetary control" as most business men will agree, is an unfortunate one. Budgets do not control. They do not take the place of Executives, nor, can they ever be expected to do so, no matter what improvements are made in techniques or operations.

Budgets are merely a tool of management, although a very valuable one. Too much must not be expected of them. Like any tool, their value to a considerable degree lies in the use made of them, and in the ability of those using them.

Final Approval Of The Budget

Once the budget is complete it should be passed by the Chairman of the Green Committee or Controlling Committee, then to the Board of Governors, for final adoption.

By such a presentation the President says to his Controlling Body, in effect, that the position of the Club and its possibilities for the future have been diligently studied and that the proposed budget constitutes the most promising program, in so far as it is possible, to foresee future conditions.

Unexpected developments may arise which will alter the plans, but until they do, this will be the program.

The adoption of the budget by the Board of Governors should constitute an expression of satisfaction with the program if executed as planned.

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The Committee Chairman, His Duties

Charles Connelly

It is a pleasure to appear here today. Although my duties as Chairman of the Service Section of the Massachusetts Golf Association are quite different from my former duties as Green Chairman at Tedesco C.C., I still remember quite vividly the day I was thrown to the wolves (the golfing membership). At that time, I was as green as an Irishman from the old country not knowing the difference between seed and stolon, or between fairway mowers and blitzers, but I was determined to do a job - as good a job as possible. I had one advantage at that time. I was not married and so had more time to devote to my duties as Chairman. I also was fortunate in having a Superintendent that was patient and helpful and who taught me many things, among them patience.

The duties of a chairman are quite varied, so let us start at the point where a new chairman takes over. How should he start and where?

First: he should get acquainted with his Superintendent. Listen to his problems of the past year. If he has time, visit with the Superintendent while he is getting the equipment in shape for another season.

Second: sit with the former Green Chairman. Find out if any programs have been formulated; how far they had been carried out. Evaluate them.

Third: Back to the Superintendent. Go over the program. What has been done and what has been left undone. Discuss with him your thoughts on a program. Listen to his ideas. Between you, I am sure you will arrive at a good working program for the year.

Now you are ready to go over the past year's budget. Take it apart piece by piece with your Superintendent. Two heads are better than one. Go over his equipment problems, his wage problems, his fertilizer and chemical problems, his construction problems. If outside contractors have to be called in, get estimates. Now you are ready to prepare your own budget. Be sure to add for contingencies. After the budget is prepared, compare it with last year's, but don't use last year's figures except as a guidepost. If you are over last year's figures, know why and be ready to answer questions.

The next step is to request a hearing from your Finance Committee to present your budget. I feel that the request from the Green Chairman is better received than from the Superintendent. If you feel you need support, bring the Superintendent with you.

By this time there will be a notice of a Turf Conference. This should be a must for all Green Chairman or a committeeman. This is where you learn how little you really know about the job you are trying to do. But, it is a part of your education. Here you learn the effects of compaction, weed control, fungus control and many other interesting things. Your Superintendent already knows those things. He is hoping to gather one item that may help him solve one of his many problems, whether it be at the Turf Conference or in the course of the many head to head conversations with other Superintendents who have had similar problems.

A meeting with the Golf and Tournament Committees is now in order. In fact, the Green Chairman should have a voice in the scheduling of all tournaments at his club, both men and women's tournaments. Be sure also that your Superintendent has a schedule of all tournaments.

Now comes warmer weather and the frost starts coming out of the ground. There begins to be a little more activity around the clubhouse. After a conference with the Superintendent, it may be decided to keep the course closed. Now you really become the Green Chairman, known by various other names as "Czar", "Dictator", or "General".

You now are ready to be a second pair of eyes and ears for your Superintendent. Catalogue all member complaints to be passed on to the Superintendent and also your own observations on minor repairs to improve

playing conditions. Keep in contact with your Superintendent by either walking or riding around the course. I prefer the evening hours. Show him you are really interested in his problems and are willing to share them. Don't be afraid to compliment a worker who is doing a good job, but don't criticize - that's the Superintendent's job. If you show the workers that you are really interested, I am sure they will put out that little extra which is always reflected on the better courses.

Let us sum up now the duties of a Green Chairman:

First: He must be interested.
Second: He must be willing to devote time to his duties.
Third: He should be willing to attend a Turf Conference or two, and read up on his subject.
Four: He should know his budget, and check his expenditures at least monthly.
Five: He should keep in touch with Superintendent so that he will be fully aware of his problems.
Six: He should act as a buffer between the Superintendent and the membership.
Seven: He should assist in the scheduling of all tournaments.
Eight: Be aware of member complaints and after screening, bring the necessary ones to the Superintendent.
Nine: Walk or ride the course with his Superintendent at least once a week.
Ten: Know the crew. Treat them as you would like to be treated if your positions were reversed.
Eleven: Have the authority to close the course when and if conditions warrent it.
Twelve: He should be the liaison between the Superintendent and the executive branch of the club.
Thirteen: He should have patience. All programs take time to develop,
Fourteen: He should be an active golfer although not necessarily a low handicap man.
Fifteen: Remember that his job is to serve the membership and maintain the type of course they want and not to rebuild the course as he would like it.
Sixteen: Last but not least, I would suggest that he subscribe to the U.S.G.A. visiting service. Their helpful and timely suggestions can help smooth the path of his Superintendent as well as aid his own education.

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## Long-range vs. Short-range Planning

George Farber

The subject I have been given is Long Range Planning vs Short Range Planning. In my book there is not such thing as short range planning. You either have a long range plan or you have no plan. I suspect that I am here because when we built our golf course, there was no long range planning and because of this we have a very sad tale to tell.

We were playing in a glorified cow pasture in Leicester until it was decided that we had outgrown the place and should look for something better. It was at this point that we made our initial mistake and perpetuated this error until we ran into real serious trouble three years ago when we had to go back over all our troubles that could have been avoided had we done some long range planning from the start.

When we decided that we wanted to make a change, we should have engaged a good architect and consulted with some of the experts who know something about what you should look for when you build a golf course. Instead of that, one of our members took it upon himself to roam the country side looking for land that he felt would adapt itself to the building of a good golf course. He picked out a beautiful spot in Boylston that lent itself to a good layout. At that point we made a deal with an outfit that built golf courses and bought ourselves, what we thought, was a bargain. We have been paying for that bargain, through the nose, for the last three years and have spent very close to $150,000 correcting the mistakes that we made and doing some of the things that should have been done when the course was built. A few of the mistakes that we discovered after we got into trouble are:

1. We discovered that we have an inadequate water supply and no place to get water. We know now that by the time we get through and have watered all our fairways that we are going to need approximately 750 gallons per minute. We have available now only 200 gallons per minute. After all kinds of testing and drilling, we find that there is no water available to us on or near our land. The town that supplies us water is not able to help us. We now have to build a reservoir to hold 7-8 million gallons to supplement our inadequate supply. Had we been aware of this situation we might not have bought the land we are on.

2. We find that our greens were incorrectly built without foundations or drainage and that they are all going to have to be rebuilt.

3. Our soil is very heavy clay, retains a great deal of moisture and we have had all kinds of drainage problems. It was so bad that there were many parts of the course that were not playable until the middle of June. It was impossible to get equipment in to cut grass or to do any work. These are only a few of the things that we ran into that could have been avoided, had we started immediately with the proper experts and a long range plan.

Three years ago when I was asked to take over the problem of getting straightened out, I was completely bewildered. I had no idea that there could be as many problems as we encountered. We were extremely fortunate in being able to obtain the services of your Professor Joe Troll, Al Radko of the U.S.Golf Association, Greens Section; Jeff Cornish, the highly reputable architect that hails from this town and Dick Blake, who is now our superintendent. With all this misery behind us, I can tell you that if we had to do it all over again, these are the steps that we would take.

1. We would call in a good architect, discuss our wants and needs with him and then go about looking for the spot that might fill our bill. After we had gone this far, I would feel that I would want to discuss various phases with men like Al Radko and Joe Troll. Before we started to build, I would want to see a long range plan that could be worked on from year to year adding as you went along. This is what we finally did three years ago and there are so many advantages to a scheme of this kind that it would be fool-hardy not to have it.

2. After this I would be sure that we had a top notch Greens Superintendent. Building the course is only part of the problem. Maintaining the course and doing it properly is all important and unless you have a man who knows his business, you can be in all kinds of trouble. We have been very fortunate in having Dick Blake with us for the last three years, who supervised the rebuilding. Because of our past experiences, nobody realizes more than we do, how valuable a good Greens Superintendent is.

3. I would then go about trying to find a man for Greens Committee Chairman who was willing to sacrifice at least 4 to 5 years to the job. An intelligent and appreciative committee is most important and they should be made up of men who are willing to serve for longer, rather than shorter, periods. There is so much to learn about the care and upkeep of a golf course that it would be impossible for anyone to digest in a short period enough to make it worthwhile. Continuity of service is most important. After three years with an excellent committee we are still finding it most difficult to solve many of our problems because of lack of knowledge. Imagine where you would be with a whole batch of new faces periodically, who had to learn from scratch. There can be no long range planning when chairmen and committee members change faces frequently. Short term planning is expensive and short term committees can become a serious liability.

A long term for chairman and committee is important for the morale and security of your Greens Superintendent and crew. They have to know where they are going and what they are trying to accomplish. This can't be done with a new group of bosses every year or two.

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## The Golf Course Superintendent - His Duties

Sherwood Moore

This topic of Green Chairman-Committee-Superintendent relations can certainly become an involved one. Much has already been said and written about it - and no doubt with the number on this panel, there will be some repetition. I think Al Radko has done a wonderful job though in dividing up his panel so each of us has a specific area of the subject to discuss.

Honestly, I would much rather get right down to earth and tell you how we do a specific job at Winged Foot, such as maintaining fairways or greens, or installing water lines or drainage. That is right down a

Superintendent's line. But the topic of green chairman-committee-superintendents relations is a tough one. It is an inspirational talk more than a practical one. It is a challenge though and makes you give it a lot of thought before you begin discussing it.

The direction of my discussion is to be along the vein of "The Golf Course Superintendent, His Duties." Who is this man, the superintendent? What are his qualifications? Just what are his duties or responsibilities? These questions all tie in together for when you talk about a golf course superintendent you are talking about his qualifications and responsibilities.

The golf course superintendent is the man who is directly responsible for the playing conditions on your golf course. In his hands is placed the responsibility of maintaining the entire golf plant grounds, including all extra activities such as tennis courts, swimming pool, picnic grounds, bowling greens, etc., etc.

In regards to the golf course superintendent's qualifications I would like to list the following - not necessarily in the order of importance for they are all of equal stature:

1. A superintendent must be a man of integrity - of high morals and ethics- for he is the trusted custodian of valuable club property.

2. He should have a basic knowledge of turf grass science.
This is where a scholastic training applies. It is not absolutely necessary for him to hold a degree from a college -although this requirement is becoming more and more to the foreground as golf courses look for new superintendents; but it is to his advantage to attend some agricultural school and to become highly trained in the fundamentals and techniques of his profession.

3. He must have a broad knowledge of golf course operations.
This is where experience counts. This is only gained by working on a golf course, under a competent superintendent, for a period of years.
All of the schooling in the world is of no value if it is not put to practical use. Education coupled with experience is a team that cannot be beat. An old sea captain who was asked if he knew where the rocks were in a certain harbor, drew on his experiences when he replied, "No sir, but I know where they ain't."
So the superintendent must know where they "ain't" and have a complete knowledge of all the parts of the golf course and how these parts are related to the game of golf.

4. Ability to manage personnel.
Amen! This is a topic in itself!
If I were to list these qualifications according to importance, this would be number one.
All I can say is, a superintendent is only as good as the crew working behind him.

5. Working familiarity with business management, principles and practices.
This qualification is becoming more and more evident with each passing year, due to the fact that it costs a heck of a lot of money to maintain a golf course these days.

This factor has contributed enormously to the elevation of the golf course superintendent. When a club starts spending $75,000 to $100,000 a year on an eighteen hole golf course, they want to be sure that money is spent wisely.

This phase of our work has been and will be touched on by other members of the panel.

6. Ability to communicate effectively.

This also no doubt will be discussed by our last speaker on public relations, but mention is made of it here for it is a tremendously important qualification.

It is sometimes necessary for a superintendent to get up on his two feet and explain his budget, program or planning to a board of directors. Also he should be able to submit weekly, or bi-monthly or monthly reports, also with special projects to his chairman.

7. The Superintendent must have a desire to learn and advance.

In this profession, as in many others, you never stop learning or going to school. Proof of this is this large group here today, and the fact that turf conferences are held all over the country and they all are breaking attendance records. The desire to attend conferences, to join the local and national superintendents association and participate in their programs is a required qualification of a progressive golf course superintendent.

8. Knowledge of machinery, equipment and mechanics.

It has often been said that in few other professions is a person required to have a working knowledge of so great and varied an assortment of skills. He must be an agronomist, a landscape gardener, an arborist, a golf course architect, a road builder, painter, mason, carpenter, plumber, electrician, swimming pool authority, tennis court expert, bookkeeper, personnel manager and psychiatrist, and above all, a mechanic. In these days of automation, the superintendent had best know something of mechanics. At Winged Foot we do not buy hydraulic oil in one or five gallon cans anymore, but in 55 gallon drums. When we lost a good share of our equipment in a fire in 1959 we spent $75,000 to replace it and that only included replacing two burned tractors. When you have eleven tractors, two jeeps, two pick-up trucks, a dump truck and fifty other pieces of motorized equipment, you can see how necessary machinery becomes a part of your qualifications.

9. Wide familiarity with the game of golf.

This does not mean only in the ability to play the game, but familiarity with the whole society of golf. The role of the USGA, the PGA, the CMAA, industry and all other facets relating to golf.

10. Ability to accept responsibility and to make decisions along with analyzing and solving problems.

This is an important qualification and one that I admit we sometimes become a little lax in! The superintendent should be willing and ready to accept responsibility, for the more responsibilities you have the more indispensable you become and the more you should be compensated for it.

In my years of experience I have found that the average member does not want to be bothered with details. Once the board or committee have determined policy, then it is your responsibility. They want to enjoy their day at the club and their round of golf.

And this brings us to the duties or responsibilities of the golf course superintendent. We have discussed who is this man, the superintendent; what are his qualifications; now what are his responsibilities? I am not going to dwell long on this subject for the Golf Course Superintendents Association of America in their pamphlet "An Introduction" spell out the superintendent's responsibilities, but I think it wise to review what the greens committee should expect from the superintendent.

The following fourteen points with sub-headings outline the job duties of the superintendent:

1. Area Maintenance.

This refers to the golf course itself, plus clubhouse grounds, parking lot, and new grounds construction.

