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STOCKBRIDGE SCHOOL

TURF CLIPPINGS

CONFERENCE PROCEEDINGS

TURF MANAGEMENT CLUB

Seniors: [Left to Right]: Row 1: M. Mastandrea, J. Ressler, J. McGuill, R. Lussier
Row 2: P. Metcalf, D. Pullen, P. Losius, G. Stedman, J. Kaczenski
Row 3: S. Tallman, M. Hannigan, C. Babcock, J. Ziemba, B. Stewart, G. Moscato
Row 4: J. Pluta, A. Niblett, D. Wall

Freshmen: [Left to Right]: Row 1: D. Sullivan, M. Shorey, P. Kwasnowski, T. Barrett, R. Arzillo, F. Stanley, J. Logan
Row 2: G. Sargent, F. Arruda, M. Spaulding, G. Howard, W. Murray, E. Cadenelli
Row 3: J. Anderson, D. Mulholland, G. Roth, G. Marks, D. Morrison, D. Sylvester, W. Bevins, D. Pease, B. Peeples, R. Micelotta

RECIPIENTS OF GOLF COURSE SUPERINTENDENTS ASSOCIATION OF AMERICA AWARDS

Left to Right: Mr. Charles Baskin, President GCSAA, who presented the awards; Robert McIntyre and James Kaczenski, Seniors in the 2-year Turf Management program in The Stockbridge School of Agriculture; and Stephen Finamore and William Spence, Seniors in the 4-year Turf major in the Department of Plant and Soil Sciences.

LAWRENCE S. DICKINSON SCHOLARSHIP

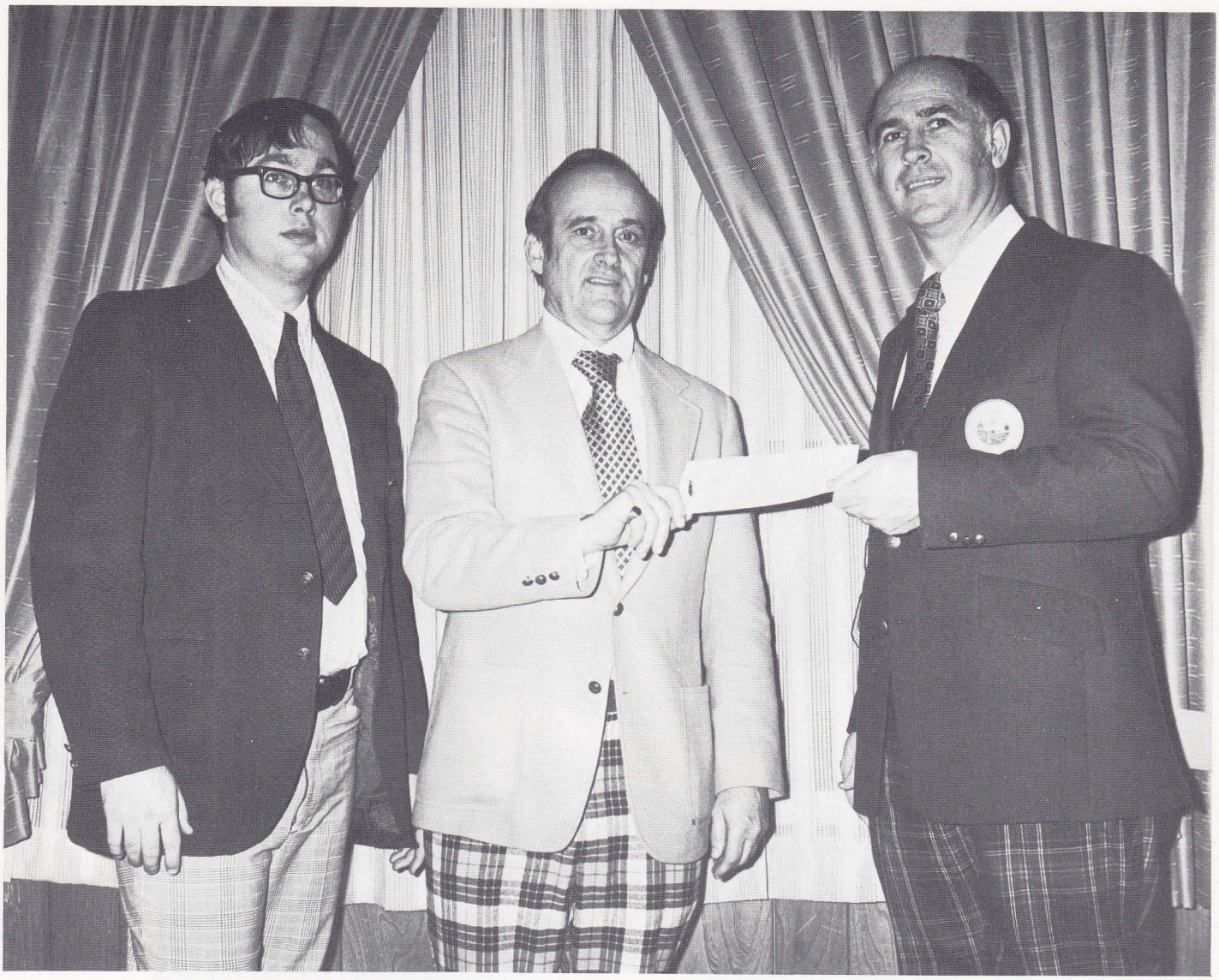
Mr. Tom Curran, President of Golf Course Superintendents Association of New England, presenting the Lawrence S. Dickinson Scholarship Award to: Left to Right: William Spence, 4-year Turf major and Gerald Moscato, 2-year Turf major; and Mr. Curran.

CONNECTICUT PGA SCHOLARSHIP

Mr. Walter Lowell of the Connecticut Pro Golf Association presenting scholarship awards to: Left to Right: Darrell Haslam, 1974 Winter School for Turf Managers; and Gary Marks, Freshman in 2-year Turf Management program in Stockbridge School of Agriculture; and Mr. Lowell.

HUDSON VALLEY

Mr. George Pierpoint presented a scholarship award from the Hudson Valley Golf Course Superintendents Association to Allan Reimann, 1974 Winter School for Turf Managers.



Mr. Charles Baskin, President of Golf Course Superintendents Association of America, Presenting a Grant for Nematode Research Studies in Turfgrasses. Left to Right: Dr. Robert Carrow and Dr. Joseph Troll, Department of Plant and Soil Sciences, and Mr. Baskin.

Note: The Long Island Golf Course Superintendents Association also presented a Grant but a picture is not available.

TURF CLIPPINGS

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Turf Management Club
Department of Plant and Soil Sciences
University of Massachusetts
Amherst, Massachusetts 01002

Editor
William Stewart

Adviser
Dr. Joseph Troll

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HISTORY OF GOLF

George F. Sargent
Stockbridge '75

Golf, a leading leisure past time, has been known to man since 15th century Scotland. There is no one founder of the game and even the word "golf" itself has no definite origin. Most historians, however, assign a Celtic (pronounced "Keltic") origin to both the game and name,- although the actual beginnings date back to ancient Rome.

The Romans, in the days of Julius Caesar, played a game called "pagznica". The game was played by hitting a feather ball with a bent stick. When the Romans crossed the Channel and occupied Scotland, they introduced the game into the British Isles and it became the forerunner of the game of golf as we know it today. By the 15th Century the Scots had refined pagznica into a crude form of present day golf.

The popularity of early golf can readily be seen from an Act of Parliment in 1457 which prohibited both golf and football. King James II insisted the game required neither skill or strength and should be abandoned. So, tradition has it that some of the nobility decided to introduce James II to the game, with the results that the law was repealed and the King became an avid golfer.

During the reign of Mary, Queen of Scots (1552) the famous St. Andrews course was established. Mary herself was an avid golfer even to the point where she supposedly played the day her husband was murdered.

In 1608, James VI of Scotland vacationed in England. He became bored and decided a few rounds of golf would be an antidote to boredom. As the game was unknown in England he was forced to design his own course and so, Royal Blackheath, 8 miles from London was established.

Golf, aided by the interest of royalty, continued to increase in England and Scotland and what began as a pleasant past time blossomed into the competitive sport it is today.

Private clubs were established in the late 17th Century and the first recorded tournament was played in Edinburgh, on a 5 hole course, in 1754. The Society of St. Andrews Golfers, established in 1754, adopted 13 official articles of play which form the standard for today's game.

In the 18th Century clubs were still crooked wooden sticks and golf balls still made of feather. However, something for present day golfers to ponder -- in 1767, James Durham won a silver cup at St. Andrews with a 94.

THE NINE TOUGHEST HOLES IN THE WORLD

Robert Wilbur
Stockbridge '75

After a recent world wide tour I have compiled what I believe to be nine of the hardest golf course holes in the world.

The first hole is located in Nidock, Canada. Situated in the country, it is perhaps the most picturesque of all. Looking down the fairway, it does not seem difficult at all but after taking the first shot, the second shot will most definitely be with a shotgun because there are hundreds of grizzly bears in the woods.

For the second hole we travel to Hanoi. It is a par-3; not too long; not too short. If you don't make it to the green on the first shot, you are penalized by making your way through the mine field sustituted for the fairway.

The third hole is in neighboring Wong-Tsu, China. It is a very long par-5. You must be in the best of shape to play this hole for if you don't run very quickly to your ball after every shot, you are in danger of losing it to someone who thinks it is a ping pong ball.

Sweden is the site of the par-4, fourth hole. It is a very sharp dog-leg with a very cold water pond in front of the green that the golfer must swim across. However, there are the most gorgeous blondes to warm you up after finishing. Needless to say this was my favorite hole.

We are now teeing off in Brazil. This fifth hole is a very short par-3. The difficult part of this is trying to putt over all the coffee beans.

The sixth and probably the toughest, is in the Sahara Desert. It is a par-5 that has yet to be parred. Have you ever tried to go some 600 yards using just your sand wedge?

We are now on the seventh tee. It is in Minneapolis - St.Paul. The only hard and strange thing about this hole is that the green is really a pool table and if you don't happen to be a pool player, well, you guessed it - Minnesota Fats is there to help you out.

The eighth hole is located in Israel. It is perhaps easiest of the par fours. The only thing to look out for are the frequent feuds this country seems to get into with her neighbor.

The ninth and most interesting is in Dublin, Ireland. It is truly a magnificient and intriguing hole. There is a lonan right smack in the center of the fairway. You'd better stay clear of it because those leprechauns can play some pretty damn mean tricks on you!

"Stockie Madness"

Robert White
Stockbridge '75

I consider myself a professional hitch-hiker and I do a lot of walking between rides. One of the benefits of this is that I have become aware of the beauty in trees, shrubs, flowers and grasses. In a sense, it has been a rebirth to nature. Before I became a professional hitch-hiker, all the greenery went by unnoticed.

This rebirth has led me to see every plant as a unique individual. I have to laugh at myself. Many a time I have found myself along the roadside checking grasses for ligules, auricles, stolens, and rhizomes. Now I realize that grass is not just another blade in this vast kingdom of green but is as unique as night and day.

Just the other day, I found myself approximately thirty yards into the woods (we all know there are no cars there). I thought I saw an Aeschulus hippocastinum (Common Horsechestnut) and it turned out that I was wrong. I found myself a little discouraged; however, on my way back to the road I sighted several trees and grasses that I could distinguish and therefore I regained my confidence.

So, the next time you are hitch-hiking, don't be a grouch because no one picks you up, just take a look at the beauty that God gave us all.

"BARTENDER, ONE MORE ROUND FOR PYTHIUM"

William Martin
Stockbridge '75

Let's look at turfgrass management for what it is, common sense and deductive reasoning. Basic principles are formed and then put to work. We fight the forces of nature. A thunderstorm causes erosion. We repair the damage and prepare for the next thunderstorm. When heavy rains occur, parts of the course go under water. When the rain lets up, you improve your drainage. When a dry spell occurs, the grass suffers, wilts and dies. Of course you ask the management for $100,000 for a new watering system. Very simple. When Pythium comes your way, chewing on your grass, we become quite indignant at that little pest and knock him out with some Tersan SP. Like I say, it is a simple job.

But nature in her own way is even simpler. Mice eat the insects. Snakes eat the mice. Survival of the fittest is the only world that insects and animals know. Bigger insects devouring smaller insects to make themselves bigger. I think that this is safe to assume on even the smallest of living materials.

Let's apply this to disease organisms that attack our grass. There are many in the soil at all times, waiting for the right climatic conditions. When the conditions become optimum, they burst forth to show us what a small but powerful condition they can be.

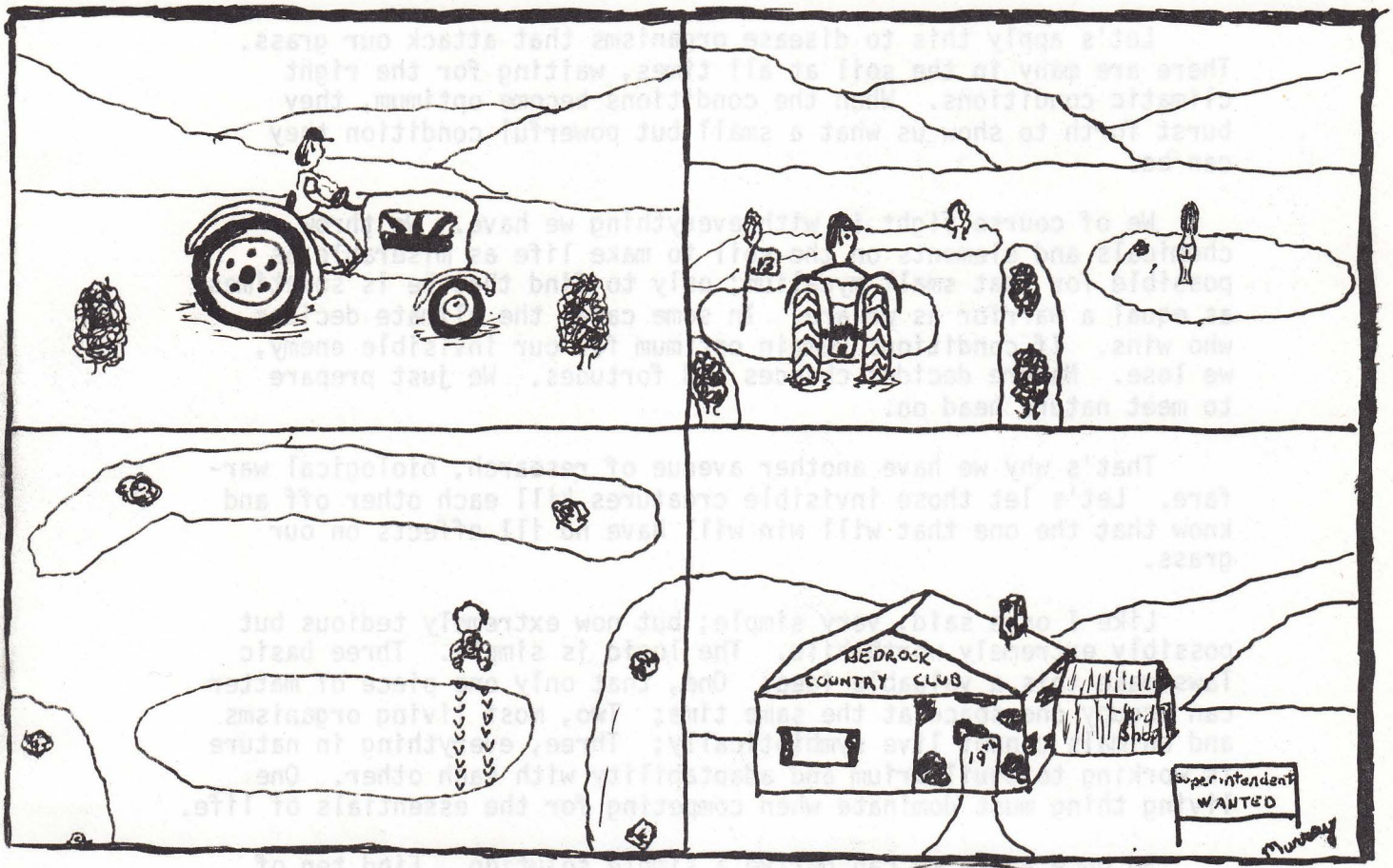
We of course fight it with everything we have. We throw chemicals and elements on the soil to make life as miserable as possible for that small mycelium; only to find that he is sometimes as equal a warrior as we are. In some cases the climate decides who wins. If conditions remain optimum for our invisible enemy, we lose. Nature decides chances and fortunes. We just prepare to meet nature head on.

That's why we have another avenue of research, biological warfare. Let's let those invisible creatures kill each other off and know that the one that will win will have no ill effects on our grass.

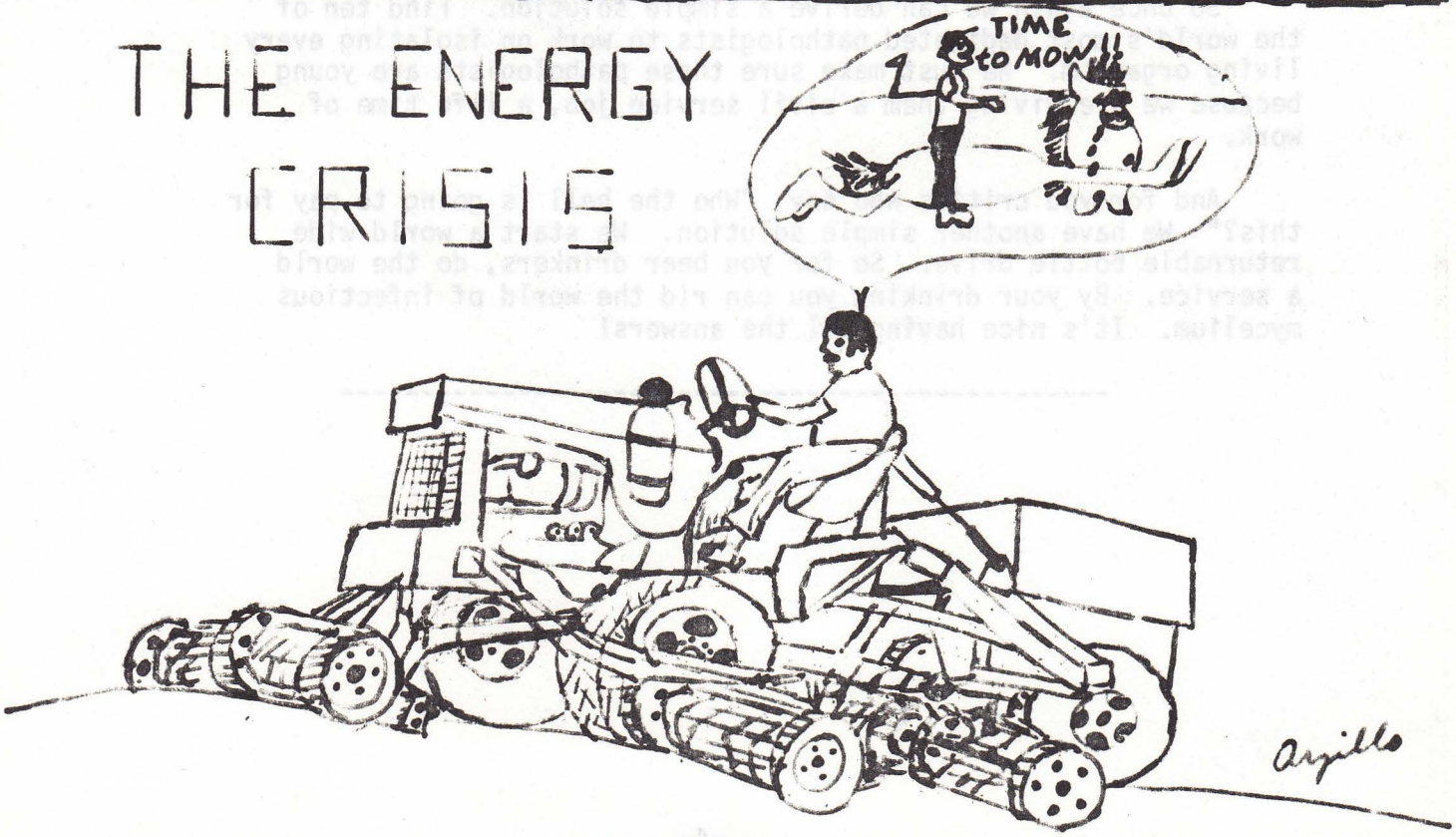
Like I once said, very simple; but now extremely tedious but possibly extremely worthwhile. The logic is simple. Three basic laws make this a valuable idea: One, that only one piece of matter can occupy one space at the same time; Two, most living organisms and animals cannot live symbiotically; Three, everything in nature is working to equilibrium and adaptability with each other. One living thing must dominate when competing for the essentials of life.

So once again we can derive a simple solution. Find ten of the world's most dedicated pathologists to work on isolating every living organism. We must make sure these pathologists are young because we are giving them a civil service job, a life time of work.

And for you critics who say, "Who the hell is going to pay for this?" We have another simple solution. We start a world-wide returnable bottle drive. So for you beer drinkers, do the world a service. By your drinking you can rid the world of infectious mycelium. It's nice having all the answers!



THE ENERGY CRISIS



Will we be forced to cut our fairways by means of horse???

Dr. Joseph Troll, Department of Plan and Soil Sciences, was presented several awards for Outstanding Service.

Mr. Tom Curran presented Dr. Troll with a plaque from the Golf Course Superintendents Association of New England.

Mr. Paul O'Leary presented Dr. Troll with a plaque from the Turf Alumni of the University of Massachusetts and the Stockbridge School of Agriculture.

Note: The Cape Cod Golf Course Superintendents Association also presented an award but a picture is not available.

1974 WINTER SCHOOL FOR TURF MANAGERS

Left to Right: Row 1: Dr. Robert Carrow, Frank Curto, Ron Pacquette, Raymond Saleeba, Don Myers, Mark Christianson, Charles Greenwald, Mike Rosenquist, Thomas O'Neill, Don Baker, Dr. Joseph Troll

Row 2: Edward Kaplan, William Turner, Robert Lake, Ronald Sherman, Roy Davis, Terry Hill, Mark Gosselin, Steve Cadenelli, Allen Reiman, Charles McLure

Row 3: Steven Tricca, James Sady, Charles McKenna, Brian Winn, Edward Brearley, Gregory Greaf, William Berger, Douglas Bell, Charles Meyer

Row 4: Esmond Bernier, Richard Rockwood, John Fagan, Steve Foran, William Prest, Byron Johnson, Dean Ayres, Les Guedel

Row 5: Dean Gibson, D.R. McMillan, Bruce Carlson, Joseph Perez, Hugh Rogers, David London, Darrell Haslam

ANNUAL TURFGRASS CONFERENCE PROCEEDINGS

1974

Conference presentations have been approved by the individual speakers.

The various topics are presented for your information as follows:

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PANEL ON 1973 TURF PROBLEMS IN REVIEW - 1974 POSSIBLE REMEDIES

William G. Buchanan, Moderator
Eastern Agronomist
USGA Green Section
Highland Park, N.J.

The panel today is made up of men that represent four different areas of the country. Each of these areas have their own particular problems. Today each man will discuss some of the problems he has encountered over the year and remedies that help to solve the problems. We are fortunate to have such a wide geographical area represented. This will give us exposure to problems that we normally would not come in contact with and maybe, just maybe, if we ever do come into contact with a similar problem we can think back to today and come up with a solution.

PROBLEMS OF "73"; SOLUTIONS FOR "74"

George B. Thompson, Superintendent
Columbia Country Club
Chevy Chase, Maryland

The figures 40-10-40 can be used in describing growing conditions in the Transition Zone, Washington, D.C. area. We have 40" of rain, 10" of snow and 40 days over 90°. The growing season, frost to frost, is approximately 200 days. The past year was the warmest in the 102 year record keeping history of the National Weather Service. The annual average temperature was 59.3°.

Mid-Atlantic golf course superintendents found "73" to be a trying year, however, in many respects it was just another year; we had 37 days over 90° and rainfall was 6" below normal and 17" less than the monsoons of "72". The reasons for the all-time record were mild winter, spring, and fall and although we were below normal for 90° days, we had the warmest June, July and August mean temperature of all time, 78.8°.

Because of the temperature extremes Northern and Southern grasses are grown in the Washington, D.C. area. Bents are standard on greens and in many cases tees, which are constructed properly. The greatest variance is on fairways where Bermudas, Blues, Tall Fescues, Zoysia, Fine-textured Ryes, and Bents are being grown as well as the ever present Poa annua. In selecting a fairway grass it really boils down to when you want your best grass or when will the members accept poor fairways. Those of us who manage Bermuda fairways experience a bad period in the spring when the cool season courses are at their best, however we can forget our fairways in the summer and concentrate on greens and tees. Some of us are trying a marriage between the new fine leafed Perennial Rye and Bermuda. This is showing promise and may be a solution for the Transition area. The newer Ryes show good drought and heat resistance, however get clobbered by Pythium. I had one fairway which was completely defoliated

by Pythium, however, when cool weather arrived complete recovery was made in 3 weeks without reseeding. Rye has no stolons or rhizomes but it has good recovery potential from its crown.

Bluegrass is the most popular fairway grass in the Washington area. It holds up quite well for 3 or 4 years and then degenerates rapidly from Fusarium roseum. Some of the newer varieties may offer hope for the future.

The clubs which had planted Bent originally have converted to other grasses, mainly because they didn't want the tremendous outlay for fairway fungicides. I think certain clubs with large budgets could be successful with Bent, however, management would be critical.

What set 1973 apart from other recent years was a marked increase in insect activity brought on by two consecutive warm winters and wet springs. We have had the most damage from grubs since the early 60's. The Hyperodes have not reached our area as yet but we had plenty of trouble with Chinch Bug, Frit Fly and another weevil which attacks Zoysia called a Zoysia Bill Bug. We had more generations of Sodweb worms and cutworms than I could remember. The moths were constantly flying. I sprayed greens 13 times last year, generally 8 to 10 treatments are necessary.

Another new problem is a Fairy Ring-type fungi. This organism has yellow rings for 3" up to 30" in diameter and even though it is not very devastating it is quite unsightly. On certain occasions we have seen 30 or more rings on one green.

The last two mild, open, winters have created conditions for more traffic injury both foot and vehicle. The golfers are putting more demands on superintendents and in many cases the superintendent does not have the authority to restrict play any more.

Wilt, Crabgrass (Silver and Common) and Pythium are a way of life with Mid-Atlantic superintendents and must be contended with every year. I would like to offer my friends in the Northeast some tips that have helped Washington area supers and even though this Northeast Section may only get Pythium or Silver Crabgrass every 5 or 6 years, the potential is there every year.

Silver Crabgrass, Goosegrass, Eleusine indica

Pre-emergence chemicals are most effective. Some results can be had with post-emergence chemicals, however must catch very early and repeat 3 times. If the plant gets any size at all, it gets away from you. Because of the duration of our season some apply a pre-emergence at full rate April 1 and repeat at 3/4 rate in June. If we only plan to treat once and Silver is the main problem, we generally wait until late April or early May. One mistake many of us make is in giving up on one product and switching around every year. Good Silver Crab control can be had with 3 or 4 products. The main thing is to stick with one product for at

least two years. If an improvement is not seen the second year then a change may be appropriate. Ninety percent control is generally not enough when the plants reach the size of a pie plate and did you ever try to cut that stuff, almost impossible, it even resists a sharp verticut. It is most troublesome on cool season tees, where divots are being taken out. As the barrier is broken, young seedlings quickly emerge. We found if divots are not patched within a few days it is too late. Silver Crab is no problem in shade.

Pythium

This disease is a very devastating one, but one which can be controlled chemically and even to some extent culturally once it is understood. We start looking for it after 5 consecutive nights in which the temperature does not drop below 70°. One rule of thumb we use is when the combined overnight low temperature and low humidity does not fall below 155, conditions are favorable for Pythium. This does not mean that you will get Pythium every night that these conditions exist. As a matter of fact there are some nights when this figure is 160 or more and we do not get it. I believe some nights are actually too hot and humid for it. The only way I can be sure of chemical control is when I leave one part of that area untreated. We have a local telephone number which gives us temperature and humidity, 24 hours a day, many of us have recording thermometers, which gives us a 24 hr. temperature graph. To properly diagnose Pythium it is important to get out early in the morning before any mowing or watering takes place. I get at least two strains of it. One is the typical Cottony Blight with Bright White Cottony Mycelium. This Mycellium is white, similar to Dollar Spot only much heavier. I have never noticed much kill where this Mycellium was active.

The other Pythium organism I get has lighter Mycellium similar to Dollar Spot only this Mycellium has a definite blueish cast to it. I think this organism is Pythium ultimum, it differs from Dollar Spot in that the lesions are straw colored with reddish margins while early Dollar Spot lesions are white on each leaf. This organism is very destructive and moves rapidly. Close observance reveals each infected plant collapses. There is also a water soaked appearance around each diseased area. Rye and Highland Bent are good indicators and ironically Bent seems to be damaged more than Poa annua.

