1953 ANNUAL CONFERENCE

Mid-Atlantic Association

OF

Golf Course Superintendents

AND

Silver Anniversary

Meeting Of The

MID-ATLANTIC GREENKEEPERS ASSOCIATION

JANUARY 6 and 7, 1953

Under The Auspices Of The

UNIVERSITY OF MARYLAND

Department Of Entomology

ERNEST N. CORY, Director

This SILVER ANNIVERSARY meeting was dedicated to the charter members and founders of the Mid-Atlantic Greenkeepers Association, now the Mid-Atlantic Association of Golf Course Superintendents. Seven of the original fourteen members who founded the group are still active Greenkeeping Superintendents. They are: O. B. Fitts, the first president; Reg Giddings, Reuben Hines, Bob Scott Sr., Dick Scott, Tom Ryan and Dick Watson. To a large extent the Mid-Atlantic owes everything they are today to these men.

The 1953 officers of the organization are: President; James E. Thomas, Army Navy Country Club, Arlington, Virginia. Vice President; Robert Scott, Jr., Bonnie View Golf Club, Baltimore, Maryland. Secretary - Treasurer; Charles Schalestock, Farmington Country Club, Charlottesville, Virginia.

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Compiled Courtesy of

West Point Products Corporation
West Point, Pennsylvania

ATTENDANCE

1. Dr. R. B. Alderfer	Pennsylvania State College State College, Pennsylvania
2. Harry N. Allanson	Jefferson Lakeside CC Richmond, Virginia
3. William E. Ambrose	Aberdeen Proving Ground Maryland
4. Frank Baptista	936 Philadelphia Avenue Silver Spring, Maryland
5. L. W. Brown	G. L. Cornell Company Bethesda, Maryland
6. J. J. Cockriel	Glenwood Golf Club Richmond, Virginia
7. Bill Compton	Prince Georges Country club Landover, Maryland
8. Sam Conger	DuPont Company Greensboro, North Carolina
9. George L. Cornell	4715 Miller Avenue Bethesda, Maryland
10. John Z. Davis	R. F. D. #3 Vienna, Virginia
11. Tom Dawson	Country Club of Va. Richmond, Virginia
12. Wilson Disney	F. W. Bolgiano & Co. Washington, D. C.
13. Thols. E. Dougherty	The Springfield Club Wallingford, Pennsylvania
14. H. S. Dunn	C/O C. F. Armiger, Inc. Silver Spring, Maryland
15. Ruben Hines, Jr.	C/O C. F. Armiger, Inc. Silver Spring, Maryland
16. Robert L. Elder	U.S. Golf Association Beltsville, Maryland
17. R. B. Essex	Columbia Country Club Chevy Chase, Maryland
18. O. B. Fitts	4340 Fairfax Drive Arlington, Virginia
19. Allen W. Fredd	A. P. Peckworth Company Pikesville, Maryland
20. Charles Ganey	Baltimore City Park Baltimore, Maryland
21. William H. Glover	Fairfax Country Club Fairfax, Virginia
22. David W. Gordon	Wm. F. Gordon Company Doylestown, Penna.
23. William F. Gordon	R. D. # 1 Doylestown, Penna.
24. Wajoech F. Gransky	Aberdeen Proving Grounds Maryland

25.	Fred V. Grau	U.S.G.A. Green Section Beltsville, Maryland
26.	Reed H. Gulick	Calvert Distilling Company Relay, Maryland
27.	R. M. Gustin	Silver Spring, Maryland
28.	John C. Harper II	U.S.D.A. Division of Crops Beltsville, Maryland
29.	F. J. Haske	G. L. Cornell Company Bethesda, Maryland
30.	C. H. Heintzeman, Jr.	Memorial Stadium Baltimore 18, Maryland
31.	R. P. Hines	7215 Kentucky Avenue Bethesda, Maryland
32.	Carroll Hitchcock	Pikesville 8, Maryland
33.	Edward C. Holmead	936 Philadelphia Avenue Silver Spring, Maryland
34.	Wayne B. Jerome	Congressional CC Washington 14, D. C.
35.	Russell W. Kerns	Green Hill Yacht & CC Salisbury, Maryland
36.	John W. Leavell,	Andrews Air Force Base Washington, D. C. %A.I.O.
37.	J. Wm. Leverton	Glenwood Golf Course Richmond, Virginia
38.	C. W. Lindsay	140 Winter Street Hagerstown, Maryland
39.	T. L. Lumsden	Bethesda Country Club Bethesda, Maryland
40.	Harold J. Mahoney	The UpjohnCompany Kalamazoo, Michigan
41.	Tom Mascaro	West Point Products Corp. West Point, Pennsylvania
42.	Howard McCarty	Mt. Pleasant, Maryland
43.	Hugh McLellan	Army Chemical Center Maryland
44.	John Milan	2111 Garrison Blvd. Baltimore, Maryland
45.	R. Morgan	4915 13th Street, N.W. Washington, D. C.
46.	Frank Murray	Route 1 Rockville, Maryland
47.	Dr. O. J. Noer	Milwaukee Sewerage Commission Milwaukee, Wisconsin
48.	John L. O'leary	Easton, Pennsylvania
49.	Pete Petrone	The Upjohn Company Salem, Virginia
50.	Rear Admiral John Phillips	Army-Navy CC Arlington, Virginia

