1960

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Geoffrey S. Cornish

Larry Thompson

Roger H. Barrett

Albert Allen

Laurence M. Thompson

See next page for additional authors

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STOCKBRIDGE SCHOOL

TURF CLIPPINGS

CONFERENCE PROCEEDINGS

1960
Anthony Caranci (r) representing the New England Golf Course Superintendent Association presenting Dr. Jesse A. DeFrance a plaque in appreciation for his outstanding work in the field of fine turf.

The Stockbridge School Turf Management Club also considers it an honor to dedicate the 1960 Turf Clipping to Dr. DeFrance.
KARNIG OVIAN RECIPIENT OF G.C.S.A. SCHOLARSHIP AWARD

Dr. Gene C. Nutter, Executive Director of the Golf Course Superintendents' Association and Editor of the Golf Course Reporter presenting Karnig Ovian, Stockbridge Turf Senior, with the G.C.S.A. scholarship certificate for outstanding achievements in the study of fine turf.

We are very proud that Karnig was awarded this scholarship, because he is the first recipient of this award.

After graduating in June of 1960, Karnig will be the new Superintendent at the Highland Golf Club in Shelton, Conn.
To form a bond of common interest between the Turf Management Club, the alumni of the Stockbridge and Winter School Turf Majors and all interested friends of the University of Massachusetts Turf program.

Vol. 1 No. 5  Turf Management Club  Agronomy Department  University of Mass.

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RECENT DEVELOPMENTS AFFECTING GOLF COURSE DESIGN

Geoffrey S. Cornish
Golf Course Architect

When Laurence Thompson asked me to prepare an article for TURF CLIPPINGS on developments in the last quarter century that have influenced course design, I thought I had an easy assignment. Further contemplation, however, convinced me that a book would be necessary to do justice to all factors involved. Accordingly I am listing five developments only and discussing their implications briefly.

1. HIGH COURSE-MAINTENANCE STANDARDS

Higher standards brought about by superintendents are apparent to all of us who were around golf courses twenty-five years ago. For example, refinement of roughs has proven to be the greatest boon of all to both high-handicap players and newcomers to the game. But less rugged grass roughs make it necessary for architects to dream up other nightmares for low-handicap players. To this end, traps and other hazards such as water are so placed that they can catch the long hitter who is wild, but do not trouble either the accurate or the short player.

2. HEAVIER PLAY

The most exclusive country clubs are experiencing heavier play, while the increase on fee-type courses is a veritable tidal wave. In this regard it is noteworthy that architects in orientating holes today have to consider the rising sun, whereas until a few years ago only the setting sun was of significance.

Several years ago I wrote an article for GOLFDOM in which I stated an 18-hole club could comfortably accommodate 400 adult male playing members plus other classes of membership. But several new clubs with which I am now working are limiting family membership to 300 or less. This is because the average member is playing two or three times as many rounds a season as he did formerly.

A fundamental of golf-course architecture is to make a course relatively easy for the high-handicap player and yet testing for the low-handicap man. This in itself speeds up play, but the net effect on speed of play is insignificant in relation to the numbers who would play if more facilities were available. It is fundamental too that hazards that hold up play unduly should be eliminated. But in streamlining courses there is danger of making race tracks out of them. Hence to assist in handling the increased traffic architects can contribute most by promoting new facilities.
3. MECHANICS OF THE GAME AND PLAYING EQUIPMENT

Bob Grant of Bolton and I watched Paul Harney test several holes we had recently completed at Bob's course. We were amazed to see him reach an elevated green with his second shot on a hole measuring 590 yards.

It is true that Paul hits an astonishing long ball, but many leading amateurs and professionals are getting the ball farther and farther down the fairway. And, more and more, par 4's are being reached with a driver and a wedge.

This play is influencing green design. Nearly all greens today are of the raised sculptured type rather than the flat older type which blended into the fairway, thus permitting a run-up shot. Likewise, contouring of the approaches is becoming increasingly important. And large putting surfaces are being designed to call for putts as long as 80 to 90 feet if the approach shot has not been accurate.

When the Connecticut P.G.A. held their Pro-Am tournament at Crestview this past season, only a handful of the professionals scored lower than 80. This was because they were 3-putting Felix Thompson's large and lightning-fast rolling greens unless their approach shots had been dead to the pin. As one reporter put it, "the raised and contoured greens took most of the professionals off into bogeyland". On the other hand, these same players with today's playing equipment and increased knowledge of the mechanics of the game can annihilate older layouts with smaller greens.

4. HEAVY EARTH-MOVING EQUIPMENT

Introduction of bulldozers, scrapers, pans, draglines, clams, and other mechanical marvels has revolutionized golf-course construction. In brief, this equipment permits architects to design more lavish and interesting courses and to have them built for figures even lower than those required for more modest courses completed a few decades ago.

5. BETTER FARMS AVAILABLE FOR GOLF COURSES

Heavy earth-moving equipment also allows us to utilize land on which it would have been prohibitive to construct a golf course before World War II. But in the last three or four years all through the North East better and better land has become available for golf purposes. Indeed as recently as 1952 only the roughest farm land was available for golf unless very high real estate prices were paid. But there is a revolution taking place in agriculture; and numerous beautiful dairy, tobacco and potato farms are now available for country clubs. The potato farm at Ellington that is Hartford's newest course, the Hart Farm at Simsbury, Lush Acres at Rehoboth, Knight Farm at North Kingston, R.I., Althea Farm at Sharon, and Andy Boy Market Gardens at Concord are just a few examples of Southern New England's most beautiful farm lands that are now being converted to Country Clubs. And the same phenomenon is taking place in other North Eastern States.
It is encouraging to note that this combination of better land, modern earth-moving equipment, and increased know-how is affecting design in such a manner that superior golf courses are the final result.

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FROM THE EDITOR
Larry Thompson (60)

The cover for the 1960 Turf Clippings features golf turf. We feel that this publication will help the superintendent keep up to date on the ever changing ideas, experiments and technique of turfgrass management.

Turf Clippings has grown in size since the first publication. Consequently the expenses of the publication is an increasing problem. Without the financial assistance from the annual turf conference, the size and quality of the publication would be impossible. We hope this year the articles will help to answer some of your questions.

I wish to thank all those individuals whose contributions of articles and time make the Turf Clippings of 1960 our largest publication. A great deal of credit should go to Mrs. Joseph Troll, who has labored many hours on the little things to make the final publication possible.

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FIVE YEAR RESULTS
Larry Thompson (60)

I am sure Henry Homan, the founder of the Turf Club five years ago, had no idea of the success that would follow. We feel that it is the best and most educational club of any major, not only at Stockbridge, but in the University.

The speakers present during the Winter School Meetings vary greatly, but blend harmoniously with the educational end. From week to week, they ranged from a prominent Superintendent to a seed salesman or even an insurance man explaining aspects applicable to golf courses. The speakers for the club are well screened and picked months in advance. The meetings are all well attended.

With education in mind, the Turf Club could develop into the strongest club at the University in years to come.
Turf Management Club News
by
Roger H. Barrett

The Turf Management Club enrolled its largest membership with a total of twelve seniors and twenty-five freshmen for the 1959-1960 season. Many of the students are enrolled with more practical experience, in the management of fine turf, than in the past years.

1959-1960 Officers

President - - - - - - Samuel Delmolino
Vice President - - - - - - John Mulhearn
Secretary - - - - - - - Roger Barrett
Treasurer - - - - - - - Everett Wood

Laurence Thompson was elected to edit the "Turf Clippings" for the 1960 Spring issue. Meetings were held during the 1959-1960 season to prepare all necessary data to produce this helpful publication.

Donald Bevilacqua, our program committee chairman, selected a fine group of educational speakers for meeting with the winter school group.

Guest Speakers

February 10, 1960 - - Kayem Ovian
Superintendent, Woodmere Club, Inc.
Woodmere, Long Island
Subject: Business Management

February 17, 1960 - - Richard McGahan
Representative, Hart Seed Co.
Subject: Product of Seed

February 24, 1960 - - Paul O'Leary
Superintendent, Equinox Country Club,
Manchester, Vermont
Subject: Winter Injury

March 2, 1960 - - - - Paul Checkele
Representative, The Upjohn Company
Subject: Turf Diseases

Professor Lawrence S. Dickinson also spoke to the Winter School, reviewing the trends of golf course management in past years.

Professor Joseph Troll was selected to be the advisor of the Turf Management Club for the 1960-1961 season. This will be his second consecutive year as advisor. We feel and I speak for the club to be very fortunate to have him as our advisor.
From all appearances the Turf Management Club is getting stronger each year with the enlargement of each new class. The purpose of the Turf Management Club is multiple:

1. To promote a better understanding of the fundamentals of Agrostology.
2. To recognize by appropriate means, the position of the golf course superintendent.
3. To introduce Stockbridge freshmen and Winter School students to the University Community and to further and better the knowledge of all those interested in Fine Turf.
4. To form a bond of common interest between the Turf Management Club; the Alumni of the Stockbridge Turf Majors, and the Winter School.

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

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Quotes from 1960 Seniors

Dave Macora  "Well our biggest green at Surpremant is 27,000 square feet"
Karney Ovian  "What did you get?"
Larry Thompson  "Did we get that one Karney?"
Sam Deimolino  "Boy am I tired"
Jim Diorio  "Did I miss much yesterday?"
Lanny Shaeffer  "I still think New York is a better State"
Don Bevilacqua  "I think I bombed that test"
Roger Barrett  "Them damn diapers sure pile up fast"
Andy Ansaldo  "Well - Why not?"
Ron Holcomb  "Does this look right to you"
Joe Zoppo  "Boy I'm sweating this one"
Bill Whitely  Before - "Study for what test?"
          After - "Boy I flunked that one"
Test returned - 95% for Whitely.
Prof King  "All volunteers be here at 3:30 A.M."
Prof Hamilton  "Of course there's a quiz Wednesday"
Prof Troll  "I'll turn my collar around" - "OK but don't mention my name"

-5-
Poa annua -- Friend or Foe

By
Albert Allen
Golf Course Superintendent, Kerwood Country Club
Salem, Massachusetts

Because of the publicity given at present to annual blue grass, a great many people seem to think that it must be of recent origin. This is far from true, as it has been with us a good many years.

Margaret Plues, in her book on British Grasses published in 1867, says that it is often called "Suffolk Grass" from its prevalence in that county; and she also notes that this species is to be found in great abundance in America, Europe, Northern Asia, and Northern Africa, up to an altitude of 4000 feet.

Chemical treatments to eradicate this past began a good many years ago, from the Ammonium sulfate era in 1925 to the pre-emergence gambit in recent years.

Throughout this entire period there has been one procedure touched on from time to time: this has been the use of arsenicals, from arsenate of lead to calcium arsenate.

Success has varied from person to person and through different sections of the country.

I believe that Poa got a new lease on life during the World Wars, when the price of lead soared and the hydrocarbons came into the picture. Persons that managed to stick with lead arsenate have, I think, fared much better, as a whole.

A shining example is Arthur Anderson of Brae Burn. Arthur uses lead in copious quantities, on tees, fairways, and greens; and the course shows the results in an almost total absence of Poa.

Daniels of Purdue has done considerable work with arsenicals, and his results show considerable promise for control of annual blue grass.

One thing that is very important with arsenical control is moisture content in the areas being treated. Turf that is on the dry side will be subject to a great deal more injury than turf on the moist side.

New products show much promise for the future, but you should remember one thing: tests at experiment stations are carried out under optimum conditions and under the supervision of the most competent men in this field.

When you decide to try some of the newer chemicals, make haste slowly. Before you try these controls on all your greens, tees, or fairways, try a small amount under your own conditions. It is much better to lose 1000 square feet than 18 or 36 greens.
In addition to chemical treatment, sanitation can go a long way in the control of annual blue grass. Instead of scattering the clippings from a green that has Poa, make a point of disposing of these clippings where they can't be tracked around the course.

Use of machinery to elevate the seed heads where they can be mowed by a greens mower will help to control the pest.

When conditions are adverse, the only thing that can save you from losing all the Poa at once is eternal vigilance and a prayer. Having greens with Poa, under these conditions is like swinging a tiger by the tail: as long as you keep swinging, you are all right; but just stop to change hands - and, brother, you have had it.

The Horticulture Show

by

Laurence M. Thompson

Whim-bam, there goes a tree, falling on campus, here and there - trucks going by with flowers stacked to the top, students carrying tools, knives, axes, paint brushes, looking and dressing nothing like anyone else on campus. Don't worry folks! - it's only the annual Horticulture Show starting to take shape.