If you get hit with Pythium don'tstop watering, most of us have a tendency to stop completely becuase it is a water mold. As a result the turf gets under drought stress and becomes even more susceptible to this disease. Pythium is active when humidity is high and evaporation is slowed down so watering schedule should be cut; however, don't stop completely, give the plant enough to keep it healthy. All the disease needs is a ground fog for spore germination. We even seem to get less on mornings following a rain.

Pythium is primarily a saprophyte and it can be seen often working on grass clippings. When we started picking up clippings on aprons, collars

and tees, there was a marked decrease in fungus activity. Most of us have stopped the nitrogen race; this has resulted in generally better putting surfaces and heartier turf. Another bonus from more prudent use of nitrogen is a plant which resists Pythium infection; the higher the fertility level or nitrogen imbalance, the more Pythium.

Chemicals do a fine job on this fungus. We have two very good ones. They are both contact fungicides which can be washed off by rainfall, however, they are both very effective in controlling the organism for 3-5 days. They are both very expensive; however, money should not be of that much concern when greens are endangered. It's much cheaper to spray than to replant.

When we experience a season like this past one, there is a tendency to let down and give up. The turf looks like hell and we are being criticized for not doing our jobs. We have a tendency to stop watering, syringing and spraying because we don't think it can look worse than it does. Well it can look worse, 10% turf loss on a green looks bad but isn't 90% better than 100% loss? Don't give up, hang in there, there will be less 90° days ahead of you than there are behind you.

TURF PROBLEMS OF 1973
SYSTEMIC RESISTANT DOLLAR SPOT

Jack Martin, Superintendent
Shackamaxon Golf & Country Club Inc.
Westfield, N.J.

The problems of the New Jersey-New York area in 1973 were not unlike the problems of the same area during 1972, just more severe. Rainfall during 1973 exceeded 1972 which was the heaviest in over a decade. Temperatures and humidity remained high throughout the season. A record heat wave topped off the season in the last week of August and the first week of September. Many of those who had seeded lost seedling grass from wilt and disease. Syringing of everything was a must throughout the season, especially for wet wilt. Turf grass diseases were prevalent all season with Pythium and Fusarium roseum more severe than ever. Crabgrass and goose grass had record turn outs, with both germinating later than I have ever experienced due to the record rainfall and the late heat wave. Japanese beetle grubs were a big problem on many courses, having not been a problem for many years.

Rather than elaborate on all these problems which I'm sure that most of you have experienced, I would like to discuss a unique problem that I have experienced over the past two seasons and have been compiling data on. That problem is Systemic Resistant Dollar Spot. Dr. Herb Cole had an excellent article on dollar spot in the January issue of "The Golf Superintendent." I will also make some comments on that article as we go along.

During the early and mid-sixties many people in my area including myself were controlling dollar spot with mercury and Cadmium. Then came the resistant strains to these materials. Acti-dione and other contact fungicides were then used. When the systemics came on the scene in 1971, many thought that our dollar spot problems were over. I used Benomyl (1991) in 1971 and didn't see a dollar spot on the course the entire season.

In 1972 I applied fungicide for leafspot control in the spring. Early in June I noticed dollar spot on my fairways. No systemic fungicide had been applied previously that year. At that time (June 5, 1972) Benomyl (1991) was applied at the one ounce rate. It did not give control. Following this, Benomyl was applied as heavily as 6 ounces per thousand square feet with no success. Many people observed the disease and some thought (including the manufacturer) that perhaps this was not dollar spot. Since it had a very heavy cotton-like mycelium, some thought it might be Pythium. Samples of the fungus were sent to several universities (including Rutgers and Penn State) for identification and experimentation. Benomyl was applied in the laboratory at 100 x with no control. During 1972 I tried all the systemics available including 3336 and Mertect 140-F, at different rates to no avail. At that time I had to revert back to contact fungicides - Acti-dione and Dyrene were the main types used. These did give control but only for short periods of seven days or less during stress periods. Naturally, I spent a small fortune that summer trying to keep the systemic dollarspot under control. Dollar spot was prevalent as late as October and some of the scars were still visible in the spring of 1973. Now the question was - "What to do in 1973 without spending a small fortune on fungicide again?"

During the winter of 1972-1973 I spoke to anyone and everyone in an effort to find an answer to this problem. I found out that fewer than ten courses throughout the country had reported systemic resistant dollar spot. However, this past year (1973) more people encountered it. By the beginning of the season in 1973, no one had the answer, so it looked like another season of trial and error. One systemic manufacturer felt that if the systemic was applied in the spring (April and May) that it (the fungicide) would get established in the plant and do the job during the summer, provided it was also applied at the recommended rate during the summer also. This is an expensive proposition for even the wealthiest clubs if fairways are to be included, as they were at my club. I decided to try this on ten acres of fairway. The manufacturer felt so strongly about it that he offered to absorb the cost of the material if it did not work.

I applied two applications of 3336 - one on April 24, 1973, and one on May 16, 1973, at one ounce/1000 sq.ft. on five fairways. The other fairways were sprayed with Acti-dione at one and one-half times the recommended rate or one and one-half units/acre (22.5 oz). On May 23 fairways that received the systemic fungicides had heavy dollar spot, the others were clean. Listed in this report are the dates and application rates of the chemicals used on fairways this past season of 1973. Most applications had thiram included. Most applications had Tru-green at 2 oz/1000 sq.ft. and/or Urea at 1/16 to 1/8 of a lb/1000 sq.ft. The fertilization

program on fairways gave three pounds of nitrogen per 1000 sq.ft. yearly. Two pounds of Uramite in the spring and one pound of 30-3-10 were applied in the fall. With fairways spraying on different days, etc., the timing of applications may seem irregular. However, there were many variables that had to be considered such as incidence and degree of infestation on different fairways, weather conditions, chemicals on hand at the time, the water system (250 g.p.m.), etc. This all occurred at Suburban Golf Club, Union, N.J. I not only tried to find out what chemicals and their rates would control the systemic resistant dollarspot, but I considered the cost factor also. Many of the chemicals gave control at double the rate which made the cost prohibitive. My observations are as follows:

Acti-dione	-The recommended rate of one unit per acre did not give dollarspot control. At the one and half unit rate, it did give control but it lasted for less than ten days.
PMAS & Thiram	- PMAS at 1 qt/acre or 3/4 oz/1000 sq.ft. and Thiram 3 oz/1000 gave less than ten days control.
Cadmium & Thiram	- Caddy 1 oz/1000 sq.ft. and Thiram 3 oz/1000 sq.ft. Caddy alone or mixed with Thiram did a good job in most cases. Control lasted 10-15 days. It was the most economical.
Daconil	- At 4 pounds per acre gave less than 5 days control.
Dyrene	- At 4 oz/1000 gave less than 10 days control.
PMAS & Acti-dione	- A combination of PMAS at one quart/acre and Acti-dione at one unit/acre gave excellent results. Control lasted over 25 days. Caddy was also put on the fairways in question the day before. This treatment was not very economical.
Acti-dione RZ	- At one and one-half pounds and Thiram at 8 lbs/ acre control was good for 25 days. It was the second most economical.

Dates and Application Rates

April 23 - All fairways (except 7,8,13,14,15) with Acti-dione one and one-half units per acre.

April 24 - Fairways 7,8,13,14,15 with 3336 1 oz/1000.

May 10 - Fairways 7,8,9,13, with 3336 1 oz/1000.

May 11 - Rest of fairways one and one-half units Acti-dione (except 14,15).

May 16 - Sprayed 14 and 15 fairways 1 oz 3336/1000.

May 23 - Dollarspot sighted on all systemic fairways 7,8,13,14,15.

May 29 - Sprayed 7,8,13,14,15, fairways with PMAS 1qt/acre-Thiram 3 oz/1000.

May 30 - Sprayed 13,14,15 fairways with 2 units Acti-dione/A. Sprayed rest of fairways with one and one-half units Acti-dione.

June 14 - Spot sprayed fairways with one and one-half units Acti-dione and Thiram 3 oz/1000.

June 19 - Spot-sprayed fairways with same mix as June 14.

June 20 - Sprayed 4,5,6,10,11,1,18 with 1-1/2 units/A of Acti-dione and 3 oz/1000 Thiram.

June 20 - Sprayed 7,8,9,3 with PMAS 1 qt/A and 3 oz/1000 Thiram.

June 21 - Sprayed 15,17,12 with Caddy 1 oz/1000 and 3 oz/1000 Thiram.

June 23 - Sprayed 13,14 with Caddy 1 oz/1000 and 3 oz/1000 Thiram. Heavy dollarspot. This application reduced dollarspot but did not stop it.

June 24 - Sprayed 7,8,9 fairways with Daconil 4 lbs/A. Stopped dollarspot for a short time only.

June 24 - Sprayed 13,14 with PMAS and Acti-dione mixed. PMAS 1 qt/A. Acti-dione one unit/A. Excellent control.

June 26 - Dollarspot just starting on all fairways except 12,15,17, which were sprayed with Caddy and Thiram. Also, none occurred on 13,14 which were sprayed with Caddy and Thiram and PMAS-Acti-dione combination.

July 1 & 2 - All fairways (except 13,14) sprayed with 1 oz/1000 Caddy and 1-1/2 oz/1000 Thiram.

July 23 - Sprayed 13,14 fairways with Acti-dione RZ one and one-half lbs/A and 3 oz/1000 Thiram.

July 23 - Sprayed 15,17, half of 12 with PMAS 1 qt/A and 3 oz/1000 Thiram.

July 26-27 - Sprayed all fairways (except 13,14) with PMAS 1 qt/A and 3 oz/1000 Thiram.

August 17 - Sprayed 8,9 fairways with one and one-half oz Caddy and 3 oz/1000 Thiram.

August 23 - Spot-sprayed fairways with Acti-dione 1-1/2 units/A Acti-dione and 3 oz Thiram.

August 27 - Sprayed all fairways (except 13,14) with 1 oz. Caddy and 1-1/2 oz. Thiram/1000.

August 27 - Sprayed 13,14 with Acti-dione RZ 1-1/2 lbs/A and 1-1/2 oz Thiram.

August 31 - Sprayed all fairways with Caddy 1 oz and Thiram 1-1/2 oz/ 1000.

Conclusions:

Systemic fungicides applied in the spring have no bearing on control factors throughout the season. It seems that the systemic resistant dollarspot is not resistant to Cadmium or Mercury. It can be controlled at different rates with most of the contact fungicides. The cost is prohibitive where contact rates had to be increased. I found that Cadmium and Acti-dione RZ did the best job for the money. Although not listed in this report, I used a contact and systemic combination of greens and tees with good success. I feel that the combination (systemic and contact) is, perhaps, the best answer provided the cost is in line. I also encountered Pythium and Fusarium roseum on greens and collars this year. The systemic appeared important for Fusarium control.

TURF PROBLEMS IN THE NORTHEAST

Robert E. Grant, Superintendent
Brae Burn Country Club
West Newton, MA.

No one connected with turf in the Northeast will forget the 1973 season. Almost every golf course experienced turf loss or setback on fairways and aprons. Most greens and tees were in good condition due to increased maintenance practices. Mother Nature threw the book at us when she supplied excessive amounts of rain, heat, humidity and cloudy days. For most superintendents it was a ten week battle against wilt, scald, and disease.

I would like to read one paragraph of a recent report written by Bill Buchanan, an agronomist for United States Golf Association Greens Section, after he had visited a golf course in the Boston area on July 19, 1973. He wrote the following: "Hot weather combined with saturated soil have caused a considerable amount of turf to be lost on fairways. The greens do not appear to have been damaged. Fairway damage has been caused by heavy rains saturating the soil and water standing in the low pocketed areas where drainage is poor. The high temperatures not only heat the water but greatly accelerate the transpiration process of the plant. When the soil is saturated, the soil lacks oxygen, and when the transpiration process accelerates, oxygen is required in large quantities. Since oxygen is not available, the plant wilts. Also, the high temperatures of the water adversely effect the plant. In simple terms, the plant becomes wilted or scalded from lack of oxygen and from the heat that the sun and water generate."

Now that I have explained what our turf problems were in 1973, I would like to explain how they happened. Outside of the week of the Turf Conference in Boston, January 7-12, we experienced a very mild winter. Loss of turf due to winter kill was at a minimum and all courses opened around the first of April in excellent condition. May was a normal month but in June the rains came. About six inches of rain fell during that month. The latter part of June temperatures and the humidity started to rise. At this point every superintendent in the area knew we were in for a long summer. The first week of July was the backbreaker when four inches of rain fell in four days, followed by several days when the humidity and temperatures were in the mid to upper ninetys. These conditions set the stage for wilt, scald, and disease. The poa on the fairways was effected first, and the the permanent grass. In some cases the tees and greens became a problem. With the exception of a few days in mid August we did not experience normal weather until September. As the younger generation would say, it was a real bummer.

During late June when the weak, spindley turf along with its poor color became noticeable, most superintendents attempted to adjust their programs. Fertilizer applications were reduced or eliminated, fungicide applications were increased, normal cutting schedules were altered, spiking equipment was put to use, and everyone was prepared to water for wilt. The results were that some turf was still lost but many acres were saved.

Regardless of what has happened in the past, we should learn from our experiences. I would like to pass on to you some of the observations that were made in the Northeast during this hot, wet, humid period:

1. Turf, five years old or younger, was not a problem.

2. Low maintenance, unwatered fairways did well.

3. Intermediate rough cut at 1 1/2 inches was not effected.

4. Well draining, sandy soil golf courses were in the best condition.

5. Time of cutting and equipment used is very important.

6. Drainage --surface and soil-- is probably our greatest problem.

7. Poa annua is always the first to go.

8. Some chemicals did the job, some did not. Many were not available when needed.

9. Automatic watering systems, with syringe cycles, were worth the investment.

10. The Golf Course Superintendent should have the authority to close the golf course if necessary, plus complete control of golf cars.

11. When the Greens Committee and Membership were informed as to what was happening, they seemed to understand.

I am sure you all realize that there are many turf problems in the Northeast other than the ones I have talked about. My feeling is to cover this one subject rather than to generalize.

Now, with the aid of slides I will show the problems and what is being done about them.

PROBLEMS IN THE MIDWEST AREA

William Burdick, Superintendent
Canterbury Golf Club
Beachwood, Ohio

In the problem department Canterbury is no different than any other 50 year old Midwest country club. There are built in problems, problems that evolve due to economic conditions, and problems that are created by various weather conditions that are often typical of a specific geographical location.

In 1973 Canterbury was host to the National PGA Championship. That made us aware of two distinct problems that we had to solve.

One was to conserve labor by the use of equipment because of increased labor costs (at present our labor costs averages $100,000.00 to $110,000.00 per year), and at the same time accomplish certain jobs in less time because of the tight time schedule that PGA would require. The second was to correct drainage in small localized wet spots.

To conserve labor I concentrated on two problem areas, fairway fungicide application and employee transportation around the golf course.

Fairway spraying was taking approximately 14 hours per application with one complete application each 10 days on our bentgrass fairways. We are also required to spray the 15' intermediate rough around each fairway. It was also difficult to stay on this schedule during periods of wet weather when equipment could not be used on the fairways. If we went to larger capacity spraying equipment this would solve the problem of faster application but not during wet periods. We had tried using a helicopter in the past with good results but this was expensive and weather and wind conditions were difficult to cope with. The obvious solution was a mist blower that could spray a fairway from the rough during wet periods and was light enough to be used in the fairways when conditions would allow. We chose the 100 gallon Myers Mity Mist. Results were excellent, cutting our application time down to 5 to 6 hours. During windy conditions spraying could be done from the upwind side of the fairway. The equipment was light enough to permit use during wet conditions and was fast enough to stay ahead of the morning play. Night applications are also very easy with the mist blower.

The blower was nozzled to cover 5 acres with 100 gallons. The machine was equipped so that we could spray from both sides for center fairway application or from either side for perimeter applications. The blower also uses a spray boom to cover the area directly under the tractor. The boom proved to be the only problem. The boom came equipped with brass tee jet nozzles that when operated at 350 PSI would wear out in one application. This showed up as 5 yellow streaks down the center of each fairway one month before the PGA. The nozzles were replaced with the same round steel nozzles used in the upper blower manifold which corrected the problem. They can also be replaced with stainless steel tee jets for additional life if the tee jet pattern is preferred.

Our next problem was to find an economical way to put as many employees on wheels as we could. We were operating with 9 transportation vehicles at approximately $2500.00 per unit with a need for 12 to 14 such units. We didn't feel justified in spending $2500.00 per unit for transportation so we chose the 300 pound capacity Jobber truck, made by Larkin Aircraft, priced at $450.00 per unit with an expected life of 3 years as opposed to the $2500.00 units with a life of 5 years. We purchased 4 Jobbers and three Jobber trailers at an additional cost of $125.00 per trailer.

The Jobbers were used for one full season with no down time and when used to transport greens mowers and personnel cut 45 minutes per man from our greens mowing time. They were used to transport rotary mower operators and sand trap crewmen for additional labor savings.

We feel the Jobbers will last the expected 3 years with approximately $50.00 per unit, per year in repairs and many dollars saved in our labor budget.

Our drainage problems have been minor in past years but have been on the increase the past two years. Canterbury has what should be a very adequate surface and subsurface drainage. The localized wet spots began to show up in depressions directly over or near tile lines so we naturally

thought the problem was broken or plugged tile. As these areas were dug up for repair we found the tile was clean and open and also dry. The soil was found to be very compacted down to about 10 inches. We had been aerifying fairways 4 times each fall but this did not seem to help the problem. As I was going thru my records for the past winters I found that for 4 years we had not had over 1 inch of frozen ground at any time. Our normal Ohio winters will freeze ground to 12 to 18 inches. I feel that our compaction is building up due to the lack of frost action.

We started improving drainage by adding in line tees and surface risers to our subsurface drainage with a 4" drain cap at sod level. These were installed on 15' centers and worked well but would continually plug up with grass clippings and also made fairway aerification difficult. It also seemed like a slow and expensive way to cope with what should be a temporary problem. We knew that if we could move the excess water through the compacted layer the problem would be minimized or eliminated.

The approach we took was to use a small generator and heavy duty electric drill equipped with a 2 1/2 inch tree food auger and bore down through the compacted soil layer into the gravel surrounding the drain tile. These holes were bored on 1 foot centers and left open or filled with pea gravel. The turf would soon grow over the holes but still allow water to seep through.

The project was fast with no mess and the holes will remain for several years in our heavy clay soil. Although this method is only temporary it has solved what could have been a serious problem until the soil is again lossened through winter freezing.

We have also changed our aerifying equipment from the old 140 spoon aerifier to a new machine that uses 300 spoons. Fairways were aerified 4 times beginning in late September. The cores were broken up and the thatch pellets removed by blowing and sweeping. Lime was then applied at a rate of 1 1/2 tons per acre to complete the project.

Summary by Mr. Buchanan

We have heard four talks about many different problems. Each speaker has offered solutions that worked for him. We must be mindful of the phrase "worked for him". As we are well aware, each course has its own individual problems. Sure, certain ones may be common to a particular section of the country, but these problems will affect different courses in different ways. Therefore, it is up to the individual superintendent to seek a solution to the problem and be flexible enough to adapt this solution to his own particular needs. There have been many excellent ideas presented by our panel, and now it is up to each individual to see how some of these ideas can be applied to help him remedy his problems.

MOVEMENT OF WATER TO A HOLDING POND

Anthony B. Caranci, Jr., Superintendent
Ledgemont Country Club
Seekonk, Mass.

We at the Ledgemont Country Club are under a unique situation concerning water facilities. We are located in the Town of Seekonk, Massachusetts, near the Rhode Island State Line. The town has 48 wells on our property and for many years these 48 wells were the only source of water to supply the entire town of approximately 12,000 people. With Ledgemont being the town's only water source we were under many very tight restrictions. Some of these restrictions were:

--That we could not enlarge our very small holding pond, which was part of a stream that flowed all but a few weeks in August, during normal weather conditions.

--We could not at any time either dredge this pond or deepen the entire stream that passed through at least seven holes of our course.

--We could not dam this pond nor the stream at any time.

--And we could not dig any wells in the area. In fact after having checked with the town and the state we found that the entire golf course was under a so-called water protection shed and we could not install any wells on the entire 210 acres of our property; let alone the area where these 48 wells existed.

When we irrigate our golf course normally with the stream that always flowed, except for a few weeks in August, and the small holding pond that this stream flowed into, we would purchase approximately $3000 to $4000 worth of water, per season, to properly maintain our turf during July and August. Remember, the town would pump water from 48 wells on our property and then sell the water back to us. Quite unique!

Our club and the Town Water District for over 20 years operated under an agreement that the town would supplement our own water supply when needed; however, during times of extreme drought the club would be limited for fairway irrigation but would always be allowed enough water for our greens. Over the years we were the largest water customer in town and always the first customer to be rationed during water shortages.

Apparently the town began to grow and the town's water supply was not enlarged to meet the additional needs of the community and when the last drought came upon us, three years ago, we were the first customer to be rationed. Well before long we were not only rationed but completely shut off from using any water what-so-ever as far as turf was concerned, due to the extreme water demands of the increasing population of the town. Our clubhouse operates on a separate meter and if I were to take five gallons of water from the meter supplying the golf course a highly sensitive gauge would record this action in the town's pumping station, which is located between my Eighth and Fourteenth holes.

I met with the local water board numerous times to try to impress them as to the tremendous cost to the club if we were to lose all the greens. We acquired a little to syringe the greens but this also ended within a few days. While the townspeople were ordered not to water their lawns, you can imagine the outcry from those who saw a golf course sprinkler turning on a green of a wealthy golf course.

Now we had a real problem, no water.

I began calling companies who owned tank trucks to try to have water hauled in to us to at least save our greens. This created new problems.

Sitting in the clubhouse having lunch one afternoon looking out into the panoramic view I could see an old gravel bank with a beautiful pond that was no longer in use, approximately two miles away. I began to think of the possibilities of getting this water to our club. I went to seek out the wealthy owners of this abandoned gravel bank to see if some arrangements could possibly be made to pipe this water to our club. The owners were willing to sell me water but we could not get easements to lay pipe over all the individual properties leading to our club, approximately two miles away.

I did recall, however, that every spring during the thaws and April rains storm water would come into the golf course from behind my 14th tee, by the 13th green, and travel over a swale and end up in our holding pond in front of my pumping station. So I crossed the street opposite my 14th tee and began walking the terrain to see just where this flash flood water would come from. The vegetation got so thick and swampy that I could not walk it any farther than half the distance between the old gravel bank and our club, which was about a mile. Then I tried to approach this area from the gravel bank side, only to find that the pond did flow west, in the opposite direction to the club, and there was quite a rise in the terrain between the water and the swampy area to the east in the direction of the club.

Well, I had to try something. We were going to lose all the turf, especially the greens, so I decided to take a chance to get some of this beautiful water to our own small holding pond. I first made an agreement with the owners of this pond to pay them $1000 for the use of the water. Then I acquired a backhoe and dug a trench across a small service road which was adjacent to the pond and I installed a culvert-type pipe under this road. Then from the other side of the road I had a trench dug for approximately 1000 feet to the east reaching this swampy area which was impassable by foot or with equipment. I had surmised that if this swampy area was filled with water it would eventually reach the area next to my 13th green, ending up in my holding pond. I hired a gasoline pump and installed it along the side of the pond. I received permission from the different property owners whose land I thought this water would pass and we began pumping. Lo and behold we pumped for 22 hours, wondering where the water was going, anticipating lawyers letters to be served upon us very shortly. I was now worrying as to how many cellars we were filling with water. Every time a police car would pull up, I thought this was

it! But they came to check out complaints from the neighbors that the motorized pump was keeping them awake. Within the 23rd hour, after saturating the entire swampy area with water, we saw some water beginning to trickle out from a depression underneath a horse barn. This trickle of water lead to a small duck pond which was as dry as powder. The owner of this farm had an old bathtub in one corner which he kept full of water for his ducks during this drought. You should have seen the reaction of the ducks when they began seeing the water trickle like a quarter inch hose into their dried up duck pond. The water began to flow and within two more hours the duck pond was filled and overflowing over the land heading toward the country club. Like a miracle this water went under the road, through the storm drain, by my 14th tee, beside my 13th green and entered my sluiceway at my pumphouse. We were able to pump around the clock, to get enough water to keep our greens in excellent condition and our tees and fairways in fair condition.

We did encounter many problems, such as the home owners complaint about the noise from the pump running all night. The local town selectmen had a special meeting and ordained special hours in which I could run my pump. Every time we stopped pumping, it took at least six hours from the time we started the pump until the time the water reached the club. We experienced a tremendous amount of vandalism. Five o'clock in the morning, with a nice bright hot sun beginning to rise, we would find the pump was vandalized, wires were gone, radiator filled with beach sand, etc. We had to pay a watchman around the clock until we built a temporary building around the pump. One morning they had broken into this temporary building and put just enough sand in the crankcase to destroy the motor. I think that one of the problems was that this pond was being used at one end as a swimming area and the teenagers thought that we would pump it dry. This is why we experienced an exceptional amount of vandalism.

After many meetings and public hearings with the state and local boards of health, public works, conservation, water districts, etc., we were able to accomplish the following:

We purchased a piece of land below our property line which was beyond the so-called "water protection shed". We hired a test drilling company to drive test wells throughout this newly purchased property at a cost of $3000. Believe it or not, the only area where we could possibly acquire approximately 250 gallons per minute was in the most inaccessible area of this property. We had to build a road to the site almost 1000 feet long. We had to build a well site to be able to hold the twenty ton well drill. Then of course we had to drill the well, build a vault, re-route two small streams, install 1000 feet of six inch pipe to bring this water back to our pumping station and pond area. We did get permission to enlarge our pond approximately five times its holding capacity at that time after many meetings with the state.

We ended up spending over $70,000 for a well which provides 250 gallons per minute, pumping 24 hours into an enlarged holding pond, which we still cannot dam its outlet. We then pick up this water with additional pumps and irrigate our turf.

After all this -- the next two seasons were wet and we haven't had the opportunity to use this new set-up!

MAINTENANCE OF LOW BUDGET, SHORT SEASON GOLF COURSES

Professor Vaughn H. Holyoke
Extension Crops Specialist
University of Maine
Orono, Maine

I will use my time this afternoon to consider some of the problems of low budget golf courses and also to take a look at some possible solutions. I will not get into the real nuts and bolts of how to maintain a course on a low budget, because many of you men are far more qualified to do this than I am. A number of my comments will also reflect not just the problems of low budget courses but the low concentration of courses in Northern New England.

The term "low budget" is rather abstract and means different things to different people. To someone in Washington County on a 9-hole course with a $5,000 budget, a $50,000 budget at one of our country clubs seems like a lot of money. Yet this $50,000 budget may seem pretty small when stacked against a course in some other part of New England. So talking about a low budget course is similar to asking the question "How big is big".

Regardless of budget size, the principles of sound management are the same for all. It's a matter of setting up a list of priorities and trying to get the maximum amount of return for the dollar invested.

Fertilizer

One of the budget items that can often be manipulated is the money spent for fertilizer. When dollars are scarce, it may be time to stop worrying about such things as the source of nitrogen and salt concentration and start worrying about the pounds of nitrogen, phosphorus and potassium it takes to make grass grow. In the fertilizer area, I would quickly delineate greens from tees and fairways. Because of the high value of greens and the potential problem that a little discoloration can cause, I'm certainly not opposed to the use of organic fertilizers on greens. Actually I'm not opposed to organic fertilizer being used anywhere on the course, but when dollars are short, there may be another way.

Too often I see superintendents using high priced organics on fairways when some of the money might have been better spent on an aerifier to spruce up the greens. In other cases, organic fertilizer is being spread at such a low rate that one would never see the benefit. A higher rate of a less expensive material might better serve the purpose, at least for a while.

I often smile at a statement found on turf fertilizer bags which indicates that "It is non-burning if used as directed." I submit that no fertilizer will burn if used with the proper judgment.

I hope to leave today without getting shot by an irate fertilizer salesman, but I still feel there are opportunities for some low budget

courses to get more mileage from their fertilizer dollar.

Equipment

As I travel around Maine, I'm convinced that a good aerifying and topdressing program would do more to improve the greens than any other management aid. In addition, there is a need for verti-cut machines, sprayers and cyclone type spreaders. These are pieces of equipment that are used only a few times a year but are essential for carrying out a good management program.

It is often possible to convince a superintendent of the need for this equipment, but it can be pretty difficult to show him where to get the money to buy it. I used to think that cooperative buying was the answer, but I've changed my mind. I do feel, however, that a cooperative effort between neighboring clubs can help. Why can't one club buy an aerifier while another club buys a topdresser, etc. Then work out a lease agreement where everybody gets a fair deal. Such an arrangement has some drawbacks but when I see the crying need for equipment on our small courses, I think we should try to make it work.

Disease & Insects

Pest control on many low budget courses is more a matter of cure rather than prevention. When dollars are scarce, there is a tendency to gamble on getting missed by a disease outbreak rather than treating to prevent it. In northern New England I suspect there is some merit in this approach. The one exception is snow mold, where through the efforts of the industry people the superintendents have accepted snow mold prevention as a regular budget item.

Salary

In keeping with other items in a low budget golf course is the salary of the superintendent. I suspect that a number of people here today (especially the younger men) started at a salary close to what some of the top supers in Maine are currently getting. I assure you that their salary is not due to their lack of knowledge, but is due rather to their desire to stay in Maine and enjoy some of our fringe benefits. It's perhaps ironic that low budget courses which expect and receive the most out of a man, actually pay him the least. These supers must be a master at stretching dollars and due to the small staff they must get out on the course and sweat with the crew.