51. Joe Reposkey — Talbot Country Club, Easton, Mary land
52. J. W. Reynolds — Monacan Hills Country Club, Manakin, Virginia
53. James A. Reid — Suburban Club of Baltimore, Pikesville 8, Maryland
54. Jim Roach — Sunnybrook Golf Club, Flourtown, Pennsylvania
55. Benson R. Robinson — 4305 Finley Avenue, Baltimore 6, Maryland
56. C. P. Robinson — Armour Fertilizer Works, Baltimore, Maryland
57. Charles Schalestock — Farmington Country Club, Charlottesville, Virginia
58. Wm. C. Schreiber — Cedar Point Golf Club, Patuxent River, Maryland
59. L. R. Shields — Woodmont Country Club, Rockville, Maryland
60. Bob Scott — Baltimore Country Club, Baltimore 10, Maryland
61. Dick Scott — Rolling Road Golf Club, Catonsville, Maryland
62. Ro bert E. Scott — Bonnie View Country Club, Baltimore, Maryland
63. J. C. Seacrist — Martinsburg, West Virginia
64. E. R. Steiniger — Pine Valley Golf Club, Clementon, New Jersey
65. Jim M. Shepherd — Country Club of Maryland, Towson 4, Maryland
66. Frank I. Shuman — 309 Oreland Mill Road, Oreland, Pennsylvania
67. Robert W. S. Smith — Baldwin, Maryland
68. Ernest E. Stanley — Rt. 3, Fred,Virginia
69. Leonard J. Strong — R. D. 4, Bethlehem, Pennsylvania
70. Otho Swain, — Burning Tree Country Club, Bethesda 14, Maryland
71. S. A. Sweeney — Prince Georges Golf Club, Landover, Maryland
72. George Blair Taylor — Baltimore New-Post, Baltimore, Maryland
73. James E. Thomas — Army-Navy Country Club, Arlington, Virginia
74. Marion P. Toms — Congressional Country Club, Washington, D. C.
75. K. S. Troensegaard, — P. O. Box 116, Fort Belvoir, Virginia
76. Frank W. Tull — Hercules Country Club, Wilmington, Delaware

77. J. R. Vaughn — Michigan State College, East Lansing, Michigan

78. Robert A. Vaughn — Clifton Park, Baltimore, Maryland

79. Richard Watson — 7311 Aberdeen Road, Bethesda, Maryland

80. Paul E. Weiss — Lehigh Country Club, Emmaus, Pennsylvania

81. Charles L. Wilfong — Green-Valley CC, Philadelphia, Pennsylvania

82. William H. Wilmot — Summit Hall Turf Farm, Gaithersburg, Maryland

83. Charles A. Young, Jr. — Bureau of Parks, Baltimore 17, Maryland

84. Reg Giddings — Seaford Golf Country Club, Seaford, Delaware

SOIL CONDITIONERS

R. B. Alderfer
Pennsylvania State College

Why are soil conditioners of interest to you who are so directly concerned with the management of turf soils? Soil conditioners provide a long sought means of improving an undesirable and of maintaining a desirable physical condition of the soil through the proper application of certain organic chemical compounds to the soil.

Our knowledge of how these synthetic soil conditioners actually work and what value they may have in turf soils is very meager. Our information is based, for the most part, on one year's experience with them.

What are these soil conditioners and what do they actually do in the soil? There are two different compounds available today as soil conditioners, the one is a vinyl acetate meleic acid polymer and the other a polymer or polymers of polyacrylonitril. These materials serve as the cementing material by which the smaller particles of the soil are held together to form aggregates. The higher the proportion of the soil which has been aggregated into small pinhead to grapenut sized granules, the better its tilth.

How much of these soil conditioning materials is needed and how should they be applied? The commonly used rate of application has been one part of soil conditioner to 1,000 parts of soil. Much more information is needed before we can recommend rates for all conditions for which these materials are to be used. It has been definitely established, however that these materials must be brought into intimate contact with as much of the soil as possible in order to be most effective. This means that they dry forms must be thoroughly mixed with that part of the soil to be conditioned or that the liquid forms be applied with sufficient water to move the conditioning material to the depth desired. This latter operation is not an easy one except where just a very shallow surface layer is to be treated.

It is also highly essential that these materials be allowed to take up sufficient water from the soil to attain their maximum stabilizing effect. In addition, the soil must be put into the desired physical condition or tilth or have it already existing. Soil conditioners themselves are wholly unable to produce good tilth. They merely keep the soil in whatever tilth it was put or fad when they were added to the soil.

Where in turf soils might these conditioning materials have some value? The most logical place would appear to be in putting an otherwise poor soil physically into more desirable condition. Undoubtedly there are cases where the soil is sufficiently poor to warrant the use of conditioners. There is no evidence from actual experiments conducted to date, where the mixing of these conditioners with the soil to establish a better root bed has led to better establishment and early growth of turf. On the other hand it has been definitely established that both of these conditioning materials are capable of stabilizing newly seeded areas on sloping terrain against the loss of soil, seed and fertilizer by erosion. They may serve here in the same way as a thin surface mulch of straw or hay.

The results of some preliminary studies at Penn State this past summer reveal another important possible use for these conditioners in established turf. It has been found that when these materials are added to a turf soil in good tilth, its resistance to compaction is materially increased. The treatment of already compacted turf soil is of no avail in correcting this highly undesirable condition. If any thing the effects of this compacted soil condition are accentuated.

There is also the possibility of using these materials in the improvement of poor soils which one may be forced to use for composting. In addition the treatment of aerifier cores before they are pulverized and dragged back into the aerifier holes is another possible use.

It has been found that these conditioning materials are not stable in soils having a pH much below 5. Hence, they should be used only in soils after they have been limed and not before. They do not appear to be affected by high pH. In fact, their effect seem to become greater the higher the pH, which probably accounts for their very satisfactory performance on alkaline soils in the southwest.

It is not yet known that their value might be on the sandier soils, though it may be greater than previously supposed. Neither do we know how long the conditioners themselves or their effects will last in the soil. Certainly specific conditions will determine this for any given soil.

Snythetic soil conditioner represent a truly important contribution to the soil and plant sciences because they at last would appear to offer the means by which the problem of soil tilth can be studied and may be effectively solved.

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POA ANNUA AND CLOVER CONTROL

Ralph E. Engel
Rutgers University, New Jersey

Control of *Poa annua* and clover offer a real challenge to any golf course superintendent. It has been said that these weed pests arise from mismanagement, but I consider this an unfair and inaccurate method of explaining their presence in turf. We do agree that a healthy turf (a dense turf) is the best insurance against *Poa annua* and clover and an adequate cover is obtained through the cumulative effect of the many factors that are essential for good turf. Some of these are good drainage, use of the best grass species for the job, proper use of fertilizer, correct use of water, controlling disease and insects, and the right consideration for the many other factors essential to good turf. Even if man were superhuman and could supply all the maintenance factors to the fullest possible extent, the weather or nature can still ruin turf and lead to *Poa annua* and clover invasion.

