

1968

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STOCKBRIDGE SCHOOL

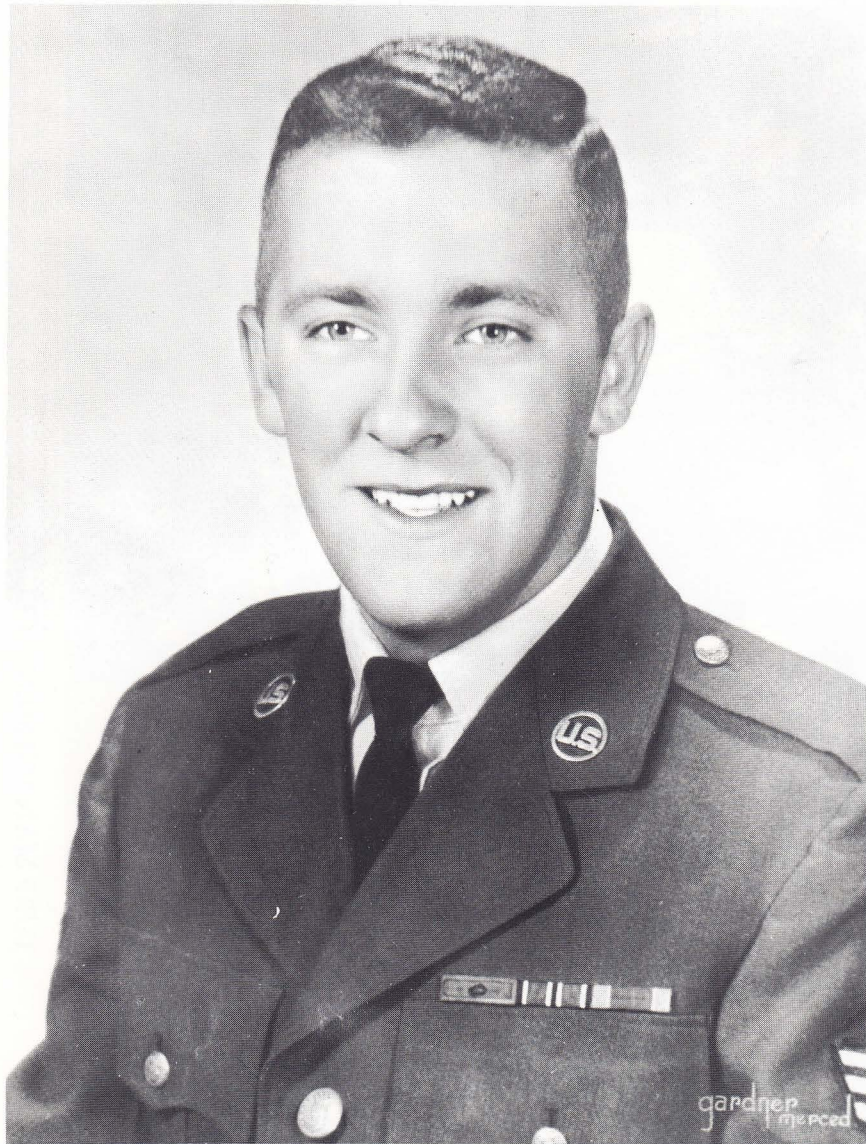
TURF

CLIPPINGS

CONFERENCE PROCEEDINGS



IN MEMORY OF



TIMOTHY BRADFORD GOODALE

April 4, 1943

February 24, 1968

The 1968 Turf Clippings is dedicated to the memory of Timothy B. Goodale, a member of the 1968 Stockbridge Winter School. A resident of Windsor, Connecticut, Tim previously attended the Robinson Preparatory School in West Hartford, Connecticut, Pierce Junior College in Los Angeles, California, and the Hartford Branch of the University of Connecticut. During the summers he worked for the Metropolitan Life Insurance Company in Hartford and the Country Club of New Seabury, Massachusetts. The spare time left, after studies and working, Tim devoted to winning numerous trophies in sports car racing. He was also an avid skier and golfer. Tim's outgoing personality and his capacity to brighten some of the duller moments won him a host of friends here at Stockbridge. Because he was a friend, Tim will be truly missed.



TURF MANAGEMENT CLUB

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TURF CLIPPINGS

Published By

The Stockbridge Turf Management Club
of the University of Massachusetts

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

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Dedication - Timothy Bradford Goodale
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MAINTENANCE OF GOLF CARTS

Thomas Pepe

Introduction:

The care and maintenance of golf carts on a golf course is becoming a very important job. When golf carts were first used on a golf course it was never thought that they were really parts of the winter maintenance program. They were used during the summer then thrown in a shed, if they were lucky, and let stand there all winter. When spring came around they were dusted off and ready to go for the next season.

Today the care of golf carts is becoming a specialized and definite part of the golf course budget.

The practical side of this program starts with the mechanical work and ends with the economic values of winter overhauling of golf carts.

Since the winter overhauling of golf carts has become a part of the Superintendents it must be made to follow the KNOW, HOW, and WHY of your job.

At this point, I would like to say that this is my point of view and what I observed while working at the Woodbridge Country Club in Woodbridge, Connecticut. The overhauling program I am going to discuss was set up by Jack Lynch, Superintendent at Woodbridge, and his mechanic, Don Beardmore.

I would first like to look at the mechanical set up of winter overhauling and then the economic values.

Mechanical Work:

There are certain steps which have to be taken in systematic order. Each cart must undergo each step so if anything goes wrong with a cart you know it has undergone these certain overhauling steps. That way you are not guessing whether or not you did check a certain thing on that cart.

The first step is to clean the body, motor, and batteries of all dirt and grease. Then you repair all body damage, such as cracks in the fiberglass, dents in the bumpers, etc.

While the fiberglass is drying (replacement of a whole fiberglass panel may be necessary) you take out the batteries and cables. Clean all battery poles and coat with a thin coat of grease to preserve them. Clean all cables on a steel brush wheel and spray with an aluminum paint, which may be scraped off where they make contact with the battery post.

At this point it is necessary to check the contacts which control the speed of the cart. More than likely, they will have to be replaced.

It is now necessary to sand down, with a sandpaper wheel, all rust spots. The spots which were subject to acid erosion should be treated with "baking soda" before grinding. You are now ready to paint the interior of the cart

which houses the engine and batteries. It is recommended to use a black tar type paint.

The outside of the cart should now be ready to paint. If the body work you have done is not dry and ready to be painted, this is a good chance to check tires for leaks and the need for air. However, if the body is ready to be spray painted the tire check should be done last.

The paint you use should be of high quality. Because of hts exposure to the weather and to the user as a cart, it must look good, yet be durable. Besides painting the body; the bumpers, tire rims, and steering post should also be done.

The cleaning of the upholstery should be done in the spring when you can take them outside and rinse with water. Since they will be in storage for the rest of the winter they will only get dusty again anyway.

Replace all batteries and cables when paint is dry. Make sure you charge the batteries for the rest of the winter as needed. Lubrication of all moving parts should be made at this time.

The program may differ, depending upon the type of cart - gasoline or electric. Your budget may also alter your program of winter overhauling.

Economic values:

The end product of overhauling carts in the winter is the money you save.

The following prices are related to the Cushman Electric Cart. When these carts are new they cost \$1,200. After the first year they depreciate about \$300. This rate of depreciation is the same for most carts. Therefore, if they are traded in at the end of the year, the loss will be \$300. The program I worked under averaged out to be about \$25 a cart. This money was broken down into \$5.00 for paint, \$10.00 for parts and repair material, and \$10.00 for labor. Therefore, if you overhaul your cart instead of trading it in, you will only lose \$25, or save \$275. After the first year the depreciation will be less and you will still end up beating the depreciation value. You will save money in the long run. What I mean is - your carts will last longer and look better by overhauling.

With a little understanding of mechanics, this system can be modified to any golf course. I would recommend the winter overhauling of carts to anyone. I cannot see any reason why it can't be done or why it should not be done.

WHY A GOLF COURSE SUPERINTENDENT SHOULD PLAY GOLF

Stephen Skowronski

There are many reasons why a golf course superintendent should play golf. The biggest reason is that he can give his work an honest appraisal from the

standpoint of proper playing conditions and aesthetic value. Proper playing conditions would include many areas. When the superintendent plays the course he can find many small mistakes which he would not ordinarily see. For instance, he may notice an uncut strip of turf in the fairway and know that the mowers should be fixed to prevent a reoccurrence. The superintendent may notice that the teeing area is long. He remembers that they were cut just a couple of days ago and realizes that the tees must be cut more often. He may also find that the tees are being clipped too long because when he places his ball on the tee it seems to be resting on the grass rather than on the wooden tee. Another thing which is not very noticeable is a raised cup on the putting green. This is caused by the pulling out of the cup cutter. The worker then presses this down but yet when you putt the ball still seems to break off at the last second. This is because the edge of the cup is still raised even though it looks level to the human eye. Besides noticing imperfections in his work, a superintendent may find other things which need work. Trees may need trimming, tees might have to be leveled, or a green which must have some grain removed.

Besides the golfers demands for playing conditions a superintendent, as a golfer, notices many things that will help improve the aesthetic value of the golf course. This is more important in many golfers eyes than the actual playing conditions of the course. For instance, if the fairways, tees, greens and roughs are regularly cut guests will tell their friends about it and in that way bring more money into the club. Keeping the course green is another important factor. No one enjoys playing on brown dried out turf. Keeping trees trimmed and free of dead limbs will also help to improve the fairways appearance. Sand traps can become an eyesore if they are not kept trimmed and properly raked. No one enjoys having to blast from a six inch deep footprint. Another thing which detracts from the beauty of anything is litter. Litter is not the superintendent's fault entirely if the players do not use the litter baskets provided. However, the superintendent has to pick up for those who do not care about the beauty of their course. Having to pick up this litter is wasting manpower that could be used to work on something more important.

These are a few reasons why a superintendent should play golf. Also if a superintendent enjoys the game he will enjoy his work more because he has something to work for other than just pleasing the membership. He will also be making the course conditions better for himself.

TREE PRUNING

M. Walsh

Pruning is defined as the methodical removal of parts of a plant with the objective being to improve it in some respect for the purposes of cultivation. Golf course superintendents should be familiar with at least some phase of tree pruning. Most courses could pay an outside tree company to remove branches but on the whole, it is an expense which the budget of most clubs does not include. For this reason I shall attempt to establish a few basic principles involved.

Tree pruning is executed for three main reasons. They are as follows:

Health: Pruning for health reasons may include any of the following - the removal of dead and diseased branches to prevent the penetration of root producing fungi into the rest of the tree, removal of intersecting branches to prevent possible further decay problems, and the thinning of live branches to permit sun and air to circulate through and under the crown or to compensate for root losses. I feel that the last reason is most significant. This thinning which permits sun and air penetration would be especially advantageous for the trees surrounding greens and tees. Some species of grasses will not withstand shade, resulting in the death of grass under the particular tree. On a golf course this is very unsightly and in most cases intolerable.

As mentioned above, pruning is also done to compensate for root losses. This is especially significant in the area of trees where a ditch must be dug and roots removed, since all or most nutrients are being drained from the tee soil by these roots. Unless the roots are removed, the tee will never be a good one.

Appearance: Shaping to bring a tree into its characteristic form or to balance a mis-shapen tree often is desirable when dealing with specimen trees or formal groups. This pruning for appearance would especially apply to trees around the club-house and parking lots.

Safety: The danger created by dead limbs and branches over areas where people walk is apparent. This hazard should be eliminated in such areas as tees, greens, fairways, and club-house area by periodic pruning.

Much has been written on the proper time of the year for the most efficient pruning. It was once thought that the time to prune is when your saw is sharp, meaning that pruning may be performed at any time.

Since it is realized that wounds heal more readily during the growing season, it is more desirable to prune during the period from April to September.

In Canada, where I live, the golf season is not long enough to allow time being spent pruning trees. Most of our pruning is done during the winter months when snow cover on tees, greens and fairways prevents injury to turf from falling limbs, or even cut-down trees.

Before attempting to prune a large tree the following equipment must be secured:

2 manila ropes - 1/2-3/4" in diameter and 120-150" (one rope for climber and one rope to lower heavy limbs).

1 handsaw (use of a chain-saw in a tree is unwise for the amateur) about 26" long, with 6 teeth to the inch for normal pruning needs.

1 pole pruner 10-14' long for pruning small, hard to reach limbs.

2 belts for carrying saws, and a paint pot containing a wound dressing for painting cuts.

When all equipment is secured, pruning procedure must be considered.

Before the job starts all equipment must be inspected for safety purposes. When this is completed, the pruner secures his position in the tree to be pruned. A safety saddle and taut-line hitch should be employed.

In general, the best practice is to start at the top and work down. Dead wood should be removed first along with small intersecting limbs. Diseased or bore-infested wood usually should be removed whether completely dead or not. Then the tree is pruned for general appearance. The resulting wounds from cuts must be painted with a recommended tree dressing to prevent future invasion by disease causing fungi.

When removing any branch an undercut must be made about a foot beyond the final cut. One continues the undercut until the saw binds. A cut should then be made above the limb 1" past the undercut. This results in the limb being severed from the branch or trunk. If the final cut were made in the beginning, the weight of the branch being removed may strip the bark down the side of the trunk. This could result in future infestation and even death.

I have made no attempt to cover all phases of tree pruning but I hope that those of you involved in golf course work will gain some measure of benefit from my discussion of the principles and techniques involved in tree pruning.

GOLF COURSE LABOR: A DILEMMA

Robert Barber

This time of year presents one of the greatest problems for a golf course superintendent. This is getting ready for the new year.

Sixty to seventy-five percent of the average golf course budget is due to labor costs, also, suitable help is becoming difficult to find and keep.

Scarcity of golf course employment relates to two causes - the technology of golf course operations has advanced where suitable technological help to carry out modern practices in handling chemicals, fertilizers, and equipment is difficult to find. Secondly, industry has created a highly competitive wage scale, a greater amount of fringe benefits, and an attitude of year round job security, whereas, the average golf course is unable to compete economically.

It may be found that a labor movement is necessary. I am not favoring union approach, as this certainly hinders maintenance operations. However, union operations could bring a reluctant employer around to the point of realizing that golf course employees have certain basic needs; - such as a reasonable wage scale and fringe benefits, including sick leave, vacations, health and accident insurance and year round employment.

In most cases the golfing public is engaged in business, where labor relations are vital aspects of management. These people should be receptive to similar programs for their golf course employees if the superintendent and greens committee will forward the need. Therefore, this is one of the real challenges facing golf course superintendents, to plan and present to their clubs a reasonable pay scale and benefit program for their employees. This in turn would partially solve their annual problem for spring help.



TURF MANAGEMENT SENIORS

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- Row 4 W. Vassalo, S. Bonner, D. Lass, D. Malcolmson
- Row 5 O. Casterella, R. Osterman, A. Scola

ANNUAL TURFGRASS CONFERENCE PROCEEDINGS

1968

Conference presentations have been approved by the individual speakers

The various topics are presented for your information as follows:

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TURF PROBLEMS

Alexander M. Radko, Eastern Director
USGA Green Section

Several years ago, Mr. Michael O'Grady, superintendent of the Country Club of New Bedford, confronted me with a problem. He said the ripple sole shoe was being used at his club -- he was against it, and he barred them from the course, and he said the USGA should get behind a move to outlaw this "monster". We did! We conducted some research and lo and behold what was the result? The tests showed that the ripple shoe caused less turf damage than several other type shoes. And so I was in trouble with Superintendent O'Grady again. But not for long, the saving factor was that the indentations caused by the ripple sole shoe made the putting surface look just like the shoe -- rippled! And so it was literally abandoned by nearly everyone. The most interesting thing that resulted from these tests was the effect of the ordinary spike shoulder on the golf shoe. Some time ago Mr. C.C. Cogan, green committee chairman of the Irvine Coast Country Club in California, calculated the number of depressions made on a green to be as follows:

A pair of golf shoes has 24 spikes and each spike has a protruding shoulder.

A golfer averages 28 paces per green in playing a hole.

$24 \times 28 = 672$ impressions made per green.

$672 \times 18 = 12,096$ impressions made per 18 greens.

Let's say that your play averages 200 rounds per day each month, then $12,096 \times 200 \times 30 = 72,576,000$ impressions made on your greens each month from spiked shoes alone. No wonder greens become compact!

How much play is the course built to withstand? Traffic on the golf course has increased since the '40's. There was the time when it was unusual to see golfers playing on a week day. At that time 50 golfers on Saturday or Sunday was also considered a crowd. Many courses today have 200 to 300 golfers daily. Would these courses stand up better if these golfers wore a smooth rubber soled shoe? -- Paul Runyan, noted golf Professional, at the GCSAA Conference in San Francisco stated that he thought so. He is a strong advocate of the smooth shoe; he didn't believe spikes were necessary on golf shoes. Nor does Superintendent Bill Riley, of the Essex Fells Country Club, Essex Fells, N.J. Bill has long been an advocate of smooth soled shoes for golf, and he has persuaded more than one person to believe in this too. There is some good that's come out of it all. Because of these tests mentioned above, there is a strong move on to recess the spike shoulder into the sole leather, and a few shoe manufacturers have already begun to do this, but like all things new, changeover is slow.

