SUMMARY OF PROCEEDINGS

ANNUAL CONFERENCE OF THE

MID-ATLANTIC ASSOCIATION OF GOLF COURSE SUPERINTENDENTS

Under the Auspices
of the
Extension Service
University of Maryland

Lord Baltimore Hotel
Baltimore, Maryland
January 8 and 9, 1962

INDEX

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Call to Order

Dr. George S. Langford
University of Maryland
College Park, Maryland

Gentlemen, it gives me a great deal of pleasure to call this conference to order. Last evening I was especially gratified to see this conference being publicized and receiving proper recognition in one of the Nation's great cities - Baltimore. I hope all of you have observed the big sign on the Lord Baltimore Hotel welcoming each of you to the city as a golf course superintendent. This is a well-deserved and earned recognition. Your reception has often been less pretentious and as a result relatively few people in the city know that the Mid-Atlantic Golf Course Superintendents were holding a convention in their midst. But today, with the sign of welcome, it is almost impossible for anyone passing along either Baltimore or Hanover Streets not to know you are here. This is not only good for the Golf Course Superintendents, but for golf as a whole.

At this time I shall call upon Bob Shields, the chairman of your program committee, who is here to welcome you and tell you about the program.

Welcome to Conference

L. R. Shields, Program Chairman
Woodmont Country Club
Rockville, Maryland

As Program Chairman I would like to welcome you to the 32nd annual conference of the Mid-Atlantic Chapter of Golf Course Superintendents. A special welcome to those from out of town, including the group from the Philadelphia area led by former National President, Marshall Farnham.

The Program Committee has made every effort to assemble a program that will appeal to a great variety of interests. We start this morning with a man who was once a club Greenschairman and is now President of the Mid-Atlantic Golf Association, Mr. Richard Essex. Next will be Mr. A. E. Martin a club manager, thoroughly familiar with country club operation, telling us how we can best work with our manager.

From Pennsylvania to tell us what to do when there is talk of remodeling the course comes golf course architect, Dave Gordon.

This afternoon we get into the basics of creating conditions for good turf by starting with Dr. Jim Miller of the University who talks on Soils. Then Dr. John Gallagher tells us how to get rid of the weeds, followed by Dr. Jesse DeFrance on Herbicides, Fungicides and Insecticides. Verne Fish of Toro closes the educational

session for the day by explaining how to care for our maintenance and mowing equipment.

Tonight a good time is in store for all when we meet here in this room for a Social Hour sponsored by Bolgiano Co., G. L. Cornell Co., National Capital Toro and Baltimore Toro. Please be here promptly at six o'clock.

At the banquet tonight I know you will enjoy meeting some of the officials from the University of Maryland and hearing Dr. Albert Piringer talk on the Effects of Light on Plants.'

Tomorrow will bring together well-known turfgrass personalities like Dr. Jim Watson, Dr. Jack Harper, Charles Hallowell and Al Radco. Of special interest will be a message from Dr. Gene Nutter on the Management Challenge. Dr. Nutter, who is the Director of the National Association, wants superintendents to educate themselves and pull themselves up. Don't miss his talk.

We held the Superintendent speakers until last and asked our friend Dr. Fred Grau to act as Moderator. We know you will want to hear every one of them.

May I express my thanks to the 20 or 30 people who appear on the program, the members of the Program Committee, the University of Maryland and Program Director, Dr. George Langford.

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Greetings from the President

George C. Gumm, President
Mid-Atlantic Ass'n. of Golf Course Superintendents
Berlin, Maryland

It is a pleasure to extend Greetings to you on behalf of myself and our Board of Directors, and I wish to thank our Program Committee and the University of Maryland for their work in presenting us with such a fine educational program.

All of our speakers have been asked to leave a copy of their speech with Dr. Langford so that a brochure of the Conference can be printed and forwarded to those who registered.

Tonight at 6 p. m. we will have our cocktail hour in this room, and I want to thank the F. W. Bolgiano Co., G. L. Cornell Co., Gustin's Baltimore Toro, Inc. and National Capital Toro, Inc. There will be a little special entertainment at this affair. We have asked that all room gatherings be stopped during this cocktail hour.

Following the cocktail hour we will have our annual dinner and Dr. Cory, Dr. Langford and Charles Hallowell will be presented with their honorary membership certificate, and Dr. Felix Juska with a complimentary membership certificate.

I thank you for attending again this year and I am sure we will all enjoy a fine two-day session.

The Golf Course Superintendent's Place in Golf

Richard Essex, President
Mid-Atlantic Golf Association
Chevy Chase, Md.

The increased importance of the Superintendent in Golf over the years can be pointed out by the fact that it was not too many years ago when you men were known as "Greenskeepers".

Many of you can recall when the job was just about what the name implied. That was the day of the hand greens mower and the horse drawn fairway units. Add some kind of make-shift spray unit, hand tools, such as scythes, etc, and the ordinary equipment found on farms of the time, spreaders and hay-rakes, etc, and horse drawn and it is easy to see the job required a farmer with a knowledge of the grasses in the area.

Today the Course Superintendent is required to have a knowledge of automotive equipment (tractors, trucks, loaders) power tools of all descriptions, fungicides, herbicides, fertilizer of all kinds, principles of labor management, budget management and golf course architecture. Several universities offer courses in the profession as it is now recognized. As the popularity of the game has grown more and more money has been invested to provide facilities to play the game and each year the cost of maintaining these facilities increased. As the amount of money spent annually rises, so does the importance of the men charged with the economical application of these funds.

A recent article in the Wall Street Journal on the difficulties of Golf Club operation stated that the cause of most failures is mismanagement. While the article referred to the operation as a whole, we know the course budget is one of the largest items on any Club's annual statement. In order to be a part of a successful operation, a great deal depends on the ability of the Superintendent to produce the most from the dollars allotted him. To do this requires organization and planning. Any operation that moves from day to day, week to week or even month to month is far more costly than one that is intelligently planned for longer periods, such as seasons or even a full year or more.

The largest part of any budget is labor. It is very easy to let the same men perform the same jobs year in and year out if you are fortunate enough to have men who are skilled and dependable. However, the cost of labor rises continually. New machinery is introduced to the field constantly. New maintenance methods are devised by the Superintendents and demonstrated and discussed at your monthly meetings. The proper use of new machinery and new methods can greatly reduce labor costs. To accomplish the savings available necessitates the training of the crew in new machinery and new methods. Unless this is done the so-called labor saving machine is mothing more than another item to be paid for and maintained, and is therefore a waste of money. It might do the job a bit better and make the crewman's job easier but it is still a waste of money.

A point to be kept in mind. As hourly rates rise in industry, our rates must also rise if we are to maintain a crew. It is imperative that we make full use of the newest equipment with fewer and better trained men who can perform many different jobs. The superintendent who follows this principle of training and labor reduction will have little trouble convincing his chairman he needs a piece of equipment. The one who buys the equipment and still has rising labor costs can expect to be called for an accounting sooner or later. It is difficult to reduce a force of

loyal, faithful men, but the days of the man who can use only hand tools are numbered.

The proper, most economical management of labor is an extremely vital part of being a valuable man in the operation of a golf plant.

The average club member has very little knowledge of the real function of the Course Superintendent and what it takes to provide him with a perfect layout at all times. He seldom has the opportunity of observing the superintendent in action and may not realize the work is planned so it will not interfere with his enjoyment of the course. This doesn't prevent him from complaining when he sees something he feels should be done. General Floyd Parks made a remark to me when I was appointed Greens Chairman at Columbia about ten years ago. He said "Remember, you maintain a golf course not for the members, but in spite of the members." In other words - "Don't fight it."

Many things can be done in general practice to keep down the complaints. One of the most annoying things to a player is an untidy course. We know the player contributes to making a course untidy, but there again, we can't fight it too hard. Many clubs provide trash receptacles at every tee and this helps but doesn't cure. A regular clean-up program is necessary and should be followed faithfully.

First impressions are very important. When a player comes out on the first tee and sees a clean, pleasant area, his game has started in an atmosphere he can enjoy at least until he hits his first shot. The Club House area should be given special attention as more members see this part of the course whether they play or not.

A golf course is much easier to keep up than it is to get in shape. Routine, planned maintenance practices can make the job of preparing for a special event an easy one and goes a long way to please the members who play the couse day in and day out.

The greenskeeper of past years has moved ahead as golf has moved ahead and is now an agronomist, a labor manager, a landscape expert, a financial wizard in many cases of short budgets, a diplomat in his relations with his chairman, and in more and more situations, a golf architect. His contribution to golf is seldom recognized by many people. Nevertheless, the people close to the operation of the facility realize his importance and appreciate his place in golf.

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How the Manager and Superintendent May Help Each Other

A. E. Martin, Manager
Congressional Country Club
Washington, D. C.

When Mr. James Thomas called me and invited me to appear at your conference I was most appreciative, yet wondered just where I might fit into the picture. I so expressed myself to Mr. Thomas, and he jokingly said, "Well - your good friend Col. Dick Daley says you know a little something about budgets." So - I accepted.

When my wife learned of this she said, "How can you contribute anything? You don't know anything about their complicated job of growing grass". That didn't help my ego, but in hunting for an answer I remembered that as a youngster in school, being too small to play football, I had helped my team win through efforts exerted as a Yell Leader. Thought I, maybe I could be your Yell Leader.

Finally, I confided in a fellow country club manager that I had accepted this invitation and asked him what he thought I should say to the Gentlemen of the Greens. He jumped at the chance. "Tell them," he said, "to make the first and last holes EASY pars and put drain-board grooves in all the greens slanting toward the cups. The steaks taste better that way."

A facetious statement, to be sure, but applied seriously...though not literally ...it bespeaks volumes. (Repeat "Tell them to make the first and last greens SURE pars and slant all greens toward the cups--the steaks taste better that way."

Without realizing it, my friend had cutely phrased a rule which you and I recognize as a basis one for all organizations..in one word..cooperation. Applied to our situation it means that, where our professions meet, we as Greens Superintendents and Managers must cooperate one with the other, if our goal is to be attained.

Now this is not a new or startling observation. We have all heard it before and know it to be true. However, being human, we sometimes forget this fact in life. And where we do remember, where does this cooperation start -- with the Manager, or with the Greens Superintendent? This is like the question "Which comes first, the chicken or the egg?" I answer with another question, namely .. Does it really matter?

True in some organizations the Greens Superintendent reports to a General Manager and in others reports direct to the Greens Chairman or to the Governing Board. I have heard the point of which is the better arrangement discussed long and honestly on the floor of the Club Managers' conference. To the argument that, if there is to be unity and progress, there can be only one staff head in a country club - with no division of authority between Greens Superintendent, Pro & Manager, I contended then, and contend now, that the point is of no particular significance if the attitudes of the three men concerned are correct ones. As an individual, I have been privileged to work under both arrangements. I choose not between them. I know to my own satisfaction that, if the attitudes of the three men towards their jobs and associates are ones of cooperation, the desired result will be forthcoming, regardless of which policy is in effect. Conversely, if the attitude of any of these three men is warped, biased and sneaky, the final results cannot possibly be of the best.

Now - with attitudes correct, how can I help my associate, the Greens Superintendent, do his job well and perhaps with more ease?

(1) I can act as voluntary liaison between him, the Officers and the Members, to keep him informed of situations with which he possibly has not had the opportunity to become familiar. For example, if I hear more than the usual amount of "crab "crabbing" among the Members about the way the rough is being cut (and to me a reasonable amount of expression is healthy, because it indicates interest), I think it is both my privilege and duty to inform our Greens Superintendent of same. If I hear repeated criticism about the lack of cleanliness of the shelter wash room on the back side of the course, I can and should inform Mr. Superintendent of the trend of comment. Maybe he will want to change the time schedule of that employee whose job it is to keep the wash room clean. If I hear complimentary remarks day after day about the beauty of his greens, this too, I think I should relate to him...and maybe, just maybe, he wouldn't object, if in this case, I told the Greens Chairman about it also.

(2) I can take a personal interest in the men of his crew, as I do with my own staff - this with his due approval, of course, and strictly in line with his operating policy. Often the Manager, by the nature of his job, finds himself in a

position to speak or act to the advantage of the greens crew separately or in conjunction with an over-all plan. Example--It was with just as much concern for the greens crew as for the house and other sports crews that, in 1948, I successfully convinced the Congressional Officials that the Club should make available for the employees Group Hospitalization and Death Insurance. And, by way of side comment, I would be less than honest if I did not admit that I felt a sense of satisfaction just this last week when I called in our Greens Superintendent, Mr. John Henley, and handed him a check for $1,000 to be presented to a fine elderly lady, who, early in December, lost her husband through death after a long illness. The husband was our oldest employee, a greensman who had helped turn the ground for the Congressional building in 1923. Superintendent John was gracious enough to ask if I didn't want to present the much-needed check. I thanked him and told him "no" - I had had the privilege of presenting to the widow Uncle Ed's Christmas bonus and I felt he should have the pleasure of presenting the insurance check.

To elaborate further by example of advantage to the Greens Dept. thru Management's effort in the over-all, I cite another recent action of our Governing Board. After a number of years of study and weighing the possibilities of the Club being able to carry the cost, an employees' pension plan was brought into being, at no cost to the employee except application of his or her loyalty and effort converted into a reasonable term of service. As Manager, I take credit for bringing about consideration of such action by our Powers-that-Be. I also take credit for encouraging them to include all employees and not just the top echelon. Further, I assumed a measure of responsibility, as manager, for maintaining operations at a level which will permit continuance of the plan. True, given the same contacts and background knowledge, our Greens Superintendent might have done as good or better job than I, but the boundaries of his position do not include or require that he gather in this particular knowledge or maintain those particular contacts. However, notwithstanding the fact that he contributed no direct effort toward the establishment of the pension plan, he and his crew will benefit just as much from its establishment as well as the house and the other sports crews. I figure I extended our Superintendent a helping hand.

