SUMMARY OF PROCEEDINGS

ANNUAL CONFERENCE OF THE

MID-ATLANTIC ASSOCIATION OF GOLF COURSE SUPERINTENDENTS

Under the Auspices
of the
Extension Service - University of Maryland

Holiday Inn, Downtown
Howard and Lombard Streets
Baltimore, Maryland
January 10 and 11, 1966

INDEX

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MID-ATLANTIC ASSOCIATION OF GOLF COURSE SUPERINTENDENTS
HOLIDAY INN, DOWNTOWN - BALTIMORE, MARYLAND
JANUARY 10 AND 11, 1966

Summary

With more than 200 in attendance, the annual conference of the Mid-Atlantic Association of Golf Course Superintendents was called to order by Dr. George S. Langford, State Entomologist, University of Maryland. In the absence of President Thomas A. Doerer, Jr., President Elect Angelo Cammarota read President Doerer's message. This was followed by Greetings and Welcome from Dr. Gordon M. Cairns, Dean of Agriculture, University of Maryland.

The speaker at the Banquet was Dr. Edward W. Aiton, Director, Extension Service, University of Maryland. Honored at the Banquet for his outstanding turf work and contributions to Golf were Dr. Felix V. Juska, U. S. Department of Agriculture, Beltsville, Maryland. He was presented with a beautiful silver tray. National officers of the Golf Course Superintendence Association of America in attendance and participating in the meeting included - L. Robert Shields, President; Edward Roberts, Jr., Vice President, and Ben J. Chlevin, Executive Director. The program committee consisted of: Sheldon R. Betterly, Angelo Cammarota, Elwyn E. Deal, Lee C. Dieter, Frank J. Haske, Russell W. Kerns, George S. Langford, Alex D. Watson and George C. Gumm, Chairman.

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THE PRESIDENT'S MESSAGE

Thomas A. Doerer, Jr.*
(Read by Angelo Cammarota, President Elect)

Welcome fellow Superintendents, Members and distinguished Guests, to this our 37th annual Turf Conference.

This Turf Conference has become known over the years as the number one conference of the year, not only because of the early date, but because of its quality and presentation.

For this achievement we must at all times recognize the cooperation of the University of Maryland through its capable staff of turf experts, and particularly recognize the untiring efforts of Dr. George S. Langford, who for years has spearheaded this fine conference.

We must also recognize our own educational chairman and his staff for assisting Dr. Langford in the preparation of this fine program.

Each year our program committee endeavors to bring you the best speakers available to enlighten us on the problems and complexities of our daily work. Problems such as growing healthy turf, also maintaining turf, labor management, equipment, traffic and particularly water.

Many of these topics are listed in this year's program, and now may we get on with the conference. By all means have a good time while attending the conference.

*Illness prevented President Doerer from attending the Conference

WHERE WILL I BE TOMORROW

L. R. Shields, President
Golf Course Superintendents Association of America
Woodmont Country Club, Rockville, Maryland

Because we are connected with golf these figures, facts and daydreams on the growth of golf have important bearing on us, our work, our future. As the demand for courses increases and the number of golfers increases, the competition for our services as experienced superintendents also increases, and we find that we are the possessors of a rare commodity - the know-how and ability to maintain a golf course. This is a good thing and will get us by for a number of years, but it is not enough to reach our goal which is - recognition, professional rating and just compensation.

We want recognition and credit for the work we do and for the contributions we make to the game. This is human nature. We want a professional rating because we are engaged in a profession. The difference between a profession and a trade is: a profession is governed by basic rules of nature and is a vocation that requires learning rather than work with the hands. A trade is governed by man made rules and the tradesman need not be aware of the rules of nature involved. We would like to have compensation more in line with our responsibilities. Qualification and contributions to the success of the club. Today our take home pay is less than the house manager, less than the professional, and less than the chef. When tips are included we earn less than the maitre d'hotel, less than the bartender, less than the starter and less than the locker room attendant. Is the superintendent less deserving than these people? Is he less sincere or less interested in the Club's well being?

Our greatest strength lies in the fact that in this growing industry our services are the most indispensable. A golf course couldn't survive long without the attention of a golf course superintendent. Our weakness is due to the fact that we are not on the same educational level as our employers and therefore cannot meet with them on an equal basis. This situation will change as more college men enter the field, but it will take time. Another weakness is the fact that we do not come in contact with members. Frankly I know of no quick solution to this problem. Our work is such that we must be in the background, but as long as we are we will be taken for granted and overlooked. What do we do? We can't quit trying, we can't go on strike for the things we would like to have, and we can't demand recognition. The only thing we can do is do our jobs better, cheaper, safer and with less interference with golf. This is what we were hired to do, and we are doing it. By doing this, by doing all we can to place more emphasis on the condition of the playing area, we enhance our position and our work.