There is one changeover that isn't slow. Superintendents often say that they wish they could hold on to a green committee chairman for more than one year. It is commonly known that by the time the superintendent is able to communicate with his new chairman, it's time to replace him. It's been said before that no one could hope for a business to operate efficiently that way, and so it's foolish to expect that a golf course could. Many of the most successful programs are the result of a solid understanding between superintendent and green committee chairman of long standing. This allows for continuity of program, and without question a chance to develop a strong, well-rounded total program. Some clubs accomplish this through one chairman of long tenure,

others form rotating committees of three to five persons who each serve a three year term. Each member succeeds to the chair, then retires from the committee, and is replaced by a new member. This type rotating committee allows for continuity of program also.

Problems with labor are becoming worse all the time. Our Program Chairman, Mr. Anthony Caranci, wrote an excellent article for the March '68 Newsletter of the Golf Course Superintendents of New England. Points that he stressed were that the superintendent needs to be a "Miracle Man" to hire a crew at wages and benefits presently offered; that wage scales were far behind the times. He cited this schedule:

	1963	1964	1965	1966	1967
common labor	\$3.15	3.25	3.45	3.65	3.85 per hour
skilled labor	\$4.40	4.50	4.75	4.90	5.15 per hour

He asked, "How can we compete with this labor market, offering what clubs offer today -- seasonal employment at rates far below what industry offers?" And this is true, the theme of the labor market available for golf work today seems to be, "Why should I work to be a success, when I could live so comfortably as a failure!"

Problems in course construction were increasingly evident in '67 and this is most discouraging. We have come a long way in know-how but we still find construction errors that would startle even the novice turf aspirant. This doesn't refer to all, but there are courses that are built by companies who specialize in road-building and other such foreign construction. They bid on golf construction projects and if they submit the low bid, they tackle the job, with no prior knowledge of what's required, nor any apparent interest to find out. This is where the good, capable, conscientious architect comes into the picture but there are too many who are architects simply because they hang out a shingle saying so. This is the kind of world we live in ... we take a half million dollar risk on the say-so of a smooth talking individual saying, "I'm a golf course architect!" How can this happen? Easy, any smooth talking individual can sell any committee ... when he gets through with them, his word is law forever after. He is the final word in design, construction, agronomy, irrigation, and subsequent management. A bus full of trained agronomists couldn't convince the committee that he is wrong on even the slightest point.. but they find out too late ... it takes time, a year or two before things begin to go wrong...but then the committee people responsible go all out to defend their stand..which is exactly the same as that of the self-appointed "architect." They cast their lot with him so they don't look foolish -- so they don't appear to have made a wrong choice. Who then lives with the problems? Who has to correct them? Who then gets all the static and heart-aches? You're right, the superintendent! To take a line from a Pop song today -- "And the beat goes on, and on, and on, and on."

1967 TURFGRASS PROBLEMS

Lee Record, Agronomist,
Eastern Region, USGA Green Section

The wet season of 1967 will be remembered for some time. It was a good year for golf courses and course superintendents. A good year is not always an easy year. Heavy rainfall was the rule rather than the exception during many periods of the season; snap decisions had to be made in conjunction with daily cultural programs.

The early spring was cold and wet. A good snow cover was left during this period. Desiccation was not of concern. Snow mold was at a minimum. This may be contributed to the improved cultural practices which we now employ on most of our courses.

As the spring continued, rain was the rule rather than the exception. Growing conditions were poor for permanent turfgrasses. Bentgrass which had been overseeded on many courses the previous year had a setback; Poa annua was favored by spring conditions.

Roughs had been limed and fertilized the previous fall, which was good timing. However, mowing practices during this spring period could not keep up with the growth. Fairways also had their share of growth. Early fertilization, which was poor timing this year, encouraged more growth than was needed. Wet conditions and poor drainage hampered playing conditions on numerous fairways. Hydraulic fairway units were up to their axles in mud. Triplex mowing machines were used to keep the turf down on many fairways. As one superintendent mentioned during a spring visit, "I can hear it growing!"

Drainage was of great importance. Areas which never held water, were ankle deep. Fairways were so wet and puddled you could just about see the water run uphill. Drainage, as I mentioned, was of real importance. The favorable acceptance and quickness on installing the slit trenches when areas were workable was a life saver. Slit trenches are three to four inches wide and are cut to a depth of two to three feet, backfilled with 1/4 or 3/8's inch washed gravel to the surface. It is important to fill the trenches with gravel only, soil may not be placed on the gravel as a perched water table will be the result. Under normal growing conditions turf will fill across the trench in a matter of weeks. The caution here is to stay within the three to four inch width.

Slit trenches were only one method of helping to ease the wet conditions. All shapes, sizes and materials were used for normal tile line and drainage installation and I may add here with great success.

Herbicide applications were washed out more often than one would like to count. Broadleaved weeds were still growing strong after each rainfall. However all was not lost, weeds in general were not a real problem; isolated cases were the general rule. 2,4-D is still the best for broadleaved weed control. Clover, knotweed, chickweed, etc., can easily be controlled with one of the MCPP formulations or Dicamba. Timing of the material in question is of importance here. Dicamba can be used later in the season with great success and less injury to permanent turfgrasses and Poa annua than other materials.

Poa annua eradication was always a topic of great concern. This spring more calcium arsenate and bensulide were applied for Poa annua control than any other material. Lead arsenate and sodium arsenite treatments are still being used for Poa annua suppression.

Disease was not of great importance during the wet spring period. Helminthosporium spp. was evident on bluegrass; fungicide applications corrected this condition.

When Poa annua began to seed during the mid-May period, it really did seed. Some of the heaviest seeding that had ever been witnessed on the East Coast. Mowing practices had to be conducted daily on fairways as clipping accumulation was heavy. Fairway sweepers were on an increase at many clubs during this period. This looks to be one way, although slow and expensive, of reducing the Poa annua population. As Poa annua finished seeding, the turf went into the summer in a weak off-color (yellowish) condition.

Conservative cultural practices were the general rule to follow during this spring period. Excessive clippings were being removed from greens, tees and fairways, where cultural practices were followed too strongly.

Insect activity was noted throughout the year. Cutworm activity was noted from May on through October. Earthworms were in abundance during all periods of the season. Chinch bug activity was evident but overlooked; growing conditions were so strong this season that the turf responded before evidence of their work was noted. During the late May-early June period, an old insect which had been on Long Island for approximately 10 years on a limited number of courses made new strides into Westchester County, New York and lower Connecticut. This insect is called Hyperodes spp. and is a member of the weevil family. Research work is now being conducted on this insect at Cornell University. The Hyperodes spp. insect did some damage on Poa annua but did not seem to effect the bentgrass or fescue. Native bluegrass and improved bluegrass varieties were not effected.

The summer rains caught many by surprise from week to week. Syringing greens, tees and fairways were the rule. It is almost next to impossible to educate a country club membership why it is necessary to syringe after a deluge of rain. Those superintendents who did experienced favorable working conditions, those who didn't or couldn't had adverse conditions to work with.

During August, dollar spot made its mark on many golf courses. Fairways in particular were hit the hardest. Disease was not of real concern, however. Preventative fungicide applications have held the disease element down. Because of the rain, fungicide applications on greens were being practiced every five to seven days or more often if conditions were warranted.

Renovation and overseeding of fairways to permanent turfgrasses went on as usual and with some great results. Bentgrass is being introduced into most fairways, especially those with fairway irrigation. Although 1967 will be remembered as a wet year, the experiences learned during the year will never be forgotten.

SOUTHERN TURFGRASS PRODUCTION AND PROBLEMS

Ralph W. White, Jr., Agronomist-Turf
Southern Turf Nurseries

The basic differences in turfgrass production and problems in the South from those in the North are: the characteristics and requirements of the grass varieties used, the longer growing season, more severe pest problems due to warmer temperatures, and the very low capacity of the sandy soils to hold water and fertilizer. These facts, plus the poor distribution of the 55 plus inches of rainfall, increase production costs and problems.

The permanent grasses used mainly for turf purposes in the South include centipede, bahia, St. Augustine, zoysia, and bermuda. In sections of the South where grasses turn brown during fall and winter, overseeding with cool season grasses such as rye, fescue, blue and bent grasses is often practiced.

In the South there is really no such thing as a low maintenance grass when compared to Northern standards. However, centipede and bahia grasses under Southern conditions are considered low maintenance grasses since both can be established from seed and generally require much less care than other grasses used for turf purposes.

Centipedegrass has been a popular lawngrass in the coastal plains of the Southeast for years. Fertilizer and mowing requirements are quite low when compared to other lawngrasses and centipede is well adapted to poor soils. Major problems associated with centipede include low wear resistance, high susceptibility to nematodes, and iron deficiency. Brown patch disease may also be a problem on centipedegrass. It is considered the best all around lawngrass for the South by many turf specialists.

Bahiagrass is used for roadside plantings, lawns, and athletic fields. The chief advantages of the bahiagrasses are their wear and drought tolerance and they have few serious insect and disease problems. Two major disadvantages of using bahiagrass are: rapid growing tall seedheads produced from spring until fall requiring mowing as much as twice a week; and the open type turf which is quite susceptible to weed encroachment.

St. Augustinegrass is the most popular lawngrass in Florida. It grows equally well on a wide range of soil types and is the best salt and shade tolerant grass in the South. The chief disadvantage of St. Augustine is that it is susceptible to the lawn chinch bug an insect that can completely kill a lawn within weeks. Another major problem is the thatch buildup which provides an ideal habitat for insects and diseases and makes control of the pest difficult.

Zoysiagrass, like St. Augustinegrass, is well adapted to salt and shade situations. In addition, zoysia will withstand wear and because of its slow growth, the mowing frequency is reduced. The major disadvantages include susceptibility to the hunting billbug and parasitic nematodes.

Bermudagrasses are used on athletic fields, golf courses, and home lawns. The improved or hybrid bermudagrasses produce higher quality turf. They do not produce viable seed and therefore must be plant vegetatively. Common or "cotton patch" bermuda produces seed in abundance. The advantages of bermuda-

grass include wear tolerance, fast recovery from abuse, tolerance to many herbicides, and ease of overseeding for winter color with bents, ryegrass, and fescues. Disadvantages include poor shade tolerance, frequent mowings, and high susceptibility to nematodes and lawn caterpillars.

Commercially, most St. Augustine sod is produced on muck and peat soils. Centipede, zoysia, and bermuda sod is grown on sand-peat soils and bahia on sardy soils.

Commercial production of bermudagrass stolons is done on sandy soil because of better harvesting conditions.

Most home lawns are spot or completely sodded while utility and roadside areas are seeded. Golf courses and athletic fields are mostly established by sprigging.

INSECTS - The number one pest problem on turfgrasses in the South is insects. The chinch bug is considered the most economically important lawn pest in every Gulf state except Texas. Damage from chinch bugs has been reported on other grasses; however, chinch bugs have been a serious problem only on St. Augustinegrass. In Florida, it is reported to be second only to the citrus rust mite in the amount of money spent on control measures. High temperatures and heavy nitrogen fertilization are directly correlated with chinch bug populations. These pest produce about three to four generations per year. Studies have shown that it takes seventy days from egg to adult during 70 degree F. temperatures whereas only twenty-five days are required when the temperature is 83 degrees F.

The lawn caterpillars, armyworms, and sod webworms are the second most important insect pest on turfgrasses in the South. These insects are encountered on all turfgrasses but are most serious on bermudagrass. All lawn caterpillars are attracted to heavily fertilized turf and can be a problem year round in the South Florida area.

Insects of lesser importance include grass scales, mole-crickets, bermuda-grass mites, grubs, and billbugs. While these insects are not regularly encountered, their injury can be severe when large populations develop.

NEMATODES - Nematodes are microscopic in size, worm-like in appearance, and feed on the roots of turfgrasses. Increased research during the past few years have shown these pests to be a major problem on most turf areas in the South and account for much of the damage once attributed to insects, disease, and nutritional problems. In fact, it is becoming a standard practice for golf course superintendents to treat their greens at least once a year. Nematode populations are worse on sandy soils than on clays and muck soils.

WEEDS - The second most important pest problem in the South is weeds. Like other sections of the country, weeds constitute a major production problem on all turfgrass areas, but the complexity of the problem differs in that many weeds that are annuals in the North are perennials in the South and many cannot be selectively controlled.

The most common broadleaf weeds are pennywort, Dichondra, Oxalis, purslane, spurge, carpetweed, Florida beggarweed, Lippia, black medic, chickweed and Mexican clover. Most of these weeds can be easily controlled with either 2,4-D

and related compounds or atrazine and simazine, depending on the type of turfgrass in which they are found.

Common grass weeds include crabgrass, crowfoot, Dallisgrass, wild onion or garlic, annual bluegrass, common bermuda, sandspur, and smut grass. Sedge weeds include nutgrass and watersedge. The grass and sedge weeds are much more difficult to control than broadleaf weeds as most of these cannot be selectively controlled. At present, there is no selective control of established common bermuda in other turfgrasses. However, other established grass and sedge weeds can be controlled in bermuda and zoysia by using the organic arsenicals alone or in combination with 2,4-D. In St. Augustine, centipede, and bahia, there is no satisfactory control for most established annual grasses. Therefore, the only solution to the problem is to use pre-emergence herbicides and follow good sound maintenance practices.

DISEASES - In the South, more than one hundred diseases have been reported on the various turfgrasses. However, only seven of these diseases are considered serious. These fungus diseases include brown patch, dollarspot, Helminthosporium, Pythium, gray leaf-spot, rust and fairy ring.

Brown patch affects all turfgrasses but is especially bad on St. Augustine and centipede. The disease is most prevalent during periods of warm days and cool nights. A temperature range of 64 to 68 degrees F. is needed for the spores to germinate. When temperature rises above 73 degrees F., parasitism of the grass begins and symptoms become more noticeable between 80 and 85 degrees F. During periods of severe infestation excess watering and nitrogen fertilization should be avoided.

Dollarspot also affects all turfgrasses but is especially hard on bermuda, zoysia, and bahia grasses. The optimum temperature range is between 60 and 80 degrees F. which occurs during the spring and fall. Dollarspot is often associated with low fertility and therefore is often overcome by applying fertilizer.

Helminthosporium affects primarily bermudagrass almost any time of the year that the grass is green but is most severe during the spring and fall when temperatures range from 68 to 96 degrees F.

Of the warm season grasses, Pythium attacks only bermudagrass. However, the disease is quite severe on the temporary winter grasses. There is very little disease activity below 68 degrees F. with maximum activity around 90 to 95 degrees F.

Gray leafspot is a parasite found primarily on St. Augustinegrass but will also occur on bermuda and centipede. The disease is most prevalent during hot, rainy weather. During periods of severe infestations, nitrogen fertilizer should be used sparingly as it increases the severity.

Rust is a problem on bermuda, zoysia and St. Augustine, especially during the warm, humid weather.

Fairy ring is found to infest all warm season grasses. It is noticeable during the warm months of the year.

SOILS - Virgin Southern soils range from a pH of 3.8 to 8.0. The acid soils are usually found on the peats, mucks, and flat woods soils whereas the highly alkaline condition is encountered on marls. Intermediate between the extremes are the loamy sands and sandy clays. Since a pH of 5.8 to 6.2 is the ideal range for growing turfgrasses, the native pH often must be adjusted. In addition, most turf is grown on sandy soils low in nutrient and water holding capacity, therefore proper fertilization and adequate irrigation become essential. Because of the poor chemical and physical properties, the soils often are amended when a high quality turf is desired.

NUTRITION - The first nutrient to become deficient on Southern turfgrasses is nitrogen. Leaching rains and excessive irrigation necessitates frequent applications of nitrogen if a high quality green turf is desired. For example, on putting greens a minimum of 24 pounds of nitrogen per 1000 square feet per year is required. On tees and fairways 12 to 18 pounds per 1000 square feet per year is necessary. For home lawns, depending on the variety of grass to be fertilized, anywhere from 2 to 18 pounds per 1000 square feet per year is recommended.

Phosphorus on most soils is not critical, especially if the area has been fertilized for a few years with a fertilizer containing phosphorus. Annual requirements on most turf areas vary between two and four pounds of P_2O_5 per 1000 square feet.

Potassium, like phosphorus, will tend to accumulate on most soils. For this reason, two to six pounds of K_2O per 1000 square feet per year seems to be adequate.

Iron deficiency is more of a problem than all other minor elements. Iron chlorosis often results from a lack of this nutrient, an alkaline soil situation, or a poor root system.

WATER - Even though the average annual rainfall is around 50 inches per year in the South, water is still the limiting factor in producing high quality turf. This fact is due to the uneven rainfall distribution and the high evapo-transpiration rate. Therefore, the success of growing any turfgrass depends upon supplemental irrigation.