(3) I can on occasions act as arbitrator between Greens Chairman and Greens Superintendent. I recall once that shortly after one of our annual meetings the new Greens Chairman came to me and said, "Look, I cannot possibly work with that impossible so-and-so we have out there as Greens Superintendent. "He'll have to go." And he meant it. What the new Chairman didn't know was that the Greens Superintendent had come to me the day before and said (in effect), "Look, that so-and-so doesn't know the first thing about maintaining a golf course and I'm not about to put up with him." A timely word of restraint to each of them, with a suggestion that they simmer down and each give the other an opportunity to prove himself, brought a pleasing result. After two years of working together they had joined the mutual admiration club and each was often heard extolling the virtues of the other.

(4) From the direct material standpoint, I can see to it that orders are placed and purchase orders issued promptly for supplies, repair parts, etc. requisitioned by the Superintendent; that the weekly pay checks are ready on time so that his men do not become disgruntled because of delays. When holidays play tricks with the regular work routine, I can encourage the payroll clerk to hurry along her calculations and maybe pay a day ahead of time. This extra bit of effort on the part of the office crew may buy goodwill for the Superintendent that will stand him in good stead at some critical time.

To continue to enumerate possibilities in this category would bring about an endless list. Suffice to say it is well for me to remember the little things that through thoughtfulness spell cooperation.

(5) BUDGETS. Here I am sure I can lend real assistance to the Superintendents.

What is budgeting? It is simply the projection into the future of past experience (usually in terms of dollars), tempered to allow for known and anticipated upcoming situations. It goes without saying therefore that to be of any real value, the experience figures that go to form the foundation of the projected budget must be correctly and honestly accumulated. Mr. Superintendent must be sure that his daily records are kept accurately and in sufficient detail to make them of future value as well as current value. The summarizing of those daily figures into monthly and yearly records can be a chore if the daily records are numerous. The Superintendent can save himself a great deal of time where dollar records are involved if he will accept the summary figures of the Club bookkeeper, or at least use the Club's summary figures with which to compare and verify or disprove the correctness of his own calculations. Acceptance of this assistance from the Manager and/or his bookkeeper is a natural and non-compromising procedure.

Good budgets are prepared from more than one year's experience, granting that the records are available. However, caution must be exercised to see that out-dated figures are not included. For example, wage rates of ten years ago were much, much lower than they are today...than they were last year...and from all indications lower than they will be next year. To include payroll expense figures of ten years ago would serve only to lend misrepresentation to the averages which we seek for the purpose of projecting next year's budget. On the other hand there may be some reason to consider long term records where division of the budget into operating and capital expenditure parts is concerned - where rates of depreciation and obsolescence are concerned - and where insurance valuations are concerned. In my opinion fairest determination here can be effected by Superintendent and Manager working together in cooperation with the corporation's comptroller or bookkeeper - each thus helping the other.

.....and above all (if I may issue a warning), please don't any Superintendent put too much stock in the old adage "I'm a greenskeeper - not a bookkeeper". Remember, you are now Greens Superintendents, not just Greenskeepers. I cast no reflection on the latter, but the word "superintendent" infers at least greater responsibility...and today, this responsibility you must carry. If you don't believe this is important, I refer you to and suggest that you go back and re-read the front page article which appeared in Wall Street Journal under the recent date line of December 28, 1961: "Ailing Country Clubs...Costs, Mismanagement, Overzealous Promotion." True we need not be pushed into panic by this article, but it might be well if both Managers and Superintendents consider the contents of the same soberly.

(6) There is an intangible way in which I think I can help our Superintendent, too. I can encourage him to associate himself with other men of his profession such as you.....
.....and right here I would like to personally compliment you as an association, on the tremendous progress you have made, particularly in recent years. We of the Club Managers Association , and the Golf Professionals Association too, I am sure, recognize the fact that you carry well your responsibility as the ranking society of your profession.

I can enccurage our Superintendent to be well read, professionally - read the "Reporter", your official publication, for example. He doesn't have to agree with everything that he reads, but certainly he cannot read same without stimulatinf his thinking.

....Now I could take offense at that "crack" about cost of the Club House operation, but I won't, because Mr. Boyd is at least partially correct in his

statement - and besides, while I don't believe that I ever had the pleasure of meeting the gentleman, apparently he was born just 30 miles south of where I was born... and one of my dear friends was, for a number of years Manager of Camargo. Besides, I do like the way Mr. Boyd forcibly states some pertinent facts.

And right here I think it not inappropriate that I mention that both the Superintendent and the Manager will find their mutual operating problems minimized if they are fortunate enough to have a Greens Chairman who understands operational finance - particularly as same relates to budgets. Currently we at Congressional are in a fortunate cycle. Our Greens Chairman is a very successful energetic contracting builder with an engineering degree, who fully understands this phase of his chairmanship. If we of the staff had become a little lax in our detail record keeping of Greens and Grounds costs, he most certainly has corrected same. There are few detail financial questions that can be asked about our Greens operations today which cannot be answered quickly by reference to the record files. Our Greens Superintendent and his crew hold the man in great respect and from all indications the entire personnel of the department enjoy their work. As Manager, I am exceedingly pleased because this helps me in the overall administration of Club affairs, and helps keep tension and stress at a minimum in the overall organization.

While pointing out some ways in which I think a Manager can be of assistance to the Greens Superintendent, I have in the process indicated in some instances how the Superintendent can assist the Manager. Further, I think the Superintendent can help the Manger by accepting gracefully the Manager's efforts to assist him, and vice versa. It is not difficult to misinterpret good intentions. Mr. Superintendent can help also by cooperating closely with the Pro and Manager (as Mr. Boyd said) by giving due notice in advance, for example, if a part of the course is to be closed to play at some specified time for some specified reason. Materially, he can help by keeping the property roads and parking lots cleared of snow in the winter time without the Manager having to push to get it done. He can grant without grumbling the loan of the field truck in an emergency to move in the fashion show platforms from winter storage, or to haul clay for the tennis courts. He can keep the fireplace wood bin at the Club house filled in the winter without waiting for the Manager to call for or beg for the wood. He can get his requisitions for materials into the office before the need becomes an emergency. He can get his payroll time book in to the office without the paymaster having to call for it. He can see to it that he doesn't put some one to work until that some one has provided his social security number, or in the case of a minor, until that minor has provided the necessary work permit. He can report immediately an accident involving his employees and/or the Club's equipment. He can approve his department's invoices quickly to permit the Club to take advantage of cash discounts, and to save the office clerk the time and annoyance of having to chase down this or that invoice. He can encourage courtesy and friendliness on the part of his employees in their contacts with employees of other departments. Yes, by remembering to do the many little things of this nature, while being duly concerned with the big ones, Mr. Superintendent can make my life as a Club Manager just that much more livable.

To summarize: If you and I and the Pro will work amiably together and grant each other the same amount of tolerance that we grant to the employees within our individual domains, we will "go happy - be happy" and at the same time do a better job for our employers.

The Architect in Remodeling

David W. Gordon
Golf Course Architect
Doylestown, Penna.

I. Needs for remodeling

A. Improvements for actual playing of game.
1. Eliminate outmoded bunkers.
2. Readjust distances for longer game today.
3. Realign fairways as well as reduce their widths to 40 to 50 yds.
4. Redesign greens to fit present play.
5. Eliminate trees which have grown to interfere with play.

B. Improvements for better maintenance.
1. Eliminate sharp slopes on greens, tees and bunkers.
2. Redesign greens.
   a. For more cupping space
   b. For better topsoil conditions.
   c. Change to better strains of grass.
3. Eliminate water pockets and sharp ridges in fairways
4. Enlarge tees to give more teeing surface
5. Eliminate sharp mounds used to bury stone, etc.
6. Thin out trees to allow for air circulation, and eliminate competition for light and soil nutrients.

C. To solve problems created by encroachment.
1. Highways.
2. Clubhouse expansion.
3. Need for practice area, pool, etc.

D. Add additional nine or eighteen holes to golf course.

II. Benefits of retaining an architect:

A. All changes are contained in one package.
1. May be in letter after a survey of course.
2. May be in plans and specifications where extensive changes are to be made.
3. Includes visits and exhibits to help sell membership.

B. Ability to program and budget work.
1. Not to interfere with golf
2. Ease problems for maintenance crew.

C. Makes use of established theories of golf design rather than whims of green chairman or green superintendent.
1. Eliminates abortions.
2. Eliminates continual renovation due to dissatisfaction with prior changes.

D. Relieves the green chairman and green superintendent of the responsibility of individual changes.
1. Architect must justify changes if they are questioned.

III. Problems that may be encountered:

A. Selection of golf course architect.
   1. An architect in your area whose work you are familiar with.
   2. An architect whose name appears on the American Society of Golf Course Architects' membership list.

B. Attempting to undertake too much construction in a given period.

   1. Inability to finish work in specified time may jeopardize remainder of program.

C. Skimping on construction specifications to save money.
   1. Be sure required fills are made, especially in slopes.
   2. Be sure finest quality materials are used even though something cheaper may be available.

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Fundamental Facts About Soil, Lime and Fertilizer for Turf Grasses

Dr. J. R. Miller
University of Maryland
College Park, Maryland

Lime and fertilizer are very important in the establishment and maintenance of turf grasses in the Mid-Atlantic States. To use lime and fertilizer to best advantage on turf grasses one must consider some of the basic fundamentals regarding soils.

Soils are composed of air, water, minerals and organic matter. The mineral fraction of the soil consists of various size particles (gravel, stones, sand, silt, and clay) and through the action of weathering many of these particles release plant food for use by growing crops. However, the quantity of plant food supplied in this manner is not sufficient to meet the needs of turf grasses and additional nutrients must be supplied from commercial fertilizers or other sources.

The nutrients added to soils and those released in the weathering process are held primarily by the clay particles and the fine organic matter in the soil. The clay particles are very small in size (less than 0.00008 of an inch and have a negative charge. As a result of this negative charge, the clay has the ability to attract plant nutrients that have a positive charge (such as calcium and magnesium in lime and the potassium found in turf fertilizers) thus reducing their loss by leaching. On the other hand, plant food elements which possess a negative charge such as nitrate nitrogen are not strongly attracted by the soil and can be easily leached. Since nitrogen in this form is easily leached from soils and relatively large quantities of nitrogen are contained in grasses, this plant food element is usually recommended for turf grasses at higher rates of application than phosphate or potash. In addition to nitrate nitrogen, the phosphates also have a negative charge. However, this plant food element does not react like nitrate nitrogen as it forms insoluble chemical compounds when added to the soil. As a result very little phosphorus is lost by leaching and there can be a buildup of this nutrient in the soil when large amounts of fertilizer are used. A good example of this is the very high level of phosphorus often found in soils from greens.

The organic matter portion of the soil is also very important because of the many useful effects it produces. Some of these are as follows: 1. Increases water-holding capacity. 2. Improves aeration (especially on heavy clay soils). 3. Promotes good tilth. 4. Helps to hold plant food in soil.

Many of the soils of the Mid-Atlantic States are quite acid and need lime for the satisfactory growth of turf grasses. Most of the grasses recommended for lawns and golf courses grow best in soils that have a pH of about 6.5. A recent summary of more than 1000 soil samples from established lawns showed that 59 per cent of the soils were below pH 6.1 and needed an application of lime. It was encouraging to find that only 16 per cent of the soils from greens were in this category. In the case of fairways the acidity problem was more serious with 49 per cent of the soils below pH 6.1.

In addition to correcting the soil acidity, lime is also important for the growth of turf grasses because it --

1. Supplies calcium - also magnesium in some cases.
2. Causes phosphorus and other plant food elements to become more available.
3. Stimulates bacterial activity.
4. Indirectly improves structure of heavy soils.

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Turf Grass Weed Control

John E. Gallagher, Agronomist
Amchem Products, Inc., Ambler, Pa.

In the effort to provide top quality turf under present day player demands, weed control can play an important part. It has often been suggested that a vigorous turf is the best weed control practice. No one seriously disagrees with this statement. The problem seems to lie in the establishment and maintenance of this vigorous stand of turf. Any injury and subsequent weakening of the turf opens the way to weed problems. If costs more to maintain weeds than to control them. By using weed control practices all other management practices such as mowing, fertilizing, watering and aerification go into the management of turf.

This year turf people had to be weed conscious. The Eastern half of the country had what will probably be remembered as the worst crabgrass year in a long time. A cold, wet spring followed by a warm, wet summer delayed germination and then went on to produce a magnificient crop of crabgrass. Weeds in general grew well and all turf herbicides have been put to a severe test. Many of the standard materials were not up to their best results.

From a research outlook considerable emphasis has been placed on pre-emergence crabgrass control. With the continued improvement in the type of herbicides available it is hoped that we will soon truly lick the crabgrass problem. A second direction in which research is moving is that which is providing turf tolerance information. This is a very encouraging trend. We are getting new grass strains almost as fast as we are getting new chemicals and it is time we in research agreed that tolerance to herbicides is vital in the establishment of these new strains.

Why Weeds

Since we know that maintaining a strong vigorous turf is difficult, we might look into some of the preventable man-made causes of turf weaknesses.

1. Water misuse. Too much water can occasionally be attributed to natural causes, but I am sure that the acreage of good turf ruined by the man behind the sprinkler would far outnumber that caused by flooding from natural causes. Water movement through surface and subsurface drainage can determine the type of plant material which will survive.

2. Fertilizer misuse. Without proper fertilization we cannot provide the growth rate needed to maintain turf vigor. Too little is as much a problem as too much.

3. Insect and disease injury. Unless we anticipate this type of injury by preventative action, particularly when through past experience we know it will occur, we have weak turf and subsequent weed invasion.