This group, perhaps because of the lack of formal training, worry very little about their image, but they worry most about doing the best they can with what they have available.

University and Industry Support

As I look at the turf programs at the universities in northern New England, they leave a lot to be desired. I'm not faulting the universities because with their limited resources, they are perhaps doing all they can. Yet I suspect that a large percentage of the low budget courses are in

the states that offer the least amount of help. Yet these are the courses that can't afford the highly skilled superintendent nor can they afford the services of the consultant.

College administrators are constantly talking about regionalized programs and I sincerely feel that turf might be a place to start.

Currently the northern courses are heavily dependent upon the technical guidance of industry people. In Maine (and in other areas I'm sure) we have been blessed with industry reps who in most cases have the superintendents' best interest at heart. Yet at times some good solid help from a regionalized research and extension program could help.

As I look ahead, I don't see the lot of the low budget course improving rapidly. Due to location or circumstances, it will probably remain in the low budget category. Although it will probably move ahead, it will undoubtedly progress at a slower rate than others and will thus fall further behind. The superintendents will continue to work harder for less and try to get more for their budget buck than will their rich cousins. But hopefully they can learn to pool their resources and will cut where it counts and not where it hurts.

TURFGRASS FERTILIZATION

Professor John C. Harper, II
Extension Agronomist
The Pennsylvania State Univeristy
University Park, PA.

I wonder how many superintendents in the audience really have a planned fertilizer program? Or how many think they have a planned fertilizer program? For those of you who feel you have a program, what is the program based on? Are you using a program because someone else has had success with it on their course, or because a highly respected friend recommended it? Are you using a program because a University Soil Testing Laboratory or a commercial soil testing laboratory told you this should be your program? Or have you based your program on the physical condition of your soil and its inherent fertility, the species or variety of grass; the usage to which the turf is being subjected; the climatic conditions, including length of growing season; the type of fertilizer, especially nitrogen, you wish to use; your labor situation; your budget; soil test results; and your general management program.

Superintendents have asked, and rightfully so, "Why have a planned fertilizer program?" "Why not fertilize grass when it needs it?" This certainly appears to be a sound approach to turfgrass fertilization. A planned fertilizer program must be flexible enough to permit fertilization

when it is "needed". A properly planned and executed fertilizer program has this flexibility and in addition results in more efficient fertilization. It enables you to more efficiently utilize your crew, to maintain better fertilizer records, and it may result in an economic advantage of buying all your fertilizer needs during the off-season. More important you will be putting your whole management operation on a more business like basis and will be providing input you must have in order to prepare your annual budget. In today's world of shortages and rising costs of fertilizer and labor, error costs are magnified many times over.

Turfgrass is a very unusual crop. Most agricultural crops are fertilized once or at the most a few times, grown to maturity and harvested. Crops of this type have maximum fertility requirements for a relatively short period of time. Turfgrasses, on the other hand, must give maximum performance throughout the growing season. In this respect they are most similar to species grown for pastures, but even on pastures we tend to remove the animals at certain times and allow the pasture to recover. In your case you cannot remove the "animals" during the playing season.

Soil Conditions

The size and arrangement of soil particles has much to do with the water and air relationship of soils. Fundamentally, they affect the biological properties of the soil. Poor aeration and inadequate drainage (function of size and arrangement of particle size) decrease microbial activity necessary for the breakdown of organic materials and the conversion of nutrients to forms that the plant can assimilate. Oxygen must be available to the plants if they are to utilize the nutrients. Inadequate drainage may result in anaerobic decomposition and the formation of various products in toxic amounts.

As the colloidal content (clay plus fine organic material) of the soil varies, the soil's capacity to release nutrients to the plant is affected as well as its ability to retain fertilizer elements applied to the soil. Light, sandy soils with little colloidal content have low nutrient and water holding capacity. Heavy soils high in colloidal content have much higher nutrient and water holding capacities but may be plagued with inadequate aeration and drainage due to poor physical condition. On golf course turf this problem may become critical on soils of high compactability. A chemical analysis of the soil may show high amounts of nutrient constituents and yet the soil may be unproductive if the physical arrangement of the particles prevents adequate air and water movement.

The inherent fertility of the soil is primarily a function of the parent rock from which the soil was derived and the climatic conditions. Most of the soils of the United States are relatively deficient in phosphorus. Muck and peat soils often contain very little lime carbonate. Associated with this condition is a reduced availability of nitrogen and mineral nutrients. Sandy soils are normally very low in content of all nutrients. As rainfall increases and leaching occurs

all soils become more deficient in mineral nutrients no matter what may have been the nature of the parent rock. The amounts of available phosphorus and potassium in the soil must be considered in establishing a fertilizer program. In this respect soil tests can be of great value. This information is necessary to balance the soil nutrient supply and fertilizer applications with the need of the plant.

The soil pH is extremely important. Proper liming is the key to effective fertilization. Research and practical application has shown time and again that the greatest availability and efficiency of most of our plant nutrients occurs when the soil reaction is slightly below the neutral point at a pH of approximately 6.5. When soils are on the alkaline side we may find low availability of phosphorus, iron and other trace elements. Going to the other extreme at a pH of 4.5 to 5.5 we find that phosphorus fixation by iron and aluminum is increased. The availability of calcium, magnesium and potassium is decreased because they have been replaced by hydrogen on the soil colloid and subsequently leached out.

Bacterial activity necessary for the breakdown and conversion of many fertilizer materials and for the decomposition of clippings is most active when the soil has a neutral or slightly acid reaction.

Turfgrasses make their optimum growth at definite pH ranges. Kentucky bluegrass does best at a range of 6.0 to 7.5, the fescues and bentgrasses at a range of 5.5 to 7.5. The mid point of these ranges is approximately 6.3 to 6.5. We are fortunate that the best pH for nutrient availability and bacterial activity is also the best pH for optimum turf growth.

Grass Species or Variety

Fertilizer requirements may vary greatly between grass species and to a lesser extent between varieties within a species. This is primarily due to inherent genetic differences which determine the natural habit of growth of each species or variety. Fescues grow much slower than bentgrasses and therefore have a lower nutrient requirement, especially nitrogen. Kentucky bluegrass is a weak absorber of phosphorus. Although the phosphorus requirements may be no greater than other grasses, soils must contain a liberal amount of available phosphorus because of this poor absorbing factor. Kentucky bluegrasses suffer from phosphorus deficiency on a soil where fescue and bentgrass will grow normally. We are all aware of the differences in nitrogen requirement between Kentucky bluegrass and Merion Kentucky bluegrass. Vigor among creeping bentgrass varieties or strains differ significantly. The more vigorous varieties naturally will use more nutrients, especially nitrogen, if they are to be held in a highly vegetative stage. Grasses also differ considerably in the spread, depth and character of their root system with subsequent differences in their capacity to secure nutrients from the soil.

Usage and Management

The amounts of fertilizer needed will vary with the usage to which the grass is subjected and the intensity of management. Heavily trafficked areas will require higher total amounts of nutrients than will minimal use areas. This is obvious in your fertilizer usage on roughs, fairways and greens, although some of this variability will also be due to species or variety.

Management practices obviously affect the fertilizer program. If clippings are removed as on a green more fertilizer will be required than on an area where the clippings are not removed. Irrigated fairways will require more fertilizer than non-irrigated fairways. Any management practice that tends to stimulate growth will result in increased need for fertilizer.

Climatic Conditions

As indicated earlier, soils in areas of high rainfall may suffer considerable loss of nutrients through leaching. Total nutrient requirements will be higher than for areas of less rainfall and similar length growing season. The length of the growing season may vary within relatively small geographical areas. Temperature fluctuations coupled with adequate moisture affect the rate of grass growth and consequently the nutrient needs.

Soil Testing

Soil testing can be a very useful tool in determining fertilizer requirements. Unfortunately soil testing is too often misunderstood. There are relatively few who understand the value and the limitations of soil testing and use them intelligently in their overall program. There is a second much larger group that feels that soil testing is a "panacea" or "cure-all" to be used only when everything else fails. Soil tests are only another of the tools you have at your disposal in carrying out an intelligent management program. Few of us, if any, can look at a grass and say it has a phosphorus or a potassium deficiency, even though the grass may not appear to be growing as well as it should. Soil tests will indicate serious nutrient deficiencies of the soil and enable you to set up a program to correct these deficiencies. When corrective programs are set up to overcome these deficiencies, do not expect to correct the situation in a single season or two. In many cases it may take three to five years or longer to correct a major soil nutrient deficiency problem. For this reason there is little benefit in testing a given area more than every three years. In the early days of soil testing in Pennsylvania, a complete program based on one or more materials was given to the superintendent upon completion of the soil test. This proved highly unsatisfactory, in that superintendents wanted to use materials other than those given in the program and secondly, it took away the initiative for the superintendent to establish his own fertilizer program. At the present time Pennsylvania soil test recommendations give information that can be used in planning fertilizer programs. Recommendations are given in terms of nutrient requirements in order that the superintendent can set up his own program using any type of fertilizer materials and application schedules that fit those materials.

Fertilizer Materials

The character of the fertilizer materials, especially nitrogen, to be used must be considered in setting up a program. Considerable amounts of time, money and effort have been expended on nitrogen usage research and practical application. I know you have heard many times - "It does not matter what type of nitrogen is used, quickly available or slowly available, as long as it is used properly." Some superintendents are still using soluble (quickly available) nitrogen sources and trying to get by with the same number of applications as their neighbor who is using a natural organic material, urea-form compound, isobutylidene diurea, or coated nitrogen material (slowly available). This is certainly not an argument against the use of soluble sources of nitrogen. Many of you know from experience that ammonium sulfate will grow turf of the same quality as activated sludge, ureaform or IBDU when the material is used properly.

Turfgrass has the ability to assimilate some nitrogen in the ammonia form but the greatest uptake is in the nitrate (NO_3^- form. I doubt if any of us even realize or think about the complex changes a nitrogen fertilizer material undergoes before it is utilized by the plant. Assuming we start with an organic material (an organic fertilizer or natural organic matter in the soil) a process known as aminization takes place by microbial action resulting in the formation of amino acids. Ammonification of these amino acids by microbial activity produces ammonia (NH_4^+). The ammonia in turn undergoes nitrification to nitrite (NO_2^-) and then to nitrate (NO_3^-), the form commonly utilized by the plant. The fate of nitrate in the soil can be many-fold. Nitrate may be used by plant uptake or microorganism utilization, lost through leaching or through a process known as denitrification. Denitrification occurs in saturated soils through anaerobic decomposition which releases the nitrogen as ammonia gas.

Quickly available sources of nitrogen may be inorganic salts such as ammonium sulfate, ammonium nitrate or nitrate of soda or they may be water soluble organics such as urea. The most significant characteristic of quickly available sources of nitrogen is that they are soluble in water. This has many ramifications. Being soluble they go into solution in the soil solution quickly and are, therefore, almost immediately available for plant use and may result in "luxury consumption" by the plant. "Luxury consumption" is manifested in flush, succulent growth extremely susceptible to insect and disease attack or mechanical damage. Because these materials do go into solution rapidly they are subject to leaching losses which combined with rapid growth result in a relatively short duration feeding period. Excessive application of these fertilizer salts may cause "burning" of the turf which in reality is a dehydration of the plant tissue. In order to avoid these problems quickly available nitrogen materials must be applied frequently at very low application rates.

The slowly available nitrogen sources include natural organics such as seedmeals, sewage sludge, tankage and manures; ureaform compounds; isobutylidene diurea; and the newest entry in the nitrogen sweepstakes, coated materials.

Natural organic materials depend upon microbial decomposition to reduce them to soluble forms of nitrogen. They supply small amounts of nitrogen over relatively long periods depending upon the rate of bacterial decomposition and the organic makeup of the material. Bacterial decomposition is accelerated by increases in temperature, provided adequate moisture is available. Hot, humid days are responsible for the so-called "natural organic nitrogen explosions" brought about by accelerated decomposition. Under these conditions some natural organics may release offensive odors. Natural organic materials high in lignin and cellulose are more resistant to bacterial decomposition than those low in these fractions. These materials have a high safety factor but have the disadvantage of being low in analysis (3-7% nitrogen) necessitating the handling of a large bulk of material. For the most part they have good stability in storage and are relatively easy to spread. Application rates may be higher and at less frequent intervals than with the quickly available sources. Natural organic nitrogen materials are one of the most expensive sources of nitrogen on a cost per pound of nitrogen basis.

Ureaform is a generic term used to describe a wide range of materials which are mixtures of methylene ureas. The methylene ureas may range from short chain water soluble polymers to long chain highly insoluble polymers. Thus a ureaform compound may be a ureaformaldehyde plastic or resin such as used in buttons or knife handles having completely unavailable nitrogen and no agronomic value or a product containing some unreacted urea along with methylene ureas having readily available and slowly available nitrogen and consequently high agronomic value. The resultant material contains 38% nitrogen with approximately 70% of the total nitrogen as water insoluble nitrogen. Like natural organic nitrogen materials bacterial decomposition is necessary to release the nitrogen for plant use. The longer chain polymers are much more resistant to decomposition than natural organics and normally will have a residual carry over into the second and third years following application. Because ureagorm is a high analysis material a relatively low bulk must be handled to obtain the desired nitrogen application rates. The higher resistance to bacterial decomposition of the more complex polymers results in small amounts of soluble nitrogen at any given time and leaching losses are minimal. Ureaform is safe, odorless, has good stability in storage and excellent spreading characteristics. Infrequent applications at high application rates are practical with this material. Ureaform is presently the least expensive form of slowly available nitrogen.

Isobutylidene diurea (IBDU) is a synthetic organic material imported from Japan. It contains 31% nitrogen with approximately 75% of the total nitrogen as water insoluble nitrogen. Unlike natural organics and ureaforms the release of nitrogen from IBDU is not dependent upon bacterial decomposition. Nitrogen release occurs through a chemical-physical process known as hydrolysis. This process, highly dependent on water availability, is much less dependent upon temperature than is bacterial decomposition. Thus nitrogen will be available from this material during cool periods provided there is adequate moisture. Leaching, odor, safety and spreadability characteristics are similar to ureaform. It is relatively stable in storage provided it is kept dry. It

has little or no residual from season to season and like ureaform can be applied at relatively high application rates and at infrequent intervals. It is intermediate in cost between ureaform and natural organics.

Coated nitrogen materials are the most recent addition to nitrogen fertilization. Capsule-type materials consist of fertilizer particle (usually urea) encased in some type of coating material. The matrix type is a homogeneous mixture of the fertilizer and the matrix material. Wax, latex, plastic resins, asphalt and sulphur are used as coating and matrix materials. Nitrogen may be released from these materials through physical or biological means or a combination of the two. The rate of release from these materials will vary with the coating material and the thickness of the coating or the type and amount of matrix material. Controlled release is obtained by blending particles of different coating thicknesses or matrix content. These materials normally are of high analysis (20-36% nitrogen) with good safety and spreadability. Handling and storage can be a problem in that any mechanical damage to the coating can result in rapid release of the nitrogen. In addition some coating materials are hydroscopic and exposure to the atmosphere can cause degradation. Application rates will vary from medium to high depending upon the individual material. At the present time these materials are quite expensive but cost has not been stabilized and hopefully these materials will, in time, be less expensive than other controlled release nitrogen types.

The selection of nitrogen materials for your fertilizer program should be yours and yours alone. You should choose a material you feel you are best suited to use based on your individual labor, budget and equipment situation. Above all you must have confidence in the type of material you choose. The worst thing you can do is to get into a situation of switching materials from year to year. Many superintendents, for example, gave up on ureaform after using it one year because they felt they were not getting results. This is not a fair trial as ureaform response the first year is not up to expectations because the population of microorganisms attacking this material must be built up in the soil. This can be overcome in the initial year by using slightly higher than normal application rates.

Every golf course should have an intelligently planned fertilizer program based on the needs of the grass, the physical and chemical soil conditions, the climatic conditions, the labor situation and the budget. The basic program must be altered in accordance with the season -temperature, rainfall, etc. Because of this your actual fertilizer applications will vary greatly from year to year yet you will be following the same basic program. Tools such as soil testing, fertilizer research, cost studies and management studies are available for your use. Why not use them?

DETERMINING TURFGRASS FERTILIZATION NEEDS

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This topic is particularly important today since we have to keep the grass growing well amid increasing costs. There is little we can do to streamline labour forces equipped with modern machinery; but we can certainly reduce fertilizer costs by looking carefully at grass growth patterns and satisfying them with the cheapest types of plant nutrient possible.

My own opinion is that superintendents are not applying fertilizer to complement grass growth, but are fertilising to produce a pleasant green colour. Again, I am sure that most superintendents could save money, particularly on bluegrass-fescue fairways, by not applying fertilizer when the grass will grow on its own. Irrigated bentgrass greens show a more even pattern of seasonal growth, yet even here, fertilizer applications may be safely reduced during the period of maximum natural growth.

These methods of reducing fertilizer application correspond to modern theoretical ideas. For example, turf durability is increased by encouraging a "hardier" type of growth, and turf recovery from damage is hastened by maintaining root carbohydrate reserves.

The first table shows the soil physical conditions which are essential if the nutrients applied are to be utilized efficiently. In cool, wet climates (particularly our maritime area), excess water must be removed from subsoil, topsoil and the surface. This allows the soil to warm up two weeks earlier in our spring, prevents leaching and loss of fertilizer materials by washing. This also prevents compaction and poor root aeration.

These soil physical conditions must be considered in the order given. For example, it is pointless improving the soil surface conditions if the subsoil has an impermeable layer.

The second table emphasizes the importance of the correct choice of grass for the work it has to do. No amount of fertilizer and good management will maintain a grass which cannot tolerate the prevailing winter and summer conditions, or the local diseases. No amount of fertilizer will accelerate repair in a slow growing grass. No amount of fertilizer will make a high maintenance grass grow well if skilled management, money, machinery and sensible timing of essential operations are not available.

These points are again summarized in a logical order of importance, and it is instructive to note how low on the list of basic priorities the fertilizer appears. Fertilizer usage is determined in practice, not by theoretical requirements, but simply by the amount of money available.

The third table shows how the fertilizer requirements can be broken down in detail. These must be considered, not in terms of total weight required, but in terms of corrective, maintenance and production requirements of the soil-grass system.

Clearly, no amount of fertilizer will produce good grass growth if there is a deficiency of an essential element, or even if the pH is too low. Far too much fertilizer is wasted in this way, and it is essential to carry out a soil analysis to enable these deficiencies to be corrected. Without a soil analysis no superintendent can hope to guess, much less correct, the type and extent of these deficiencies. It must also be realised that deficiencies can develop even though a fertilisation programme is carried out, though in this case an unbalanced application of nutrients is indicated.

Fertilizer requirements, therefore, depend on the corrective, maintenance and production requirements of the soil-grass system itself, and in Table 3 each of these are broken down into their individual components. Soil deficiencies, of course, arise from use of nutrients by the grass, leaching of nutrients by natural or artificial methods, and non-availability of materials due to low pH or other causes of fixations.

Maintenance requirements vary widely, depending on how much new growth the grass must produce. In addition, a hard working grass requires more nutrients. The health of the root system can be severely restricted by bad irrigation and mowing practices and it is equally important to avoid "forcing" growth in spring and autumn which will deplete the carbohydrate reserves in the roots. Under high wear conditions, a vigorous growing grass, a healthy root system, exceptionally good soil physical conditions, as well as ample nutrients are all needed to produce satisfactory growth.

Production requirements are often overlooked, and in the case of tees and greens, where nutrients are removed in the clippings, these must be replaced.

Having considered the background to fertilizer utilization, Table 4 gives the requirements of the grasses themselves for the Maritime Region of Canada. The Maritimes have a short five month growing period, and, being a maritime climate have a high annual rainfall. These requirements in Table 4 are approximate requirements for grass growth itself, and do not include the amounts needed to correct soil deficiencies. It is also assumed that there is little nitrogen left in the soil in spring due to excessive winter leaching. This table gives both minimum and normal figures for grass growth under various conditions, with percentage increments needed for sandy conditions with high leaching, for new establishment, or for irrigation leaching.

In order to equate Maritime turfgrass requirements with your own soil reporting system, I have included here the Nova Scotia recommendations for different qualities of grass based on soil test ratings. Regrettably the lack of money restricts fertilizer application to both

"coase" and "medium" turf, and these rates could be greatly increased, money permitting.

The next table gives the approximate amounts of nutrients removed in clippings from the more important turfgrasses over a five month period. These are the nutrients that must normally be replaced, and which are needed for adequate growth. Unfortunately, root growth was not measured, nor were the root systems analysed chemically. These figures are interesting because they show a 30% recovery rate for nitrogen, a 10-20% recovery rate for P_2O_5 and a 30-50% recovery rate for K_2O. It is interesting to compare these figures with the recommendations made in previous tables, the high K_2O removal may suggest increasing the K_2O recommendations, but this situation is complicated by "luxury consumption."

Now to consider the steps involved in working out a fertilizer programme to suit a particular soil analysis or a laboratory recommendation.

Table 6 shows a laboratory recommendation of: 200 lbs/A N, 70 lb/A P_2O_5 and 40 lb/A K_2O.

The first step is to convert into pounds of nutrient per thousand square feet, which gives 5 lb. N, 2 lb. P_2O_5 and 1 lb K_2O per thousand.

The next stage, shown in Table 7, is the most important stage of all. Choose a cheap agricultural fertilizer with the minimum amount of nitrogen (3%-5%) and a P_2O_5 : K_2O ratio which matches that of the laboratory recommendation.

This is important because by separating the P_2O_5 and K_2O from the nitrogen, it provides independence in the timing of the nitrogen applications. An example of this choice is illustrated in the table.

Having chosen the appropriate agricultural fertilizer with the correct P_2O_5 : K_2O ratio, then calculate the amount needed for 1,000 square feet of the turf. This is given in Table 8 for two types of fertilizer material. It is now possible, by simple substraction to determine the additional nitrogen required, and this is shown in Table 9.

These nitrogen requirements are dealt with independently, because the characteristics of many turf nitrogen fertilizers differ from those of agricultural fertilizers. Also, most superintendents carry out more frequent applications of nitrogen to ensure continuous grass growth.

Table 10 gives the most important characteristics (based on 1973 information) of the types of nitrogen fertilizer available. The price, time to act, time to produce maximum effect, and duration of the effect are tabulated for each fertilizer, and are based on information obtained at Truro, Nova Scotia. Choosing the most suitable type of nitrogen fertilizer type is not easy, and the factors influencing the superintendents' choice are given in Table II. These will vary from situation to situation, the two extremes being the expensive slow release fertilizers, and the cheaper normal agricultural materials.

It is immediately apparent that no single "turf fertilizer" is, or ever can be, ideal for every situation. By keeping the nitrogen fertilizer application separate from the P_2O_5 and K_2O applications, a good deal of flexibility is given, together with the opportunity of reducing costs.

Timing of fertilizer applications is important. Normally turf-grasses show two growth peaks which reflect the availability of water. Irrigated greens show less marked seasonal peaks of growth.

Clearly, for efficient grass growth, adequate P_2O_5 and K_2O must be made available before each growth peak, particularly for early spring growth. Additional P_2O_5 and K_2O may also be supplied to improve the grass conditions before winter. It is no accident that the commercial fertilizer type chosen (low N, correct P_2O_5 : K_2O ratio) is also suitable for a "winterizing material" and is further matched to the prevailing soil requirements with minimum waste.

This nitrogen fertilizer can be chosen and applied to suit any circumstances. Large applications of N at the beginning or the end of the season should be avoided, since these "force" growth and reduce root vigour and carbohydrate reserves. Again the low N fertilizer will avoid this difficulty.

It is possible to make economies with nitrogen applications in spring, because the grass will invariably grow in spring with little or no fertilizer. Equally, grass grows well in early autumn. In both cases there is no need to apply fertilizer in large quantities to increase growth further, since this produces problems of increased mowing, over-succulence and additional expense.

However, when the spring or autumn growth peak is over, additional nitrogen fertilizer is required to maintain growth. If a slow release fertilizer is applied, less frequent applications are needed, but the superintendent must allow for the time delay before this material begins to take effect.

This approach to fertilizer may seem too complex, particularly on a golf course, where fertilizer requirements differ from fairway to fairway. It is not as complex as it would appear. Areas with similar requirements can be grouped together and treated as one unit. Additional dressings of P_2O_5 and K_2O can be applied to make individual "corrections" to the basic "group application", and cheap superphosphate and potassium chloride can be used for this purpose.

In certain cases, where only P_2O_5 or K_2O are required, this requirement can be met using superphosphate and potassium chloride respectively, and saves application of a complete fertilizer with consequent waste of money.

The last "form" shows the whole scheme reduced to a simple mathematical exercise, no more complicated than filling out an income tax return, and far more rewarding.

Finally, the superintendent should not follow these recommendations mechanically. It is essential that the superintendent knows when his grass begins to grow, and when his grass produces growth peaks. Common sense dictates that a sudden high rainfall period may require an additional (unplanned) application of nitrogen. Tournament requirements may dictate special fertilizer applications to ensure growth and good conditions for the event. In all cases, this method provides the flexibility needed for such individual requirements and changes in plan. In addition, unnecessary application of nutrients is avoided. Using this method, the superintendent is giving the grass exactly what it requires at the most appropriate time, and will encounter few problems if he knows his requirements, his fertilizers and his grass. (For more specific information and a copy of the tables, write directly to Dr. Wray.)

SHORTAGE OF PLANT FOOD AND HOW TO ADJUST TO SUPPLY AND COST

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Probably the last thing you want to hear is someone up here talking about shortages. We have all had our fill of waiting in line for gas or trying to buy something and being told that it is temporarily out of stock. We must face facts, shortages are here to stay for a while.

Last fall, when we first talked about presenting this talk, I thought the topic might be "ancient history", or at the worst, only a minor problem for this spring. I am sorry to say the fertilizer problem is still very important, and by no means is it near being solved. There isn't a day that goes by that some article isn't written covering this topic or one which is directly related, and that is the food shortage and prices. Not an awful lot has been written concerning the fertilizer situation and the recreation or turf market. This is basically due to the ratio of consumed tons and money. The same basic ingredients are used in both markets; therefore, shortages are directly proportional for both markets.

In the next few minutes I will attempt to explain the fertilizer shortage and some of the fundamental reasons for it. I will then try to relate it to your industry. As I said earlier, little has been said in relation to the turf market directly. For this reason, I must use slides which are directed to the farm or commercial users. But as I said earlier, their problem is yours and vice versa.

Slide 2. In the fall of 1974 and now the spring of '74, the American fertilizer consumer will be unable to get all the fertilizers they want for the first time in over a quarter of a century. What has happened? Who is to blame? What will be the result?

Slide 3. The industry was producing record amounts of fertilizer, more than 42.5 million tons for domestic use in the fiscal 1972-73 season. During the first four months of the 73-74 year, domestic fertilizer deliveries rose 12% over the previous record year. But the consumer
Slide 4. still couldn't get all they demanded. Adding to this domestic demand was an unprecendented world pressure for American fertilizer. Because of price controls, exports of U.S. fertilizers to foreign buyers have been able to top the domestic selling prices. An example of this differential would be Urea, some months back which was frozen at $77.00 and could be sold on the export market for $110.00. U.S. exports of nitrogen and phosphate materials increased 18-26% during the year 1972-73. Because of U.S. dollar devaluation and the government economic controls, foreign buyers were able to outbid the American farmer for fertilizer supplies. Example: $10,000.00 worth $14,000.00 on the foreign market. Other problems came as a result of a skyrocket burst of world and domestic concern and demand for greater food and fiber production.

Slide 5. Government release of acreage encouraged farmers to increase production rapidly. U.S. farmers planted 25 million more crop acres in 1973 than in 1972. USDA estimates that farmers will plant another 11-12 million acres. Much of this is from the Soil Bank. I believe the last remaining acres. The consumer may be short as much as 2 million tons this year. The government once again forgot to consult the fertilizer industry.

Slide 6. Release of the fertilizer industry from economic controls on October 25 came too late to be helpful for full planting needs, but it did assure U.S. farmers that they could bid with world markets for U.S. fertilizer supplies. So what has happened since October 25, we are competing on the world market now, urea is over $200.00 a ton, and unavailable phosphates are almost $150.00. In connection with the decontrol, U.S. producers reaffirmed commitments to American agriculture with assurances that potential fertilizer exports -- not already under control -- would be diverted to U.S. markets. This meant a possible availability of an additional 1.5 million tons by July. We have seen very little of this up to the present time.

Slide 7. Further, decontrol brought back onto production a few outmoded fertilizer plants that had been or were scheduled to be closed because they were not profitable at earlier controlled price levels. By December, domestic deliveries of fertilizer running 16% ahead of fall 1972.

Also, with decontrol, imports could begin to flow into the U.S. in increasing amounts, now that the American market could pay world prices. As I stated earlier, this resulted in much higher pricing.