Where will we be tomorrow: No one knows, because none of us can foretell the future. But we can examine past achievements and past trends, new standards, and new goals and come up with an indication as to where we are going. I see the superintendend more and more in the spotlight as people begin to realize the importance of turfgrass to their golf game. More personal credit and acclaim will be given to the superintendent at big tournaments and wherever golfers gather. This will add glamour and prestige to the position, making it more desirable to theirs. The competition thus created will weed out those who cannot keep up. There will be no place for the man who walks on a golf course and says "I used to have a vegetable garden in my backyard so I am qualified to be a superintendent." There will be no place for the man who conducts himself like a greenskeeper and allows himself to be called a greenskeeper.

There will be more and more automatic fairway water systems. They will be installed using plastic pipe and there will be no water shortage. Soiled water will

be reclaimed and used for agricultural irrigation rather than returned to the stream for the use of somebody else below. More water storage lakes will be dug to save winter water for summer use. In California they pump water back into the ground during the winter and store it there until needed.

As time goes on you will be asked to assume more and more responsibility. You will have everything outside the clubhouse in your care. You may have the title of General Superintendent and be in charge of the lawns and landscaping of the houses surrounding your golf course. You will have your own secretary to answer the phone and keep the records. Accounting will consist of a statement from your bank with a record of credits and debits made on your account. Through the use of credit cards bearing a bank account number, your bank will pay bills for you or your Club. Little money will pass through your hands as there will not be much need for actual cash. Your checking account credit card number will serve as cash wherever you go. This does not mean that you will earn less money. You will earn more than you can imagine. Not simply because you are in a vital spot in a vital industry, but also because of the natural economic growth of the country. This growth has been at the rate of about 5% per year and we can expect it to continue. To find approximately what your salary will be in the future take 5% of your present salary and add it to the amount you pay income tax on this April. Do that 5 times to see what your salary should be in 5 years. Using this formula the average superintendent having a present salary of $10,000 per year can expect to see that figure grow to $17,000 in five years. A superintendent with education, ambition and initiative can advance his earning well beyond the average 5%, but it will take application of time and talent.

Education is the key to the future, and without it superintendents stand still and wait to be passed over in the shuffle. You younger men must go on with your formal schooling, we older men must continue to observe, study and learn from our fellow superintendents at meetings such as this and the National Turfgrass Conference. The biggest blur on our crystal ball is the situation in Viet Nam. It could change our whole future considerably. Let's hope for a just and honorable peace soon.

LABOR MANAGEMENT --PANEL DISCUSSION

Walter C. Densmore, Director
Mount Vernon Ladies Society
Mount Vernon, Virginia

When attending one of our Annual Conferences I shared a room with our late lamented friend, Bill Glover. It must have been the year he died. He was concerned about his high blood pressure. The doctor had unwittingly told him it was caused by worry and I think his main worry was what he could be worried about. However, Bill was a perfectionist and as we retired we had quite a discussion about this very topic of labor management. Although he didn't know it, I think this was one of his worries and my how they would have increased by now.

Because of my previous experience as a greens committee member and chairman and since I work for an organization which has to wrestle with so many of your problems, the golf course superintendent has my most sympathetic understanding. I know how demanding your job is and it is most so here in the Mid-Atlantic area. This is a time in which indifference in any line of endeavor is becoming the rule rather than the exception and yet golfers are demanding a higher degree of excellence in course maintenance than ever before. If you are to apply your knowledge and skills to the extent of fulfilling the requirements of your profession, you must have the essential staff and tools. This very quickly adds up to an adequate budget and it comes hard in most clubs. Without the essentials you can lose your greens as easily as the accomplished surgeon attempting a delicate operation without proper help or instruments. Now we assume we have the budget and thus the materials and fine tools which have been developed by golf course suppliers and we come to the basic need - sufficient well trained help to enable us to get the most and best results.

Our British friends frequently give a toast of "Here's to ourselves, good men are scarce!" The last four words say a lot and have dire meaning for us today. We are looking for reasonably young men of average intelligence who have industry enough to work irregular hours all days of the week during most of the year. Such men are well aware of their potential these days and there is still competition for their services. Then our main concern is just what it takes to attract the type men we need and want.

I have talked with many of you and I believe without exception you have said that wages are all that count. Fringe benefits do not mean a thing to most of your men. This is far from my own personal experience in our organization so there must be some definite reasons therefor. A good many years ago we decided it was very unsatisfactory and costly to try to operate with varying the size of the work force to meet the fluctuating demands of the seasons. We did all possible to defer work from the peak periods to the slack ones to enable us to keep the maximum number of men year around. You must have well trained men if you are to get the best out of machines and materials. It costs to train men properly and in your business it is a job for the Superintendent, should not be relegated to a lesser member of your staff who cannot do it as well. Your success in holding men you want to keep will depend to a great extent on you - the way you train a man, the way you treat him and look out for his needs. Remember that you are his "Chaplain" as well as his boss. When he does a good job congratulate him and if he makes a mistake, correct him kindly but let him know it will not be so kindly if he makes the same mistake again. All of this is basic but very important.