In summary, the production and problems of turfgrasses whether North or South, are basically the same. The differences are in the intensity and complexity of the problems in the South. Not only are the individual problems serious, but often two or three of these problems may be prevalent at the same time. Diagnosing the problem becomes most difficult, especially for the layman.

CANADIAN TURF GRASS PRODUCTION AND PROBLEMS

David Moote
Superintendent
Rosedale Golf Club

Location of Toronto

Southern Ontario is often considered by U.S. citizens to be a part of the frozen north but in fact if a line were drawn due east from the northern boundary of California it would pass through Southern Ontario and follow along to the

Massachusetts-Connecticut border. The city of Toronto is 100 miles north of this line.

But as you know, the Great Lakes dip 500 miles southward into the heart of North America, to all intents and purposes surrounding Toronto by the influence of the Great Lakes. (Lake Ontario to our South never freezes.) The nearness of these Lakes has the same moderating influence on Toronto's climate as the ocean has on the New England States.

In the lee of Lake Ontario and Lake Erie, Ontario produces grapes for the wine industry, peaches, tobacco and many other tender crops. Further away from the water, the picture is not the same. You all know Keith Nisbet, G.C.S.A.A. Director. Westview, his golf course is 25 miles north of Toronto (away from the influence of the lakes) and 10° colder night temperatures are common. In general, Toronto's golf courses are closed following the first lingering snow anytime during December to open the 1st half of April.

Metro Toronto has a population of 1.8 million who play on 80 golf courses within a radius of 25 miles. Turf on Toronto's courses is as fine as one can find anywhere. We believe this is due to the concentration of courses which stimulates competition between superintendents, allows for easy interchange of knowledge at Turf meetings but equally important is the interchange of golfers. We have members who play regularly on your New England courses at Augusta National and spend their winters playing golf in Florida. They know - or like to think they know - good golf conditions and it's for sure those travelling golfers keep us on our toes.

Psychology behind Turf Production and Problems in Ontario

Too often Turf Conferences and turf managers gear their thinking toward growing grass, the greener the better, and anything which interferes with this is a problem. This is negative thinking. Let us as turf managers, whether we manage parks or golf courses, take a positive approach and continually strive to provide the best (playing) surface, for the most people, for the longest period of time.

Think of this as it applies to your own application. "How can I provide the best playing surface, for the majority of the people who will use it, for the most days in the year?" Use this in your thinking when you time the Spring opening, fall closing, when golf cars run, how often you aerify, fertilize, and most important, how your mowing practices are carried out. What is good on one golf course or in one area will not always work in another. The fast, fast, greens of a country club may be useless at a municipal course where a high handicapped would invariably 4 putt.

Cutting Height and Practices

The formal training most prospective superintendents receive does not include the principle and maintenance of reel type mowers. Discussions often cover the height of cut certain species of grass can tolerate; rarely, however, is consideration given to whether the height of cut is acceptable to the golfer.

Mower Condition

New superintendents cannot grasp the value of very, very, sharp mowers.

Fairly sharp mowers are considered good enough. There is, however, one common denominator on all courses with tight, fast greens -- super sharp, well conditioned mowers which are checked every day and lapped in once a week.

Greens

Today good golfers expect and demand fast, tight greens. To achieve this the turf must be cut as closely as possible, often, and always with razor sharp mowers. If, during the season, the turf begins to suffer a little or if some scalping occurs in wet weather, the height may be raised perhaps 1/64". This normally will provide the relief that is needed and as soon as possible the height of cut should be dropped again.

Tees

Many intensively maintained private courses today cut tees with putting green mowers. Members are demanding a closer cut and superintendents find management of turf is often easier. Sherwood Moore, formerly of Winged Foot C.C., Mamaroneck, New York, states, "When turf or tees is cut around putting green height, you can see trouble coming and head it off." Tees cut at 3/8" with a putting green mower are easy to maintain but even more important are what the golfers desire.

Standardization of Mowing Equipment

The mowing of greens and tees with putting green mowers allows for the standardization of equipment and eases personnel training problems. Select a mower which can mow both greens and tees well. Greens can then be mown with new mowers for 4 or 5 years which are then retired to tees, to greens nursery, to top-dressers and finally cannibalized for parts.

Fairways and Rough

Most fairways were cut at approximately 1" in height until recently. This was an attempt to strike a happy medium between bent grass which demanded a close cut and Blue grass and fescue which needed 1" to 1 1/4" minimum. What happened? It was a case of no maintenance for anything; too close for blue grass and fescue and too high for bent and the golfer.

It didn't take long before superintendents realized that fairways first and foremost are to play golf on. Today many of the same fairways are cut at 5/8" with high frequency mowers as often as 4 times a week, drill seeded with bent grass to increase bent grass population, watered and fertilized as required by bent grass.

This is more expensive maintenance but by use of hydrolic lift mowing equipment for both fairways and rough and narrowing fairways, costs have been kept in line and the golfer has what he wants.

Aerifying and Top dressing

In the early 1950's it was stated that the more one aerified the better. Again, many felt what was good for the grass had to be good for the golfer. There was no happy medium. If it looked like one green was becoming compacted,

all the greens were aerified. The golfer objected and often aerification was completely discontinued. Non-aerification lasted rarely more than a few years before shallow rooting and compaction problems returned. This prompted the switch from reel spoon type aerifiers to the punch type. The golfers liked this better initially because there was less surface damage. Top dressing followed each punching but golfers objected to bubble of grass which formed over each punch type hole.

Today's practice has swung the full circle. Punch type machines are used on collars and tees where the soil cores produce a good top dressing and the bubbles of turf are not objectionable.

On greens the reel type aerifier with open 1/4" spoons is used. When spoons are in good condition, sharp, shiny, and operator travels slowly, little surface disturbance is noted. This aerifier is often followed by a soil slicer which almost completely repairs any damage created by the spoons and opens the turf to receive top dressing. Top dressing is well matted in 3 or 4 times, back raked to push off any foreign material, mowed and lightly watered (often at night). The resultant surface is true, fast and golfers do not object.

Timing is very important to us in Toronto. Keep in mind that courses must be in best condition for the most people for the longest time. Because Toronto courses are closed over winter, spring aerifying and top dressing is normally done only as required (3 or 4 greens). In Fall, however, Ontario superintendents like to do all greens, completing the operation by mid-September. This is active golfing weather and, if properly organized, the operation can be completed in 2 or 3 days and greens back to normal in a week to 10 days. If the top dressing and aerification is delayed because of player pressure until late September or early October, turf growth has slowed and the holes can be open October, November through April and May. This is 4 months out of an 8 month season. (Rather ridiculous.)

Some Canadians like to sneak in an extra top dressing on both greens and tees when most golf is finished, normally in early December. This heavy top dressing of a least 1/3 yard per 1000 square feet when evenly spread and matted is washed in by winter moisture and appears to give good winter protection from desiccation, one of our biggest headaches.

Top dressing Materials

This is a study in itself and because commercially prepared top dressing is not available in Canada, most superintendents produce their own.

Special emphasis is put on sand. Superintendents generally concur with the findings of Penn. State Univ. and specify that a minimum of 75% of the sand must fall between 14 mesh and 48 mesh screen size. Sedge peats usually provide the organic matter as the resultant mix works into the putting turf better than if Sphagnum peat is used. Top dressing piles are sterilized with 1/2 pound of Methyl Bromide per yard of top dressing. The sterilized mixture of sand, top soil and peat is then composted a minimum of 2 to 3 months. This ensures that a homogenous blend is applied.

Winter Preparation

More and more research work is being done and is gradually making sense out

of disorder. A program which has worked satisfactorily over the past three years is as follows. Preparation starts in late summer when the last growing season is applied and the aerifying of fairways, tees and greens is begun. Snow mold protection has always been a problem, the old procedure was to broadcast dry 3 to 4 oz. of Calo Clor mixed with 5 pounds of activated sewerage sludge per 1000 square feet just before the first permanent snow. This controlled the disease relatively well on bent grass greens but gave no control on poa annua collars.

Today it is felt that a treatment must be made by spraying for Fusarium or Typhula when either first appears in late September or early October. Plan the application at about the time the leaves fall in moist humid weather, 1 oz. Calo Clor or 1/2 - 3/4 oz. PMAS. The timing of the spray is most important. If the winter diseases are not controlled at this time, turf will be badly damaged in the Spring no matter what the ensuing programs are.

Fairways and tees are also sprayed at this time with 3/4 oz. PMAS per 1000 square feet.

Dormant fertilizer application is applied in mid-November after all chance of growth is terminated and when one is sure of a good rain or two before freeze up.

Sewerage sludge at 50 pounds per 1000 square feet. There is no question that this gives early greening desired by the golfers, yet does not produce a lush growth pushing Poa ahead of the bent. Why early greening results only if application is made before winter and not if in Spring, is a mystery.

In early December the conventional snow mold application is applied 3 oz. Calo Clor per 1000 square feet. Greens are then top dressed heavily and matted to prevent desiccation.

Snow Fencing

Some greens are surrounded by snow fences to keep skiers off and reduce desiccation. In some areas subject to severe desiccation, brush is used in conjunction with snow fence. No fence is used around greens that are on the north side of a hill or in a shaded location unless ski damage is expected. The fence is then set well off the green. These shaded areas hold snow on their own and are subject to suffocation or disease damage. Depending on how the year breaks, the snow and ice may be removed.

There is no question that good internal and surface drainage is important in winter survival. Slit trenches made by a small ditcher or chain saw and filled with 3/8 stone or calcine clay respectively has helped in local pocketed areas that were missed or developed through settling.

The most critical time for us is in the spring between the time the snow goes until the ground thaws and the water system is turned on. At this time, if high winds develop when only the top inch or so of soil is thawed, complete kill can result. This is the reason for snow fences, brush and late top dressing. The water system must be made operative at the first possible moment.

Much of the discussion today does not come with schooling but is learned the hard way. As you can see, greens as well as tees, fairways, must be treated individually.

Keep your eyes open, be observant and remember the golf course is for the golfer. Provide the best surface for the most amount of people, for the longest amount of time.

TURF RESEARCH ABROAD
C. R. Skogley
University of Rhode Island

I. Agricultural Research in Europe

- A. Anyone familiar with the history of research in agriculture will realize that Europe has long been a leader. Much of the early work in soil chemistry and physics, study of soil origin and soil classification, crop genetics, breeding and selection and, in fact, most phases of basic and production research in agriculture was started in Europe.
- B. Turfgrass has little bearing on the fullness of one's stomach-- the major backing for agricultural research anywhere until relatively recent years. Problems with crops and animals were researched as problems developed since life itself, and certainly profit and standard of living depended on this ages-old No. 1 industry. Turfgrass appears to be a luxury item. It is found in abundance only in relatively affluent countries and research is limited to these same locations. It appears that most turfgrass research is limited to the U.S. and Canada, Australia and to a very limited extent to a few European countries.
- C. In Europe the major turf research is found in England. The Sports Turf Research Institute in Yorkshire is the only non-industry turf research program in Britain. There are no college or university programs in research or even in teaching. There are a number of industries in Britain and on the Continent that do some turf research. This is generally limited to research related to the products for sale--fertilizer, pesticides, seed or equipment. The one exception I found was in Norway. A member of the Agricultural College of Norway who received his M.S. degree from U.R.I. has initiated a turf research program. He has made a fine collection of bluegrasses and fescues from throughout Norway, has produced seed of these grasses, and made some genetic studies relating to them. He has variety trials involving cutting height and fertility levels underway.
- D. I made a thorough study of literature on all agricultural institutes in Western Europe to determine whether any turf research or teaching was being done. Not one mention of turfgrass was found.

E. Research locations visited were:

1. Levington Research Station, Fisons Horticulture Ltd.
2. Sports Turf Research Institute, Bingley, Yorkshire, England.
3. Various seed companies in England.
4. Seed companies in Switzerland, Netherlands and Sweden.
5. Agricultural College of Norway.

F. Except for Britain home lawns are not routine in Europe. Home grounds are routinely very small and most often, if planted to anything, they are vegetable gardens. Where lawns do exist on the Continent, it is rare to see a good one.

TURF RESEARCH AT HOME

Victor B. Youngner
University of California

During the last two decades turf research in the United States has made truly spectacular advances. Prior to World War II only a few Experiment Stations in the Eastern half of the country had turf research programs. Today almost every state has one or more projects covering all aspects of turf culture.

The California program had its beginning at UCLA in 1948 and today is centered on the Riverside campus of the University. Because of its size, long coast line, mountains and deserts nearly every turfgrass species is grown in the state. Consequently, the scope of the research project is one of the most extensive in the United States.

One of the first activities of a new turf research program is variety testing. Performance of existing varieties must be thoroughly evaluated before significant research can be undertaken. Variety testing remains a part of all turf research programs because new varieties are developed, new problems arise and new management techniques are introduced with great frequency.

A natural extension of variety testing is turfgrass breeding. As the inherent weaknesses of existing varieties are documented, the next logical step is to select strains, if possible, that are free of these deficiencies. The trend today in turfgrass breeding is towards the development of varieties adapted to specific environmental niches and for specific uses. Although broad adaptation is a desirable objective from the viewpoint of the turf and seed industries the narrow objective appears more attainable because of the vast range of conditions under which turf is grown. For example, high tolerance to soil salinity is very important in the Southwest but considerably less so in other parts of the country.

Weed control has always been an important part of most turf research programs. With the introduction of 2,4-D and related compounds great advances

were made. Preemergence herbicides have now made control of crabgrass, once the scourge of the turfgrass industry, an attainable objective. However, some weed problems remain with us and indeed seem to be increasing in severity despite all that is done. One of these is the control of Poa annua on bentgrass greens. No safe post-emergence chemicals have been developed and pre-emergence materials have given mediocre results. Research has shown that one of the reasons for the unsatisfactory results with preemergence herbicides is the great variability of Poa annua. Many of the types present in greens behave as true perennials under putting green management. These survive for years gradually spreading in much the same way as bentgrass until a single clone may cover many square feet of area. Most of these exhibit no increased disease tolerance and may become badly infected at various times of the year. However, they usually have sufficient survival to spring back quickly and to even spread further when favorable growing conditions exist. These perennial Poa annua strains make quite good putting surfaces, hence, there has been much interest in developing methods of managing Poa annua in greens rather than combatting it.

Poor bentgrass growth not only produces an unsatisfactory green but is conducive to Poa annua invasion. Therefore, many research institutions are pursuing studies on special root zone soil mixtures for putting greens. Compaction, low water infiltration rates and poor aeration are major problems. Two approaches are being followed in general. One is to amend existing or readily available soils with various organic or mineral materials to achieve a soil with the desired characteristics. The other method is to start with sand of fairly uniform particle size and add soil amendments to give a soil with satisfactory water and nutrient retention while still providing the necessary infiltration and aeration characteristics. Progress has been made in this direction but results have not been completely satisfactory so the search continues. The problem is one of achieving a stable balance among the various soil characteristics at a cost that will not be excessive.

Because turf growers in the West depend upon irrigation during much of the year research institutions in these states have been leaders in studies on irrigation management and methods. While this dependency upon irrigation has obvious advantages in the degree of control which may be exercised upon the soil-plant-water relations it also poses problems. The increased cost to turf production demands careful regulation of water application. However, unless large amounts of water are applied to leach the soil at regular intervals an increase in soil salinity will result.

Much study has been devoted to the use of soil moisture sensing devices such as the tensiometer. Many western turf managers are now using tensiometers as a guide for their irrigation practices. Tensiometers in pairs placed at various locations in a turf area will provide important information on soil moisture conditions difficult to obtain by other methods. One instrument of each pair is placed in the primary upper root zone and the other at a greater depth. By frequent reading of the two tensiometers in each location a turf manager can determine when and how much to water.

Methods of automatic sprinkler control with tensiometers have been developed. Sprinklers can be turned on and off as determined by the tensiometers. As these control systems are perfected, they are almost certain to find wide acceptance among the large turf installations.

Recent years have seen an increased interest in what may be called basic research on turfgrasses. This has become necessary because solution of the practical cultural problems often is limited by insufficient knowledge of the basic genetics, physiology and ecology of grass growth.

One of the basic studies that we have been investigating for a number of years is the responses of our turfgrasses to temperature and light conditions. In order to better understand the causes of bluegrass turf failure in the Southwest we have studied the differential responses of selected varieties to various factors of the environment. We have shown that the optimum temperature for tillering is much lower for some strains, e.g., Newport, than for others such as Merion or Fylking. Therefore, it should be possible to select strains better able to maintain satisfactory density during hot summer weather.

Investigations of root temperature as distinct from air temperature have shown that moderately high root temperatures (80°F) will restrict root growth of even warm season grasses such as bermuda. This has pointed out the importance of providing the best possible conditions for the turf during the cool fall and spring seasons so that a good root system to carry the plant through the summer can be developed.

This brief survey of a few of the turf research projects at the California Experiment Station is not meant to be exhaustive. Many types of studies have not been mentioned, for example the vast number of investigations on turf nutrition and fertilization. However, I hope that it has served to give you some idea of the scope of the work today and of the concepts motivating modern turf research.