Slide 8. Use of commercial fertilizers by U.S. farmers has increased by nearly 400% since 1950 as its primary role in increased crop production has become evident. Fertilizer use accounts for one-third of the nation's increased crop production over the past 20 years. Part of

this increased use is reflected in the predicted shortage of a possible 1 million tons of nitrogen and 700,000 tons of phosphates this spring. This converted to manufactured fertilizer amounts to about 4 million tons; 10%-20% of the total tonnage moved in the U.S. during the 1972-73 season.

Slide 9. One of the prime reasons for this sharp increase has been the crop value returned and non-inflationary fertilizer prices. Since 1910 fertilizer prices to the consumer have increased less than 80%. During the current period of inflation, average fertilizer prices on September 15, 1973, according to the USDA, were only 17% higher than 1967.

Slide 10. It is no secret that prices have risen since the Oct. 25 removal of controls. However, based on USDA average yield and fertilizer use per acre figures, -- even if fertilizer prices increased 75% above previous controlled prices, the additional cost of production would be only about 7 cents per bushel of corn, 9 cents per bushel of wheat, and about a penny per pound of cotton.

Slide 11. Meanwhile, the average plant nutrient content or an analysis -- has increased nearly 85% from 23% in 1950 to 42 1/2% in 1973. This 20-year boost in plant nutrient content of fertilizer means the consumer gets more value per ton of fertilizer and per dollare than ever before. This ratio also holds for the turf business.

Slide 12. The fertilizer foresaw coming shortages nearly three years ago. Phase I economic controls went into effect in August 1971, just as the U.S. fertilizer industry was coming up for air after three of the worst financial years in its history. During the years 1968, 1969, 1970, the industry had dismissed many personnel, closed plants, and otherwise cut costs to try to counteract trends toward complete depression in our industry. Phase I regulations tied all industry profits and prices to performance during these three losing years.

Slide 13. Why wasn't something done earlier to insure the American consumer that fertilizer suppliers would be adequate? As early as February 1972, The Fertilizer Institute, our spokesman in the industry, began telling all who would listen that unless U.S. economic controls were lifted from fertilizer, a shortage crisis was inevitable. In October of last year, it finally became clear to the government that the combination of fomestic price and profit control, and pressures of high export prices was forcing more and more of our fertilizer into the profitable overseas market.

Farm pressures over short supplies built up in Congress. The Secretary of Agriculture stressed the need for immediate decontrol of fertilizer prices. After much deliberation, the Cost of Living Council on October 25 released our industry from <u>all</u> economic controls. In connection with this decontrol, firm commitments were made by forty of the larger producers that maximum effort would be made to serve the U.S. Market. This was the 1.5 million tons I mentioned earlier.

Slide 14. As important as the decontrol effort was, it did not come early enough to the consumer's needs for the Fall of 1973 or even the Spring of this year.

Still, producers and manufacturers scrambled to close up the gap. Underlying their efforts was the realization that the future of our industry depends on the economic health of our country. New plans for production expansion have been announced; also, some old inefficient plants have been reopened. Added supplies will be available by this spring -- but not nearly enough to supply the market. A conservative estimate places the short fall at not less 5%. A more realistic estimate seems to be between 10-15%. In tonnage figures, this is around 2 million tons.

Slide 15. Additional problems besides production capacity influence fertilizer deliveries. Ammonia production for nitrogen fertilizers is almost totally dependent on natural gas as a feedstock. On the average, 36,000-40,000 cubic feet of natural gas are required to produce one ton of ammonia. The ammonia industry uses about 2% of the
Slide 16. total U.S. gas consumption each year. Interruption of natural gas supplies cut production of ammonia by at least 200,000 tons in 1972 and may cut output by 500,000 tons more in 1973-74. Although rail companies are ordering new rail cars in record amounts, fertilizer companies report they are getting only about one-half the number of hopper and box cars ordered for fertilizer shipments. This is the main concern when it comes to Potash. Fuel for truck operation, plant operation, and other equipment, as well as electrical power, are plaguing industry and decreasing deliveries to retailers as well as producers. This is, of course, no news to everyone in this room.

Slide 17. <u>What about beyond 1974?</u>
As Fall 1974 and Spring 1975 approaches, more new production capacity for nitrogen will be coming "on stream" thanks to industry relief afforded by deregulation, if adequate natural gas is available.

During 1974, new plants, and interim revival of some older plants, will add about 750,000 tons of ammonia to U.S. supply, and about 800,000 tons of phosphate. In 1975, new potential capacity for phosphate production is seen at about 1.5 million tons.

All of this is fine, but what does it mean to you, the golf superintendent, sod grower, or landscaper? What I said in the beginning still holds, the same materials utilized in the farm or commercial fertilizer will be used to formulate your turf products; therefore, shortages are interrelated.

Probably the best way to approach this might be by product. In the turf market nitrogen is considered the most important element. This element, as far as the Northeast is concerned, is probably second in short supply. I explained earlier the reasons for the raw material shortage, basically the ammonia production. Cost of most nitrogen materials has almost doubled in the last six months. At the present

time, a product such as urea seems to have no limits on pricing. We just received another 17 dollar per ton increase this week on a product which is already well over $200.00 per ton.

There is one small bright spot on the horizon concerning nitrogen; this being the supply of organics or slow release materials are in slightly better supply. The ecology movement has created an awareness in many communities to process their waste materials and attempt to market an end product which will help offset the cost of processing and collecting. If every city or town which ahs considered this move were to go into production, they would pay us to take the material off their hands.

The most critical ingredient at this time is phosphates; this being DAP, triple superphosphate and normal or 20% super. This material is just short, and even with new plants waiting to produce, it appears it will be some time before we can see an end to this shortage.

Potash, the third main ingredient in most formulas, is in fair to good supply, but the big problem is rail cars. Once again there is no solution, and it may get worse.

In dollars and cents what does this mean to you, the end consumer? In a broad sense the increase in mixed fertilizers will range probably between 30% and 40%. This is a substantial amount of money when you consider the fertilizer budgets some of you operate under.

What can you do to ease yourself through this problem?

1. Soil Test -- Don't waste material. Custom apply material where it is needed.
2. Use Organics -- Still a good buy.
3. Take in material early -- A bird in the hand will be to your advantage.

PANEL

CONTROL OF POA ANNUA WITH THE TRICALCIUM ARSENATE PROGRAM - SUGGESTIONS

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The objective of the tricalcium arsenate program is to selectively remove Poa annua from a stand of desirable grasses while not harming the desirable species. Many superintendents are aware of successes using this program, as well as failures. The result has been uncertainty over whether to use tricalcium arsenate and if so hoe to establish a sound program that can be successful. The purpose of this paper is to outline a few suggestions that the superintendent should be aware of when using tricalcium arsenate (CaAs).

1. Determine the percentage of Poa annua present. An accurate estimate of the percent annual bluegrass present in an area can be made in early to mid-spring when the light green color and abundant seedhead formation are apparent. If 10-20% of the turf is Poa annua, a superintendent may wish to use high enough CaAs rates to eliminate all the annual bluegrass at one time. With 20-70% present a program of gradual (3-5 years) removal might be appropriate. With 70-100% Poa annua complete renovation followed by the use of CaAs to keep annual bluegrass out may be in order. Sodium arsenite, paraquat or cacodylic acid can be used for complete kill of all plants while having only short term soil residues.

2. Before applying CaAs the superintendent should become familiar with any soil factors on his course which may affect the toxicity of CaAs. The most important factors are: soil pH, soil drainage, and soil texture. Soil phosphorus level may have a minor effect in some cases.

If the soil pH is 5.8 or below, enough lime should be applied to bring it up to pH 6.2-6.8. At below pH 5.8 CaAs will breakdown much faster resulting in unpredictable behavior and increased toxicity. It is best to apply lime 4-6 months prior to any addition of CaAs.

At pH above 7.2 free $CaCO_3$(lime) may be present in the soil causing inactivation by precipitation of arsenic on the surface of the $CaCO_3$. Thus, somewhat higher rates of CaAs may be required to achieve any given degree of control. The use of acidifying nitrogen fertilizers under such conditions may be helpful.

Any wet areas on the course should be drained before using CaAs. In excessively wet spots the arsenate may be reduced to the much more toxic arsenite form, collect due to runoff, or be more toxic because the turf is less vigorous under wet conditions. Also during periods of unusually heavy rainfall (Fall 1972, Spring 1973), CaAs should not be applied or applied at low rates.

The superintendent should determine the texture of the soil on his course. In general lighter soils (sandy) require less CaAs than heavier (clay) soils to achieve a given level of Poa annua control. However, sandy soils which contain appreciable iron and/or aluminum may require higher CaAs rates. Also, heavier soils low in these components may require less. When determining the soil texture remember that compacted soils may appear to be heavier than they really are.

Determine the phosphorus level in your soil. Contrary to popular belief soil applications of phosphorus at normal rates have very little effect on arsenic toxicity. If levels are high then there is little need to use phosphorus except possibly during overseeding at light rates (1/4-1/2 lb. P_2O_5 /1000 sq.ft.). With low to medium soil tests it is best to use normal rates of phosphorus to assure good growth of the desirable species and to insure adequate seedling survival.

3. If Poa annua is to be controlled with CaAs then any maintenance deficiencies that may encourage encroachment must be corrected. The most common factors which promote infestation are excessive watering,

excessive use of nitrogen and compacted soils. Under these conditions growth of the desirable species may be restricted, resulting in return of Poa annua or other weeds. Also, any turfgrass which is not physiologically healthy due to poor soil conditions, maintenance deficiencies, etc., may be more susceptible to arsenic injury.

4. The next step for the superintendent should be to establish CaAs test plots on representative areas on the course. With a drop spreader different rates of CaAs could be applied in strips across 2-3 representative fairway sites. Test plots should be established in the spring and observed over a full growing season. When selecting the rates to apply use your judgement as to the conditions on your course (pH, soil texture, wet or compacted soils, etc.) and what is suggested on the bag. As a general rule, safe CaAs rates are somewhat lower in the Northeast than given on the bag. Once a "recommended (1X)" rate is chosen, then lay out test plots at 1/4X, 1/2X, 1X, and 2X. After observing these plots over a full growing season the best CaAs rate to use for a full CaAs program can be determined.

Early fall and spring are considered the best times to apply CaAs. Avoid application if the turf is frozen, excessively wet or during high temperature stress periods. If Poa annua goes out during a stress period, a superintendent could quickly put out test plots at different CaAs rates and observe them for 1-2 weeks. After this period he could apply the highest CaAs rate that did not cause injury on desirable species. This would prevent reinfestation of the area with annual bluegrass.

Make sure that you get a good distribution with your spreader. Check the CaAs for a good particle size distribution(little fine material). Also CaAs should not be mixed with other herbicides without first trying out the combination on a trial area.

5. If excessive CaAs is applied by mistake or environmental conditions result in enhanced toxicity, three safety measures are possible.

(a) While soil applications of phosphorus have little affect on arsenic activity, foliar applications do markedly reduce arsenic toxicity. Superintendents should have a supply of soluble phosphorus (mono-ammonium phosphate, di-ammonium phosphate, potassium phosphate) for such emergencies. The phosphorus can be applied at 1/8-1/2 lb P_2O_5 /1000 sq.ft. in enough water to just wet the leaves. Do not water for several hours after addition of phosphorus. Applications may have to be repeated once or twice at intervals of 4-7 days.

(b) In cases where arsenic toxicity is quite severe, application of 10-15 lbs $CaCO_3$/1000 sq.ft. may be required. The lime precipitates the CaAs and prevents release of the arsenic.

(c) A combination of (a) and (b).

6. The superintendent should inform his Greens Committee and club

membership in writing of the type of CaAs program he is going to use. It is particularly important that they be aware that gradual removal may take 3-5 years. Also, it should be emphasized that Poa annua is susceptible to environmental stresses (especially low and high temperatures) and under these conditions it may kill out whether or not you are using CaAs. A good example of this was in mid-July of this past year in the Northeast when annual bluegrass was injured on many courses due to waterlogged soils followed by high temperatures.

7. Once a superintendent has achieved the level of control that he desires, reduced rates of CaAs can be used. Again test plots may be laid out to determine the correct rate.

TRI-CALCIUM ARSENATE - USE AND ABUSE

Thomas R. Rewinski, Superintendent
National Golf Links of America
Southampton, N.Y.

The National Golf Links of America is located in Southampton, New York. In 1968 the club voted to have an automatic irrigation system installed. The irrigation system was to be installed in the spring and early summer of 1969. At this time I proposed to the Greens Committee that if an irrigation system was to be installed, we should have a Poa annua control program and a fairway fungicide program in our overall maintenance program. Poa covered about 70% of the fairway areas at this time. As result of my suggesting and insisting on these programs and with the help of the U.S.G.A. Green Section these programs were adopted. We urged the Green Committee to accept the Poa annua Control Program in order to keep this weed-grass from gaining the upper hand over the permanent grasses.

Both programs were adopted. The Poa Program was started in 1969 and the Fungicide Porgram started in 1970.

In March of 1969 I applied Tricalcium Arsenate at a rate of 6 lbs. per 1000 sq.ft. as measured from the container. This is equivalent to 3 lb. of actual material per 1000 sq.ft., since the Tricalcium being used is a 48% granular material. This one application is the only application of Tri-Cal made that year. However, in the remaining months of 1969 I fertilized with Milorganite at 800 lbs/acre in June. In August I thatched and seeded the fairways with a Rogers 548 machine. I overseeded with Fylking Bluegrass at a 30 lb/acre rate. The entire operation of thatching and seeding my 50 acres of fairway took 7 weeks. We worked 4 days a week (Monday-Thursday) on the fairways.

In October 400 lbs. of 20-0-10, 50% per acre, was applied and finally in November I limed with 1000 lbs/acre.

At this time there were no obvious signs of anything good or bad about the program, it was just too soon to tell.

Spring of 1970 was the first time I noticed any visible signs of the Tri-Cal working. The Poa was visibly injured and very slow to recover in the spring. In March of this year I increased the rates of Tri-Cal to 4 lbs. of actual material per 1000 sq.ft. Again this was the total amount of Tri-Cal used for this year. In April I started the fairway fungicide program, using Actidione-ferrated at the label preventative rates. I applied the material 8 times in the next 7 months. I apply the material the end of each month, April through October. The extra treatment is made mid-July, so in July I actually make two fungicide applications.

These are the only two exceptions that were made from the 1969 program. My fertilization, liming, thatching and overseeding programs were repeated and done in the same months as the previous year.

In 1971 I really noticed a big difference in the Poa annua population. We had gone from roughly 70% Poa in the fairways in 1969 to roughly 35% at this time. This made one feel the program was going to be a success at National. As a result of the good success I was having, I repeated the 1971 program until August. In August we had such a good stand of bluegrasses and the fairways were in such good shape, I omitted the overseeding and thatching. In October and November I repeated the fertilization and liming operations.

1972 brought even more success with the program. In the spring of '72 I felt that we had only 25% Poa annua in the fairways. I applied another 4 lbs. of Tri-Cal of actual material per 1000 sq.ft. We repeated the fungicide and fertilization in the early part of the year. In August we evaluated our fairways and felt that the program was a great success. We felt to insure the continued success of the program we must re-start the thatching and overseeding program. We had a good investment into the program and it would be a shame to let it go to waste. Therefore, in September we reinstituted the overseeding program by using 5 lbs. Flyking and 5 lbs. Baron Bluegrass per acre. Because of experience with the machines and little thatch remaining at this time, the time of overseeding and thatching was cut to about 4 weeks. The remainder of the year the fertilization with 20-0-10 and liming was again repeated.

By Spring of 1973, I had 15 lbs. of actual material in the ground and control of Poa annua. I figured that when the Poa annua was at its peak there was not more than 15% of the fairway covered with Poa annua. I feel this is as good control as can be expected, because the Poa is never going to be completely eliminated.

At this time, we have changed our program from a Poa Control to a Bluegrass Maintenance Program. I now apply 1 lb. of actual material in the spring just to maintain the level of toxicity on the Poa annua. Our program still includes thatching and overseeding; however, now I am using multiple mixtures of bluegrasses. I apply 10 lbs. total seed/acre now, but ratios of seeds vary. In 1973 I mixed 5 elite bluegrasses

into the seeder and applied. This year of 1973 was a good year at National for fairways but by far the roughest from a maintenance standpoint in my 15 years as a Superintendent at National.

I feel our fairway program has been a total success and am a staunch supporter of a Tri-Cal program as long as you have good drainage.

I also have been experimenting with Tri-Cal on my greens. I have been using very light rates with good success. I used 1 lb. of actual/year/1000 sq.ft. on 3 greens since 1969. With the success of this program, I will now start using the 1 lb. rate on the remainder of my greens.

TRI-CALCIUM ARSENATE - USE AND ABUSE

Leon V. St.Pierre, Superintendent
Longmeadow Country Club
Longmeadow, MA.

In early 1945 as a member of the 10th Mountain Division, my company was in a small mountain village called C'astel Diano, high in the Italian Appenine Mountains.

Our purpose for being there was to control the high ground and play the waiting game until supplies and replacements arrived for the last big push across the Po River, into the Po Valley and the Final objective, the Brenner Pass in Austria.

While holding this abandonned ridge-top village, a mule train of big Oklahoma and Missouri mules guided by the Italian Alpini mule skinners, would daily bring the rations of 3.2 beer, G.I. chocolates and the Stars and Stripes' newspaper Mediterranean edition.

This particular morning I received my copy of the Stars and Stripes and immediately turned to the "Letters to the Editor" page. One letter caught my eye. It was from a line soldier of the 34th Division, complaining about the old infantry motto, "The Infantry is the Queen of Battles." This G.I. added, "The Infantry is the Queen of Battles, but, I say, She's an old whore."

Like the Infantry, "Poa annua is the Queen of Battles but, I say, she's an old whore."

Here's this gallant grass plant, Poa annua, every Spring and Fall, looking like a real trooper, holding its head high, until the enemy: high temperatures, humidity, heavy rains, northwest winds, and heavy play descend upon it.

The aftermath is an old story. Our old friend, Poa, has become a casualty with no replacements to cover for it.

Gentlemen, most of you have fought the Poa annua wars and have received your campaign ribbon for the 1973 growing season. You have been rewarded by your employers by still having a job. However, it certainly was not a very gratifying experience.

Now, you're asking yourselves, O.K. pal, what's the solution? In 1973 we not only lost a lot of Poa annua but also lost a great percentage of basic grasses too.

You must agree, turf maintenance would have been much easier if Poa was not as prevalent.

Let us address ourselves to the Abuses of Tri-Calcium Arsenate, and for some serious discussion on pesticides in general.

Some pesticides have been promoted as "safe" pesticides. But, the word "safe" can be used in a relative sense only.

The mere "registration" of a pesticide with the U.S. Department of Agriculture does not, in any way, assure its safety.

The claims of the chemical industry and pesticide applicators, stating that the products are safe, for the most part, are unfounded. Adequate research in this area, simply has not been done.

When using Tri-Calcium Arsenate, you're not fooling around with talcum powder. You're handling a cehmical that can and will do excellent work, under the proper conditions. A great deal of thought and reflection should be given before using this material.

Once a decision has been made to use Tri-Calcium Arsenate, an ambitious drainage program, is a MUST. Fill-in all pot holes, install slit trenches where needed, re-shaping and contouring of severely depressed fairway areas.

An over-application of Tri-Cal on heavy soils and hilly areas would be considered abusive.

After all the steps have been thought out and completed, you are now ready for the USE of Tri-Calcium Arsenate.

My personal experience with the use of Tri-Calcium Arsenate goes back over a seven year period, with my baptism by fire taking place on May 11, 1967, using 4 lbs. of material to a 1,000 sq.ft. area.

A second application was applied on June 8, 1967 at 2 lbs. to a 1,000 sq.ft. of material. This provided approximately three pounds of actual material to a 1,000 sq.ft.

All fairways were treated at this time. No thinning of Poa annua occurred until July 18, 1967.

August 16, 1967, all the fairways were aerified six times over and followed by a verti-cut operation set at a 1/2" depth.

Fairways were then seeded, using a cyclone sower mounted on the rear of a Cushman truckster.

A mixture of bentgrass seed was used, at 40 lbs. per acre. Golfers' desires for having a close cut fairway in the area of 1/2" to 5/8" made it necessary to choose bentgrass.

The installation of a fairway irrigation system in 1958 and close mowing thereafter were the chief causes of the high population of Poa annua (approximately 90%) on fairways. We all know, bluegrasses will not stand up to that kind of abuse.

This basic program was continued during the years of 1968-1969-1970-1971 and 1972:

Used 4 lbs. of Tri-Calcium Arsenate to a 1,000 sq.ft.

Fertilizer used was 20-0-10 or similar types, not containing any phosphorus.

Fairways were spot-seeded in the late summer and early fall using a mixture of bent grasses.

In 1970 I noticed that bluegrasses were volunteering in areas where bentgrass was seeded. I revised my thinking and started using the new variety of dwarf-type bluegrasses, such as: Pennstar, Nugget, Baron, Fylking, Merion and a small percentage of bentgrass was also used in these seed mixtures, going on the theory that whatever grass was suited for the area would survive. This plan was carried out in1970-1971-1972 and 1973 at 20 lbs. to the acre.

It is no longer practical to maintain all bentgrass fairways. Today's heavy play and adverse climatic conditions dictate the use of the dwarf-type bluegrasses in a mixture. The use of bentgrasses in moist areas is still desirable.

In my opinion Tri-Calcium Arsenate controls Poa annua germination, better than any chemical on the market today. However, it does have its erratic periods.

My woman's intuition told me not to use any Tri-Calcium Arsenate in 1973. I followed my hunch and no arsenical was used at all in 1973. This proved to be the right decision.

The cost of a Poa annua suppression program in the earlier years was modest enough to be absorbed in the regular golf course maintenance budget. This year's explosive rise in prices may change the thinking of any club embarking on this type of program.

In 1967, i ton of Tri-Calcium Arsenate cost $450.00. Six tons of material were needed to do the golf course, or a total of $3,500.00. The cost in 1974 per ton of the same material is .59 per pound or $1,160.00 per ton, or $6,960.00 to cover the same area.

We all know what the solution is to fairway problems and this may be just the year to do it. Raise the heighth of cut to 1" in March and keep it there until November.

The last decade in the golf course maintenance world has been one of mechanization, gadgetery, gimmicks and in many cases an outright sham on how to achieve perfection in grooming. This came about for many reasons: more golfers visited and played more than 10 different golf courses in one season; member's superb ego, believing his golf course is the best in the area; superintendent's own intense pride in the course he's in charge of, and lastly television.

We have created a monster that is getting to be impossible to handle. Gentlemen, no turf conference has dared to explore in depth, why there will never have absolute perfection on a golf course for 7 or 8 months of a golf season.

The Use and Abuse of any chemical and machinery starts with the Superintendent. Let's stop the gymnastics and do what we all know is correct. Nature cannot and will not be manipulated.

The 1974 golfing season will be the YEAR to come back to reality!

TRI-CALCIUM ARSENATE: USE AND ABUSE

Melvin B. Lucas, Jr., Superintendent
Garden City Golf Club
Garden City, N.Y.

Poa annua? No! "Some say they can get it out of the greens. I am sure that I know of no way to get rid of it, except by letting the golf course go into a haymeadow for a few years." This was the last statement made in an article from the NATIONAL GREENKEEPER, September 1927 and written by Mr. John McNamara, First Vice President of the National Association of Greenkeepers of America. The Yearbook of Agriculture, Grass 1948, states "Annual Bluegrass: It is of little economic importance and under most conditions is considered a weedy pest, especially on lawns and golf courses."

This is a favorite subject to me. I have given a number of talks the past five years and have addressed the Investigating Committee on The Arsenic and Lead, Federal Insecticide, Fungicide and Rodenticide Act (7 U.S.C. 135 st.seq.), held at U.S.D.A., Beltsville, Maryland on October 29, 1971).

I have been using tri-calcium arsenate for the last eight years at The Garden City Golf Club, which I might add, with great success in suppression of Poa annua, crabgrass, goosegrass and the inactivity of white grubs in all areas used. My rates and application methods have varied from the use of 85% Lime Tri-Calcium Arsenate and the 48% Granular material. To this date we have applied 12# A/1000 sq.ft. to all greens and fairways. The tees vary from a low of 16# a/1000 to as high as 45# A/1000 sq.ft.

I don't think I should continue on the uses as per good but an insight into abuses. I refer to abuses that the superintendent receives. I am first thinking of this past season and how well we can recall this treacherous past. I also look back on many a good superintendent and friend who succumbed to this fatal year. The possibilities were bleak for many but the undercurrent and proclamations from many others agonized the reasons for job loss. Why during equal stress periods for everyone are the most controversial statements made about the ones on a tri-cal program, and the others who are not are overlooked? I have never seen nor heard of a chemical that has been so well proven as one of the finest tools to turf, also been used as a crutch by so many who have never used it nor studied it as the final axe to condemn the individuals who have.

The vast knowledge of the management of fine turf can be heard from the local stardom of any ordinary club, the caddies, waiter, waitress, bartender, locker room and to your own help. These people are not vying for your job but try and seek some importance for the knowledge they possess. These people have an unbelievable access to your members, whom we never meet except by that one irate moment on the course when we least are ready. Why is it that the lowly scuttlebutt from caddy or any other type will influence the member? The reasons are communications. Never involve anyone before you commit yourself to the Green Committee, bulletin board message with your signature. Secondly, the idle small talk that we readily convey toward anyone who asks for information. Later as time goes on this talk gets out of hand to the final coup de grace, as being our reason for failure. Any program different from the norm will always be attacked whether your turf was lost from a pump failure, vandalism, wilting, a layering problem under your turf or even an overdose of fungicide, etc., that had created a singe. How well we become familiar with the town crier who informs everyone of someone's demise.

There has been many a fine script written in preparation for the members as to what will take place in the near future on the links. I cite a documentary that was put out by Baltusrol Golf Club, Springfield, New Jersey. The management of The Greenbrier, White Sulphur Springs, West Virginia had notices in all their rooms as per the Poa annua control. At Cherry Valley Club in Garden City, New York a special letter was sent to every member to inform them of intent. I am sure there have been many other fine reports made for inter-club relations.

The technical side of papers and reports on tri-calcium arsenate are plentiful, from Cecil Kerr's THE MODE OF ACTION OF ARSENICALS IN THE SOIL; ARSENICAL SAFETY; and many papers he has given throughout the country; the fine research work of Drs. William Daniel, Purdue University and Ralph Engel of Rutgers University; the practical side of research work done by Messrs. Joseoh Flaherty, Baltusrol Golf Club; Thomas Rewinski of The National Golf Likns, Southampton, New York and so many others that have constantly spoken at turf conferences and have filled so many of the proceedings.

During my military obligation I had the pleasure of meeting Mr. Manuel Francis, then superintendent at Vesper Country Club, Tyngsboro,

Massachusetts. There I saw an amazing bentgrass golf course and learned much about tri-cal from him and Bert Fredericks, now at Vesper. The tri-cal program started eight years ago on Long Island, and near 70% of the clubs are in some sort of a program. When I started at The Golf Club they had used 55 million gallons of water per year to grow Poa annua; we now average 14 million gallons. The nitrogen requirements are now 2#/1000 sq.ft. on fairways and 4#/1000 sq.ft. on greens and tees, compared to 8#/1000 sq.ft. that had been applied to all areas. The Golf Club had experienced loss of turf in some of the low or poorly drained sections of the course year after year. We started the applications of tri-cal and lo and behold don't you think that the loss of grass in the same areas now was dying, as told to me by an array of authorities, because of the tri-cal. We all know that drainage is the key to success no matter what or if any program you are following.

To generalize a bit, how many past superintendents have fought Poa annua with the scorched earth policy and never batted an eye, nor did your members, when all turfgrasses totally went or suffered. The advent of tri-cal has brought on a new dimension. The program starts in the spring, and before you know it, August appears and the Poa annua takes its vacation: it was going to leave sometime, but why the sorrow? We look around and see a very aggressive bent and bluegrass population. Link this with a well timed seeding and a grass cover can be established without much competition from undesirable weeds. When this initial loss of the Poa annua happens, you are suddenly an outcast closely linked to insanity or to have committed heresy to our esteemed club. Many times we find our Green Committee will become quite the authorities on tri-cal, and later they themselves are quoting to other club members and also to members of other clubs. It becomes amazing that a successful and busy business man becomes so involved in the idiosyncrasies of our profession. His new knowledge earns him quick acclaim from the golfing world; thus, the term, self-proclaimed agronomist, comes to light which many times will make many people suffer.

I have worked closely with programs at Woodcrest Club in Syosset, Garden City Country Club and Cherry Valley Club. These clubs converted to bentgrass with much success. I do have a vivid picture of one club that would have 50% loss of Poa annua each year. The program was started; after one full season the fairways looked good. They came through a hard winter; they began a program on their putting greens. The season progressed and so did the turf cover on fairways as well as greens. They combatted automatic irrigation problems, and as the season drew to an end the course was in fine shape. The pressures and problems that beset the individual were and are astounding; he was let go.

I would like to cit a passage from a letter I received from Major General Howard Snyder, while serving at Fr. Devens. "You are fortunate to be following such an engrossing and rewarding profession. Certainly one meets a fine cross section of Americans at any golf club, public or private." How true he is but we should not relax any of our efforts. This profession is a great one. We are given every piece of equipment and chemicals to work with. A few of these chemicals are more critical to work with than others. The expertise on handling them is as critical

as your expertise of handling that fine cross section of people at your club.