Although there is no simple or sure formula for controlling *Poa annua* and clover; man can still curb these pests on many turf areas. It behoves us to consider some of the factors that might be useful to the struggle with *Poa annua* and clover.

I. Factors that encourage *Poa annua* and clover.

A. We have data which shows soil compaction encourages *Poa annua* and clover.

B. The overuse of water leads to loss of the permanent grasses and the development of *Poa annua* and clover.

C. Insect damage.

D. Disease damage.

E. Any practice that damages the permanent grasses.

F. Incorrect Fertilizer practices.

G. Any other factor that interferes with maintaining a sound turf cover.

H. Use of the wrong grass for the job.

II. How can Poa annua be kept at a minimum?

A. Use the best grasses available.

B. Keep a solid turf cover.

1. Control diseases.
2. Control insects.

C. Proper watering.

1. Apply water at the correct rate.
2. Apply water at the right time (not too early or too late)
3. Apply the correct amount.

D. Keep compaction at a minimum.

1. Avoid over watering.
2. Avoid traffic on wet areas.

E. Proper fertilization

1. Very high phosphorus encourages Poa annua
2. Potash level appears to have little influence on Poa annua.
3. Rate of nitrogen fertilization - increased rate decreased Poa annua as long as the increase is healthy for the permanent grasses.
4. Time of fertilizer application - It may be desirable to stimulate the bentgrass in the warmer part of the growing season when the Poa annua is less likely to benefit.

F. The use of chemicals for control of Poa annua.

1. Arsenate of lead was used on putting greens far more abundantly in the past. Many believed that Poa annua was less troublesome where it was applied.
2. Sodium Arsenite.
   a. Used to destroy plant.
   b. Used to destroy seed set (appears to best approach) - light applications (1 lb/A) as needed to check seed set in the spring.

c. Not recommended for greens.

3. Use care to avoid injury to the permanent grasses. No one should embark on a general use program until he has worked with the chemical and understands its inconsistencies that are associated with soil moisture, temperature, etc.

4. Other chemicals may be available in future but none can be recommended for trial at present.

III. Clover control - Lowering height of cut suddenly in hot weather, overwatering, compaction, and disease result in weaker turf and allows clover to increase.

A. Since clover requires a good supply of lime for best growth some have attempted to control it by withholding lime. Usually this is futile, because clover can persist at low lime and pH levels. It is better to supply the grass with the amount of lime required for its best growth. Usually a vigorous grass can do more to keep out clover than a low pH.

B. Fertilizer practices.

1. Are very important in clover control.
2. Rate of nitrogen application - low nitrogen favors clover - high nitrogen favors grass. Additional applications of nitrogen are in order on sections where clover is a problem.
3. Type of nitrogen carrier - clover can be crowded out with either inorganic or organic nitrogen however the inorganic appears to be more severe on clover.
4. Rate of phosphorus and potash application- P & K tend to encourage clover in absence of N - however, they have little tendency to encourage clover if sufficient nitrogen is applied.

C. Use of chemicals for clover control.

1. It is better to use nitrogen fertilizer than chemicals to discourage clover in putting greens.
2. Na arsenite.
   a. 1 lb/acre with repeated treatments.
   b. Late summer or early fall best.
   c. Use when soil moisture favorable.
   d. Keep turf injury at a minimum.

3. 2,4-D for clover control.

a. Varies in effectiveness from 0-90%.

b. Dangerous on bentgrass -- rates of 1-1½ lbs. or more may severly injure or kill bentgrass fairway turf.

c. Rates below 1 lb/acre less likely to be effective.

4. 2,4,5-T for clover control.

a. Considered by some to be useful for clover control.

b. Use caution to avoid injuring the grass.

5. Endothal.

a. A very potent chemical, rate of 1/2 lb./acre may give serious injury.

b. Has not been consistent in giving a kill.

c. Appears that we need to know more about time of technique of application.

IV. Use caution with chemicals.

A. Use them on an experimental basis in order to become familiar with their peculiarities.

B. Use great care to avoid serious loss of permanent grasses especially in spring or early summer.

C. Destroying undesirable plants such as *Poa annua* or clover leaves bare ground that will be occupied by weeds unless grass is introduced to grow in these areas.

In closing, it is fair to say that we need more or better tools to combat clover and *Poa annua*. Yet we still have techniques that well produce profound, reductions of these "pests". Use of the best grass for the job and careful maintenance will accomplish a great deal in reducing the *Poa annua* and clover content of turf.

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TURF DISEASES

John R. Vaughn
Michigan State College

All plants, including grass of all types, are subject to diseases, just as animals and man. The same kinds of organisms cause the diseases of plants that cause disease in man. This does not mean that a bacterium from a diseased plant could cause a man to have a sore throat or any other disease. Diseases are caused by bacteria, viruses and fungi. Among the approximately 100,000 diseases of plants, none has ever caused a disease of man or animal.

When we consider plant diseases then we are concerned only with the micro-organisms which attack plants and cause disease in plant. Many of the plant disease germs are so specific in their perference that they will attack only one variety of a species of plant. The majority of diseases which affect human beings are caused by bacteria and viruses and a very few by fungi. Plant diseases, on the other hand, are about 90% fungus caused. Because of this, I think it is a good idea to discuss fungi briefly. Some understanding of the nature of these agents of plant disease will help to explain the development and control of the diseases of turf.

Fungi are plants which are so small that they are seldom seen by the naked eye unless they are growing in mass under ideal conditions. Although fungi are plants, they have no chlorophyll and cannot take their own food and must get food from outside sources. When this source is another plant, such as grass, then a disease is the result. Not all fungi are harmful, in fact, many are very beneficial to man.