4. Mechanical injury. Regardless of how accomplished we have weak spots open for weeds.

5. Mowing practices. Any mowing practice which permits a build-up of clipping to develop a thatch or actually allow a pile of clippings to lay on the surface of the sod results in injury leading to weed problems.

6. Misuse of chemicals. Turf herbicides must be used within the limits specified if they are to do their job safely. With chemicals, as with many other operations, "When all else fails, read the directions."

7. Misuse of plant material. Don't force a grass to do a job when other plant material will do it better for less.

8. Poor design. Under present day use demands, it pays to "Think Big". Make the area involved large enough to distribute the wear.

9. Miscellaneous. This covers the unexpected - animal damage, delinquents, etc. You should have anticipated it. If you did not, then repair the damage before weeds come in.

Weed Control Recommendations

Turf weed control is actually a relatively stable program. The confusion of a multitude of new chemicals for specific weed problems rarely actually reaches the level of the user. This is quite evident when I compare talks on weed control a few years ago with this one today. I will add only a few herbicides today that were not in use two years ago, and they are mostly in the field of pre-emergence crabgrass.

Broadleaf Weeds. For broadleaf weeds we still use phenoxy compounds. To them we have added Simazine, Endothal and Neburon.

(Phenoxy Compounds) The phenoxy compounds control most of the common broad leaf weed problems. Certain cautions must be observed when using these materials. Spray to avoid drift to desirable ornamentals; use half rates when treating bents, St. Augustine and new grass strains of which the tolerance has not been established. Phenoxy compounds are most efficiently applied with low volume, 10-20 gpa, and low pressure, 40 psi for turf weed control. Phenoxy compounds are available as amines, or emulsifiable acids esters and formulated for spraying or spreading.

If possible use separate equipment for turf weed control. If the same equipment must be used for other purposes, thoroughly clean before and after using - flushing out the entire system.

2,4-D Susceptible Weeds. Weeds easily controlled at rates of 1/2 to 1-1/2 lbs. acid equivalent per acre.

Dandelion (Taraxacum officinale), narrow leaf plantain (Plantago lanceolata), broadleaf plantain (Plantago major), self-heal (Prunella vulgaris), curled dock (Rumex crispus), Florida pussley (Richardia scabra), and many other broadleaf weeds.

Weeds hard to control - require specific formulations or repeat treatments.

Wild garlic and onion - 2,4-D ester formulations. Eradication covers a two-three year period. Knotweed (Polygonum aviculare) treat in two leaf stage. Wild carrot may require a repeat treatment in 3 weeks. English daisy (Bellis perennis) emulsifiable acid 2 lb/A repeat treatment.

2,4,5-T. Weeds easily controlled at rates of 1/2 - 1 lb/Acre. Most clover species - white dutch (Trifolium repens), hop clover (Trifolium procumbena) and black medic (Medicago lupulina) and creeping beggarweed (Meibomia cana) in Centipede turf.

Weeds hard to kill require repeat treatments - Oxalis (Osalis stricta)

2,4,5-T Propionic. Weeds easily controlled at 1-1/2 lb/Acre. Common chickweed (Stellaria media), field chickweed (Cerastium arvense), spotted spurge (Euphorbia supina), Oxalis (Osalis stricta), clover species and Henbit (Lamium amplexicaule).

Weeds hard to control require at least two treatments at the 1- 1-1/2 lb/A rate.

Yarrow (Achillea millefolium), mouse-ear chickweed (Cerastium vulgatum), ground ivy (Nepeta hederacea). For weeds other than spotted spurge make applications during the cooler part of the year.

4(2,4-DB). 2,4-D Butyric - Post-emergent application to seeding broadleaf weeds. Rates of 2 + 2 lb/Active per acre appears tolerant to many turfgrass species.

Simazine. Research work conducted by Dr. Evert Burt (1) has established the value of Simazine and Simazine - 4(2,4-DB) combinations for general annual weed control in St. Augustine and Centipede turf. "Simazine at 2-4 lb. per acre active ingredient as a pre-emergent treatment was effective in controlling most annual weeds. 4(2,4-DB) at 1 to 2 lb/acre as a post-emergent treatment was effective in controlling most young broadleaf weeds. A mixture of the two herbicides was effective in the control of established broadleaf weeds and provided a short period of residual activity. St. Augustine was slightly retarded at the 2 lb. rate of 4(2,4-DB). The following species were sufficiently tolerant to permit the use of Simazine and 4(2,4-DB): Florida No.4, Floratine, Bitter blue and common St. Augustine grasses; Centipede; Meyer, Ruglawn, Manila and Emerald zoysia grasses; Tiflawn, Ormond and common Bermuda grasses. Dichondra and most northern grasses are susceptible to injury from the use of Simazine. Newly sprigged St. Augustine may be injured at higher rates.

Endothal. At rates of 1/2 - 1 lb/A for the control of the following weeds. Speedwell (Vernoica spp.) Knotweed, Black medic, Hop etc. - and for post-emergent applications to control Crabgrass (Digitaria sp.) witchgrass (Panicum capillare), barnyard grass (Echinochloa crusgolli), foxtail (Setaria sp.) Sandspur (Cenchrus Tribuloides). In most cases multiple applications at rates of 2.1 - 3.5 lb/A for seedling plants, 7-10 lb. for mature plants. Treatments and interval varies - 2-3 at 5-7 day intervals are most common.

Caution: Turfgrasses can be injured. Fine leaf fescue grasses, St. Augustine and Centipede grass should not be treated. Applications made at 85° and higher will

cause discoloration.

Phenyl mercuric acetate - P.M.A. - for crabgrass and foxtail species 0.75 lb/A or 5-7 pints of a 10% formulation. Three applications at 7-day intervals on seeding plants.

Contact Chemicals

Potassium Cyanate (KOCN) and Sodium arsenite Na As_2O_3. Contact killers, relatively non-selective produce burn on most turf species. Control is achieved by retreat treatment on annual grasses.

Perennial grasses

Dallis grass (Paspalum dilatatum), Nutgrass (Cyperus rotundus) in Bermuda grass turfs.

Organic arsenicals. In general 10 lb. active ingredient per acre as single, double or triple applications. The discoloration to the Bermuda is in relation to the amount of material applied per treatment. Nutgrass will need repeat treatments over several years for eradication. In all cases follow manufacturers directions.

Goose grass or crowfoot (Eulsine indica) in Bermuda grass can be controlled by the same treatment as for Dallis grass when it is in the seedling stage.

Pre-Emercence

Crabgrass - Digitaria species. This is wide open, many materials have had several years consumer use and are becoming established within their limits. Long range pre-emergence - non-selective to turf grass seeds. Applied prior to crabgrass emergence.

Dacthal - 8-12 lb/A. Toxic to red fescue and Colonial bent
Zytron - 15-20 lb/A. Toxic to Red Fescue.
Calcium arsenate - 10 lb. 85% or 12. lb. 73% arsenic trioxide
Lead arsenate - 24 lb/1000 sq. ft. The arsenates will prevent poa annual vigor and survival. Arsenates have caused turf injury and growth inhibition. Winter applications not advised.
Chlordane - 60-120 lb/A technical. Spring applications are most satisfactory and vermiculite formulations show advantages.

Late pre or early post single applications for season control.

Diphan - 30 lb. per acre
Calcium propyl arsenate - $1\frac{1}{4}$ - $1\frac{1}{2}$ lb/1000 sq. ft. Has turf grass seedling tolerance. Effective post-emergent up to first branching stage.

New this Year: Trifluralin 5-4 lb. (turfgrass injury); Dipropalin 6-10 lb. (good turfgrass tolerance); Bandane 30-60 lb. (good turfgrass tolerance)

Grass Killers - Non-Selective

Dalapon (10-20 lb/A.)--Amino triazole (8-16 lb/A)--TCA 60-100 lb/A): Specific chemicals for the non-selective removal of grasses around trees, sand traps, driveways and other areas where kill of grasses is desired. These materials may be combined with sterilant type herbicides to provide long range kill of growing plants and pre-emergence control of ungerminated plants.

The range of rates is given to cover different conditions of grass species and density. Repeat treatments may be needed.

Soil Fumigants and Short Term Sterilants:

Sometimes the best weed control practice is to start fresh with a weed free seedbed. The following materials will provide such a condition:

Seedbed Sterilization

Chemical: Methyl bromide; Rate, 1 pound per 100 sq. ft.; Time of application, after final seedbed preparation; Remarks - Gas-tight plastic cover required to hold gas in place for 24 hrs. Delay seeding for 3 days after treatment. Better gas penetration if soil is dry.

Chemical: Vapam; Rate, 5 pounds per 1000 sq. ft.; Time of application, after final seedbed preparation; Remarks - Soil should be moistened nearly to field capacity prior to treatment. Liberal amounts of water required to seal gas in soil. Delay planting at least 2 weeks after treatment.

Chemical: Mylone; Rate, 5 pounds per 1000 sq. ft.; Time of application, after final seedbed preparation; Remarks - Same as Vapam.

Surface Treatment

Chemical: Calcium Cyanamide; Rate, 50 to 80 lbs. per 1000 sq. ft.; Remarks, Work half of the calcium cyanamide into the surface inch of the soil. Spread the remaining half on the soil surface after working. Do not seed the lawn for 30 days after treating. Test-plant some radishes or similar seed in the treated soil before seeding lawn.

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"Theory and Practice of Herbicide, insecticide and Fungicide Applications in Dry Form"

Dr. J. A. DeFrance
25 North Road
Kingston, Rhode Island

Members of the Mid-Atlantic Association of Golf Course Superintendents:

I appreciated the invitation to speak to you on "Theory and Practice of Herbicide, Insecticide and Fungicide Applications in Dry Form," and I consider it an honor to participate in the program of your Annual Conference.

That the subject is timely is attested to by a featured article in the January 21 issue of the magazine Chemical Week titled "Weed Controllers Going Dry," which indicated that the Northeastern Weed Control Conference most attention centered on granular formulations...."Granular formulations seemed to be of most interest to the conferees, as was the case at last year's meeting, and a ready audience was guaranteed anyone discussing formulations suitable for use in granular form."

Dr. R. D. Sweet, weed control expert from Cornell University, indicated at the weed control conference that "Amongst farmers, the interest in granulars stems primarily from their dislike for hauling water or for running the sprayer to some location away from the field in order to refill. The water problem is acute even in regions where water is relatively plentiful."

Also at the Weed Control Conference Dr. Paul H. Schuldt indicated that a granular formulation was effective as the same chemical in 50 per cent wettable powder as spray for control of crabgrass in turf. Dr. Illnicki, Campbell, Tisdell and Collins of New Jersey Agricultural Experiment Station indicated satisfactory control of weeds in potatoes with granular material. Dr. Havis at Massachusetts, Dr. Ahrens at Connecticut and Dr. Bing at Farmingdale, Long Island indicated satisfactory weed control with granular materials in nursery planting. Mower and Cornman of Cornell; Duich, Fleming and Dubeck of Pennsylvania State University; Engle, Ilnicki and Cook, New Jersey; and Rice and Skogley of Rhode Island reported good results obtained with granular material for pre-emergence control of crabgrass.

Granular pesticides are dry solid materials to which a chemical or pesticide has been incorporated. The particle size is 100 to 1000 times larger than a dust. In contrast to sprays, granular particles are applied without mixing or diluting with water or other liquid. The accumulated information from research data and practical use by both professional turf people and home owners substantiate the fact that granular pesticides are highly effective.

The main theory or purpose of application of pesticides in dry form is to provide prevention and/or control without injury to the basic turfgrasses from the proper dosage of the material. An important factor that would influence activity of the material is excessive rainfall and irrigation, so judgment is needed wtih regard to maintaining sufficient effective material in the required location for satisfactory control. This is true also of solutions and sprays.

Weed and Feed, developed by Scotts, was a pioneering concept that made selective weed control a reality with convenient, dry-applied materials. This weed control was selective in its action. As Warren Post indicated, "Maybe it couldn't talk, but I am not so sure it couldn't think." At least it was capable of discrimination. What could it do? It could differentiate between the dicot plants like dandelions and the monocot plants like Bluegrass. It could tie the former in knots and eventually kill them, with scarcely a scratch to the latter. It was selective. But it did not stop there. Simultaneously it fed a good square meal to the turf, helping it heal any scars left by the dying weeds. Once people understood that such seeming miracles were possible, this product proved to be a prize-winner.

Another pioneering concept by Scotts was that complex chemicals could be formulated into convenient forms for easier, dry applications. And according to Warren Post, again, "There was no question about it - applying materials in dry form to turfgrass areas was far more accurate and far less messy than with liquid applications. Scotts Scutl was marketed in granular form in 1950."

Even more important than a practical control for crabgrass was the fact that Scotts could now formulate modern chemicals in a dry, dilute form and so light in weight that anybody could use them. Control of crabgrass with pre-emergence herbicides has been readily accepted by home owners and professional turf people in the short time that they have been available. It is believed that the acceptance of pre-emergence herbicides is due in part to the availability of easily applied granular formulations. Accuracy of application was provided by means of the calibrated Scotts Spreader.

After granular Scutl, Halts and Clout became available as a team to lick crabgrass. These granular materials are selective, and in the case of Halts, used for pre-emergence control of crabgrass, and applied at Standard Setting of No. 10 on the Scotts Spreader, filters through the leaves to the soil where it is most effective. Whereas Clout for post-emergent control of crabgrass, 4-XD for broadleaf weeds like dandelion and plantain; and Kansel, a specific for clover and chickweed, are applied

at Standard Settings of 6 and 4½ and are designed for and attended to stay on the weed foliage, thus providing selectivity by the materials by absorption of the chemicals. The granular forms then provide for better placement and can be absorbed and kept in the soil surface by granular release.

The granular formulations have been processed to minimize hazards against children and pets and an extremely high safety factor prevails. This is of great importance to the home owner as well as in the use for a professional program on big scale areas.