In closing, the tri-cal program like anything else we tackle needs total support from as much golf oriented societies, so that we may call upon them when situations get close to document our desires. We have met with the EPA and have been given professional use allowance. But what of tomorrow, will the energy crisis, OSHA, availability of certain metals no longer can be acquired, the cost becomes prohibitive to use, or will we be forced to go backward to the philosophies of John McNamara when we have lost 47 years of highly refined tools to keep that professional image real.

EXPERIENCE WITH TRI-CALCIUM ARSENATE AT BALTUSROL GOLF CLUB

Joseph R. Flaherty, Superintendent
Baltusrol Golf Club
Springfield, N.J.

The use of tri-calcium arsenate for Poa annua control at Baltusrol Golf Club was begun in 1969 in conjunction with a fairway renovation program begun the previous year. In the fall of 1968 we initiated a complete fairway renewal program employing the scorched earth method, the details of which I outlined at this conference last year. In April of 1969 we applied tri-calcium arsenate to fairways renovated the previous fall and continued this program on fairways renovated in 1969 and 1970. The fairways treated in April 1969 received 6 lbs. actual arsenate/1000 sq.ft; those treated in subsequent springs received 6 lbs., 4 lbs. or 2 lbs. depending on their particular condition. No single application of arsenate at a rate higher than 4 lb/1000 sq.ft. has been made on any fairway since April of 1970.

Concurrent with the application of tri-calcium arsenate on renovated areas in the spring of 1971, we also applied the chemical on 12 or our 36 fairways not scheduled for complete renovation. These fairways had been renovated in the early 1950's, and still had a population of healthy bentgrasses with manageable thatch. On these holes we decided to try to eliminate Poa annua gradually through the application of tri-calcium arsenate, applying just 2 lb. of actual arsenate in April and another 2 lb. in August, the intention being avoidance of a complete loss of Poa annua at the height of the summer while still achieving the accumulation of 4 lb. of actual arsenate/year in the soil. As events developed, however, through mid and late August we had several heavy rains with general inundation of large areas of the fairways, and considerable loss of both bent and Poa annua, and so we really could not determine objectively whether the lighter rate split application actually achieved a controlled Poa annua reduction. I can say that I've seen equally serious turf damage following heavy rains during hot weather before we ever

applied tri-calcium arsenate. So, although the degree of control obtainable by lighter applications couldn't be estimated, I certainly couldn't blame the damage to our fairways on the presence of the arsenate.

One fact we did observe in the spring of 1972 was that the fairways which had received 2 lb. arsenate in April and 2 lb. in August of the previous year had less Poa annua present than those that received 4 lb. in April and nothing in August. Thus in both 1972 and 1973 we split the application on all fairways and control has been excellent to date.

We have now reached the point in the program where our Poa population vis-a-vis bent is very low, probably no higher than ten of fifteen percent, and in the summer of 1973 for the first time we had no soft crabgrass germination whatsoever in the fairways. At present we have actual arsenate cumulation totals of from 12 to 22 lb. on the course, and the absence of crabgrass indicates that arsenate levels are at or near the toxic point. Thus I don't plan to apply any in the sping of 1974, and the decision as to whether or not to apply any in August will be made after observing the fairways for any resurgence of crabgrass and/or Poa annua. If we see a return of either of these, we will know our toxicity levels are falling fairly rapidly and an additional application of 2 lb. actual arsenate will be made. If not, we may well forego another application until 1975 rather than risk elevating our toxicity to a level where the bentgrasses are injured.

We've had no difficulties to date that I could definitely ascribe to the effects of tri-calcium arsenate. In the summer of 1973 we lost a good deal of turf following the record rainfall of August 2 in which 6 1/2" fell in four hours. It is possible that our losses were increased by the presence of arsenate in a saturated soil. However, as I said above, I've seen our fairways damaged nearly as badly after heavy summer rains in years prior to our beginning the arsenate program. So I couldn't state objectively that the presence of the arsenate made the situation much worse than it would have been anyway after weather conditions such as we experienced last August.

I want to emphasize that a Poa annua reduction program using tri-calcium arsenate is not painless, and that some unsightliness is inevitable between the time Poa annua is killed and the time that desirable grasses fill in or the new overseeding takes hold. If you proceed cautiously and with light applications, adjust soil pH, and drain soggy areas before beginning the treatments, the chances for severe problems will be minimized and the probability of greatly improved fairways populated by more resilient grass varieties will be excellent.

TRI-CALCIUM ARSENATE - USA AND ABUSE

J.R. Bone, Manager
Field Development
Chipman Division of Rhodia Inc.
Somerset, N.J.

Tri-calcium arsenate under the trade name Chip-Cal is labeled for control of weedy (crabgrass, Poa annua, and chickweed) and insect (grubs of Japanese and Asiatic beetles) pests infesting established turf, such as parks, golf courses, and lawns located on industrial sites. "The Right Approach" to tri-calcium arsenate usage requires establishing and following a sound turf management program in accordance with label recommendations.

The first step in "The Right Approach" is to assure that areas to be treated with tri-calcium arsenate are properly drained. Poor drainage often interferes with plant growth creating a stress condition making plants susceptible to chemical injury. Further, excessive moisture may interfer with fixation of tri-calcium arsenate thus reducing effectiveness, or under some conditions may add to formation of more toxic substances giving rise to non-selective activity.

When drainage is deemed satisfactory, the next considerations are the factors relating to arsenic toxicity to Poa annua. Three factors contribute substantially to the effective use of tri-calcium arsenate: soil texture, available phosphate, and soil pH.

Sandy soils or those with low levels of fertility tend to require less tri-calcium arsenate for desired pest control than those with high levels of fertility or clay fraction. Arsenates are generally either fixed in the soil or absorbed by plants; factors stimulating fixation tend to reduce herbicidal activity. While judicious use of chelated iron and zinc may be most beneficial to desirable turf species, over use of either will reduce the effectiveness of tri-calcium arsenate.

Those factors affecting tri-calcium arsenate in the soil also influence the behavior of phosphates. As with arsenates, phosphates are either fixed in the soil or absorbed by plants; soil texture and fertility directly influence these activities. High levels of phosphate in the soil tend to overcome arsenate by antagonistic action. The use of phosphorus in fertilizer programs should be cut to a bare minimum. In emergency situations where Poa annua is being removed more rapidly than desired a small amount of a liquid fertilizer containing P_2O_5 may be used to promote Poa annua for emergency cover. Granular phosphates should be avoided even in emergency situations due to residual effect in the soil.

Soil pH is an important factor in the use of arsenate; if pH is below 6.0 or above 7.8 generally the availability of tri-calcium arsenate is reduced. Application of lime can be an effective means of increasing soil pH; however, tri-calcium arsenate and lime should not be applied at the same time.

Some plants can be injured by concentrated applications of arsenicals; however, many plants thrive on accumulations of arsenicals. In essence, this is the basis for "The Right Approach", increase tri-calcium arsenate to a level toxic to Poa annua and maintain. Depending on conditions described above, 16 to 30 pounds per 1,000 square feet of tri-calcium arsenate may be required to achieve Poa annua control; crabgrass, chickweed, and grubs of Japanese and Asiatic beetles will also be controlled in this rate range. "The Right Approach" recommends fall and spring applications over 1 1/2 to 2 years to develop the desired level of tri-calcium arsenate in the soil. With repeated applications, small amounts of arsenic become available to plants, gradually removing susceptible pests; thereafter control can be maintained with light annual applications. Fall and spring applications are stressed as the sensitivity of Poa annua to arsenic is increased by factors such as short cloudy days with low light intensity and cool weather.

Factors determining rate and number of applications vary with location and must be determined on an individual basis by the professional turf manager based on his thorough knowledge of soil type, pH, phosphate level, and zinc-iron requirements of each site.

As Poa annua is removed, it is recommended that an active reseeding program be conducted as dictated by conditions and desired results. In general, turf species such as bent, bluegrass, zoysia, bermuda, and fescue are extremely tolerant of tri-calcium arsenate; contact with flowers and shrubs including their immediate root zone should be avoided.

To review the following ten points summarize "The Right Approach":

1. Drain low areas
2. Correct soil acidity if needed
3. Eliminate phosphorus in fertilizer program
4. Aerate
5. Overseed often
6. Vary Chip-Cal application rates according to existing conditions
7. Achieve Poa annua toxicity
8. Maintain toxicity to Poa annua
9. Emergency use of liquid fertilizer
10. Arsenic toxicity

"The Right Approach" for tri-calcium arsenate usage in the hands of professional turf managers promotes the kind of turf today's recreational activities demand.

OPERATING AND MAINTAINING MUNICIPAL GOLF COURSES

Gregg Deegan, Superintendent
Unicorn Golf & Recreation Area
Stoneham, MA.

In my talk today I am not going to bore you with the operations and maintenance procedures of a golf course per se. I am sure that you gentlemen are quite familiar with the cultural practices. What I would like to try and do is point out the differences which I have found in a municipal operation.

As far as administrative practices are concerned, I have found myself more involved than at a private club.

Budget Projections, Bids Specs, Article proposals, are some of the areas which now I am quite familiar with. It was difficult at first to establish an operating budget since the golf course has changed so drastically. A nine hold course, no equipment, no irrigation which meant that there was capital investment as well as operating costs.

When equipment was purchased to set up the course, specs had to be written up on every piece of equipment before it went out to bid. As you might imagine, this alone proved to be very cumbersome since you know what make of equipment you want, and you would have to write the specs so close that you might not get three bids - which is needed before any bid is accepted.

In article proposals, changes in policies such as job classification, pay benefits, or capital expenditures are submitted in the twon warrant and are voted upon at an open town meeting.

In order to prepare a sound defense of an article, the people must be made aware of the problem before hand. Short releases in the local papers or being in contact with the various town officials prepare and forewarn the public. Usually if this policy is followed, there is no problem having the article pass if it is reasonable.

For example, when equipment was purchased for the golf course, a loader/backhoe went out to bid but we did not purchase one since monies became low. I made the finance board, as well as the committee aware that because of all the work in changing the golf course, installation of an irrigation system, etc., that the piece of equipment was necessary. Therefore, the following year when an article was submitted to purchase one, there was no problem at all although the D.P.W. was refused at twon meeting the same piece of equipment.

One of the reasons which I feel gives a municipal operation an edge over the other departments is that we are turning money back into the town. It isn't like the school department or D.P.W.

In our budget analysis I set up meetings with all of the subcommittees

to find out what their intentions are for the upcoming year. After the expenditures have been figured out, I listed the projects in an appendix which is submitted with the budget to the finance board.

After the board has had a chance to analyse it we are called in to defend our proposal and answer any questions which they might have. I have even given members of the board a tour of the course since some of them were never on a course before. It usually is very effective.

A yearly projection of the budget must be very accurate since there really is no recourse but a special finance meeting. For example last year in my labor budget when I figured the cost involved in putting in fairway irrigation, I relied heavily on E.E.A. help which we had the year before. When Nixon cut out the program, this increased my labor budget to the point where I had to request for a transfer of funds. (All discussions and actions are carried by the local papers). If a mistake is made the whole town knows about it.

Then of course is the letters to the editor which range from starting times for residents to eliminating leagues. When the course first opened the leagues were the ones who supported Unicorn and now that the course has improved to the point where the residents are playing it, they want it all to themselves.

We are catering to a small percentage of the town but must satisfy the majority. Since the multi-recreational area concept has been adopted, the criticism has been reduced.

This past year was difficult for us since all municipalities have changed their fiscal year from January/December to July/June. When monies were appropriated last year I was given 1 1/2 times my normal budget. As you well know last year with weather and disease, plus labor, and now this year with everything sky-rocketing, we spent part of the 1974 appropriation. It is going to be an interesting spring until the new budget goes into effect in July.

I work quite close with the town accountant. Being unfamiliar with town policies and payments, etc., it was quite difficult at first since up to this past year I was responsible for payroll, payment of bills, etc., which must be made up on a voucher, signed and then given to the treasurer. Anything over $2000 I am required to go to bid.

The one point which I feel is a mistake with a lot of municipal golf courses is that they fall under another department like the Department of Public Works. I'm sure you will agree,with all due respect, that there are two distinct interests and the Superintendent or Assistant of Public Works cannot appreciate turfgrass culture to a degree which is required on a golf course.

The committee which I am responsible to is comprised of nineteen members, although fourteen only are active. They represent an honest cross section of the community, therefore there are no special interest groups. They meet once a month in which I am required to attend. Prior

to the meeting I make up an agenda of problems, ideas, etc., which is sent to each member. When the meeting is held, all members are therefore prepared and a lot of unnecessary briefing is eliminated.

This has worked out very well. The meetings last two to three hours and many ideas which you may think of as great, by the time the meeting is over you find out aren't so great after all. If problems are presented at one meeting and then at a later meeting a possible solution, much can be accomplished. This probably sound like a lot of unnecessary action but when the public is directly involved, the more an idea is discussed, the less flack is going to result later on.

Operations

The golf course, recreational areas and buildings which include a grill, pro shop, and indoor ice arena, which was completed last September is my responsibility. We have the Whalers practicing there this year and since they are leaving Massachusetts, we hope to have the Braves next year.

The golf course which was changed and opened two years ago is now a 9-hole golf course. Prior to this time, Unicorn was an 18-hole golf course but because of town acquisition and boundaries we ended up with a 14-hole golf course. It was redesigned into a nine hole layout by myself and the pro, Paul Barkhouse. Out of the 80 acres, 55 are golf course, the rest has been utilized into ball fields, cross country course, and the Skating Arena.

Since there was neither equipment, utilities or irrigation of the golf course when it was purchased, the first year proved to be quite hectic. We opened the 16th of May the first year and closed the 26th of November. First year we grossed $55,000 in greens fees. Last year with the installation of fairway irrigation and an opening of April 5 we grossed $93,000 in greens fees and netted $22,000 to the town. The revenue is based strictly on daily fees. There is no membership or season rate. The rates last year were $3 and $5 during the week and $4 and $6 on weekends. We had 33,000 rounds of golf for 1973.

The pro shop and grill is run by the golf pro and all revenue received in either shop is his. His only responsibility to the town is to collect all greens fees and promote golf. There are no passes what-so-ever. Even members of the Unicorn Committee pay. The only exception is another Pro or Golf Superintendent.

The golf pro has five gas carts which he leases. There is not much demand since it is 9 holes and fairly flat. Also with the caliber of golfers or hackers who are ignormant of any golf etiquette, it is just as well that there aren't many carts.

Maintenance

Because we are a municipal, daily fee golf course, the play is very rough on the course. Carts over greens, bags on greens, throwing of

clubs plus 5 & 6 somes takes its toll. I have plans to hire rangers next year because the course personnel should not be the ones to reprimand the golfers; it is taken too personal. The National Golf Foundation figured a maximum of 220 players per day. Last year we went over 250 players frequently.

Aerification was performed 5 times on greens and tees, fairway twice. I leave the greens around a 1/4 inch because of the play involved. Last year we built 4 new tees and this year we will have completed 4 more. Because of the limited space and heavy play, we have accepted a sod program on the par 3 holes in which we resod the tees each spring. This money is now included as part of my operating budget.

Vandalism was not much of a problem until the ice rink opened up. Now the traffic cutting across the course to get to the rink has made a marked increase to the problem. It may come to the point where a fence around the rink or a night watchman is added.

In closing I feel that the popularity of municipalities operating golf courses is going to continue to increase because of the revenue involved, which reduces or stabilizes the tax rate and also provides an area where the multi-recreational idea can be practiced.

MAINTENANCE OF A HIGH BUDGET GOLF COURSE

Edward C. Horton, Superintendent
Winged Foot Golf Club
Mamaroneck, N.Y.

Today, golf course superintendents are utilizing better maintenance procedures than ever before - and the saying "that a golf course is not a place to waste money nor is it a place to save it either" is being adhered to by most clubs. As a result, the term "High Budget Golf Course" should not imply a better maintained course - but instead, a golf course which is perhaps equally well maintained as its neighbors but somewhat unique in one or more aspects. This would have to be so to justify the label "High Budget Golf Course" in my mind.

Winged Foot Golf Club is unique. Designed by Arthur W. Tillinghast, it has become a club known throughout the world for two golf courses which have repeatedly challenged the regular and tournament playing golfers for more than fifty years without a major change in design or construction. This "uniqueness" is what I hope will allow me to interest you in the following presentation.

Located in wealthy Westchester County - twenty miles north of New York City - golf clubs in our area are subjected to some of the highest costs of maintenance in the country:

In 1973, golf course maintenance averaged around $7,230 per golf hole.

Broken down this was approximately $4,532 for labor, $736 for payroll taxes and employee benefits and $1,116 for fertilizer, seed, sand, topsoil and chemicals. Care for trees, shrubs and annuals used $118 per golf hole, whereas, $69 was allocated for miscellaneous tee and green equipment and supplies. Gasoline, water, electricity, heating fuels and lubricating oils cost approximately $304. Most clubs spent approximately $355 for equipment and facility repairs and overhauls. New equipment purchases, although more variable than the above expenses, are generally around $500 per golf hole per year. In summary, it cost approximately $135,000 to $140,000 to maintain an average 18 hole golf course in our area.

At first glance the Golf Course Maintenance Budget for Winged Foot Golf Club would coincide with the above figures quite accurately. At least this was so until it was announced that we would be hosting the U.S.G.A. 1974 Men's Open Tournament. This tournament immediately reflected its influence on our annual maintenance budget again emphasizing that Winged Foot was to be unique. With two golf courses, we were projecting expenses of between $260,000 and $270,000 for our golf course maintenance. However, tournament preparations have resulted in a projected 26% increase in total 1974 payroll and related expenses. Categories in our maintenance budget such as Sand and Fill - up 32%; Tee and Green Equipment - up 70%; golf Course Supplies - up 21%; Building, Water System and Equipment Repairs and Replacements - up 38%; and Miscellaneous Purchases - up 65%; reflect that 1974 will be a unique year for Winged Foot's Maintenance Budgets. In fact, if the cost of site construction and site restoration is included in this year's budget, we will have a total budget of $420,929 - an increase of approximately 56%.

Since Payroll and Salaries comprise roughly 70 to 75 percent of the total golf course maintenance expenses, it might be of interest if I could show just how some of the working hours are spent on our golf courses. At Winged Foot Golf Club we spend approximately 17% of our time caring for the "greens" - actually 17 Man Hours per year for each 1000 square feet. Notably, the "greens" represent only 2.4% of the total area. "Tees" require approximately 8% of our time; "fairways" - 11%; "roughs", including all tree work - 17%; "sand traps" -7%; and "clubhouse grounds" -5%. Mechanical work, renovation and construction projects require 17% of our time during the warmer months. During the winter, equipment overhaul, tree care, construction and vacations account for another 18% of the total time spent on golf course maintenance.

As we manage our golf courses, you and I are always trying to improve efficiency. The last two to three years were exciting for all of us. At Winged Foot the purchase of new equipment, such as the triplex greens mower, the mechanical sand trap rake, the nine gang hydraulic fairway mower, and automatic irrigation control, allowed us to make an interesting comparison between labor figures for 1971 and 1973. Man Hours of Labor per year were reduced from 6,655 to 4,452 for greens and collars, 2,762 to 2,654 for fairways, and 2,813 to 1,967 for sand traps. Justification for this new equipment could easily be seen by converting the 3,157 Man Hours per year to dollars. At Winged Foot this amounted to approximately $16,500.

The cost of labor naturally requires me to briefly discuss the role of a labor union in golf course maintenance. As you may perhaps know, twenty-five years ago a quarrel arose between golf course management and grounds labor which resulted in Local 32E of the Building and Service Employees Union, affiliated with the A.F.L.-C.I.O. gaining a foot-hold in Westchester Country Clubs. As the story goes, the quarrel between the clubs and the maintenance personnel could have been resolved without the union for only five cents per hour wage increase. However, a strike ensued in which several greens at Winged Foot were burned with kerosene, club members became responsible for mowing the courses and supplies for the grounds and clubhouse could only enter through a neighbor's backyard. In the end approximately twenty-give Westchester golf clubs now operate with unionized grounds labor.

As with almost everything, there have been resultant advantages and disadvantages in having the grounds personnel belong to a labor union. Union negotiations have raised hourly wage rates to the point where they are now comparable with industry. Fringe benefits are far greater than before and as a result it is easier to attract more desirable personnel. Actually, the labor union provides a source of employees and allows us thirty days of trial labor before we must hire a prospective employee on a permanent basis. Our union contract is used as a guideline to deal with various personnel situations equally and fairly. The employee knows that he cannot be discharged without good cause and thereby has gained the job security which was often lacking before.

Unfortunately, it is not always an advantage to have to hire personnel through the union office and it os definitely a disadvantage that upon written request of the union we could have to discharge any employee. Seniority clauses in the union contract often force the club to retain less efficient employees during off season lay-off periods.

Without a doubt, it is costly to employ union grounds personnel. Employees who have worked more than six months per year are guaranteed seven days sick leave and twelve paid holidays. After an employee has served five years he receives three weeks vacation with pay and after fifteen years he receives four weeks. The club is required to contribute $30 per month per employee to the Union Welfare Fund and $12.50 per month per employee to the Union Pension and Retirement Fund. Disability Benefits for all employees are required to be paid for by the club. The work week is limited to 40 hours - eight hours Monday through Friday and time and a half pay is required for work on Saturday or hours in excess of 40 during the week. Sunday and Holiday work hours are paid for at twice the regular houring rate. This year our minimum hourly wage rate is $4.40. Fringe benefits are expensive as can be readily seen when some of them are totaled:

Annual Lay-off Pay	$5,541
Paid Holidays	6,125
Sick Leave	5,035
Vacation Time	5,339
Union Benevolent Fund	5,760
Union Pension Fund	2,400
	$30,202

But there are other factors contributing to the uniqueness of Winged Foot Golf Club. There appears to be a special breed of golfer belonging to our club. At one time in the recent past Winged Foot members had the lowest per capita handicap of all clubs in the nation. An annual metropolitan golf competition which required scores from twenty members of each participating club to be totalled had to be changed to the total scores from only four members. Before this, Winged Foot won the event every year.

Yes - I am proud of the members of Winged Foot, but in my next breath I will curse these dedicated golfers who make Winged Foot their home. How do you keep these golfers off the course after a six-inch rainfall - how could you convince them to play a temporary pin position during the winter and early spring months? In a survey made of 54 neighboring clubs, only 5 allowed winter play on the greens. But only Winged Foot averaged 50 to 180 golfers each weekend during the winter. Fortunately, we no longer have to sweep the snow from greens and tees and provide sand buckets for golf tees. Don't laugh. We were only recently relived of this duty. Our neighbor, Siwanoy Country Club, where Vinny Pentenero is the Superintendent, still faces this winter maintenance situation. Fortunately, he is using temporary greens for winter play.

Perhaps you have seen our Number 3 East Tee in the late fall or winter. At first glance, it would appear that we had neglected and lost this tee. But no - Bermudagrass which is naturally dormant at this time of year presents quite a contrast with the rest of the course. Each winter the tee is covered with salt hay to help prevent winter injury. The tee is unique and I don't know of another in our immediate area. It has often presented us with the opportunity to see diseases common only on the southern turfgrasses.

Another unique approach to turfgrass maintenance around our swimming pool and bath house grounds was begun when Sherwood Moore was Superintendent at Winged Foot. Zoysia, another southern grass adaptable to our climate, was vegetatively planted into the existing bluegrass lawns and then practically through neglect allowed to overrun the entire lawn area. Once this had been accomplished, the turfgrass maintenance around the pool decreased dramatically. Zoysia grows actively for a period of only three months - a period which coincides exactly with our three month swimming season.

Very few golf clubs are able to adequately fund proper tree maintenance programs. Although our programs are far from perfect we are trying to establish practices of regular pruning and fertilization. The results are extremely satisfying. We have been privileged to have Dr. Pirone visit us on occasion to take some pictures of our specimen trees. We were also fortunate to have had Benlate on an experimental basis to help prevent Dutch Elm Disease on some of our elms for almost three years before the product was marketed in this country.

Yes, the uniqueness of a club such as Winged Foot has its advantages. We are often asked to field test products before they are generally available to the public. At present we have three such trials in progress at

our club. It is quite exciting as well as informative to be involved in this manner.

Winged Foot has been a stepping stone in the learning process for many young men aspiring to be Golf Course Superintendents. This was especially so when Sherwood Moore was the Golf Course Superintendent. At present we have several young men at Winged Foot who are contributing greatly to our operation. It is a tribute to our long termed employees such as Charlie Lund and John Corsi that they can continue to patiently teach young men the "tricks of our trade".

Winged Foot is unique in another way also. Not only have I had the opportunity of working at a great metropolitan golf club but it has presented me with the occasion to travel in a consultant capacity to Morocco and Ireland. To describe these trips would require far too much time, but if I may at the end of my talk I would like to show some slides which can express some of my experiences far better than words.

Enough said - Dr. Troll asked that I also discuss some of our tournament preparations:

In June 1972 Winged Foot Golf Club was the host club for the U.S.G.A. Ladies Open - just a warm up for this following summer. For, as I have mentioned, the U.S.G.A. Men's Open will be played on the West Course June 10 to 16, 1974. This will mark the third occasion Winged Foot has been selected as a Men's Open Site. As a point of interest, it is the only club to have had two of its courses selected to host the U.S.G.A. Men's Open. In 1929 the U.S. Open was to be played on the East Course - however, due to unforseen traffic over the club entrance road which bisected the East Course, the tournament was shifted to the West Course at the last moment.

Perhaps it may surprise some of you to learn that a course is selected at least five years in advance for this major tournament. But, when I illustrate some of the preparations we have undergone, I am sure you will understand why so much time is required.

Once we had been awarded the Open, our Green Committee immediately requested that George Fazio - Golf Course Architect - visit the West Course to examine its suitability for modern tournament play. Remember, we had not hosted a major event since 1959. Mr. Fazio proposed several subtle course modifications which were reviewed by our Green Committee and the U.S.G.A. The U.S.G.A. seldom requests course changes but generally wants to approve of any modifications made to a course after it has been selected as an Open Site.

The implementation of Mr. Fazio's suggestions marked a phase in tournament preparations which I term "Site Construction".

Most of us have participated in the design and construction of tees, greens or whole golf holes and we each know the thrill of creation realized in doing this work. Much of this was my first experience with construction and I was eager to learn.

First on our list of projects was the reconstruction of Number 10 West green. 4 West championship tee was then relocated, increasing the length of the hole and further accenting the dogleg. To compliment the new tee, the right and left fairway bunkers were repositioned to greatly restrict the landing area. Number 4 West will be a good test of golf this summer.

An extension to Number 14 West tee was added, requiring the construction of a retaining wall almost 200 feet long and 10 feet high in places. This added approximately 55 yards to the hole most birdied in 1959. The front of the green was then protected by constructing a new sand bunker across the left hand of the green, creating an excellent pin position just beyond the bunker.

18 West tee was lengthened making the finishing 454 yards. Normally played into the wind, it is a great golf hole.

Five West - considered one of the easier holes on the West Course was strengthened by surrounding the green with carefully placed bunkers. Although still considered a "breather hole", a poorly executed shot will no longer reach the green.

The short par 4 11th hole was strengthened by a fairway bunker placed in the drive zone on the left. Second shots played from the narrowed landing area will have to be carefully dropped over a deep sand bunker which now stretches 3/4 of the way across the front of the green.

At various strategic locations selected by our Committee 147 trees approximately 15 feet in height were planted. 25 existing trees were relocated with a Tree Spade and almost 300 small trees were planted in background locations.

All of the Site Construction was done with our own grounds crew and as you can imagine, we accumulated quite a few hours in construction:

Construction Project	Hours of Labor
10 West Green	363
4 West Tee	73
4 West fairway bunkers	168
5 West Green bunkers	172
11 West fairway bunker	49
11 West green bunker	148
14 West tee	429
14 West green bunker	81
18 West tee	146
Tree work	951
	2,580 Hours

During much of the above construction, we were in the process of converting our manual irrigation system on the East Course to automatic, screening the sand in all of the West Course greens bunkers and instal-

ling approximately 7 miles of 600 volt electric cable to supply drinking fountains and I.B.M. equipment. We also had to regrade and reseed the edges of almost 1 1/2 miles of new service roads. At all times we operated with a crew which never exceeded 19 and performed routine maintenance on the two courses during some pretty poor grass growing weather - to put it mildly.

This spring, we have only to construct a practice tee, install 500 yards of 4 inch videocable, repair trenches and move into phase two - that of Tournament preparations.

Water hazards will have to be clearly marked with red and yellow stakes. Boundaries will be defined with white "Out-of-Bounds" markers. "Ground-Under-Repair" areas will be clearly denoted by paint and signs. Five miles of rope and stakes will be installed for spectator control. Two to three miles of snow fence will be erected around the designated Practice area and press facilities and along unprotected boundaries.

350 trash receptacles will be assembled and placed throughout the course. During the tournament Boy Scouts will walk the course removing discarded litter. The receptacles will be emptied at night by our crews using three trucks and a central depot.

70 portable toilets will have to be located in accessible situations to allow servicing daily. A multitude of scoreboards will have to be set up and probably painted. Drinking fountains requiring ice and servicing each morning will be placed on every second tee for the contestants.