2. Structure Maintenance.

This is the second item listed under responsibilities of a golf course superintendent and includes such items as buildings, fences, bridges, pumphouse and shelters. Outside of the clubhouse and the staff or help's quarters, these structures generally do become the responsibility of the golf course superintendent. The service or maintenance building is one building which usually is neglected, so in the planning of the maintenance building this is where the superintendent should have full say.

3. Equipment.

The responsibilities of equipment are the purchasing, storing, inventory, use and repair. The superintendent is best qualified to know what equipment will best meet his needs.

4. Personnel.

Naturally the procurement, training, direction, and firing of the maintenance crew working staff should be the full responsibility of the golf course superintendent. We have already stressed under the qualifications of a golf course superintendent how important it is for him to have the ability to handle personnel. So many of these qualifications and duties go hand in hand, for if he has the qualifications he will naturally assume the responsibilities.

5. Materials of Supply.

This the same as equipment - where the superintendent should have the responsibility of purchasing, storage, inventory and use of supplies.

6. Cost and record keeping. And this includes cost accounting (expenses), weather records, material applications, equipment records, inventory, repair and depreciation records, gasoline and oil records, and of course payroll and expenditure records. Every operation of golf course turf management can be made better, easier, and more understandable to club management by the use and application of a record system that will reflect your day to day operation. Today's higher costs, specialized methods of turf management, critical labor markets and all other factors

which make golf course management a complex job -can be better done when records can be used to back up the judgment of the golf course superintendent.

7. Reports

Hand in hand with cost and record keeping are your reports. You are spending someone else's money and in some cases a good deal of it, so why should you not make reports telling and showing where that money has gone or is going. Your reports should include planning, progress, committee meetings, and the like. At Winged Foot I submit periodic progress reports, an annual report, long range planning reports, and miscellaneous reports that might include such items as inventory, conference proceedings, emergencies or special situations.

8. Budget, and this includes preparation, explanation and execution. If you really want to elevate yourself, submit a sound well-prepared budget to your greens committee and board of directors. You then approach them on terms they understand - business.

9. Cooperation and this means cooperation with your members, committees, department heads, etc.

Much has been written about the necessity of the superintendent, manager and professional cooperating to the fullest to provide a successful and progressive club. And that also applies to the membership in general and to various committees.

10. Knowledge of the game of golf is also another responsibility of the golf course superintendent. He is growing turf for the average golfer and it should be maintained in such condition as funds allow to afford the greatest enjoyment to them. He should play as often as possible to better understand the condition of his course from the golfer's viewpoint; and attend and assist in any way possible all golfing events in his area.

11. Landscape maintenance.

The landscape on your golf course -trees, shrubs, and flowers - is just as important and just as much your duty as a golf course superintendent, as are the greens, fairways and tees that come under your constant care.

12. Golf Cars.

Golf cars are here and they are here to stay. How many times have we heard that these past several years. But it is true - they have already become a part of the game of golf. And I am not going to start talking about golf cars here as that is a subject in itself, but it is the golf course superintendent's responsibility to take the lead in this new venture and see that the problem of proper and adequate housing and maintenance of the cars is provided. If not, you may find your maintenance building taken over by golf cars and you, yourself, maintaining the fleet on weekends. Your terrain might require some construction to facilitate the use of golf cars on your course; you must be prepared to repair damage; to set up rules and regulations; and above all to have the authority to close the course to carts because of adverse weather.

13. Extra Club Activities.

This includes all those extra recreation facilities that are provided to varying degrees such as swimming pools, tennis courts, bowling greens, picnic grounds, etc. The superintendent generally has the equipment to maintain these areas so naturally they fall under his responsibilities.

14. And last, but not least, is his responsibility for progressive education -joining superintendents' associations, attending turf conferences, schools, subscribing to publications and supporting associations such as the USGA.

It is often asked how much responsibility or how many duties the golf course superintendent should be willing to assume in areas other than the maintenance of the golf courses. Of course the desires of the house committee, greens committee and the board of directors will decide how much responsibility for clubhouse care and other activities the superintendent will assume. But, in general, I would say that the superintendent should offer as much of his time as he can without jeopardizing the principle job of maintaining the golf course. As mentioned before, the more that comes under your care, the more indispensable you become and the more salary you can demand.

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## The Budget

Lee Kowalski

The Budget, next to the quality of your personnel, is the most important part of the Green Chairman and The Committee's function. The budget provides the funds to maintain your golf course in the condition your Green Committee wishes. It is the principle control for maintenance, improvements and purchase of new equipment.

Many clubs have a policy of changing their chairman every two or three years which makes it difficult for a Superintendent to get up any long range program, or at times to keep up as good a program as the previous Chairman. At our club we have a Planning Committee which is permanent, and any long range planning goes through them for their approval; if accepted, this committee follows the plan through. In our committees we have the younger element present so they can be trained and educated for future responsibilities as chairman.

At the Country Club of Fairfield I make up the Green Budget and submit it to the Greens Committee for their approval so that the Chairman can present it to the Board of Governors. The Committee and I meet and go over every part of the budget, and discuss all the wages paid, the help, how their time is broken down, their overtime, and whatever extra benefits they can receive from the Club, such as hospitalization, insurance, Christmas bonus; and hoping that eventually a pension plan can be provided, so we can keep our good personnel year after year. I would let them know my fertilizing program for the greens, fairways and tees; how many times, when, why, and what fertilizers are used; the same for fungicides and insecticides. If there are any difficulties in obtaining

funds for fertilizing and supplies to complete the program that will give your members a better golf course, I would suggest you ask your Chairman to contact the USGA Green Section and ask for their help and recommendation. I am sure with their knowledge and backing your committees will see the light. A suggested list of improvements, with estimates, is presented with the budget. The Green Committee can then decide what improvements they want and present them to the Board.

Each spring the Greens Chairman and any of the committee who wish to come, will pay us a visit at the golf barns and be introduced to all of the golf personnel. This meeting of the Greens Chairman and personnel, I think, is very important. Have coffee and doughnuts ready to relieve the tension. Put your equipment on display so the Committee can see what work has been done all winter. Incidentally, every year I send my Chairman a list of all of the equipment, repairs made, the date each piece of equipment is bought and the life expectancy of each.

In your talks with the Chairman on Budgets, make it a point to plan to play a game of golf together during the summer. Then you can explain and show how you are following the program presented in the Budget. In Syracuse the Greens Chairman and Iplayed practically every week. This makes you play your golf course and also it is benefiting because a Greens Chairman who can understand your problems and plans will be your champion.

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## Public Relations

Leon St. Pierre

Number One on the Agenda

In many instances, the Superintendent-in-charge of the Golf Course, is confronted by so many problems, he must solve himself, that the matter of Public Relations is placed at the bottom of his priority list. In fact, it may be so far down that it is never even carefully examined. This situation is understandable but a grave mistake. After all is said and done, what is the truly basic commodity in all businesses?

It is human effort. Some of the effort is applied clerically, and some of it is applied manually, but people and personalities are back of it all. It is an old military axiom that a poor plan, well executed will succeed, where the perfect plan poorly executed will fail. How true this is in business. The accurate communication of ideas is essential to the execution of the plan. In business, we consider the program of Public Relations as the program of communications. The Management may have the finest plans and policies in the business world, but time, thought and effort must be spent on transmitting or communicating these ideas to the employees, the members and the community, in which the Club is located. That being the case, somebody has to take charge and work at it, and the somebody is the Chairman and the Superintendent.

Things Public Relations Can Do for the Chairman and Superintendent

1. Increase Club good will, by developing member understanding and appreciation of services rendered.

2. Help promote good labor relations; reduce employee turnover; make easier the securing of high caliber personnel.

3. Create broader understanding and sympathy with the problems the Chairman of the Grounds Committee and Superintendent faces.

Employee Relations

a. Employee benefits such as Blue Cross, Blue Shield and Life Insurance plans.

b. Pension plans

c. Liberal vacations - 2 to 3 weeks - and major holidays

d. Service pins or watches awarded for years of service at the Employees' Annual Dinner.

e. Bulletin boards and posters

f. Suggestion system

g. Employee information meetings

Ways and Means of Improving Public Relations with Membership

1. A Complaint Box in the locker room will help to reduce pressures while the Chairman is not around the Club.

2. Colored slides taken before and after every major construction job, also pictures taken during the four seasons, showing work performed by the Golf Course Crew, should be shown at the Annual Meeting, in conjunction with the Golf and Grounds Annual Report.

3. If any major repairs or construction are to be made, let it be known well in advance, so that it will not be a complete surprise to golfers, when they get on the course.

4. A Greens Committee should be made up of a cross section of high and low handicapped golfers. This Committee should include one member from the Women's Golf Committee.

5. An Open House at the Maintenance Barn is an effective way to have members see for themselves what type of equipment it takes to maintain a golf course and in what condition the equipment is. This Open House could be held in late March, just before the golf season begins. At the same time, a Lawn and Garden Clinic could be presented, questions would be answered by the Superintendent, and the County Agent, using some of his printed matter.

6. Playing golf at the proper time with the Chairman, and members, that are sympathetic to better golfing conditions.

7. During special tournaments that have a gallery, mingle with the spectators.

Public Relations at Work on the First Tee

Have you ever watched the Golf Pro operate on the first tee? During busy days you will notice the Pro greeting the golfers and telling them how happy he is to see them. You will, also, notice how casually he will give a friendly tip on a player's swing or game, and possibly, recommend a heavier or lighter set of woods, therefore, setting up a sale; and, at the same time, doing a Public Relations job. I am not suggesting that the Superintendent stand around the first tee area on busy days, wearing a carnation in his coat lapel, and glad-handing the members, as they approach him; let Jack the head waiter do that when the members go in the dining room for dinner. I am suggesting, however, keeping the Chairman well-informed, so that he in turn can do a very effective job informing and educating members using the methods mentioned earlier. A well-informed Membership is a happy Membership.

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## A Study of Wilt

Harry Heusal

It is generally recognized that wilt in turf grass is the result of a rate of transpiration that exceeds the plant's intake of water. My discussion of wilt, which is the result of experimentation in the laboratory, in the greenhouse and on the Yale Golf Course, carries this definition further. I would say that wilt occurs when the transpiration of water through the stomates is greater than the rate of absorption through the roots. Also, to the classifications of dry wilt and wet wilt, I am adding a third variety, which I will identify as "cloudy days wilt."

Dry wilt occurs when the soil is so dry that there is no water available to the roots. It is easy to understand that in this situation, when transpiration takes place the plant is unable to replace water that is lost.

Before taking up wet wilt, I should like to discuss the wilt that frequently plagues us following two or three days of cloudy weather. It is possible that an explanation for this may be in the process of rehydration of starch in the plant. This is my hypothesis concerning "cloudy days wilt."

Hydration of Starch: A plant manufactures food on days of high light intensity. In this food-making process, called photosynthesis, the plant absorbs $CO_2$ through the stomates onto the mesophyl cells, and the chloroplasts absorb light energy from the sun. The food product is sugar.

Sugar takes a lot of space, and a grass plant does not have much

space to spare. Therefore, it changes the sugar to starch in a dehydrated form for storage.

On cloudy days, the $CO_2$ intake is reduced because the stomates are only partially open and the chloroplasts are not very active because of the low light intensity. Consequently, the production of the plant's food supply is reduced. If the cloud cover continues long enough that the plant becomes undernourished, the plant must draw on its reserve food supply, that, is the dried starch. Only through water absorption can the dehydrated starch become available to the plant. As long as there is sufficient water, all is well. No starch in poa while in seed production.

But suddenly, after a couple of days of low light intensity, the sun comes out. The stomates open wide and evaporation is accelerated, and the plant loses much of its water supply. The water intake is still slow, and water is still being used to dissolve the starch.

Now the plant must change from the process of rehydrating starch reserves, which requires a great amount of water, to making a fresh supply of sugar, which also requires water. In the photosynthesis process, the mesophyl cells must be moist in order to absorb the required $CO_2$. Water is of vital importance at this time to every function within the plant, and yet the stomates, being wide open for action, are losing the vital moisture to evaporation. If the evaporation exceeds the ability of the plant to take in sufficient moisture for its functions, the plant collapses. Diagnosis: wilt.

Now Back to Wet Wilt. We have all observed grass areas where the soil was saturated with water, yet this grass seemed to wilt faster than grass in drier areas. Despite saturation of the soil, the wilt results from excessive transpiration, though this is not as self-evident as the relationship of transpiration and absorption of water in dry wilt.

I have been carrying on experiments to investigate the relationship of stomate numbers to incidence of wet wilt, and have found a very significant relationship. I firmly believe from the evidence of experiments and from actual practice on the golf course, that the control of wilt lies with the control of the numbers of stomates and of the opening of the stomates, so as to govern the rate of transpiration from the grass plant. I'll give a detailed description of these experiments.

EXPERIMENT I:

I set up two identical flats containing Annual Bluegrass and Creeping Bent. One flat was watered twice a week and the other 6 times a week.

After a period of five weeks, each flat was set in front of an electric heater which had a fan attached to it, creeating the effect of hot air blowing across the grass.

The grass that was watered 6 times a week wilted in 20 minutes. The grass that was watered twice a week took one hour to wilt.

The soil that was watered 6 times a week was not saturated, just fairly moist. There were enough open pores in the soil to permit gas exchange. I believe that this is evidence that it was not a lack of oxygen that made the grass wilt.

I also noted a difference in root length. The roots in the wet soil were somewhat shorter than the roots in the drier soil. This could affect the capacity of the plant to absorb water.

EXPERIMENT II:

The same test was tried again two weeks later, using the same flats with the grass that had survived the first test. The day was cloudy when this test was made. The grass in neither flat wilted.

EXPERIMENT III:

The same test was repeated two days later. Since this day was also cloudy, half of each flat was covered with newspaper, and the greenhouse lights were turned on. Then the heater-fan was started. The exposed portion of the well-watered grass wilted in 14 minutes. The exposed portion of grass that had been watered twice weekly wilted in 50 minutes.

Next the lights were turned off and the newspaper removed. The grass now exposed in both flats did not wilt even after 1 1/2 hours.

CONCLUSIONS: The results of these three experiments demonstrate that both light and water are important factors in the occurrence of wilt. Therefore, it becomes evident that stomates are in some way responsible for wilt.

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With the benefit of a newly-discovered method of making impressions of plant tissues for microscope slides, I was able to make impressions of grass blades so that stomates could be examined clearly and counted under the microscope.

I set up experiments for counting stomates on lightly-watered and heavily-watered grass.

EXPERIMENT IV:

Thirty pots were planted with Annual Bluegrass. Half of these were watered twice a week over a period of four weeks; the other half were watered six times a week for the same period.

The grass that was watered 6 times a week had an average of 8 stomates and 19 epidermal cells in the area that could be seen under the microscope.