To me the value of the granular fungicide Scutl, with the phenyl mercurials and Thiram content, is that it provides a broad spectrum fungicide of gradual release and long duration for protection against the many turfgrass diseases.

An important factor in the use of Halts for pre-emergent control of crabgrass is that no skips or misses should be made; the material must be applied prior to germination of crabgrass, and the Halts barrier must not be disturbed by raking, aerating or otherwise.

Continuous research with much time and effort has determined the rates of application, and timing of treatments for various products so be certain to read the directions and follow them.

I wish to acknowledge with thanks to Dr. Evert O. Burt of Scotts Research Division for considerable of the following which he presented at the recent Florida Turfgrass Ass'n. meeting.

Herbicides that kill by contact action can be applied by granulars, also. Granular pesticides are also active when applied to the soil. Soil grubs and other soil insects are readily controlled. Granular herbicides are highly effective in controlling weeds in ponds, lakes and drainage ditches in that the particles settle to the bottom of the water and act through the roots of aquatic weeds. Light weight granular materials float on the water surface and are effective in killing floating weeds. Aerial applications of granular pesticides is not only feasible, but practical.

The increased popularity of granular pesticides is due in large part to the advantages of such formulations. Granular applications are safer than sprays around flowers, shrubbery and other ornamentals. Light weight granular pesticides are easy to handle and do not compact the soil as much when applications are being made. In addition to being easier to handle, granulars are safer. For example, a particular organic phosphate chinchbug chemical in the granular form is 55 times safer than the same chemical to be used in the spray form. Granular pesticides have the advantage of being easily and accurately applied. Recently, application equipment for large scale use such as golf courses, memorial gradens, industrial sites, etc. has become available.

Even though in some instances the cost of granular materials may be slightly higher than cost of liquid forms, the convenience and accuracy in application, as a rule, more than compensates for the greater cost. Since all types of pesticides as well as materials such as lime and fertilizers can be applied with a spreader, it is not necessary to have both a sprayer and a spreader to adequately maintain turf.

Remember that turf cut at fairway or lawn height can stand stronger concentrations of the chemical products than turf cut at putting green height. Likewise, some products are better applied during the cooler seasons of the year than during the hot summer months. The kind of grass to be treated has been a factor in weed control in some instances. For example, it has been noted that Kentucky bluegrass has been

injured less by certain chemicals than was Chewings fescue, the other fine leaf fescues and the bentgrasses. It has been noted that on strongly acid soils of low fertility, the basic turfgrasses suffer more from certain chemical application for weed control than where the soil is less acid and more fertile.

The satisfactory maintenance for weed-free and disease-free turf is not the result of one-shot miracle products but rather a planned program with application of proven products to help maintain high fertility to provide dense healthy turf; and the application of products when needed for the control, protection and insurance against invasion of weeds, insects, diseases and other pests.

To summarize briefly, the increased use of granular pesticides is due to:

1. The convenience and ease of application. There is no need for mixing, weighing in ounces or pounds, etc., or measuring areas, and so considerable time is saved.

2. Accuracy of application is provided by the Scotts calibrated Spreader and that makes for easy application.

3. Increased safety factor. A rigid specification for any products offered to the consumer is that they must not endanger children or pets, either as a packaged product or after application to the turfgrass areas.

4. There is a selectivity and some granular products filter through the leaves, distinguishing between width of leaf, and others that remain on the broad-leaf plants for best results.

5. Placement is provided - chemicals can be absorbed and/or kept in the soil surface for better efficiency.

6. There is a saving in cost of having only one type of applicator.

7. There is less soil compaction from use of lighter equipment and material, and there is

8. Greater safety to flowers, shrubbery and other ornamentals, and to turf.

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GOLF COURSE MACHINERY AND ITS MAINTENANCE

Verne C. Fish
Toro Manufacturing Corp.
Minneapolis, Minnesota

Are you getting your money's worth from your grass cutting equipment? You say yes, no. How do you know? If you stop to think a few minutes, you might be surprised to learn that you don't know the answer to this vital question.

First of all, let's establish Toro's interest in this subject. Machines that wear out prematurely through improper care and maintenance do result in an increase in parts business. The improper machine for the job and abuse do result in early replacement of the equipment. This should make Toro happy. It doesn't. Choose the cirrect machine for the job and then take care of it. We can wait for your replacement. Here's a simple formula which might help you determine whether or not you are

getting your money's worth from your mowing machinery.

Machinery operating costs - $\frac{\text{Original cost} + \text{Repair costs}}{\text{Time}}$

Let's take this formula apart and look at it a piece at a time. First, original cost. Why does a tractor cost so much money and still need repairs and replacing? Actually your golf course tractor is practically hand-made, not a production line tractor such as a farm tractor. There is more labor involved thus higher priced. The golf course tractor is engineered to eliminate as much damage to turf as possible and still equal or better the power and durability of other types of tractor. Actually, they cost around $2600.00 which is about the same as you pay for a medium priced car, less accessories. On the average, you turn that car in at 30 to 35,000 miles. Let's see what happens to the tractor during its life-span. Tractors usually run about 7 hours a day and 5½ days a week. Allowing 6 full months for idleness in a year, the tractor totals up about 924 hours per year. When pulling gang mowers, the tractor travels approximately 5 m.p.h. which equals 4,620 miles per year. However, tractors pull mowers in second and third gear.

Tractor time in third gear (70%) or 647 hrs./ yr. @ 810 r.p.m.
Tractor time in second gear (30%) or 277 hrs./ yr. @ 1,480 r.p.m.

If you combine the engine speed, plus the hours run in each r.p.m. catetory, apply the result to an average (high gear) of an automobile, the net result will be equivalent to 22,057 miles per year. Tractors are used on your course a minimum of five years or an equivalent of 110,285 miles. This $2600.00 tractor now appears to be doing its share for the budget.

Well, maybe the above is true, but $395.00 for the 21" Power Greensmower sounds darn high. And besides, we are always buying bedknives and bushings for it. How come?

PGM statistics are of little value unless applied in such a manner that they compare against some other piece of equipment, PGMs actually run substantially more than you might think.

a. five cuttings per week @ w hrs. per cutting equals 15 hrs. per week.
b. 26 weeks per year of cutting equals 360 rolling operative hrs. per year.
c. At an average mowing speed of 3 m.p.h. that machine travels a total of 1,170 miles per year.

These rolling 1,170 miles mean actual operating wear. If we adjust downward 10% for transporting purposes - green to green, the following figures begin to come to light.

a. 1170 miles means the reel bearings must deliver accurate to within .002" some 7,949,800 revolutions per year.

b. The bedknife receives 55,598,400 cuts per year and a lot of that cutting is being done under wet, and sandy, hot and dry conditions, not to mention loose spikes dropped from some member's golf shoe.

c. The front rollers, which are constantly being exposed to sand and grit, along with the corrosive effect of chemicals, must deliver to within 1/64" accuracy some 2,205,492 revolutions.

Assuming that your club has six power Greensmowers, we multiply the above unit statistics by six and an obvious pattern of wear shows up. Six PGMs cost approx-

imately $2,400.00. This is nearly the same cost as that $2,600.00 tractor. However, the 6 PGMs travel a total yearly mileage of 7,020 or nearly 2,400 more miles than the tractor (actual rolling miles) or about 35% more mileage than the tractor.

As you probably know, a club which has six Greensmowers receives a longer life-span from its equipment and experiences lower maintenance costs than if it were to use three Greensmowers for the same amount of work. The reason for this is that when all the greens are being cut with only a small number of machines, each machine has to be run faster. These excessive speeds not only increase wear, but the operator does not have time to notice harmful objects such as sticks, stones, spikes from golf shoes and coins. It is our feeling that enough machines should be used at the club to prevent abuse or overuse of the equipment. Actually you can operate on fewer dollars by spending more for equipment.

These figures are quite realistic and certainly give us an idea as to the type of performance that is expected of your equipment. Building this performance into golf course mowing machinery is Toro's job. Our experimental and product engineering departments are continually striving for QUALITY PERFORMANCE AND LONGEVITY. They subject the machines to many tests such as: dropping them from various heights, driving them down flights of steps, mowing nails with reel mowers, and mowing down 2 X 4's with rotarys and occasionally they even try them on grass. Seriously though, it is not a small job to decide which brand of machine is best for your purpose. We know that TORO IS THE BEST YOU CAN BUY.

Assume you've bought Toro equipment. You now ask yourself, "AM I GETTING MY MONEY'S WORTH? We don't know until we look at repair costs.

During the last war it was discovered that automobiles would perform for several thousand miles more than was anticipated. Prewar cars were junked at 30 to 35,000 miles. These same cars were run 100,000 and more miles when it became necessary. This, of course, was due to proper care and maintenance. The same is true with grass cutting machinery. Naturally, there are certain moving parts that are going to wear out, but we can offer suggestions to help prolong their life. These suggestions are for the most part outlined in the Owners' and Operator's manual which comes with each machine.

A. Daily checks. (1) Loose bolts, (2) Belts and chains, (3) Cleaning mower.

B. Lubrication. (1) Oil level and air cleaners, (2) Zerk fittings, (3) Check gear case levels.

C. Adjustments. (1) Follow factory recommended procedures, (2) Correct tools, (3) Weather conditions, (4) Regular adjustment.

D. Training the Operator. (1) Difference in operators, (2) Correct instructions, (3) Induce personal pride.

One common reason for a shortened life-span and high maintenance costs is the use of the right machine in the wrong job. For example, in most cases a distributor has no jurisdiction as to where small home-owner type machines are sold. The sales force is cautioned about selling these machines to commercial users. A small machine is used by the home-owner about 20 weeks a year with an average use of two to three hours per week. The machine will last the home-owner perhaps ten years, which means 500 hours running time. This 500 hours means about 12 weeks of use to commercial users. In many instances the machine is worn out before the warranty has expired.

In choosing your equipment, here're a few things which might be considered:

1. Consider the area to be cut. Is it wooded, rough cutting, hilly or formal areas? Then decide if a reel type or rotary type or sickle type machine is to be purchased.

2. Consider the amount of usage. Perhaps the machine will be used in large extensive areas and figures are available as to the capacity of the machine. If the machine is to be used for trimming purposes and the usage is not too extensive, a small, light-duty machine can be used, but high maintenance costs must be expected.

3. Simplicity of design is very important, as a complicated machine has many moving parts and will have a high maintenance cost. Also it may be difficult to adjust and a trained expert may have to be used for adjustment and repair.

4. Constructions and durability. The machine should be substantially built, well-braced with good bearings. The side-frames, handles or drawbars should be heavy enough to do the job. The bed bars, reels, blades should be ridigly built.

When you have made your decision, then check with your dealer. He will probably have suggestions for your consideration. We have now purchased TORO Equipment and set up systems for maintenance and repair. Now we ask again, "ARE YOU GETTING YOUR MONEY'S WORTH? You still don't know - no records. (TIME)

It is wise for every user of heavy equipment to keep a record of operation and maintenance. Over a period of years it will pay dividends. This record should show the following:

(1) Name of machine, (2) serial number, (3) date purchased, dealer and price, (4) all lubrication points, (5) accumulative running hours, (6) parts replaced due to wear or breakage and cost, (7) total labor for installing parts.

At the end of the cutting season, this record should show the number of hours equipment has run, plus the cost of maintenance. It will also serve as a record to help promote new equipment.

There is no set life-span for any machine because there are too many intangibles. The question of "cost per machine per year" and "useful lifespan" can only be answered by you. The variations in terrain on which the machine is used, the type of lubrication it receives, the correctness of repair, the treatment by the operator, storage, accuracy of records all have bearing, and in fact determine the answer of these questions. Comparison of your own figures over a period of years will enable you to see when machines should be replaced due to high maintenance costs. Also it will show the life expectancy of any piece of equipment at the time of purchase. Buy QUALITY equipment. Buy the right machine for the right job. Operate and maintain it properly. Keep adequate records. Then and only then will you be getting your money's worth.

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"The Effect of Light on Plants"

Dr. Albert A. Piringer
U.S.D.A., Beltsville, Maryland

Plant scientists have known for over 40 years that the length of day controls many phases of plant growth and development. This response to daylength is called

photoperiodism. Initially scientists studied which plants flowered or grew best on long days and conversely which liked short days best. Later they learned that the photoperiod response depended on the daily duration of darkness and if the middle of a long night was interrupted with white light the plants responded as though they had received two short nights, hence long days. Since white light is a mixture of colors, plant physiologists tested the photoperiodic response of plants to the various pure colors and learned that red was the most effective kind. Subsequently, they learned that many kinds of plant responses other than flowering were controlled in much the same manner by red light. More recently, studies in the U.S.D.A. showed that the action of red light could be nullified by far red given immediately after the red. (Far red is the name given to part of the infrared just at the red end of the visible spectrum.)

All this information indicates to the plant physiologist and biochemist something about the nature of a substance involved in the light control without ever actually seeing it. He knows that the controlling substance is a pigment because it absorbs red light; that very little of the pigment occurs in plants because even albino (Colorless) plants respond to red light; that because the pigment absorbs red light so strongly it must be blue when it is seen; and that the pigment has two interchangeable forms because of its characteristic reversible reaction with red and far-red light.

During 1959 very precise and sensitive spectrophotometers enabled U.S.D.A. scientists to detect the operative pigment in intact plants and more recently, a mixture containing the pigment has been extracted from certain plants and held in the test tube for several months without loss of its character. It is a large molecule; a protein. The pigment, called phytochrome, has been detected in many plants and its purification and identification are expected. Although its specific action is not yet known, phytochrome is obviously involved in basic reactions controlling many features of growth and development in plants.

A very recent development in plant-growth control with supplemental light was the discovery that, to cause long-day responses of plants, light given intermittently is as effective as light given continuously during the interruption period. This lighting procedure is being currently used by U.S.D.A. plant physiologists to study the mechanism of growth control with lights and its mechanism can be related to the phytochrome system.