TURFGRASS RESEARCH - AN INDUSTRIAL APPROACH

J. A. Simmons
O. M. Scott & Sons Company

The turfgrass industry has made available a range of products that provide with but few exceptions for every turfgrass need. Most of these products have been developed within the past ten years. With continued effort the number of new products should increase in the years ahead. This latter statement raises this question: What do these products represent in terms of technology, cost, time and industrial competency? Another way of asking the same question is to say - What are you really buying in a turfgrass product?

For the next few minutes this paper will be an attempt to give you an insight into some of the many research and development operations that precede the marketing of a turfgrass product. In particular, attention will be given to the following:

1. The scope or magnitude of commercial research
2. The research staff and its organization
3. Research and development operations and some commercial research contributions

For the most part the information will represent the work conducted by my company.

First, let's define "Commercial Research" - How does it differ from research conducted at our State Experiment Stations? The difference could be defined as one of purpose.

The Experiment Station Researcher is concerned for the most part in developing new knowledge, new concepts that pave the way for new developments. The industrial or commercial researcher's work must result in a product in which his company will invest, risk dollars to market, because it has potential consumer value and utility. You may have noticed that the modifying word "potential" was used. A product resulting from commercial research work, is judged a success only when it is delivered to and accepted in the market place.

Each commercial research program must have a well defined and rather specific purpose or policy as well. Such a policy sets goals and parameters by which research management develops and utilizes its resources. This research policy operates within a broader or general company policy or philosophy. Our company goals can be stated simply as helping all consumers, professional and amateur, achieve success. We define success as a dense green lawn or turf for as many days of the year as possible without undue effort. Nothing encourages consumer participation more than success.

Scope of Industrial Research

One of the best ways to define the scope or magnitude of commercial research is to cite two statistics - annual expenditures and the number of personnel engaged in research. However, no known detailed survey has been made to determine these figures. The Agriculture Research Institute did conduct a nationwide survey of the Agricultural industry and determined that \$460,000,000 was applied to commercial research in 1965. This survey did not include companies specifically engaged in the turfgrass sector of the economy.

In our company one out of every eight people employed are actively engaged in R & D activities. This means that in the aggregate more than 100 people are devoting their time to new technology. Other companies marketing turfgrass products could swell the personnel count to an impressive figure. For comparative purposes the USDA and SAES reported the equivalent of 245 scientists conducting ornamental and turfgrass research in 1965.

The Research Staff and Its Organization

What research disciplines are needed and how are they organized for work? In our R & D group there are at least 13 different research specialties or discipline represented. They are organized broadly in three main areas -- biology, chemistry and engineering. From an administration as well as stage of product development standpoint, personnel in the biology area are further organized into two main departments -- Bio-Chemistry and Product Development.

The Bio-Chem group is responsible for defining biological activity of chemicals in lab, greenhouse test programs and in primary field tests. The development group handles the field testing at Marysville and at six stations located through the United States. Also, advanced greenhouse work is carried on to support promising product compositions in the advanced stages of development.

The Chemistry Department is responsible for synthesizing very small quantities of experimental chemicals for the Bio-Chem testing program, formulation studies and the analytical methods for new products.

Engineering provides the data needed to produce new products starting with a process search for feasible production methods, to pilot plant studies and finally to the manufacturing process. Biology, chemistry and engineering work as one team in a commercial research program.

Toxicology- the study of pesticides and their affect on animal and human systems - is an essential part of any commercial research program. Some companies are large enough to have their own program. We make use of outside laboratories that are especially equipped for handling this type of research. However, we do conduct some special types of toxicology studies. More will be said later in this paper about these studies and the cost of toxicology.

We go one step further in our organizational approach to take full advantage of the research staff. Many research projects are of such magnitude that several research specialists are needed to adequately develop a project. For this reason, we organize our personnel on a project basis, also.

An example would be the fertilizer program. For a two year period, an Agronomist, a Physiologist, an Analytical Chemist and a Chemical Engineer studied several new potassium phosphate complexes as sources of plant nutrients for our fertilizer products. Data which included chemical reactions, analytical methods and plant response curves were used by research to help make decisions that related to product composition and manufacturing facilities. Also the information was organized and presented in two papers at the eightieth annual meeting of the Association of Analytical Chemists.

The research staff is further strengthened by the assistance of consultants. These consultants, university scientists working in highly specialized fields - help keep our people abreast of most current research developments. Science is moving so rapidly that it is next to impossible for the researcher to review all the necessary literature and still do his work. The statement is made based on studies that a new PhD graduate must spend 20% of his time reviewing the literature or become technically obsolete in ten years. The university consultant is one important way that our staff overcomes the hazards of technical obsolescence. Other methods include monthly meetings to hear invitational speakers lecture on some phase of science and by attending as many scientific meetings as possible.

The above discussion should bring out one important aspect of commercial research. It is a team effort - a coordination of disciplines to forge science into new technology. The premium placed on coordinated effort to achieve a goal will become more apparent as we get into the actual function carried out by commercial research.

Research and Development Operations

Biology: There are a number of standard screens or test systems to which a chemical must be exposed in the biological area before it becomes a product. A minimum of twelve (12) such systems are part of the standard program. Some of these studies can be conducted simultaneously and others are initiated as

more basic tests are completed. A minimum of three and usually five years of greenhouse and field work is required to satisfactorily define the performance characteristics of a chemical.

Laboratory and greenhouse facilities play a fundamental part in determining whether a chemical has biological activity. These facilities overcome the limitations imposed by weather and space on field testing. Weather restricts field work to specific seasons. Since many chemicals persist in the soil, a given plot area cannot be used more than once in a three to four year period.

One of the standard methods used to define activity is the small plastic pot test conducted in the greenhouse. A group of five to ten plants, each representative of a specific weed or desirable plant family, are used as indicator plants. Such tests take anywhere from four to six weeks to complete. Those chemicals that show activity greater than proven standards are moved on to new test systems.

New methods are constantly being devised to isolate biological activity more quickly and efficiently. Such methods as the blotter test use root elongation as a measure of chemical activity. Most of these tests use either germination, growth rates of plants, fungi, etc., as activity indicators.

The Bio-Chem group has another way to isolate chemical activity. All plants exchange oxygen and carbon dioxide as a result of photosynthesis and respiration. A chemical capable of disturbing these processes would affect the rate of gas involved by the plant. A very sensitive instrument called a polarograph can detect the slightest changes in oxygen exchanged by a plant cell. This capability eliminates the need for a large plant, so a one-celled plant - such as algae - is substituted as an indicator. The algae is introduced into a known concentration of the chemical and within a matter of minutes the effect can be precisely measured on a strip chart. Such a system saves time in terms of weeks, valuable greenhouse space, and chemical costs.

Biological activity can be isolated in lab and greenhouse screens but the correlation between greenhouse and field activity is low. This is the reason for a series of field experiments starting with primary tests to confirm greenhouse findings and continuing on to advanced tests over a three to five year period. Each chemical and each formulation of that chemical must go through each field test system.

In any one year it is not uncommon to treat some two or three thousand plots in studying one particular chemical. Plot sizes are usually related to the stage of development. Plots as small as one square foot can provide as much information on phytotoxicity as one twenty-five times that size. Careful planning is essential to make the most effective use of field plots.

Test systems are purposely designed to reveal every conceivable performance characteristic of a given chemical.

But the system does not supplant the need for a keen and observant researcher. One example shows the value of the researcher. In 1964 a fungicide program was undertaken to isolate Stripe Smut control. It included a series of fungicide treatments applied to diseased turf throughout the summer months. Visual observation failed to detect any appreciable reduction in Stripe Smut.

The spring of 1965 one of the researchers reviewing the experiment noted that three of the plots contained a bright green dense turf. The other plots were badly thinned and brown. A potential control for Stripe Smut had been observed for the first time.

Since a light rate of the active ingredient PCNB had been used in a repeat application program, it was decided to explore heavy rates in single massive dosages. For the remainder of 1965 and 1966 this program was pursued in detail.

The heavy dosage approach proved highly successful. From this program the first positive control for Strip Smut was developed.

PCNB controls as well as prevents Stripe Smut and other diseases. Only one to two applications are needed per year to prevent disease activity due to the good residual properties of PCNB. This important contribution could have been lost or never discovered if it had not been for an alert researcher.

The research program at Marysville, Ohio is supplemented by a regional testing program. The United States is a vast country with several rather well-defined climatic regions. These regions have distinct plant communities. A chemical that works on one weed or one specie of grass may be ineffective or detrimental in a different environment. There are a number of examples that demonstrate regional differences.

Atrazine and Simazine at one to two pounds of active ingredient per acre can easily eliminate most grasses like bluegrass, bentgrass and fescue. But these same two chemicals can be applied to grasses like St. Augustine, centipede and zoysia with complete safety and they provide excellent weed control. Diphenamid is another example. It cannot be used on any of the grasses mentioned at ten pounds per acre but dichondra is completely tolerant.

My company has recognized these regional relationships by setting up a series of field stations in six locations throughout the United States. The states involved are Florida, Texas, California, Oregon and Washington, D.C. These stations range in size from 2 1/2 to 10 acres, have irrigation systems, and are manned by experienced research personnel. The regional research program provides the following benefits:

- (1) A rapid and efficient method of evaluating all biologically active chemicals on major turfgrass species used in the USA.
- (2) The development of products and program especially designed for each climate region.
- (3) The ability to quickly evaluate any unusual trends in product performance.

Another field station operation organized and initiated in 1964 places our commercial research operations on an international basis. The Scott Company began marketing lawn products in Europe through the Wolf Gerate Company of West Germany in 1965. Wolf is a large manufacturing and merchandising operation with outlets in many European countries.

Since European growing conditions differ from those in the USA the research and development program was undertaken to support the marketing program. Also lawn trials are conducted in five west European countries by Wolf personnel. This R & D program is coordinated with the Scott program in the USA.

In three short years there has been a great increase in turfgrass research in western Europe by both public and private organizations.

The above examples represent only part of the test systems used by the biology group. This particular program has seen some changes in methodology and techniques over the past fifteen to twenty years. The program has become more and more sophisticated and expensive. The success of the program depends on good systems and well trained researchers.

Chemistry

The chemistry staff makes its contributions to the research program using highly specialized equipment and instrumentation for making small or micro quantities of chemicals and for analytical studies. The chemists synthesize or formulate quantities of chemicals for the initial lab and greenhouse tests. In the very early stages of developing a chemical that shows promising biology activity, the biologist and chemist work very closely together. They must determine as quickly as possible the most effective chemical formulation. Once the activity has been established, three important jobs must be completed:

- (1) Determine the chemical and physical properties
- (2) Develop an analytical procedure
- (3) Establish the stability or shelf life of the formulation.

The chemical and physical properties give the biologist clues to what can be expected in field tests. A highly water soluble chemical may leach readily in the soil or be deactivated quickly by the soil colloids. A water insoluble chemical may suggest residual properties. The influence of these properties on all aspects of environment must be researched in field plots.

The analytical chemist must develop methods by which the concentration of a chemical in any type of formulation can be determined quickly and accurately. This analytical method is used to verify the quality of the product before it ever leaves the manufacturing plant. It is also used by state control labs as well as the company as further evidence of product quality. By today's standards, developing analytical procedures were a simple challenge about five years ago. Formerly most products contained one and possibly two active ingredients. Simple analytical systems were usually sufficient. Today, in the era of multi-purpose products containing three or more chemicals in combination with fertilizer, simple analytical systems cannot do the job. It takes complex expensive instrumentations like infrared and ultraviolet spectrophotometry and gas chromatography. Some thirty analytical procedures have been developed in support of the product program. They were used to make 64,000 analyses last year for production. Fast, accurate instrumentation makes it possible to handle large numbers of samples.

Occasionally some concern is expressed about the ability of industry to produce combination products with the active ingredients properly distributed throughout the carrier at the right concentrations. Our experience has demonstrated that it is possible. We do it every day. The product meets specifications based on approved analytical procedures or it does not leave the plant.

Also the chemists must conduct a series of studies to determine the

stability or activity of a proposed chemical product which may be stored over a long period of time. A year or more may lapse between production and the use of the product. There are a number of possible ways by which chemical degradation or loss of activity can take place. Some of them include interaction with carrier, interaction with other active ingredients, high temperatures, light, excessive moisture, etc. All these factors must be researched. An accelerated system of exposing the formulation to controlled high temperatures for short periods of time is one method. These results are verified against long term tests under normal storage conditions. Each new product gives the chemist a new challenge as no two formulations behave the same.

Engineering

Engineering moves into the commercial research picture once the activity of a chemical suggest that it has commercial possibilities. They must define and develop:

- (1) The best possible production process based on bench scale tests.
- (2) A pilot plant facility for the preferred process.
- (3) The manufacturing process based on the pilot plant studies.

The process studies conducted by the engineering staff must take many factors into consideration. Some of these factors include:

- (1) How and at what rates to deliver one to several active ingredients to the carrier
- (2) Save operating temperatures
- (3) Proper mixing intervals
- (4) Drying requirements
- (5) Flow-ability of the product during processing and after prolonged storage.

One very important aspect of their work is to provide facilities that insure the health and safety of production personnel.

Pilot plant facilities must be designed or existing facilities modified to determine the feasibility of proposed product process. These same facilities are used to supply materials for large scale testing programs. Together the chemical formulation group and the pilot plant operation provided some 12.5 tons of experimental formulations to biology for greenhouse and field tests in 1967. The pilot plant staff has a particularly challenging project. A patent was awarded the company recently on a process for making an improved fertilizer. This new development is a very high analysis formula, is lighter weight than the existing product and has no carrier. The engineering group through pilot plant studies will be determining the most efficient and economical process for production.

Toxicology

Earlier in this paper we pointed out that our toxicology work for the most part is done by an outside lab. The extent of a toxicology program for a turfgrass chemical depends on its oral and dermal toxicity to rats. Nine separate investigations may be necessary to fully characterize the mammalian effects of a proposed new product. Rats, rabbits and dogs are the test animals used in these studies. During the last couple of years we have been conducting

studies designed to determine the influence of soil-persistent chemicals on wild life, particularly birds. The indicator birds used were Japanese Quail. They grow fast and can be managed reasonably well in cages.

The test system followed is precise and detailed. The test area must be free of pesticides before treatments are applied. The birds must be fed a certain way, moved on a regular schedule, checked for appearance, eating habits, etc. At the termination of the test the birds are sacrificed, the internal organs studied and the entire bird analyzed for the pesticide. Every piece of toxicology data is used to develop a caution statement for the label that will permit the safe and effective use of the product.

Toxicology studies are expensive. Our costs for specialized studies have been as much as several thousand dollars. For an agricultural product where residue and reproduction studies are required, costs are reported to range upwards to \$400,000.

Disposition of Data

Every piece of data developed during the period a proposed product is under investigation is used. Detailed reports on product performance are prepared for the pesticide regulation division of USDA. Directions and caution statements that make up the so-called product label are based on information developed in the programs just reviewed.

Only when commercial research supplies sufficient information to insure effective and safe use of a product does the USDA grant permission for the sale of that product in interstate commerce.

Other important uses for research data are:

- (1) Support for patent coverage
- (2) Packaging research
- (3) Developing technical data sheets covering product performance and specifications and manufacturing specifications for each product.

A special committee made up of R & D Department managers meet each week to coordinate the technical information program.

The above review includes only a part of the operation for which our industrial research group is responsible. Such areas as grass breeding and development, seed production research, plant nutrition research, ornamental studies, mechanical development which includes spreader and mower research, packaging research, etc., are a vital part of the program.

At the start of this paper the question was asked "What does a turfgrass product represent in terms of technology, cost, time and industrial competency?" Such a question can be answered by the following statement. The products that you use in your turfgrass program represent more than just fertilizers, herbicides, fungicides or a new grass variety. They represent the expenditure of substantial research funds over a period of years by teams of experienced and specially trained personnel. Commercial research puts science into action through new product developments.

CUTTING LABOR COSTS IN TURFGRASS MANAGEMENT

Tom Mascaro
West Point Products

The cost of maintaining turfgrass areas has been increasing year after year. Unfortunately, operating budgets have not been increased rapidly enough to meet these ever-increasing costs. Club officials must recognize this and, unless they are satisfied with a sub-standard course, they must take a hard look at their operation and supply the funds to provide people with what they want. It appears to me as I visit clubs around the country, that bar stools have more chrome, carpets are thicker, walls are expensively paneled and draped, and the golf courses are going to pot.

I would like to go on record by saying that the superintendent is not to blame for this situation. By and large the average superintendent is doing an amazing job with the funds and facilities he has to work with. He is making every effort to learn more, to develop new techniques that will save the club money. He attends turfgrass conferences and monthly meetings. He freely trades information with fellow superintendents.

But, in my opinion, this is not enough. He needs to get through to the club officials and get them to recognize where the problems are.

The basic problem is simply this: "You must spend money to save money." O.J. Noer had a classic statement of his own that said it in a different way. He was heard saying, many times: "A golf course is not a place to save money -- or to waste it." These statements pave the way to our discussion, "Cutting costs in turfgrass management." When we begin an analysis of any operation to bring down costs, the first things we look for are those areas where most of the money is being spent. The sum total of savings on little things is insignificant. It is in the big spending areas where the greatest savings can be made.