The annual Horticulture Show is slated to begin the 31st of October and last through Sunday afternoon. In the past years the show has drawn over 25,000 people and this year it should have equal popularity.

Every major at Stockbridge plays an important roll in the success or failure of the show, because it is the great effort of the students to create originality to put the theme over.

As we are turf majors, naturally our part is cutting, loading, hauling, and laying the sod for the different scenes and supply all majors with enough grass to make their exhibits look like an outdoor scenery with original beauty.

As freshmen and this our first show we as a class rose to the challenge and did a job well done. The team work displayed by the turf majors was well seen by others and thought well of. The boys got immeasurable experience with cutting the sod plus the experience of laying it to specification.

The show is a part of our school work and I am sure all will reap the harvest in taking any credit for the success - curricula wise plus a self-satisfaction for a job well done.
Please Repair Divots and Ball Marks

Boss - We Need A New Tractor!

What makes you say we need an irrigation system?

Looks a bit congested.

Who needs water?

Keep the death hand out!

Turn the page
Living next to a golf course does have disadvantages.

Nice putt.

How is my form?

Oh! For Pete's sake, say, play another ball.

That's the way the ball bounces.

This is my book.

That's all.
MESSAGE FROM THE WINTER SCHOOL PRESIDENT OF 1960  
by  
William T. Sell  
Port Country Club  
Port Washington, Wisconsin  

In the past 33 years many commendable things have been said about the Stockbridge School for Turf Managers. I shall not attempt to add to those many words of wisdom.

On behalf of the members of the Winter School of 1960, I would like to express our sincere thanks to all who had a part in instructing us during the last eight weeks.

We have all gained new knowledge and ideas, not only from the instructors and the association with them, but also the wonderful association with each member of the class.

I know, as we leave the Stockbridge Winter School, we feel ever grateful that we were able to attend, so that we all leave here to become better men in the field of turf.

THE MOST OUTSTANDING TURF SENIOR FOR 1959  
by  
Joseph E. Zoppo (60)  

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

Douglas Hawes, who hails from Dartmouth, Massachusetts, was the second recipient of this award. "Doug" has been a top student in the school, showing interest in all school and class activities. He is now enrolled in the four year course. His major is Agronomy. He is continuing above average scholastic work.

Our congratulations to "Doug" for a well earned award.
The Value of the Proper Use of Lime

by

Charles Allen III

Did you ever walk over a putting green and observe the spongy, uneven, poor type of turf that is the consequence of a deficiency in lime? Have you ever observed a home lawn that you know had sufficient application of everything else except lime?

What value does lime have beside changing the pH of the soil? At U. R. I., under Dr. DeFrance and again at the U. of Mass., under Dr. Colby, I have learned that a change in pH is only one result of the use of lime. Lime promotes granulating of the structure of the soil, and ties up excess soluble iron, aluminum, and manganese into insoluble forms. More phosphorous and potash are made available for grass growth. Lime favors activity of microorganisms within the soil, which decompose organic material, changes pH, and adds calcium and magnesium.

Prof. H. Burton Nusser stated in his book Turf Management, "The availability of applied phosphate is reduced in acid soils. At reactions below pH 6.0 to 6.2 highly insoluble compounds of iron and aluminum are formed."

Numerous experiments have been made attesting to the fact that turf diseases are more prevalent under acid conditions.

I don't think that everyone should immediately cover his turf with lime, because too much lime would probably be as harmful as not enough. First the turfgrower should find out the requirements of his particular turf. Too much lime could tie up minor elements, such as iron, to the extent of a chlorotic turf.

What is the pH in the upper 2" of the turf as compared to the pH at a depth 4", 6", 8" or even 12", wherever the root zone extends? Are the roots at 2" depth at which maximum use of available elements can be expected? If so, -- fine; but if not, what can be done to help the situation? The next time you have your soil tested, why not take 2 deep plugs, say to a depth of six inches, divide it into thirds, separate the bottom third, the middle third, and the top and put them in separate containers. Then test them or have them tested separately for pH. It may be that the pH is the same at the lower portions as in the upper portions, but what if it isn't? We could help the situation by aerifying and topdressing with cyanamized compost. It has been established that cyanamized compost has a definite effect of raising pH of the soil. Cyanamid contains the equivalent of 70% lime (hydrated). It is mixed 13 lbs. to one cubic yard of a desirable topsoil mixed with coarse sand. Application rates are only ½ to 1/3 cubic yard per 1000 sq. ft. It was interesting to me that this would have such a significant hearing on raising the pH.
Most of the greens, especially in the northern part of
the country are comprised of bents. Bents will do well in soil
on the acid side, but I have also learned that bents will do
well in soil with a higher pH. I have again learned that a
higher average of $N_2$, $P_2O_5$, $K$ and minor elements is available
at a pH range of 6.0 to 6.5. Of course, many comprise with
the bents and use a pH of 6.0. It is my contention that a
bent turf growing in a soil with a uniform pH level of 6.0 with
occasional applications of lime merely for calcium and mag-
nesium will have greater resistance to diseases, help prevent
the accumulation of thatch, lessen chlorotic conditions, lessen
weeds that have a higher adaptation to an acid soil than bents
and produce an all-round healthier turf, assuming other condi-
tions such as drainage and fertilizer practices are favorable.

I must also point out that a certain amount of lime may
be used, depending on the existing pH, without changing the
pH of that soil. In other words, lime applied in this manner
would act as a calcium-magnesium fertilizer. Calcium promotes
root formation, growth and regulates the intake of other plant
foods. Magnesium is as important to the formation of chlorophyll
as iron is to the formation of blood.

If you ever try my theories and find them to be correct,
tell your neighbors; but if you find me wrong, keep it quiet.
How else could I ever become an expert?

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Summer Placement
by
John Mulhearn '61

Along with the academic course here at Stockbridge there
is also a practical course, namely summer placement, which must
be successfully completed before a student can receive his
diploma. Summer placement begins the first of April at the
end of the Freshman year and continues through to September
and the enrollment in the senior year. It plays an important
part in the molding of future golf-course Superintendents.

From the standpoint of the student this is a very important
part of schooling. The theory, rules, definitions, and whatever
else has rubbed off during the first year in the classroom can
finally be applied in a practical manner. Under the guidance
of an experienced superintendent reasons for preventative or
corrective measures can be clearly understood while actually
doing the job.

During this period the students also become acquainted
with the managerial end of greenskeeping. They attend greens
committee meetings, become familiar with the club's budget, and
see how it is used, they also learn how to keep time, and how
and why records are kept.
Placement is also an important time for him conduct-wise his actions, interests, initiative, imagination, and ambition are carefully evaluated and determine what kind of recommendation will be forth coming.

The purpose of summer placement is the gaining of education and experience. However, it is understood that a student must earn and receive a fair wage. The wage scale varies depending upon the person’s own ability and the geographical location of the job. In many instances a student on summer placement has earned enough to defray expenses for his senior year in school.

Stockbridge School provides the ways and the means; the rest is entirely up to the individual in the field of turf.

--------------------------------------

A Greenhouse on the Golf Course?

by

Robert Sullivan, Superintendent
Tekoa Country Club
Westfield, Massachusetts

How many golf courses have you ever seen with greenhouses, on them? Golfers playing at Tekoa Country Club in Westfield, Mass, have seen one there and probably wondered what it was for. The greenhouse, located south of the work shop at Tekoa, came into existence two years ago when the greens committee responded to my request for such. Everyone is proud of the work that is done there.

The flowers that enhance this Country Club are only a few of the Courses beautified areas. Before the greenhouse was built, a landscaper was hired every spring to do the work of planting flowers beds around the Club House and lawns. Two years ago, I hired an assistant superintendent, who used to be in the flower business before working on the golf course. In addition, I felt that what I had learned about flowers while in school and that with my assistant's knowledge and ability, we could operate the greenhouse and do our own landscaping in the spring. Since the members of the Club are aware of the many landscaped areas on the course, they appropriated the money and the greenhouse was built.

The greenhouse, 10 ft. by 20 ft., has been in use for two years now; it will pay for itself in five years. With the money saved from hiring a landscaper, we are able to use our own help at very little over-time. We are saving money also by starting the plants in the greenhouse ourselves.

I hope this idea will be considered by other superintendents who have a little extra time and a knack for growing flowers. It will save money for the clubs, beautify the grounds, and show to the members their interest in the clubs and in their work.
MORE OPPORTUNITIES IN THE FUTURE
FOR THE AGGRESSIVE SUPERINTENDENT AT COUNTRY CLUBS

Kayem Ovian
Woodmere Country Club
Woodmere, Long Island

ESTABLISHED SUPERINTENDENT:

Should assume more responsibilities, such as maintenance of Tennis Courts, Swimming Pools, Squash Courts, Bowling Alleys, Winter sports, and also maintenance of all physical buildings belonging to the Club. The Superintendent is better qualified for the above jobs than any manager because of the knowledge he has in maintenance. Most managers' interests are centered around only food and bar operations and, as a result, maintenance will deteriorate over a number of years. The above would be a dual job known as Golf Course Superintendent and Maintenance Manager.

If you are interested in achieving a higher goal, you should consider becoming General Manager, which is the number-one position at a Club.

To prepare for a General Manager's position, you must get involved with Club House operations such as: front-office duties with switchboard, mailings, accounting department, dining room and bar operations, outdoor parties, kitchen operation, men's and ladies' locker-room service, grill rooms, parking problems, ordering and receiving supplies.

The success of a General Manager is to coordinate labor with various departments and minimize extra payroll cost, and to keep employees busy throughout the departments.

The importance of furthering your education by attending evening classes and taking Administrative courses in Hotel and Restaurant Management would hasten the years for you in becoming qualified as a General Manager. Some of the courses that should be considered would be:

- Hotel & Restaurant Management
- Bookkeeping I and II
- Food Control
- Beverage Control
- Meat Cutting
- Dining room operation, including banquets and labor management

STUDENTS IN TURF MAJORS:

Should prepare themselves in college by taking as many courses mentioned above as possible before graduation. They would have the advantage over others who are just Turf Majors; and when the opportunity should present itself at a Club, they would be better qualified.

Summary: My opinion is that the superintendent or student who wishes to apply himself may better himself with a Country Club by not refusing more responsibilities. It may take time to solidify your position, but knowledge and experience will be rewarded.
SOIL, SAWDUST AND TURFGRASS

Robert Ansaldo (60)

The fundamental purpose of soil is its productivity, or its ability to produce green plants. The quality and character of these plants is dependent upon soil elements and organisms (living or dead). Because the organic matter and humus in the soil is unstable, it is necessary for Golf Course Superintendents to provide a program that will replenish the supply. This is where the use of sawdust come in.

Fast-growing bent grasses develop thatch or fibre. This may be controlled with the use of sawdust (1 part) and sand (2 parts) mixed with the proper material: sewage sludge, bone meal, or lime. (Ref. #1) Sawdust, because of its absorbency, bulk, and chemical composition, will aid in the reduction of compaction of the upper crust, it will help the golfer to hold his shot, it reduces the rate of evaporation in hot weather, it lowers the temperature of soil and reduces the possibilities of freezing and thawing. It increases the carbon content of the soil and promotes the carbon-dioxide and oxygen exchange which is necessary for plant growth. It is the belief of some people that "sawdust make soil sour". This is not true! There is a slight and only temporary increase in acidity, but when the built-up organic acids decompose, the result is negligible.

If a good fertilizer program is used with sawdust, a first-class turf can be maintained with about half the recommended dosage (½ lb. nitrogen per 1000 sq. ft. every thirty days). Sawdust tends to rob nitrogen when first applied, but this can be remedied with an application of nitrogen with the sawdust. The nitrogen that is taken in the decomposition of this sawdust is turned back into the soil and is, of course, available to the plants. I might add, the rate it is released is much slower. The sawdust to use is hardwood (#3) maple, birch, or oak, since the softer woods break down at an undesirable rate. The rate of application (spring and fall) should be the same at all times to prevent the material from layering.

In conclusion I would like to predict that sawdust as an additive to soil is going to become more widely used, since the availability of good topsoil is becoming more scarce.