Some fungi make cheese, some make wine; yeasts (which are fungi) make bread rise and ferment grain to make beer and alcohol. Some fungi -- the mushrooms -- are food for man, and others produce medicines to cure mans' diseases. The new wonder drugs such as penecillin, streptomycin, and aureomycin are all produced by fungus growth as is the one antibiotic plant fungicide Acti-dione.

Although we say that a fungus is the cause of a disease of the grass, there is more to a disease than the presence in one place of a plant and a disease causing fungus. Disease is really like a three legged stool which will not stand without all three legs. The three legs in the case of a plant disease are the susceptible host plant, the disease-causing plant, and the right weather (environment) for the development, and spread of the disease. The fungus can often live for months and even years in the soil and will not cause disease until the right temperature and moisture occurs and then it will attack the plant. This situation is found in the case of most of the turf diseases, is the fungi which cause dollar spot, brown patch and all the other turf diseases are well adapted to life in the soil. These fungi can be found in the soil of golf greens at any time of the year so we know that the disease factors are present except for the right environment.

Dollar spot and brown patch are very familiar to people who work with turf. Another disease, called melting-out, is becoming increasingly important. Many reports of extensive damage have come from the mid-west and more recently from the east and the south. The disease is caused by another soil-inhabiting fungus, and one which produces spores which are like seeds of higher plants and can be distributed by the wind as well as by the machinery and by the traffic on the turf. The fungus grows up the grass blade from the soil, kills the blade and moves into the stolon and the roots, killing the entire plant. If the weather continues to be favorable for the disease, the killing spreads until large areas of the turf are completely destroyed. If conditions become unfavorable, the fungus returns to its life in the soil continuing to produce spores which can be spread to other areas to live in other soil until the conditions again become favorable for the development of the disease. High humidity and warm temperatures apparently favor melting-out although the range of temperature over which severe melting out has been observed can vary from 75 to 105 degrees farhrenheit.

Many fungicides have been tested against the melting-out fungus but only the new anti-biotic fungicide, Acti-dione has been found to be effective. This material checks the disease and regular all season sprays will give protection against melting-out and will control dollar spot and brown patch as well. Although we speak of curative spray applications, there is no real cure of diseases of turf. The part of the grass plants destroyed by fungus infection can never be cured. Only if the disease is stopped before complete killing can there be recovery and that is by the regeneration of grass shoots from the roots and stolons. Preventative spraying is the best way to control turf grass diseases and is essential to the maintenance of fine turf in most areas of the United States.

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WHY DID SO MANY GREENS GO OUT THIS YEAR?

O. J. Noer
Milwaukee Sewerage Commission

In May I was in Detroit. There was a Scotsman in charge of the greens at one of the clubs there. He was having trouble and thought the solution to his problem was to rebuild all the greens. The grass was Washington bent and he felt that the life of this grass was 17 years. I pointed out that the greens at the Milwaukee Country Club were Washington bent and were over 25 years old and came from the same nursery. They had never been bad so the trouble in Detroit was not due to the kind of grass.

Snow came to Milwaukee in November, before any frost. During the winter there was 100 inches or 130 inches of snow. Snow mould did a lot of damage to greens. Turf rotted on excessively thatched greens because the surfaces stayed excessively wet. There was some dessication type injury during the extremely hot week in early April.

While in Indiana this summer, Carl Bretzlaff, one of the top superintendents of the country said "O. J., I am having no end of trouble more than at any time in 30 years. I used too much milorganite and other fertilizer and am paying the penalty". I made no comment even though the grass looked different than ever before. On the way back to Milwaukee, I speculated about his trouble and wondered if it might not be too little rather than too much. The nitrogen could have been leached by the heavy rains. I wrote Carl a letter and suggested he set up three plots 10 x 10. I told him to use Nitrogen on the first plot, Potash on the second and Nitrogen and Potash combined on the third plot, and suggested rates for each. When I called him two weeks later Carl told me that he had not bothered running the test plots but had treated all the greens with Nitrogen and Potash. He fertilized again a week later and said greens were unusually better. In the northeast area, they had lots of trouble, because of an extended-drought it is always the unusual that causes trouble. Superintendents in the midwest take dry hot weather in stride. I would like now to show some pictures of the things I encountered this past summer.

Here is an apron of a green in Chicago in May. You can see that the turf didn't look too good. Here is a picture of a green in Michigan. You can see how the turf could be peeled back--much rooting had occurred during the winter.

The next picture is a close-up of the same green showing quite clearly that there are not roots underneath. The grass was excessively matted and the soil was extremely wet. Algae took over, and, as you can see--it was not the strain of grass which was Washington bent--but rather its management.

Here is a green at Spring Lake in Michigan, where they had aerified and managed the grass properly. The turf was good but despite troubles in the years before when that was not done. Here is a picture taken in Louisville. Poa annua was bad down there and it killed out in the wintertime. It had not filled in. As you can see, much of this damage is due to mower injury.

I have been trying for a long time to get a picture showing the silver colored goose grass or silver crabgrass. They used PMAS and 2,4-D the ester type to control it. After the Poa disappeared, the combination of chemicals killed the goose grass and everything else. In this instance there was little else so reseeding was in order.

Here is a picture taken in Kentucky. They had used a concentrated solution of Sodium Arsenite and had applied it with an eye-dropper to the individual silver crabgrass plants. The next day they watered the turf.

You can see the injury that occurred as the water carried the concentrated solution from the silver crab to the surrounding bent grass.

In July and August, greens looked bad everywhere. Much of the damage occurred between Friday and Monday when no one was left to stop wilting. Many greens became too wet because they were too dry underneath.

I have been waiting a long time to get this picture. This is Pythium. Here is a close-up of the Pythium ring and you can see the dead grass.

This is a green in Massachusetts. The bad surface drainge contributed largely to this poor turf.

Here is a green in Chicago when the temperature was near 100 degrees. Ponded water was in the low depressions of the greens. It had rained at 6:00 am and the course was closed for a couple of hours until the ponded water could be removed.