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CONCEPTS OF TURFGRASS WATERING

Dr. James R. Watson, Jr.
Toro Manufacturing Corp., Minneapolis, Minn.

An understanding of several basic concepts is necessary in order to properly water turfgrass areas. To the casual observer, and often to the man actually doing the job, watering of turfgrass may appear to be a simple routine task, but the man planning and directing the watering program, the golf course superintendent, recognizes that his simplified directions of "Water no. 10 approach for one hour tonight" are the result of balancing and adjusting many complex factors. The superintendents concept of the proper use of water on turfgrass areas is based on an efficient program designed to meet the physiological and use requirements of the grass as modified by the climatic and soil environments.

Water and Plant Growth: Water is an essential component in all phases of growth and activity and is involved either directly or indirectly in all operations

pertaining to care and management of turfgrass. Water is necessary for germination, for cellular development, for tissue growth and for food manufacture (photosynthesis). It acts as a solvent and carrier of plant food materials. Nutrients are dissolved in the soil, taken in through the roots and then carried to all parts of the grass plant. Food manufactured in the leaves is translocated throughout the plant body in water. Water transpired by the leaves serves as a temperature regulator for the plant. The amount of water within the cells of the grass leaves plays a major role in counteracting the effects of traffic. When the plant cells are filled with water, they are said to be turgid. Such a condition helps the leaves to resist traffic (foot and vehicular); hence, adequate water within the cells helps avoid the damage which may result when pressure (traffic) is applied to grass in a state of wilting. Wilt is a condition that exists when the cells do not contain enough water. Such cells are said to be flaccid. For all these functions very large quantities of water are required and they, as well as other considerations, must be kept in mind when developing a concept of turfgrass watering.

Water and Choice of Grass: There are wide differences in water requirements, drought resistance and tolerance among grasses. For the most part, however, selection of a particular grass for golf course turf is dictated by factors which do not always permit the superintendent to take advantage of these inherent differences. Nevertheless, when an opportunity to choose a new grass arises, it is important to keep in mind that even within species there are strains of turfgrasses available for use which may contribute to a better water use. For example, a dense, tight growing strain would be preferred over a more open type, as would a strain potentially capable of producing a deeper root system. A more dense strain would be less likely, generally speaking to be invaded by weeds--which rob moisture--and a depper root system would permit foraging through a larger volume of soil for moisture; hence, extending the interval between irrigations. The proper use of water, then, includes setting up a watering program to take full advantage of these and other inherent capabilities of those grasses best adapted for use on the golf course. Such will definitely register an improvement in water use.

Water and Environment: Environment--both climatic and soil--exerts a marked effect on water use. Adjusting watering practices to suit and demands of climate and to meet the needs of a given soil and grass actually are basic to the proper use of water; hence, important in development of concepts of trufgrass watering.

Climatic factors--temperature, rainfall, sunlight, wind and humidity--necessitate adjustments in the watering program through their influence on the choice of grass; growth activity, including transpiration; replenishment of soil moisture; and removal of excess soil moisture--drainage. Regional adaptation of turfgrass species is determined almost entirely by climate, more particularly by one climatic factor--temperature. Thus, generally speaking, Bermuda and other "warm" season grasses are adapted in the southern part of our continent, while bent and other "cool" season grasses are adapted in the northern areas. In addition to the large scale influence, local climate directly affects the growth rate of turfgrasses; and when grasses are growing rapidly, they require greater quantities of water. In areas of intense sunlight with attendant high temperatures along with low rainfall and humidity (arid and semi-arid regions), water use rates are much higher than in cool, humid areas.

Soil as the medium for turfgrass growth must provide support for the plant, serve as a storehouse for nutrients, supply oxygen and act as a reservoir for moisture. The texture (size of soil particle), structure (arrangement of soil particles), and porosity (percentage of soil volume not occupied by solid particles) of a soil are the basic physical factors which control the movement of water into the soil (infiltration), through the soil (percolation) and out of the soil (drainage). These factors (texture, structure and porosity) along with organic matter

content determine the water-holding capacity and control the air-water relationships of the soil.

Texture is a most important characteristic of soils because it describes, in part, the physical qualities of soils with respect to porosity, coarseness or fineness of the soil, soil aeration, speed of water movement in the soil, moisture storage capacity and, in a general way, the inherent fertility of the soil. Sandy soils are often loose, porous, droughty and low in fertility, whereas clay soils may be hard when dry or plastic when wet, poorly aerated, but high in moisture retention and possibly high in fertility.

Structure, which refers to the arrangement or grouping of the individual particles into units called aggregates, plays an important role in developing a concept of turfgrass watering. The structural aggregation of soil is greatly influenced by the amount of colloidal organic matter present. The end product of decay or organic matter--humus--is an integral part of soil aggregates and is sometimes referred to as the cementing or binding agent in aggregates. Stability of aggregates is directly dependent upon the amount of organic matter and the degree of biological activity obtaining. The structural aggregation of soil determines, to a large extent, the porosity, permeability and water capacity of soils of like texture.

Total porosity of a soil is made up of the sum of the small (capillary) and large (non-capillary) pores. The small pores hold water by capillarity and are responsible for the water-holding capacity of soils. The sum of the volumes of the small pores is called "capillary porosity". The large pores will not hold water against the force of gravity, they are normally filled with air and are responsible for aeration and drainage. The sum of the volumes of the large pores is called "non-capillary porosity".

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

If traffic were not a consideration the ideal soil for plant growth, in general, should have about fifty percent total porosity equally divided between small and large pores, or, in other words, contain twenty-five percent water space and twenty-five percent air space. On areas where traffic becomes overriding consideration (golf greens), then the total porosity of the soil is of less importance than ability to resist pressure (traffic). This is evidenced by results of studies sponsored by the USGA Green Section and conducted at Texas A & M. These studies have shown requirement for a minimum total pore space of 33 percent. Significantly, the small and large pore space is approximately equally divided--twelve to eighteen percent for large pore space and fifteen to twenty-one percent for the small. The aim or purpose of using high sand percentages is textural stability of pore space.

In respect to porosity, the basic factor controlling water movement, it should be noted that wetting agents do not alter or effect the distribution of large or small pores. However, because these materials (surfactants) do reduce the forces of adhesion and cohesion, they will improve the movement of water through the soil profile, providing impermeable layers do not exist.

Compaction of soil refers to a condition in which aggregation is reduced or absent; hence, the soil is dense--or the number of large pores reduced. Degree of compaction at or near the surface is of especial importance, insofar as infiltration of water is concerned. It has been shown experimentally that a very thin layer of compacted soil will materially reduce the rate of infiltration. It has also been established that most of the compaction on turfgrass areas occurs within the upper two inch layer of soil. Unless alleviated (by cultivation) a compacted layer will have an important bearing on the rate of water application; hence, on the overall watering program.

Modification of soil to improve physical and chemical properties with resultant efficiencies in water use is paramount to success in new construction, rebuilding and renovation programs.

Soil water may be classified as available, unavailable and excess. From the standpoint of utilization by plants, soil water above the wilting point and below field capcity is considered available. Moisture below the wilting point is held too tightly to be extracted by plants and is classified as unavailable. Water above field capacity is subject to removal by the pull of gravity and is said to be excess. Excess water is that which replaces air in the large pores. When all air is replaced--when the large and small pores are filled with water--the soil becomes saturated. Soils maintained at or near the saturation point are most detrimental to turfgrass growth.

One may become familiar with the various levels of soil moisture by making periodic observations of a wide range of conditions--study soil cores taken immediately following a soaking rain or thorough irrigation and periodically until the soil appears dry and the grass begins to wilt. After practice, one soon becomes able to examine the soil and determine from a practical standpoin the amount of soil moisture present.

Drainage, or the removal of excess water from a soil, is of two types--surface and internal. Surface drainage is accomplished through grading and contouring of surface areas. Internal drainage is a function of physical soil properties and may be of far greater importance than some of the other factors mentioned--for example, water holding capacity of soil in golf greens. On most turfgrass areas one is usually able to apply water if soil moisture becomes limiting, but in too many cases during periods of heavy rainfall, rapid percolation, with subsequent removal of the excess water, does not take place. This is particularly true of many green and tee areas. Unless soils are adequately drained, many problems associated with saturated soils will arise.

For new and existing turfgrass areas, a determination of soil physical properties for each golf course soil coupled with a knowledge of how each independently and collectively affect water use is basic to the proper use of water.

Watering Practices: Once the physiological requirements of the grass and the influence of climate and soil properties are understood, the proper use of water from a practical standpoint, may be resolved by answering three questions: How often to apply water? How much to apply? How to apply it? There are no simple answers to these questions, rather the answers are a matter of judgment--judgment based on knowledge and understanding of the particular set of conditions existing on each golf course. The limitations imposed by frequency and amount of play, the capacity of a given irrigation system, the availability of personnel and the prevailing weather conditions all have important bearing on specific watering practices.

How often? Supplemental irrigation is always necessary if turfgrass areas are expected to remain green throughout the growing season. The frequency of irrigation

is governed by the water holding capacity of the soil and the rate at which the available water is depleted. For the most vigorous and healthy growth, watering should begin when approximately 40 to 60 percent of the available water has been depleted. Most plants show a marked growth response when soil moisture is maintained between this level and field capacity. Assuming equal depth of rooting, sandy type soils will have to be watered more frequently then will loams or clays. Climatic conditions such as high wind movement, intense sunlight, low humidity, and temperatures all contribute to high water use rates. Such conditions dictate more frequent watering than the reverse set of conditions.

Frequent watering of poorly drained soils tend to keep the upper layers of the root zone near the saturation point most of the time. This encourages shallow rooting and promotes weak turf which is susceptible to weed invasions, disease and insect attacks as well as damage from traffic-soil compacts more severely when wet. Frequent, shallow watering of well drained soils may not, in itself, be too serious, but such practices are not economical--they cause excessive leaching of nutrients, require more manpower, use more water than necessary and produce more wear and tear on equipment and facilities.

How much? The amount of water to apply at any one time will depend upon how much water is present in the soil when irrigation is started, the water holding capacity and the drainage characteristics of the soil. The amount to apply will also, to a certain extent, depend on local weather conditions--it would not be wise to satisy the water holding capacity of a soil just prior to showers or a rainstorm, if such could be avoided.

Generally, one should apply enough water to replenish that portion of the available water in the root zone which had been used by plants since the last irrigation; or, ideally, about 50 percent of the available water--assuming the system can be set in operation when approximately 50 percent of the available water is exhausted. In actual practice it is seldom possible to control water programs accurately enough to accomplish this--local differences in soil, terrain, grade, etc., would preclude such a degree of accuracy even if sufficient control of irrigation facilities and enough competent personnel were available. Nevertheless, through careful study of the soil characteristics, one can adjust the watering program to conform closely to the ideal amount of water needed.

Enough water should be applied to insure that the entire root zone will be wetted. Too, on natural soils (as opposed to those modified for intensive use) sufficient water should be applied to bring about contact with sub-soil moisture. Continuous contact between the upper and lower levels of moisture will avoid a dry layer through which roots cannot penetrate. Application of too much water at one time is serious only if the soil is poorly drained and the excess cannot be removed within a reasonable period of time.

How to? Water should never be applied at a rate faster than it can be absorbed by the soil. Sprinklers that do not adequately disperse water, as well as sprinklers that deliver a large volume of water within a concentrated area, tend to cause surface runoff. Whenever water is applied at a rate faster than it can be absorbed by a given soil, the water is being wasted. The sound watering program, then, would call for sprinklers that apply moisture slowly enough to permit ready absorption. When surface conditions such as compaction exist, it should be corrected by aeration (cultivation) or spiking. Such will materially improve the infiltration rate of water.

Once surface runoff is evident, the sprinklers should be turned off. If the soil has not been wet to the desired depth--this may be determined by probing and examining the depth of penetration--then the sprinklers may be turned on again at

the end of thirty minutes to an hour, depending on the permeability of the soil.

Adequate equipment and facilities, obviously are basic to the successful performance of watering practices. When either or both are lacking, their replacement with well engineered layouts and modern sprinklers should be planned on a long range basis. Serious consideration should be given to installation of semi-automatic and possibly completely automatic systems when replacement is necessary or in new construction.

Other Implications: Concepts of turfgrass watering based on the proper use of water has implications beyond the immediate production of high quality golf course turfgrass. Water is unquestionably our most important natural resource. It is not, as we are often prone to think, inexhaustible. The search for new sources of potable water, the study of methods to conserve present supplies and to reclaim polluted waters is being carried on continually. The importance of these as well as other projects concerned with the study of water resources is evident when one realizes the projected population increases for the next 15 years add up to an additional 50 million persons (by 1975). Some say that as a result of this and attendant demands that it is possible over-all water use may increase as much as 70 percent by 1975. The impact of such an increase in water needs could have, for many regions, some rather serious implications.

In addition to the long range implications, the expenses involved in irrigating is another important concept of water management not directly related to the production of high quality turfgrass. Water for turfgrass is costly, whether the source is from municipal systems or whether the course installs its own pumping plant and utilizes water from deep wells, natural or man-made lakes or streams. Costs are involved in the installation of watering systems and for the equipment needed to apply water to turf areas. Expenses do not stop once the initial investment in the irrigation system has been written off. Each time the pumps are started it costs a few cents for the power to run them, and, of course, there are substantial labor costs involved in the application of the water.

The saving of only a few gallons of water daily, whether by the judicious use of water, or by efficient operating procedures, could mean a sizable savings in funds on an annual basis.