The grass that was watered twice a week had an average of 7 stomates and 29 epidermal cells.

This means that the grass watered 6 times a week had one stomate for every 2 epidermal cells, and that the grass watered twice a week had one stomate for every 4 epidermal cells. This 2-to-1 and 4-to-1 relationship held true in the cross-section of the grass blade, though only the palisade layer could be seen in the cross-section.

EXPERIMENT V:

The watering procedure in Experiment IV was reversed, using the same pots of grass. In three weeks time, the grass that was now watered 6 times a week had the 1-stomate-to-3-epidermal-cells relationship on the new blades of grass.

The grass that had been watered 6 times a week and then only 2 times a week, took 5-to-6 weeks before the one-stomate-to-4-epidermal-cells relationship became established.

EXPERIMENT VI:

A box was constructed with heat and light control and a built-in fan. The light could be adjusted from 100 fc to 3000 fc. The same pots of grass were then tested in the box, with the following results:

1. The higher the light intensity, the sooner the grass wilted. And inversely, the lower the light intensity, the longer it took for the grass to wilt.

2. The grass with the most stomates wilted first.

3. With no light and 90-degree heat, the grass watered 6 times a week wilted in 2 hours.

4. With no light and 90-degree heat, the grass watered twice a week was still holding up after 3 1/2 hours - when the fan burned out.

5. Below 70 degrees F., both well-watered and dry grass took longer to wilt.

6. Between temperatures of 75 degrees and 100 degrees F., light intensity being the same, there is not much difference in the rate at which grass wilts. That is, with a light intensity of 3000 fc, for instance, heavily-watered grass wilted in 15-to-20 minutes, whether the temperature was 75, 80 or 100 degrees. The lightly-watered grass wilted in 2 to 3 hours, whether the temperature was 75, 80 or 100 degrees.

CONCLUSIONS:

My conclusions from these experiments with heat and light intensity are that: (1) high light intensity is required for grass to wilt; (2) grass wilts faster at temperatures over 75 degrees F. By heavy watering or by growing grass in wet areas, one is, in effect, inviting wilt. Under wet conditions, as my experiments demonstrate , the grass blades develop more stomates quantitatively, and as a result this grass is particularly susceptible to wilt.

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Now, WHAT CAN WE DO ABOUT WILT? Can we control it?

Dr. Israel Zelitch of the Connecticut Agricultural Experiment Station discovered a number of chemicals that will close stomates on tobacco leaves. In 1961 Dr. Zelitch published a paper entitled, "Biochemical Control of Stomatal Opening in Leaves." One of the chemicals which he named was phenylmercuric acetate.

I experimented with phenylmercuric acetate on grass watered 6 times a week, with a fan on and high light intensity. The fan burned out in 3 hours and 12 minutes, but the treated grass was still in good shape.

Next I tried pots of grass under bell jars - 2 treated and 2 untreated. The grass that had not been treated with phenylmercuric acetate was covered with dew (or gutted water) inside of an hour. No dew (or gutted water) formed on the grass that had been treated, in a period of 12 days. But as the grass grew, droplets did form on the area of new growth. After 20 days, droplets began to form also on the treated portions of the grass blades.

I then carried out the phenylmercuric acetate tests on a larger scale at the Yale Golf Course. The results were not satisfactory. Surface tensions caused the spray mixture to ball and roll off the grass baldes. Only a small number of stomates were affected and closed.

However, when I added a non-ionic wetting agent to the solution of phenylmercuric acetate and water, the results were strikingly effective. Seventy percent of the stomates were closed. During the summer season of 1962, I was able to effectively control wilt on the Yale Golf Course with this mixture.

The mixtures which I used to control wilt contained: one-half to one quart of 10% phenylmercuric acetate and one quart of non-ionic wetting agent, mixed in 300 gallons of water. The spray was applied at the rate of 5 gallons to the 1000 square feet of turf. This application reduced or stopped wilt for a period of 5 to 15 days. Only on Merriam Blue Grass (B27 USDA) was the effect harmful.

This method of controlling wilt is dependent on the following factors:
(1) rate of growth of the grass;
(2) amount of water available to the grass -natural or applied;
(3) frequency of cut; and
(4) quality of spray application.

SUMMARY

1. To the classifications of dry wilt and wet wilt, I would add a third variety which I call "cloudy days wilt." Each of these varieties of wilt rises from a different set of environmental conditions.

2. The number of stomates on the grass blades determines how soon the grass will wilt.

3. The number of stomates increases with the amount of water.

4. The roots become shorter with heavy watering.

5. High light intensity triggers wilt.

6. By closing the stomates with an application of phenylmercuric acetate and non-ionic wetting agent in water, wilt can be controlled.

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I wish to thank the staff of the Connecticut Agricultural Experiment Station who were most generous with their time and knowledge; the personnel of the Yale Forestry School for their technical assistance and for the use of the lab and greenhouse and also the Magovern Company which paid for all my equipment.

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## Specifications for A Method of Putting Green Construction

Presented by
Alexander Radko

Golf course construction is presently enjoying its most accelerated pace since the introduction of the game of golf into the United States. Not only are new courses being built but old ones are being "modernized."

The cost of maintenance has influenced some clubs in their decisions to undertake a rebuilding program. There is a need to do away with features such as sharp contours and abrupt tee slopes which create maintenance problems.

Golf course design and golf course construction have been considered an art rather than a science. The individuality and the character of golf courses in this country have resulted from the artistic talents of some of the great architects in whose minds they were conceived.

Likewise, construction methods have been developed as a result of individual experiences and individual preferences. It is a tribute to those whose efforts have gone into golf course building as well as to those who maintain them that so many courses have stood up well over the years.

The pace of golf activity and the traffic on golf courses is presently at a peak, however, which has never been equaled in our country. Many of the construction methods that were satisfactory in an earlier day, will no longer produce greens which will withstand the wear that is now imposed upon them.

Because of these considerations, the Green Section has for the last decade interested itself in construction methods and in a study of the physical problems of soils used in putting greens. Research in these

matters has been sponsored by the Green Section at Beltsville; at Oklahoma State University; at UCLA; and during the past six years an intensive program of study has been supported at Texas A.&M. College.

It has been found that the problems of construction procedures and methods and those of physical behavior of soils cannot be separated. The two matters are related and must be considered together if a desired result is to be produced.

The findings of the Green Section sponsored research are such that a sufficient amount of information is now available to warrant the publication of a suggested method of construction. The procedures which are outlined here may well be used as the basis for specifications which a club may present to the prospective golf course builder.

Such specifications will place no limitations upon the individuality nor the artistry of any architect. They will, however, provide a guide for the builder and for the club which wants to be assured that the greens they build will continue to provide good playing conditions for many years.

The basic considerations underlying the specifications and methods presented are those of good drainage and resistance to compaction. These ends cannot be achieved without some compromise. A highly permeable soil which drains readily offers some problems in the establishment of turf. It is loose and sometimes may create difficulty in the changing of cups. These are minor problems, however, when weighed against the advantages of rapid drainage, good aeration, deep rooting, protection against diseases, protection against over-watering, protection against salt problems, a putting surface which holds a shot without being overly wet and one which resists pitting by golf balls.

The methods and specifications outlined in the following pages represent the best thoughts of the Green Section staff and of numerous soil scientists who have given serious attention to the problem. It is hoped that they will result in more satisfactory and less troublesome putting greens throughout the nation.

1. Subgrade

The contours of the subgrade should conform to those of the proposed finished grade, with a tolerance of plus or minus 1". The subgrade should be constructed at an elevation 14 inches below the proposed finished grade. The subgrade should be compacted sufficiently to prevent future settling which might create water-holding depressions in the subgrade surface and corresponding depressions in the putting surface.

Where terrain permits, it is possible to build the subgrade into the existing grade or to cut it into the subsoil. It is not necessary to elevate or "build up" the green unless design considerations dictate the desirability of doing so.

It will be noted that courses of materials above the subgrade consist of 4 inches of gravel, 1 1/2 to 2 inches of coarse sand, and

12 inches of topsoil. Thus the total depth will be 17 1/2 to 18 inches. However, this fill material will settle appreciably, and experience indicates that 14 inches will be the approximate depth of these combined materials after settling.

2. Drainage

Tile lines of at least 4-inch diameter should be so spaced that water will not have to travel more than 10 feet to reach a tile drain. Any suitable pattern or tile line arrangement may be used, but the herring-bone or the gridiron arrangements will fit most situations.

Cut ditches or trenches into the subgrade so tile slopes uniformly. Do not place tile deeper than is necessary to obtain the desired amount of slope. Tile lines should have a minimum fall of .5%. Steeper grades can be used but there will seldom be a need for tile line grades steeper than 3% to 4% on a putting green.

Tile may be agricultural clay tile, concrete, plastic, or perforated asphalt-paper composition. Agricultural tile joints should be butted together with no more than 1/4" of space between joints. The tops of tile should be covered with asphalt paper, fibreglass composition, or with plastic spacers and covers designed for this purpose. The covering prevents gravel from falling into the tile.

Tile should be laid on a firm bed of 1/2" to 1" of gravel to reduce possible wash of subgrade soil up into tile line by fast water flow. If the subgrade consists of undisturbed soil, so that washing is unlikely, it is permissible to lay tile directly on the bottom of the trench.

After the tile is laid, the trenches should be backfilled with gravel, being careful not the displace the covering over the joints.

3. Gravel and Sand Base

a. The entire subgrade should be covered with a course of clean washed gravel or crushed stone placed to a minimum thickness of 4 inches.

The preferred material for this purpose is washed pea gravel of about 1/4" diameter particle size. Larger gravel or stone may be used, but it is important that changes in size between this course of material and the succeeding one overlying it not be too great. Otherwise, smaller particles from overlying material will wash into the gravel, clog the pores or drainage ways and thereby reduce the effectiveness of the gravel.

The maximum allowable discrepancy appears to be 5 to 7 diameters. In other words, if 1/4" pea gravel (about 6mm) is used, then the particles of the overlying course of sand should not be less than 1 mm. in diameter. If stone of 1 inchediameter were used, it would be necessary to include a course of pea gravel to prevent the movement of smaller soil aggregates into the stone.

b. When the gravel is in place, assuming that pea gravel has been used, a 1 1/2" layer of coarse washed sand (commercial concrete sand is

satisfactory) should be placed to a uniform thickness over the gravel.

The tolerance for error in the thickness of gravel and sand courses should be limited to plus or minus .5 inch.

4. "Ringing" the Green

When the courses of gravel and sand are in place and outlets have been established for subsurface water (through the tile lines), the green should be "ringed" with the soil which is to be used for aprons and collars. This soil should be placed around the green and any contours established in such a way that they will blend into the putting surface.

The next step is to fill the depression, which represents the putting surface, with the prepared topsoil mixture described in the following paragraphs.

5. Soil Mixture

A covering of topsoil mixture at least 12 inches in thickness should be placed over the sand and gravel layers.

The soil mixture should meet certain physical requirements.

Permeability - After compaction at a moisture content approximately field capacity as described by Ferguson, Howard and Bloodworth, a core of the soil mixture should permit the passage of not less than 1/2 inch of water per hour nor more than 1 1/2 inches per hour when subjected to a hydraulic head of .25 inches.

Porosity-After compaction, a sample of the soil mixture should have a minimum total pore space of 33%. Of this pore space, the large (non-capillary) pores should comprise from 12 to 18% and capillary pore space from 15 to 21%.

Information with respect to bulk density, moisture retention capacity, mechanical analysis and degree of aggregation in the hands of a soil physicist may be helpful in further evaluating the potential behavior of a putting green soil.

Few natural soils meet th requirements stated above. It will be necessary to use mixtures of sand, soil, and organic matter. Because of differences in behavior induced by such factors as sand particle size and gradation, the mineral derivation and degree of aggregation of the clay component, the degree of decomposition of the organic matter, and the silt content of the soil, it is impossible to make satisfactory recommendations for soil mixtures without appropriate laboratory analyses.

The success of the method of construction herein described is dependent upon the proper physical characteristics of the soil and the relationship of that soil to the drainage bed underlying the green. Therefore a physical analysis of soil should be made before the soil components are procured. When the proper proportions of the soil

components have been determined, it becomes extremely important that they be mixed in the proportions indicated. A small error in percentages in the case of a plastic clay soil can lead to serious consequencies. To insure thorough mixing and the accurate measurements of the soil components, "off site" mixing is advocated.

Any soil physics laboratory which is equipped with the facilities to carry out the measurement described by Ferguson can prescribe a soil mixture for putting green use. Green Section offices can provide names of laboratories so equipped upon request.

6. Soil Covering, Placement, Smoothing and Firming

When soil has been thoroughly mixed off site, it should be transported to the green site and dumped at the edge of the green. Padding the edge of the green with boards may be necessary to prevent disturbance by wheeled vehicles of the soil previously placed around the outside of the putting surface. A small crawler-type tractor suitably equipped with a blade is useful for pushing the soil mixture out onto the prepared base. If the tractor is always operated with its weight on the soil mixture that has been hauled onto the site, the base will not be disturbed.

Grade stakes spaced at frequent intervals on the putting surface will be helpful in indicating the depth of the soil mixture. Finishing the grade will likely require the use of a level or transit.

When the soil has been spread uniformly over the surface of the putting green, it should be compacted or firmed uniformly. A roller usually is not satisfactory because it "bridges" the soft spots.

"Footing" or trampling the surface will tend to eliminate the soft spots. Raking the surface and repeating the footing operation will result in having the seed or stolon bed uniformly firm. It should be emphasized that the raking and footing should be repaated until uniform firmness is obtained.

Whenever possible after construction, saturation of the soil by extensive irrigation is suggested. Water is useful in settling and firming the surface. This practice will also reveal any water-holding depressions which might interfere with surface drainage.

7. Sterilization of Soil and Establishment of Turf

These steps may be accomplished by following well-known conventional procedures.

The foregoing steps in construction have been used successfully in many greens in various parts of the nation. It should be emphasized that each step in construction is dependent upon all the others. It is inadvisable to use the gravel and the proper soil mixture unless the intermediate layer of sand is used to separate them. The courses of gravel and sand may result in saturation of the lower portions of the topsoil mixture unless the proper soil mixture is used.

In short, do not attempt to incorporate some of these steps into green construction unless they are all used in exact accordance with these recommendations.

The foregoing specifications tell the club how to proceed with the job of building a putting green but they do not tell why one should follow these procedures. There is ample evidence in the body of published literature to support the methods herein advocated.

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## Management of Kentucky Bluegrass and Grass Mixtures for Turf

F. V. Juska

There are many management practices directly under the control of the operator which affect vigor, quality, and persistence of turf. Adherence to a few cardinal principles will aid materially in obtaining high quality turf, or at least acceptable turf. Due to adverse weather conditions encountered during the summer months, every precaution should be taken that will aid in the survival of grasses. In some instances, demands of play, inherent problems, and adverse weather preclude the implementation of good management practices.