References:
1. Information received from Manuel L. Francis, Supt., Vesper Country Club.
3. Report #1666-1 of Forest Products Laboratory, Madison, Wisconsin.
SENIOR STOCKBRIDGE TURF MAJORS—1960

Top row, left to right: R. Barrett, K. Ovian, S. Delmolino, D. Macora, J. Zoppo
Front row, left to right: D. Bevilaqua, L. Thompson, R. Ansaldo, R. Holcomb
FRESHMAN STOCKBRIDGE TURF MAJORS—1961

Top row, left to right: J. O'Connell, E. Galvin, D. Mauk, B. Keohan
Middle row, left to right: N. Dennehy, J. Mulhearn, R. Sullivan, W. Kittler, W. Emerson
Front row, left to right: W. Tower, N. Beauregard, R. Gray, E. Wood, J. Graham
SUSCEPTIBILITY OF MERION BLUEGRASS TO STRIPE SMUT

by Donald W. Bevilacqua (60)

Note: This report is given so that you, the Superintendent, will know what to look for if this disease hits your area. At the present time Stripe Smut is not a dangerous disease in the New England area. It has been located in the Virginia area, but is becoming increasingly widespread.

Stripe Smut (Ustelago striiformis) In May 1958, plants in a 3-year-old plot of Merion were observed to contain large numbers of dead and dying leaves having a conspicuous shredded appearance, and gray or black strips.

Description of Stripe Smut

Infection occurs by germination of smut chlamydospores in the soil to produce hyphae with systemically invade seedlings and young tillers; further evidence shows spores carried on seeds may induce infection.

Smut sori develop on leaves, resulting in long, narrow, gray or black strips. The gray strips are unruptured smut sori; the black streaks result when the smut sori rupture and liberate mature spores. Infected leaves curl from the tip downward and become shredded; leaf blades then turn light brown, wither, and die.

Infected bluegrass plants are most readily observed during cool weather in spring and fall. They are difficult to find during hot, dry weather because diseased leaves wither prematurely and infected plants die; they are also difficult to find after mowing because of their growth. Since Stripe Smut infection is systemic, few plants recover from the disease.

For all practical purposes, varieties and selections other than Merion, Common, and Troy Kentucky bluegrasses can be considered moderately to highly resistant to the Stripe Smut races.

The evident susceptibility of Merion bluegrass to Stripe Smut suggest that this variety may be seriously damaged in areas and under conditions where the fungus occurs. Since they are infected systemically they remain diseased until they die.

New tillers that arise from the parent plant are almost invariably infected by Smut. However, it is encouraging to find that some varieties and selections of Kentucky bluegrass growing adjacent to plots of heavily Smutted Merion bluegrass were only lightly infected. Although no artificially inoculated with the fungus, failure to succumb after exposure to natural infection suggests that these varieties may possess resistance to the disease.

This disease spreads very fast during cool weather.

Information from: Susceptibility of Merion to Stripe Smut by K. W. Kreitlow and F. V. Juska.
BENTS IN THE SOUTH

C. E. Thompson
Chattanooga Golf & Country Club
Chattanooga, Tennessee.

Putting greens in the South are generally planted with Bermuda grass. This surface is used during the summer season only. After one or two heavy frosts this grass goes into a dormant stage. If maintenance practices have been timed perfectly with favorable weather conditions, and if, they are overseeded with rye grass they will be ready for use at this time. The following spring, with the coming of warm weather, the Bermuda reasserts itself and crowds out the overseeded growth, and play is continued on the permanent surface. This change of grasses, known as the "transition" period, is by far the largest single problem with which growers of turf in the South are confronted.

In an attempt to eliminate this "transition" period, several clubs have changed their greens from Bermuda to bent grass. This was accomplished by a variety of methods. Some greens were completely renovated by removing the sod and the top ten inches to two feet of soil. Drain tiles were then set, the top soil was mixed with sand, and the surfaces were regraded. Others were rebuilt simply by killing the Bermuda with methyl bromide gas and replanting with bent. Several bents were used, both from seed and stolons.

Varying degrees of success have been noted throughout the area. Relative success can be measured only by the playing public and those maintaining this grass. Opinions differ widely on this subject, but courses continue to join the original few in the changeover to the bents. I do not know of a single case where any one has reverted to the Bermuda-rye combination.

Several clubs that have made the change are concentrated in the Knoxville-Nashville-Chattanooga, Tennessee, and Atlanta, Georgia, sections. Persons interested in fine turf are always welcome to stop in and see this cool-season grass being cultivated in this area.

Golf players and those of us in charge of maintenance are indeed grateful to our Yankee friends who have been invaluable for their advice and for this wonderful little grass plant that puts so true and stays so green year after year in this Rebel territory.
HONORARY MEMBERS OF TURF MANAGEMENT CLUB

Samuel Delmolino, President of the Turf Management Club, presenting Dr. Gene C. Nutter and Dr. Jesse A. DeFrance with honorary membership certificates in the Turf Management Club.

Dr. Gene C. Nutter was born in Delaware, Ohio on January 12, 1923. He is married and has two children. He received his B.S. in Agronomy in 1948 at Ohio State and his Ph.D. in 1951 at Cornell University. While studying for his Ph.D., he was a research assistant in ornamental horticulture between 1948-1951. Between the years 1951-1959 he was an assistant agronomist at Florida University. In 1959 he was named the Editor of the Golf Course Reporter.

Dr. Jesse A. DeFrance is a native of Golden, Colorado, graduated from Colorado State University in 1924 and received his M.S. degree in 1926. He received his doctorate in 1932 at Cornell University where he was an instructor in courses of lawn-making and greenskeeping. In 1936 he went to the University of Rhode Island as Associate Research Professor of Agronomy and Landscape Gardening. Dr. DeFrance recently retired from U.R.I. and is presently a consultant for O. M. Scott & Sons Company.
GRADUATES OF WINTER SCHOOL FOR TURF MANAGERS—1960


Fourth row: Prof. E. Pira, Prof. J. Troll, Dean F. P. Jeffrey, A. Allen.
ANNUAL TURFGRASS CONFERENCE PROCEEDINGS
1960

Conference Presentations Have Been Approved By The Individual Speakers

The various topics are presented for your information as follows:

Weather - We are Going to Have Weather, Whether or Not - What Should We Expect by O. Tanenbaum & R. E. Lautzenheiser .......... A-1

The Nature of Winter Injury to Plants by Dr. Johnson Parker .... A-1

Turf Problems
You Name It and We've Had It in '59 by Alexander Radko & T. T. Taylor ................................................................. A-3
Topdressing Experiences with Greens at Century by James Fulwider A-5
Poa annua - Fairway Renovation at Winged Foot
by Sherwood A. Moore ....................................................... A-6
Winter Problems at Ekwanok by Paul O’Leary ...................... A-8
Progress Through Drainage by Kayem Ovian .......................... A-10
Winter Injury on Home Lawns by Orlando Capizzi .................. A-12

The Status of Pre-emergence Chemicals for the Control of Crabgrass by Dr. R. E. Engel .................................................. A-12

Turf Nurseries - Establishment, Maintenance & Utilization by Robert Grant ................................................................. A-14

Soil Compaction by Dr. R. B. Alderfer .................................. A-16

Water Management Practices on Turf Areas by Dr. J.R. Watson ... A-18

Getting to Know Your Members by Owen Griffith .................... A-23


General Lawn Management (Alternate Session)
Conserving Soil for a Good Lawn by Dr. William G. Colby ........ A-27
Fertilizing and Liming by Dr. Joseph Steckel .......................... A-28
Grasses and Grass Mixtures for New England Lawns
by Dr. Robert Scherry ...................................................... A-29
The Care and Maintenance of Establishment Lawns
by Dr. John R. Davis ........................................................ A-34
Dr. O. Tanenbaum and R. E. Lautzenheiser listed three types of weather forecasts. These are the 24-48 hour, the 5 day and the 30 day. The first is 80% accurate, the second about 60% and the thirty day only 50%.

Introduction of automation, rockets and satellites bodes well for the future of weather forecasting and increased accuracy is expected. Dr. Lautzenheiser mentioned that a number of weather bureau publications might be of value to the superintendents. A list of these is obtainable from the U. S. Weather Bureau in Boston.

I would like to mention that among our New England Superintendents Leon St. Pierre has acquainted himself with the work of the Weather Bureau and I understand he has found much of value in his study.

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THE NATURE OF WINTER INJURY TO PLANTS

Johnson Parker

The talk today on winter injury will necessarily emphasize the woody plants: trees and shrubs, since the speaker is best acquainted with this topic.

Winter damage can be caused by the following factors:

1. Mechanical effects (snow break, etc.)
2. Winter drying ("Parch blight", etc.)
3. Extremes in low temperature (especially in autumn and spring).
4. Sudden warming in winter (tree crack, etc.).
5. Other oddities (warm weather in mid-winter followed by cold).

1. Mechanical effects are rather obvious, and suitable pruning to minimize branch and trunk break is mostly a matter of common sense. Frost heaving in nurseries is mostly a nursery problem and covering seedlings with slash or branches has been found very effective in our nurseries in preventing this.

2. The problem of winter drying is probably the most serious one, especially to evergreen trees and shrubs. A few slides are shown of the high mountain situations near Mt. Rainier, Washington, to illustrate the effect of extreme conditions on evergreens.

Some of the physiology of winter drying is further explained. The continued transpiration of water from the leaves when the stems and/or roots are frozen and thus cannot replace this water, is a problem to many horticultural trees, shrubs, and vines. The winter of 1957-58 was particularly severe in this regard, with much winter damage to the sheep laurel and planted Rhododendrons. Nursery damage was also widespread in various native evergreen conifers. The soil was frozen three feet deep in places, and at Keene, New Hampshire tree trunks
dried out to levels approaching air-dried lumber. Tree trunks act as water storage organs to some extent and tree water contents often reflect severe winter conditions. Protection against bright sun is somewhat helpful in preventing this condition.

In the western states, autumn-planted wheats, which become young seedlings by December, are subject to winter drying even though they may be quite cold resistant. Cover by snow is always a protection, provided it does not linger too long in spring and result in fungus damage.

3. The direct effects of cold can best be explained, first of all, by showing how cold hardiness (resistance to low temperature) varies with the season. A series of slides are shown to illustrate this. Some plants harden much faster in the autumn than others, and of course, by mid winter, some are much harder. The effects of artificial-cooling appear to support the results of field experiments with natural cold.

The discoloration of the leaves is taken as a sign of injury, and is illustrated in another slide.

The decline in photosynthesis in winter is illustrated for some common evergreens in another slide, and it is pointed out that most evergreens can continue to make food from atmospheric carbon dioxide and water well into the winter, and even in January.

In order to illustrate what probably happens in cold injury to plants, a diagram is shown in which extracellular freezing is compared to intracellular freezing. The former means that the ice forms outside the cells (but in the tissue) and dehydrates the cells. The latter means that the ice forms inside the cells and apparently disrupts the fine architecture of the cell structure. The former is nearly always killing, the latter is nearly always killing. The latter occurs most probably in late spring injury. The former occurs during the winter.

What are the changes that occur in cells which prevent this injury? Some slides are shown to illustrate changes in some pine bark cells from summer to winter. These changes include a thickening, and even gelation, of the main mass of the cell and an increase in sugar. The protoplasm itself seems to gain in protein, and the green bodies bearing chlorophyll, called chloroplasts, appear to shrink and clump together in winter. Apparently this allows the cell to undergo severe dehydration without injury as a result of extracellular ice formation.

Finally the problem of trunk-crack is mentioned, since this is more common in planted ornamental trees than in forest trees. This injury occurs, not because planted trees are necessarily exotics, but because the boles are often bare and open to the weather, while in the forest, trees protect one another against sharp temperature changes and sudden warming from the sun.

The theory is advanced that most trunk crack is a result of warming after the trunk is frozen and this can be much retarded or prevented by shading or by binding with loose burlap. Once the cracks form, they rarely heal since they are readily sprung open again by cold weather, which shrinks the wood.
The '59 season was one of weather extremes -- the last comparable year in golf turf history was the year of 1928 when wholesale loss of greens was a reality. This last year fairways were the big problem, though trouble on other areas occurred too. The more severe the weather, the more moderation practiced in the management program, especially in practices that could hurt. All during 1959, Superintendents were treading on thin ice weather-wise, therefore they practiced extremes in program moderation. "Hair line differences" in management made major differences in the performance of the turf.