Where is the largest expenditure in turfgrass maintenance? Labor, of course. This is where most of the money is spent. Labor budgets today average about 70% of the total budget. I wonder how many people realize that in 1939 - 30 years ago - the labor budget averaged 70%. It is obvious that little or no change has taken place. This is obviously not true in other industries. Coupled with the fact that labor usage is high, is the fact that labor is also scarce. Competition for manpower -- that is getting higher wages and more benefits in other industries-- is slowly driving turfgrass management into a corner.

What can be done? Well, it's better to start too late than never. And the way to start is with a plan. A plan that covers all aspects of the problem. You can make up your own, or use the following as a general guide. Remember, don't cloud your plan with a lot of unrelated problems. Stick to one concept, and that concept is doing the job that the membership wants done with a minimum of labor and cost. Don't compromise. Cheap labor and improvised equipment waste money. Your club is not looking for something cheap. They want top quality at a reasonable cost.

Areas to Explore

1. Your over-all system of operation
2. Operations that lend themselves to mechanization

3. Preventive equipment maintenance program
4. Parts inventory and control
5. Reconstruction to reduce maintenance
6. Redesign of fairways and roughs
7. Comprehensive study of sand traps
8. Labor and labor relations

Let's elaborate on each one of these points.

1. Over-all system of operations -- When you take a cold, hard look at the average system of operations on many golf courses, you find that the sequence of operations and the methods employed were not developed from the standpoint of efficiency, but rather were developed through trial and error. In many cases we find not a planned operation, but an inherited system. This does not mean that the whole system is bad, but it does mean that there is plenty of room for improvement.

It is my feeling that the whole system must be re-evaluated. A scientific and practical approach must be developed to meet the challenge of the sixties with its rising economy, high prices, and labor shortages. In evaluating a system of operations, one must start with cost and time studies. This is something that is seldom, if ever, mentioned in any turfgrass publications. The first thing you need to get into cost and time studies is a stop watch. This little instrument will give you a lot of information. For example, how long does it take to mow a green? If you determine the time that the reel is actually cutting grass, you will find that the total time is only 10 to 11 minutes for an average 6000 sq.ft. green. The rest of the consumed time is used up getting to the green, preparing the mower, emptying the basket, hand-spitting, etc.

In industry, we are guided by a rule known as "Parkinson's Law." His law states: "Work expands to fill the available time." (It might be a good idea to type Parkinson's Law on a piece of paper and glue it to the back of your stop watch.) It means that, if you have an hour's time to get dressed, you consume the time doing so. If you have only ten minutes to get dressed, you accomplish the same job in that amount of time. Therefore, if it is the custom at your club to allot three hours to a man to mow his greens, then he will use this time to complete his task.

If you change the procedure, you must also change the time consumed, and this is directly related to cost. What we are really attempting to do is not to force a man to work harder and faster, but we are developing a system which will make him more efficient and therefore do more at less cost. The formula I use is 10 minutes a day represents a saving of \$100.00 a year, because you must add to the hourly rate, vacation and all benefits the employee receives. Projecting from this formula, if we have a crew of ten (10) men, at a savings of \$100.00 a year each, we wind up with \$1,000.00 saved. Assuming that I am correct in my observations, and taking the low figure of one hour per day saved, this represents a saving of at least \$600.00 per year times ten (10) men is \$6,000.00. This represents a nice chunk of your labor budget.

What I have pointed out here, however, does not mean that you can proudly tell your club officials that they should deduct this money from your budget. Every cent that you save is going to be needed for the inevitable increases in wages, including your own salary and equipment to replace manpower.

2. Let us now explore operations that lend themselves to mechanization. Here is another area where a great deal can be done. Far too many golf courses are still back in the horse and buggy days. Antiquated equipment, or worse yet, total lack of equipment, means that the job to be done must be bulled through with expensive hand labor. In this day and age, we cannot afford to dig ditches by hand. We are wasting money when we mow an area with an eighteen inch hand-pushed rotary mower when the job can be done with a riding triplex. We should not waste a man's time in walking when he can ride. We should use machines that require one man rather than a crew. Many operations can be mechanized today with modern equipment. Some of these operations include aerification, top dressing, dragging, mowing, watering and even supervision.

Two-way radio systems increase efficiency tremendously, making possible immediate contact with workmen on any part of the golf course. Closed circuit Television is also being experimented with in turfgrass management. There are many areas where remote observation saves a great deal of time and effort. For instance, a T.V. camera can be installed in the pump house. Meters, dials, and operation of the pumps can be observed on the monitor set installed in the equipment center. Two-way radio systems and closed circuit T.V. greatly enlarge the superintendent's ability to manage many more things in a shorter space of time.

3. We should initiate and enforce a preventive equipment maintenance program. Much has been said on this subject, but not much has been done about it. Ford Motor Company has published these figures. Failure to replace a damaged \$10.00 dry type air filter on a tractor can cause more than \$150.00 engine damage. Replacing a \$2.50 hydraulic fluid filter may save \$25.00 to \$50.00 in parts and labor later on. A cracked hose between the air filter and carburetor costs just one dollar to replace, but can cause \$100.00 or more engine damage. In less than a half hour, \$1.00 or \$2.00 worth of labor, you can clean, service, and fill a battery that might save a new \$20.00 battery. Just a few minutes spent each week inflating tires correctly can save \$10.00 or \$20.00 or more in yearly excess wear to tires. We could go on and on. With a good preventive program of equipment maintenance, we not only pick up impressive savings, but equally important is the equal savings in down time while repairs are being made.

4. Parts inventory and control is another area that saves money in wasted down time. Many supply distributors have spoiled you with their efforts to keep you supplied with parts on a minute's notice. It takes more than a minute to get you the part; and both you and your supplier are losing money and patience. It does not take much time to sit down with your supplier and determine those parts on each machine that are going to wear. Order them and stock them in your own parts inventory. Ask your supplier to replenish your parts stock in an orderly fashion as you use the parts. When a good parts inventory system is installed, you will find that you will not have to run all over hell to get things moving again.

5. Reconstruction of the golf course layout is a big area to reduce costs. You must learn that you have to spend money to make money. Many golf courses were designed when labor was cheap. Tees are usually the prime target in reconstruction. Many tees and tee areas cannot be maintained efficiently with modern equipment. Reconstruction will eliminate a lot of headaches along with saving a great deal of money. Reconstruction of bridges, hard-to-maintain creeks and banks all fit into these areas of exploration for cost savings.

6. Redesign of fairways and roughs can easily knock off fifteen to twenty-five acres of intensive care turf. Many golf course fairways have become bowling alleys and greens have become saucers. Constant mowing in straight lines has destroyed the free flowing design of the architect. Fairways have become wider than they need to be. Stake out each fairway to make it look like its original design and you will find that you will pick up quite a few acres that do not need the intensive care you are now giving them. When this is done, it will be reflected in savings in mowing time, fertilizer, water, and wear and tear of equipment.

7. A comprehensive study of your sand traps may reveal a substantial area for cost reduction. I believe that I am correct in stating that the maintenance of sand traps is the second largest item in your budget. Anything you can do to eliminate traps or reconstruct them for easier maintenance is going to reflect substantial savings each year.

8. Labor and labor relations is seldom considered as a cost-saving area, since we usually relate it to higher wages, more benefits and more manpower. Yet, if we look at it logically, we find that labor and labor relations have a profound effect on costs. I am talking about efficiency in performance. I am talking about attitude. A well-adjusted worker that likes his work, communicates well with you and enjoys working at your club, is an asset to your organization and can be directly related to cost of operation. The first thing you must offer is a decent living wage with all the expected benefits. But it doesn't stop there. A good man wants to become part of the act. He is willing to share your problems, if he can share in the praise. Recently, a golf course superintendent told me that, while he was having lunch in the club house, a member came by and praised him for the fine condition of the course. He said it made him feel good all over, and the raise he had been thinking about didn't seem as important. I asked him if he had gone right out and told his men the same thing. Unquestionably, they would have felt as good as he did about it.

There is virtually nothing that motivates people more than pride. I feel certain that many of us work for less than we could get somewhere else, or in another line of work, because we are willing to trade dollars for satisfaction. All of us would rather work for less dollars and be happy, than to make a lot of money and be miserable. I believe this is especially true of workmen who choose golf course work for a living. In many ways, it is a hell of a way to make a living. Rain and mud, stinking hot and freezing cold, bitching members, and flying golf balls, tiring work, and no one appreciates the work that he has done. The disadvantages of the job must be offset with enough good things to make him want to stay on. Becoming part of the team is a strong motivating force that will keep him on the job day in and day out.

Building the team is your responsibility. Learn to communicate with your men. Bring them into the act. Hold meetings with them. Explain in detail what you are trying to accomplish. Involve them in your short and long-range plans. You will find that it will pay big dividends. When you sense that a man will not become part of the team, get rid of him. If you can't replace him, you may be surprised to find that your team will take up the slack. Get rid of dead-heads. Take the money you were paying them and give it to your good men. Analyze it this way. If you have ten men and two are fouling up the works, get rid of them. For round figures, let's say they were making \$2.00 per hour. That's \$4.00 an hour you have picked up. If you divide the

\$4.00 among the eight remaining men, you can increase their wages \$.50 per hour. You can get a lot of mileage with this kind of money. Bring your men into the act. Let them know that you have just so much money to spend on labor to get the job done. Every additional man you hire is robbing their paycheck. Make them conscious of this. The less men to do the job, the more they make. Efficiency will sky-rocket. Your men will give you more ideas than you ever dreamed of to cut costs.

Summarizing the points that I have outlined, I would say that I have lightly skimmed over some of the important areas that you can study for cost savings. If you apply yourself, I am sure that you can come up with some surprising answers. When you do come up with answers, go over them with your officials. If you can sell them your ideas, you will find that they will help you achieve your goals.

REMEMBER -- as superintendent of turfgrass maintenance, you must concern yourself with only three primary areas of activity. These three areas are covered by the three F's:

1. Finances
2. Future planning
3. Fouled-up details.

THE RELUCTANT HUMAN

Professor John W. Denison
University of Massachusetts

Are some human beings reluctant? Are all humans reluctant? What would you think if I were to say, "Joe was reluctant to accept the job of foreman"? Maybe we had better find out what the word reluctant means. Brother Webster states, "Reluctant - 1) Struggling against, resisting; 2) Characterized by reluctance; averse (implies habitual or rooted repugnance); unwilling; disinclined." Under synonyms Mr. Webster states - Reluctant often implies an internal or inner struggle. It is this last meaning that I will use when referring to the word reluctant. A person to whom I refer to as being reluctant is one like Joe. He was having an internal struggle with himself about accepting the job of foreman. I guess we could also say that he was in some measure afraid or even better, apprehensive of becoming the foreman.

When Joe Troll invited me to speak on this program and suggested the general subject of labor management, let me tell you I was quite reluctant! I had an internal struggle -- I'd like to meet with that golf group again, but what in the blue blazes do I know about their labor management. Yet, their problems must be the same as in my industry, but I don't want to possibly make a fool of myself in front of some visiting experts. Yet, maybe I could present one or two management tips or perhaps refresh their memories to good administrative practices, but - yet - but -- do you understand my inner struggle or reluctance?

Are any of you reluctant when invited to speak? Are you reluctant because you'r not willing to research your assigned topic and then put it all in your own words? Are you reluctant to speak for fear you'll not do well and get passed

over for that promotion? What if you make a boo-boo in front of your subordinates, will they lose respect for you? Will your peers laugh at you? Truthfully, how many of you have experienced this feeling of reluctance? If you haven't, do you think you ever will? I'm sure that anyone who assumes leadership has or will many times. Therefore, if you desire to be a good boss, an accomplished administrator or a recognized leader, you've got to be willing to look around for more knowledge about your job and the many facts related to your job. The better you do this, the better educated you become. But most important, you strengthen your wisdom, which in turn will give you inner or personal confidence. Education often has little value unless you have the wisdom to put it to work properly. I suggest that anyone desiring wisdom and confidence bad enough has the necessary tools to remove this specific wall of reluctance -- the reluctance to get up and speak or express yourself.

Dr. Troll, after listening to the other speakers and reading the program, I want you to know that you've done a nice job coordinating this program. Really, I'm serious, I'm not fooling, I'm not blowing your horn just because these people are here and I'm not polishing the apple to get the job that's open in your department. Folks, do you recognize the reluctant human again? Inner struggle -- he did a good job, but - maybe he will think - yet - he deserves some praise - but- maybe someone will misunderstand my motive - yet - but - yet. Why are we often reluctant to sincerely praise one another without fear of how it may be received or what others may think of it? Maybe we could say that "Well, it's human nature to be suspicious." As a maintenance administrator, are you reluctant to get up in front of your men at an important meeting and praise the club officers present for the fine job they are doing and tell them how happy you and your men are working there? What if the meeting were one week before the club was due to close for the winter? What if it were one week before the club officers and members were meeting to discuss maintenance funds and personnel wages for the ensuing year? Would anyone suspect anyone else or would anyone guess that someone might suspect someone's motives? You're right; this goes on at many meetings and conferences. To help remove this reluctance to sincerely praise deserving subordinates or superiors, you as an administrator, foreman or leader must spend some of your valuable time in getting to know and to understand those you work for or with. Without this knowledge and understanding, timing and tact are seldom used properly and this is when people will begin to suspect your motives. So, if you desire to be an accomplished, well-liked leader or administrator, get to know your people and then use timing and tact when you wish to thank or praise those deserving of it.

I have a junior staff member in my office who became very interested in the topic that I was invited to speak on here today. In fact, he was so intrigued with my topic that he intimated he'd like to give part of this presentation because he felt that he had some real good ideas. He could have done a real nice job, but since he hasn't done much public speaking, I figured he'd better wait for a smaller group. Also, he is pretty well liked and respected by the boss as he is a real go-getter, and I'd have hated to see him make a mistake and feel bad, so I figured I had better do the job. Has anyone recognized this common situation and the types of reluctance strewn all through it? As an administrator, are you reluctant to let your aggressive, younger, next-in-line assume some of your responsibilities? Do you feel his enthusiasm and help him? Do you train and teach him to the best of your ability? Or, are you once again one of those very common reluctant humans? Might or could it depend on how secure you as an administrator feel in your present position? I suggest that most anyone of us

here today who was not too sure how solid his administrative position was would undergo some type of inner struggle when deciding whether to go all out to help an understudy. Isn't this a very natural reluctance? I think it is, but it is one which should be removed if we wish to become a respected leader or administrator. It is one of the toughest types of reluctance to get rid of completely. For as humans, we all have egos and status which we attempt to protect; we generally seek some job security and will fight to keep it; and we don't care to make too many personal sacrifices, usually only when necessary. Yet, I believe to be top-notch in administration, these factors must become secondary and not primary. Before I leave this area, I've got to tell you right now that I do not have a subordinate itching to take my position. I was using this as an example. One piece of truth though, I know that I will have very soon and then I must practice what I preach.

I have a brother-in-law who struggled, made many personal sacrifices, and last year finally made the management team. He became Production Manager. His boss, who had been Production Manager moved up to Production and Procurement Supervisor. Top management in his company recently made quite a number of administrative decisions that upset most of management and all of the plant labor force. As he told me, "The 'esprit-de-corps' of the entire plant is being lost." Labor is no longer concerned with top quality or efficiency, and the union leaders are suggesting that more money is the only solution to the problem. He is constantly being called onto the carpet for production problems, and he is now being badgered by the union every time he attempts to institute new efficiencies. In plain words -- he's now between the frying pan and the fire; he seems to get burned no matter which way he turns. I asked if he would rather be back at his previous job where he was accepted as one of the boys in the production lines with less responsibility and less money. After thinking for a minute, he admitted that he would if things were going to be like this very often, but that now he would be reluctant to inform management he didn't want to assume all the responsibilities inherent with this job. Why be reluctant to tell them? Wouldn't they understand? Would they fire him? Would he be happy taking orders from someone that was originally taking them from him? Do you suppose he has an inner struggle? He sure has -- he's reluctant to continue with the mounting pressures, yet he's reluctant to now try and return lest he lose everything. The point I wish to make is this. Are you really leadership or administrative material or do you have too many reluctances standing in your path? I know that I've got some of these reluctances to contend with should I desire to seek an administrative or management position. I'd have to decide for sure if I could settle many inner struggles or reluctances such as:

1. the reluctance to accept all the responsibilities that go with the job being sought or being held.
2. the reluctance to make required personal sacrifices, such as working nights, traveling, changing social habits, or moving the family whenever and wherever required.
3. the reluctance to give and receive criticism from above and below.
4. the reluctance to continually seek new knowledge and new ideas and then to accept the new challenges these would present. The 'rut' is often quite comfortable.
5. the reluctance to present your subordinates with your goals and values lest they use them against you in their climb up the ladder.
6. the reluctance to let your enthusiasm show, lest management or labor suspect your sincerity.