Summary

In summary, concepts of turfgrass watering embodies many factors which individually and collectively affect water and its proper use. To use water properly requires an understanding of the fundamental role water plays in plant growth; of the effects climate and weather have on growth rates, how they influence water use rates and choice of grass. Good water management demands a knowledge of the basic physical and chemical soil properties, how they effect water absorption, storage and drainage as well as the frequency, rate and manner in which water must be applied. Further, proper use of water means correlating all this basic information with the requirements for play and programming a watering schedule to fit the existing irrigation facilities so as to make the most efficient use of them and the available labor force. Good water management implies planning, on a long range basis, for replacement of inadequate systems and out-dated equipment with well engineered layouts and modern equipment. By so doing, economies in operation and conservation of water will be effected. Finally, the proper use of water is an art-skillfully performed by the turfgrass Superintendent who has acquired his knowledge through study, observation and experience.

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THE PENNSYLVANIA TURFGRASS PROGRAM

Dr. J. C. Harper
Pennsylvania State University
University Park, Pennsylvania

Education, extension and research are the basic blocks upon which any well rounded turfgrass program must be built. None of these alone can be utilized to the utmost advantage unless supplemented by the others.

Research has made great strides since the end of World War II. Education has not kept pace with research. Increased recreational facilities, especially golf courses, retirements and death have resulted in an unprecedented demand for qualified superintendents.

Penn State is attempting to help alleviate this problem by offering a standard four year college course leading to a degree in Agronomy with a major in turf management, a two year winter course with summer practicum designed directly to develop potential golf course superintendents and a complete course of graduate study in turfgrass management leading to a master of science or doctor of philosophy degree.

Pennsylvania was the first state to employ a full time turf extension specialist. The basic function of this position is to improve turfgrass installations throughout the State through education and consultant service on construction, establishment and management problems. The turf extension specialist must carry a flexible program geared to rapid changes that may occur throughout the year due to unusual climatic conditions, insect infestations, new diseases etc. A large share of the specialists time will be involved in "trouble shooting" work. I personally visited 120 golf courses, 60 athletic fields, and over 100 other turf installations during the past growing season.

In Pennsylvania the turf specialist is also responsible for the writing of all turf soil test recommendations. This involves approximately 3500 individual reports annually.

Preparation of publications is another time-consuming job that falls to the extension specialist. Pennsylvania will have available in the spring an expanded and revised athletic field circular and an entirely new Turfgrass Guide. A home correspondence course directed at the non-professional is also being prepared.

No turf extension program can exist without turf research information to back it up. I feel that Penn State, under Dr. J. M. Duich, has the finest turf research program in the world. The transfer of research information in easily understandable language from the research personnel to those people who can use the information, has always been a problem. The dissemination of such information is one of the basic functions of the extension specialist.

The research program at Penn State staffed by two full-time agronomists, one full-time pathologist, 3 full-time graduate students, and part time help from several other individuals is directed at obtaining basic information adaptable to all phases of turfgrass management.

The breeding program which has developed Penncross creeping bentgrass and Pennlawn red fescue is currently engaged in a program to develop improved colonial bentgrass, red fescue, creeping bentgrass, tall fescue and Kentucky bluegrass. Strain testing for turf quality is being conducted on warm-season grasses as well as

cool-season.

Fertilizer research at Penn State is respected throughout the turf industry, especially for the basic work done on ureaform fertilizers. Current work is being carried out on all basic forms of nitrogen singly and in combination.

Disease control, weed control and thatch control programs are also being conducted. The newest project underway is a soil modification project aimed directly at golf course construction. This is a long range program using 9 soil amendments in 81 different soil mixture combinations and subjected to compactive forces similar to an actual golf course green.

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POA-ANNUA CONTROL PROGRAM AT KENNETT SQUARE GOLF & COUNTRY CLUB

Paul Weldin, Jr.
Kennett Square Country Club
Kennett Square, Pennsylvania

Four years ago during Mr. Hallowell's Spring visit, we considered renovating #1 Green in order to reduce the amount of Annual Bluegrass. The opinion at the time was that perhaps during August Sodium Arsenite could be applied at the rate of one pound per acre to reduce growth of the Bent Grass and to kill the Poa-Annua. After doing this, the green was to be over-seeded with Pen-Cross Bent. However, during the summer it was noted that the Poa-Annua was fading and that our basic grass was growing much stronger. Our Greens were originally seeded to the old South German mixture which contains everything but the kitchen sink. My policy has been to over-seed when necessary with Seaside. When August arrived, the Green was in such good condition we felt that renovation would be out of the question. The reduction of Poa was not only evident on #1 Green, but a general reduction had taken place on most of our Greens. I am not trying to imply that Kennett has no Poa-Annua in their Greens, however, the amount is greatly reduced and areas of soild Poa-Annua have practically vanished.

The program that was used to bring about the measure of control obtained has been described many times. To quote an expert from an article written by Dr. Fred Grau, in Golfdom, February, 1961: "Another misconception occurs in relation to use of arsenicals for poa and crabgrass control. The questioner uses arsenicals and wonders why results are not forthcoming. A study of management practices reveals that the fertilizer program quite effectively nullifies the effects of the arsenic. It has been shown that low phosphorus increases effectiveness of arsenical treatments. Yet the turf in question receives regular treatments of phosphorus-bearing materials which build up the P level in the soil, practically insuring failure with arsenicals."

Another article published in the Eastern Turfletter, December, 1959, entitled "More About Poa-Annua (Annual Bluegrass)" states that good drainage is essential in the control of Annual Bluegrass citing depressions where constant puddling occurred encourages soil compactions thus inviting Poa-Annua infestations.

Still another exerpt by Dr. Grau appearing in the Golfdom, October, 1961: "Water, more than any one thing, was the villain in disguise. Too many golfers and green chairmen insist that the greens be kept soft with excess water. In one instance (not an isolated one) the greens were watered 4 to 5 hours in the front, then 4 to 5 hours in the back, using a set sprinkler. Poa was the only grass that could grow but the question was, "What can we do about Poa?" We still have a long way to go in the educational field on the simplest basic management procedures."

To tie the foregoing statements together, I have found them to be correct regarding my experience with Poa-Annua. To elaborate a little further, every phase of green maintenance must be carefully thought out otherwise one thing may be done to eliminate and two things done to perpetuate. Calling off standard greens maintenance practices in order, aerifying, top dressing, fertilizing, watering, and the use of selective herbicides and fungicides. Having five of the above six correct and abusing one could nullify entirely the benefits of the five regarding Poa-Annua. An example would be using a non-sterilized top dressing mixture could possibly be the cause of a re-infestation of Poa-Annua.

The entire Greens Maintenance Program at Kennett is designed to produce the best possible turf under our conditions. We apply our fertilizer on a weekly basis throughout the season. The amount of control over the growth rate during hot weather or adverse conditions in my opinion far offsets the small additional labor involved.' The drainage in our Greens has a lot to be desired with only #1 Green having a tile in one corner. With this situation, I am forced to consider the turf more than the golfer during hot weather while carrying out our watering program.

Aerifying and top dressing enter into our control basically by the use of steamed, or another term would be, sterilized top soil. Aerifying is done twice a year, Spring and Fall, to naturally relieve the compaction, a situation which Poa-Annua likes. The top dressing is used as a carrier for our selective herbicide, arsenate of lead. This selective herbicide, in my opinion, is one of the best broad spectrum values on the market today. The undesirable items that are controlled by it are so numerous that we incorporate it as a routine item annually. It controls grubs, chickweed, and to a degree crabgrass, and it will help control our friend Annual Bluegrass.

The rate we used arsenate of lead is as follows: for two years it was applied ten pounds per one thousand square feet twice a year, Spring and Fall. On evidence that perhaps the arsenicals were reducing Poa too rapidly during July and August, our rate for the last four years has been five pounds per one thousand sq. ft. This rate has proven to be thus far satisfactory and we contemplate no change.

If, as stated before, proper procedures are followed, fungicides naturally fit into the picture in keeping the Bent grasses healthy and thus aid in the resistance to Poa-Annua infestation.

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IDEAS, GADGETS AND THINGS

A. M. Radko, Eastern Director
Greens Section, U. S. Golf Ass'n.
New Brunswick, New Jersey

"Necessity is the Mother of Invention". Never were truer words spoken so far as golf course maintenance and management is concerned. Superintendents strive to make the maximum use of every piece of equipment, they improvise or make changes in order to get top mileage for every dollar expended. In our travels we have the opportunity to see many of these ideas and gadgets at work. Here are a few that may be helpful to you.

1. A slicer for putting green turf. Credit for this gadget we believe belongs to Mr. Manny Francis, Supt. of Vesper CC, Lowell, Mass., although we recently observed it in use at Pelham CC, Pelham Manor, N. Y. where Mr. Steve Kristoff is Superintendent. Many clubs have as standard equipment a power sod cutter which does a fine job of cutting sod to a uniform depth and has made the task of sodding greens,

tees, aprons and other turf areas much easier. This sod cutter employes the principle of an oscillating movement of the cutter blade to do its fine work. This is but one job for one machine and when not in use, like other specialized equipment, it sits in the barn for long periods unused. These men did something about it--they took a worn cutter blade and welded the serrated, triangular sickle bar knives, which are standard for all hay or cutter bar units, vertically 1¼ inches apart to the worn cutter blade. Thus they employ all the good principles of the power sod cutter to slice their greens. The improvised gadget doesn't cost much to make, and it is excellent to use on greens to cut thru thatch, isolated dry spots, for overseeding, or prior to fertilizing, liming, or top dressing. According to Steve, they can do nine greens a day at Pelham with the improvised turf slicer.

2. Don't discard that old barber's chair -- do as Mr. Ray Brigham, Supt. of the Rhode Island CC, West Barrington, R. I. did with one. By removing the back and replacing the seat with a flat board surface he converted the old barber's chair into a swivel work bench. By use of the swivel operating handle, which is standard for barber's chairs, Ray can turn the improvised work bench to any desired position from any working angle.

3. Polyethylene to the rescue -- Last winter the freezing weather closed in on the Northeast sooner than expected and many were unable to complete projects underway. One who was caught in this predicament was Mr. Elmer Michael, Supt. at Oak Hill CC, Pittsford, N. Y., who had just lifted some fine Merion bluegrass sod from the nursery. The sod was all rolled and stacked neatly when the "deep freeze" set in around Thanksgiving Day. Fearful that he would lose the sod completely he decided to cover it with a polyethylene tarp. The sod was covered thru to April when it was laid on the tee, weak, but still alive.

Incidentally, and in the same vein, Mr. Ed Casey, Supt. at Baltusrol Golf Club, Springfield, N. J. has made it a practice with good success to cover stolons, when planted late in Fall, with a polyethylene tarp also for winter protection.

4. To Spread traffic on Fairways -- Many, many tractor miles are driven over fairways during the course of each year. Particularly in mowing fairways, is tractor and gang unit traffic heavy. Also as fairway outlines are fixed, mowing in the same manner each time will cause for tracking and added compaction where tractor and mower wheels move in the same lanes each time fairways are mowed. The accumulated effect of equipment traffic on fairways can cause turf injury, and we see this mainly in the narrow approach areas where the tractors with mowing units generally have to turn and in doing so the turf is bruised, torn, or otherwise injured. Throughout the rest of the fairway mechanical injury is not so acute a problem, but lesser difficulties could result.

To reduce the chances of injury and to spread tractor and gang unit weight Mr. Jack Ormond, Supt. Canoe Brook CC, Summit, N. J. employs the following technique: Mr. Ormond mows fairways three times weekly, on Monday, Wednesday, and Friday. On Monday he uses only 5 units to make the outline cut--this is done by disengaging the two outside units and allowing them simply to ride over the rough. On Wednesday only one unit is disengaged and the outline cut is made with 6 units. On Friday the outline cut is made with all 7 units engaged in cutting position. Once the outline cut is made, then all 7 units are engaged to mow the remainder of the fairway area. In this way Mr. Ormond distributes the tractor and mower weight throughout each fairway and lessens hazard of turf injury due to mechanical wear.

5. For accurate measurement of chemicals -- Fungicides and herbicides must be used in exact amounts to give desired results on fine turfgrass areas. The margin of tolerance of grasses to chemicals is often slight; therefore, you must be

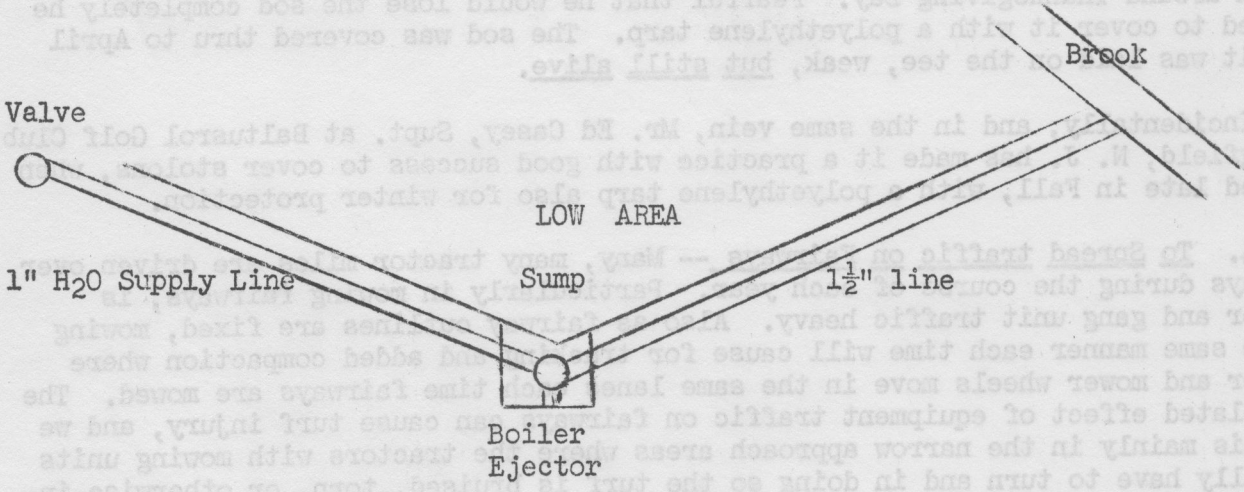
sure of the amounts being applied. For dry materials, Mr. Sherwood Moore, Supt. of Winged Foot Golf Club, Mamaroneck, N. Y. uses a regulation Post Office scale for accuracy in weighing chemicals for use on greens.