The concessionaire will have to install his refreshment tents and another tent company will help to erect tents for First Aid, Volunteers, Scoring, Parking Attendants, Marshalls and an outdoor Pro Shop. Crews will construct bleachers to seat over 2000 people throughout the course. A press tent with almost 9000 square feet of floor space will be constructed. 200 typewriters, interview rooms, developing trailers and telephone rooms all must be provided. Water and electrical facilities will have to be brought to the site. Kiosks to house I.B.M. computer information booths are planned for 4 locations.

The tournament will be televised for 2 hours on Saturday and 3 hours on Sunday. There will be a 1/2 hour wrap-up on Friday. To provide this telephone and television crews will lay 35,000 feet of videocable and over 7,000,000 feet of conductor wire. 13 separate golf holes will be televised, from ground locations or from erected towers.

The preparations seem endless. Signs must be painted and installed often as far as twenty miles from the club - not speaking of the hundreds of directional and instructional signs for the grounds itself. Storage has become an obvious problem. Already we have run out of space and are hard pressed not to lose ourself in the clutter.

Perhaps one of my greatest sources of concern stems from the fact

that we hope to park spectators on our East fairways. Should we have rain I dread the thought of the possible damage that can occur. But we have no alternative and are preparing entrance and exit roads to best accomodate our guests. Hopefully, we had our share of rain in the last three years and will be presented with favorable weather.

Now, what about the actual golf course preparations. Greens will be cross-cut in the morning at approximately 1/8 inch, tees and collars daily at 3/8 inch and fairways once or twice daily at approximately 5/8 inch. At this time I don't forsee the necessity of rolling the greens as accomplished at Oakmont by Lou Scalzo or topdressing with sand which was so skillfully done at Merion by Richie Vallentine. We hope the roughs will be uniformly cut at around 5 inches and that the fairways will be bordered with a 9 foot 1 1/2 inch intermediate rough. Banks greens will be mowed at 1 1/2 inches in most instances to allow the ball to descend into the heavier rough at the bottom of the elevated greens.

After months of preparation which we hope will be rewarded with a successful tournament, the work will not be over. "Site Restoration" will be next. Both courses will have to be prepared to meet the demands of our membership. Deprived of their course for a week and freshly tutored by the best golfers of the world, I know that our members will be at the first tees early Monday morning - provided that there is not a playoff.

Site restoration will not only include disassembly of everything that took months to assemble, but it will also require seeding of the inevitable beaten paths, including crabgrass prevention pre-emergents if at all possible. The five inch rough will have to be lowered to normal heights and the width of fairways restored.

This great annual event will come and go as it has so often before. 1000 volunteers will have worked 40,000 hours to help us to assure its success. Scott Benty, Assistant Superintendent, John Corsi, Foreman, Charlie Lund, Mechanic, and our grounds crew will have done their best and this alone will be enough to satisfy me.

TRENDS IN AGRICULTURAL EDUCATION AND WHERE ARE THE EMPHASES

Assistant Dean John W. Denison
Director, Stockbridge School of Agriculture
University of Massachusetts
Amherst, MA.

Good Morning Ladies (?) and Gentlemen:

My assignment this morning has really had me scratching my head on just how to best approach this topic to keep it interesting. Looking at the mix of the audience this morning, I guess I could report that one

trend in agricultural education is that of increased interest in the general Horticultural field by women. In both the Stockbridge School of Agriculture and our four-year programs, we are enrolling more women. After giving it some careful thought, one could ask "Well, why not?" I talk with an increasing number of young women who really have the same type of desires, relative to future jobs, as do the many young men who apply for our programs. They want to work with plants, soil, shrubs, trees and flowers in the out-of-doors and be able to stand back once in awhile, look over a job they have completed and say, "There, I've really accomplished something with these hands that can be enjoyed by all!" You all know just how satisfying this can be, right? If this trend continues and these gals do become knowledgeable trainees in Turf Management, Landscaping, Nursery Management, Arboriculture or Park Management, I hope that you people in these many businesses will give them equal consideration when hiring new personnel. I realize that there will be some interesting situations develop in areas where men have always had the job, mainly because there never was a trained woman applicant. I can relate to you a reverse type of this situation. Each year in my office, I hire a student to help my secretaries with their many duties. Yes, my secretaries are women in case you were wondering and I'm sure you weren't(!) but I hired a male student secretary! He was the only male applicant out of the 40 who applied. As you might guess, there were a few raised eyebrows among the secretaries on campus but he has been a great addition to my office.

Another trend which has been most intriguing is the overall growth in the College of Food and Natural Resources in the past four or five years. Once believed to be phasing out due to lack of demand, now we are the largest professional school on campus and still facing strong demand. Again, more and more young people, both men and women, want outside-type work associated with plants, animals and land and that is satisfying and hopefully rewarding in terms of dollars. They, as many of us, are beginning to believe there will be a great future in many of the areas of agriculture and they want to be part of it. The faculty and those of us in administration also believe this and sincerely hope that we can be an important part in shaping this future through education and research of the highest quality and relevancy. To meet this challenge, it is going to take a real coordinated effort by you people who are active in industry, our faculty and administrators and our state and federal governments. We all must stay closely tuned to each others needs and overall goals. You businessmen and women play a dual role when it comes to education. You are the employers thus you must counsel us on your research needs and on what types of specific training you desire in your future employees. To provide you with these things, we are sure to need your generous financial backing. You have been a great help to us already in research, especially Turf research, and we sincerely thank you for this interest. But with a central administration and legislature that seems not to understand our future and the future in general for agriculture, we have an uphill battle to provide students and industry with their essential needs.

This situation reminds me of the story of the old Mainiac many years ago who was driving his horse and buggy to town and was hit by one of the

first cars in the area. Went to court and the judge was perplexed. He asked the old Mainiac, "How come you are suing when the officers at the accident reported that when he asked you how you felt immediately after the accident you replied -- never felt better in my whole life! He looked at the judge and replied, "Well judge, when that car hit my horse and wagon, we were all knocked into the ditch upside down. That officer came along, saw my horse had a broken leg so shot him in the head, saw my hound lying there all covered with blood so shot him in the head and when he got to me and asked how I felt, by God I never felt better in my whole life!" Well that is the situation today in Agriccultural Education, we have never felt better in our whole life even though it has often been sort of rough going at times. Therefore, I'm optimistic that with strong cooperation between the Massachusetts Turf and Lawn Grass Council, the Golf Course Superintendents Association of New England, The Massachusetts Nurserymens Association, The Associated Landscape Contractors of Massachusetts, The Stockbridge School and the University of Massachusetts, the future can only be a bright one for all of us.

Thank you and enjoy the rest of this fine conference.

MAINTENANCE OF MUNICIPAL PARKS AND RECREATION AREAS

Baldwin Lee, Superintendent
Springfield Department of Public Parks and Recreation
Springfield, MA.

When we talk in terms of proper, intelligent maintenance of municipal park and recreation areas, immediately we relate to the identifications of problems. As an administrator, our responsibility is to solve these problems by the utilization of what resources we have available to us. My mission this morning, therefore, will be to attempt to identify some of these major problems and offer, through our experiences, the resources available to us, to attempt to solve, or at least make a dent, into the situations.

With the limitations of time, I will identify my problems as an administrator in two major categories, namely, Money and "People and Politicians."

The Springfield Park and Recreation Department is in the "unique" situation of being an urban city, with all of its problems, in a rural section of our state. Therefore, we have the opportunity to deal with problems consistent with both urban and rural. Our department also has the responsibility of five major functions, particularly unique to the park and/or recreation department.

We have the responsibility of not only providing public recreation to all of our citizens throughout the year, but also to provide and

MAINTAIN all of these facilities in a professional manner, so as to assure good, wholesome, constructive recreation. Over and above these functions, we have the responsibility of the city forestry department and the proper maintenance of all tree-belt trees, as well as park-land trees in an area comprising twenty-eight square miles. We have the added responsibility of the city horticultural department providing, amongst other things, the maintenance of eight-six terraces and beautification programs with formal flower plantings at our municipal buildings, as well as the formal gardens at our main park. Built in here, are turf problems related to lawn bowling, as well. Thrown into the pile, also, is the proper maintenance and operation of a zoo, which sometimes we use to describe the overall operation, as well as the proper maintenance of two eighteen-hole golf courses, eighteen championship clay tennis courts, as well as many other facilities located in forty-one different parcels of park lands, running from two acres to 890 acres.

Those of you who are in administrative responsibilities can fully understand why I have selected the title "People and Politicians" as one of the major breakdowns of problem solving. Those of you with the responsibility of maintenance, itself, or who serve in a supervisory capacity for maintenance, are even more aware of these problems. I assure you that I can, and most administrators, can, identify with you. You live with them. Sometimes, I am sure, you feel that the front office, or the administrator cannot hear you, or is not aware of your problems. But we are! we do hear you! we are with you! Our problem, too many times, is that we can't help you.

Just what are these problems? I think, number one, we have to list people, patrons, the users. There is no question that the way in which people use public facilities is consistent with the permissive attitude that now exists in our society. "We pay taxes; what the hell do we care?" "We pay their salaries; let them solve the problem." The sick society is well represented in the subject of vandalism.

With the increased leisure time, with the availability of low-cost or no-cost recreation on these facilities, with the pressures that exist on our peoples in our society, today, we are finding an unprecedented use of our facilities, further compounding the problem. In all too many cases, an unrealistic approach on the part of the politician in providing new facilities, added facilities, or, more important, funds for proper maintenance of facilities.

In regard to the second phase of our problems, funding, in all too many cases, our functions end up as low man on the totem pole. In comparison for the community dollar to be doled out by the general appropriation of taxes, we are not where we should be on the priority list of the Mayor, Selectman, or Town Manager. Education, the Welfare handouts, the problems connected with the Police Department with drugs, etc., although sometimes justifiably accurate, do come first, which makes it difficult for the administrator to gain the necessary funds. So how do we approach these kinds of problems?

In the area of vandalism, we have been successful in establishing

some curbs. We have done it in the following areas: Improved surveillance; insistence upon prosecution; considered vandalism on the drawing board (that is, on the design of buildings and facilities, have built-in protection; providing good recreation programs; an attempt to involve potential delinquents and vandals into constructive activity; developing a team approach within our department, to these problems.

We have really tried to relate to all levels of personnel in our department, including administrative, as well as supervisory and maintenance personnel. It demands good in-service training programs within the department to insure good maintenance practices. It demands good chain-of-command, and understanding of responsibility, so that every employee can relate to a supervisor, and every employee knows his job.

In dealing with the public, it demands complete protection of employee (that is, on the golf courses, if the rules and regulations call for replacing divots, fixing ball marks, etc., that when infractions occur, that there is someone there supervising, to identify the "culprit", and that individual is punished, and that all individuals are treated equally in this particular area); that the administrator recognizes that there are many resources available to him in a community to do this job. The administrator who takes the attitude as described as the low man on the totem pole, is a poor administrator in this day and age. It does not have to be this way. He should have the ability to "wheel and deal" without selling his soul to the political structure, to gain the monies necessary, as parks and recreation in the community, is vital. People are aware in this day and age, of the need for parks and recreation, as never before; and, at the budget time, it is a hell of a lot easier to sell the advantages of a golf course, a zoo, a playground, a physically handicapped program, a retarded program, etc., than it is to sell sewer pipes, or the clerical help in the City Hall, and it should be just as easy in selling, as text books, drug abuse programs, etc.

Never before has there been such funding to local communities as is the case with State and Federal legislation now available. We are now implementing a million dollar capital improvement program through the Legacy of Parks, federal money, including, by the way, engineering costs and construction costs of a drainage system at one of our golf courses.

We are about to have approved, a two million dollar package of State and Federal funds for what we call, a Restoration Program, in the department, which involves, not only capital improvements but monies to properly restore what we have and to preserve what we build.

Another resource is the use of volunteers, which is a subject in itself.

What is available to the administrator? In summary, we are faced with problems in our operation that no administrator has had to face in the past but at the same time we have resources available to us. It is incumbent upon all of us, once these problems are identified,

to build a program based on these resources, some of which are mentioned today, in attacking the problem. All too many public servants use problems as excuses to put their heads in the sand and ignore; the good administrator taps resources; involves people; recognizes every employee as a member of a team, and indeed as an individual; and, in a professional manner, utilizing every technique possible, "SELLS" to his community, an outstanding product, good leisure-time activities, on well maintained facilities.

MAINTENANCE OF GRASS TENNIS COURTS

Wayne Zoppo, Superintendent
Agawam Hunt Club
East Providence, R.I.

At Agawam Hunt we have 12 grass tennis courts which cover 80,000 square feet, which are divided into 2 banks of 6 courts each called "A" Courts and "B" Courts.

The strains of grass we have on the courts vary from Poa annua to Colonial bent to bluegrass. To take care of these courts properly we have 2 men that work full time on them from mid-April to mid-November.

In the spring we roll the courts approximately 5 times at different angles to level and firm them up. After the initial rollings in the spring we roll the courts an average of once a week through the year, usually in the morning after the dew has been taken off or in the early evening. We use a tractor with iron wheels with a one ton roller. We sod or seed any bad areas that we may have so that the courts will be in satisfactory shape when they open approximately on May 20.

The cuts are cut every other day from the second week in May through the second week in October with an hydraulic greensmower. In the spring we start our with a height of cut of 5/16";then about the end of June we raise the height of cut to 3/8" at which we cut at until the first of September; then we return to the 5/16" height of cut. All courts are hand watered as needed, putting on only enough water to last through the day in order to keep the courts as firm as possible.

Up to 1971 when a court was cut and then watered it would need a fresh set of lines so the lines could be seen. But in 1971 we started using an athletic field marking paint which has worked out very well. Now we only have to line the courts every 5 to 6 days.

To fertilize the courts we use Scott's 24-5-3 applied at 1 lb. N per application, approximately once a month -April through October - except in July when we apply chelated iron instead of fertilizer so the grass will not be soft and succulent in periods of hot and humid weather. I have followed this practice the last 7 years and feel by

starving the grass in July very definitely keep the disease problem down to a minimum. I also apply chelated iron and Aqua Gro on a 3-4 week schedule throughout the growing season.

For three reasons:
1. Iron gives us added color.
2. The Aqua Gro improves water penetration.
3. And eliminates wilt.

Before we started an Aqua Gro program we could water in the morning and have wilt in the afternoon, but with an Aqua Gro program now, we water in the morning and do not have to worry about wilt even on a 90-95 degree day. I should emphasize that the amount of Aqua Gro you put on and the number of times you put it on, varies with the amount of thatch you have.

We also follow a preventive schedule of applying Scott's fungicide every 2 weeks mid-May through mid-September. If we do see any disease, it is usually brown patch and we spray Tersan OM or Dyrene to control the disease immediately.

In the fall after the courts have been shut down for the year, usually after Columbus Day, we start a verti-cutting, aerification, overseeding and topseeding program. But before we start these programs we attempt to verti-cut out as much of the white line material as we can.

Verti-Cutting

At first we tried to verti-cut the direction in which we mowed in but found that we ripped up too much turf. So we tried going the opposite direction to which we cut, which worked out fine. We try to go down as deep as possible but can only go down 3/4 to 1" deep because the courts are so hard.

Aerification

We use a 5/8" tines to aerify. After cleaning the courts we must roll them because the aerifier lifts up the turf slightly.

Overseeding and Topdressing

We overseed every fall with a mixture of 66% Exeter Colonial Bent and 33% Pennlawn Fescue, applying approximately 1 lb. of seed per 1000 square feet. We then top dress with screened loam, not a mixture of sand and loam, at the rate of 1.2 cubic yard per 1000 sq.ft.

Laying Out a Court

A court should always be laid out with the long way North and South, to avoid having players look directly into the sun while playing. The length of a court is 78' and the width is 36' for a doubles court and 27' for a singles court. You should always have at least 21' behind the base lines so the players will have enough room to move around. You should also have a backstop beyond 21' to stop tennis balls. The net posts are 3' outside the doubles line. The top of the net at the post should be exactly 3'7" and in the middle of the court it should be exactly 3'.

As you can see maintaining a grass tennis court is a lot like maintaining a golf course green, except that you try to keep the courts as hard as possible and as I stated before only putting enough water on to last the day.

There are some disadvantages to grass tennis courts:

1. Its high initial and maintenance costs.
2. Lack of uniform bounce when not in nearly perfect condition.
3. It is relatively slow drying after a moderate rain.
4. It is slippery when damp.
5. It discolors the balls and you need repairs to properly maintain the courts.
6. And grass courts will cost from 10 to 14 thousand dollars per court to install, depending on how much grass area you have outside the actual playing area.

In closing on the maintenance of grass tennis courts, I would like to say that unless a club is prepared to spend a high amount of money to maintain grass tennis courts, I would suggest going into either clay or hard tennis courts because after the initial cost of installing them, there is very little maintenance to them.

Clay Court Construction

A clay court is generally constructed in the following fashion:

1. A field of open drain lines are set 10' apart, approximately 2'6" below the finish surface.
2. The drain lines are then covered with a 5" bed of cinders or gravel.
3. Above this is placed a 3" compacted layer of 1 1/2" crushed stone.
4. This in turn is topped off with a layer of 3/4" stone to fill the voids.
5. Then a 3" layer of clay screened through a 3/4" to 1" mesh is compacted over the base.
6. The final topping consists of a thick layer of clay screened through a 1/4" mesh.

Maintenance of Clay Courts

On clay courts in the spring after they dry out, you verti-cut them to level them out, then roll the courts and install the tapes for the lines. After that is done the only daily maintenance needed is to brush the courts and clean the lines which takes about half an hour for two courts. In real dry weather you will have to apply calcium chloride to keep the dust down.

Some of the Advantages of Clay Courts Are:

1. That materials for construction are available in most parts of the country.
2. They can be built with relatively inexperienced labor.
3. With reasonable maintenance a player can have a relatively uniform ball bounce.
4. Repairs are rather inexpensive.
5. And because a player can slide on this surface, it is easy on the feet and legs.

Some of the Disadvantages Are:

1. It may take a day to be playable after a moderately heavy rain.
2. Depending upon the color and nature of the clay, it may stain the balls and create a glare in the players' eyes.
3. And daily maintenance is required to keep the courts in reasonable playing condition.

Hard Courts

There are 2 types of hard courts to choose from. They are asphalt and synthetic turf. Asphalt courts would be the most inexpensive of the two because all you have to do is have a good gravel base with drainage and lay the asphalt. The cost of an asphalt court would be about $11.00 per court. For an additional 3 thousand dollars you would be able to lay a surface over the asphalt courts, called cushioned asphalt, which would beautify the court immensely.

Some of the Feautres of a Cushioned Asphalt Court Are:

1. Superb playability.
2. True ball bounce.
3. True plane surface.
4. A non-abrasive surface which is easy on players, as well as tennis balls, and shoes.
5. They are available year round.
6. It has a non-glaring surface in a choice of many standard non-staining colors.
7. It dries rapidly after a rain.
8. You have a cushioned surface with sure footing and no skidding.

These courts require no daily upkeep and little maintenance. The colored surface should be topdressed every 4-6 years. To keep the color vivid, the surface should occasionally be flushed with water and brushed to remove dust and dirt.

Synthetic Turf - There are many types of synthetic turf to choose from, but if anyone is thinking of putting it in, they should be prepared to spend close to 20 thousand dollars per court.

TRANSITION FROM NATURAL TO ARTIFICIAL TURF

George Toma
Director of Field and Landscaping
Arrowhead and Royal Stadiums
Kansas City, MO.

Good afternoon, fellow turf men ... again, it is a great honor to be invited back here on hehalf of the University of Massachusetts Turf Grass Conference. I really enjoyed last year's conference, and I can honestly say it was a super one.

Last year we talked about our playing field maintenance programs for the Kansas City Royals and Kansas City Chiefs when we had Mother Nature's grass about some of the playing fields I worked on for the National Football League Super Bowl games. In Kansas City our past playing fields of natural grass were the envy of every professional baseball and football team. The most important part of this was that we operated on a limited budget with poor soil conditions -- no tile drainage except for the natural sloping surface drainage and without the necessary turf maintenance equipment. Working under these hardship conditions, we maintained a field that was used by baseball, soccer, and football plus other events. And, the thrill of all this was we did not have any complaints from the players, fans and our office. Most of all, we only had one knee injury in nine years on natural grass, and luckily it was a non-operational one at that. Foreign soccer players stated that we had the second best soccer field in the world with only the one in England beating us out. So, as we look back under these all-round poor conditions having three sports played on one field and natural grass surviving, giving the players a playing field they enjoyed playing on, and one of beauty from a fans' standpoint. All of this is in the past, and as days go by, we often hear conversation that someday in the near future our natural grass is on vacation and someday will return again.

In August of 1972 we opened our new Arrowhead Stadium, home of the Kansas City Chiefs, with an artificial surface of 2M Tartan Turf. In April of 1973 we opened our new Royals Stadium, home of the Kansas City Royals, with the same artificial surface, Tartan Turf. I have worked with artificial turf on a limited basis since 1967, so working our two new stadiums with artificial turf did not hit me all at once. I have worked on all three artificial surfaces, namely, Poly Turf, Astro Turf and Tartan Turf. The transition from natural to artificial for my men was very minor, for as I have stated before many times that natural grass has taught many of us in the turf business "PRIDE", and natural grass has taught my men to maintain artificial turf. I have found in my travels if you have a good natural grass field and switch to artificial turf, you will have a good artificial turf field. If you had a poor natural grass field, you can bet your boots you will find that the artificial turf field will also be poor.

It seems to boil down to the first 3 letters in "management" -- M-A-N. I did not see a vast difference in maintaining both types of

fields. They are about even in pluses and minuses, with natural grass that is well maintained giving one a better playing surface for the players and less complaints. In Kansas City when we are talking about our natural grass field --which we could say cost $20,000 -- and that figure is way overboard compared to our new Tartan Turf fields, we are speaking of a figure of near $1,200,000. It takes about the same number of people to maintain artificial turf as it did natural grass. In maintaining our natural grass field we had equipment worth around $3,000 compared to the $25,000 worth of equipment we now have for artificial turf. For example, we had one Toro Professional mower, one Jacobsen Estate, one three-gang roller and spiker. In maintaining artificial turf we have a $4,000 vacuum that we must use. If we don't use this type, we lose our warranty on the turf. We have a $4,000 35 hp tractor to pull a $12,500 water removal machine. The self-propelled water removal machine, which is a good one - The Astro Samboni - runs around $25,000. We have a $3,000 air compressor to blow packed dirt out of the turf and a near -$3,000 tied up in hand vacuums and scrubbers. So, you can see it takes some equipment to maintain artificial turf at professional standards.

Let's look into our daily schedule. One plus for artificial turf is it gives the men a little more sleep. On natural grass we had to start at 7:00 a.m. to remove the tarp so the tarf would not burn the grass as the sun came out. On artificial turf we start our men at 11:00 a.m. and remove the tarp from the field. The field cover, 160 x 160 feet, is placed on the field each night after a game. This is a little more difficult than on natural grass since we cannot drive large bridge spikes into the artificial turf to prevent the field cover from blowing away. We use a vast number of sand bags. The field cover is used to keep the sliding pits (dirt area around the bases) from becoming mud and to keep the artificial turf dry so the balls will not skip. Ground balls are hard to handle on wet artificial turf, for they seem to skip. Instead of mowing the turf, the field is now vacuumed, and the time to do this could be doubled or even tripled over the mowing time, for one must go very slowly to get all the dirt out of the turf. The men daily will walk the entire field with a special cleaning solution to wash out tobacco juice stains, and with a special paint brush they comb out burn marks on the turf that are caused by the players' shoes on sudden stops and starts which fuse the turf blades together. They also carry an aerosal can of special gum freeze and freeze the gum melted in the turf and comb the gum out with these special combs.

If it rains, there is no drainage system on artificial turf except the drains along the playing field wall. After a rain, we must take the water removal machine and remove the excess water, and it takes plenty of sun and wind to dry the artificial fibers. Before a game it takes a few more men to help get the field ready after practice in the 15 minutes allotted for this. Here it is taking street-sweeping-type push brooms to sweep the dirt off the turf around the sliding pit areas. To maintain a good artificial turf field, one must have a good maintenance program. Still, a very, very important factor is that one must be very careful not to overdo it and wear the turf out, not through play, but through too much maintenance. So, the maintenance runs nearly the same - a plus

for artificial is that it can withstand more extra events that could play havoc on natural grass. But, as far as playing conditions go, a well maintained grass field has it all over artificial. 99% of the players dislike artificial turf from a baseball player's standpoint especially on hot days when the surface temperature could hover around 130°. Players playing on it all year complain about their legs being tired in August. During hot-day games in Kansas City we have boxes filled with ice, and when the players come in the dugout between innings, they place their feet in these ice filled boxes. In football many teams that have artificial turf practice all week on natural grass and play their game on the artificial only. Players practicing all week on it complain of tired legs and no spring in their legs on Sundays. The plus factor on artificial turf for football is that you can have so many extra events on your field, especially in colleges. So, this is a very big plus factor, but you are losing the good players' playing conditions as on natural grass. On a football field one does not replace divots after a game on artificial turf. Instead of the men walking each five yards with a pre-germinated seed and soil mix, they carry a bucket with PRS ammonia solution, a paint brush comb, aerosol gum freeze. Here they remove shoe polish, gum and turf burns. Some of the turf burns can be as much as six feet long.

The costs of decorating a football field of artificial surface compared to a natural surface runs 75% more in price. There should be no smoking on artificial turf since the ashes or butts will melt an area about the size of a dime. There is no re-sodding of artificial turf, but an artificial turf nursery is necessary. One square yard of natural turf re-sodding may take minutes, but one square yard of replacing artificial turf may take a day. Artificial turf playing fields may receive a plus for all the extra events, but to the players, it is a minus since they much rather play on natural grass. I have talked to people and players who have stated that this field is better than that field even though it is the same make of artificial turf. Here again it boils down to the "man" in management, plus the type of installation -- a good one or a poor one by the artificial turf company.

Now for some of the headlines I have run across this past year ...

1. National Football League Players Association has long advocated turf moratorium on further installation of artificial turf until the turf was tested more fully. The board is informed that Dr. James G. Garrich, head of Sports Medicine at the University of Washington, has preliminary findings that synthetic turf is more dangerous to the athlete than grass. The N.I.R.B. rules that synthetic turf is a mandatory subject for collective bargaining.

2. Fast Disappearing - new types of natural turf fast disappearing from NFL stadiums were discussed as an alternative to artificial turf at Washington, D.C. conference. Two months later - Robert F. Kennedy Stadium home of the Washington Redskins, will install Dr. Wm.Daniels of Purdue University P.A.T. natural grass system.

3. Is artificial heat exhaustion for real? The season opener for the San Francisco 49'ers will go down in the NFL record book as

a loss to the Miami Dolphins. There will be no asterisk to indicate the 120° temperature on the Poly Turf floor at the Orange Bowl. Nor, will there be any indication that the unnatural heat generated by the unnatural turf caused the loss of John Brodie and serious cases of heat exhaustion suffered by Forrest Blue and Mike Simpson. Charlie Krueger, who has never been known to worry about the hazards of playing football, stated, "Nothing will be done until someone dies".

4. Pittsfield owner and coach upset over Three Rivers synthetic turf ... The turf manufacturers first led the public to believe that synthetic turf was safer than natural grass. Then they convinced many owners and stadium authorities that synthetic was less expensive to maintain. Studies have all demonstrated that synthetic turf is more dangerous, and now it becomes clear that it is also more expensive to install and to maintain.

5. Players critical of false grass ... The basic complaint voiced by the players was that the hardness and heat increases the probability of injury. "It's like playing on a concrete yard", said Tom Keating of the Steelers. Brodie said Roman Gabriel fell down without being hit and knocked himself out ... the same thing happened to Leroy Kelly of the Cleveland Browns.

6. Raiders don't dig digging on field at Coliseum ... after playing six of their first seven games on the road, the Oakland Raiders couldn't wait to get home. But, now they are not unhappy to be leaving the Oakland Coliseum to play next Sunday in Houston. They say the Coliseum field is in terrible shape. "The field is the worst "ive seen", said George Blanda. My note --here again one will spend a half to a million dollars on artificial turf --still at the Coliseum they didn't either spend the money or have the know-how. Having an inside source, they just don't give a damn. Thus, their actions have made natural grass look very bad. In my talk last year I stated how one can sod and finish sodding this minute and play on the same sod the next second. Here again --I would not blame the groundskeeper. Oh yes, the Coliseum fron office, you deserve the blame.

As I see it, maintaining the playing fields on both types of grass are about the same. If only the groundskeeper maintaining natural grass could get some money for grass, soil, drainage --not that $800,000, but just a few thousand -- not that $25,000 for equipment, but just a few thousand. There are some "plus" factors for artificial turf, but when installed we must sacrifice the plus for a minus when it comes down to actual playing conditions for the players and the beauty of natural grass. Mistakes can be made in natural grass which can be corrected by sodding or a couple hundred dollars for seed. Look at our Royals Stadium - over $800,000 invested and we received poor turf and a poor base plus a poor installation job. After one year the club has asked for the entire field to be replaced. I wish I had the time to go into the purchase of artificial turf -- the installation and what to look for -- and if I could do this for you sometime, I could save you many disappointments with your future artificial turf fields if you go that way.