Gentlemen, this list could contain a great many more of these factors so essential in creating top administrators or leaders. Before I quit, there is just one more type of reluctance I'd like to throw out because here at the college level I see it so often. Are you reluctant to use simple words in your general communications? Or do you use the biggest and floweriest words possible to impress the recipient, irregardless of whether he understands or not? The use of proper, meaningful, simple words is often purposely set aside and the gobbledygook of a specific discipline takes over. For example-- a maintenance foreman caught in a dilemma such as the one my brother-in-law is facing, would not be just a reluctant human being, he could be an enigmatic, systematized turf engineering specialist that has entered one of the responsive, transitional phases of integrated, organizational management where policy projections and flexibilities have created in him a noogenic neurosis needing immediate psychoanalysis in the form of logotherapy. Would you believe it?

Gentlemen, this world is made up of reluctant humans and we should be thankful it is. The world of business is also made up of reluctant humans, some being more reluctant than others to do the things which enable them to climb the stairs of success. This provides us with all levels of labor and management. Whatever level each of us desires to reach is partially dependent on our level of reluctance to do or accept that which is required.

THE PROBLEM DRINKER - MANAGEMENT RESPONSIBILITY

G. E. Osburn
Hercules Company

It would be logical to think that the topic of problem drinking, and management responsibility towards it, is somewhat foreign to a meeting such as this. However, after some reflection, we may find that problems due to the misuse, or abuse, of alcoholic beverages have had an impact on our family, our personal, or our business relationships. The way our society is behaving, the importance that our society places on drinking, the cocktail, and the acceptance of alcohol, is replacing apple pie on the American scene. More important to us here is the probability that the misuse or abuse of alcohol will touch our future lives, both socially and professionally. It seems fitting, therefore, that your program committee chose to include this subject on the agenda for your fine conference.

Many endeavors are represented here today, and most everyone present is a professional person; the golf course superintendent, the industry people who provide many services to the turf industry, those in the academic community, and many others represent diverse skills and occupations. But, the group has one thing in common -- all are managers. Everyone in this audience is a manager. Everyone has the management responsibility for his own personal behavior. To those who have management responsibility over the work of others, the image that those people form of us will be a reflection of our personal management ability.

To young people who are beginning their careers in industry, and in particular to the younger men in our company, we say that the way a person manages himself will be one of the key factors in assessing his ability to manage others. Again, the image that a person projects during his social, as well as during his

business hours, becomes an important criterion in his successful progress in business affairs.

I note the very fine article by Mr. Bill Rahling entitled, "The Successful Superintendent" which was printed in last month's "The Golf Course Superintendent." Among all of the things that he says that the successful superintendent needs to be, he includes the subjects of "relations with members", and "acquiring respect". He says, "The superintendent should be aware of all factors which reflect on his personal character." He further states, "...A competent superintendent who is respected should never have fear of his job being in jeopardy." Perhaps you will allow me to say that the image a person projects determines whether or not he gains the respect of others. Respect is something we earn, and cannot demand. One way we earn it is by our ability in the area of personal management.

Perhaps, it would be well to establish a base line, or some guide posts as to what we talking about when we use the term "problem drinking". We need to know that the disease, alcoholism, is the fourth ranking public health problem in the country today. The vast majority of Americans age 20 and over drink alcoholic beverages to some extent and some 6,000,000 people are problem drinkers, or have problems due to drinking. This means that some 6,000,000 people are afflicted with the disease alcoholism and in the medical sense can be considered alcoholic. Obviously, their alcoholism and the severity of the disease covers a wide range, from mildly serious to full blown catastrophe. We suggest that these 6,000,000 Americans are important to consider and to understand in our management education. We also need to be mindful to the fact that perhaps 50% of the automobile accidents today are alcohol connected. And in the one car accidents, where the driver and/or passenger is killed, one or the other, or both are "under the influence" in at least 50% of the cases. Blood alcohol tests will become standard procedure in accident investigation and in all moving violation charges. State laws today are being revised to include blood alcohol levels to indicate sobriety, and the levels indicating "under the influence" are being lowered. Some will say that this is another government interference into our private lives and our personal pleasures. None, however, will say this who have been the victims in an accident caused by someone who was not in control of himself and his automobile. We sometimes fail to realize that the automobile is a lethal weapon. We certainly understand something about other lethal weapons, and we don't want to be around a person with a gun in his hand when we know or suspect that he's had too much to drink. The car, as well as the gun, are lethal weapons and we must remember it!

Now we've talked enough about generalities, let's get back to specifics. A country club, a cemetery, a parks department, represent a substantial financial investment. A superintendent has been given the responsibility to protect, and enhance, the value of that investment. The return on investment will be proportional to the quality of supervision exercised by the superintendent. Perhaps you will allow me to say that the profit on the investment, realized by both the superintendent and the club, will be the satisfaction and the pride in which the club is held by the members and their guests.

To carry out the assigned responsibilities, the superintendent must have the tools with which to work. These represent further investment. When we think of investment we sometimes think of machines and supplies, but the largest investment we ask the club to make, and the largest investment that we have under our control, is in people. I believe you will agree that key people, who are responsible, are getting harder to find and perhaps harder to keep once we have

found them. A person who is dependable, responsible, ambitious and so forth represents a sizeable investment. We have spent time and money in his training. We assign him to work with expensive equipment; we count on him to help us fulfill our duties. We give a great deal of thought to the cost of hiring key people and we labor over the budget to find the money to acquire them. Seldom, however, do we give full consideration to the loss of a key person. As professional management people, we must think in terms of protecting our investment. And, statistically, some one in twelve to one in fifteen adults will not be able to handle alcohol. At some time in our management careers the statistics will catch up with us, and we will have a problem drinker in our work force. What do we do about it? Some say that the most expensive thing to do with a person with a drinking problem is to fire him. Others will say that the cheapest thing that we can do is to try to help him get well. I subscribe to the latter. In industry today some 70% of those who suffer from problem drinking or alcoholism can and do recover -- and return to full productivity. Since problem drinking and/or alcoholism is accepted by the medical fraternity as a disease, we can perhaps come to a better understanding of the nature of the problem. It is an insidious disease, which means that it takes a long time to develop. It may develop from the initial habit of drinking to relieve anxiety, pain or insecurity. Next the dependency stage is reached, where alcohol is used to carry out ones responsibilities; until finally the full blown effects of the disease are known to all. Perhaps the hardest job of a supervisor is to be able to see the developing symptoms, before the person is fully in the grips of the disease. We particularly need education on the subject. But I believe each of us can see, or have seen, a person's dependency on alcohol grow, and have watched the regression in his work performance, and the ability to do his work deteriorate. When we see the progressiveness of the drinking pattern in an employee we must act, if we wish to keep him from falling into the grips of the disease. If we wait until the situation has reached the chronic stage, then the denials, and the excuses for poor performance are direct symptoms of the disease. More drastic steps are now needed to help someone who does not now realize he needs help.

The "boss" is the most powerful motivator, and the only voice of authority that a problem drinker may listen to. The power over the paycheck and the threat of the loss of the paycheck, due to poor work performance, is the key. Notice I said poor work performance and not his drinking is the tool. All discussions and arguments over whether or not drinking is responsible are frustrating, and meaningless. Only a man-to-man discussion centered on the work situation, plus a time limit to get the job back in shape, can the superintendent be on firm ground and project his authority. Drinking should be discussed, but not argued, as one of the possible causes for inadequate performance and which must be corrected. This approach is proving successful in industry.

Let's look at it this way. A good superintendent knows his men. A good superintendent, or manager of men, is sympathetic to human problems. The best managers of men are those who are firm and fair, and in this manner have gained respect from their employees, because they have handled their responsibilities. Some of them may not have been to their liking, but they have handled them in a conscientious, sincere manner and have left the employees with the feeling that the boss cares. As management people, it is part of management responsibility to identify drinking problems and act on them as we do any other human problem -- firmly, fairly, and forthrightly.

Developing problems can be seen if we will look. Drinking problems are known by the family. Even a child at the age of three knows when there is a drinking problem in the home. So we, as managers of people, can and must recognize problem drinking when we see it. We prove our mettle as managers by acting on it as we would any other suspected reason for poor job performance. Perhaps, most of all, we can achieve tremendous personal satisfaction from helping a fellow human being become a better man.

CONTEMPORARY DESIGN STANDARDS

Geoffrey S. Cornish
Golf Course Architect

Golf is the Nation's fastest growing competitive sport. According to Mr. Harry C. Eckhoff of the National Golf Foundation golfers have increased from under 4 million in 1957 to over 9 million in 1967, an increase of 140 percent. Golf courses in the same period increased from around 5500 to just over 9000, an increase of about 65 percent. Moreover each golfer plays many more rounds per year than formerly. It can therefore be seen that despite the surge in golf course development, the opening of new courses is not keeping pace with the increase in play. It is therefore appropriate that Dr. Joseph Troll has arranged for this morning's session to be devoted entirely to design, construction and reconstruction.

This past summer I had the privilege of studying the renowned layout of the Chicago Golf Club for several days with the Superintendent, Mr. Donald Gerber. This course was designed around 1890 by Charles Blair MacDonal, the Father of American Golf Course Architecture. For decades it was his home club. Later around the time of World War I Mr. MacDonal brought the course up to date with extensive changes. Since that time, however, no major changes have been made. And except for a few minor changes involving tree planting, the re-opening of several sand traps that had been closed and the enlargement of one pond, I recommended none. Here, indeed is a layout that has stood the test of time. What are some of the characteristics of such a layout.

The triangle of basic considerations has been incorporated in every feature of the layout. This means first the golf course is an exciting and challenging one for all types of players; secondly, it is a thing of beauty and last but not least, future maintenance was obviously considered in all phases of planning. To elaborate further the layout is strategic rather than penal with adequate consideration given to shot values, wind effects, the sun, the horizon, distant vistas, alternate routes, variety and visibility. And "form follows function". For example, there are deep greens to accept long approach shots and shallow ones for short approaches. And here is a course built before the introduction of modern maintenance equipment that is still maintainable except perhaps for several steep banks and very deep traps. Greens built in 1917 are still covered with bentgrass and not poa annua. This is partly because the designer obviously understood the relationship between elevation of the green, its critical grades and the health of the bentgrass. And this magnificent layout certainly has eye appeal and it has character.

Contribution of Contemporary Architects -- While no golf architect should slavishly imitate any golf hole or any other architect's style, I believe that contemporary architects use what is great in the works of Charles Blair MacDonald, the first American Golf Architect, and those of his famous successors, Stanley Thompson, Donald Ross, Allison McKenzie and others. It is incidentally not at all surprising that all these men knew intimately the Old Course at St. Andrews and other famous British courses. As has been stated repeatedly, the only enduring texts on golf course design are the old links of Scotland, even though their maintenance standards are vastly different from ours.

Contemporary architects have been aware that the introduction of heavy earth moving equipment has revolutionized golf course construction. Consequently more impressive features are possible on newer courses because so much earth can be moved. Today's architects also consider future maintenance in their planning. And they have been cognizant of the immense contribution maintenance equipment manufacturers and dealers are making and how much greater this contribution can be on a course that is designed for machine maintenance, something that is becoming more important every year as the availability of labor lessens.

Green grass, trees and ponds almost regardless of arrangement are beautiful in themselves. This is termed pastoral beauty. Contemporary architects, largely through the influence of the renowned Robert Trent Jones realize that arrangement of these natural features in accordance with the principles of design greatly enriches course aesthetics. These principles are HARMONY, PROPORTION, BALANCE, RHYTHM AND EMPHASIS. This trend has also been emphasized by the influx in recent years of young landscape architects into the field of golf course architecture, because these men have spent so much of their undergraduate years in studying design. Yet as I studied the Chicago Golf Club I realized that MacDonald inherently sensed all the principles of design.

What of the Future? -- Obviously computers will play an ever increasing role in course design. Information such as average waiting time per foursome and true measures of course capacity has all been forecast by computers for several years. But today with computers, architects subject a golf course to several days of play although the golf course is still only a plan. The significance of this never fails to amuse me. Indeed computers are about to revolutionize all methods for designing a course.

Man's environment is changing, particularly for those who live or work in cities. Fresh air in cities is actually becoming a scarce commodity. Golf courses are an essential part of urban environment. Indeed they are fresh air factories, and along with other large open spaces they help to funnel air downtown and thus reduce smog and other air pollution. Furthermore they are conservation areas for birds and small animals. It is of overwhelming importance that every golf course superintendent, agronomist and every young man attending Dr. Joe Troll's classes understand this part that the golf course can play in our environment, and for all architects to be fully aware of it as they plan their courses.

The extended golf boom and the fact that each architect has designed scores of new courses and redesigned numerous established layouts and has then had the opportunity to study each after it has been opened for play has increased

the knowledge and skill of the Nation's architects immeasurably. While training both agronomic and in landscape design has been and is absolutely essential it can be said that the years of experience of architects and their assistants have created a vast bank of knowledge. Similarly the knowledge of construction superintendents and golf course contractors has increased in a parallel manner. All this bodes well for the future of golf courses.

CONSTRUCTION - SUPERINTENDENTS' VIEWPOINT

Robert E. Grant
Superintendent
Brae Burn Country Club

According to the National Golf Foundation, over 400 golf courses are under construction in the United States today. In addition many of the older established clubs are enlarging their playing facilities or are engaged in major reconstruction. Obviously the superintendent who has the opportunity of participating in the construction of a new course which he will eventually maintain or in the reconstruction of his own course will have a head start toward giving his members the proper playing conditions. Unfortunately for all concerned this opportunity is often denied the superintendent as he is appointed after construction is well advanced.

In order to build an outstanding golf course four steps must be taken and the superintendent should be involved in each phase. The steps are design, specifications, construction and maintenance.

Although the design phase is the duty of the architect, the superintendent should have the opportunity to go over the plans to be sure the golf course can be maintained at the highest degree of perfection in a practical manner.

Many turf problems are traced to the original specifications so step number two is as important as step number one. The specifications must contain all details of proper soil preparation, drainage and soil modification: the quality and quantity of seed, lime, fertilizer and directions as to how and when each is to be used; complete specifications for the proper construction of the greens, tees, fairways, bunkers, water system, ponds, pump house, service roads, or any other construction that is included in the project is a must. Architects each year are involved in the building of many golf courses, therefore the specifications are usually right but the superintendent should use his maintenance experience as a guide line and make suggestions as he may see fit. At times there is a tendency to cut costs during construction. This is the cause of dissatisfaction and irritation when the new course does not measure up to expectations. There is another area that is sometimes responsible for the failure to achieve the desired results. Making major changes in design after construction has started are expensive plus the fact that seeding, water system installation, and completion dates are disrupted. If design and specifications are carefully studied, this unnecessary expense can be eliminated.

Once the design and specifications have been agreed on by all involved the superintendent takes over. It will be up to him to supervise every single phase of the project. He will confer with the architect periodically on work that has been completed and to plan work to be done until the architect again visits the site. If unforeseen problems arise, they must be worked out by the superintendent to the satisfaction of all parties involved. We should recognize the fact that there will be only one person who will be on the site every working day from the start of the project until it is completed, and that is the construction superintendent.

Many people feel that when the last acre is seeded the construction is over and the course is ready for the full membership to start play under ideal conditions. In most cases it takes from one to three years to develop desirable turf and playing conditions. Greens will require many top dressings, stone removal, soil erosion, final shaping of traps, pruning of trees, are just some of the many problems. Funds should be allotted to carry out this work in the shortest time possible. Only dedicated maintenance can develop a course to its full potential.

Construction Methods -- There are several methods by which a course can be built or rebuilt after the architect's plans and specifications have been prepared and accepted. The five most commonly used in doing the actual work are:

#1 - A lump sum contract selected through competitive bidding. The contractor should be required to hire an experienced construction superintendent or the club may have its own superintendent serve as clerk of works.

#2 - The golf course architect contracts to do the work himself. Again it is advisable to have the club superintendent on the job.

#3 - The club's own superintendent builds the course hiring equipment and labor directly on the club payroll. He also purchases all materials directly from the suppliers.

#4 - The club hires a construction superintendent who builds the course in the same manner as the course superintendent in #3.

#4 - Instead of letting out a complete contract the work is let out in single phases. The first contract is for clearing, the second for earth moving, the third for irrigation, and so on. The club superintendent is the ideal person to coordinate the project under this set-up.

The construction method chosen by the owner or club will depend on the individuals concerned and other circumstances at the time. With an inspired design, sound specifications, methodical construction plus dedicated maintenance, any of the five construction methods can be used with satisfying results.

Due to the fact that no two golf courses are built on the same type of land, it does not seem practical at this time to discuss specifications pertaining to drainage, soil mix, lime and fertilizer. It is assumed that these specifications will be followed as outlined and agreed upon by the architect, superintendent or club owner.

Once the construction is underway the superintendent should use the following check list daily to obtain the desired results.