Winter troubles

1. Many greens were unprotected because the deep freeze set in before Superintendents had a chance to apply fungicides.
2. Extreme cold and wind caused desiccation of grasses in some areas. Poa annua too was severely injured.
3. The deep freeze resulted in a severe heaving and thawing action of the soil, which in turn caused a severe washboard effect on areas never troubled this way in normal years.
4. The soil was slow to warm up causing a late growth of grasses. Few greens had color in the area north of the Buffalo-Boston line before May.
5. Areas of poor drainage were smothered due to ice accumulation.

Spring troubles

1. Abnormal coolness of days and cold nights kept grasses from making growth and color as they normally do in Spring. Fairway grasses seemed unresponsive to normal spring treatments, and many chose to turn on irrigation systems early.
2. Spring rains were cold and clammy -- one warm rain would have helped greatly. The soil was late in warming up and grasses, therefore, were late in making growth and greening-up. Because of the poor growth of grasses, knotweed made a strong Spring growth and continued to thrive under weather adversity.
3. Play on dormant grasses did not help, in fact this further set back the grasses on greens. Temporary greens at that time helped permanent greens.

Summer troubles

1. From mid-July on, we experienced a continuous stretch of hot humid weather. Poa annua suffered badly from wilt and disease. Superintendents who applied fungicides to fairways fared better than those who were unable to. Light applications of phenyl mercuric acetate helped greatly -- some Superintendents mixed iron sulfate with PMA to good advantage.

Summer troubles (continued)

2. Insects were very troublesome -- sodwebworm in particular were active all summer long. Much turf was lost to this insect pest. Abnormal treatment for surface feeding insects was necessary. Chinch bugs, frit flies, and Japanese beetle grub were also more active than they have been in many a year.

3. The rain pattern was unusually conducive to wet wilt on greens. Heavy rains fell on Friday's while Saturday and Sunday were clear days of low humidity ... excellent for golf and just right for wet wilt. Superintendents found that more weekend work was necessary to hold the turf.

4. Weed infestations were severe particularly crabgrass, silver crabgrass, and knotweed. Dallisgrass, a prominent weed of the South, also made greater inroads into northern courses, particularly in rough areas.

Because of adverse weather, few chanced herbicide treatment. Even the lightest rates were not only hazardous to permanent grasses but devastating on Poa annua.

5. It was difficult to keep ahead of diseases on greens -- the rain pattern made it difficult to schedule fungicide treatments ... many treatments were nullified because rain fell soon after application ... Many therefore found it helpful to apply hydrated lime at light rates to check diseases until fungicide treatments could be applied.

6. Fertilizer management of putting green turf was touchier than in many a prior year. Normal programs were altered in many cases to reduced rates per application and longer intervals between applications.

7. Many learned first hand to respect pre-emerge herbicides. With their use, weather is one of the primary considerations because of heavy rates required. '59 was a poor year to judge results of pre-emerge type treatments because of weather effect ... and effect of the heavy chemical application on Poa annua ... permanent grasses in most cases were not badly injured.

8. Drainage problems of all types ... surface, internal, and seepage came sharply into focus in '59. The importance of good drainage in fine turf production cannot be over emphasized ... poor drainage conditions added to turf difficulties in '59.

Fall season

1. The high temperatures of summer extended far into October ... much needed renovation programs therefore fell far short of usual standard. Many found it necessary to reseed several times over ... many were unable to treat weeds selectively therefore they renovated by the "scorched earth" method or left weeds untreated ... seed germination was poor in most cases.

2. Poa annua regrowth in Fall also was poor, in fact in many areas it was not clearly visible until late October -- early November. This factor together with the limited response to normal fertilization led to a thinness of turf on many fairways this Fall.
TOPDRESSING EXPERIENCES WITH GREENS AT CENTURY

by James Fulwider

Before I begin the discussion of topdressing greens at Century, I would first like to describe the golf course, both physically and turfwise. This, I believe is important, and the practices applied at Century could very well not be applicable elsewhere. The terrain, for the most part, is fairly open, high and windy. Except for a couple of greens, drainage is good. All of the greens were originally Washington bent. Although the greens are of mixed species, Washington is still the predominant grass today. On the well drained greens, the Poa annua population is so low that it is not a problem. As others from Westchester County, New York will verify, Poa annua, generally speaking, is a problem. I can make statements such as I did, very frankly, because it is a situation which I inherited, and the high bent population is not of my doing. Five years or so from now, I hope I can make the same statement.

The next point is wilt. Statements concerning wilt at Century, of course are based strictly on hearsay -- from the Superintendent who preceded me, and from crew members who have been on the job for about 15 years. I was told that wilt had not been a problem in past years, and evidently it was not, according to past procedure. No crew members worked on Saturday afternoons. Men came in early Sunday mornings to rake traps and pole the greens and were gone by 0800 or so.

The fact that wilt was a minor problem and the bent population on the greens is very high, I believe, is largely due to the topdressing program which has been carried out over the past 25 years, more or less. This exact procedure, on which many of us won't agree 100%, was as follows: Every Monday, was topdressing day, weather permitting. The topdressing consisted of top soil only. I mean by that, no sand or humus was mixed in with the soil, however, the Superintendent was very conscientious in procuring the type of soil he wanted. The texture, I would judge to be a fine sandy loam. Sometimes the soil was run through a Royer, sometimes not. The soil was hauled to each green, fertilizer mixed with the soil (turned 2 or 3 times by shovels), spread over the greens with shovels and backed off with wooden rakes. The point I wish to emphasize here is that this soil was applied in liberal quantities, and I reemphasisize the word liberal. The grass was sometimes just peaking through. The soil was then watered in very thoroughly with a rose nozzle. Six to seven greens could be topdressed each week, which means that each green was topdressed about every three weeks. This procedure was carried out throughout the growing season, with no postponement for hot weather. I had the opportunity to work with my predecessor for half of one growing season and observed this procedure. Upon his retirement, I had some different ideas concerning some phases of management and practices. One of these was the topdressing program. I firmly believed in topdressing, but I thought I could save labor and time by using a dry prepared topdressing that had been heat-treated to kill weed seeds, and had sand and humus added in recommended ratios. By using this material, a
spreader could be used, and much time and labor was saved. However, the cost of this material was quite high. My program, which was carried out last year, reduced the number of times the greens were to be topdressed, but this program could seem quite extensive to some. Greens were topdressed April 21, May 25, July 7, July 27, and September 14. The cost of the topsoil alone was over $2000, and because of this I was reluctant to spread it as thick as was done by the old method. Going on the assumption that greens at Century, properly watered for the weekend, would not wilt, the same weekend labor procedure was continued. One Sunday afternoon in July, I found out very convincingly that Century's greens would wilt. I don't believe there is a more hopeless feeling, than to be all alone and to see greens starting to footprint and track on a Sunday afternoon.

We all realize there are many factors which contribute to problems such as wilt, Poa annua, and etc. But it is my belief, and this is just my personal opinion and theory, that topdressing applied liberally and regularly throughout the growing season, on creeping bent greens, reduces the problem of wilt and greatly reduces Poa annua invasion. I mention again, that we are speaking of greens which are predominately creeping bents. It is pretty well agreed that application of soil around the nodes of creeping bents, induces continuous new growth and in turn, results in a close knit turf.

You are surely thinking I must have found something bad about the old method, and I did. As you might suspect, the greens were very firm, in fact so firm that some people called them hard, and when they would get a little dry, it was hard to hold a shot. Except for this complaint, the greens were fast but putted true.

The topdressing program at Century for 1960, as you might guess, will, with some modifications, be very similar to the old method. I can't argue with 20 years of success.

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POA ANNUA - FAIRWAY RENOVATION

by Sherwood A. Moore

Mr. Troll, Chairman, and Fellow Superintendents:

My talk is mainly going to concern fairway renovation and not so much on poa annua - whether it is a friend or foe; or how to maintain it if you happen to be one of the unfortunate ones where poa annua is your predominate grass in greens, tees or fairways; nor how to control it. The only reason poa annua is mentioned here is because we at Winged Foot, happen to be one of those unfortunate ones, and because of this undesirable grass it was necessary for us to undertake a fairway renovation program.
I sometimes wonder if we want to eliminate poa annua entirely. I remember last spring some of the fellows were praying for a little poa annua - they would have just loved to see anything as long as it was green! And at times if we did not have a little annual bluegrass around we would have a lot of bare ground. It is when poa annua becomes the predominate grass that our troubles begin - one has to be an expert to cope with the whims of a poa annua turf. It is a beautiful grass when all factors are in its favor, but can let you down overnight as we experienced this past August.

As mentioned before, it is no secret that Winged Foot has its share of poa annua - it is the predominate grass from tee to green. We were in good condition during the week of the "Open", even if I do have to say so myself, except on that Saturday afternoon when 8000 cars were parked on the East course fairways and the heavens opened up with a downpour of rain like we had never seen before.

Oh well, that is a story of its own and we recovered from that and held our own, even though during the month of July dollar spot disease and sod webworm attacks started to take it's toll. But it was not until the month of August with the combination of moisture, heat, and humidity that the poa annua started to succumb. The tees and greens did not suffer too greatly as you could give them a lot of personal attention, but it is impossible to syringe acres of turf -- especially with our inadequate water system.

After a day of rain or showers, the weather would turn hot with low humidity and southwest winds, and thus fairways would begin to wilt. So even with plenty of moisture in the ground and when you knew you shouldn't be watering, you would turn on the traveling sprinklers and water all day and night. The next day where you had watered would be full of disease and where the sprinklers had not reached would be wilting. By correcting one condition you were creating another. You could not win! So much to our worry, dismay, and wringing of hands we saw the grass disappear before our eyes.

During the early part of August, a written report was sent to the Chairman of the Greens Committee and Board of Directors calling their attention to the futility of maintaining poa annua fairways, and presenting to them a program for renovating these fairways over a three-year period -- in other words we would undertake twelve fairways a year, do a complete scorch earth policy, and reseed to bent grasses. This did not meet with too much enthusiasm, but after some discussion, permission was given to do two fairways as an experiment and if they proved successful, then we would undertake the program in 1960.

In the meantime, the fairways did not improve any -- they got worse -- so I just could not see the sense in passing up the opportunity to do some sort of renovation work and at least try to get some desirable grasses in this thinned-out turf. I finally decided to spot burn the fairways that we did not scorch, for why allow the crabgrass to go to seed and accumulate more headaches for you.
the next season.

To make a long story short, we finally did perform the "scorch earth policy" on seven of our fairways (6W, 11W, 12W, 15W, 11E and 14E) and on the approaches of four short holes (3E, 13E, 7W and 10W); and the remaining fairways were all "spot burned" to kill the crabgrass. Instead of going into a three-year program we ended up by doing all thirty-six fairways in one season, but of course the method of operation was done in varying degrees.

I have some slides showing this fairway renovation program and I will give a brief description of each operation as we go along. These slides cover every step of this program from the initial burning, to aerification, use of the aero-thatch, seeding, fertilizing, matting, mowing, watering, to the final results some weeks later.

Slides ---------------

Observations and Conclusions:

You must have the courage of your convictions before undertaking a program of this extent. You must be prepared to cope with the remarks of the Grill Room Guerillas and the Lockerroom Lampooners. You cannot procrastinate.

What are the results as of now -- five months later?

Those fairways that were "scorched" show the greatest amount of bent and the least poa - 80-20% proportionately. Those fairways that were only spot burned show a fifty-fifty population.

What are we looking for?

Not a 100% control of poa annua, but at least sufficient bent grass so when the poa annua does say "good-bye" the bents will take their place and we will still have good fairways.

We hope that by careful maintenance over the next few years and with a little bit of luck the above will be the final result.

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WINTER PROBLEMS AT EKWANOK

by Paul O'Leary

Near record snowfall greeted my arrival on the job as Superintendent at Ekwanok C.C., Manchester, Vermont in early February 1958. Very little frost was in the ground prior to the arrival of this snow cover in 1958. It was mid-April before the last of it melted away. Only a moderate degree of snowmold injury occurred. This injury could have been held down to an even lower level if it had been possible to apply more than one preventive treatment.
The record is quite different for the black winter-spring of 1959. Our trouble started the day after Thanksgiving 1958 when an early storm dumped 4 to 5 inches of snow and then turned to heavy rain. This was the beginning of an ice cover that was to remain until mid-March.

Very cold weather during December, January, and February drove the frost down to a depth of 5 to 7 ft. Many days of abnormally high winds were the rule rather than the exception during this period. Only once did we have a thaw, in late January, and it was of such short duration that it failed to materially reduce the tight ice cover.