In professional sports, such as baseball, football, soccer and a variety of other events, are held today in what we call multi-purpose stadiums - those built to house all these events for the sports fans of America. The prime tenants in these stadiums usually are professional teams. The players are the best men available to supply the people who pay their freight with sporting thrills. These men are pros. Their employers have invested millions of dollars in them. These athletes have the best doctors, coaches and equipment. Stadium playing field walls are padded for their protection. Usually everything is looked into to prevent injury to these valuable players in order to protect the club's investment and to have a first-class performance. Now, the playing field at times gives us a different picture. Home and visiting players become aware to a poor playing field, and they turn gun shy. When players make such remarks as, "what a rock pile", "sand pit", "pavement" and "obstacle course", it is a safe bet that the playing of the game will be second-rate. So, when ti comes down to the playing field - where good turf is necessary to give the athlete the best possible conditions to perform on and help protect them from injury. Will these conditions be on the playing field? Here is where we all come in --the groundskeeper. Is he a profesisonal in his field as the athletes are in theirs? Is he trying to give the players the best playing field to perform on -- the fans a field of beauty -- the management a sound reasonable operation? These are the questions which should be answered by the condition of the playing field. It is our job to grow good turf and here we must hustle and work hard and may I say again -- Thanks for inviting me here, and to one and all, good luck and may all your good fortunes in 1974 be as numerous as blades of grass!

PLANT MATERIALS FOR OUTLYING AREAS

Professor John M. Zak
Department Plant and Soil Sciences
University of Massachusetts
Amherst, Massachusetts

I do not wish to imply or have you assume that I am a landscape architect or horticulturist because I am speaking about plant materials. However, I would like to pass on to you information that I have acquired from our Massachusetts Department of Public Works and Federal Highway Administration program of research and hope that you will benefit from what we have found.

Under this roadside research grant we have been testing various grasses, legumes, forbs, shrubs, and trees for erosion control, highway beautification, and reduction of maintenance costs. If a plant species is to be used under our Massachusetts climatic conditions, it must be hardy, easily established, and able to conserve soil and water.

As a result of experimentation in the greenhouse and in the eihgt highway districts of the State, we have compiled a list of plant species and methods of seeding or planting to assure good vegetative cover and erosion control.

Most of the areas we have worked on are fill and cut slopes or problem areas where grass and other vegetative species are difficult to establish. The problems exist because we are not replacing top soil and are trying to grow plants on acid subsoil and parent material which have very low fertility. Many of the sites are exposed to high summer temperatures because they face to the south and the soils have low moisture capacity.

We are very much pleased with our experimental results which indicate that it is possible to grow in this area legumes like crown-vetch (Coronilla varia), cicer milkvetch (Astragalus cicer), and flat pea (Lathyrus sylvestris). Once established, they should require no maintenance through the years.

We are also using leguminous shrubs successfully. These are 'Arnot' bristly locust (Robinia fertilis), mountain indigo (Amorpha glabra), Indigo bush (Amorpha fruticosa), dyer's greenweed (Genista tinctoria), and Cytissus species (Scotch broom and others) for the Cape Cod area. Black locust (Robinia pseudoacacia) can be used on dry sites and also false indigo (Baptisia spp), a leguminous forb.

We are also investigating plant species that fix nitrogen, but do not belong to the legume family. A small but significant number of non-legume species can also develop nodules and the bacteria existing in them can fix nitrogen from the atmosphere. Most of these species of plant are found in areas with very little soil nitrogen content. Very little investigation has been carried out with these plants and little information is available on the fixation of nitrogen, nodulation, and kinds of organisms present in the nodules. However, it is believed that some of these species of plants can fix the same amount of nitrogen as legume plants. Since these plants are nitrogen fixers, they are useful on soils of low fertility and poor environmental growth sites.

The following nodulated non-legume species are being successfully used for stabilizing slopes:

Autumn olive	Elaeagnus umbellata
Bayberry	Myrica pensylvanica
Bearberry	Arctostaphylos uva-ursi
Buckthorn	Rhamnaceae
Russian olive	Elaeagnus hortensis
Sweet fern	Comptonia peregrina

Other valuable shrubs in use are: red osier dogwood (Cornus stolonifera), tatarian honeysuckle (Lonicera tatarica), dwarfbush honeysuckle (Diervilla lonicera), Nanking cherry (Prunus tomentosa), sweet pepperbush (Clethra alnifolia), and sumac species.

There are other plants that fit into our landscape pattern which can be planted successfully. However, the ones that I have mentioned are ones that I have worked with in my research program.

Most of my work has been done on 2-1 roadside slopes. This means that a gradient of one vertical foot to each two horizontal feet produces a steep slope, difficult to work and maintain. A 3-1 slope is gentler, easier to work, can be mowed if seeded to grass, and lends itself to better landscaping. Erosion control is less of a problem.

If grass is to be grown on slopes, there will be fewer maintenance problems if the area is loamed, limed and fertilized to produce good healthy turf.

If one does not wish to mow grass, it would be possible to seed directly crownvetch, cicer milkvetch, or flat pea. Once established, it should not require maintenance. Crownvetch does very well where there is moderate soil moisture; cicer does well in wetter areas, and flat pea would be seeded on the dry sites. Cicer milkvetch and flat pea will also do well in well-drained soils of good moisture capacity.

If shrubs are desired, it would be best to plant them (or root cuttings of sweet fern, sumac species, bristly locust) in an area covered with 3-4 inches of wood chip mulch. These mulches are excellent of snlopes for control of erosion. Shrubs can be planted into these mulched areas at any convenient time. Slow-release fertilizer may be applied at the time of planting or may be delayed until the second year.

Following are tables indicating the establishment of some adaptable species, such as herbaceous plants, woody plants or shrubs, leguminous woody plants and non-leguminous nitrogen-fixing plants.

ESTABLISHMENT OF SOME ADAPTABLE SPECIES

HERBACEOUS PLANTS	SUITABLE SITE	ESTABLISHMENT METHOD
Crownvetch	Soils with some clay or fine materials	Preferably by seed (otherwise by potted plants). Apply 1 ton lime per acre. 800 to 1000 lbs. 0-20-20 per acre first year and 500 lbs. 0-20-20 second year. Be sure to add inoculant to seed before seeding.
Cicer milkvetch	Wetter areas	
Flat pea	Dry slopes	

WOODY PLANTS OR SHRUBS	SUITABLE SITE	Shoot cuttings	Root cuttings	Liner stock	Potted plants
Dwarf bush honeysuckle (1-2 ft., spreads by underground roots)	Well-drained soil	X		X	X
Forsythia (1-2 ft., spreads by layering)	Well-drained, moist	X		X	X
Nanking cherry (5-7 ft., pretty blossoms and fruit)	Well-drained			X	X
Red osier dogwood (2-7 ft., spreads by underground stolons; red branches)	Well-drained, wet	X		X	X
Sumac, fragrant (1-3 ft., yellow foliage in fall)	Dry and rocky			X	X
Sumac, shining (5-8 ft., spreads by root suckers; red autumn foliage + berries)	Dry and rocky		X	X	X
Sumac, smooth (8-20 ft., spreads by root suckers; red autumn foliage and berries)	Dry and rocky		X	X	X
Sumac, staghorn (10-30 ft., spreads by root suckers; red autumn foliage)	Dry and rocky		X	X	X
Sweet pepper bush (6-8 ft., fragrant flowers)	Wet areas	X		X	X
Tatarian honeysuckle (5-10 ft., pretty flowers and berries)	Dry or moist			X	X

ESTABLISHMENT OF SOME ADAPTABLE SPECIES

	SUITABLE SITE	ESTABLISHMENT METHOD			
		Root cuttings	Spot seedings	Liner stock	Potted plants
LEGUMINOUS WOODY PLANTS					
Baptisia spp. (False blue indigo)(3-4 ft., showy purple flowers; dies back in winter)	Well-drained and dry sites		X		X
Black locust (60-70 ft., pretty flowers)	Well-drained and dry sites		X	X	
Bristly locust (4-10 ft., pretty rose-purple color; spreads rapidly by root suckers)	Well-drained and dry sites	X	X	X	X
Broom spp. (2-5 ft., pretty yellow flowers)	Well-drained and dry sites		X	X	X
Dyer's greenweed (3 ft., pea-like yellow flowers)	Well-drained and dry sites		X	X	X
Indigo bush (8-18 ft., terminal flowers not very showy)	Well-drained and dry sites		X	X	X
Mountain indigo (3-5 ft., terminal flowers not very showy)	Well-drained and dry sites		X	X	X
NON-LEGUMINOUS NITROGEN-FIXING PLANTS					
Autumn olive (10-15 ft., fragrant white flowers, shiny leaves	Dry sites		X	X	X
Bayberry (3-8 ft., fragrant blue berries)	Dry sites		X	X	X
Bearberry (trailing vine)	Dry sites			X	X
Buckthorn (10-12 ft.)	Moist sites			X	X
Russian olive (10-20 ft., light-colored pubescent leaves)	Dry sites		X	X	X
Sweet fern (2-5 ft., spreads rapidly, aromatic)	Dry sites	X		X	X

CARE OF UNIVERSITY GROUNDS

John L. Moodie, Superintendent
Springfield College
Springfield, MA.

Maybe the title of the talk should be changed from "Care of University Grounds" to "Frustrations by the Acre."

I was going to give you specifics in our maintenance program at our campus but decided instead to generalize and leave the specifics for the question and answer period at the end.

Our campus is divided into two different areas of maintenance, namely the Athletic Complex and what I like to call the Aesthetic area or that part of the campus which includes student dorms, the Library, classrooms, the Ad Building, etc. Many campuses are divided into two different work crews - one for Athletics and one strictly for campus maintenance, but our one crew maintains ALL. This in itself leads to one frustration after another. For example, when things should be done on campus in early spring, almost all labor is concentrated preparing the fields for sports, teaching stations, etc., but I have told the Grounds crew the teaching areas have first priority because this is what the students are paying for.

Springfield College is very strong in Physical Education and must maintain top facilities on a private school budget, which in itself is quite an undertaking. I found out long ago that the Physical Education Department could easily receive money to improve and expand whereas money for the maintenance of some areas was hard to come by. For instance, after we built the Poly Turf Field, the college knew that they must allocate more money for the cleaning and maintenance of the quarter of a million dollar rug. But trying to get an appropriate percentage to care for a grass field is virtually impossible.

This is just one part of a transition that is taking place on our campus. The others are of course a new Uniroyal Track and the completion of more Laykold Tennis Courts, which eliminates the older and less adequate clay courts. These things in themselves, strictly from a Superintendent's viewpoint have been a blessing in disguise.

Before the Poly Turf era, we would have to fertilize, overseed and perhaps irrigate all summer in preparation for the upcoming football and soccer seasons. We used to paint the lines on the Football Field Friday, weather permitting, then mow and sometimes roll different ways between each 5 yard line, especially if the game was going to be on T.V. The synthetic field has taken the sweat and anxiety out of every Saturday Home Football game.

The Laykold Tennis Courts of course can be played on earlier in the season and relieve the problem of getting the courts rolled and the tapes put down.

Last fall we completed a new Uniroyal Synthetic Track and I'm sure we won't miss the maintenance problems in the spring of dragging, screening, rolling and lining our old but good cinder track.

With all these new facilities, a good, dedicated turf man might find it difficult to adjust. For example, one misses the satisfaction and pride involved in having the Football Field in tip top shape for the weekly game. After all, who in hell finds any satisfaction in running a vacuum cleaner over a Poly Turf Football Field. If a Grounds Department cannot maintain an athletic field properly because of a small budget, lack of manpower or because a grass field simply will not endure such heavy use, this is the only alternative. On the other hand, the synthetic field is only as clean as the environment around it and a good natural grass area must be maintained in order to keep the Poly Turf Field clean.

The Physical Education Training Programsat Springfield College are unique in that we have our fields in constant use. On our Poly Turf Field, which is larger than a Soccer Field, we have a Football Field, Lacrosse Field, girls' Field Hockey Field, all superimposed on a Soccer Field. All sports areas are painted with different colored lines. Along with intramurals, classes, teams, etc., this facility is in use from 8:00 a.m. to 12:00 or 1:00 in the morning, under lights. So you can see why I say "Don't fight them, join them."

I did not intend to dwell on the subject of synthetic fields so long, and it should be understood that I'm not a traitor to the cause of good natural turf by any means. Any college or university considering artificial turf should look into all aspects and possibilities before making the plunge. One favorable aspect, though, at Springfield College is that less time is needed to maintain some of these synthetic facilities, therefore more time may be concentrated on our remaining athletic fields, such as the baseball diamonds, other Soccer Fields, girls' Field Hockey and Softball Fields, etc. We have seen considerable improvement in these other areas and are looking forward to even more.

On the ohter side of campus or the "aesthetic" side, it too is looking better with more aerifying, overseeding, fertilizing and better landscape plantings. I try to instill upon the groundsmen that first impressions are lasting impressions and that the campus grounds should always be in the best of shape. The administration should also realize that sometimes the grounds are the only part of the campus seen by prospective students and their parents. After all, education is a business, getting more competitive every year, and the grounds are one integral part of a student's environment.

Among some of the problems in campus maintenance is littering, a very costly and discouraging one at best until we put out trash containers at crucial spots, probably decreasing our paper picking time by half.

Another big problem is students cutting across green areas and wearing them out. It seems very time a new building is constructed, the traffic pattern changes and the sidewalks are in the wrong place. Shortcuts across turf areas is not a new habit. I remember reading an

Alumni Bulletin written 50 years ago and they had the same problem. In an attempt to discourage cutting across lawns, we have put up stakes with rope, planted shrubs, etc., but the students seem to disregard their existence and knock them down anyway. The situation seems to be worse in the spring, just as the grass is coming alive again.

Sometimes student involvement may be a very useful tool in maintaining campus facilities and grounds. I remember a couple of years ago I came to work one morning and someone had put up stakes and string during the night with peculiar signs saying something like "Keep off the grass, the FOX is watching." I never did find out who the FOX was, but the kids did keep off the grass.

This past year a couple of students (and that's all it takes) put articles in the student paper. This made students more conscious of the problem and they were more apt to stay clear of the grass areas.

We found out also that in high maintenance areas, where students see the crew working, they are more apt to respect and cooperate. If you let an area deteriorate, the students lose a certain environmental awareness. Their rational for stepping on the grass and trampling bushes is "Well, it looks so bad now, it's not going to hurt it if I walk all over it." This is why constant care is such a necessary part of grounds maintenance.

I brought with me today a few slides of some of the things going on about campus and a look at some additional problems.

In conclusion, I would like to read several paragraphs from a letter written by a Northeastern student to a member of our radio station when he came to our campus to do a football game between Springfield and Northeastern.

"An old proverb states that first impressions are lasting impressions and my impressions of your campus and students will be very lasting indeed.

The first and most obvious impression was the cleanliness of your campus. There were no papers on the grass, no cigarette butts strewn about nor were there any signs of litter on the streets."

This is the type of praise we all are striving for and when it comes we feel we must be doing something right!

Thank you very much.

MAINTENANCE OF INDUSTRIAL SITES

George J. Moore, Mgr. Grounds
Massachusetts Mutual Life Insurance Co.
Springfield, MA.

During recent years, beautification of industrial complexes has become popular and has become the "vogue", but at Mass. Mutual Life Insurance Co. in Springfield, Mass, it has been going on for 45 years or more. It is difficult to call the grounds at Mass. Mutual industrial, but it is the category most closely related to it in the horticultural grounds maintenance field. I never know what block to check when asked on a form for magazines, equipment information, etc., as to what category I am in: golf course, park, recreation or what? We have a varied interest in many types of horticulture.

Our grounds consist of about 100 acres of "Park Type" atmosphere. We have a 25,000 sq.ft. putting green of Penncross bent for the employees noontime pleasure, also a wintertime skating rink, basketball courts, tennis courts, ballfields, picnic grounds, and about 40 acres of fine lawns. Also 18 acres of parking lots and roadways for the 2400 employees which is maintained by the grounds division and keeps the 7 man crew busy all winter. Because the majority of our employees are female we keep the parking areas in wintertime in above average conditions. The lots are kept clear at all times. Snow is removed constantly so that there is never any build up. All snow plowed to edges of lots is hauled away to a remote dumping area, making room for the next storm.

Some of our recreation areas are dual purpose. For instance, the wintertime skating rink becomes tennis courts in the spring. I do not approve of dual purpose areas as they are not satisfactory. Something must be sacrificed. In order to drain the skating rink in spring, the area must be pitched to drains. This, of course, makes for an untrue bounce for the ball in tennis. The holes for the tennis net posts allow water to seep out of the skating rink - even though strenuous efforts are made to seal them. You should one of the other, not both, on one surface.

I would like to illustrate the remaining part of my talk with a short series of slides depicting our operations on the grounds.

Our equipment consists of a dump truck, pick-up truck, a Case loader-backhoe tractor, 2 Ford tractors, 5 gang mowers, 2 tri-plex mowers, tractor drawn sweepers, thatchers, aerators, flail mowers, sprayers, cyclone and drop-type spreaders (also used for salt and sand in wanter), power and push type mowers, power edgers, electric generators, seeders, thatchers, greens mowers, boom-sprayers, and many other pieces of horticulture equipment. Not to mention the wintertime plows, blowers, salt and sand spreaders, etc.

All of our grass clippings, lawn thatchings, leaves and other organic materials are composted. We have 3 piles. One new one, one that is being constantly turned and loam added to it, and one being used in

shrub plantings or any other area where it will help improve the soil. As a company we are conservation minded and always have been. We have always strived to protect the environment whether it be in the disposal of used oils or the use of pesticides. We are attempting to maintain an oasis in an encroaching city atmosphere. 45 years ago we were in the country, later in the suburbs, and now we are almost in the inner city, with all its vandal problems. To name a few: firecrackers in the aeration holes of the putting greens, irrigation hoses cut up, sprinklers hauled up the flagpole, fences cut, cars stolen off the parking lot, shrubs damaged and stolen, debris left on the grounds by trespassers; even though we have round the clock guards and television cameras scanning the area continually. Our next step is a complete fence around the property, something we in grounds have fought against for years, but it must come.

Our automatic irrigation system was installed 9 years ago and has been a constant problem ever since. It was poorly designed and installed and I have dug up every one of the 80 large heads and most of the smaller ones to repair broken pipes, clogged valves, short circuits in the electrical system and general poor workmanship. It has been one of my most exasperating tasks in the last few years to try to reconstruct the entire system. My advice to anyone installing any automatic irrigation to thoroughly investigate all aspects and to keep a constant surveillance of the installation - right down to the smallest detail.

Our main lawn areas are the old U.R.I. #1 mixture which is 25% Merion Kentucky Bluegrass, 25% Kentucky Bluegrass and 50% Chewings or Creeping red fescue. We also have some pure Merion areas and some old mixed bentgrass-bluegrass areas. Out putting green is Penncross bent. The majority of the lawns receive twice a year applications of a 10-6-4 40% organic fertilizer at the rate of 14 to 15 pounds per 1000 sq.ft. The Merion areas receive more nitrogen in mid-summer. The putting green considerably more as well as a preventive pesticide program. A pre-emerge crabgrass killer is used once a year. Broadleaf weed spraying is done when needed, usually twice a year. Lime is applied when necessary to maintain a pH of 6.0.

Many years ago flower beds were maintained in many areas, but due to rising labor costs many formal gardens were eliminated, but recently due to the introduction of low maintenance plants (marigolds, etc), we have introduced beds of annuals at a modest cost as well as low maintenance cost.

During the past 18 years that I have been responsible for the grounds maintenance program, we have gradually grown in stature and respect and from a group of so-called ditch-diggers to a highly skilled and flexible team of employees that are called upon to perform duties of many diverse natures.

TURFGRASS DISEASES AND SYSTEMIC FUNGICIDES

Professor Houston B. Couch
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The Twentieth Century ushered in the beginnings of the use of pesticides for the control of turfgrass diseases. Each new decade saw newer and more effective materials being developed for field use, and by the early 1960's, the turfgrass management specialist had at his disposal a rather confortable collection of both organic and inorganic fungicides from which to select for turfgrass disease control. The early years of the 1960's, however, were soon to become recognized as a high-water mark in numbers of materials available -- for as the decade progressed, the range of selection was to be narrowed.

The first significant reduction in the degree of selectivity of fungicides for use in turfgrass disease control came in 1964. It was observed in this year that in certain localities the fungus that incites Sclerotinia dollar spot had developed resistance to Dyrene and/or the cadmium-based fungicides.

Shortly before the close of the decade, a second major in-road was made in the reduction of the number of fungicides available to the turfgrass management specialist. The basis for this was the increasing concern over the effects of pesticides on the total environment. After serving as a mainstay in turfgrass disease control programs for some 50 years, the organic mercury fungicide, Semesan was removed from the market, and the use pattern of the inorganic mercuries was soon to be changed considerably.

While the latter portion of the 1960's was a low ebb in the range of selection of chemicals for turfgrass disease control, it was also the beginning of a new era. By this time, the development of systemic fungicides had reached the field testing stage, and promising candidates were being checked for possible use on turfgrass. These programs were successful, and the 1970's were ushered in with two materials, benomyl and thiabendazole, being introduced for general use in the field.

Ideally, the systemic fungicide represents the ultimate in the chemical control of plant diseases. It is a material that can be applied to the plant in low concentrations. Immediately after application, it is absorbed by the plant and translocated to all tissues--where it not only eliminates any existing fungus infection, but also protects against any new infections that might occur from external sources of inoculum. This is in contrast with the classic contact fungicide, which must eliminate the invading fungus prior to its successful infection of the plant.

The development of a fungicide to meet these requirements is not an easy matter. The material must be formulated in such a manner that

it will be readily absorbed by the plant in sufficient quantities to be toxic to the invading fungus and yet not injure the protoplasm of the host. In addition, it must be transported rapidly throughout the plant and remain in an active state for an extended period of time.

An understanding of the nature of the problems that are peculiar to the development of a successful systemic fungicide, are helpful in understanding the limitations related to their use in the field. For example, in order to place such a biocide in contact with both the protoplasm of the plant cells and the protoplasm of the fungus cells and have it otxic only to the latter means that its mode of action must be very specific. With being the case, one would anticipate that such a fungicide might be restricted in the spectrum of fungi it would be effective against. Also, it would be vulnerable to the development of resistance in the organisms for which it is selective. Another expectation would be that high doses of such a fungicide could have both subtle and highly significant side effects on the plant. Furthermore, due to the long life of the fungicide in the plant, any side effects, once established, could possibly be quite prolonged.

Certain of these limitations were noted in early field reports on the use of systemic fungicides. From the Netherlands, there were cases of increases in the incidence of certain fungi on bulb crops after continued use of benomyl. The same observations were made for greenhouse-grown crops in Great Britain. In the United States, observations have been made relative to the increase of root diseases of certain ornamental plants after the use of benomyl in soil drenches, and the resistance of Botrytis cinerea on greenhouse-grown crops to benomyl has been reported. An additional side effect from the use of systemic fungicides has been noted in recent reports from Europe in which it has been observed that benomyl, thiophanate and thiabendazole are highly toxic to surface feeding earthworms inhabiting grass sod.

The first indication of possible side effects from systemic fungicide usage on turfgrass came in a report from Australia describing the buildup of a Basidiomycete on a bentgrass green after the continued use of benomyl at high rates. A recent field research report from the United States notes a possible increase of incidence of Helminthosporium-incited leafspots on turfgrass that had been treated with benomyl. Also, there have been recent reports of resistance to benomyl on the part of both the powdery mildew organism and the fungus that incites Sclerotinia dollar spot.

Our research interests in the systemic fungicides have centered primarily around their possible side effects on turfgrass and their relative effectiveness in the field control of certain turfgrass diseases. The commercially available materials tested in this program have included benomyl, thiabendazole, and the thiophanates. These experiments have been conducted both in the field and in environmental control chambers.

The series concerned with the side effects of systemic fungicides were conducted on three turfgrass species grown under two levels of nitrogen fertilization and at two different air temperatures. These

studies revealed an interaction of side effects of benomyl and thiabendazole with respect to air temperature, turfgrass species and variety, and level of plant nutrition. The phytotoxicity of thiabendazole was greatest at high nitrogen nutrition. With the benomyl-treated plants, however, phytotoxicity was observed earlier and was most severe in the plants grown under low nitrogen nutrition. Plants treated with either of these systemic fungicides, grown at 95°F showed symptoms of injury earlier and were severely affected by the fungicides than those grown at 75°F.

With the different turfgrass species entries, Kentucky bluegrass was more prone to injury by benomyl or thiabendazole, bentgrass was second and the ryegrasses ranked third. Among the respective varieties, Merion Kentucky bluegrass was more prone to injury than common, Highland bentgrass was more severely affected than Penncross, and Manhattan ryegrass showed greater injury than the variety, Pennfine.

In the field trail series, benomyl and the ethyl and methyl formulations of thiophanate were tested as 50% wettable powders in 5 gal. water/1000 sq.ft. The tests were conducted on Penncross bentgrass mowed at putting green height and under low nitrogen fertilization. The fungicides were applied through a sequence of individual 6 oz. rates to provide within a 4-week period a series of individual plots that had received the equivalent of 6 oz., 12 oz., 18 oz., and 24 oz., respectively. A single application of either benomyl or the thiophanates at 6 oz. 50% wettable powder/1000 sq.ft. induced visible signs of injury. The first symptoms appeared in 36 - 72 hours from the time of fungicide application and lasted approximately 21 days. The individual leaves were characterized by a tip die-back --beginning as a yellow discoloration and finally becoming brown in color. In overall view, the turf assumed a mottled light-yellow appearance, with light-yellow rings 1 - 2 ft. in diameter. Another aspect of the treated areas was the fact that the growth rate of the grass was reduced singificantly. This latter side effect was particularly evident at the 12 oz. accumulation level and above.

Concerning the efficiency of the systemic fungicide and benomyl, thiabendazole, and methyl and ethyl thiophanate in the control of turfgrass diseases, our field research has shown them to be particularly effective against certain summer diseases. These materials have been very effective in the control of Sclerotinia dollar spot (S. homoeocarpa) at low rates and for extended periods between dates of application. They also provide a high level of control of Rhisoctonia leafspot (R.solani) of tall fescue. In addition, benomyl has been shown to be very effective in the control of Fusarium blight (F. roseum and F. tricinctum), powdery mildew (Erysiphae graminis), stripe smut (Ustilago striiformis) and Rhizoctonia brown patch (R. solani). None of these materials will control the Helminthosporium-incited diseases.

Systemic fungicides are an important addition to the list of materials available for turfgrass disease control. Their introduction into the field use state represent the most significant break through

in the development of disease control programs since the discovery of Thiram in the early 1930's. From the foregoing, however, it can be seen that in using systemic fungicides for turfgrass disease control, it is extremely important that dosage rates and prescribed intervals of application be followed without variation. If the often used practice employed with contact fungicides of increasing dosage rates and closing up the interval between dates of application is spplied to systemic fungicide programs, it could result in undesirable side effect problems -- including fungus resistance to the materials. As a general rule, in developing the total program, no more than 6-8 ob. of formulated 50% wettable powder of either benomyl or thiophanates (or combinations thereof) should be applied annually to 1000 sq.ft. of turfgrass. The suggested schedules for use of systemic fungicides for control of specific diseases are as follows:

Fusarium Blight - one application of 6-8 oz. 50% wettable powder/ 1000 sq.ft. (or) two applications of 4 oz./1000 sq.ft. at 7-day intervals.

Stripe Smut - one application only of 6-8 oz. 50% wettable powder/ 1000 sq.ft. during dormant season.

Sclerotinia Dollar Spot - 0.5 oz. 50% wettable powder/1000 sq.ft. at 2-week intervals, or 1 oz/1000 sq.ft. at 3-week intervals. Beginning in mid-spring and continuing through fourth week of August. If this program does not hold dollar spot, then additional systemic fungicides should not be applied. Rather, a good contact fungicide should be used.

Rhizoctonia Brown Patch - Follow same program as outlined for Sclerotinia dollar spot. If this does not hold the disease in check, then no additional systemic fungicide should be applied. Instead, a good contact-type fungicide should be used. If a preventive systemic program is not being followed, and the disease occurs, a contact fungicide should be used -- not a systemic.

A LOOK AT THE FUTURE

Michael W. Sheridan
Facility Development Consultant
National Golf Foundation
Harleysville, PA.

For those of you that may not be familiar with the NGF and our purposes, I would like to tell you a little bit about our organization.

The NGF was founded in 1936, as a non-profit organization by the manufacturers of golf equipment: Wilson, Spalding, and MacGregor, to name just a few. Today we are still supported by these and others interested in the future growth of the game. The NGF works very closely

with the USGA, the golf course architects and contractors, golf superintendents, and the National Club Association.

Our primary function today is to promote the game of golf all over the country. Presently we have 8 facility development consultants, working from coast to coast. Our consultants meet with groups or individuals to provide overall guidance in determining the feasibility, needs, cost of construction, methods of financing and operational procedures.

Most of our consultant work is concerned with planning new golf facilities. But with the increasing operational problems clubs are having, more of our time is being spent with existing clubs.