6. Lime lines replaced by strips of Merion bluegrass -- Supt. Andy Lentine and Chairman Edward Suisman of Tumble Brook CC, W. Hartford, Conn. came up with a novel idea to define the "Off Limits" area for electric cars on each of their 18 holes. In place of the lime lines formerly used, they now lay in a strip of Merion bluegrass sod, which stands out like the proverbial sore thumb, to define the end of the line for cars on that particular hole.

The advantages are obvious, and even the novice could easily distinguish the Merion bluegrass strip in the bentgrass fairway.

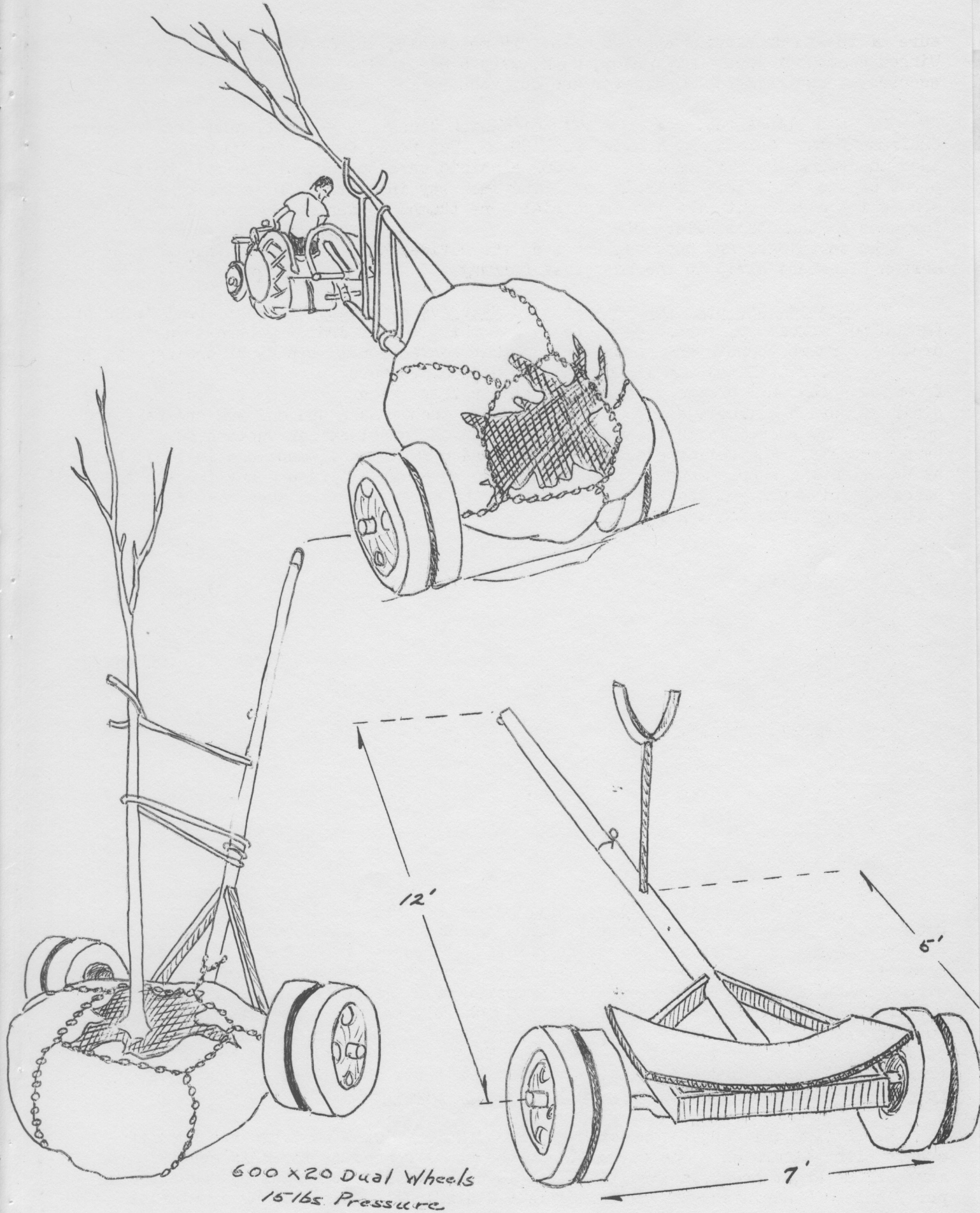
7. Suction drainage for low areas in fairways or roughs -- Supt. Paul Weiss of Lehigh CC, Allentown, Penna. gets credit for this idea of draining hard to drain areas ... where terrain and pitch is such that conventional methods of drainage fail.

Mr. Weiss utilizes the siphon and force feed pressure principle to lift water from low areas into brooks several feet higher than the area being drained. In this drainage work a boiler ejector is used with one inch intake and one and one-half inch outlet. This principle is the same as used for the small cellar suction pumps used by homeowners. The boiler ejection is standard plumbing equipment and is available at any plumbing supply house. It is hooked up to a water line and anytime the area needs draining all you need to do is turn on the water, and the area drains by suction and force feeding into the brook.



8. Gadget #2 for side-hill sod cutting -- When Mr. Charles Baskin, Supt. of the Country Club of Waterbury, Waterbury, Conn., looked for a nursery site, he could find only a sloping bit of ground of suitable size. It was no problem for Mr. Baskin to grow the putting green turf; the problem arose when he tried to get sod cut to an even depth from this sloped area. The operator tried to guide the power sod cutting machine, but the pressure exerted could not possibly be kept constant, so an unevenly cut sod was the result. After giving it some thought, he came up with the idea of affixing a rubber tired wheel to the side. This wheel was bolted on to the housing frame with an angle iron so that the machine now rides level, and sod cut to a uniform depth then was stripped from this side-hill nursery.

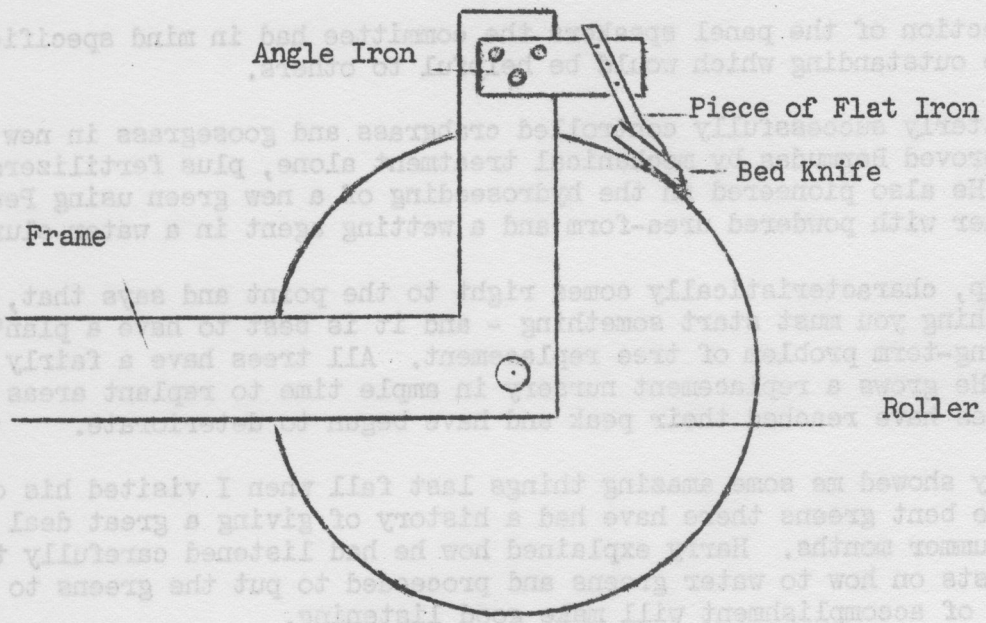
9. Define the target zone with flour -- "Hole in One" contests are popular events with golfers on a one day outing...the usual procedure for this event is to mark off a target area...a line lined circle within a 5 foot radius of the cup on a par 3 hole. Superintendents have experienced difficulty in selecting a material


12'
6'
7'
600 x 20 Dual Wheels
15 lbs Pressure

which is bright white and non-injurious to the turf. Mr. Bob Mucciaroni, Supt. at the Dedham Polo and Country Club in Massachusetts, however, has solved the problem at his course...he uses FLOUR to define the circle and he reports that it is far better than anything previously tried.

10. Roller cleaner for fairway units -- Mr. William M. Dest, Supt. of the Wethersfield CC, Wethersfield, Conn., devised a simple and inexpensive roller cleaner for his fairway units (see sketch below). This device overcomes the annoying problem of grass clippings building up and clinging to the roller. When clippings build up on rollers the height of cut is altered and sometimes causes for an uneven cut. Additionally clods of clippings bunch up and fall off rollers and tend to make fairways untidy...this ingenious gadget helps scatter clippings, and so eases the problem of messy mowing.

The roller cleaner consists of a discarded bedknife attached to the roller brackets with angle iron bolts. The old bedknife is held almost against the roller with just a minimum of clearance.



11. An improved tree mover -- Supt. Jim DeBottis of the CC of Rochester, Rochester, New York improvised an excellent tree mover when called on to do some tree planting to outline fairways on the new sixth hole at his club...moves trees 40' high with this device.

The DeBottis Tree-Mover has it all over the old stone boat in my opinion...it does a much neater job, easier by far than the old stone boat...in fact Jim now advocates that they take the stone boat to China!

(See attached insert)

ACCOMPLISHMENTS OF 1961 - PANEL DISCUSSION

Remarks by Fred V. Grau, (Moderator)
Hercules Powder Company
College Park, Maryland

It is an honor to be invited to lead a panel before this Conference. It is especially gratifying to have had such competent panel members chosen by the Program Committee. It is unfortunate that neither Frank Dunlap nor Ray Etchison are able to be with us. Jim Reid of the Suburban Club of Baltimore will present Frank's paper. I have invited Harry McSloy to tell about his program of keeping bent greens in Richmond. We are not privileged to have a paper from Ray Etchison.

Accomplishments may take many forms and mean many things to different people. During the course of a year it may be difficult for a superintendent to pinpoint his most significant accomplishments because he just may be greatly relieved to come through the difficult summer with only minor damages.

In the selection of the panel speakers the committee had in mind specific things that were outstanding which would be helpful to others.

Sheldon Betterly successfully controlled crabgrass and goosegrass in new tee plantings of improved Bermudas by mechanical treatment alone, plus fertilizers, without chemicals. He also pioneered in the hydroseeding of a new green using Penncross bent seed together with powdered urea-form and a wetting agent in a water slurry.

Frank Dunlap, characteristically comes right to the point and says that, "To accomplish something you must start something - and it is best to have a plan". Frank sees the long-term problem of tree replacement. All trees have a fairly definite life span. He grows a replacement nursery in ample time to replant areas in which mature trees have reached their peak and have begun to deteriorate.

Harry McSloy showed me some amazing things last fall when I visited his courses in Richmond. The bent greens there have had a history of giving a great deal of trouble in the summer months. Harry explained how he had listened carefully to the several specialists on how to water greens and proceeded to put the greens to the test. His story of accomplishment will make good listening.

Richard Valentine has taken the reins from his famous father at Merion Golf Club. This in itself is an accomplishment. More than that, Richard is making a study of nematodes, in collaboration with Dr. Bloom from Penn State, and has a definite contribution to make to this program.

Most of you in the audience doubtless have had experiences that would qualify you to be on this panel to tell others of your accomplishments. We hope that you will have the opportunity to participate at another date. To each panel member my sincere thanks for your thoughtful contribution. It always is a pleasure to moderate a panel of such accomplished speakers.

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WORK AT CHANTILLY

Sheldon Betterly
Chantilly National Golf and Country Club
Chantilly, Virginia

The tees at Chantilly were constructed in the summer of 1959 and in the spring of 1960 they had settled very unevenly. The Merion bluegrass, to which they had

been seeded, failed to hold due to attacks of curvularia. Something had to be done so I decided to grade the tees off and plant Bermuda.

I had a motor grader level them off making a grade of one-half of one percent from front to rear. We then incorporated our fertilizer, lime and sawdust. Enough nigrogen was added to the soil to offset the nigroten lag caused by the sawdust.

Due to the unusually late spring I had the shipment of 419 Bermuda put off until May 21. When the stolens arrived we used a five foot bush-hog to chop them up into four to five inch lengths. We then stolenized the tees at the rate of three bushels per thousand, topdressed and watered them.

In the two weeks following we had daytime temperatures in the fourties plus two nights of frost. This was not conducive to Bermuda grass growth. About June 13 the weather warmed up and the stolens began to grow but so did the crab and goosegrass.

I hesitated to use Disodium Methyl Arsenate on the new growth of Bermuda so decided to try mechanical control. The Henderson thin-cut did very well in decapitating goosebrass and crabgrass. The setting of the mower was such that it did not disturb the Bermuda but did catch many of the crabgrass stolens.

Dr. Grau visited me and was interested in this method of control. He suggested that I try his Aerothatch in addition to the vertical mower.

We got the Aerothatch and set it to cut about one-quarter of an inch into the ground. It did a very good job of lifting the crabgrass stolens up in the air, but did not cut them off. The 419 Bermuda noded at such short intervals and clung so tenaciously to the ground that the machine merely cut the stolens instead of pulling them up. The vertical mower used at right angles to the Aerothatch then took off all the weedy grasses top growth. We did this operation twice and had very little trouble with crab or goosegrass the rest of the summer.