About the third week of March, the crew was sent out to remove what ice remained in low areas of certain greens. Turf under these areas looked normal. The first week in April, greens turf in general did not appear to have wintered badly. By April 15th, however, large areas on greens, tees and fairways showed little signs of greening.

Poa annua on green collars and in low areas of greens was hardest hit. Areas on Merion bluegrass tees, bluegrass and fescue on fairways and even in the rough were also injured. There seemed to be no set pattern as to where injury occurred; high areas, side hill slopes facing different directions, and turf of different ages was affected.

Sub-normal precipitation from mid-April to late May aggravated conditions even more. Water pipe difficulties and scheduled installation of a new main deprived us of getting on enough water at a critical time. The use of a power sprayer with a 200 gallon tank to apply light amounts of water to greens did undoubtedly help to prevent an even more serious loss from desiccation.

Over-seeding results were disappointing in most instances. Cold, dry weather in May was just not conducive to seed germination or growth of surviving plants. Abnormally cold soil temperatures due to deep frost retarded growth when recovery ordinarily would be expected.

During the month of June, seasonable temperatures and normal rainfall finally turned things in our direction. Poa annua came back in many areas where overseeded Bent had failed to become established and provided a cover until the warm July weather caught up with it. That is another story in itself and one that many of you are familiar with.

In summary, I believe the following combination of factors contributed to our loss of turf:
1. A continuous tight cover of ice.
2. Extreme frost depth into the sub-soil.
3. Dessicating winds during the winter and early spring.
4. Water system difficulties.

On the basis of the foregoing and from what I have learned
in talking to fellow Superintendent's regarding winter problems, may I suggest these points:

A. In construction or re-construction of greens, be sure to provide adequate surface drainage in at least two directions. Avoid or correct water-holding pockets.

B. Facilitate surface drainage during thaws by shoveling drain paths through the snow.

C. If practical, completely remove snow cover from greens where ice formation is likely to occur and remain such as on north slopes and in shaded locations.

D. Have your water system as near ready to operate as possible in the early spring.

E. Have your power sprayer ready as your "ace in the hole" to check dessication on exposed greens early in the season before you risk operating your water system.

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PROGRESS THROUGH DRAINAGE

by Kayem Ovian

The Woodmere Country Club is located on the South shore of Long Island very close to the New York City line. The Atlantic Ocean is but a few miles away with a salt water inlet leading into our Club grounds. The golf course consists of approximately 135 acres which are almost perfectly flat, our highest elevation being approximately twenty feet above high tide. I mention high tide because of the effect it has to any such golf course which depends on tide changes for drainage.

During the Fall of 1955, before the completion of my first year, I had experienced the damaging hurricanes of that year. Three greens and three fairways were flooded with salt water and the other fifteen holes were saturated with heavy rainfall which just wouldn't drain off fast enough. In fact, most of our fairways in low areas were untouchable for about a three week period for daily maintenance.

This condition had to be corrected immediately because of the problems which arise from poor drainage. On our new property of thirty-five acres, four holes, the members were still playing preferred lies because of very thin growth. I felt that fertilizing and seeding would not be the answer at this time, and that drainage would be my wisest move.

My crew began digging and we discovered that on our established course (which is better than forty years old), 4" land tile and 6" vitrified pipe was used, with the trenches back-filled with the heavy clay material. This, of course, was the reason for poor drainage with which our club had been suffering for many years. If these trenches had been backfilled with a porous material our troubles would not have been too serious.

I decided then that I would uncover and replace all these pipes
with a more suitable drain pipe because of our low and flat terrain. We re-layed and improved our drainage lines throughout the golf course with 4", 6", and 8" porous wall pipe.

Porous wall pipe is made from cement, sand, and crushed aggregates and is porous for its entire length and circumference. We have used over 40,000 feet of this pipe and have overcome all of our problems resulting from drainage.

The method of installing was to spread approximately 2" of bank-run on the floor of the trench and lay the pipe which is self-aligning because of a bell and spigot. Then the entire pipe and trench is back-filled with bank-run up to within 4" of the sod line. The top 4" of trench is back-filled with topsoil, making allowance for sodding or seeding. The movement of water downward with this type of drainage trench is quite rapid. I would like to suggest the necessity of having a vertical pipe extended from the drain pipe to the sod line at the lowest points where, from heavy rains, water will accumulate. This direct contact from fairway to the drain pipe is necessary to run off water immediately, with the size of hole not much larger than a golf ball. These few holes should be kept clear from grass growing in and clogging the opening.

All of our main drain lines or arteries drain off directly into the bay, or they lead into 42" and 36" concrete pipes which carry the water out to the bay. Therefore, during high-tide there is water pressure against our lines which is a greater force and prevents water draining off our golf course until the tide begins receding.

There are two very important thoughts to consider in draining off a difficult or flat area:

1. In which direction would it be the most advantageous to drain.

2. Would the maximum pitch be gained in this direction?

We were able to install our drainage lines for a very conservative figure of approximately $1.33 per ft. The reasons being:

1. The importance of having five men on a year round basis which we continue to carry.

2. The easy digging minus stones, which couldn't be done in places such as New England.

The break-down of our expenses was as follows:

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
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<tbody>
<tr>
<td>Labor</td>
<td>$30,000.00</td>
</tr>
<tr>
<td>Pipe</td>
<td>16,800.00</td>
</tr>
<tr>
<td>Bank-run, topsoil</td>
<td>6,000.00</td>
</tr>
<tr>
<td>Misc. supplies</td>
<td>600.00</td>
</tr>
</tbody>
</table>

$53,400.00

Since these drains were installed, our membership no longer
suffers with sloppy conditions after heavy rains and we have very few days when the golf course is not playable. We very seldom have preferred lies and most important, regardless of rainfall one or five inches, we are able to cut fairways with a seven gang unit within a thirty hour period.

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WINTER INJURY ON HOME LAWN

by Orlando Capizzi

Three most important types are: dehydration, freezing out and snow mold. Dehydration, excessive drying out, is common where there has been limited rainfall during the late fall or where soil moisture is low during the winter months. This, in turn, is aggravated by deep freezing of the soil and dry cold winds as we had the winter of '58 - '59. Dry soil with dry air draws the moisture out of the dormant grasses, and they just shrivel up and die. Injury of this type occurs on well kept turf as well as ordinary turf. It is most severe on wide open areas and high areas. Method of preventing or trying to prevent this type of injury is to be sure that your turf goes in to the winter with plenty of soil moisture. The soil should be moist to a depth of at least 6 inches. Protect your wind swept areas with an evergreen hedge or a snow fence. Of course, better than this is a good snow cover. But, around the greater Boston area snow cover does not last all winter. The best possible way to prevent dehydration is substantial soil moisture and the breaking up of long sweeps of the wind.

Freezing out, different than dehydration, is caused primarily by poor surface and subsurface drainage, compacted soils and where shallow roots prevail. The years, '58 and '59 saw a lot of this damage. Water collects in depressions or frozen soils prevents drainage even when physical conditions are satisfactory. Alternate freezing and thawing separate the grass roots from the soil, and this in turn causes dryout. Saturated soils is another good reason for freezing out.

Snow mold most generally can be controlled by spraying with a mercury fungicide after the first good ground freeze and again during a mid-winter thaw.

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THE STATUS OF PRE-EMERGENCE CRABGRASS CONTROL

by Dr. R. E. Engel & W. F. Meggitt*

Rutgers University

Pre-emergence crabgrass control is destruction of crabgrass through pre-germination applications of a chemical which destroys

*Professor in Turf Management & Assistant Research Specialist in Weed Control, respectively.
the weed at or near the time of germination. This method is a sound approach and the results obtained with several chemicals have been encouraging. Chlordane, calcium arsenate, and lead arsenate have been used most in previous years. Dacthal and zytron made very promising appearances this past season.

The Chemicals

Chlordane has been known to exert a pre-emergence effect on crabgrass since approximately 10 years ago. Some very good results have been obtained in New Jersey with 60 to 80 pounds per acre. Dry spray applications as used have been very poor. Late March appears to be the best season for application. More information is needed to show the conditions where this chemical will give consistently good results.

Calcium arsenate gave very good crabgrass control in 1959 at New Brunswick. The phosphorus level and other soil factors influence control and turfgrass injury. Many calcium arsenate preparations exist. These must be known and conditions for avoiding turfgrass injury must be established before calcium arsenate is recommended for general use. Calcium arsenate is a poisonous chemical.

Lead arsenate at rates of 20 to 25 pounds per 1000 square feet has never given good or consistent control at New Brunswick. This type treatment appears inadequate. Lead arsenate is a poisonous product.

New Chemicals ---- Dacthal and Zytron performed very well at New Brunswick and other agricultural experiment stations in 1959. They need further testing to determine if control will be consistent and they will be safe on turfgrasses.

Safety

Serious turfgrass damage by a pre-emergence herbicide defeats the purpose of the treatment. Since the safety limits for the various chemicals and grasses are not thoroughly established, the degree of risk is unknown for too many turfgrass conditions.

Pre-emergence treatments should permit turfgrass reseeding no later than September of the same season. All the chemicals interfere with seeding for varied periods of time after treatment. Heavy or excessive applications of arsenicals and possibly others can interfere with seedling establishment for considerable time. While most of the materials applied at moderate rates appear to permit reseeding by the end of the season, far more information is required on this subject.

Use of pre-emergence crabgrass herbicides is not recommended by the New Jersey Agricultural Experiment Station during 1960. These comments on pre-emergence crabgrass control have been issued for informational purposes only and they cannot be used for promotional purposes.

Pre-emergence herbicides can be purchased to varied extent.
Those who will use these materials should exercise conservatism. Also, following instructions may be critical for success or safety.

Pre-emergence crabgrass control is worthy of close observation to learn the philosophy and techniques. The developments have grown from limited research efforts. While all biological problems grudgingly reveal their secrets, current results will stimulate more work which will soon make pre-emergence one of our finest turfgrass improvements.

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TURF NURSERIES

Establishment, Maintenance & Utilization

by Robert Grant

Ten or fifteen years ago, a turf nursery on most golf courses consisted of 500 to 1000 sq. ft. of putting green turf. In many cases it received a minimum of care until it was needed and then it was too late. Today turf and stolon nurseries play a very important part in the very day maintenance of the long range program of the progressive golf club.

Although most of my talk will be illustrated with slides, I would like briefly to discuss the establishment, maintenance and utilization of these areas.

When needs can be anticipated in advance, stolons for vegetative propagation can be produced in a nursery located on the course. This will assure a supply of fresh material at a cost usually lower than when purchased from a commercial source. Establishment and maintenance of the stolon nursery is fairly simple. The area should be sterilized and a good seed bed prepared. The soil should be moderately fertilized to prevent a too rapid growth as succulent stolons are not satisfactory. There are two systems used in growing stolons; one in rows and the other by the solid turf method. Both will be illustrated by slides. If they are planted in rows, a minimum of 3½ to 4 feet is required. The stolons should be placed in a shallow furrow using one square feet of nursery sod to 100 linear feet. If the solid turf method is to be used, five bushels of stolons will be needed per 1000 sq. ft. Late summer or early fall is the best time to plant the nursery. Material at this time is less succulent and more resistant to adverse conditions. As in seeding, the grass has a better opportunity to get well started before weeds become a problem.

Should the stolons be grown by the row method, they can be prepared for planting by chopping or shredding so that they can be separated easily and distributed uniformly. Cut pieces should not be over six inches in length. In the case of the sod grown method, the stolons can be harvested by removing every other blade from the verticut. The machine should be set to cut or tear the stolons from the sod stolon nursery.
Stolons should be applied to the prepared green site by broadcasting 4 to 10 bushels per 1000 sq. ft. The stolons should be rolled to press them into the surface and may be covered with topdressing. Rolling should be repeated after topdressing. Stolons will require ample watering until they are established. This, in my opinion, is the most important factor.

The most rapid establishment of creeping bent greens is made by light but frequent applications of nitrogen. The use of liberal amounts of organic nitrogen in the seed bed may cut down the need for some or all of the surface applications of fertilizer. Cutting, light verticutting and topdressing at repeated intervals will help develop dense sod in the shortest period of time. After the turf has become well established, the area should have the same maintenance program as the greens of the course.

Sodding is the most expensive method of turf establishment. It involves the cost of the sod plus a large amount of labor necessary in the sodding operation.