Another job of the Foundation has to do with teaching the game. We have leading PGA professionals all over the country, who work with our Educational Services Division to conduct teaching seminars at schools, camps and other recreational centers all over the country.

The NGF Publications and Research Division distributes everything from Planning the Golf Course and golf etiquette to computer read-outs on the statistical aspects of the game and its future trends.

The National Golf Foundation is not in the business of selling golf, we have no axes to grind. Our goal is simply to promote the game of golf.

What's happening in golf course development? Back in the early 60's golf development reached a high of over 500 new courses a year. That figure has been dropping gradually until levelling off the last few years ato about 300 new facilities.

In 1973 the total number of courses open, including additions, executives and par 3's were 322. Under construction 290. In planning 292. Roughly 60% of those were real estate developments.

One of the future objectives of the NGF is placing a maximum effort toward the development of public golf in the U.S. One statistic that should serve to explain why we stress the building of public golf facilities. Of America's 13 million golfers, 85% are in the non-country club class, while only 55% of the courses are non-country club. This in a nutshell explains why our public courses are crowded and why we need more of them.

Less than 15% of the golf courses being planned today are private clubs. With the increasing costs of construction, land, taxes and day to day operations, the private clubs are declining.

To help combat these problems and needs, the National Golf Foundation has begun to conduct Public Golf Seminars over the entire country. These seminars are being held primarily to focus attention as to where courses are needed and the steps to be taken until the course is open for play.

As it is not within the privince of the Foundation to initiate private investment in golf facilities, our role in encouraging the building of more public courses continues to be, to advise and assist in any way we can those who have expressed an interest in a golf course project. We do, however, feel that it is our duty to be sure that those responsible for planning government owned and funded recreation facilities -- city, county or state -- are aware of which areas badly need more public golf courses and of the advantages that accrue to an area from including well-designed and well-run public golf courses in the total public recreation plan.

As a first step in increasing our capacity to assist in these areas, our Facility Development Consultant staff was increased from five to eight men. With better coverage of all parts of the nation assured, the Foundation next turned its efforts toward identifying those areas of the country which have the greatest need for additional public golf courses, so that we could give extra attention to assisting these areas.

To determine the areas of greatest need, NGF made a statistical study based on our recommended proportion of 18 holes of public golf per 25,000 people. The population figure for each county in the entire United States was divided by 25,000 to determine the minimum number of holes of publicly available golf each county should have. These figures were then compared to the number of holes of public golf now existing in each county to determine how many additional holes of public golf are needed to meet the 1970 census population requirements.

Of course, there are other vital considerations:

1. Is land available? (For example, consider New York City. There is not enough land available within driving distance of the city to provide the number of public golf courses that should ideally be available to that number of people.)

2. Is the land suitable for golf? (Terrain, general climate, availability of water, length of growing season, type of soil, etc. must all be considered.)

3. How many private courses are located in the area? (Are there enouth "unattached" golfers to warrant more public courses?)

4. Does the area have tourists during the golfing season? (Such areas may well need many more public courses than the office report would seem to indicate.)

5. What are the local economic facts of life? (The price of land, tax rate, etc.)

Alert municipalities are exploring the possibilities of obtaining assistance through various Federal aid programs in providing needed golf/recreational complexes for their residents. Many communities have already developed extensive recreation facilities through this means. A digest of possible Federal assistance programs that could include golf courses follows:

A Legacy of Parks: The Surplus Property Program - Under legislation signed by President Nixon on October 22, 1970, states and their political subdivisions may obtain for public park and recreation use, Federal properties that are declared surplus to the needs of the Federal Government. Conveyances are made free or at virtually no cost to the recipient.

BOR Grants From The Land and Water Conservation Fund - Since 1965 when the Bureau of Outdoor Recreation began making matching grants from the Land and Water Conservation Fund to Municipalities for qualifying projects, thousands of new outdoor recreational facilities have been developed throughout the nation. $66 million dollars was appropriated fro the BOR 50-50 matching grant program for the current fiscal year. While this is less than one-third of the amount usually approved in the past, a BOR spokesman states there is $136 million still outstanding from funds already authorized. BOR is now working on its 1974-75 budget and plans to request $300 million for this program. One way the private land owner can benefit from BOR funding is through donation. Let's say the landowner wants to build his dream golf course, potentially he can donate his land to a municipal body, receive a 50-50 development grant, and then arrange to lease the facility from the municipality or county.

The Community Facilities- Loan Program - This program became effective July of 1973, and authorizes the Farmers Home Adm. to make loans for development of community facilities for public use in rural areas and towns of up to 10,000 population.

Revenue Sharing - There are examples throughout the country where municipalities have used the new Revenue Sharing program for recreational facility development, including golf courses.

Conventional Municipal Golf Course Financing - Most existing municipal golf courses were financed through the sale of general obligation bonds issued by the municipality concerned or by general budget allocations. Municipalities receiving Federal grants are using general obligation bonds for their share of the facility development costs.

Privately owned daily-fee golf courses also have means to gain money to finance golf facilities, though somewhat limited.

Commercial Public-Service Facilities in National Forests -Resorts, hotels, cabin camps, ski lifts, stores, gas stations, golf courses and similar developments offering accomodations and services needed by the public are permitted on national forest land under special use permits.

Farmers Home Adm. Loan Program - Under the farm loan program, eligible farmers may receive loans to assist in boosting their income by converting all or portions of their farms and ranches to income producing outdoor recreation enterprises.

Small Business Adm. Loans - When financing is not otherwise available on reasonable terms, the SBA may guarantee up to 90% or $350,000 whichever is less, of a bank loan to a business firm, provided that the planned project is deemed feasible.

Earlier I mentioned the decline in new private clubs being built. There is also a decline in the success of existing private country clubs. How many private clubs in your area are having severe problems. How many have been sold or are considering selling?

Sooner or later the private country club reflects the socio-economic conditions as they exist in all of society. Many private clubs are realizing these conditions too late and have caught their memberships and defenses down. Some of the problems include:

Inflation - Club managers feel that escalating costs are the biggest threat to the private club over the next five years. Real Estate taxes have become another big problem. Many inter-city clubs are being assessed as though they were high rise apartment complexes, based on "best land use" instead of recreational open space.

Some private clubs are thinking twice about remaining non-profit and tax exempt. This is prompting some clubs to turn profit motive and operate like any other business. Once clubs boasted about their full memberships and long waiting lists. The member clubs of the National Club Assn. are down from a high of 50% eight to nine years ago, to less than 10% now with waiting lists.

There are now over 70 bills in Congress ranging from tax reform and environmental protection to amendments of OSHA. This legislation could have a significant impact on the private club industry and each club should keep up with regulations that can affect them.

Social problems within the private club concern themselves mostly with communication, communication between the oldline and the new young members and also in relation to other social and ethnic issues of today.

Solutions? What ever they might be and where ever they may apply, the private clubs have got to take stock in themselves and quit reading the country club obituary column and start operating more like a business. Some may have to decide if they are to be a full family operation or revert back to just a golf club. Either way a long range planning committee must study the needs of the membership for the future.

Public Golf

While the problem of wekend congestion on golf courses has received considerable attention in the industry in the past decade, another problem in the distribution of play is even more critical. Many of the same golf courses which have been unable to accomodate the crush of weekend golfers are comparatively abandoned on weekdays.

With operation and maintenance costs increasing steadily, municipal and daily fee golf course operators face the incompatible alternatives of attracting more customers or raising fees. Weekend saturation is a reality at many courses and a possibility at most, leaving

increased midweek play as the most important source of new revenue.

Ideally, golf courses should experience about 70% of their play on weekdays. Anything over 60% must be considered good by today's standards, but anything under 50% can mean trouble for a public golf operation.

The long-promised effects of Americans expanded leisure time, the four-day work week, early retirement and new affluence simply have not filled the weekday void for golf courses. Enterprising operators are no longer waiting for them. They are going after the midweek player with all the inducements at their command.

Efforts to increase weekday play generally fall into three categories:

1. Financial considerations
2. Changing golfers' habits
3. Developing new players

It has long been the practice at most municipal and daily fee courses to offer a cheaper rate for weekday play than for weekend and holiday golf.

There are literally thousands of others following the same philosophy with only slight changes in the format. Some courses go so far, for instance, as to offer a bargain rate for golf car rental, along with reduced green fees on weekdays.

Changing Habits.

The golfer who cannot be lured to the course through weekday savings must be approached in another way. Many times the mere introduction to the pleasures of midweek golf, uncrowded conditions on the course, in the pro shop and the restaurant, is enough to coax an avid golfer into setting aside a regular weekday for his game. Certainly there are an increasing number of occupations which provide for off time during the week and these will increase as the weekend , as we now recognize it, continues to lose its identity for many employed persons.

Radio advertising has been effective in pointing out the advantages of weekday golf and, at the same time, enticing travelers off the highways and onto golf courses in major vacation areas. One chain of golf courses in the Northwest has patterned its radio advertising after ski reports, the aired message mentions course conditions, green fees, lesson tee rates, lounge and dining facilities available and updates the information by adding the waiting time, if any, a player can expect at the first tee. This, of course, is usually minimal on weekdays.

The municipal or daily fee golf course is rare which does not set aside one portion of one day each week for men, women, jujiors, seniors or given golf associations. These programs can all be expanded through special efforts of management and through the

cultivation of active, imaginative group leaders. Regular and varied competitions and special events make these days more than just another golf date for those who take part.

Many golf courses promote league play on special weekdays, generally after the workday at twilight during the prime season. A golf course with five leagues of eight four-man teams each would add 160 rounds of golf a week or over 3,000 over a five-month season.

League play can also be developed beyond the twilight zone, especially in metropolitan and industrial areas. Night shift workers can be organized into morning or early afternoon leagues.

Another program which has been particularly successful at short courses has been a golf-for-lunch bunch concept. A good, quick-service lunch counter and nine holes which can be negotiated in little over an hour can be parlayed into a busy noon hour. Businessmen frequently stretch lunch periods into two hours, lingering over martinis or discussing business with a client. Much the same results can be realized discussing business and lingering over six-foot putts.

Virtually every daily fee and municipal course serves as the headquarters for at least one or two golf associations which meet regularly and play on specific weekdays. In some less populated areas where golf courses are few and far between, promotionally minded owners and operators are expanding upon this situation. They are encouraging the development of individual golf clubs or associations in various communities as far as 25 or more miles away and setting aside weekdays on which these groups are specifically favored with starting times and other considerations.

In other areas where golf courses are relatively plentiful, a cooperative venture can benefit them all. Programs such as home and home matches, member-guest days and multi-course tournaments can develop a region of nomadic golfers. And it follows that a golfer who develops the habit of moving around among several golf courses is going to play more often, including weekdays.

Developing new golfers, the final and ultimately the most important of all methods of creating more play, both on weekdays and weekends, is given priority attention by the National Golf Foundation, the USGA, the PGA and other golf organizations. But too often it is overlooked or down right neglected at the first classroom of the game, the individual public golf course.

Ask any golf course owner or operator what he is goind to develop new golfers and he probably will make immediate reference to so-called "Clinics" or group lessons offered junior and women golfers, usually in early spring and usually at no cost or a minimal registration fee. In his column, "Swinging Around Golf", in GOLFDOM recently Herb Graffis suggested that "the golf business today is very sick, and it needs drastic medicine to make it well."

Graffis went on to suggest, among other prescriptions, that free lessons should be offered at private clubs and at resort courses.

"Most well-managed clubs could afford to increase the professional's salary by what he gets for lessons", he wrote, "and offer the professional's and qualified assistant's services without charge on the lesson tee."

He pointed out that golf resorts are backward in the failure to utilize the valuable advertising inherent in improving the golfer's games and failure to provide able teaching professionals without charge to guests at the resort.

Taking Graffis' suggestion a logical step further, public courses, whose lifeblood is the continuing development of new golfers, not only should, but in the interest of the game, get on the free instructional bandwagon. Because most people begin at public golf courses if they begin golf at all, it is here where instruction is most vital and, unfortunately, often the most overlooked.

Well, I have attempted to inform you of the national Golf Foundation, its purpose and the job we are trying to do in helping new and existing facilities. As for the future of the game and the entire industry we are faced with five acute problems.

1. Taxes, as mentioned earlier are forcing some privately owned and private country clubs out of business.

2. Ecology, new environmental regulations are playing shanks with golf course maintenance and future golf development. Controls on fertilizer and pesticides will be reflected in maintenance programs. Wetland and burning laws will affect the building of new facilities.

3. OSHA, the Occupational Safety and Health Act, can come down hard on the industry in more ways than one in club house and golf course operations.

4. Slow Play, may be the most serious problem facing golf today. Immediate steps must be taken at every level to speed up play. GOLF DIGEST recently suggested six major slow-play antidotes.

1). Develop and enforce a slow-play accountability system.

2). Bring back continuous putting and one cleaning per hole.

3). Allow a "putting" ball on the green.

4). Reinstate the lateral boundary rule.

5). Install slow-play checkpoint signs or a clock at the half way house to make them more time conscious.

6). Encourage, or make mandatory, the use of 150-yard markers.

And the last and maybe forever, the least, the energy crisis. Local golf and recreation should have a big year, people will be visiting the golf courses more instead of traveling on vacation. Golf maintenance may suffer because of the shortage in fuel, fertilizer, pesticides and other supplies.

What can be done about these problems? To start with, all golf facilities should support their local or state golf association. It will be the pooling of knowledge and working together in these problems - not trying to solve them individually - that will lead to success and a useful solution.

As for the long range effects of the energy crisis and inflation, I tend to agree with Cyril Brickfield, President of the NCA, "the energy shortage, plus foresight and initiative, could being about increased activities in clubs." The emphasis here on "foresight and initiative" should relate to all of golfdom's problems. For, ultimately, it will be the ability of the total golf industry to keep up the changing times through conscious design rather than through the course of chance.

WATERING OF GOLF COURSE TURF

William H. Bengeyfield
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What a great privilege it is to attend the 1974 Massachusetts Turfgrass Conference. In the world of turfgrass management this is the Conference of Professor Dickinson and Dr. Joe Troll. To participate in it is a very real honor for me and I thank you very much.

As turfgrass managers, we all know that grass can't be grown with water alone -- but it can't be grown at all without it. As we have learned on television, the man who controls the waterhole controls thousands and thousands of acres. Water was and still is king. As witness to this, note the present legal battles between Arizona, California, Oregon and Washington over water.

Although flood and furrow irrigation have been practiced for centuries, sprinkler irrigation is a rather new development. It is far more efficient and effective. The sprinkler irrigation industry, as we know it today, started with some field grown crops in 1910. It gradually developed until the Nelson Lark Sprinkler was patented in 1921. A man by the name of Buckner started his sprinkler company in the 1920's and introduced the long-arm-spinner sprinkler in 1926. The slip-joint came along in 1925, the impact head in 1933 and the first Rainbird sprinkler the same year. In 1934, Rainbird introduced the first part-circle sprinkler and Skinner the first rotary pop-up turfgrass sprinkler in 1935.

So you see, the sprinkler industry is a relatively new entry in the field of agriculture. The first sprinklers were moved by hand, then by wheels, rollers, wire, engines and tractors. As the rigs grew bigger and bigger, the sprinkler became smaller and smaller. Today we hear of "mist irrigation" for certain crops as well as fertilizer injection systems and the actual control of heat or frost with irrigation applications. The world's millions could not survive without the huge irrigation studies and have developed huge pumps and above-ground irrigation lines in their project to harness the Danube River for irrigation of thousands of acres in Russia. The irrigation sprinkler industry is growing in world importance and yet is still in its infancy.

The Golf Course

But what about the watering of golf course turf? How much water do you really use on your course? How much do you really need?

Perhaps one of the simplest and best methods for testing how much water you are actually applying to any area is through the use of tin cans. The No. 10 cans from the club kitchen are ideal. Starting from the base of a sprinkler, place a can every 5 feet along a radius of the sprinkler. This can be done at 90 degrees (i.e. in four directions) around the sprinkler. Then by measuring the depth of water collected in each can after a 1-hour run, you can determine how many inches of water per hour are being applied to each canned area. Of course, you may run a series of contiguous sprinklers and find the total precipitation rate in any given area.

There are many factors involved in determing the maximum water rate of the grass plant. For example, differences occur due to grass types, height of cut, depth of rooting, soils types, temperatures and humidities, wind movement, compaction, fertilization, etc. Considerable work has been done in this area and a general guide to maximum water use rates has been developed. Remember however, these are general figures and intended as a guide only.

Estimated Maximum Water Use Rates

Temperatures	Area	Use Rates Day	Use Rates Week
50-60 degrees	Coastal Calif.	.05-.1"	.35-.7"
60-75 degrees	Coastal valleys	.15-.2"	1 - 1 1/2"
75-90 degrees	Inner Calif. valleys	.25"	1 - 3/4"
90 degrees and up	Desert areas	.35-.5"	2 1/2-3 1/2"

If you want to estimate how much water you may need on your course, this simplified method may be used:

Maximum water use rate per week	X	Total acreage to be covered	=	Inches of water needed per week

There is one additional factor you must know; one acre inch contains 27,154 gallons of water. To illustrate the computation:

Total acreage	100
Maximum water use rate per week	1 inch X
Needed acre inches per week	100 acre inches

One acre inch contains 27,154 gallons; therefore 100 acre inches X 27,154 gallons = 2,715,400 gallons needed per week or about 40,000 gallons per day.

Automatic Irrigation

According to Billie Buchanan of the USGA Green Section, about one-third of Northeastern golf courses now have some type of automatic irrigation system. When an automatic system is properly designed, engineered and installed, it will give the golf superintendent far freater control over irrigation levels and irrigation efficiency. Automatic irrigation is here to say and, if you do not now have one on your course, the chances are great you will within the next 5 or 10 years.

I want to emphasize there is one thing an automatic irrigation system is not -- and that is automatic! An automatic system depends almost entirely on the good jugment of a good golf course superintendent. Certainly, the superintendent must be involved during the planning, design and installation phases of any new automatic irrigation system. After it is installed, the superintendent will spend more time than ever in planning irrigation needs, setting the controllers and constantly checking on its overall operation. Although he is responsible for it, he will need all the help he can get from the maintenance crew. One of the best men to keep the superintendent informed of automatic effectiveness and functioning is the fairway mowerman. He covers the golf course at least twice weekly and, if alert, can quickly spot inoperative sprinklers and other irrigation problems that are bound to develop.

Unfortunately, not all automatic irrigation installations have been a success. To some degree at least, the golf course architect, the engineer or irrigation designer is responsible. There are occasions, however, when the client or the golf course itself (club officials) must share the responsibility for a poor automatic installation. Club officials sometimes become so intent on saving money and cutting costs, they lose sight of the ultimate objective --a good irrigation system. After all, anyone can be a low bidder but their

work rarely measures up. The point that must be kept in mind; indeed the only point of concern to the golf course superintendent and to the club itself is that:

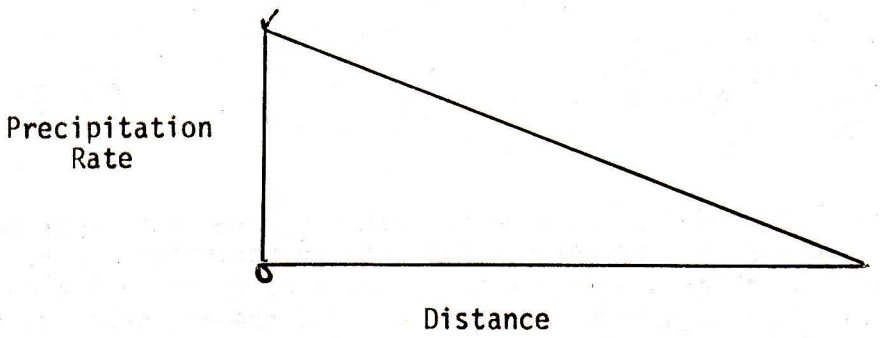
> The irrigation system required for the golf course should determine its cost -- not the cost of the system determing the type installed!

Without any question, this philosophy is essential if your golf course is to be properly automated for irrigation.

Some Basic Concepts

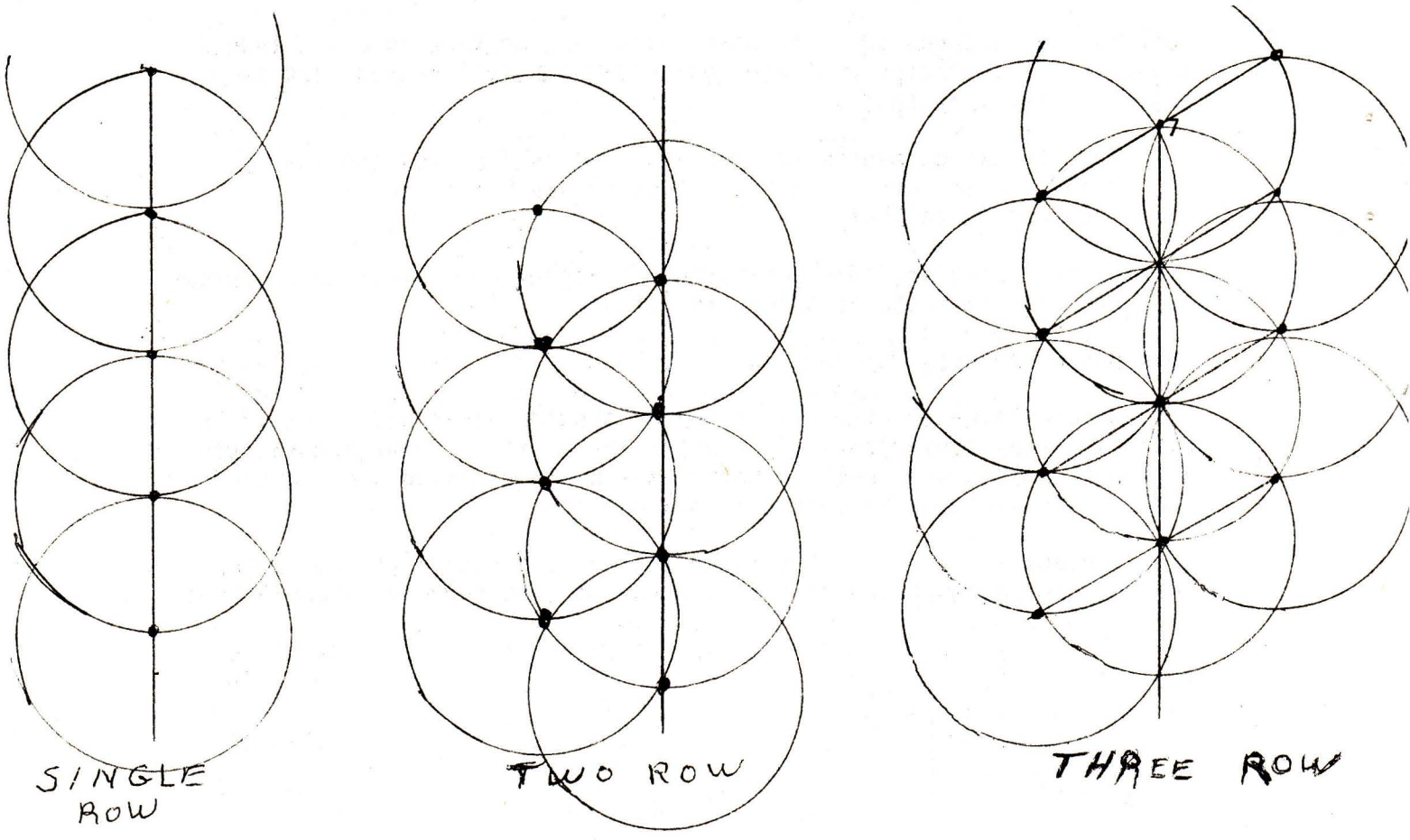
Before going any further, everyone should understand a few of the basic theories behind rotary sprinkler irrigation. Understanding the following points will help in understanding good design and the need for certain features in automatic irrigation.

Concept #1 When a rotary sprinkler is designed at the factory, the engineer attempts to develop a straight line curve as shown below:



The greater the distance from any rotary sprinkler head, the lower the rate of precipitation. Although this is almost impossible to achieve in the field, the engineer would like to come as close to this type of curve as possible.

Concept #2 In order to gain uniform precipitation rates over an extended area, triangulation of sprinkler heads is essential. A unfiorm pattern cannot be developed with a rectangular placement of sprinkler heads or any other configuration. Only triangulation offers the possibility of unifrom coverage as illustrated below.



Concept #3 In order to achieve uniform coverage, our experience indicates the need for 100 percent overlap between sprinkler heads. This means, each sprinkler must throw to the base of those sprinklers adjacent to it. If an 80 percent overlap is used, the sprinkler will only reach 80 percent of the distance to the neighboring sprinklers. This usually results in non-uniform coverage and development of dry areas somewhere between sprinkler heads.

Concept #4 Irrigation engineers will frequently refer to the "Co-efficient of Uniformity". This is a difficult term to understand but basically is an effort to determine the degree of uniform coverage of a sprinkler head. When testing new sprinkler heads on a test stand, water is collected at given intervals throughout a 360 degree arc. The following formula is then applied to determine the co-efficient of uniformity:

$$100 \left(1 - \frac{\text{Sum of deviations}}{\text{total water caught}} \right)$$

Practical Questions Frequently Asked

Some of the most frequently asked questions on automatic irrigation are listed below. We have tried to provide the answers to the best of our experience and understanding.

1. What is best, a one, two or three-row system:

If you are after uniform irrigation over most of the fairway area, a three-row system seems essential. The need takes us back to the triangulation concept mentioned above.

2. What is best, hydraulic or electric systems?

Both have proven to be effective and efficient. One may prove advantageous under certain circumstances --the other under different circumstances. Overall, however, either system seems capable of doing a good job.

3. Who makes the best equipment?

All major automatic irrigation manufacturers today are producing some excellent automatic systems. In the past, the introduction of some "new lines" have sometimes introduced "new problems." Therefore, the best investment is frequently with the older, field tested, tried and proven equipment. Probably the best answer to this question lies in a counter question, "What manufacturer offers the best service and the best dealership in your area?"

4. Is it really important to have a valve under each sprinkler head?

Definitely yes!

Spotting Weaknesses in Irrigation Design

In 20 years of observing automatic irrigation installations on golf courses, we have become familiar with some of the weak points in design. Perhaps you will be interested in those which occur quite frequently.

An automatic irrigation system can be either "used" or "abused" by the superintendent. Usually there is an initial tendency to overwater. The superintendent must remember to use the new system to apply only that amount of water which the golf course needs. Just because a lot of money has been spent and a new system available, it does not have to be used every day if turfgrass requirements are otherwise. Learn the capabilities of the new system as they apply to grass needs.

When planning an automatic system, all main lines should be looped. Looping insures better pressure distribution throughout and the additional expenditure is more than worth its cost.

Automatic sprinkler heads should be in a triangular pattern at a spacing of no more than 65 feet to 70 feet. When head spacing is further apart, it is difficult to apply water uniformly at a delivery rate acceptable to most soils. Furthermore, wide spacing patterns are greatly disrupted when wind velocities exceed 10 mph.

The ideal irrigation delivery rate for most turfgrass areas is from 1/4" to 1/3" of water per hour. Most sprinkler heads exceed this rate. Low delivery rates are similar to a soft, gentle rain while heavy delivery rates increase runoff and similate a thunderstorm.

Be sure the new system is capable of irrigating the required acreage within the time span allotted. In other words, if there are but 10 hours available for irrigation, the system must be capable of accomplishing its job within that time span.

The number of controllers throughout the golf course property and the number of sprinkler heads per station are important points in achieving good irrigation control and uniformity. It is easy to reduce the number of controllers and/or increase the number of heads per control station in order to reduce installation costs. However, the results will be disappointing. For fairway irrigation heads, no more than 4 to 6 should be under the control of any one station. Each station should control only those heads at or near the same fairway elevations. Similarly, each station should control only those sprinkler heads located in the same general type of area; i.e., dense shade, soil types, and particular areas such as tees, greens or fairways. The sprinkler heads under the control of any one station should be under as similar growing conditions and circumstances as possible.

Are central controllers (located in the superintendent's office or elsewhere) really helpful and worth the cost? I doubt it. I think it is important for the superintendent to have a central on-off switch for the complete automatic system. However, irrigation requirements vary so greatly from one area to another and throughout the golf course property that a central controller seems hardly worth the expense. The best irrigation decisions are made on the site and not from some central point.

Experience proves that quick coupler valves are an important adjunct to automatic irrigation. There should be at least one quick coupler at every green, tee and every 200 to 300 feet along each fairway. They will prove to be invaluable in the future.

Part-circle sprinklers and full-throw sprinklers should not be under the control of the same station. It is impossible to achieve uniform precipitation rates with this kind of hook-up.

Soil moisture sensing devices have been offered as a means to "automate" an automatic irrigation system. It has been our experience that they have totally failed. The sampling is so small or inexact that it is impossible for the sensing device to draw an "overall" picture of irrigation needs.

Most automatic irrigation systems bring complaints from the golfer regarding wet sand in bunkers. The only solution here seems to be in developing better drainage within the bunker as well as using the right type of sand which will dry out quickly. Automatic sprinkler heads should certainly not drain into bunkers.