Here is a picture showing how water can be squeezed out of a heavy organic mat at the top of the green. The presence of too much water prevents the movement of air into the root zone. Here is a picture of a green in Louisville. It had been cultivated. Notice the recovery of the turf in the Aerifier holes. Here is a close-up showing the long roots that had formed under these spots.

Here is another green where they had used too much sulphate. The green was cultivated with the Aerifier and the green was drenched to leach out as much of the excess Nitrogen as possible.

Notice the recovery occurring first around the cultivated holes.

In Indiana, this course lost many greens. They re-seeded with red top on a heavy surface thatch. The grass germinated, withered and died because it made no contact with the soil. Notice that the only place where the plants survived was where the thatch had been spiked. So seed could come in direct contact with the soil.

Heavily thatched greens show they are sick when they begin to foot-print badly. If one digs down with a knife, you will find that you can squeeze water from this heavy thatched layer and the soil is perfectly dry underneath.

Here is a picture of soil profile taken at Pine Valley. Eb. Steiniger, superintendent there, has always been careful with his top dressing. Notice that after 25 years the soil is in excellent condition and he does not have an accumulation of too much grass at the surface. Here is a picture of a home-made machine to remove thatch from greens. Joe Farinda went to the junk pile, got some parts and rigged up this Ideal Greens Mower. He welded rods two inches apart on the blades. He removed the bed-knife and used this machine to mechanically remove the thatch. Roy Jones at Lansing, Michigan made one that worked even better. Notice that he used sash weights to hold down the front of the mower.

Here is a close-up of the surface after the thatch had been removed. It was still playable.

Here is a close-up of the pad-like material at the surface of some greens. One should never top-dress too heavily on thatched turf. When the thatch becomes buried, it is always a source of trouble. When conditions are as bad as this, the most practical answer to the problem is a plow, but players will not tolerate that approach.

Here is a picture showing how it is possible to cultivate heavily matted turf to help decompose this organic material. This shows an old hole and a new hole with the new roots growing in it.

In Massachusetts, in the Cape Cod area, temperatures were high. This picture shows the many localized dry spots and the crabgrass coming in where light shallow watering was practiced.

Here is a picture of damage to turf caused by power mowers. The vibrations of power mowers certainly aggravate compaction and you can see here on the collar where the friction from the drum, especially when the grass is in a state of wilt, has killed it.

And here is apicture of a green showing good management practices. Notice the wide apron and the wide sweeping turn that the greens man made when he turned the mower.

Here is damage caused by fairway units being used too close to a green. The wheels continually drag over the same area and the result is no turf at all.

Here is a picture of a Toro Professional which is widely used to cut the aprons of greens.

Mowers should be sharp at all times but particularly during these critical periods.

Iron Chlorosis was evident both in the north and in the south. The velvet bents are the worst when it comes to Iron Chlorosis. Heavy rains, excessive water, over-liming, too much phosphate, are some of the causes of Iron Chlorosis. All these things lead to reduce the movement of iron.

Here is a picture of a green suffering from Iron Chlorosis. They had been sprayed with iron sulphate. Notice the outline of the hose that laying there when the green was sprayed. The grass is yellow.

Here is a picture of the first stages of Iron Chlorosis in Florida. The grass turns yellow and algae is beginning to take over. Algau usually grows quite rapidly in the advance stages of greens hit badly with Iron Chlorosis. They lost their Bermuda because of the Algae.

Here is a picture of a soil profile at Milwaukee Country Club. I have told this story many times identifying each layer with the man that was in charge of the course during these years. This bottom layer shows the sand regime of Charles Gardner, the second layer shows the peat regime of Fred Haselow and the top layer of good soil is Ted Booterbaugh. He used a good soil mixture of not too much clay or too much humus and enough sand to give the soil a good consistency. By making the transition gradual these layers are not too much of a problem.

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TIMES AND METHODS OF AERIFICATION

Tom Mascaro
West Point Products Corporation

There are three factors that control plant growth. They are sunlight, climate and soil.

There is little we can do to modify sunlight or the length of the day. There is little that we can do to modify climate. Temperatures cannot be changed and rainfall cannot be controlled. We do, however, modify rainfall in a limited way with artificial irrigation. Generally speaking though, we cannot do much about the climate.

The soil, therefore, is the only factor over which we have any degree of control. It is ours to do with as we wish. We can build it up or destroy it, and we can modify it to suit special conditions. Therefore, when we speak of aerification, we speak of our ability to manipulate soils so that conditions are favorable to plant growth.

First, let us consider the plant itself. All plants are in two parts. The leaves and stems above the ground; the roots and root hairs below the ground. Most people concern themselves primarily with the part above ground and seldom consider the other half of the plant.

Much time and money are spent in trying to cure the ills of that part of the grass plant above the ground with no consideration at all for the root system which cannot be seen.

Roots need space in which to grow. Spaces should be provided in the soil for the free movement of air, water and fertilizing materials. How is this accomplished? -- by plowing, of course. We know that the reason the farmer plows is to change soil structure. He does this every year. On turf areas, this cannot be done because the use of the area would be lost over too long a period. So, unfortunately, when we make mistakes on turf areas, we have to live with them. Dr. William Daniel of Purdue University recently made the statement that the Indiana farmer buries his mistakes each year. If we could do this on our turf areas, we would have far less problems.

Man, being conscious of this, has tried many ways to develop tools that would cultivate turf areas without destroying their usefulness. One is amazed to find the number of man hours that have been devoted to the development of these implements. Suppose we trace them back. Garden forks have been used to punch holes into the ground. Many hand spikers have been developed and discarded. Various punching machines have been developed. At one time, a great favorite for use on golf greens was a machine that drilled holes. Various hollow-tined implements have been developed over the years. Some have proven to be useless; others have shown varying degrees of success when properly used. Those in this audience use the open, spoon-type, cultivator for the most part, I believe.