The success of the job depends on the preparation of the soil, the quality of the sod and the skill and care taken in laying the sod. Sod, that is grown for tees and greens or any other area, should receive the same care and maintenance given the established turf on these areas. Where small areas are involved, sod may be lifted by hand. There are power sod cutters for larger areas. Sod should be cut 12 or 18 inches in width and not more than three feet long. Large pieces will stretch and are difficult to lay uniformly. Good turf of bent grass should be cut ½ to ¾ of an inch in thickness while bluegrass and fescue will require a somewhat thicker cut. If the cut sod is to be held for several days, it should be laid out flat, grass side up in a cool place and kept moist. Stacked sod will yellow and weaken rapidly and will not be in good condition for laying. Sod should be laid on a firm surface free of foot prints and other depressions. The sod is tamped or rolled lightly and then a topdressing worked into the seams. Water should be applied regularly to prevent drying of the edges. Additional topdressing and a light roller used to level out minor high or low spots after the sod has become established. Sodding may be done anytime during the growing season if handled carefully and properly watered.

Although sodding is expensive where there is a need for turf in the shortest possible time, it is often justified.

A good example of utilizing both sod and stolon nurseries is a club here in New England that is in the process of rebuilding three greens a year. When the program was started, it was decided to grow their own sod and stolons. The original stolons which happen to be C-1 and C-19 were purchased from a commercial grower and placed in rows. The following fall with this material 15,000 sq. ft. of putting green nurseries was started. The reconstruction program began and the next year three greens were sodded. Just as soon as the turf was lifted from the nursery, the area was restolonized so that sod could be developed for the next fall.

After a year where winter kill and summer injury was serious,
we all should think of nurseries large enough to meet any emergency. It is the best insurance for quick recovery we can possibly have.

SOIL COMPACTION - A MAJOR TURF PROBLEM

by R. B. Alderfer

Soil compaction is such a serious problem in turf areas, because it either directly or indirectly influences so many of the conditions which control the growth of grass and because it makes the job of turf management so much more difficult.

What happens to a soil when it is compacted? Most soils consist of a mixture of solid particles of many sizes and shapes. The texture of a soil is determined by the proportion of stone, gravel, sand, silt and clay particles which it contains. The sandy loams have a large amount of sand-sized particles and a rather small amount of clays, while just the reverse is true for clay loams. A handful or a cubic foot of soil is not all solid matter. Among these soil particles, is a network of openings or voids of various sizes and shapes which are called pores. The nature of the pore spaces in the soil is of critical importance because moisture movement and storage, aeration and root growth are regulated by the size, shape, and continuity of these soil pores. There are two general types of pores in soils, the large or non-capillary pores and the small or capillary pores. The larger pores serve as drainage conduits. It is through these pores that the most rapid entry of water into soil occurs and through which any excess water that the capillary pores cannot hold is drained into the substratum or into underground drains. When water is drained out of these pores by the pull of gravity, they serve as air chambers through which the soil "breathes". When soil particles are pressed together by some compacting force, first the number of large, non-capillary pores is reduced. This loss in non-capillary porosity is also reflected in a decreased intake of the soil for water and a corresponding increase in the amount of water which may be lost as runoff. One of the characteristic features of compacted soils is the way in which the particles are pressed into flat, plate-like units, and are layered together much like a flagstone in a wall. In this layering the particles overlap, so that the pores between them are not only small but offset from one another. Water movement through these flat, horizontal pores is very slow. Thus, owing to the great retentive capacity of these pores for water, they remain water-filled for a long time. Aeration of a soil depends upon the number of pores that are not filled with water. Hence, the greater the compaction, the greater the number of small pores which will remain water-filled and the poorer the aeration. Water is able to hold very little oxygen especially when the water is warm. This is why the aeration of the soil beneath a compacted layer, wherever it may be in the soil profile, is often so poor.

Lack of proper aeration, resulting in too small a supply of oxygen to the root and the accumulation of too much carbon dioxide around the root, will adversely affect the ability of the root to
take in nutrients and water. It has been shown many times that lack of oxygen for normal respiration by the root can cause a plant to exhibit nutrient and water deficiency symptoms even though there is a plentiful supply of nutrients and moisture in the soil. In very compact layers, the supply of water held at low tensions, sometimes referred to as easily available water, is very small. For these reasons, turf will show symptoms of water stress on a bright summer day with a hot, dry wind even though there is plenty of moisture in the soil. Compact layers can also offer mechanical impedance to the entry of roots.

Compact layers can occur everywhere in the soil. Many turf areas are underlain with tight, naturally compact subsoils or hardpans, in which tile drains may have to be placed to remove the excess water from the soil above them during wet weather. In a great many turf soils, compaction is worst right at the surface. This is the part of the soil which gets the greatest amount of pressure. In many respects this is the worst place for compaction to occur.

Soils become highly vulnerable to compaction when for some reason or another the soil is left without any surface cover; when the resistance of the soil to compaction is low; and when the moisture content of the soil is such as to permit maximum compactability. This suggests three ways for trying to decrease the amount of compaction of soils. Any practice such as fertilization, liming, disease and insect control, and mowing which results in maintaining a healthy, vigorous, thick grass cover, will help to protect the soil from the full effects of the compacting force. Since the compactability of most soils is greatest at high moisture contents, one should try to avoid irrigating the soil just prior to the time when traffic will be heaviest. Allowing the soil to dry will help to protect it from compaction to some extent. Mixtures with fairly large proportions of coarse to very coarse sand will provide a certain amount of "built in" resistance to compaction. Soil with just the right assortment of sand, silt and clay are often easier to compact and to remain compacted than those with large amounts of either sand or clay. One has to remember that use of large amounts of coarse sand to build in some resistance to compaction can at the same time lead to water and nutrient supply problems. It is possible that synthetic aggregates may be useful in making up a so-called compaction-proof soil.

Correction treatments are still largely mechanical in nature, involving either the punching of holes or of cutting slits in or through the compacted layer. No chemicals have yet been found which will correct all compaction problems, though in certain situations gypsum has helped to improve the permeability of tight, clay soils.

Considering how long compaction has been known to be a serious turf problem, the only progress that has been made in its prevention or correction has been with the use of soil mixtures and with aerator implements for re-establishing some non-capillary porosity in the soil.

Much needs to be done in trying to solve some of our soil compaction problems. Use of chemicals such as soil conditioners in pre-treating the soil prior to establishing the turf has not been too promising, largely because their effects do not last long enough. Very
little research work has been done with wetting agents on compacted turf soils; just how much value these materials would have requires additional research. Cultivation of established turf areas with the use of aerators, consisting of hollow-tined spoons or spikes is now considered a necessary practice in a sound maintenance program. As much as we would like to prevent compaction, the fact remains that it does happen because most of our turf soils are not compaction-proof.

WATER MANAGEMENT PRACTICES ON TURF AREAS

J. R. Watson

Good water management is the art of producing the highest quality golf course turfgrass consistent with existing grasses, climate, soil and irrigation facilities. Water management is based on an efficient watering program designed to meet the physiological and use requirements of the grass as modified by the climatic and soil environments. Experience, knowledge and understanding of the fundamental principles involved serve as a basis for determining water practices for a given turf area. This, coupled with thorough planning and adequate facilities, will determine the success or failure of any given water management program.

Water is an essential component in all phases of grass 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. When plant cells contain an abundance of water, they are turgid. This helps the leaves to resist pressure from traffic and machinery; hence adequate water within the cells helps avoid the damage which results when pressure is applied to wilted grass -- wilt occurs when the cells do not contain enough water and are said to be flaccid. For all these functions very large quantities of water are required and they must be kept in mind when setting up sound water management practices.

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 turfgrass superintendent to take advantage of these inherent differences. Nevertheless, when an opportunity to choose a new grass arises, it is important to keep

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1 Director, Agronomy Division, Toro Mfg. Corp., Minneapolis, Minnesota
in mind that even within species there are strains of turfgrasses available for use which may contribute to better water management. 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 deeper 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 a particular turfgrass area. Such will definitely register an improvement in watering practices.

Water and Environment

Environment -- both climatic and soil -- exerts a marked effect on water use. Adjusting watering practices to suit the demands of climate and to meet the needs of a given soil and grass actually are basic to the proper use of water on turfgrass.

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 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. Sands hold less water than loams, and loams hold less water than clays. Under most conditions, loams display desirable air-water relationships. Sands permit more ready infiltration of water than do clays. Likewise, soils that exhibit good aggregation (a measure of structure) permit more ready infiltration of water than soils that display poor structural properties.

Compaction of soil refers to a condition in which aggregation is reduced or absent; hence, the soil is dense. The 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 one-half to one inch layer of soil. This has important bearing on the rate of water application.

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 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 standpoint 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 coupled with a knowledge of how each independently and collectively affect water use is basic to the proper use of water.

Water 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 turfgrass area. The limitations imposed by frequency and amount
of play or use, 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. Assuming equal depth of rooting, sandy type soils will have to be watered more frequently than will loams or clays. Climatic conditions such as high wind movement, intense sunlight, low humidity, and temperatures conducive to rapid turfgrass growth, all of which contribute to high water use rates, dictate more frequent watering than the reverse set of conditions.

Frequent watering of poorly drained soils tends 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 invasion, 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 may 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 also will, to a certain extent, depend on local weather conditions -- it would not be wise to satisfy the water holding capacity of a soil just prior to showers or a rainstorm, if such could be avoided.

Ideally, one would 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. 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

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water within a concentrated area, tend to cause surface runoff. When water is applied at a rate faster than it can be absorbed by a given soil, the water is being wasted. Sound water management then, would call for sprinklers that apply moisture slowly enough to permit ready absorption. When surface conditions such as compaction exists, 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

Water management practices have implications beyond the immediate production of high quality turfgrass. Water is unquestionably our most important natural resource. It is not, as we may sometimes 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 are another important phase 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 sizeable saving in funds on an annual basis.
GETTING TO KNOW YOUR MEMBERS

by

Owen Griffith, Hartford Courant

I appreciate the honor of being asked to speak to the annual Fine Turf Conference, and I hope that I can be of some assistance to the men who handle the very important work of keeping the golf courses in such fine condition.

There has been mention made of the fact that the title of Golf Course Superintendent is too long for headline purposes in the newspaper. In my capacity as golf editor of The Hartford Courant in Hartford, Connecticut, which incidentally is the oldest newspaper in America, it was established in 1764, -- I have cleared that hurdle by referring to the superintendents as course experts -- and I use that title as often as possible. I think the name fits appropriately.

I have been fortunate in getting to know the many capable members to the Connecticut Association of Golf Course Superintendents -- more or less intimately in the past few years. And this is where I have learned to know the important part they play in the tremendous expansion of the game of golf.

Where the newspaper men are gradually getting to know more about the men who tend the golf courses, it is also as important that the superintendents get to know their own club members. It is with this in mind that I titled this talk -- "Getting to know your members".

Public relations programs have become more and more important in every line of business, as the years go by. During World War Two every branch of the service had men known as Public Relations Officers, and the part they played was a big one, in keeping people informed of the doings of every kind.

So it is with you superintendents. Public relations efforts are to pass along information. Keeping the golf club membership informed of your work is necessary. As one club president in Connecticut said recently, after I had written a small piece about the weather conditions of the past year and how it had made the superintendents' work much rougher -- "That article was wonderful! It let the members know of the troubles our superintendent faced".

And another of our superintendents added, "Getting to know the member is essential. One must gain their confidence but in doing this one must respect their position -- and above all, know one's place."

There are several ways through which the Superintendents can get to know the members -- by posting notices of the work being carried out, and by conversation.

In both these outlets, if we could call them outlets for the want of a better word, -- the course experts should reveal the work
that is being done at the time, tell of the future projects, outline the physical changes and the development of better turf through improved methods.

Then there is the question of climatic conditions and what it does to the course -- and this should be stressed since, as you all know, this is where a lot of the gripes start. Bad weather makes a course tougher to play one, and when Mr. Member's score is not too good he gripes about the course.

The budget for course upkeep goes up when you superintendents meet with adverse weather conditions such as storms, extreme droughts, high humidity, floods and other problems of this nature. So, when you reveal that situations, over which you have no control, have arisen it can be seen obviously the maintenance costs go up.

As I had mentioned earlier, putting notices in the pro shop, locker room and clubhouse notice boards will help to convey your message to the membership and perhaps answer some of the questions of the members.