Some common causes of poor turf:

1. Improper use of fertilizers: Too much nitrogen results in succulent growth of the tops at the expense of root reserves. Too little nitrogen results in a thin turf of low vigor. Fertilize the grass according to its needs. Secure soil tests for information on the analysis of fertilizer needed. It is more desirable to apply nitrogen fertilizers more often in smaller amounts to obtain uniform growth. Uniformly growing turf will also fit into a regular mowing program or schedule.

2. Improper watering: Frequent light watering is not only uneconomical but also encourages shallow rooting and increases the incidence of disease. Water deeply and less frequently to develop deep roots. A plant with a good root system is better able to withstand adverse conditions. Syringing bentgrass during hot weather is not considered watering. Putting greens kept a little on the dry side are less likely to wilt during hot humid weather.

3. Plant adapted varieties and mixtures: Regardless of previous preparation and management, unadapted species will not provide a suitable turf. Check with your experiment station to determine which variety is best suited for your location and your management conditions.

4. Height and frequency of mowing: Mow according to the species requirements. Removing over one-half of the leaf surface at any one time is harmful. In general, the closer a grass is mowed the more frequent it should be mowed. Mowing height is dirctly proportional to depth and quantity of roots produced; the lower the cutting height, the

fewer roots. Mow upright grasses at a height of 1 1/2 to 2 inches. Mowing bluegrass and red fescue lower than this height accounts, to a large extent, for their failure on fairways and other areas, and thus it becomes necessary to resort to stoloniferous grass such as bermudagrass and bentgrasses which are able to withstand close mowing. Frequent mowing increases the density of the turf but does not enable the operator to mow more closely without a reduction of root reserves.

5. Too much traffic: Few of our grasses will withstand heavy traffic continuously. Internal cultivation will help on putting greens and fairways. However, pathways will either require paving with asphalt or construction of a gravel path.

6. Too much shade: Most of the grass species are unable to withstand deep shade. Remove trees and trim lower branches to admit more sunlight. Shady areas an clubhouse grounds can be made very attractive with ground cover plants. Another approach may be the application of gravel under trees confined with a steel or aluminum strip around the drip line of the tree.

7. Poorly drained soils: This is a condition that is frequently built into existing greens and other turf areas. Frequent aerification and spiking alleviates the condition but the cure may involve rebuilding the greens.

There are other management practices such as the use of sharp mowing equipment, a good fungicide program, chemical weed control, etc. that should be mentioned; however, time will not permit a discussion of all aspects of management as it affects turf vigor. The remainder of the time allotted will be used to illustrate two or three practices --fertilization, height and frequency of mowing, and their effect on grass vigor.

Discussion from Slides

Summary statements relative to fertilization, frequency and height of cutting Merion and common Kentucky bluegrass and their effects on turfgrass vigor:

1. An extensive root system and vigorous but not excessive top growth are important objectives in maintaining good quality turf. Applications of nitrogen made prior to periods of low temperature will improve root development without a correspondingly large gain in top growth. Although fall nitrogen applications will help to improve root development and po possibly ground cover, they will not eliminate the need for applying nitrogen at other periods of the year.

2. Under greenhouse conditions, the greatest yield of clippings was produced by turf aupplied with a high level of nitrogen and cut at 2 inches.

3. High nitrogen and low cutting treatments inhibited root and rhizome production to the greatest extent.

4. Highly significant differences in root quantity were obtained

with weekly defoliation and 2-inch cutting height in contrast to 5 times weekly and 1-inch mowing height. Crown weights indicated a denser turf for the frequent cutting interval.

5. Cutting height influenced the quantity of roots more than frequency; however, more roots and roots per tiller were obtained from weekly mowing. Results indicate that "frequent" mowing will not permit a decrease in mowing height without a reduction in the quantity of roots per tiller.

6. A measure of root reserves was obtained by growing sod cores in a growth chamber in the absence of light. In each comparison of weekly and more frequent mowing at 1- or 2-inch height, weekly mowing was superior with respect to the amount of reserves calculated on a tiller basis.

7. Results from both the greenhouse and field trials indicated a higher quantity of roots for the weekly defoliation and 2-inch clipping height.

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## What's New in Fertilizers

Geoffrey S. Cornish

Although we are in an era of wonderful new chemicals, it is of interest that very few fertilizers have been completely outdated in turfgrass work.

Until well after World War I many superintendents used nothing but barnyard manures in their fertilizer programs. Even today many a superintendent if he can obtain manures uses them in his compost for future topdressing, while courses in the poultry raising areas of New England still spread poultry manure over their fairways in winter with good results.

And there was the "sulfate of ammonia" era in the nineteen twenties when some turfgrowers used nothing but this inorganic nitrogenous source on their grass with impressive initial but ultimately disastrous results. Still sulfate of ammonia has a role today. For example in Central New York State it is one means of reducing the high pH of the soils and particularly the extremely high pH of those greens built or topdressed with sand with a high limestone content - a phenomenon Dr. Bill Colby once told me was bound to occur.

By the late twenties an increasing amount of sewerage sludge was being used together with complete fertilizers. During the thirties because of relatively low prices and increased supplies many natural organics such as castor bean pomace, cottonseed meal, tankage and blood meal were in use. And by World War II pilot projects were underway which eventually led to production on a large scale of newer types of fertilizers.

In talking with superintendents I have found that many, after years

of observation feel there is merit in using a variety of materials in their fertilizer programs. And in the fertilizing of putting greens, more and more experienced superintendents recommend frequent but light feedings in place of the old practice of heavy monthly doses. I hope some of our speakers this afternoon will comment on these trends towards variety and frequency particularly in view of the introduction of the newer fertilizers.

It is well to remember that the injudicious use of any fertilizer material without consideration for season, weather and soil conditions is bound to lead to trouble sooner or later. And even in new greens where the fertility level has to be raised through heavier feeding, there are instances of overfertilizing.

Another trend in the last decade has been to an overall increased use of fertilizers and as a result the turfgrass areas of the nation have become increasingly beautiful. While the wise superintendent still limits himself to 3 to 6 pounds of nitrogen per 1000 square feet per season on old established greens with perhaps 8 - 10 pounds on brand new greens, the great increase in use of commercial fertilizers on golf courses has come on fairways. Until after the Korean War the grass on many a fairway as well as on home lawns merely existed in a perpetual state of starvation. Today in part because of the missionary work of Al Radko, the late Tate Taylor and other Greens Section workers the majority of country club superintendents in New England are applying 150 - 200 pounds or more of nitrogen per acre per season to their fairways as well as other plant food elements. And with the greater refinement of grassed roughs more of these are being fertilized once or even twice annually with wonderful results.

In recent years there has also been an increasing awareness of the roles of N.P.K and other elements. Agronomists and plant physiologists are focusing attention on this important item and are on the threshold of many new discoveries. For example, Bandel and Kresge* at the University of Maryland have discovered that potassium winterized forage crop roots. It causes larger, deeper and more uniformly distributed plant roots which can withstand the harsh physical forces encountered during winter.

Also because potassium also increased the ability of root cells to resist freezing Bandel and Kresge observed that fertilizing with potassium is similar to adding anti-freese to your automobile.

While their research is not yet applied to lawngrasses we can see that if it holds true for our crop, the use of potassium may greatly reduce the tragic winter injury so frequently encountered in New England greens, tees, fairways and lawn areas.

This afternoon we have a distinguished group with us who will tell us about several fertilizers and also something about the role of the elements. Following short talks by each speaker I hope there will be plenty of questions from the floor. When our time expires at 3 PM, I am sure that each speaker will still answer any remaining questions.

*Bandel, V.A. and Kresge, C.B. "Potassium Winterizes Your Forage Crop Roots." Crops and Soils, December 1962.

## Methylene Ureas

Harvey Stangel

The ideal nitrogen fertilizer is commonly believed to be a slowly available source of nitrogen. Such a nitrogen source should have fewer leaching losses, no luxury consumption and little if any gaseous losses of nitrogen. In addition it should be non-burning and have no toxic effects.

The Urea-formaldehydes presently meet these requirements closer than any other fertilizer being offered in quantity. They have been on the market and have been used successfully by turf managers for the past 10 years. In spite of the opportunity to become familiar with urea-formaldehydes as a fertilizer, there appears to be a lack of familiarity with this product among many people, a misunderstanding of its use and properties and in some cases, mis-use.

I have been asked to talk on methylene ureas and frankly was surprised to see another man on the program who was also asked to discuss urea-formaldehydes. Just so there is no misunderstanding, let us say now in clear English of unmistakable meaning - methylene ureas and the present urea-formaldehyde fertilizers offered on the market, regardless of source, are one and the same. There is no difference between methylene ureas and urea-formaldehyde fertilizers now on the market.

But they differ in their content of specific methylene ureas. For instance, all urea-formaldehyde fertilizers now on the market contain free urea or unreacted urea in addition to the reaction products or polymers of urea and formaldehyde --the starting materials look like this.

Slide 1

This is urea on the right, the old familiar fertilizer that we have had around for thousands of years in animal manures and more recently as a chemical fertilizer. It contains 46% N and its structure and formula are given. On the left is formaldehyde which is a pretty good preservative or embalming agent. It is a good fungicide and bactericide, if you are not too fussy. Not too many years ago it was used to preserve some foods. Milk was one of them. But, as your know, formaldehyde is toxic so it can no longer be used for that purpose. However, by reacting urea and formaldehyde we change the availability of urea. If only 1 molecule of formaldehyde reacts with urea we get -

Slide 2

methylene diurea. It is CWS (cold water soluble). It is also quite rapidly available. Half the N in this molecule is readily accessible to microbes. And the other half of it is available soon after the two outer N groups are knocked off. It is also non-burning.

If we add on another molecule of urea and formaldehyde we get -

Slide 3

dimethylene triurea. Now this is a largermolecule and not quite as readily available because only the ends of 2 urea molecules can be knocked off easily by microbes. One urea molecule and the ends of 2 molecules are protected. This molecule is also less soluble than the previous one. Now addition of urea and formaldehyde molecules can go on until we get a molecule that is so large that it is insoluble and practically unavailable like this -

Slide 4

This is penta methylene hexa urea, that is 5 formaldehyde molecules and 6 urea molecules. It is insoluble even in hot water and is available so slowly that only about 8% of the N in this is available each year. Now let's look at a commercial urea-formaldehyde.

Slide (Large)

A commercial urea-formaldehyde (UF) contains all of the polymers of urea and formaldehyde that I showed you previously plus some larger ones. We simply do not know how to make a UF fertilizer with only one of these polymers. Suppose this fertilizer is a 10-6-4 or a 20-10-5 and that we will examine only the nitrogen present in it. We will further suppose that ammonium nitrate, ammonium sulfate, ammonium phosphate, urea and urea formaldehyde are used to formulate it. All of the ammonium nitrate, the urea, the N from ammonium phosphate and ammonium sulfate and any unreacted urea from the UF will be found in the inorganic N portion (the blue portion). All of this N as you know is quickly available and will burn a plant, if applied at the usual rates. All the rest of the N is UFN and will not burn a plant if applied even in large amounts. However, all of the UFN is not equally available. You recall the methylene di-urea consisted of 2 molecules of urea and of formaldehyde? The ends of the urea molecules were exposed, hence it would be rather quickly available and is somewhat soluble. As we increase the numbers of formaldehyde and urea molecules in the chain the solubility and the availability goes down until the large polymers are not even soluble in hot water. Well, too much of the red fraction is not desirable either -- and the AI (Activity Index) has been devised as a test to indicate when too much of this material is present.

To put it very simply, the AI is the ratio of the UFN left after leaching the fertilizer sample with cold water (CWIN) to that which is removed by leaching with hot water. The more of the CWIN which is hot water soluble, the higher the AI.

Now, we in Nitrogen Division have a lot of curiosity. The theory says that as the solubility of these UFN molecules decreased, that is as the polymer length increased and more urea molecules were protected, it should become less available. So in the lab we made up some of these fractions and had them tested at the New Jersey Agricultural Experiment Station. Now this wasn't just for academic reasons, but to find out how improved UF fertilizers could be made.

Slide

The theory was right. As the polymer length increased the solubility

decreased, the availability decreased and the amount of turf produced by equal amounts of N from each of these polymers decreased. The response from dimethylene triurea was less than from the low solubility fraction. In effect the larger the molecule the lower the response was.

Slide

And when all of these materials were put into one test we found that the fraction which gives the best performance was the trimethylene tetraurea. However, it does have some limitations. It does not begin to breakdown appreciably until about 3 1/2 to 4 weeks after application. And for this reason we need the other two less complex materials and some inorganic N for quick response right after application. So experience has not been so bad. A good turf fertilizer thus needs some quickly available N, a larger amount of the slowly available fraction such as trimethylene tetraurea and minimum of the low solubility fraction.

Slide

Now I don't want to leave you with the impression that the low solubility fraction is valueless. It does supply N at a slow but continuous rate. It is usually most noticeable in the way that it improves the color and over a period of years this fraction will build up in the soil and keep your turf growing continuously at a higher rate.

Slide

How does a commercial UF compare with other slowly available materials on the market? Because it is a blend of UF molecules of different availability it does perhpas what is considered to be a better job with a single application than do many other slowly available nitrogen sources. Under field conditions, however, we recommend that UF fertilizers be applied twice a year, early spring and late summer. And we think you will have then set the stage to put your most capable talents to work to produce top quality turf.

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## Plastic Coated Fertilizers

Louis I. Hansen

The concept of slow release of soluble plant nutrients from granules applied to the soil is not new and has been accomplished in a number of ways. This has been done by the chemical reaction of urea and formaldehyde forming a condensation polymer, by producing chemical compounds containing plant nutrients which are only slightly soluble, by concentrating certain organic residues high in nitrogen, and by coating granules which contain one or more of the plant nutrients.

Urea formaldehyde has been made for years and utilized on turf and sod. Considerable research has been done each year to improve the release qualities of this polymeric material.

One chemical company has been working with magnesium ammonium phosphate to give the trade another effective slow release fertilizer.

A number of companies have coated granular chemicals and fertilizers with some degree of success.

Archer Daniels Midland Company has worked the past four years on the various problems encountered in coating granular materials and have been able to overcome to a degree the obstacles which have hindered this progress. The main problems which must be overcome and clarified are outlined and will be discussed briefly:

1. Obtaining the granular materials for turf with the proper ratio of plant nutrients, mainly nitrogen with minimal amounts of P and K, such as 4-1-1, or 4-2-1.