When soils are cultivated a number of things occur. We can review here the work done by Dr. R. B. Alderfer of the Pennsylvania State College. He has demonstrated visually how grass roots, when given the opportunity to grow, stabilize the soil much like the soil conditioners about which we hear so much at the moment. Soils full of roots become stable. The active organic matter produced by the grass roots aggregates the soil and does more good than any mechanical tool will ever do. Soils full of grass roots become dynamic. The soil itself is an inert material and, unless organic matter is present to form aggregates or the grouping together of soil particles, it is not stable.

Soils containing active organic matter derived from grass roots expand and contract on alternate wetting and drying, and this is nature's way of aerating soils.

Therefore, we should look upon cultivation of turf areas only as a means of establishing a good root system.

From then on, the task is to maintain that root system so that the plant can function properly. Regular cultivation will provide the conditions necessary for the maintenance of the root system.

The proper times to aerify depend largely upon local conditions, climate and soil. This last year was a critical year for turf over the country. Much turf was lost and jobs lost with it. One golf course I have in mind had extremely bad conditions on their greens. The man in charge had been there for 35 years and, being familiar with the turf problems that he had, he always kept the grass in fairly good condition for the players. However, two weeks after his retirement, the greens exploded. Those who were in charge of the course were not familiar with the conditions of the greens and, because the greens were not properly handled, they simply went out.

I mention this to illustrate the point that turf can be grown and maintained under the most adverse conditions providing that the man in charge is there 24 hours a day and 7 days a week. This might be all well and good but the majority of us like a little free time to do other things. That is why we are constantly striving to learn more about the problems with which we are faced and how cultivation of the soil can tide us over those critical periods which we all have to face sooner or later.

All too often throughout this country, I have seen cases where most of the turf had gone out on greens--excepting those areas where adequate cultivation and good management had been practiced. Greens that were aerified when they are weak must be handled with care. After all, the superintendent is on the job to see that the players have the best possible playing conditions. Aerification carefully done on such areas will not retard play.

Another problem with which we must contend is thatch. The control of surface thatch goes hand in hand with aerification. However, aerification is not the complete answer to the control of surface thatch and other methods have to be developed to control these conditions.

Underneath mat, though, can be controlled through aerification. There is plenty of evidence showing that grass roots help to break down underneath mat when they are mixed with the soil. The use of lime is certainly recommended where heavy layers of underneath thatch exist.

The improper use of top-dressing materials also present us with a problem. Cultivation of turf areas gradually eliminates layers that developed through such improper use of top-dressing. Many times sand layers are formed when such areas are cultivated. By cultivation, the roots can penetrate the sand layer and shallow roots are eliminated. Unless such areas are cultivated, these sand and humus layers tend to hold too much water. Since air cannot pass through water, root development is usually restricted to the areas above these layers. Breaking through thatch layers allows for the free movement of water into the root zone, thereby helping to overcome so-called "dry spots". Much water is lost from heavily thatched areas and the end results is that some areas are too wet and some are too dry.

The true effects of soil erosion under turf is another study on which I believe more work should be done. We know that it occurs but the process if so gradual that the loss of soil over a long period of times is not noticed. The experience of Charlie Wilfong, Superintendent of the Green Valley Country Club, illustrates how much soil can be transported by water. A housing project next to his golf course was situated in such a way that all the drainage water passed down over his fairways. He noticed that his turf was becoming weaker and weaker through the season and was at a loss to explain it.

A soil sample taken to a depth of about six inches showed a build-up of raw clay about three inches deep under the original soil surface. The problem of the run-off water was solved by the construction of a dam and diverting the clay-laden water. Then a program of cultivation was started in order to re-build the three inches of clay that had been deposited into a better soil. Through aerification and the addition of an organic coco product much has been done towards rebuilding this soil. His work will have to be extended over a long period so as not to interfere with play. The gradual improvement of these areas should eliminate his problem.

In closing, cultivation of the soil serves a variety of purposes and the reasons for making it a part of the maintenance program are many and varied.

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COST OF TURF RENOVATION AND ESTABLISHMENT WITH ZOYSIA GRASSES

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Paper prepared for presentation before the Turf Conference at Baltimore, Maryland, January 7, 1953, sponsored by Mid-Atlantic Golf Course Superintendents Association and the University of Maryland.

The most costly turf today is poor turf composed of weak unadapted grasses. Renovation of poor turf costs money which most clubs can ill afford, especially if it is necessary to renovate and reseed periodically because of the failure of weak unadapted grasses.

Many golf clubs have been forced to renovate fairways for one reason or another, in order to provide improved playing conditions. Let us examine a typical case and see if we can determine the approximate costs. We shall assume first a case where cool-season grasses have failed in mid-summer and weeds (crabgrass, clover, goosegrass) have taken over, and it is planned to reseed cool-season grasses. High temperatures--humidity, heavy rains, heavy traffic, - you know the stage setting all too well.

Weed Control - 3 applications chemicals (Sod. Arsenite, 2,4,5-T Potassium Cyanate) $10 /A Estimate each	$ 30/acre
Aerifying - 6 times for seed bed $5 hr. for tractor and Machine and Labor	$ 30/acre
Fertilizer - 1000 lbs./acre	$ 40/acre
Seed - 100 lbs./acre @$1	$ 100/acre
Applying seed and dragging labor	$ 10/acre
Assume perfect success - good stand	
	$ 210/acre

After this has been accomplished there is a period of at least a year during which time the golfer must play preferred lies and there is no cushion of turf. Without a doubt there will be an infestation of weeds the following summer - it usually happens. Some reseeding in spots may be needed - this, too, is usual.

This adds to the cost. Furthermore, there is no real assurance that a satisfactory turf will result -- especially when the weather conditions recur to knock out the young, tender, disease-susceptible grass and necessitate the same renovation program each year. This is not the usual thing but it has happened, especially when Poa takes over the new seeding.