Many of the clubs publish monthly house organs. This is an excellent medium for the Superintendent to get across to the members his thoughts on the course, and how it is being improved, what work is being done, and what is planned for the future.

The personal contact with members is invaluable. Many of the clubs allow the Superintendents to have lunch daily in the clubhouse -- and this is a wonderful opportunity for the members and course experts to discuss any problems which may arise. Of course, in some cases the clubhouse grill is restricted to members.

Talking with members while they play their rounds of golf, but not keeping them in conversation too long, is another way of "getting to know your members". The weekend is an excellent time to meet the members, while the biggest part of the membership is playing. But sometimes this is practically impossible since most courses are crowded on Saturdays and Sundays.

There is no question that the Superintendent or Expert, should play golf. This is probably the best way to reach the member, and at the same time increase your friendship with them. In playing a round with members you have an excellent chance to explain the many problems which you encounter in the maintenance work -- and how the course could be made a better place to play on. And at the same time the operational costs could be discussed with those who are vitally interested in this phase of the course work. You will gain many new friends, and I am sure, your companions will be all the more impressed with the idea that the Superintendent is not only a highly efficient man, but a real good fellow to play golf with.

On the other side when the Superintendent plays a round of golf with members he gets to know the other fellow's point of view. Perhaps one member wants to know why a certain trap could not have been placed at a different spot when it was installed. And, too, the Superintendent could get a tip from one of the playing members which could
help his maintenance operations. A member might be an expert in
some line of business that is aligned to golf course upkeep, and his
suggestion for a certain type of work could be of benefit to you,
the Superintendent.

Then there is the caddy, who can be a definite asset to the Super-
intendent, and the boys who carry the bags could be the best friend
of the Superintendent. The caddy can make suggestions to the player,
where the Superintendent cannot. These suggestions may and should
deal with the importance of treating the turf tenderly, rather than
tantalizing it to the extent some do. The caddy would appreciate
the fact he is looked on as a person to help in keeping the course
in the best of condition, while acting as a sort of liaison between
the member and Superintendent.

There is another form of contact with the members which has
proven beneficial to both sides. This is giving advice on the
care and upkeep of the members' lawn.

You could set-up a fertilizing program and help them get their
lawn started properly in the spring -- and take a look at it during
the summer, when and if they have a growing problem. Giving proper
guidance in the selection of seed and chemicals to be used would be
helpful and appreciated I am sure.

I hope that these suggestions on getting to know your members
will be of some help. In my limited experience I know that the
members appreciate help from the superintendent -- and they want to
get to know the man who looks after their favorite course -- but
sometimes the barrier that seems to exist between them is never
broken down. Once the Superintendent shows that he is ever so anxious
to improve the club members' own grass plot it will help in the
efforts to build up a friendliness that did not exist before.

I know that in the past few years golfers have learned, in
greater numbers, the value of the course Superintendent. They respect
his knowledge of caring for the golf course. The many turf
conferences and conventions have done a great service to golf -- they
have presented the facts to the Superintendents who have in turn put
the suggestions into practice, and as a result the standard of golf
courses has risen all over the country. Golf course members see the
improvements on their course, and realize that their own superintendent
is the man who is best fitted to keep the course in first class
condition. The golfers' respect for the course expert then goes up
many points.

Course Superintendents can help cement this bond of friendship
between members and themselves by contacting sports writers on news-
papers and telling them of incidents which may have occurred on the
course. Or perhaps there was something they did to improve the
course. Or maybe let the writers know of an improvement program
which is planned. All these things are of interest to golfers.

Golfers like to read about their clubs, or even the club nearby
where they occasionally play. This is another way in which the
Superintendents can get to know their members better -- and at the
same time keep the public informed of the club doings -- aside from
the weekly scores which the newspaper prints. Maintenance equipment is a good topic for a story, if something new has been added.

Of course it is best to contact your greens chairman before any publicity is given out, but if it is a story which is of benefit to the club, publicity-wise, it is more than likely he will be in accord, and will give his approval.

In Connecticut there is a fine tournament held every year -- known as the Superintendent-Club President-Greens Chairman-Professor event, and which has proven to be a wonderful way for the Superintendent to get to know others of the club who are vitally interested in the improvement of the course.

Golf Course Superintendents are Very Important People -- and thus can rightly be termed VIPs. But the Superintendents have to sell themselves to the members. They must get to know the membership.

I hope I have been of some help to you gentlemen in offering my thoughts on getting better acquainted with your members. It has been a tremendous pleasure speaking to you today and I do trust that this part of the Fine Turf Program has proven interesting.

I thank you for your attention and wish you all the best for 1960 -- good weather, good courses, and good luck in your efforts, which are a big part of the grand old game of golf.

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NEW TRENDS IN CLUBHOUSE LANDSCAPING

Subtitle - Use more flowers!

A. W. Boicourt

I. Attractive Clubhouse

1. Increases membership
2. Members stay long
   a. Spend more = greater income

II. Unfortunately

It costs money

1. Increases maintenance
2. Increases labor cost
3. Trained personnel may be difficult to find (send more young people to the University of Massachusetts)

III. It can be done!

1. Use flowers, trees, shrubs and evergreens that require minimum of maintenance
2. Keep plantings simple but effective
3. Keep small beds out of the lawn area.
4. Plant slopes or uneven ground that are difficult to mow

IV. How?

A. Follow Basic Principles

1. Demonstrate how a short line can be made to appear longer and vice versa.
2. Illustrate landscaping methods for two tall houses.

B. Demonstrate on Model

1. Show ample parking area
2. Simple foundation planting
3. Where flowers can be used

a. Kinds: Chrysanthemums
   Daylilies
   Candytuft
   Petunias
   Geraniums
   Bulbs - Zinnias
   Roses - floribunda type

C. Summary

Demonstrate with flannelgraph. Show completed planting.

1. Use more flowers
2. Keep Plantings Simple

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CONSERVING SOIL FOR A GOOD LAWN

William G. Colby

High velocity ice age winds that accompanied retreating ice fields northwards, blanketed much of the Northeast with a relatively thin mantle of fine textured, tan colored, soil material. While the thickness of this layer varies from nothing to as much as 3 feet, the usual depth is from a few inches to a foot.

This wind deposited material is easily recognized. It is uniformly fine textured with few stones or coarse sand. There is little or no evidence of stratification so characteristic of waterlain material. It is typically light colored except where the organic matter in cultivated soils obscures the true color. There will be a sharp line of demarcation in all instances, except where the layer is very thin, between the wind deposited surface layer and the underlying material irrespective of whether this material is glacial drift, boulder clay, outwash sand or gravel or bedrock.

The difference in texture between the top soil and coarse underlying subsoil can be easily recognized by simply rubbing a small quantity of soil material between the thumb and forefinger.

A-27
Although not very thick in most areas, this fine textured loess layer is very important to plant growth. Its moisture holding capacity is good - in most cases much superior to that of the underlying materials. Its nutrient supplying power while not great before liming and fertilizing is also usually much superior to the coarser materials below. This is why the roots of most plants, even trees, will be found comparatively near the surface. Few, if any, trees in New England have deeply penetrating tap roots. This is why this region suffers so much damage from heavy windstorms and hurricanes.

Because this top soil layer is so important to plant growth, it is important in any construction operation to save as much of this material as is possible. If in the grading or excavation operations, it is mixed with the coarse sub-surface sand and gravels, most, if not all, of its value will be lost. If it is buried under more than a few inches of fill, its usefulness will also be lost.

Many people have the conception that good top soil or loam must be dark colored. This is not true. The important thing is to be fine textured so as to have good moisture holding capacity. In cultivated soils, the surface 8 to 10 inches or plow layer, will be dark colored due to organic matter from decaying plant roots. In many instances, the fine textured material may extend for several more inches but is light in color. This fine textured, light colored "subsoil" as it is often called, is just as valuable after liming and fertilizing as the dark colored "top soil". All of the fine textured material should be saved. Therefore, the first step in any construction operation whether it is for home construction, industrial building or development, or highway construction, should be to scrape off all of the fine textured top soil (regardless of color), push it to the side where it can be stockpiled for final grading and lawn construction operations. It is becoming increasingly important to do this because it is becoming increasingly difficult to purchase good top soil at any price. Many towns in Massachusetts are adopting by-laws which prohibit the indiscriminate removal of top soil from land and selling it. This is right and proper for once the top soil is removed, the usefulness of most of this land for plant culture is destroyed forever.

The quantity of suitable top soil in most areas is limited but if all of the available suitable material is conserved, there will be enough to take care of most, if not all, of the requirements for satisfactory lawn construction needs. Many lawn problems can be solved before they arise if the top soil on the site is conserved for the final grading operation.

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FERTILIZING AND LIMING


Turf grows on soil. Construction practices for turf should consider the soil. Limestone and certain fertilizer applications may be made most appropriately prior to the seeding.
Limestone decreases soil acidity. The amount of limestone application can and should be determined by a lime requirement test on the soil. A simple pH test of the soil may be inadequate for estimating the application rate. Complete mixing of the limestone with the soil will give the best result.

Phosphate fertilizer should be added in large amounts and completely mixed with the soil (top 4 to 6 inches) prior to seeding. Research results on forage grasses show excellent establishment and production for periods in excess of 5 years from applications of 25 pounds of 20% superphosphate on each 1,000 square feet. Additional results show that phosphate does not leach from the soil.

Nitrogen fertilization at construction time is more complicated. Ammonium nitrogen does not leach easily from the soil although it changes somewhat quickly to nitrate nitrogen. Nitrate nitrogen leaches easily and quickly. This information strongly suggest the application of ammonium, urea, natural organic, sludge or urea-formaldehyde forms of nitrogen just prior to seeding. Ammonium or urea forms may be used at 1 to 2 pounds of nitrogen each 1,000 square feet. The other forms may be used in larger amounts. The nitrogen material should be completely mixed into the soil.

Potash fertilization may be estimated best by the soil test results.

In summary, preseeding preparation on loamy sands or sandy loams:

1. Lime by lime requirement test,
2. Apply ample phosphate for growth of seeding plant,
3. Ammonium nitrogen leaches less easily.

GRASSES AND GRASS MIXTURES FOR NEW ENGLAND LAWNS

Dr. Robert W. Schery, Director
Lawn Institute

The choice of a suitable grass or seed blend for New England lawns is not simple and clear cut. It will depend upon the specific lawn, embracing many possibilities in soil quality, slope, shade, and such like. Decision will also depend upon the amount and kind of care which can be expected. One would be foolish to recommend bentgrass unless regular fertilization, precise mowing, watering and disease control accompanied its use. On the other hand, a Kentucky bluegrass-lawn fescue combination might thrive with but moderate care (although again the specific conditions will be determining). And finally, the use to which the turf will be put has a bearing. Play yards might contain coarser grasses, that lawns conspicuous near the house could not countenance (although in New England quality species do so well, that there is little call, even for play areas, for hay grasses).
Let's first narrow our field, on the basis of broad climatic considerations. For most of New England, with the possible exception of some seashore locations used solely in the hot summer months, southern grasses can be ruled out. In spite of the intense publicity accorded Meyer Zoysia, and some of the hardy bermudagrasses, these species have little merit for New England. Even though they might survive, the length of time needed to establish them, and the prolonged dormant season (October-April) makes them a poor bet.

Secondly, for a real lawn, we might dismiss the field or hay grasses. Most of them are far too coarse to be attractive. Most are also bunch grasses, not spreading by rhizomes or stolons. Most become clumpy in time, especially where not seeded thickly, crowded to force dwarfing (which implies fairly skilled management). Thus, timothy, orchardgrass, and tall fescue can be ruled out (the latter may occasionally have a place on difficult roadsides, or playground areas where appearances count little).

For much the same reason I would restrict conventional "nurse-grasses". With proper soil preparation, and with modern techniques for seeding, fertilizing, mulching and watering, the need for nurse-grasses has largely disappeared - if, indeed, it ever existed. Nurse-grasses are quick sprouters, and as such quickly give the impression of an excellent stand. In this sense there is some sales appeal for an inexperienced home owner. But more and more suburbanites are becoming gardening literates, and can be told (understandingly) that quick greeness may be inimical to long term quality.

Such is exactly the case; tests have repeatedly shown that the fast-growing nursegrasses usurp space, moisture and nutrients that might better spur establishment of permanent grasses. Ryegrass makes a quick cover the first season - but by the next year is dead, and its place occupied by weeds or a thin turf. Ryegrasses and redtop are the more frequently used nurse species. Occasionally there may be justification for their inclusion, such as on very steep slopes that need cover hurriedly; but in general I would prefer they not be in a seed mixture in any consequential quantity (at most 10%).