2. Obtaining granular materials that are homogeneous - all ingredients in one granule.

3. Obtaining granular materials with a minimum surface area -- smooth granules with fairly uniform sized distribution.

4. Selecting the most practical vehicle and method of encapsulating the granules to attain maximum durability.

5. Selecting satisfactory laboratory methods for measuring durability of coated materials.

6. Obtaining satisfactory evaluation data for coated fertilizers on turf to correlate with these laboratory testing methods.

Considerable time has been spent coating high nitrogen granular products with varying durabilities for evaluation on turf. Products such as urea, ammonium nitrate, 30-10-0, 18-46-0, 20-10-5, and 16-8-8 have been coated, as well as blends of coated ammonium nitrate, triple super phosphate, and potassium chloride to give a 4-1-1 ratio and urea, triple super phosphate and KCl in a 4-2-1 ratio. These materials can be obtained in granular or prilled form, but the particle size and size distribution varies greatly causing large variations in surface area to be coated, so a comparison of the durabilities based upon percent coating is not always realistic.

Ammonium nitrate can be obtained in a fairly uniform mesh and when coated gives excellent durabilities with a 5% leach in the 72 hour water immersion test. Urea, on the other hand, with similar size distribution, and coated at the same level will have a percent leach varying from 15 to 30%.

The urea prills look round but contain cracks, crevasses, and craters which produce a greater surface area and are, therefore, more difficult to coat.

Triple super phosphate can be obtained from some manufacturers as a smooth granule and requires less than half the amount of coating to get durabilities down below 10% leach in the 72 hour water immersion test.

Muriate of potash being crystalline is fairly easy to coat and requires less coating to get good durability.

The three-component granular fertilizers, such as 20-10-5, and 16-8-8, etc. are usually more difficult to coat. The granules are heterogeneous, have large variations in mesh size, a poor size distribution and considerable fines. Most three-component fertilizers contain too much broken material that has been screened after coming from the dryer and the granules being too large have been broken up in the hammer mill, screened, and added back to the regular production.

An approach to this problem of practicability of coated fertilizer for turf and sod is afforded by blending the individual coated components, such as ammonium nitrate and urea with triple super phosphate and muriate of potash. A considerable cost saving can be realized making up a 4-1-1 or a 4-2-1 blend and from the turf grower's point of view he can get the type of blend that will best suit his particular needs.

The laboratory durabilities of these coated fertilizers have been measured by three methods: the water immersion test, wet soil burial, and the conductivity measurements of soluble nutrients in the soil. These three methods will be discussed briefly and illustrated along with results which have been obtained by correlating this data with actual performance on turf.

A. The Water Immersion Test

The percent by weight of soluble nutrients leached out in a period of time is measured by adding 20 g. of coated fertilizer to 100 g. water and leaving for 72 hours. An aliquot of the filtrate is taken and evaporated to dryness and the residue weighed. This is recorded as the percent leached out. Table IIA (slide 1) compares the percent leached of uncoated with light, medium, and heavy coated.

B. Wet Soil Burial Test

This measures the percent soluble nutrients left in the soil after varying periods of time up to three months or more. The wet soil test is performed in a one-gallon round tin pail. The bottom of the pail is punctured with five quarter-inch holes arranged in an X pattern to permit excess water to drain. The pail is filled with black silt loam soil within three inches of the top. Five 20 gram portions of fertilizer in double nylon bags are placed on the top of the soil in the pail. To avoid chaneling and saturation, the bags are flattened out and covered with an additional 2 ½ inches of soil. The equivalent of 1/2 inches of water is added every second day requiring an hour or more before the water soaks completely into the soil. This level of moisture is above soil capacity, and the excess drains slowly out of the holes in the bottom of the pail. The bags of fertilizer are removed periodically for examination during the two to four months of exposure. The top nylon bag filters all soil and fine particles so the residue in the second bag can be dried, weighed, and analyzed, and the results recorded. (See table IIB --slide 1)

The wet soil burial tests were designed to obtain the following information:

1. What types of film forming materials are most resistant to soil bacteria, soil chemicals and fungi?

2. What types of film forming materials offer the greatest water resistance or water vapor barrier?

3. What nutrients leach out of the granules most readily?

4. Does the water pick up any insolubilizing materials as it traverses the top 2 1/2 inches of soil above the fertilizer in the flattened bags?

5. How do different coated fertilizers behave in this test? (slide 7)

   a. Urea - uncoated urea decompose readily to $NH_3$ and coated urea has improved durability.

   b. Coated three component fertilizers 20-10-5, 16-8-8, and 10-10-10 behave as expected. The N and K leach out more rapidly than the phosphates.

   c. The 4-1-1 blend of coated individual nutrients were remarkably resistant in these tests. See ratio remaining after 8 weeks.

   d. Coated ammonium nitrate is excellent fertilizer for turf. Coated 0-46-0 requires a low level of coating and even after 8 weeks still has 62% $P_2O_5$ left.

   e. The coated 0-0-60, although quite soluble, still has 59% $K_2O$ left after 8 weeks.

C. Salt Injury Test

This test measures the concentration of soluble salts in the soil near the germinating seed. The slides 2 and 3 show the placement of the seed and the fertilizer and effect on germination with higher levels added. After one week's exposure samples of soil were removed and diluted in a one to five ratio and the conductance was measured using a Wheatstone bridge. The results are compared in Table 7 (slide 4).

Salt injury experiments were designed to check the following:

a. Can soluble salt concentrations in the soil be measured accurately using a Wheatstone bridge?

b. What is the effectiveness of a coated fertilizer in releasing soluble salts in soils? This slide compares coated 16-8-8 at 15% leach against uncoated in two soils, Zimmerman Sand and Clay Loam.

A comparison of germination studies shows that the uncoated germinated @ 0.5 g. fertilizer and, at higher levels, no germination resulted. The coated germinated up to 3.0 g. level and above no

germination occurred. The conductances measured at these levels of fertilizer shows the concentration of salts at 34-42 mhos and above no germination occurs -- salt injury.

c. How do coated fertilizers react in different soils (clay, silt and sand loam) and potting soils using different moisture levels and at different durabilities? In potting soils the nitrogen was varied from 1 1/2 - 3 pounds per cubic yard, in other soil studies, used 4 pounds nitrogen per 1000 square feet.

## Evaluation Studies

Coated fertilizers have been evaluated on turf during the past three years using established Kentucky Blue Grass at Toro Mfg. Co. and at different Agriculture Colleges (Minnesota, California, Indiana, Rhode Island, and Florida).

Several slides will be shown to compare the clipping heights of grass using coated against uncoated fertilizer with check plots. Each of these were replicated three times and represent the average dry weights of clippings per 1000 square feet.

a. In 1961 a durably coated 16-8-8 with a 10% leach in 72 hours was evaluated using 4 pounds of nitrogen per 1000 square feet. Slide 5 compares the dry weekly clipping weights of check against coated and uncoated. The uncoated releases its nutrients rapidly causing very rapid growth the first six weeks and levels off. The coated fertilizer starts slowly and holds the clipping weights above the 6 pounds per week all summer and also maintains excellent green color during the growing season. The color was determined using the Munsell color slides, color comparisons. The check plots never got much above 3 pounds of clippings per week at any time during the growing season.

b. In 1962 a number of coated granular fertilizers were compared at the Toro Mfg. Co. See slide 6. All plots were fertilized using the same level of nitrogen, that is, 4 pounds per 1000 square feet. The coated fertilizers were: 16-8-8 at 5% leach and 20% leach, coated ammonium sulfate and coated ammonium nitrate at about 10% leach. These were compared against a blend of coated individual plant nutrients in a 4-1-1 ratio using ammonium nitrate, triple super phosphate and KCl, and finally against activated sewage sludge. The table shows the average clipping weights of three replicates of sample.

The above turf studies have indicated the following:

1. There is a correlation between rapid durability tests and turf growth. Compare 16-8-8 @ 5% versus 20% leach. The 5% leach gave 119 pounds clipping versus 97.7 pounds for 20% leach.

2. Different granular materials can be coated to give satisfactory performance on turf for at least three months. Compare ammonium sulfate, ammonium nitrate and 16-8-8.

3. The individual plant nutrients AN, T.S.P. and KCl can be coated separately at different durabilities, and blended in a 4-1-1 ratio gave 111.4 pounds.

4. The check plots gave only 32 pounds clippings.

5. A commercial organic fertilizer under similar conditions gave 83 pounds.

## Conclusion

In conclusion I would like to emphasize at least two important points.

1. The concept of coating granular chemicals or fertilizers is economically sound and practicable. This is due to the following:

   a. The fertilizer manufacturers can now make smooth coatable granules.

   b. New coatings and techniques have been developed so that durably coated granules can be made at competitive prices which do release nutrients slowly during the entire growing season.

2. The concept of coating small particles can be applied to industrial chemicals other than fertilizer granules to achieve slow release.

By improvements in the vehicles and methods of application and production of smoother and more uniform granules, durabilities will be improved at lower levels of coating and cost to produce a practical and effective product for utilization in a wide variety of crops.

Recognition should be given to these men for this paper: J.R.Watson, R. Farnham and W. Martin.

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## The Role of Sewage Sludge

James M. Latham, Jr.

About 8 years ago, while preparing the program for the Southeastern Turfgrass Conference, we asked O.J. Noer for his views on a debate of this type. His views were negative, saying that a fertilizer's quality was based on performance rather than talk. He felt that if a question exists on a fertilizer's merits it should be tested in the field, rather than at the conference table or on a chemist's slide rule. Performance ratings should be based on color, density and resistance to damage from traffic, diseases and the like, NOT on the amount of hay produced per unit of area.

The remarks in this paper are limited to activated sewage sludge to which nothing is ever added to enhance its fertilizer values. There are only 3 cities whose plants qualify for this category -Milwaukee (the first ever built), Chicago, and Houston. The sludge from other cities that use different systems is, at best, a simple soil conditioner.

Activated sewage sludge is not just residential sewage, but includes a wealth of proteins from industrial plants such as breweries, tanneries, meat packing plants and the like. In Milwaukee, for instance, almost 25% of the nitrogen is supplied directly by brewery wastes. Harmful acids, petroleum materials, etc. cannot be put into the sewerage system. It contains not only N & P, but about 0.6% K, 3.0% iron (elemental) and every other minor and trace element known to be useful in plant nutrition. These amounts might not correct a deficiency but could prevent deficiencies when used in a general program.

There is a great deal of worry over high phosphorus levels today, but only when pH levels are high enough to promote iron deficiency. The fairways at Milwaukee Country Club have received 3000 lbs. of activated sludge per acre per year since 1932. After all that time, soil phosphorus level is only in the range of 600 lbs per acre. These bentgrass fairways are second to none - little Poa annua, no thatch, and the finest playing surface imaginable.

Sewerage sludge has been sold to turfgrass growers since 1926. In spite of the many recent advances in fertilizer technology, it remains the standard to which all organic nitrogen sources must measure. One of the first experimental plots evaluating nitrogen sources, at Arlington, Va., in 1941, showed the high quality turf that can be produced with activated sludge. Similar results have followed in New Jersey, Georgia, Florida, Mississippi, Wisconsin, Iowa, California and other states.

A part of this high quality is in the realm of disease incidence. One of the first lessons I learned in the Northeast was that dollarspot became a problem when nitrogen supplies ran low. Several superintendents said that activated sludge-fed areas were less susceptible to this disease, than areas fertilized with other nitrogen sources. Their ideas were confirmed by Cook, Engel, and Batcheder at Rutgers University. After 3 years testing they concluded: "Activated sewage sludge was most outstanding in inhibiting outbreaks of dollarspot. The effect was greater than the normal reduction of this disease expected from nitrogen stimulation."

Pure culture work at Rutgers and Iowa State University indicates that when activated sludge or its extract is mixed with agar and innoculated with fungi, growth of certain organisms is inhibited. Some of these include Sclerotinia homoeocarpa, Rhizoctonia solani, Curvularia sp., Typhula sp., and others. Such data is indicative, but does not tell the full story, since a healthy soil condition never has only one strain of microorganisms present. As an illustration, the researchers at Rutgers made approximations of the number of soil microorganisms present under various fertilizer regimes. They stated, "field soil from turf plots receiving activated sludge contained a microfloral population of 10 to 20 million organisms per gram of soil. Soil receiving other types of fertilizer contained only 50 to 100 thousand organisms per gram." It is theorized that the heavy microbial population lessens parasitic activity. It is known to help decompose thatch, so this may be a "back door" effect in the reduction of parasitism.

The Rutgers group also found that granular activated sludge ranked best for uniformity of growth with fertilization patterns used. Their observations also showed that activated sludge fertilized plots have shown "remarkable resistance to wilt" and may be related to the disease problem.

In Tifton, Georgia, Dr. Homer Wells of the Coastal Plain Experiment Station has reported that incidence of Pythium aphanidermatum on ryegrass over-seedings is less intense where activated sludge is used as the source of nitrogen.

Nematodes are a problem for turfgrass growers over much of the U.S. While at the University of Florida, Dr. Gene Nutter found these beasties a problem in his nitrogen source test. To check this he treated half of each plot with Nemagon. Results were amazing, not because the treated areas greened up rapidly, but because some of the untreated area was just as green as that treated. Invariably these plots were receiving activated sludge as the sole source of nitrogen.

This was corroborated recently by Jackson, Burton and Good who reported on a 5 year nitrogen test at Tifton. Activated sludge produced top quality color, density and root growth of Tifgreen Bermuda, in spite of the highest nematodes counts. Dr. Good explained the situation simply- that the more grass you have in a pasture, the more cows can be grazed. The more roots you have in the soil, the more nematodes can be fed.

This best illustrates the key benefits obtained from activated sludge- the production of healthy plants. No claim is made for fungicidal or nematocidal properties. It just grows good, healthy grass and supports heavy populations of non-parasitic soil microorganisms. This combination will always reduce disease incidence.

It is not a once-a-year material, it is not infallible. It is easily handled but is not a cure all.

It is a material that gives optimum results when used in a comprehensive fertilization program.

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## The Role of Ureaforms in the Turf Fertilizer Industry

Robert M. Miller

It is certainly a pleasure and a privilege to be present on this panel and to discuss the role of ureaforms in the turf fertilizer industry.

Recently, a fertilizer company planning to make a turf fertilizer asked us to supply a nitrogen product that could be applied once a year, be quick acting, long lasting, non-burning, and granular for ease of application. This sounds like quite a large order, but I believe all of us would have requested most, if not all, of these characteristics if asked what we desired in an ideal turf fertilizer.

In the past, a nitrogen fertilizer was accepted as either a soluble or an organic product. Although soluble products color-up turf rapidly, care has to be taken to prevent them from discoloring or burning turf. On the other hand, organics can be applied with more safety but will not respond as rapidly as soluble products. However, under ideal conditions - good soil, moisture and warm temperatures -- organic materials will break down relatively fast.