Practically every man who comes to my office looking for a job asks right off what we have to offer in the way of health and life insurance, vacation, sick leave. We have medical protection, paid by employee, and adequate life insurance which is furnished by the employer. I am thoroughly convinced that these two benefits alone

not only attract some of our people but help hold them. We are fortunate that the waiting period for both is minimal, and I think that is very important. If some clubs would find it difficult to obtain group health insurance because the organization is too small, then I would urge this Association to become instrumental in trying to get the clubs of a metropolitan area to pool their resources. This was done in the very beginning of Group Hospitalization in D. C. when many governmental offices got together about 30 years ago. We offer reasonable vacation and sick leave with pay. Our whole program of "benefits" is geared to meet the average of what is offered by our most serious competitors.

The type workers you really want today are not for working all week-ends and holidays. Every effort should be made to see that your work program allows as many men to be off on such days as possible. I know some of you have had to come to this long ago. Your real job is to find out who is getting the men you need and what the average offering is. It is the duty of your chairman to see that the club board of directors gets the message. When clubs want, or need new greens today they pay the going price. It is mighty poor business not to provide the essential maintenance. Since most of the members of club boards are business men, the job of getting the point across does not appear to be insurmountable.

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F. Frank Rubini
Maryland National Park and Planning Commission
Silver Spring, Maryland

I am indeed pleased to have this opportunity to speak to you and also to hear what the rest of you have to say about "Labor Management". I am here to learn, just as you are. You cannot expect, nor do I propose, to give you any profound talk about golf course-labor management. My responsibility as Director of Parks for Montgomery and Prince George's Counties is for a total of three-hundred men in many categories of labor and maintenance; the smallest group of men involved in our organization are the golf course crews for Sligo and Northwest Park Golf Courses.

Even though our golf course section has the fewest men in our Park System, I do not wish to imply that they are the least important. They are the most important for two very good reasons: 1. Their results can mean the difference between a profit or loss at the courses. 2. They can be the greatest public relations men we have since their work is noticed by so many players.

As you are all so well aware, a poorly kept course, especially a public golf course, can mean the loss of thousands of dollars in revenue from lack of play. Golf course maintenance must be of the same high caliber, whether it be the private country club or the daily-fee public course. The maintenance men on the course are in daily contact with players. Their attitude, courtesy and etiquette can prevent so many telephone and letter complaints, that the "I'm a taxpaper" type of player likes to make. None of us has the ideal setup, we both suffer from the same ailments; namely, low salaries, inexperienced help, lack of help and frequent turnover.

I would like to relate our problems, what we are doing about them, and what our future plans call for:

Our salary scale for park laborers is from $1.46 to $2.65 pr/hr depending upon their previous skill. We find very few who come to us with prior golf course experience. We attempt to hire at $1.62 pr/hr and have had some modest success at this step. A proposal to start all new inexperienced men at $1.78 is due this month. All men are employed on a year-round basis, with fifteen days' annual leave,

fifteen days' sick leave, twelve legal holidays, social security, retirement, health insurance and uniforms. Sounds good doesn't it? Actually, all of these benefits mean very little to the men who start with us, the most important item to them is -- that starting salary! Another of our problems at Northwest is, the distance a man must travel to get to work. We've lost some good men because of this factor. Northwest has a complement of eight full-time men and six to eight summer college student help.

-------the fundamental requirement for the effective utilization of manpower is capable supervisors. I believe that this is one of the most important factors we should consider. Most park agencies have grown in recent years to such an extent that great reliance must be placed in supervisors, whether they are located in the main office or out in the field. We are blessed with Bradley Strouth at Northwest and because of job classification in a public agency, he is called a supervisor, but he is a superintendent in the true sense of the word, as we all are aware of the fine job he does. Therefore, since great reliance must be placed upon them, they must be constantly aware of their responsibilities in regard to work-force efficiency. There are four areas where they must look, and keep looking, if they are seeking to participate in the strengthening and building of an agency, private or public. These can best be identified if a supervisor would ask himself the following questions:

1. Can I improve the organization of the work in my group?
2. Can I improve or simplify the methods of doing the work?
3. Can I increase the ability of my employees to actually do the work?
4. Can I increase the "will to work" of the employees?

If he can answer "yes" to any of these four questions, it is a sign that he has an open mind.