This leaves us with only a few stalwarts, renowned as quality turfgrasses for northern climates - notably the Kentucky bluegrasses, red fescue varieties, and for specialty purposes the bentgrasses and Poa trivialis. Occasionally there may be limited use for other grasses as well, even kinds ordinarily considered a weed (such as poa annua). Canada bluegrass is sometimes planted on poor soils along roadsides, although too "open" for lawn purposes.

Kentucky bluegrass. Kentucky bluegrass is the most famed of all lawn grasses, the standard of excellence in most people's mind. Seed of the parent species, termed natural Kentucky bluegrass by the trade, is harvested mostly from sods in Kentucky, and from Missouri northward into Canada. The grass has persisted in these areas, often the same fields, for decades, subject to whatever hazards might occur. Natural selection would seemingly eliminate weakling types, at the same time that it encouraged "ecotypes" (natural strains peculiarly adapted to the many local environmental variations).
Thus in choosing natural Kentucky bluegrass as the hard core of any seed mixture, a seedsmen avails himself of a proven turf species, that is also subtly variable (and hence flexible for adaptation to differing lawn conditions). This, it seems to me, is a strong argument for the use of natural Kentucky bluegrass in all seed mixtures. Natural bluegrass is also generally more economical than named varieties.

Before discussing the newer bluegrass varieties on the market (and there are many more just around the corner), let's consider how these varieties are generally developed. Traditionally, clumps of natural bluegrass, noted for unique appearance, performance or location, are selected and plants isolated. These are perpetuated free of other bluegrass plants which might mix or cross with the selection. In bluegrass this is a reasonably simple process, since seed is largely apomictic (that is, most are produced without sexual crossing, and hence should have identical heredity with the mother plant).

Commercial growing of such selections (varieties) presents added problems and costs, usually reflected in the higher prices of their seed. Firstly, the variety must be agronomically grown in areas where bluegrass does not volunteer; most production of named varieties comes from the Pacific Northwest; on soils "virgin" to bluegrass. Even then there is apt to be a slight percentage of sexuality, and some off types. This may require hand roguing. Add cultivation expenses and transportation to eastern markets, and it becomes evident why most bluegrass varieties are premium seed.

The fact that a variety costs more, does not necessarily guarantee better performance. It should excel for the one or two characteristics for which selected, but when planted away from home base its identical heredity may lack the flexibility of a variable population. Sufficient experience over the country has not been had with some of the newer bluegrass varieties, to yet judge how adaptable and long lasting they will be in different regions. Even though a variety may appear spectacular its first few years, in time it may suffer from build-up of disease, mat, or other troubles not suspected initially. This has happened on Merion, an outstanding variety, but one on which it was not originally realized rust would be such a serious problem. Other diseases built up, too; the variety proved weak in the southern portion of the bluegrass zone; it tends to mat, requires heavy feeding, and the seeds proved exceptionally slow to germinate. The influence that time has is shown by one football field in northern Indiana, seeded to Merion several years ago with considerable fanfare, now reportedly plowed and replanted to natural Kentucky bluegrass.

Nevertheless, Merion is an excellent variety, of distinctive appearance and growth. Where adapted, its special needs recognized and met by skilled management, it certainly provides excellent turf (having increased resistance to leaf spot where this may be a serious affliction in spring).

Park bluegrass is a newer variety, in appearances and performance almost indistinguishable from natural Kentucky bluegrass. Man seems to have provided for Park some of the advantages that nature provided for natural Kentucky bluegrass - the intermixing of "strains". The variety was created by planting together a battery of good-performing selections in Minnesota, and then selecting for its vigor the outcome.
from this intermixing. The outstanding feature of Park is that large, quick-germinating seeds yield vigorous seedlings. This is notable in contrast to the slowness of Merion, and germination is as rapid as with the best and heaviest seeds of natural Kentucky bluegrass.

Newport is still another variety which will be abundant on the market soon. The Lawn Institute has had no prolonged experience with this variety, originally selected on the Coast or Oregon and distributed with the Carnegie hybrids for test. In observing Newport at test locations, it has had a bright attractive appearance and thick texture. Its performance seems to vary seasonally; it appears to green up more slowly in spring than the natural bluegrasses, but holds color more attractively in the autumn.

Delta is a Canadian selection being widely marketed. It is notable for high yields, but in appearance and performance is little different from natural Kentucky bluegrass. Arboretum is a similar selection from Missouri.

The future will doubtless provide a plethora of new varieties. Probably each of these will have certain attributes for which it is outstanding. Until the lawnsman becomes well acquainted with a variety, and expert enough to cater to its needs, mixtures with natural Kentucky bluegrass might best be used. In that way candidate plants are provided to fit almost any lawn condition.

Agronomists conditioned to identicalness in crops may find mixing varieties a bit distasteful. Variability is more a virtue than a drawback in a lawn, however. Mowing minimizes differences, and obviously there is no need to mature anything all at once for harvest. Individual plants best adapted to the particular lawn and its care will in time presumably dominate the turfgrass community. No one can know beforehand just which component will supply the adapted survivors.

Red fescues. Plantings over the country suggest that not a great deal of difference exists between red fescue varieties: one is usually substitutable for another. Most quality red fescue seed is grown in Oregon, including, in addition to the parent creeping red, Chewings, Illahee, Pennlawn, and Rainier. Pennlawn has received an excellent press, but in most of the demonstrations I have inspected differences were not great. All are excellent companions for bluegrass in seed mixtures. Indeed, the mixed plantings may be mutually beneficial to each species. The growth habits, appearance, and cultural needs are so similar, that the red fescues and Kentucky bluegrasses are like ham-and-eggs in quality seed blends for the northern two-thirds of the nation.

In New England, any of the red fescue varieties should do well. They should persist on the poorer soils in shady and dry situations. Their narrow blades make a most attractive turf, while the upright growth (as with bluegrass) permits clippings to drop through to the soil and decomposition, lessening thatch danger.
Obviously, including red fescue in a seed mixture extends the mixture's potentiality. The fescues should help colonize less favorable sites, and the fair-size seed gives reasonably quick initial growth, substituting for a nursegrass very nicely. Yet lawn fescues are not aggressive want-it-all grasses that can't live compatibly with other species.

**Bentgrass.** No grass yields a more attractive cover than bentgrass, if maintained with the care accorded a golf green. However, this is usually beyond the capacity of a home owner. Instead, mat and thatch develop and the bentgrass becomes seasonally blemished from disease (where fungicidal prophylaxis is not regular). If not mowed frequently and carefully, the turf may become stubby and brown at certain seasons. Tight bentgrass growth is not compatible with other lawn grasses; disruptive patches develop, blemishing the lawn. Because of special requirements, we prefer bents as specialty grasses, managed specifically for their needs.

There are a great many well known golf green bentgrasses. It is pointless to enumerate them, since they are seldom used for lawns, or without professional care. Two of the creeping bents are available as seed, Seaside and Penncross. The latter has had good reports, as a substitute for the vegetative strains customarily used on golf greens.

The bentgrasses more frequently used for lawns are of the Colonial type (Agrostis tenuis). This species is basically an erect sort, but apparently creeping "blood" has become so mixed with it that seldom is seed free from some matting tendencies. The Astoria variety is said least contaminated with creeping characteristics. Highland and Colonial are other varieties often included in seed mixtures. All should do well in New England, if given the necessary intensity of care.

**Poa trivialis.** "Poa triv", often termed rough bluegrass, is really more like a bentgrass than a bluegrass (Poa). It is especially adapted to moist situations, and does well in shade. Consequently it is often used in shade seed mixtures for humid climates. There are no varieties. Seed is imported from North Europe.

Because it is shallow rooted and soft (won't stand traffic), Poa trivialis is not as widely usable a turfgrass as are the bluegrasses and fescues. In summer it may suffer from heat and drought much as does bentgrass. And since it spreads by stolons, it also forms colonies which can mat and repress growth of other turfgrasses.

A good lawn mixture for New England might well be based on these grasses. It should certainly contain both Kentucky bluegrass, and some of the Oregon fescues. For shade plantings, the fescues might well constitute the larger percentage; for good soils and open areas the bluegrass might predominate. Varieties to be included are a matter of individual preference. For the average home owner who simply wants a "nice lawn" (and is not concerned about individual characteristics) a seed blend largely of the parent species, with an intermixture of one or two named varieties, might well constitute the most foolproof recommendation.
Along with the recommendation of grasses, one must recommend care (suited to the species chosen). For the bluegrass-red fescue blend, reasonably high mowing is suggested (which in turn suggests rotary rather than reel mowers). Also autumn seeding and fertilization should be stressed. Watering and other special attention can be minimal, although weeding would certainly help improve appearances.

If a bentgrass mixture were used, frequent meticulous clipping with a reel mower would be suggested. Watering and regular fertilization would be called for, and this in turn would intensify need for hot weather fungicidal treatment. From time to time the turf would have to be thinned or aerified.

For a resume of suitable grasses by regions, may I refer you to the March-April 1959 issue of Better Crops with Plant Food. Some discussion along the same lines is given in "The Best Turf for Athletic Fields", (January issue of Scholastic Coach). A general summary, "Lawns - Their Making and Keeping", has been reprinted from the Handbook on Gardening of the Brooklyn Botanic Garden. Other reprints and further information is available upon inquiry to the Lawn Institute, Route 4, Marysville, Ohio.

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MAINTENANCE OF ESTABLISHED LAWNS

John R. Havis,
Waltham Field Station, University of Massachusetts,

LIMING PROGRAM

Once the desired pH range is established, it can be maintained on most soils with the application of 50 pounds of ground limestone every three years.

FERTILIZER PROGRAM

The standard program is 3 to 4 pounds of nitrogen per 1,000 sq. ft. split in three applications over the year: April 1 - middle of May - September 1. This is so much better than many lawns receive that it is still a good goal.

Here are some variations:

a. If nitrogen is all or more than 75% Urea-form, use 4 to 6 pounds of nitrogen and apply either all at once or split for two applications per year.

b. If the lawn has a sprinkler system or the owner is diligent about irrigation through the season, a good program would be 1/2 to 3/4 pounds of nitrogen applied at monthly intervals from April through September, using inorganic or organic or a combination.
c. Merion Bluegrass apparently does better with a higher rate of fertilizer - about 6 pounds of nitrogen to 1,000 sq. ft. per year.

INSECTICIDE PROGRAM

Chlordane is still the standard lawn insecticide. Five (5) pounds of 5% formulation per 1,000 sq. ft. applied every three to five years is recommended for grub control. The granular formulation makes application easy with a spreader. Other materials are Dieldrin (greater toxicity to humans) and Heptachlor. Spring is a good time to apply insecticides.

IRRIGATION

Objective is to replace the water that is lost. Remember that the loss of water is faster in hot weather than in cool weather. Lawns cut at 1 1/2 to 2 inches will need about 1 inch of water every four to five days in hot weather; less often in cool weather. Measure rate of application of the sprinkler with a coffee can or similar container.

MOWING

The height should be 1 1/2 to 2 inches for bluegrass and fescues, and 3/4 inch for bent. A lower cut reduces the size of the root system, weakens the top, increases weeds, increases need for fertilizer and water. There is no reason for changing the height during the season. Mow as often as needed - every three days may be necessary in rainy periods in the summer. Letting the grass get too high before mowing encourages disease.

COMPAC TION

Heavily travelled areas need aeration, particularly in the spring.

DRY SPOTS

These spots wilt in the summer even after irrigation. Aerate thoroughly and apply limestone, then soak thoroughly.

PATCHING

A common cause of crabgrass is bringing in loam for patching or for general over-seeding. Consider using sod in patching or using the soil already in place with the addition of peat.

WEED CONTROL

Chemicals should be used not as a regular program but to help solve a specific problem. Good vigorous turf is the best weed control.

a. For Dandelion and Plantain - 2,4-D. Apply in the early Spring before flowering or around the first of September. The grass will benefit from an application of fertilizer near the time of the herbicide application.
b. **Chickweed and Clover** - Silvex. Use in the spring or the fall. Follow recommended rate carefully to avoid injury to grass. Bents appear to be more susceptible than other grasses.

c. **Crabgrass** - DSMA. Apply at any stage of growth. Two to four applications are recommended. Follow directions very carefully.