After seven years of turf fertilizer research, a new type of nitrogen fertilizer, the solid ureaform, was introduced by Du Pont in 1955. Although entirely different from either soluble or organic materials, ureaform has some characteristics of both nitrogen sources. Also, ureaform should not be confused with urea fertilizer. Although chemically an organic material, urea feeds in a manner similar to soluble nitrogen producing rapid response on turf.

Unlike other nitrogen fertilizers, ureaform provides turf with soluble and insoluble, or long-feeding nitrogen. The soluble portion becomes available quickly and shows a rapid color response. The long-feeding portion gradually becomes solubilized in water and in turn is acted upon by soil organisms to make the nitrogen available to the growing plant.

Ureaform is produced in complex chemical facilities by combining urea and formaldehyde at a ratio of about two parts of urea to one part of formaldehyde under controlled conditions with an acid catalyst.

Strict process control is essential in the manufacture of ureaform. If the urea and formaldehyde reaction is not properly controlled, the final ureaform material could end up as urea-formaldehyde resins or "plastics" which have no fertilizer value. Also, improper process conditions might leave excessive amounts of soluble nitrogen in the final product. Neither extreme is desirable since nitrogen would be too rapidly or too slowly available to the plant.

In determining the turf-feeding value of a ureaform fertilizer, two critical factors must be considered: (1) percentage of long-feeding nitrogen (insoluble nitrogen); (2) activity index.

Long-feeding nitrogen (the portion of ureaform insoluble in cold water) should make up between 70 and 75 per cent of the ureaform.

Activity index (AI) is a laboratory measurement of the agronomic quality of insoluble nitrogen as judged by nitrification rate or rate of release in the soil. The higher the activity index, the faster the nitrification. Conversely, the lower the activity index, the slower the nitrification. As a result of studies by leading authorities, the American Association of Fertilizer Control officials have established an activity index of 40 as the minimum for acceptable plant response. If activity index is below 40, nitrogen release is too slow; however, if it is above 65, nitrogen release is too rapid and defeats the purpose for which ureaform products are intended. Consequently, an activity index of between 50 and 60 is generally considered the best for supplying the most uniform nitrogen release pattern throughout the growing season.

It should be kept in mind that both the amount of long-feeding nitrogen and activity index (AI) are of utmost importance in judging the quality of a ureaform.

The United States Department of Agriculture at Beltsville and the DuPont Company pioneered the research in determining ureaform's best proportions of quick acting and slow release nitrogen. Du Pont set up a pilot plant to produce various ureaform reaction products for field evaluation by their own men, as well as college personnel. This pilot work served two purposes: (1) to determine which formulation was best for the consumer, and (2) to gain production know-how.

When ureaform was first offered for sale, there were many investigators and consumers who questioned its value. This was certainly understandable. Everyone understood how to use soluble and organic nitrogen carriers, but ureaform was an entirely new type of nitrogen fertilizer.

Some of the questions concerning ureaform were:

(1) Because ureaform contains urea and formaldehyde, and since formaldehyde kills plants, is ureaform dangerous to plants?

To date, investigators have been unable to find a trace of formaldehyde in soils or water solutions where ureaforms have been added.

(2) When ureaform is applied in the spring to provide nitrogen throughout the summer, is it possible that a quick release or burning will occur during a hot summer?

To our knowledge, this has never occurred when ureaform was applied at the recommended rates. Where we have had complaints, the cause may have been due to slower breakdown during periods of stress. During these periods of stress, if color is essential (and on a green, it could be), we have suggested a light application for color. Organics could be used, but the timing is better with a soluble.

(3) Is ureaform compatible with other nitrogen carriers?

Solubles, organics and ureaform are all converted to nitrates in the soil; thus, all become available to plants in the same form. The growing plant is not concerned with the form in which a product is applied, only in the form in which it is available. Ureaform may be used with organics and/or solubles and do an excellent job. It is only when too much of any or all are applied that problems occur.

(4) Isn't price a little too high?

It is surprising, but some people still buy fertilizer by the ton, not in pounds of plant food. The true value of a fertilizer is in the amount of plant nutrients it contains, the cost of labor to apply it, the safety to the plant in applying it, and the total number of applications needed during a growing season to provide uniform growth. Sales with these factors in mind show ureaform to be fully competitive with all other nitrogen carriers.

(5) Doesn't it take more nitrogen from ureaform to grow a plant than is needed by other forms of nitrogen?

This is an understandable criticism, and some of the initial short-term work may have been the reason for it. For example, Dr.W.H.Daniel, Purdue University, stated that more nitrogen was needed from ureaforms to supply the needs of plants than from other sources of nitrogen. However, Dr. N.R. Goetze's (now of Oregon State College) soil work at the same school showed more nitrogen was in the soil from ureaform than from other nitrogen sources. Dr. R.E.Blaser, of Virginia Polytechnic Institute, found he had to supplement the ureaform application the first year with a small amount of soluble nitrogen, but after two years it was not necesaary. Pennsylvania State University showed similar results. We stated that the nitrogen return from ureaform was at least as good as, or better than, other nitrogen fertilizers. However, total nitrogen return may not occur within the first year after application. I guesss we were all saying the same thing but in a different way. Our work showed that ureaforms build up a base or residual nitrogen level, and once established, the efficiency of ureaform is at least as good as any other form of nitrogen.

This work was duplicated by Dr. Daniel. For three years he applied ureaform to the turf, and for two years after application the turf appeared to be fed although no additional nitrogen was applied.

Dr. Daniel's work was substantiated by T. G. Byrne University of California Agricultural Extension Service at Alameda County, and Dr. O.R Lunt, University of California at Los Angeles, and I quote:

"Urea formaldehyde has been promoted on its ability to supply nitrogen at a slow, steady rate for prolonged periods. Its successful use in this role is dependent on the development of an adequate level of 'residual' nitrogen in the soil.

"A common cause of disappointment from the use of ureaform is the failure to develop adequate reserve.

"Greenhouse production data on carnations indicate that once the proper level of urea formaldehyde has been established in the soil, annual application rates are no larger than those required when frequent applications of soluble materials are made. Three pounds of nitrogen per 100 square feet per year is an ample rate. In other words, the efficiency of recovery of nitrogen from ureaform is as good and probably better (as a rule) than that from similar annual amounts of soluble materials -- under otherwise similar management programs."

Ureaform will break down into available nitrates when soil pH is between 5.5 and 7.5, but the ideal pH is between 6 and 7. Adequate phosphorus and potash levels in the soil are needed to produce a healthy plant, but they have no effect on the ureaform nitrogen breakdown.

Ureaform can and is being used to provide a portion of the nitrogen in mixed fertilizers. However, between 50 and 75 per cent of the

total nitrogen should be derived from ureaform in order to provide the long-feeding, gradual release patterns. I am certain that your fertilizer supplier will tell you the amount of ureaform contained in the fertilizers advertised to contain ureaform nitrogen. Also, when a complete fertilizer containing ureaform is used, enough actual nitrogen must be applied -- if you expect to get the long-feeding effect. For example, I doubt that the user would be satisfied if a mixed fertilizer containing 50 per cent nitrogen from ureaform were applied at the rate of two pounds of nitrogen per 1,000 square feet once a year. As I said earlier, ureaform is about 25 per cent soluble and the long-feeding portion will not all be returned the first year. In this case, you would be expecting less than three-quarters of a pound of nitrogen to show an effective release pattern for a long period after the soluble portion of the product has been used. This product at this low rate could possibly show a gradual release after a base nitrogen level has been established, but it is questionable. Ureaform is an excellent nitrogen fertilizer; it is not a miracle worker.

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## Why Low Phosphorus and Higher Potassium

L. J. Sullivan

There has been a spectacular increase in the culture of special turf during the past 10 or 15 years. This conference, and other meetings of its kind all over the country, lend support to this fact. Large areas which used to be farms and open country, are now part of the ever-growing suburbia. These suburbs boast green lawns, school grounds, country clubs, industrial grounds and other turf areas. Turf has really come in to its own. Moreover, everything points to a further continuation of this trend, and an even greater emphasis on grass, especially here in the east.

The use of fertilizer on grass has enjoyed an equal if not greater rate of growth. More turf is now being fertilized than ever before, and at heavier rates of application. This is due to many factors such as greater knowledge of turf needs, better stands, improved grass varieties and high standards of turf quality demanded by the public. Big improvements have taken place in the quality and variety of fertilizers designed for feeding grass. They have become more specialized and more sophisticated. As previous speakers have indicated, newer developments are on the way. In searching for better feeding programs for greens, tees, and fairways, soil testing has been tried and found to be very helpful. It is now a standard tool in diagnosing problems and prescribing lime and plant food for turf.

Our Company was quick to recognize the value of soil testing as a diagnostic tool, and we have been doing soil testing on an ever-increas- in scale for the past 25 years. The benefits of soil testing have been two-fold. In the first place, the soil tests perform a real service to the customer, helping him grow better turf after following the recommended lime and fertilizer program. Secondly, the soil test information helps us learn more about soils and their behavior under turf, and this knowledge is helpful in developing new products that more nearly meet the needs of turf grasses under varying conditions.

Through the years we have observed that golf course superintendents, as a group, are very knowledgable fertilizer users. Now this is not surprising when you consider how costly a mistake can be when dealing with country club turf, for example, burning a few greens just before the big tournament. Frequently, however, we find that soil test results for some clubs show that they have not been using the most suitable fertilizer analysis for their greens, tees or fairways. This happens mostly with clubs being tested for the first time by our representative.

In the past few years we note an apparent tendency on many courses to neglect lime, or not to use enough lime. Today's management which involves heavier fertilization and more irrigation creates the need for more lime than heretofore. A check-up of the pH status of your course is in order if it hasn't been done in the past two or three years. When lime is neglected, you lose feeding efficiency, or more simply stated, you waste fertilizer.

Other findings and suggestions will be developed in the table which will follow:

1. PUTTING GREENS
N. E. 1960-61

| Soil Test | Phosphorus | Potash |
|---|---|---|
| Poor | 78 | 972 |
| Medium | 162 | 888 |
| Good | 1917 | 297 |
| Totals | 2157 | 2157 |

This tabulation is based on a total of 2157 putting green soils. These clubs are located in the North-East area consisting of New England, Eastern New York, New Jersey and Eastern Pennsylvania. A total of 1917 soils showed good phosphorus, or 89% of the total. Only 78 soils, or less than 4%, showed poor tests.

In contrast, only 297 potash tests were good, or 14%. Of the remainder, 972 greens or 47% were poor in potash.

2. Summary of Soil Test Results

Country Clubs - N. E. Area
Putting Greens - 1960-61

| | | |
|---|---|---|
| Equal Phosphorus and Potash | 17% | 367 |
| Phosphorus Lower than Potash | 5% | 108 |
| Potash Lower than Phosphorus | 78% | 1682 |
| | 100% | 2157 |

This summary is from the same 2157 greens. It shows the association of the soil test results. Potash is lower than phosphorus in 78%, or about 4 out of every 5 greens.

Remembering the information in table 1 - only 14% good potash tests compared to 89% good phosphorus tests - it is obvious that these fertility levels are not in balance. Low potash is associated with good phosphorus in 1682 of these greens. This is 78% or the great majority of the total.

3. Plant Food Removed by Grass Turf
Clippings from Bent Grass

Total Dry Matter 100 lbs. per 1000 sq.ft.

| | |
|---|---|
| Nitrogen | 4.8 lbs. |
| Phosphate | 1.8 lbs. |
| Potash | 3.2 lbs. |

These are the figures for plant food removed by clippings from bent grass greens. We see that the amount of nitrogen is 4.7 lbs. per 100 lbs. dry matter, and this is greater than either phosphorus or potash. The approximate N-$P_2O_5$-$K_2O$ ratio of plant food removal is 3-1-2.

Thus we see that the majority of soils show a build-up of phosphorus and a depletion of potash under actual putting green conditions. Plant food removal data provide part of the explanation. Greater mobility of potash and heavy watering also contribute to the condition. A tendency to neglect lime would also tend to lower potash in putting greens.

All of this adds up to the need for a high nitrogen fertilizer for greens of this area containing at least twice as much potash as phosphorus. This conclusion is supported by similar findings from other areas, and also by reports from independent workers.

4. Balanced Feeding Program for Putting Greens

| Type Mgt. | Pounds Plant Food Per 1000 sq.ft. Nitrogen | Phosphate | Potash |
|---|---|---|---|
| High Level | 10 | 2½ | 5 |
| Velvet Bents | 6 | 1 | 2 |
| New Greens | 8 | 3 | 2 |

A series of programs has been developed for different grasses and various levels of management. Three of these are listed here. The so-called "High Level" program seems to fit more situations than any other, and details are given in this paper. Best results have been obtained from repeated light feedings which prevent danger of nitrogen explosion, and also produce greatest feeding efficiency from the amounts of potash provided - in other words, luxury consumption of potash by the grasses is avoided, and danger of potash burn is reduced.

The velvet bent program is recommended for lower fertilization situations. For newly constructed greens, the final program in the table gives best results.

Results from these programs have been excellent. Many who have gone to hydraulic feeding during the summer months are pleased with slow, steady growth, and frequently report less trouble from the usual summer diseases.

5. Fairways

N. E. 1960-61

| | Phosphorus | Potash |
|---|---|---|
| Poor | 387 | 217 |
| Medium | 360 | 375 |
| Good | 301 | 456 |
| Totals | 1048 | 1048 |

The fairways tell a different story. Here the phosphorus tests are evenly distributed. Potash tests are much higher than in the greens. Clippings are not removed so that the greatest potash losses are from leaching from the root zones.

6. Summary of Soil Test Results

Country Clubs - N. E. Area

Fairways - 1960-61

| | | |
|---|---|---|
| Equal Phosphorus and Potash | 42% | 440 |
| Phosphorus Lower than Potash | 49% | 513 |
| Potash Lower than Phosphorus | 9% | 95 |
| | 100% | 1048 |

In studying the association of phosphorus to potash, we see that the largest group of soils need more phosphorus than potash. A somewhat smaller number need equal phosphorus and potash. Country Club fertilizers such as 10-6-4 and 16-8-8 or similar analyses are indicated. Most superintendents are feeding twice a year, spring and fall, and under irrigation, summer feeding is becoming more general.

Suggested balanced feeding program for greens using Agrico 12-4-8 and Agrinite to supply these balanced amounts of plant food per season.

Pounds per 1000 square feet

| Nitrogen | Phosphorus | Potash |
|---|---|---|
| 10 | 2½ | 5 |

7. Tees

N. E. - 1960-61

| | Phosphorus | Potash |
|---|---|---|
| Poor | 15 | 36 |
| Medium | 36 | 78 |
| Good | 273 | 210 |
| Totals | 324 | 324 |

The tees show higher fertility levels than the fairways, indicative of more liberal fertilization.