The shortage of time precludes my going into more detailed examination of each of the four areas where it is possible to obtain more effective utilization of manpower. However, the matter of the employees "will to work", which is more often referred to as incentive or motivation, deserves further consideration at this time. This problem of potential production, or work effort, versus actual production is mostly a matter of motivation. The work is there; the tools are there -- all that is needed is the will to do work.

What creates will to work? In the first place an employee joinedyour agency to get a job and begin a career. That is, to trade a certain number of hours and effort for a certain number of dollars. The problem then is how much effort should an employee put into his work in order to give the agency a fair deal, and, how to get the employees to give this effort. According to various studies, high production and employee effort result from supervisors who tend to delegate some authority and responsibility to members of the work group and give the members of the work group greater freedom of action. This, of course, does not mean that discipline is relaxed. It means willingness of the supervisor to let employees shoulder some of the responsibility and thus feel more important to the group. Supervisors who see themselves as members of their work group, who see their job as one of leading, not dictating or ruling, are most likely to have groups which rank high in production.

Two other important areas wherein more effective use of manpower can be attained and which are a product of capable supervision are, employee training and the maintenance of employee morale. You pay for training whether you do it or not, so you might as well benefit from it. In-service training gives the supervisor something positive to do in improving employee attitudes. We all know how discouraging it is for a golf superintendent to lose men who knew what to do and how to do it, but we also know that he must take the new man and quickly train him for the job.

For help in this, a recommended resource is available. "In-service training for parks and recreation", published by the American Institute of Park Executives in December 1953. The methods here apply to golf course personnel as well as other related jobs in parks.

You have nothing to sell, but service. See that it is the best service you can give to the public. And, remember, your employees are your salesmen. For, as Benjamin Franklin once said: "I early found that when I worked for myself alone, myself alone worked for me, but when I worked for others also, others also worked for me." * * * * * * * * *

James E. Thomas,
Superintendent, Army-Navy Country Club
Arlington, Virginia

The subject of this panel is Labor Management. It is being approached as a discussion of how to secure, keep, and train competent help in competition with the labor market as it exists at the present time, also as a case history of my own personal experiences. I would like to emphasize there is no attempt being made to discuss organized labor, either as a union, or to lay down any fixed set of rules governing employment. The problem is how and where do we obtain qualified workers, then how do we keep them, after they have been secured? The situation is acute and no doubt will get worse before any improvement occurs.

As a case history - At the Fairfax course of the Army-Navy Country Club there has been over thirty men on the payroll since January 1, 1965. A normal working crew for that course is nine men, plus a few extras during the summer season. The regulars on each of our courses can have year around employment if they choose to remain during the winter months. However, should a man quit during the off season, there is no attempt made to replace him until the next spring. So far at Arlington the picture has not been too bad, yet since Labor Day seven of my experienced men have left for better paying jobs at a wage scale I was unable to match, due to a fixed budget. These men were able to secure employment at rates of pay averaging from $2.00 an hour and upwards, plus a forty hour week, and normal working hours.

What advantage did these men gain by changing jobs? A five day work week, no reporting on Saturdays, Sundays and holidays, no starting to work at the crack of dawn, more pleasant working conditions and more leisure time. All of this is a result of changing times, which we are always confronted with, and if we fail to keep abreast and adjust to these changes as they occur we are soon out of step with what is taking place around us.

The Army Navy Country Club has an excellent Employee Welfare Program which has been in effect since January 1, 1957. The program embraces:

A. A comprehensive Program of Health Protection
B. Life, Accidental Death and Dismemberment Policy
C. Retirement Plan
D. Vacation and Sick Leave Policy

To participate in the Comprehensive Program of Health Protection, which is Grou Hospitalization and Medical Service, one must have been actively employed for a period of at least three months. His cash contributions to the program will be the full cost of the premium. After the three months have elapsed both the club and the employee share the premium cost equally.

Participation in the Life, Accidental and Dismemberment Insurance requires 12 months of continuous active service. The worker pays the full cost and the amount of Life Insurance is equal to the salary he earns.

The Retirement Plan is available if you are an employee and over 25 years of age. One is eligible for this Club Pension Plan after 3 years of continuous service. Each employee contributes 4% of his earnings towards a Retirement Annuity. When he subscribes to the plan the Club assumes all the premium costs of: The Health Protection Plan and the Life, Accidental Death and Dismemberment Policy. Also there is a group Disability Policy, the Club contributes nothing to the cost of this. All of these benefits are augmented annually by an employee's Christmas fund.

There is a vacation and sick leave policy. Every employee is entitled to two weeks vacation with pay each year, earned at the rate of 1 day for each month of employment. After the completion of 5 years of continuous employment, 1 additional day of vacation will be granted for each year. Total vacation cannot exceed one month in any one year. Earned vacation must be taken by the end of the year in which it is earned and cannot be accumulated for subsequent years. After one year of continuous employment, an employee will be granted one day of sick leave for each month of employment, but not to exceed thirty days.