Greens

1. Each green should have at least 8 areas for cupping.
2. Measurements of the putting surface should be the same as shown in the plans.
3. There should be room for turning a greens mower off the putting surface.
4. Greens should drain in 2 directions or more and be free of channels.
5. All mounds and banks surrounding the greens are well pulled out with no abrupt slopes.
6. Walk off to the next tee should be planned so no traffic areas will be created.
7. All traps should be visible from where most approach shots are taken.
8. It should be possible to see a ball roll on to the green.

Sand traps

1. All traps should have an entrance and exit.
2. Surface water should be prevented from running into the trap.
3. All slopes should be constructed so they will hold sand.
4. All traps should be free of unplayable lies.
5. All traps should be pleasing to the eye.

Tees

1. Grade all tees from front to back, one foot to 100 feet or one percent.
2. Pitch tees slightly from middle to sides for drainage but do not crown tees.
3. Tee slopes should be pulled out four feet for every foot of rise in elevation.
4. It is very important to get the surface of tees as smooth as possible.

Fairways and Grass Rough

1. Remove all bumps and undulation that would be scalped when mowed.
2. Remove all depressions that would hold water.
3. Make sure surface drainage is perfect.
4. All debris such as sticks and stones should be removed.

As the construction of the course progresses the superintendent should check the yardage of each hole and consider the location of cart paths and

service roads. If it is financially possible they should be installed during the course construction. All roads and paths can be constructed more reasonably at this time.

All specimen trees should be retained where possible. Banks of ponds above water level should be pulled out to allow mowing. A one to four slope is ideal with a minimum water depth of four feet.

A qualified superintendent that has the desire, imagination, and is willing to pay attention to fundamentals, can and will produce a fine golf course.

CONSTRUCTION BY CONTRACT AND THE ROLE OF THE SUPERINTENDENT

David Canavan
Moore Golf, Inc.

The method by which a vast majority of golf courses today are being built is by contract, with a firm experienced in golf course construction. This can be done with one contract and one firm doing all the construction or with three separate contracts. This latter method is used extensively in areas that are planted with Bermuda grass. The breakdown of these contracts are:

1. Clearing, earthwork, drainage, soil mix, fine grading.
2. Irrigation system.
3. Planting.

The first step for an individual or group planning a golf course is to obtain the services of a competent architect. If there is a choice of sites, which is now very seldom the case, it is wise to have the architect in the picture prior to making a definite commitment on the land. If you want his time and opinion, be sure to pay for it. The architect will then prepare detailed plans and specifications and put the job out for bids. After the bids are in, the work is then awarded to the lowest responsible contractor and the work will progress.

Where does the golf course superintendent fit into this picture? All too often he is the forgotten man. Everyone knows that a superintendent must be hired, but usually no one does anything about it. Now that construction is underway, attention turns to hiring a pro who may well be needed but usually not for a year. The superintendent, in most cases, will be an absolute must in four months. It would be ideal for the new superintendent to be on the job from the start, and to have some say in the specifications. It is more normal for the superintendent to be hired after the job has started, so I will try to outline some things for a new superintendent to do and look for.

Before you take the job, one of the most important things to do is to read the specifications and look at the plans. You will have very little chance to change anything major after a contract has been let. It is a good idea to find out what the proposed budget will be and, if possible, talk to the architect.

Once on the job, it is important to do the following:

1. Find out exactly what your responsibilities and your authority will be during construction.
2. If you have any questions as to the plans and specifications, go directly to the architect for his thoughts and reasons for them.
3. Avoid as much as possible having to give orders and messages from the architect to the construction superintendent.
4. Give any suggestions or complaints directly to the construction superintendent - not to any of his employees.
5. Sit down with the architect and contractor and determine at what point you will take over maintenance. The contract may end in many ways:

a. With seed in the ground

This type of contract definitely is the most clear-cut, and is perhaps the best in the long run. It forces the club to hire a good superintendent early. It also drives home the point that he must have men and equipment that fall.

b. Other ways of ending are:

A reasonable stand of grass
A green cover
One or two mowings

None of the above will give the owner a golf course. It will only delay the take-over of maintenance by the owner's superintendent 10-30 days.

c. Contractor will maintain until ready to play.

In the few contracts so worded, the owner usually is not planning to hire a superintendent.

As a maintenance superintendent, you should be ready to take over the work as soon as the contractor has fulfilled his contract on any given area - green, fairway, or tee. It is important that there be no lapse in the maintenance of the seedling turf. This take-over of the maintenance by the superintendent will in no way relieve the contractor of any obligations he may have under his contract.

6. Maintenance building

One of your first needs will be a maintenance building for your equipment. It must either be built or converted from a present structure.

7. Maintenance equipment

While it is advisable to give the club a complete list of equipment needed, it is imperative that you have the items which you will need when you take over maintenance.

8. Topdressing

Get a good supply under cover if possible, as it is advisable to try to get 3 topdressings on greens and 2 on all tees before opening day. It may be advisable and cheaper to pay the contractor to mix some of your topdressing with his larger plant. This usually is not fine enough for finish topdressing, but it will do for the first topdressing on the greens and all topdressing on the tees.

9. Watering

The most important single factor in bringing in a course is to keep the seed and seedling turf damp. If you have to take over the course from seed, you should have a crew of about four men one week before you will need them to water, once the seed is in the ground. About all one man can handle is one hole, as he must water very light and often.

10. Mowing

The greens should be mowed at about 1" the first time and lowered slowly, once the greens fill in. All other areas should be mowed about 1" higher than their final height and slowly lowered. It is very important to mow often as new turf, many times, will grow faster than an older stand of grass.

11. Washes

Unless you have sheet washes which will require complete reseeding, it is best to ignore washes no matter who is required to repair them, until the grass in the unwashed areas has taken a firm hold.

It is very important for the superintendent of a new course to impress upon the official of his club the work he must do and the men and equipment he must have. On an existing course, you will usually have a greens chairman who has some idea of what has to be done, but the bringing in of a new course is usually one thing he is not used to.

The bringing in of a new course can be, in spite of the hard work, a very enjoyable and rewarding job.

SEED PRODUCTION

Robert J. Peterson
E. F. Burlingham & Sons

The Willamette Valley of Oregon is blessed with nearly perfect weather for the production of grass seed. Ample rainfall, in the area of 39 inches annually occurs mostly from November thru April. Our summers are dry assuring good weather at harvest time. We can windrow all of our grass seed crops and combine them out of the windrow at a moisture content of 8 to 10%. Therefore, within this framework a large and specialized industry has developed. I'm sure

all of you are aware of the large amount of turf grass that comes from Oregon; however, I wonder if you realize that we produce over 200 million lbs. of grass seed annually and that we are growing for certification over 100 varieties of grass seed plus many proprietary varieties.

Some years ago seed was harvested more or less as a byproduct from meadows or pastures as the case may be, but this certainly no longer is the case. The grass seed industry has undergone many technological changes with the greatest advances having come in the past 10 years.

Grass seed production today is a well organized and highly skilled project with the seed being produced by men who make this their single endeavor. The grass is grown specifically for seed. Some produce grass seed only while others may include it in a rotation program with row crops such as: green beans, sweet corn and other vegetable crops, if irrigation is available. Actually today many of our grass seed men are utilizing irrigation. This may sound a bit strange and a bit inconsistent with my remark about our abundant rainfall. The fact is, however, that most of our grass seed crops are spring planted and irrigation is very helpful, if not indeed necessary, to establish this baby grass seed crop thru the first summer or 1st year establishment period.

We also find, with the large number of varieties now produced, that many are later maturing than was the case when we simply grew the old standard items.

For those of you who have not had the opportunity to visit the seed production area of Oregon, I should like to give you a word picture of the process and then illustrate some of my points with slides as well as offer the opportunity for you to ask questions.

In order to carry out all of this program a good number of our seed companies use fieldmen who are trained agronomists, that work directly with the grower in his production program. The chemical and fertilizer companies also provide competent and up to date information needed by the growers.

We have today many new and sophisticated varieties of turf as well as forage grasses. These are the products of many years of work by plant breeders in the public institutions and private breeders in the United States and Europe. All of these parties are extremely interested in having their varieties reproduced in such a manner that will preserve the genetic purity of the products of their research.

In my opening remarks, I mentioned that the Willamette Valley is an ideal area for grass seed production and that we have a large acreage devoted to this enterprise. While this is indeed the case it is also a problem since the acres available are not without limit and since the number of varieties of each species is expanding so rapidly it becomes a problem to find fields which meet both history and isolation requirements. For instance, we may not plant a Bluegrass variety on land which has grown bluegrass in the previous 3 years and the turf-type perennial ryegrass and bents have a requirement of 5 years. Additional isolation requirement is at least 165 feet isolation from any other variety of the species to be produced. This means there has to be close coordination and cooperation between growers both at the time of planting and during the entire life of the crop.

After selection of the field to be planted the best procedure is as follows.

If the field was not in a clean cultivated crop, the best procedure is a summer fallow program. The ground will be worked usually until the middle or end of October with final working and preparation of seedbed made at that time. The field is then allowed to rest about six weeks until the early part of December to permit germination of any seed in the soil surface. Then the field is sprayed with an herbicide such as IPC & 2,4-D to kill germinated seedlings. Approximately 2 months later or at this time of the year the field is ready to seed. If any more germination has occurred we use an application of a material such as paraquat. This defoliant type material will burn off any small seedlings before they have the opportunity to establish a root system which allows them to survive at the same time these materials which have no residual effect allow us to seed within 24 hours of treatment.

Seedings are then made at 12 to 18 inch row spacings using rather low seeding rates. With this row spacing it makes it easier to do either hand roguing within rows or spot spraying should this be necessary and I might add it quite often is necessary.

It is during this first summer the irrigation is of the greatest aid, since the amount of growth obtained the first summer determines whether or not a selective grass herbicide can be used the first fall and before a seed crop is produced. Secondly, the irrigation allows us to plant at any time. For instance, if the field is not clean of contaminate for planting at this time, it does allow us to carry on additional spray programs and plant as late as June or early July and still have a successful stand development.

Once the stand has been established we use a complete fertilizer program with most of our grass seed crops getting annually 150 units of actual N plus phosphorus and potash as needed. This is done in split applications and formulated for each field as required.

I might add that we usually have very wet conditions in our fields from the latter part of November until May so that special equipment must be used to get on these fields. We call these rigs, swamp buggies; they have large flotation type tires that allow us to cover ground that is impossible to get on with conventional type equipment. These have been a great aid, as I can remember a few years ago flying up and down the valley and seeing tractors mired down in one field after another which not only delayed proper timing of fertilizer and herbicide applications but also tore up the fields very badly.

Now, we come to the time of harvest, all of our grass seed crops can be windrowed, allowed to cure in the windrow and direct combined from these windrows. Determination of time of cutting used to be done on a visual basis or at time seed could be hand threshed from the heads or shatter was starting but there was always a good chance some one would either cut too early or a loss would occur due to shatter when crop was allowed to stand too long. Now time of cutting is determined by head moisture content. The determination for cutting time and method of easily determining moisture was developed by the USDA Experimental Engineering Laboratory at Oregon State University. It has been determined for instance that Ky. bluegrass should be cut at 28%, Perennial ryegrass at 40%, Creeping red fescue at 24%, etc., for all of the grass seed crops we produce. When cut at these levels we obtained the highest poundage of good viable seed. Now this is head moisture we are speaking of and not safe storage levels. After cutting windrows are left 5 to 7 days at which time moisture level is down to 10% or less and the seed is ready to combine.

It might be of interest to you to know that field moisture is done by means of direct moisture reduction test using the exhaust from an automobile or tractor. A representative sample is hand stripped, placed in a pre-dried container and moisture is driven off using a temperature of 300°F. Weighing is done on a dietary scale on which has been superimposed a percentage scale. Container is filled until scale reads 0% and after drying sample is reweighed for change. This change represents the amount of moisture driven off. This method is accurate within 2% when compared with moisture readings obtained in the laboratory using standard electric oven and 24 hour drying procedure.

Most of our seed today is handled in bulk boxes from field to cleaning plant since these can be readily cleaned out and clearly identified to prevent any contamination during harvest.

After harvest all of our grass seed fields are burned generally by providing a fire break around the field and then setting them on fire and in some cases we do use propane field burners after straw has been baled. This procedure is used for sanitation purposes or control of certain fungus diseases for which we have not other control methods which are as effective. This is a must and while we are hearing a good deal of static about air pollution because of the smoke, none the less, we can still burn with a permit which is issued if weather conditions are such that smoke will be dispersed into the atmosphere. Additionally the complete removal of straw from this burning affords better utilization of fertilizer on the next crop as well as better control with our selective grass herbicides. Then in the fall, usually the 2nd half of October, our grass seed fields will be sprayed with these selective grass herbicides to control any annual or seedling perennial grasses present which leaves only the original established crop plants. We will also put on a fall application of fertilizer and the process continues all over.

In addition to the processes of which we have been talking, there are a goodly number of variations which are worked out on an individual basis and this is the point at which the fieldman for the seed firm must be alert to handle each field on an individual basis.

We do have today a large number of herbicides to choose from and many more coming on and the seed companies who are involved in seed production must have their fieldmen keep current on all of these as well as any other new techniques available for the production of cleaner seed. The best place to clean any seed crop is in the field. Much can be done in the cleaning plant but the market demands ever higher quality seed free of weeds and other crop contaminants which are difficult or impossible to separate in the cleaning operation.

Just on the horizon is a new planting method which is still in the experimental stage but does give promise of even cleaner fields to start with. We shall be using this new approach for the first time this spring and should have some good information in a year or two on its effectiveness.

CEMETERY TURF MAINTENANCE ON A HIGH AND LOW BUDGET

Stanley Sosienski
All Saints Cemetery

Is there anyone present who has never been to a cemetery? The occasion of your visit makes a difference in your observation of the grounds. Pre-occupation during a funeral prevents one from paying closer attention to the appearance of the surrounding area; an individual pays less attention if his relationship to the deceased was particularly close. Only extreme cases of either outstanding care or deplorable neglect are noticed during funerals. You are more likely to observe the condition of a cemetery when you drive your mother-in-law to visit her husband's grave; while decorating dad's grave on Memorial Day, or perhaps when looking for the resting place of a high school chum. During such visits, what do you notice?

1. Is mowing necessary?
2. Is the turf a deep green color?
3. Is a thick stand of grass apparent?
4. Are weeds non-existent?

I. Difference in Care -- Why is it that some cemeteries impress you with their beautiful park-like appearance; while others prompt you to disinter a loved one, if your family could afford the expense. Unfortunately a trip to some cemeteries requires work gloves and overalls as functional attire. Before you pay your respects you may have to pull weeds, sow grass seed, spread fertilizer, or even be forced to mow the turf. Why such an extreme difference in care between one cemetery in comparison to another? Management? In many instances good management insures proper care; in most cases money insures care. Good management without an adequate budget cannot provide satisfactory results.

II. How many operate on a budget -- How many cemeteries operate on a strict budget? Very few do. Some cemeteries, such as the Chicago Catholic Cemeteries, provide a labor budget for turf maintenance in addition to other operations, to include hours in labor to be earmarked for mowing and trimming. Weekly this budget allocates as much as 8 hours an acre, for monument cemeteries with many obstructions; however, it provides a little as 3 hours an acre for modern memorial parks, during the same period. Although the Catholic Cemeteries of Cleveland do not operate on a labor budget for turf maintenance; the administration keeps track of expenditures that fall into this category. Mowing and trimming ranges from \$113.00 to \$685.00 an acre annually. More cemeteries operate on a budget that provides for turf maintenance supplies, rather than labor; these use the previous year's expenditures as a basis for their current budget. Directors of most cemetery associations approve chemical expenditures piecemeal, rather than to grant by means of an annual budget.

III. A High Budget -- Fortunate are those Associations who enjoy a lucrative operating and care fund, hence they are able to operate on a high budget if they choose. Supposing I managed a cemetery and was able to submit a budget of this sort for approval to Directors, whose expectations of superb maintenance was of primary importance in comparison to any funds their association could easily afford. How high a budget would I draft?

example: High Budget

1. Fertilizer

<u>Time</u>	<u>Type</u>	<u>Rate per acre</u>	<u>Cost (per acre)</u>
Late May	21-7-14	418	\$54.00
	83% Org		
	66% Insol		
Early Fall	10-4-6	436	\$13.00
	Granular		
	Soluble		
			<hr/>
			\$67.00

2. Sod for Winter Graves

Based on 200 funerals per annum.

32 square feet X .07 = \$2.24

Per Grave \$2.24 X 72 graves = \$175.00

3. Expenditures on the following chemicals would vary annually. A close survey of the turf condition in each section, plus results of all soil tests (to determine pH), would be the deciding factors on additional funds you would include in your proposal.

The amount of grass seed you would purchase would be based on the previous year's expenditures.

Other supplies as required

<u>Material</u>	<u>Rate</u>	<u>Cost (per acre)</u>
Limestone	1 Ton	\$11.00
Herbicide Broadleaf 2,4-D-EWT 40	2 1/2 pts	\$ 2.25
Herbicide (Knotweed, Cheickweed) Banvel D	1 gal.	\$ 4.00
Herbicide (crabgrass) Tupersan (reseeding possible)	1 bag 2500 sq.ft. \$4.77	\$83.00
Grass Seed	174	\$71.00

Finally, anticipate use of insecticides in 20% of your cemetery, and ask the Board of Directors to include an emergency fund to be earmarked for such a purpose. You cannot predict if weather conditions in the coming year will be conducive to Chinch Bug, sod webworm, or if Japanese Beetle or moles, will cause you unexpected problems.