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THE NEW COURSE AT FIVE FARMS

Frank P. Dunlap
Baltimore Country Club
Baltimore, Maryland

This subject of accomplishments is to me somewhat confusing. My definition, or at least understanding is something finished and done. If I have learned anything during my 42 years around a golf course, nothing is ever finished and done. This is as it should be, for we as superintendents must be ever on the alert for ways of improving our course. A golf course has only two directions it can go, forward or backward. We should bend our every effort to see that it is forward.

I could go on at great length about the new course that we are building at Five Farms for it will be a truly worthy companion to our present fine course. It does not, as yet however, warrant the dignity of the designation as a golf course. I will leave that for some future time. I might also talk about Bermuda grass, fertilizer or fungicides. These subjects have already been covered by people more qualified than I. I shall therefore devote my time to something I feel is also worthy of serious consideration by all of us.

It would seem to me that the most important part of any accomplishment is to start. At the Baltimore Country Club we have embarked upon a ten-year program of

tree replacement and improvement. On any course as old as Five Farms there are many trees that have reached that age at which they will begin to deteriorate. Even though it will be many years before these trees actually die, we feel that now is the time to plant one close by so that when the old tree does go there will be one of adequate size there to fill the vacancy. The replacement and planting of trees on a course is not a hit or miss proposition. There should be a definite plan and schedule, to be followed and adhered to. Besides their beauty trees serve many useful purposes on a course. The proper placement of trees can change a very mediocre hole to one of beauty and playing interest. A group planting at the bend of a dog-legged hole can very often make it a dog-leg in fact instead of fancy. Screen plantings are most useful to protect players on adjacent tees and fairways. Trees on the west side of tees provide cool comfort on the hot afternoons while waiting for that slow foursome on the fairway to move on. On blind or semi-blind holes a tall tree behind the green is a great aid in determining your flight line to the hole, in fact an outstanding tree is a good target behind any green. On raised greens where the background might otherwise be blank sky, a group planting is a great aid to determining distance.

Where beauty is the objective, a mixture of evergreens and deciduous trees is most attractive. Thought should be given to both spring and fall color; flowering trees for spring and trees that turn bright and colorful in the fall. Plantings should appear natural; never plant in rows and do not be too fussy about equal distance between trees, make it look like it just happened that way.

When selecting varieties stick to those that have proven their adaptability to the climate in which they are to be planted. Native trees are always best and usually the most economical. Soil, terrain and drainage are important. Some trees do well in well-drained soils, some do not. Many will not stand wet feet - some will stand alone in exposed places while others prefer group planting and protection. Know your plant before you plant. Some plants of proven value in this climate are white pine, Norway spruce, Scotch pine, holly and of course our own scrub pine. In deciduous trees nearly all of the oaks, maples, poplars, sweet gum, locust and dogwood. I, myself, like to scatter a few fruit trees here and there. They provide nice color in the spring and the fruit is a welcome treat to players when it is ripe. A few varieties to be avoided are sycamore, catalpa and unless you have a specific place for it, willow.

When planting trees bear in mind that they do grow. Try and picture the small tree you are putting in the ground, as it will be when it has reached its full growth. Make sure the spreading branches will not make an unfair hazard in years to come. This is to be especially considered near the front of tees. Plant so that trees are not closer than a hundred feet, better yet a hundred and fifty feet from the edge of a green. The same holds true where there are tile lines; the roots of most trees will travel a long way to get into a tile line.

Where there are existing woods it is desirable to clear out underbrush and also elevate the limbs to provide good air drainage across the course. This is not only good for the turf in these areas, but also provides a part-like appearance to the whole course.

This subject is worthy of a great deal more time than I am spending on it. It does, however, serve to show what we are trying to accomplish at Five Farms. As I said in the beginning, to start is the important part of an accomplishment. And we have started.

WHAT HAPPENED TO THE MAT AND THATCH?

Harry J. McSloy
Country Club of Virginia, Richmond, Va.

Three years ago, all Richmond, Virginia greens observed, including those at speaker's Club contained from one-half to one inch of mat below the ground and approximately one-half inch of thatch above the ground. The Club's greens were slow to take water, took forever to dry out and it seemed as though these putting surfaces would never "green up" in the spring. The accepted renovation program of liming, verti-cutting, frequent two-way aerifying with the cultivating spoon machine, and spring and fall topdressing with a porous mixture, was employed on the greens to see what could be done to decompose this potential "keg of dynamite" at the surface of the soil. Coupled with this type of management, a program of watering was augmented that had been suggested by Dr. Fred V. Grau, Mr. Robert Hagen, Jim Reynolds and others in their writings and discussions. The general theme of this plan was to keep the greens on the dry side--to withhold moisture until the grass asks for it.

In 1959, under this type of management, some small amounts of decomposition of matt and thatch may have occurred on the greens, but not enough to make an appreciable difference in the way the greens handled. The following spring the same practices were employed as in the previous year with the exception that the punch-type aerifier was used and no verti-cutting was done. During a hot spell in early June of 1960, the greens turned a deep green color and growth became quite rapid. Inspection of the turf four weeks later revealed that the matt and thatch had completely decomposed--all one could see was green, healthy grass above ground, clean soil underneath the grass.

Since the disappearance of the matt and thatch, the greens have been much easier to manage. Water moves in and out of the soil with a far greater rapidity; the turf "greens up" quickly in the spring and responds to fertilizer sooner than before; and the ability of the greens to receive chemical treatment without discoloration or injury seems to have increased immeasurably. It has been noted that the granulation of the soil particles has greatly improved, but this may be tied in with the alternate wetting and drying method of watering turf.

It is difficult to determine which management practices were responsible for the disappearance of the matt and thatch. It is believed that the answer is two-fold

1. Use of the punch-type aerifier, with so many holes close together, provided an opportunity for substantially more oxygen to enter the soil than had been possible with our other aerifier. (Another Richmond Club, which had 18 greens "go out" in 1960, used the punch-type aerifier in 1961 and employed a similar top dressing and watering program. These greens are without matt and thatch and held up well during this past summer.)

2. The watering program of alternate wetting and drying of the soil has permitted more oxygen to enter the soil and for longer periods of time, as compared with greens that are kept moist constantly.

A word of clarification may be in order concerning the watering technique used on the greens. Foreman Louis Kellar of Denver Country Club many years ago expressed this watering theory rather well: "Water only the hot spots." When the greens asked for moisture in the summer and no rain was predicted, the turf was hand-watered just enough to penetrate approximately three inches into the soil. When the weather conditions appeared favorable for rain during the summer, the greens that were starting to "foot-print" were syringed lightly to prevent wilting. On some

occasions, light syringing of greens was done for several consecutive days while awaiting the rain. Very little spring and fall watering was found necessary and at these seasons moisture was applied until a screw driver pushed into the green indicated that the "field capacity" of the soil had then been reached.

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NEMATODES AND THEIR CONTROL

Richard E. Valentine
Merion Golf Club, Ardmore, Penna.

It is difficult for turf growers to realize that damage to turf grasses can be directed to nematodes. Microscopic in size, they present a new challenge to men of the soil and turf. Most state surveys show these parasitic organisms have increased in number. Worm-like in apperance, nematodes feed on the root systems of turf. Not all nematodes are destructive to plant life. The parasitic type possessing spear like mouth parts are the ones to fear. Here are the common names of a few:

(SLIDES) 1. Dagger, 2. Spiral, 3. Stunt, 4. Test Plots

Moving through the soil 2 to 3 feet a year, the parasites feed on roots by piercing them and sucking out the contents of the cells involved. The essential plant foods, minerals and water in the soil become less available to the plant because of the nematode injury to the plant feeder roots. Parasitic nematodes enlargen the destructive powers of fungi. Allowing fungi access through the newly created root wounds, coupled with the possible soil surface action of fungi etc., the destructive powers of nematodes becomes even greater.

Noticeable Turf Damage. Poor turf, showing little or no improvement after following a properly managed program may indicate the presence of parasitic nematodes. Have the soil tested for nematodes. Don't despair if tests show alarming numbers of nematodes present, remember not all nematodes are destructive. Many feed on fungi, dead organic matter and insects in the soil. Joe Valentine, golf course superintendent at the Merion Golf Club in Ardmore, Penna., and I as his assistant in 1959, observed the nematicide tests conducted by Dr. James R. Bloom and his associates. (Dr. Bloom, Associate Prof. of Plant Pathology, Pennsylvania State University). Since that time we have followed a conscientiously planned nematicide program on both of Merions courses. The results that we have obtained with the emulsifiable concentrate E C-2 (NEMAGON) leads us into treating larger turf areas, such as fairways, tees, club house area etc. (Slides)

Method and rate of Application. Nemagon E C-2 was applied at the recommended rate of 1½ pints per 1000 sq. ft. Using this standard and mixing with 200 - 250 gal. of water per green. Applications are made at 70° F. + (soil temp.) The reproduction of nematodes becomes active at this temperature. A coarse nozzle spray, we use the rose type, at reduced pressures is used to apply the nemagon, immediately following up with 1 inch of water. The water drives the material down through the turf layer into the soil where it can act upon the nematodes. Avoid puddling when applying either the nematicide or the water, otherwise some discoloration of turf may appear. Pre aerification helps the movement of the materials down in the soil.

Pre-Planting Fumigants showing good results: 1. Picfume (Dow) 2. MC 2 (Dow) 3. Vapam (Stauffer) 4. Mylone (Carbide and Carbon)

Summary and Conclusion: Don't discount the possible damaging effects of nematodes to turf. Have your troublesome turf areas tested by a competent nematologist. Continue the use of fungicides; nematicides are not a substitute. May the future findings of research lead us all to better turf.

Dr. Gene C. Nutter
Executive Director, Golf Course Superintendents Association of America, and Editor, The Golf Course Reporter, Jacksonville Beach, Florida.

What is the Management Challenge?

"The Management Challenge" facing the golf course Superintendent is brought to light by recent comments from Mr. Herb Graffis, Editor of Golfdom Magazine, made at the May 1961 meeting of the Miami Valley Golf Course Superintendents Association, as follows:"...The golf course superintendent is losing out because he is not more of a business man. The consequence of this is that the golf superintendent is going to hold a position of secondary importance in the organization of the club's administration. To move into the first echelon of administration it is necessary for the golf superintendent to have a better knowledge of business principles so that total administrative duties can become his. Presently the trend is toward a general manager to assume full control..."

As we review the six principal management requirements for successful golf course operation we note they can be grouped into three major categories. They are:

A. Production Activities
   1. Turf-Grass Technology
   2. Knowledge of Golf Course Operations
   3. Labor Management

B. Administrative Activities
   4. Work Planning
   5. Business Management

C. Salesmanship (for the Superintendent - Public Relations)
   6. Public Relations and Personal Improvement

It should be noted that Part C refers to selling the superintendent professionally, and personally, since the operations of a golf course and the functions of the superintendent deal with services rather than a material product.

Evaluation of Superintendents' Management Ability

The objective approach in tackling any problem is first to determine the present status. Table II gives an estimate of the superintendents' management ability in the three major categories of golf course operation discussed above. If this analysis seems to be harsh, it is only because of the stark seriousness of the problem at hand. It should undeniably and explosively point up to all superintendents "the management challenge".

The Order of Necessity

Now, having subjected ourselves to a severe self-analysis, let us decide the order of importance and necessity that should be placed on the six management requirements based on the professional and personal need of today's career superintendents. The following order seems most logical: 1. Business Management and Techniques. 2. Public Relations. 3. Work Planning. 4. Employee Relations and Labor Management. 5. Turf-Grass Technology. 6. Knowledge of Golf Course Operations.

This does not mean that turf-grass technology should be cast aside and a new order of superintendents evolved whose talents are primarily business management and public relations. Emphasis must be placed on new technical data. There must be additional training programs in important aspects of administration and public relations.

MEETING THE MANAGEMENT CHALLENGE

The job of improving the superintendent's status in matters of business management and public relations resolves into two approaches. The first involves SELF, or personal improvement. The second deals with PROFESSIONAL concern and improvement.

A. SELF (personal) Improvement. The following are six steps for a designed self-improvement program for golf superintendents:

1. Educational Meetings - Short Courses - Seminars. More and more educational meetings are beginning to offer subjects on business management and personal improvement in addition to excellent treatment of turf-grass technology.
2. Reading. In order to keep abreast of the times it is essential that all superintendents subscribe to and thoroughly read all magazines, newsletters, books, and periodicals in the turf-grass field.
3. Greater Effort on the Job. Work harder at developing and organizing the job.
4. Night School Courses. Almost any community offers night school training on such subjects as bookkeeping, accounting, typing, economics, salesmanship, and many other subjects important to management and personal improvement.
5. Dale Carnegie and Toastmasters. Attend either the Dale Carnegie or Toastmasters courses on speech and personal development.
6. Winter School Courses. Take leave and attend turf-management schools to master the basic aspects of turf-grass science, and courses in business management and personal advancement.

B. The Professional Improvement Aspect. While personal improvement is the first step in career advancement, a close second in importance is the aspect of professional concern and outlook. The following four elements are essential in a professional program:

1. Build stronger local or Chapter Association
2. Support and participate in the national front
3. Respect and advancement of professional ethics
4. Exert professional influence locally

Table II

Survey of Current Management Ability Among Golf Course Superintendents

% estimates by various performance levels in three major management categories			
Management Category	Performance Level	Percentage Rating	Percentage of Supt's Rating Fair to Excellent
A. Production	Excellent	15%	
	Good	25%	
	Fair	40 to 50%	80 to 90%
	Poor	10 to 20%	
B. Administration	Excellent	4 to 5%	
	Good	10%	
	Fair	20 to 30%	34 to 45%
	Poor	56 to 65%	
C. Selling	Excellent	1%	
	Good	4 to 5%	
	Fair	15 to 20%	20 to 26%
	Poor	74 to 80%	