8. Summary of Soil Test Results

Country Clubs - N.E. Area

Tees - 1960-61

| | | |
|---|---|---|
| Equal Phosphorus and Potash | 59% | 191 |
| Phosphorus Lower than Potash | 19% | 62 |
| Potash Lower than Phosphorus | 22% | 71 |
| | 100% | 324 |

The majority of tee soils are in the equal phosphorus and potash group. The previous chart showed that most of the phosphorus and potash tests were good. These results point to the need for a high nitrogen fertilizer for tees, containing equal phosphorus and potash.

In conclusion, soil tests are helpful in preparing sound programs for turf and also in evaluating the present fertility status of turf areas. Our evaluations point to the following. Greens as a group need high potash and low phosphorus. Fairways require more phosphorus than potash. Tees need equal phosphorus and potash.

A final word, our programs for golf courses are meant as guides. We know of many cases where the superintendent, with his knowledge of his problem areas and special circumstances varies the program and gets excellent results. This is as it should be, no program of this kind can be the final word.

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## Uptake of Potassium

Evangel Bredakis

Potassium is one of the essential elements in the nutrition of the plant, and one of the three that are commonly in sufficiently short supply in the soil to limit the plant growth. The importance of potassium in crop production has been recognized only since the beginning of the 19th century, although the benefits of organic and inorganic materials concerning potassium were recognized hundreds of years earlier. Saltpeter, or potassium nitrate, was mentioned both by Theophrastus (Greek philosopher and naturalist) and Pling (Roman naturalist) as being used even in that era for fertilizing plants. The use of this salt is alluded to in the Bible in the Book of Luke. Today it is common knowledge that potassium is an essential element for plant growth and reproduction. Potassium is required in relatively large amounts by many cultivated plants and usually it is present in plants in quantities larger than any of the other essential nutrients except nitrogen. While nitrogen and phosphorus are synthesized into compounds necessary for the growth of the plant; potassium is not. Researchers over the years have shown that potassium is essential for various metabolic activities of living cells. Evidence is now available which shows that potassium affects the following processes: (a) synthesis of simple sugars and starch (b) translocation

of carbohydrates (c) normal cell division (d) synthesis of proteins (e) water utilization and (f) certain secondary purposes. From the above effects of potassium one can see how important it is to support a normal plant growth.

Potassium is not distributed uniformly throughout the plant. Under conditions of deficiency, potassium is most concentrated in the newly developed parts of the plant. The mobility of potassium and its role in plant metabolism gives us this anticipation for this concentration. The higher concentration in the younger tissue may be produced in part at the expense of potassium in older tissue. The most commonly observed symptom of potassium deficiency is a marginal browning and drying of the leaves, popularly called "firing" or "scorching." Potassium deficiency symptoms usually appear first on the basal leaves and progress gradually up the plant toward the youngest leaves.

The accumulation of mineral nutrients by plants grown in soil involves various chemical and physiological processes outside and within the plant root. As far as it is known, plants absorb potassium only in the form of the ion, ($K^+$). This absorption may take place from the soil solution or by the mechanism of contact exchange between colloidal clay and plant root surfaces.

In the customary production of crops, potassium is supplied to the plants by inorganic fertilizer, organic materials and the soil itself. Of the major and secondary nutrient elements, potassium is usually the most abundant in soils. Soil potassium ranges from the soluble state through states of decreasing mobility to that of an essential constituent of certain primary minerals from which it is released only by destruction of the crystal structure. The various forms of soil potassium generally are related and comprise a system in which an increase in one form occurs at the expense of one or more other forms. The availability to plants depends on the amount and relative mobility of the different forms. The soil potassium is often divided into three categories: nonexchangeable, exchangeable, and water soluble. In most soils the great bulk of the potassium is nonexchangeable. Most of the soluble and exchangeable potassium can be considered as available but the degree and rate of availability of the nonexchangeable fraction vary enormously among soils and plants. Many investigators have greater capacity than others to utilize the nonexchangeable potassium in the soil, although there is not always agreement as to which plants have the greater capacity.

The last four years we conducted experiments to investigate the capacity of fine turf grasses to utilize the nonexchangeable potassium in the soil as well as the general overall importance of potassium. The results have not been completely assembled as yet but will be published later on. Some of the results to date can be as follows:

1. Bent grasses have shown that they are better K feeders than the fescues and bluegrasses.

2. Fritted K can be applied in larger amounts without injury to the plants and supplies the plants with K over a long period.

3. KCl (muriate of potash) 4 lbs. per 1000 sq.ft. applied at 4 intervals during the growing season showed an adequate supply of K for normal plant growth.

4. Orthoclase when applied at the beginning of the season in the amount of 40 lbs. $K_2O$ per 1000 sq.ft. supplies the plants with K over a long period.

5. The total root yields for the K treated bent grasses were 3 to 5 times more than in the non K treated bent grasses and 2 to 3 for the blue grasses and fescues.

6. The top growth was greater in the K treated plants than those which were untreated.

7. The K treated grasses were more resistant to disease than the untreated.

Before ending this article, I would like to emphasize from my own research experience in turf that there must be a balance of the essential elements in the fertilizing program in order to have a good healthy turf -- and a healthy turf means less of a weed and disease problem to the person responsible for successful turf maintenance.

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## Responsibility of Industry and Community in Land Usage and Plantings

Joseph L. Beasley

In a recent presentation on the need for developing the concept of conservation, the U. S. Secretary of the Interior, Stewart L. Udall, stated, in reference to the loss by industrialization of a certain natural retreat: "Today, except for a tiny remnant, the white sands of those once-secret coves are buried by slag heaps. The boom of the ruffled grouse has been stilled forever under a smoky sky that is testament to growth but not to progress. The dunes, pine forests and wildlife have been engulfed beyond recall. Paradise lost cannot be regained."

This is a poignant clarion, aptly put, for more determined effort in the preservation of natural sites and the development of naturalistic retreats. We must make an intelligent appraisal of "progress" in the light of "growth" and evaluate the desirable and undesirable effects of "progress" on our lands. To sound the potential death knell of our wooded areas and lands reverently studded with native growth is not to be cast aside as indolent nostalgia or idle reminiscence. It should be of serious concern that by tolerance of indiscriminate land ravage we are destroying our national legacy and thus not keeping faith with tomorrow. If we do not cope with this challenge now, we will practically deny future generations the enjoyment of a picnic grove, natural countryside or forest. Reclamation a few decades hence will be attainable only at tremendous expense, and the regrowth necessary for its appreciation will take another generation.

Some great part of our lives is inextricably bound to the land and its beneficence. Our respect and proper treatment of Nature as we've found it is not a luxury but as surely an axiom of moral law as any matter of right and wrong, and as surely a principle in engineering science as beam design or the stress of loads on a static structure. As American as might be a boy and his dog, the corner drug store, baseball and the hotdog, so also is our heritage of some of the greatest scenic beauty in the world, the finest wildgrowth and the greatest industrial potential ever accorded any nation. These must be administrated properly and equitably to prevent the flourishing of one at the expense of the other.

The proper correlation must be achieved in the provisions for the needs of our people which will not permit the irresponsible, unjustified or uncontrolled destruction of too much of Nature's habitat. We cannot leave the responsibility for determining the extent of this senseless destruction to developers or industrializers who are bent solely on immediate financial return. We stand now to have tested our historical knowledge of the mistakes of other countries and peoples in their treatment of natural preserves. The responsibility for making some drastic limitations on excessive clearing, nationally and locally, should be placed in the hands of men of vision and determination, and this responsibility should be operative and in force now.

We in the business of highway construction have come to appreciate by experience the basic and elemental fact that Nature disturbed must be Nature effectively restored. Our trespass with bitumens, steel and paint into her awesome and tranquil domain very quickly exposed us to t stark realization that our structures could survive and be useful only if we bargained for the total respect of the unused portions of terrain. Slopes can best be stabilized and erosion can best be controlled only by replanting of the newly bared land surfaces. Water conservation can only be effected by protection of existing trees and reforestation of cleared but unused areas. Simply put, we must keep our water soil-bound to keep our good soils surface-bound, and this can only be accomplished through the intermediary of plant growth.

In the design and construction of new highways, it is a fundamental principle that maximum effort be directed towards the preservation of all natural growth possible off the travelled way. This is not only an economic consideration to avoid expensive replanting, but it is a landscaping maxim that the natural scenic qualities of our countryside cannot be entirely reproduced. Also, not only is the planting of trees and ground covers a reasonable reversion to a natural state, but, as well, it has the economic advantage of reducing maintenance costs. It is far cheaper to suffer the initial cost to plant seedlings and vines as ground cover than to mow grass for generations to come. Our considerations in treatment of roadsides could not be completed by merely achieving a beautiful contrast of green and black. Nature's demands are not satisfied by any ill-fitting graft on her scars. Our travelling public and tourist industry insist upon retention or near perfect reproduction of Massachusetts' beautiful scenic qualities.

We have in the last two years, in the roadside development of our new highways, placed the following materials:

| | | |
|---|---|---|
| Shade evergreen and flowering trees: | 51,000 | |
| Seedlings, pines and other evergreens: | 307,000 | |
| Evergreen shrubs: | 85,000 | |
| Deciduous shrubs: | 42,000 | |
| Small woody shrubs: | 525,000 | |
| Sods of blueberry, sweet fern, natural growth | 443,000 | |
| Wood chip mulch: | 100,000 | cubic yards |
| Shingle-tow mulch: | 3,700 | tons |
| Hay mulch: | 3,000 | tons |

While this appears to be a tremendous amount of planting material, it is only 30% of the total needed for replacement in the stripped roadside areas.

Tree and vine cover planting are a prime consideration not only in new construction but in the maintenance of older highways as well. We pursue annual Maintenance programs of tree planting, tree trimming, tree removal of the dead and diseased, selective clearing, chemical spraying for the eradication of weeds and undesirable brush, etc. All of this is for the protection and furtherance of what we have on our picturesque roadsides, to satisfy both the aesthetic and practical purposes outlined above.

Maintenance Tree Planting

| | |
|---|---|
| 8 yrs | 14,000 trees |
| 5 yrs | 200,000 seedlings |

In spite of the fact that our present 2500 miles of State highway includes 20,000 acres of roadsides for maintenance, we feel much more could and should be done by our Highway Department in securing and preserving in their natural state many more land areas adjoining. Such valuable, untouched, wooded sites will be sorely needed by future generations for solace and relaxation. Our right-of-way takings have increased in 20 years from 50 foot widths to lateral expanses of 400 feet. Although this is principally to provide for modern highway design standards and to insure additional land areas for future widening, there is also the partial purpose of providing permanent havens for native growth. Certain qualified sections are or will be developed as rest areas or scenic vistas to accomodate the weary traveler or those in pursuit of a realistic enjoyment of Nature. We should be strengthening and enlarging this program by taking much wider layouts initially and making spot widenings of existings layouts to capture irreplaceable sites with surroundings of natural quality and views which defy duplication. Once gone, permanently marred or destroyed by development or industrialization, it will leave us cloaked in history as having been shamefully remiss in our obligations.

Section 319 of Title 23, United Statas Code, the Federal Statute controlling governmental participation in the national highway programs provides that land acquisition shall be made for such highways to include

areas for the preservation of the natural beauty through which highways are to be constructed.

But we must look to communities and their most significant resident, namely industry to accept and implement, much more strongly than they have been, the concept of the preservation of natural growth. To some extent, a general cognizance of the urgency for this now may add support to our program, but of much more importance is the necessity for progressive thinking, planning and doing to secure this general benefit for all time. Where nothing is done realistically, or is negligible in scope, 25 years from now there will be an unavoidable and irrefutable crisis and retribution will be severe. We must act now to set aside or develop natural land areas so that our grandchildren will not be denied the beautiful groves, parks and picnic areaswhich meant so much in our formative years.

Industry which is too quickly criticized for many of our society's shortcomings is yet the most powerful and leading voice when things must be done. They have the talent and the know-how to provide the most effective measures for accomplishement. I would appeal to these giants first for proper development of their own sites and second, for their force to insure that Communities in general face up to their responsibilities. Industry can, within the confines of their own areas, through proper landscape architecture and provision of the necessary land area institute the needed leadership for communities to follow. This resurgence requires more than just lip service or plans on master plans. It requires unlimited fortitude on the part of those appreciating the concept who must then drive relentlessly for its implementation. Certain resistance and public inertia will have to be overcome. The concept of land conservation is being expounded nationally by authorities from every walk of life because of the too obvious fact that further postponement will be cataclysmic.

Communities must be made conscious of the necessity for more stringent control of land usage within their borders. We must all contribute to the formation of a permanent green belt: parks for regulated recreation, wooded areas and groves for picnics and unconfined play, and certain sections of free ungoverned growth as refuges for wildlife and wild growth or as natural arboretums to satisfy the innate curiosity of our very young. No land should be "unused" in this thinking. Sections so set apart need not be in valuable areas; reclamation of swampy, run-down or other sites undesirable for development could be pursued.

There are many scientifically devised innovations which made the purchase and planting of stock a much less expensive venture and afford a program of reclamation economically practical. I cite, for instance, the availability for inexpensive planting of very young seedlings, woody shrubs and vines grown in fibrous containers ready-filled with a special potting mixture to sustain growth for two years.

It can easily be shown to the all-out detractors of natural retreats that wholesale development by construction in a city or town does not

proffer the tax relief sought since it fast reaches a point of diminishing returns. The increased public services thus mandated by such saturation begin to far outstrip the tax revenue over any long range period. On the other hand, communities which develop and properly maintain natural preserves for their residents thus encourage more expensive unit-construction and landscape beautification of properties in general which, in turn, enhances property values and achieves a far greater proportionate tax return for public service rendered.

We look then through industry to the local civic administrators and their planning boards for the rigid controls and acquisitions necessary to keep the naturalness of communities an important aspect of our way of life. At least 10% of every municipal area should be set aside for this, the heart and substance of our culture. This expenditure today, although it may be taken for granted by our children's children, still will be appreciated negatively at least in that they will lack the want of it. It is certain that for what gracious living we have today there must have been great wisdom in the planning of our forefathers. We can do no less than emulate the wisdom and strength of purpose that was exhibited by our predecessors.

We look today for substantive support from such staunch realists as organized taxpayers' associations, local finance committees, local conservation commissions, chambers of commerce, newspapers and other civic organizations. Nothing which is so very vital to our society can be deemed too expensive. Nothing is so practical as to pay now for goods or services which in the late tomorrow will become an catastrophically oppressive expenditure if at all purchasable. Any limitation in the foresight of those entrusted today with civic administration will be, as always, a curse willfully placed on the generations to come.