Now let us consider a program of renovation wherein we start with an unsatisfactory turf and plant it to zoysia. Since the zoysia is to be planted in the spring and early summer there will be no chemical weed control because we know from experience that the zoysia will overcome the summer weeds. What will it cost us to do an acre of fairway? Let us start with "Operation Zoysia" in 1952 conducted jointly by the USGA Green Section and the Mid-Atlantic Golf Course Superintendents Association at Fairfax Country Club.

Aerifying (once to make holes) ....$	5/acre
Growing seedlings (11 flats)22 sq. ft.$	100/acre
Seed and labor for planting...........$	100/acre
	$ 205/acre

This represents about the same cost as renovation and planting cool-season grasses. The difference is in the relative <u>permanence</u>. The zoysia we plant once. The cool-season grasses may have to be planted every year, every 2 years, every 5 years, depending upon circumstances.

Now let us grow the zoysia seedlings in a bed out of doors and see what the cost will be for planting an acre.

Aerifying...............................$	5/acre
Seed $2 (one ounce)................$	2/acre
Labor to plant.......................$	100/acre
Growing seedings (Dowfume or Cyanamid)	5/1000 sq. ft.
	$ 112/acre

This represents a big saving because greenhouse space is expensive. Maybe we even figured our greenhouse costs too low. I want you to understand that my figures are not absolute but are quite frankly estimates. Each of you may make your own estimates based upon your own conditions.

Now, supposing we just planted zoysia seed costing $10 a pound, hulled and scarified. We know several interesting factors about planting zoysia seed and this is what we can figure:

Seed $10 a pound, 10 lbs/acre..........	$	100/acre
Sowing the seed........................	$	5/acre
	$	105/acre

This is about as low-cost a program as we believe anyone could devise - certainly it is half the cost of the usual renovation procedures and has the advantage of being permanent. We are confident that, as soon as we can get good zoysia seed produced, we can seed it directly into existing poor fairway turf without any treatment of any kind and have it succeed and produce good turf. There will be a time lag but this is not a serious factor in a long-term program.

Let us take still another plan involving zoysia and start with one square foot of a selected strain of zoysia which you would buy for - let's say $5 just for the sake of argument. This square foot could be expanded to 200 square feet in six months or in one growing season with only part-time attention. The following year the 200 square feet could be expanded to plant one acre of nursery, again with part-time help of one man except for planting. In the third year this acre of turf would yield a minimum of half a million 2-inch plugs which would plant 50 acres of fairway turf with plugs on 2-foot centers. One man can lift and set 1500 plugs a day. This figures to about $50 an acre for labor, at $1 an hour. Since this kind of work can be done at any season of the year when the soil is in workable condition, one can take advanatage of slack times and student labor. I purposely have not figured the cost of growing the nursery sod but most of you know what it costs you to grow nursery sod.

Let us stop just a moment and review <u>why</u> we are talking about planting zoysia grasses. Most of you know by now - or should know - that zoysia is the most dependable fool-proof grass that we have ever grown in this area. It produces a turf which is second to none for playing quality in sports turf, fairways particularly. It chokes summer weeds, needs no irrigation, loves the heat and humidity and defies insects and diseases. Radko and I look over the plots then we look at each other and say, "Yep, you plant zoysia once and it is always there when you need it". It seems to love compact soil but responds to aerifying. Last summer when all cool-season grasses gave in to weeds zoysia was perfect. But why belabor the obvious? All anyone has to do is to walk over the plots at Beltsville and he will come away converted. Please remember - we stress turf quality for the game and games played on turf are not played on color. Color can be added with a dye or with a cool-season grass but that is another story.

In conclusion I want to reaffirm my complete faith in zoysia, as one of the most promising of all turf grasses in the world today. The cost of planting zoysia into an unsatisfactory turf is about one-half the cost of the usual renovation procedure involving cool-season grasses only. This saving becomes greater with the years because zoysia turf improves with age. Most ordinary turf grasses deteriorate steadily and may need to be re-established at frequent intervals.

I neglected to mention that we may be able to bring the cost of planting zoysia down considerably when we introduce machine methods. This has been done and will be given a thorough trial in 1953. The following is quoted from Georgia Coastal Plain Experiment Station 30th Annual Report 1949-1950, page 61: "Using best machines (mech. planters) it is possible to plant bermuda sprigs at lower per acre cost than those associated with planting Dallis, Bahia, and fescue from seed".

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TURF EXPERIENCES IN 1952-NORTHERN GOLF COURSES

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The season of 1952 will be remembered as a bad one for special purpose turf on golf courses in many parts of the country. The two preceding seasons were so cool and moist that Poa annua flourished and was never more prevalent and widespread. Yet damage and loss of grass in 1952 was nowhere near comparable to that unforgettable year of 1928 when many clubs lost not the parts of one or more greens, but everything on all eighteen greens. This in itself is proof that progress is being made by the golf course superintendent in solving the problems of golf turf maintenance.

Some people decry any attempt to blame weather for damage or loss of grass, and cite the isolated instance of little or no trouble on one course to prove that serious damage on nearby courses is man made and never God-given. In some cases this contention is the right one, but not always. Failure to modify a routine practice because of the unusual may happen. For example, a superintendent on a course in south Georgia once remarked that too much peat had been used in constructing one green. The soil in all the others was very sandy. He seemed puzzled when asked if this green was watered as often and if it received the same amount of water as the others. Peat has a very high, and sand a very low, waterholding capacity. His trouble vanished when the new green was watered less frequently and given more water each time. The change made sense. Because of the lower waterholding capacity of the sand it was necessary to use less water each time and water more frequently. This is but one example of many, yet the modified watering procedure would fail in a period of extremely heavy rainfall.

In each climatic zone the tricks of customary weather are known and expected. They are handled effectively and with dispatch. But troubles multiply when there is an abrupt change to a different kind of weather. Then God-given troubles may be man made also because damage might have been averted with a little extra know-how. In the Mid-west dry hot weather is taken in stride, but this occurs less often in regions where normal summers are moist and cool. Wilting and localized dry spots are not recognized in time to avert damage.