While these fringe benefits have a very substantial cash value, the average workman does not fully realize this fact as all he sees is the amount of money in his take home pay envelope. When these plans were put into effect in 1957, most of the workcrew at Arlington had been with the Club long enough to qualify for the required three years of employment. At that time the Fairfax Golf Course was not part of the Army Navy setup, as the Club did not then own the property. Fringe benefits at Arlington up until now have enabled us to maintain a fairly stabilized work force year in and year out. Yet, as some of the older men drop out for various reasons, death, illness, etc., the securing of permanent competent labor is beginning to be a problem of concern. Fringe benefits mean little to the new employee if a time period has to elapse before he can participate in them.

The Wall Street Journal of October 21, 1965 ran a feature article under the heading of: "Corporate Manhunt - Manpower Pinch Spurs Pirating - Increases Costs, Hurts Efficiency - Builders Bid up Payscales - Matson's Ships Sail Late - Job Hunting Rises Greatly - Sears Turns to Direct Mail." A few brief quotations from this article follow:

"Unemployment down - meanwhile the pool of unemployed workers has shrunk drastically - Unemployment in Mid-September dropped to an eight year low of 4.4% of the labor force - The jobless rate amongst married males - the family bread winners who generally are the most experienced and reliable workers, matched the record low of 2.2% set in March of 1957.

"The result:

A really tight manpower pinch that is beginning to delay business operations, push up costs, and prod many employers into increasing offbeat efforts to find workers ranging from computer programmers to trash collectors."

"Charles Pfizer and Company, a big New York drug maker, has 30% more job vacancies than a year earlier."

"No porters - And in Nashville, Dick Hall, Manager of the Hermitage Hotel, complains that - we now for the first time in history have no porter in the barber shop and none in the rest room. He can't find dishwashers either."

"In Detroit the shortage of skilled construction workers is so bad 'That I'd like to get out of this business, says, Mel Volin, Secretary-Treasurer of Coral Stone Construction, a home remodeling firm. We just lost a couple of carpenters for $7.00 an hour. We were paying $6.50."

"In the same city, but in a lower skilled level, Palace Laundry and Dry Cleaners must have hired 500 people to fill 50 positions this year, complains Richard Boonstra, plant supervisor.

"To round up more workers, companies are trying every known stratagem and inventing some. Nearly all are intensifying recruiting and stepping up training programs."

"On the plus side, John Stefanik, Cleveland operator of a Sohio Service Sta., is pleased with his experiment in hiring 3 housewives to pump gas, check oil and wash windshields. The men left in labor pools for such jobs are not worth hiring he says. Some he did hire made serious mistakes, wouldn't try to learn the job and insulted customers. In contrast the lady 'gas jockeys' have worked with such enthusiasm that he is now trying to hire three more.

A recent article in TURF GRASS TIMES under the caption, WE NEED MECHANIZATION FOR SURVIVAL, points out what could be an answer to the problem which we are all facing at the moment. The author of this timely article is in the audience. I quote him briefly:

"The good old days were miserable. Most of them were toil and sweat. Getting up at daybreak, performing back-breaking jobs, going to bed at night dog-tired, only to get up the next day and begin all over again."

He concludes: "Mechanization is essential to get the job done - fast and well. Mechanization is essential to you, the turf grass manager. It means job security. All of you have the knowledge to grow good grass, YOU must have the proper equipment to do the job."

Many of us still have to exist in the GOOD OLD DAYS of the past. Why? Perhaps because somewhere along the line we failed to impress upon the powers that be, that there was a more modern way to perform our prescribed duties, or if we did, they failed to heed our advice or recommendations. A few good helpers supplied with modern up-to-date equipment, and also paid at a top wage level, could possibly answer the question of how we can obtain, organize, and hold on to a permanent staff of competent and qualified workers.

MEETING THE GOLF CAR PROBLEM

Tom Mascaro, President
West Point Products Corporation
West Point, Pennsylvania

So far as we know, we have to give the Texans credit for starting the golf car problem. They started by converting jeeps and Crosley cars to carry a foursome with all their equipment. Everything big as it is in Texas, we suppose they have justification to ride after their golf balls. The idea caught on, and we began to see "Arthritis Specials" appearing in other states. A cry went up from both golfers and superintendents, objecting to this lazy way of playing golf, but the golf car won.

Figures regarding the number of golf cars in use are phenomenal. The first survey made of the number of golf cars in use was in 1952. In that year, there were approximately 1,000 cars on golf courses. In 1962, just ten years later, surveys showed that there were over one hundred thousand cars in use. Manufacturers' production figures indicated that there would be well over 200,000 cars in use by 1966.