I have cited our responsibilities in highway design as ranging from basic engineering principles through the practical considerations of public need to what might be termed aesthetic intangibles, but it is what is our citizenry demands and accepts gratefully. The same applies to industry and the communities. Proper land use is a moral law not a luxury; preservation of our green legacy which we have enjoyed should not be denied our youth to come. But concentrated planning and its thoughtful application must be exercised now. It reaches down for its final implementation to you and do it you must. No one can do it for you or better than you.

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## Turf and Other Planting Problems

H. Thurston Handley, Jr.

We all realize that industrial, park, and home landscapers are of primary and vital concern not only to landscape gardeners, but also to the homeowner and to the public. In recent years, there seems to have been an increased interest in the value of a properly maintained landscape. This can be traced perhaps to the realization that a well maintained landscape enhances property values and also has good advertising possibilities.

In addition, homeowners have more time available to work on their landscape and, with the new equipment and supplies, that have been developed, the time needed to maintain a landscape has decreased.

The problems of maintaining a landscape are many, as you know. Today our panel is concerned primarily with the problems associated with the turf portion of landscaping, but we will consider other landscape problems. As you realize, although problems are frequent, most of them can be solved using a combination of modernknowledge and equipment.

As landscape gardeners, you must realize that it is essential to keep up to date on planting problems and their solutions. There are a number of information sources available to you as landscape gardeners and, of course, the Association and trade meetings, such as the Turf Conference that you are attending today, is one of the best of these information sources. In addition, I would like to call your attention to the Extension Service in each of your representative counties and the informational services which they provide. There are over 100 publications related to horticultural problems which are currently available through your Extension Service from the University of Massachusetts and the United States Department of Agriculture.

In addition, you should keep up to date on commercial literature, particularly the labels on pesticides and fertilizer products. There are also many popular publications and other types of commercial literature which will help you, but you should be conscious of the need to question the accuracy of this type of literature and recognize possible bias.

Our panel discussion today is related to the inquiries of commercial landscapers and homeowners of Massachusetts as they have been brought to the attention of county agents situated in various sections of the state. We will also draw on data received from our testing areas at Amherst and at Waltham, as well as certain trials which have been conducted in the various counties.

Our program this afternoon will be set up in three parts as follows: First of all, a short presentation by each of the panel members covering the subjects --"Insects and Lawn Construction", "General Turf Maintenance and Equipment", "Fertilizing and Lawn Weeds and Diseases." Then there will be a general discussion session with questions from the floor with answers and comments by the panel members. We will conclude using kodachrome slides to illustrate and summarize some of the common and unusual problems connected with turf and other plantings here in Massachusetts.

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## Weeds and Diseases

Dominic Marini

Homeowner confusion and ignorance regarding lawn products --fertilizers--seed--weedkillers, etc., and lawn management practices such as fertilizing, mowing, watering and weed control is one of our most serious problems. Conflicting recommendations and advertising claims add to the confusion.

Builders lawns are another serious problem. The building boom has hit Southeastern Massachusetts as well as other parts of the State and most builders are the same wherever you go. Little or no thought is given to the foundation or the subsoil which may consist of stones, sand or clayey fill. The homeowner is lucky to get an inch of topsoil much of which can hardly be classified as topsoil.

This results in either a droughty or poorly drained subsoil and lawn problems in either case. Add to this the builders seed mix consisting primarily of rye grass and other temporary grasses and the homeowner has problems before he starts. It is also highly questionable that builders have ever heard of lime or organic matter. In all fairness, it must be said that some builders try to give a good lawn with enough topsoil and good seed.

Compaction is a problem on many lawns. Lack of drainage and poor aeration result in shallow rooting. Scuffing of turf by mower wheels on turns is an indication of shallow rooting. Soils with high proportions of fine sand, silt or clay are subject to compaction. Heavy traffic and heavy rolling particularly when the soil is wet, increases compaction. Grass frequently dies out in heavily compacted areas followed by infestations of knotweed. Aeration plus application of screened sand into aeration holes helps.

Disease problems are common. Being near the ocean our climate is somewhat milder than inland areas. Snowfall is usually not so heavy and there is much melting of snow into ice sheets which aggravates the snow mold problem. This may weaken the grass leading to other problems later. On Cape Cod heavy fog and high humidity are conducive to diseases especially on heavy turf. Alternating 3 fungicides at 2-3 week intervals usually gives good control. Toadstools are a problem on many lawns in wet weather. Frequent, light waterings encourage diseases.

Crabgrass is the number one weed problem. In Dukes County and on the Cape, because of sandy soils, lawns go dormant during the summer unless watered regularly and crabgrass takes over. Other weed problems include dandelion, plaintains, chickweeds, annual bluegrass and in Dukes County, orange hawkweed is on the increase. Most weed problems are the result of faulty lawn management.

Grubs are another problem. Japanese beetles are prevalent throughout Southeastern Massachusetts and on the Cape, the Asiatic beetle is also a problem. Birds, skunks and mice feeding on grubs frequently damage lawns.

On the Cape only spring and fall applications of fertilizer are being recommended since summer applications encourage crabgrass. On their light soils, weekly watering is necessary to keep lawns green. This results in heavy leaching of fertilizer, Ureaformaldehyde fertilizer is being recommended at 1 1/2 -2 times the usual rate to offset this.

Heavier rates of lime are also needed on the Cape. The recommended ratio is 100 lbs per 1,000 square feet to raise the pH 1 point. Some feel that this is not enough.

Salt spray is not a problem at the seashore, but flooding during hurricanes or heavy storms usually calls for renovation. Heavy rains following inundation or heavy irrigation sometimes leaches out the salt and saves the lawn. Heavy doses of gypsum or lime help.

Thatch is a frequent problem, particularly on old, well-cared for fine grass lawns, Bent in particular. It builds up to the point where water, fertilizer and lime do not penetrate, requiring drastic use of a renovator such as the Verticut machine. Thatch is very prevalent on the Cape, causing yellowing of lawns.

Winter drifitng of sand onto lawns is another problem along the seashore. Sweeping with stiff highway brooms is the only way to remove it. Snow fences help.

Zoysia is a problem in most inland areas. However, there are a number of good Zoysia lawns 6 to 7 years old on the Cape. These are summer estates where fall and spring brown color are no problems.

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## General Maintenance and Equipment

Lewis Hodgkinson

Soil - the major problem in lawn maintenance. A pH test is necessary every two years. As a minimum, a depth of top soil of six inches is usually necessary. Physical structure should retain sufficient moisture as certain coarse fills will suck the top soil dry. Where whole soil profile is poor, amendments to the profile will have to be made which is costly. Beckman pH Meter is what we use for testing.

Apply ground limestone to reduce acidity or gardening sulphur to increase it as needed. Lime may be applied anytime, water in if possible. Sulphur may burn during very hot weather so be sure to water it in. Try to attain pH 6.5. These ingredients can be spread by hand or fertilizer spreader.

Mowing - Proper height for grass is 1 1/2 to 2 inches. Clippings should be removed during wet spells to prevent diseases. Mow when turgid if possible. Reel type mower versus rotary - both are good under certain conditions. I prefer an electric mower to a gasoline mower.

Fertilizing - Spring to late summer feeding is necessary. Use a "non-burning" type high in N for home gardens. Personally, I'd like to see more potash. The granular type is still best as it is less leaching and easier to apply than liquids for home gardeners. These are better watered in if possible. A well fertilized lawn reduces the requirement for water.

Watering - Water deeply and less often, approximately one inch every five days. Apply in early morning before sun-up or late afternoon to avoid disease. Use a large flat cake tin to measure the water deposited. The pattern of the water sprinkler should overlap. Most browned-off lawns will survive drought. The type of irrigator is not important as long as it covers the area adequately. Soaker hose versus aerial applicators --both have good and bad points.

Aeration - Helps break compaction and gets air to the roots and dries out wet spots. It helps penetration of water to the roots in compacted soil and helps to get fertilizer and lime down deep quicker. Sandy or droughty soils need no aeration ordinarily. There are many kinds of aerators available.

Rolling - This can be harmful or helpful. Roll in spring and best done on shallow-rooted lawns such as new lawns or lawns with little topsoil. The purpose of rolling is to get roots back into contact with underlying soil. Hollow-drum type roller is best. Weight can be regulated. One hundred pounds of weight should be plenty. 1 cu.ft. weighs 62 1/2 lbs. 1 cu.ft. is 7 1/2 gallons. 1 gal. weighs 8 1/3 lbs.

Top Dressing - Top dressing home lawns with peatmoss or other organic material is recommended. Manure carries weed seed. Peat mixed 1/4 part to 3/4 good loam is O.K. applied 1/2 to 3/4 inches deep in late summer. Then spread a little seed to thicken the turf if need be. This procedure over a period of years will add depth and organic matter to the top soil. The other alternative is to completely rebuild. One cubic yard of soil should cover 972 sq. feet one inch deep. In practice, it depends upon the soil texture. Fluffed-up screened soil will cover about 1/2 this area.

Shade Problems - The answer to growing grass in dense shade may be a complex of factors, in addition to lack of light, such as soil too wet, aeration needed; soil compacted, aeration and/or soil structure improved; soil badly leached of lime and fertilizer elements; competition by roots of trees, etc. for food and water. Ground covers are used where grass won't grow.

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# Fertilizer Problems

William J. Bennett

Biggest overall problem in this area is "What is wanted" in turfgrass.

What is satisfactory?
Who decides this?

Biggest problem for Extension Service is information and education.

Different types of fertilizers - confusing to home owners

1. Inorganic sources - commercial fertilizers, 10-10-10, 5-10-5,etc.
2. Organic (natural) sources - Sewage sludge, Bean meals, etc.
3. Synthetic - Organic sources - Urea-formaldehyde
4. Combination - Organic and Inorganic, 10-6-4, 1-5-5, 8-6-2, 8-6-4, etc.

Health - vigorous turf - lessens problems

"Balance is fundamental"

When everything is in balance you have a healthier, denser turf. Each fertilizer is good if used according to its characteristics and within its limitations.

Works best when used in conjunction with other management practices. Ideal - Constant moderate supply of balanced nutrients

Nitrogen -

3 pounds/year - Growth regulating element - major constituent of proteins, vital for chlorophyll production - Needed in greatest quantities by turf.

Phosphorus -

Doesn't move in the soil - add during construction and mix into soil - Primarily an aid in root development. Availability is dependent on degree of avidity - Most available at pH of 6.2 - 7.0.

Potash -

Essential in transporting carbohydrates throughout the plant. Promotes sturdier plants with greater "disease resistance."

Liming -

1. Decreases soil acidity
2. Makes possible more optimum use of fertilizers

Rates of application are best determined by a lime requirement test. This is more than a simple pH test. Actually measures the exchange capacity of the particular soil. Extremely high lime requirements are possible on some of our soils - as much as 7-8 tons/acre. This amount doesn't need to be applied at one time. Maybe 2 tons/application possibly in spring and fall.

This makes you wonder about the "rule of thumb" concerning liming lawns - 1 ton/acre or 50 lbs/1000 sq.ft. every 2 or 3 years. In most cases this application will hold pH fairly constant. If you start with pH 6.2-6.5, fine; but if you start at 5.2 or a similar pH then the "rule of thumb" application will not raise the pH over a period of years.

Fertilizing program for home lawns

Based on 3 lbs of nitrogen per year - applied at the rate of one lb. of nitrogen per application.

April 1st
May 15th
September 1st

Combination of organic and inorganic sources probably best for home lawns in general.

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## Lawn Construction and Insect Problems

Herbert C. Fordham

The establishment of a good lawn knows no real short-cut or cheap way out. Employment of haphazard practices and "anything to save a buck" ideas usually result in costly, time-consuming renovation or rebuilding of a lawn area.

How often is the matter of drainage overlooked? Problems related to surface drainage are readily recognized by mere visual inspection. What lies beneath the surface can be a more critical problem. The sub-soil, although infertile, plays an important part in regulating the flow of water from the top-soil to the foundation. As such, it should be able to readily absorb excess water from the top-soil. Over gravel 14" to 16" of sub-soil is desirable. Clay requires about 8" of gravelly sub-soil and rock, about 16" to 18" of a light clay sub-soil.

The importance of a good quality top-soil cannot be over-emphasized. Although we know grass can be grown on almost any kind of soil, the cost and problems involved trying to maintain grass on just any soil is another story. A uniform soil mixture of 5" to 6" depth is necessary to assure deep root penetration. Sufficient coarse, gritty sand should be present to allow for good aeration and reduce excessive leaching out of nutrients and help the soil to retain its loose, friable quality.

In most areas good top-soil is expensive and hard to come by. Often that which is sold as top quality is inferior to existing soils.

It is usually the presence or lack of organic matter in a soil which distinguishes the good from the poor. The incorporation of from 1" to 2" of peat moss, compost or manure into the top 5" to 6" of soil will do much to restore its quality. On extensive areas where time and temporary appearance are not of great importance, one or two cover crops planted and turned under just before maturity will do equally well and usually at a lower cost.

Among the most frequent complaints pertaining to insect problems in turf areas has been the ineffectiveness of Chlordane even where applied according to the manufacturer's specifications.

Where liquid applications are made using a low volume of water, this will only wet the blades of grass. Unless heavily watered in immediately after application, Chlordane will volatize sufficiently to greatly reduce its effectiveness. This would be particularly true on a warm day. Time of application is also important. Treatments made during May and June when grubs are nearing maturity are much less effective than those made during early spring or late summer. It has also been found more effective to use granular forms on very heavy turf areas. Granules have a greater tendency to filter into the soil than other formulations. This would be particularly true where thatching has occurred.

Where ants and earthworms are a problem, particularly on newly seeded areas, treatments of Chlordane as recommended for grubproofing will give good control of ants for about one full season. Substantial reduction in the earthworm population will also be had although higher rates would be necessary to completely knock out earthworms.

One of the insect problems not readily recognized by many is the turf injury caused by chinch bugs. Trouble may easily be confused with drought injury since it is most likely to occur in sunny areas, particularly on slopes. It may start as one or more spots turning straw-like in color with a sudden increase in size. Weed growth within the area usually stands out green and unaffected.

The adult chinch bug is very small (about 1/8") and black with white wings. It will require careful examination of the grass in a narrow strip around the outer edge of a burned-out area to spot him. Treating affected areas as soon as possible with Diazinon, Sevin, Ethion or Trithion should give good control. It may be necessary to repeat applications after 7 - 10 days.

Where Sod Web Worms are a problem, materials such as Sevin, Diazinon, Chlordane or DDT should be used. Be sure to follow the manufacturer's directions when using any insecticide to assure effective results.

Two of the most common mistakes made by the average homeowner are over-seeding and under-watering. Remember with most seed mixes 2-4 lbs per 1000 sq.ft. is adequate. Watering should be light but frequent until seed is well germinated. Be sure after all the work is done, a responsible person is informed on how and when to water.

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