At sometime or other during the summer the weather was ideal for every known disease and possibly some of the unknown origin. Copperspot, dollarspot, brown patch pythium and every kind of lead spot made their appearance. Turf diseases have been discussed from this platform by other, more able speakers so it is hardly appropriate for me to dwell upon them. Fungicides for their control are very necessary tools, but the part played by nutrition, soil, water, and turf condition must not be ignored. Very often disease is secondary to something else and takes a subordinate-place when the adverse factors are eliminated. Many years ago a Minnesota superintendent was plagued with dollar spot on his Washington bent greens. Attacks were continuous from early spring until late fall. None of the better fungicides worked for him. Calo-Clor was applied each week, but nitrogen was used only when the scars made the surfaces bad for play. Then a little sulphate was applied to encourage growth and speed recovery. Now it is well known that too little nitrogen is even worse than too much in fostering dollar spot. Had the greens been provided with a uniform and continuous supply of nitrogen, dollar spot would have been less frequent and its control simplified. Our Minnesota friend might have lived longer and been spared ulcers had this fact been established before he passed on to eternity. The first clue about the effect of nitrogen level on dollar spot came from one of his colleagues by the name of Leo Feser.

In some instances sickness of grass on thatched greens has been ascribed to leaf spot because lesions have been present. Leaf spot sclerotia are everywhere and ready to attack when the opportunity presents itself. On such greens fungicides have not performed up to expectations. The fact that the attacks have started and been worse on the high, seemingly dry spots puzzled some. There should be no mystery about that. The matted grass holds all the water, because of its high waterholding capacity and because the dry soil below resits wetting. Fungus diseases flourish in a moist, medium. Mat removal to lessen the amount of organic matter, along with cultivation to improve conditions, for water movement and to encourage deeper roots are the first necessary steps. Then severe leaf spot infestation may disappear of its own accord or the fungicide will stop it.

When there is too much surface thatch, roots are shallow always. The penetration and movement of water is impeded or prevented. The discolored leaves and stems perform no useful function and are a liability. Because of its high waterholding capacity, the mat fosters disease and excludes air and oxygen. The thin veneer of live grass on top may collapse suddenly in large, irregular patches following heavy rains or excessive watering, either of which waterlogs the entire mass. A lack of oxygen, or the presence of toxic decomposition products, or both, may account for the collapse. This theory lacks proof, but the experience of one club tends to support it. The greens were cultivated with a puncher type power operated tool immediately after several drenching rains. There were green clumps of grass around each punch hole. All the other grass collapsed.

In cool weather turf can withstand and recover quickly from the effects of ponded water, but not in hot weather. Soil micro-organisms are not active until the soil temperature exceeds 60 degrees Fahrenheit.

The problem of mat removal is simple where it is of recent origin. Systematic combing, cross-raking, or brushing a few times followed by close-cutting each time rids the green of surplus grass. But where the clippings and stems have undergone decay to a peatlike material, the problem is more difficult. It can be accomplished. Rebuilding is the quick way, but is seldom sanctioned. The alternative is to make conditions favorable for soil organisms to destroy the organic matter. Cultivation to introduce air and light liming to neutralize intermediate organic acids speed the process by accelerating decay.

The axiom to water infrequently must be ignored when--grass roots are shallow or non-existent. Despite all that has been said about the necessity for daytime springing to stop wilt, the practice is frowned upon by some. They believe any amount of water applied in open sun on a hot day will burn the turf. Water of itself never killed any grass. Damage occurs only when the amount used is sufficient to saturate the soil. In hot weather, shallow rooted turf must be watched for wilting throughout the day, seven days a week. Wilting is characterized by blue color and foot printing. It must be stopped promptly otherwise the grass will wilt and turn brown.

Sometimes half an hour's delay is the difference between saving and losing grass. When there are no roots, water must be absorbed through the leaves so there is little point in spending more than 15 to 20 minutes on a green, or using more water than is required to revive the grass. Even when there is standing water in the cups from a downpouring rain of the night before, it is important to stop wilting with a little water on a hot, windy day. There is some evidence that the use of a little potash helps stop wilt on greens where the soil supply is low.

Many superintendents stop night time watering when grass is shallow rooted. Greens are watered in the morning. Then wilt rarely returns until mid-day. Greens are checked just before or immediately after lunch and possibly again in later afternoon. Part of the crew watch greens for wilt on Saturday and Sunday.

Power mowers are a contributing cause of injury when the grass is at or near the wilting stage when cut.

Weight is not the cause. It is due more to the burning and bruising action of the power driven drum. The rear wheels of automobiles do the same thing to gravel roads. Fast mowing itensifies the injury. The craze for fast mowing of fairways was short-lived. Slower speeds are sure to come on greens also. Maybe some bright engineer will find a new way to apply power and dispense with the drum. Until then, power-mowers, should never be used on wilting greens.

Some thought their troubles were aggravated by the use of too much nitrogen when the opposite was the case. Heavy rains washed the soluble nitrogen beyond the root zone.

The relationship of potash deficiency to wilting has been mentioned. An adequate supply of potash may not necessarily stop wilting but may take it less acute. Bent greens should get about as much potash as nitrogen. Some have neglected it and overdone phosphate to the point where greens are becoming low-grade phosphate mines. Overdoing phosphate or lime intensifies iron chlorosis.

There was considerable iron chlorosis, especially after heavy rains. It seems to be on the increase. Up to now spraying with iron sulphate promptly to restore green color has been the best way to avoid injury. Some of the new iron complexes, such as Sequestrin, may afford longer protection.

The troubles of 1952 were not due to any one thing and certainly not to inferior grasses. Better ones are sure to come, but many of the existing strains make a good showing if given a chance. The season demonstrated the necessity for plenty of cupping space, for good surface and underdrainge, and an ideal soil of uniform structure and composition from the physical standpoint. The excessive use of peat or muck, and the use of sand as such lead to trouble. Changes should be gradual and never abrupt. That is true of everything else we do.

Too many greens are badly built. The price of neglect then is terrific. This organization should take steps to meet with the golf architect's association and establish a basis for good construction.

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