Today, after many meetings, discussions, and clinics, we can begin to draw some conclusions from the experiences of many superintendents.

The Problems

1. Soil Compaction
2. Turfgrass Wear
3. Routing of Cars
4. Golf Car Paths
5. Bridges
6. Closing the Course to Cars
7. Car Maintenance, Service and Storage
8. Insurance
9. Budget Increases
10. Budget Funds from Golf Cars
11. The Future of Golf Cars

Opinions and Solutions

1. Soil Compaction. Compaction of the soil from golf cars is perhaps the most serious problem they have created. The weight of the cars, the golfers, and their equipment, plus the pounding and thrust of the wheels, destroys soil structure. The width, size, pressure, and design of the tires is almost irrevelant. When soils are wet they puddle. Puddling is compaction in its severest form. And without good structure soil cannot take in water, air, or nutrients. A program of aerification must be initiated to keep up with compaction as it forms. Additional fertilizer must be used to stimulate aggressive growth.

2. Turfgrass Wear. Turfgrass can take just so much wear. Golf car wheels produce a thrust for propulstion or stopping. Thrust or abrasion causes the cell walls to rupture, resulting in the dying back of the grass blade. Each golf hole must be analyzed from the standpoint of golf car traffic. It must be remembered that people usually follow the line of least resistance. Provisions must be made for convenient car use, but still disperse wear over as large an area as possible.

3. Routing of Golf Cars. Should cars be allowed to run wild over the golf course or should they be restricted to edges of fairways or the roughs? There are points of debate here. Generally speaking, it is best not to restrict cars in open areas, but only in restricted places such as tee and green areas. It has been said many times that the middle of the fairways get the least amount of traffic. Many devices have, and are being tried such as fences, rope barriers, and painted stakes. Devices such as these, distract from the beauty of the natural surroundings. Other

devices include signs and instructions on the car itself, score card instructions, and signs on the turf. Anything that is effective, without marring the beauty of the course should be used. The most popular system seems to be a combination of all these things.

4. Car Paths. Golf car paths can be a blessing or a curse. An overall plan carefully executed should be drawn before money is spent. Emergency patches of car roads can ruin the appearance of the course. An unplanned network of car paths can make the golfers feel as though they were playing golf down Hollywood Blvd. Car paths should blend with the landscape. They should be used only where absolutely necessary. Path building materials are many and varied: concrete, asphalt, wood, fine stone or gravel, sand, tanbark, pine needles, etc.

5. Bridges. Golf cars need bridges. This has become one of the costlier items. Here again the choice of materials ranges from concrete, wood, steel, etc. Pre-fab concrete slabs have been used very effectively. Bridges should be wide enough, strong enough, and permanent enough, with consideration given to their future maintenance.

6. Closing the Course to Golf Cars. Who should be vested with the authority to close the course to golf cars? Unquestionably it should be the Golf Course Superintendent. A qualified Superintendent knows the soil, drainage, and the damages that the cars will do. If the Superintendent is over-ruled, then the Club should be prepared to supply funds to repair the damage that is inevitable. The Superintendent, in turn, should use good judgment in closing the course to golf cars. This should be done only when it is absolutely necessary. An overall plan should be made to surface-drain wet areas and install a drainage system to keep the course open at all times.

7. Maintenance, Service and Storage. The maintenance, servicing, and storing of golf cars has become a major operation. This responsibility logically should come under the jurisdiction of the Golf Course Superintendent. He is best qualified to handle the mechanical problem and supervise maintenance. However, the Superintendent should not be asked to assume this responsibility unless the Club is prepared to provide him with funds to cover these additional costs. Throwing these costs into an already over-taxed budget can be disastrous. The overall golf course maintenance budget will suffer. Funds must be provided for car storage, service, and qualified personnel to handle the job. Golf car servicing and storing are almost full-time jobs and also somewhat specialized.

If a Superintendent undertakes this responsibility, it seems reasonable to suggest that his salary reflect the added responsibilities and tasks he has undertaken.

8. Insurance. The Club organization must and should carry insurance against possible suit stemming from injuries that may occur when any mechanized equipment is used. If the brakes fail on a golf car and the user runs into a tree or a stone wall, or, as in one case, a woman golfer ran off a bridge (which had no guard rails) into a creek, who pays the bill?

9. Budget Increases. Analyzing all these problems, it can readily be seen that each problem presented indicates an increase in costs.

1. Compaction means cost of aerifying equipment and manpower to operate it. It also means an increase in the fertilizer budget.

2. Wear means that some reconstruction must be done to disperse car traffic

3. Routing of cars means that signs must be purchased, and printing must be

done to educate the members.

4. Car paths are costly, and whether constructed for, or done by your own crew, expenditures of additional funds are involved.