4. Insecticides

<u>Chemical</u>	<u>Rate</u>	<u>Cost (per acre)</u>
Diazinon	1 gal	\$16.85
Chlordane	5 qts.	\$10.45

IV. Low Budget

For associations whose funds are inadequate, to the extent where directors would even consider anything close to a high budget, I submit the following outline.

Example: Low Budget

1. Fertilizer

<u>Time</u>	<u>Type</u>	<u>Rate (per acre)</u>	<u>Cost</u>
Mid May	45-0-0 Urea Granular	80	\$4.24
Early Fall	15-10-10 Granular Water Soluble	260	\$10.33
Late Fall or later	0-0-62 Muriate of Potash-granular	40	\$1.19
			<u>\$15.76</u>

2. Seed for Winter Graves

Based on 200 Funerals per Annum	32 sq.ft. per grave X 72 = 2304 sq.ft. Area to be sowed	4 lbs X .41 = 1.64 per 1000 sq.ft. 2304 ÷ 100 = 2.3 X \$1.64 = \$3.77
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3. Other supplies as required (not included in high budget)

<u>Material</u>	<u>Rate (per acre)</u>	<u>Cost</u>
Herbicide (crabgrass) Tupersan WP	24 lb.	\$61.20

A. The urea is used because it is the least expensive granular material we have to provide nitrogen for turf requirements.

B. The 15-10-10 is the least expensive complete fertilizer with a heavier Phosphorus and Potassium content to compensate for the absence of these nutrients in our spring application.

C. Since the 15-10-10 may be inadequate in K requirements to conform with a current theoretical ratio of 4-1-2. The 0-0-62 may be used as a supplement.

V. Further measures to permit operation on a lower budget.

1. Soil Testing

A. By testing you may find certain sections may be high in phosphorus and/or potassium and thus only require nitrogen in a fall application, hence cutting fertilizer cost per acre.

B. Spreading lime only in areas that require it.

2. Volume Purchase

Combining orders with other users may prove beneficial by cutting costs per ton for materials purchased.

3. Time of Purchase

Storage space permitting, purchasing off-season can be economical. Question suppliers, whether or not materials will keep for the period you intend to store them.

VI. General Practice

Very few cemeteries may operate on the ultimate budget illustrated; more operate on funds somewhere in between the two extremes, depending on attitudes of management and cash deposits in the till.

Providing superb care to entrances and areas contingent to administration buildings, while minimizing turf care in remaining areas, is the standard practice of a number of superintendents.

Other cemeterians concentrate their maximum effort on sections recently developed, in order to promote sales. Remaining sextons devote their prime attention to areas where most burials have taken place in recent years. If finances do not allow superior maintenance to all localities mentioned, I would tend to give the third choice of areas a priority of turf maintenance.

The majority of people visiting a cemetery are those who recently lost someone, whose resting place is their destination. Initial impressions of magnificent care quickly terminate when a visitor discovers the turf on his loved ones grave equals not the finest on the grounds.

VII. Minimum Standards

Operating a cemetery at the minimum standards requires \$15.76 per acre, plus seed expenses for winter burials, as outlined by the low budget illustrated previously. If a budget has to be approved annually, as much as possible above this figure should be set aside in an emergency fund. A fund of this type would take care of unexpected problems that required purchase of certain additional supplies: insecticides, herbicides, and seed (for washouts - winter damage). If seed expenditures are low during a season, and insect infestations nonexistent, you may apply a portion of this fund to weed control.

Supposing an association cannot afford to approve the low budget proposed? A Ford sedan costs as much in the country, as it does in the city. A good man digging graves expects the same salary in Watertown, as he does in Brooklyn. To purchase a pound of grass seed would require the same amount of cash in both locations.

Does your cemetery charge the same for a plot; as does the largest, most attractive memorial park in your state? Do you charge as much for lot care? People expect the same care in all locations; therefore, charge for ample care; provide care.

Conclusion

Some cemeterians believed (some still do):

1. Close mowing browns turf early in the season; therefore reducing labor expense.
2. Do not fertilize; hence, mow less frequently.

These false beliefs led to poor stands of turf -- grass did not grow -- weeds did; a low cutting height invited crabgrass. Lot owners preferred to see green color instead of brown.

How can a superintendent sell a plot, and explain a care charge that must be paid, when only a few graves obviously receive care (and these are maintained by lot owners themselves)?

The public does not expect cemetery turf to receive attention comparable to putting greens, however, it does expect the maintenance their home lawns receive.

TEN STEPS TO PRODUCE A GOOD LAWN

John Zak
University of Massachusetts

A good lawn is the pride and joy of most home owners. In order to have a satisfactory lawn with little maintenance and few problems, adjustments for the promotion of a good grass environment should be made during lawn construction. It is difficult to make a blanket recommendation on lawn construction since there are different problems or variables encountered with each site. Let us briefly discuss type of soil, type of subsoil, soil structure, organic content, fertility level, soil reaction, and seed, before going into the ten steps of lawn construction.

Fortunately, most of our soils in New England are of a type called sandy loam which is ideal for most plants because it provides good internal drainage and good aeration. Grasses as a group depend upon good aeration for healthy vigorous growth. Very sandy soils are too open or "unduly aerated". To correct such a condition before seeding down a lawn, a heavy topsoil that contains clay and organic matter can be mixed with the sand and is very effective in preventing over-aeration. Add 1-2" of a clay soil and thoroughly mix into 3-4" of existing soil. This will aid in the water holding capacity and plant food retention capacity of the soil.

A heavy soil with a large amount of clay can be modified by the use of coarse sand. The addition of lime will also alter the physical condition of

such soils by aiding granulation. Two-three inches of coarse sand mixed well into 4-6" of soil can be used to modify the texture of a heavy soil. When any soil improvement materials are used they should be well mixed. Avoid layering of the different materials within the soil, for this interferes with the normal air and water movements and may restrict root growth. Mineral soil conditioners such as calcined clay or vermiculite may be used on loam or heavy soils to improve their physical conditions. These are applied according to the manufacturers recommendations for each particular soil type.

If during the construction of a lawn, it is necessary to change the topography severely, particularly for water drainage, it is worthwhile to push aside the topsoil, make the necessary grade on the subsoil and then replace the topsoil. Low areas should be filled in and good surface drainage can be achieved by gently sloping the lawn away from the house. Presence of a high water table or a flow of seepage water near the surface of the soil causes wet soils. This is the time to install tile for internal drainage. Tile drainage can be used to intercept and drain away this excess water. One should get the advice of a qualified person to help design and install a tile drainage system. If the topsoil is to be purchased, it is certainly worthwhile to examine the source of supply before it is delivered. Sometimes it is possible to find a subsoil of a sandy loam texture which can be mixed with the topsoil to make a suitable soil for grass. Even though the subsoil does not contain organic matter, it can be added or in time the established grass will contribute to the organic content of this soil. It takes about 6" of loose topsoil on the surface at construction time in order to have the minimum 4' of settled topsoil that is recommended for lawn purposes.

Native peat or peat moss can be used where the soils, especially sands, are devoid of organic matter. One to two inches of the above materials mixed or rototilled into 2-4" of the soil should be a good conditioner for improving the structure, aeration and water holding capacity of light soils. In figuring the amount of peat, humus, or loam needed, remember that it takes 3 cubic yards to cover 1000 sq.ft. 1" deep. Fortunately, it is possible to grow organic matter with grass, so to speak. Where soils are low in organic matter, grass cover is ideal for increasing the organic content of the soil. The return of clippings and the continuous sloughing off of roots by the grass adds to the organic content of the soil. Organic matter is a very important fraction of the soil. It aids soil structure and is a source of plant food nutrients. As humus, it has basic exchange properties which prevent loss of nutrients by leaching. It also increases the water holding capacity of the soil.

Generally speaking, soils in New England are acid and such soils should be limed according to soil tests. If soil tests are not made it is recommended that 50-100 lbs. of ground limestone be used per 1000 sq.ft. of lawn area. This should be worked well into the soil as far in advance of seeding time as possible. This gives the limestone a chance to change the pH throughout the root zone and allows the seedlings to establish themselves in a more favorable soil solution. If hydrated lime is used, 2/3 of the above amounts are recommended. Hydrated lime should be mixed thoroughly after the application to prevent it from taking on moisture and becoming lumpy. There is also available on the market a high magnesium limestone called "dolomite". Many of our soils in Massachusetts are short of magnesium and the use of this limestone should take care of any deficiency.

It is difficult to recommend the best analysis of fertilizer for lawns

since soils vary so greatly in fertility and have received variable past treatments. However, a soil test will show the fertility level and give information as to how it should be fertilized.

Grasses are very heavy feeders of nitrogen, but for establishment of lawn grasses large amounts are not necessary. In fact, too much nitrogen can be wasteful since nitrogen leaches readily from the soil if not utilized by plants. It is preferable to add more nitrogen after the grasses are established. On the other hand, it is very essential to get a good supply of phosphates in the soil during lawn construction, since phosphates do not leach and generally speaking stay where they are put. It is best to add at least a minimum of 4-5 lbs. of P_2O_5 per 1000 sq.ft. Later topdressing of phosphate on an established lawn will not move into the root zone. The placement of potash is not as critical as phosphate, since it can be leached into the root zone by topdressing and irrigation. A fertilizer that could be used prior to seeding for 1000 sq.ft. of lawn is:

(Pounds of)	N	- P_2O_5	- K_2O
20 lbs. of 5-10-10	1	2	2
10 lbs. of 20% S/P	$\frac{0}{1}$	$\frac{2}{4}$	$\frac{0}{2}$

What kind of grass seed should one buy? There are only a few basic grasses that are adapted for lawn purposes for this cool, humid area in the Northeast: Kentucky bluegrass, creeping red fescue, and colonial bent.

Creeping red fescue is similar in growth pattern to that of Kentucky bluegrass, and the two grasses are excellent companions. On better soils Kentucky bluegrass will dominate but will give way to creeping red fescue in shade and on poor sandy soil. Thus, in a seed mixture for lawn, a higher percentage of red fescue is used on light soils and a smaller percentage on loam soils. Merion bluegrass is still considered the best bluegrass, although there are other new varieties that are satisfactory. New strains of creeping red fescue like Illahee are also available.

Generally, bents are not recommended as seed mixture for lawns since they require more care and maintenance. Also, when included in mixtures they may eventually take over the entire lawn area.

1. Till and rough grade:

Grass seeds germinate and grow best in a mellow soil of uniform texture. The ground should be tilled to loosen and granulate the soil. The soil should be moist but not wet for preparing a good seedbed. This is especially important for heavy soils. Rough grade the area, fill in the low spots where water tends to accumulate, level off high spots, that may be scalped later in mowing. Make the seedbed level with the adjacent hard surfaces, walks, driveways, and adjacent sod. If peat moss, sand, or clay loam are to be added to modify the soil texture, work it well into the soil after the rough grading.

2. Supply lime and fertilizer:

Broadcast the complete fertilizer (or fertilizer and superphosphate) and limestone at recommended rates or as indicated by soil tests.

3. Mix or till up to a depth of 4":

The fertilizer and limestone may be broadcast and then mixed into the soil in one operation.

4. Grade and roll:

Carefully rake and grade, remove stones, roots, and debris.
Roll the area with a medium heavy roller to firm the soil.

5. Finish grade:

After rolling, a finer and smoother area can be prepared by raking and further leveling to produce a finish grade.
The seedbed now should be firm and not fluffy.

6. Light fertilization:

Broadcast a small amount of complete fertilizer (1/4 lb. of N from 10-6-4) on the top layer of the soil in order that there will be ample plant food, where the first roots develop.

If an adequate amount of fertilizer was used in step 2, this treatment can be omitted.

7. Sow seed:

Use a spreader setting required for proper rate of application.
Make sure that wheel tracks overlap on successive passes to prevent blank areas.

A cyclone seeder can be used also and good distribution of seed obtained.

8. Rake lightly:

Use a wooden rake and partially cover the seed by raking in one direction.
Be careful not to lump the seed together.

9. Light rolling:

Roll with a light roller to firm the soil and seat the seed.
Do not use a heavy roller.

10. Mulch and keep moist:

Apply cheesecloth, netting or clean straw over the seedbed area.

Water the seedbed to thoroughly wet the soil.

Keep the soil moist for optimum seed germination.

The most critical period during germination is at the time when the seed coat cracks and the seed begins to sprout.

If the seed dries out during this period, the young seedlings will die.

Good lawns do not just appear. They are the result of an application of relatively few but important basic principles during construction. If these principles are followed, lawn maintenance is a little easier.

REVIEW OF HERBICIDES FOR TURF WEED CONTROL

Alvin A. Baber
DuPont Company

Beautiful turf is produced when sufficient knowledge of grass and its environment is combined with judicious management practices. Factors which must be considered are turf use, variety, soil, fertility, water, insect and disease control, proper mowing and weed control.

Effective weed control can make the difference between a uniformly smooth turf and one that is marred by splotches of broadleaf weeds and crabgrass. All management practices have a direct or indirect effect on weed control. Perhaps the variables which have the strongest influence on weed control are (1) proper fertilization, (2) good water management, (3) proper mowing height and frequency and (4) proper use of chemicals when needed.

Weed control in turf on a selective basis by using an herbicide, which will control the unwanted plants and leave the desired turf, is a most fascinating phenomenon. A great deal of time and effort is required to develop a chemical which has weed control properties and safety to turf. Many of the exact physiological responses of turf to selective herbicides are still unknown.

Much of the use information which is developed is critical and must be followed to the letter in order to obtain desired results. Read and heed the label!! In addition, formulations of the same basic chemical may vary in percent active ingredient, solvents and inerts. The properties of a formulation are stated on the label and use directions are specified.

Before one attempts to control weeds in turf, it is necessary to identify the weeds present. Only then can the proper method or chemical be selected to do the job. Weeds commonly found in turfgrass areas in the Northeast are: chickweed, clover, dandelion, plantain, hawkweed, knotweed, spotted spurge, ground ivy, purslane, sorrel, crabgrass, foxtail, barynardgrass, goosegrass and Poa annua. Wild onion and poison ivy are troublesome in some areas.

Naturally a greater variety of weeds present in any given turf area will cause the control measures to become more complex. For example, here are chemicals which may be used to control many broadleaved weeds: 2,4-D, 2,4,5-TP (Silvex), MCPP (Mecopex), Dicamba (Banvel D), and DCPA (Dacthal). Certain grasses may be selectively controlled by Azak, Balan, Bandane, Betasan, Dacthal or "Tupersan" siduron weed killer. Where poison ivy becomes a problem, it can be controlled with amino triazole, "Ammate" X weed and brush killer or 2,4,5-T. To renovate seedbed areas, use calcium cyanamid, methyl bromide or VPM. From the examples just given, one can see that selective herbicides for weed control in turf are distinctive in their mode of action. Therefore, we must learn the limitations of each product and more importantly -- take advantage of the individual benefits of these chemical tools to get best results.

The herbicides used to control broadleaves in turf provide control by adversely affecting the normal rate of growth of the broadleaf weeds with little or no effect on grasses. Select only the herbicides that are selective on the turf to be weeded and apply each chemical at the specific rate to control the weeds involved.

Generally, these materials should be applied when soil moisture levels are adequate and weeds are growing vigorously. Avoid drift of spray materials to other desired plants. Warm temperature (65-80°F) is desirable. Low temperature (less than 60°) retards control and very high temperature (above 90°) can predispose turf to injury from certain chemicals. Where possible do not mow turf within two days before or after herbicide application.

Now consider the numerous herbicides for control of grassy weeds in turf, as indicated by the chart. Choice of material depends on (1) weeds, (2) use and condition of turf, and (3) future management plans.

To summarize: Know your turf, identify the weed problem, select the proper herbicide and apply pre-emergence or post-emergence herbicides as necessary to conform with turf management plans and needs. To get beautiful results and beautiful turf, Read and heed the label before applying!!

Weed List	Herbicides										
	2, 4-D	2, 4, 5-TP (Silvex)	Dicamba (Banvel D)	MCPP (Mecopex)	Azax	Balan	Betasan	Dacthal	"Tupersan"	Amino Triazole "Ammate" X	2, 4, 5-T
Chickweed	X	X	X								
Clover		X	X								
Dandelion	X	X	X								
Ground ivy		X	X								
Knotweed		X	X								
Plantain	X	X	X								
Purslane											
Sorrel		X									
Spurge	X	X									
Crabgrass					X	X	X	X	X		
Barnyard-grass						X	X	X	X		
Foxtail						X	X	X	X		
Goosegrass							X	X	X		
Poa annua							X	X			
Poison ivy									X	X	X
Wild onion	X										

Information for control of weeds as indicated above was taken from labels of those products.