5. Bridges in their cheapest form are expensive.

6. Closing the course to minimize this problem reconstruction for surface drainage, elevating areas, tile drains, and sumps represent increased costs.

7. Car maintenance, servicing, and storing mean increased costs in buildings, manpower and supervision.

So the next time you hear someone say - "We ought to have more golf cars around here," - ask him if he has considered all these problems and additional costs which he, as a member, must pay for.

10. Budget Funds for Golf Cars. The picture painted so far sounds pretty discouraging. But facts are facts and we must face up to them. Actually golf cars can be profitable. So far as income is concerned, golf cars are the best thing that has happened since slot machines. Income can be used to cover the additional costs, and show enough profit to cover the very problems they have created. Income from golf cars can go as high as $185,000,00, a figure reported by one club. Average figures from various clubs reporting show that net income from cars will run from $600.00 to $1,000.00 per year.

These profits derived from golf cars should be used to take care of the damage and the necessary capital improvement of the golf course. In other words, these funds should not go into the general fund of the club, but into the operating budget of the course. This is a fair use of these funds. Why penalize the non-car user. Let the person using the car pay for the damages and additional costs.

Each club should analyze its own condition to establish an overall plan, to meet and cope with the golf car problem.

11. The Future of Golf Cars. There is not question but that the golf car is here to stay. Many golfers sit at their jobs every day; on the one or two days they play golf, the exertion of walking a full 18 holes is too much for them. By supplying golf cars, the club can enable these people to enjoy the game and still get some needed exercise.

Another very good reason for the increasing popularity of the golf car is the lack of caddies. At many courses, the caddy ranks have dwindled to the point where some means has to be found to permit the member to carry his clubs easily around the course. And what better means is there than the golf car?

In future years, we are bound to see the use of the cars increase. If this is true, we will probably see more and more golf course architects planning the original layout to overcome many of the problems which exist now on our present-day golf course.

IRRIGATION TODAY

Russell Roberts, President
Russell Roberts Company
Gaithersburg, Maryland

IRRIGATION TODAY -- one of the hottest subjects you can think of, and well it may be. There is no area of golf course maintenance that is developing faster nor where there is greater need for improvement. As little as ten or twelve years ago, golf course architects were designing an 18 hole championship course with one 20 h.p. pump serving one or possibly two quick coupling valves on a tee or green. Today a comparable course would have two 60 h.p. pumps with a combined capacity of about 1,000 g.p.m. serving a completely automatic system or certainly automatic on greens and tees and manual on fairways.

A golf course has never been any better than its irrigation system. This is truer today than ever before. You know the problems; more play, closer cuts, inexperienced workers, adverse weather, and so forth. Despite all these problems, the quality of the turf on your course must improve. You can ill afford to maintain a status quo. The members expect and even demand that their golf course improve with each succeeding year. And while adverse weather may be an excellent excuse with your fellow superintendents and possibly your greens chairman, it is lost on the rank and file member. He is only concerned with the quality of the turf under his feet and the blue sky overhead.

So you need a new or improved irrigation system for your course - and most everyone does. What kind will it be? Now do not lose sight of the fact that you are planning for the future. An irrigation system is not like a tractor, you can't trade it in on a new model every couple years. What will your conditions be 5, 10, 15, or even 20 years from now? What about that old fellow who has been hand watering your most difficult greens? Where will he be? Pushing up daisies or living off the fruits of the Great Society.

Let's consider automatic pop-up sprinkler irrigation of greens. I believe this to be the greatest asset to the superintendent since the invention of the self propelled mower. It is the first time that the superintendent has been able to have complete and absolute control of the application of water to his greens. Now stop and think about this: It is almost as if you were standing at each green 24 hrs. a day with a hose in each hand.

You can:

1. Apply water only as fast as it is absorbed by the soil.
2. Water at the best time of day or night
3. Water every day as many times as you like from two minutes to all night
4. Be assured that every time you water, each square foot of the green gets its share
5. Knock off the dew or frost
6. Syringe as many times a day as you like and you can syringe without actually adding any water to the soil, which may already be too wet
7. Maintain soil moisture at an optimum
8. Make more efficient use of irrigation water
9. Conserve soil nutrients in the root zone by not leaching them to lower levels in the soil
10. Water area surrounding green which is so often neglected
11. Minimize traffic on course, particularly around greens
12. Eliminate interference with play
13. And eliminate costly hose and sprinkler maintenance

The use of a well designed and properly installed automatic irrigation system is something you have to experience to appreciate. Some pointers on a good system are:

1. Adequate pumping facilities - two 60 h.p. pumps approximately 1,000 g.p.m.; both identical flat curve and of coupled design.
2. A small 5 or 7½ h. p. pump on a tank controlled by a pressure switch to maintain pressure on system
3. Mount pumps below water level for a static head on suction side if at all possible
4. Visit various courses with automatic systems
5. Obtain manuals from various equipment manufacturers. Learn the features of the various products
6. Know the capabilities and limitations of your system
7. Know how to operate it and why it operates
8. Install all pipe in accordance with manufacturer's recommendations
9. Use steel pipe above ground and across all open ditches
10. Check for proper wire size to automatic valves
11. Solder with rosin core solder and seal all splices
12. Bundle the wire in the trench and allow plenty of slack
13. Use ball check drains on downstream side of automatic valves. Use a minimum of 1 cu. ft. of gravel for each drain
14. Provide access boxes to automatic valves on greens and tees. Keep them behind greens whenever possible
15. Talk with your contractor. Discuss every aspect of the job with him. When he is going to start, when he expects to finish, where he will start, what type of equipment he will use, adverse weather and so forth
16. Entertain the possibility of doing some of the work with your crew. It could be the way to a more complete system .
17. Insist on a one year warranty after the system is in and operating. Some heads may need moving or you may need a few additional.
18. Expect some deviation from plans in the field, but be sure to make a record of them
19. Be sure you have a piping and wiring schematic of the system as it is installed.

With a little foresight and effort, you, too, can have a modern trouble free automatic irrigation system to help in the eternal struggle for better turf.

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AUTOMATIC IRRIGATION ON GOLF GREENS

Angelo Cammarota, Superintendent
Bonnie View Country Club
Baltimore 9, Maryland

Thank you, Mr. Haske. Greetings superintendents and guests. I consider it a privilege for this opportunity to present my views on a subject that is of mutual interest to all Golf Course Superintendents. I like to think of it as "A candid view of automatic irrigation on golf greens". What is the major problem facing the superintendent and greens chairman in this area today? The rising cost of our labor in relation to the golf course budget. This alone will be the contributing factor that will determine the use of automatic irrigation on all of our courses, irrespective of any of its disadvantages. As a good example of this we can look at the increase use of the golf cart. The fact that they are detrimental to the maintenance of good golf course turf, has not in any way curtailed their use. We, as superintendents, usually compromise and yield a great deal also in the height of cut of grasses and the use of

greens in winter. In most cases we favor the golfer.

To honestly evaluate the merits of automatic irrigation, we really have not the time since my remarks are based on the initial season of operating our system. We must investigate the positive and negative points of this type of golf green irrigation.

For the negative points, we can say: Number one sprinkler does not turn on. This happened on a few occasions. It was due to small objects clogging the automatic valve. This is not serious as it may seem as it is simple to turn on manually. Number two sprinkler fails to turn off. This can be more serious, but usually your sprinklers are set to operate in the early morning just before you start the day, and will be seen when you make your daily trip around the course. The third and most serious disadvantage is of the fixed setting of the automatic sprinkler on golf greens. It cannot properly water the greens. Plus, control the amount of water in the overlapped area. This is the only serious problem we may have to deal with, and find a solution in the years that follow.

The positive points are many. We are able to water in fertilizer with automatic sprinklers through the season. We are able to syringe greens on the few occasions when it is needed. We keep all of the surrounding area of the greens well watered, thus keeping the collars of the greens in fine shape all season. We are able to regulate the rate of sprinkler rotation and also change nozzle sizes on the sprinkler head on the greens that require a change in the amount of water needed in that particular area.

The labor saved is really the biggest item, and the most convincing factor. However, this cannot be evaluated as a complete man hour saving as you will discover after operating the system. Many additional hours are needed to keep up with the extra mowing due to the irrigation. We were able to start our crews one hour later this season and also complete our greens mowing much sooner. We were out of the way of the early golfers that seem to be increasing every year. This is a great advantage. We were relieved of the worry of not having a full crew report for work when needed. The watering was completed on the greens before the day was started. A real help.

This coming year a few additional courses will be operating automatic irrigation on golf greens. We will all experience some problems, but we should consider these, initial years of operation as a period of research in this type of irrigation. "Research is the key to tomorrow", this is the advertisement of the 3M Corporation.

We the superintendents operating automatic irrigation have the opportunity to help solve the problems of tomorrow by our experience of today. Perhaps, at our next Conference someone with some new experiences in automatic irrigation will be presenting this topic.

In closing I repeat that the cost of labor will dictate how soon we will accept automatic irrigation. Getting out of the way of the early golfer, and the absentee problem, along with the difficulty in attracting good interested golf course maintenance men will compel us to go to automatic irrigation. We

will have to learn to deal with any additional problems that may perhaps develop because of the use of it.

I am sure that in the coming years we will see more automatic irrigation on golf greens. Therefore, we must learn to work out the problems it may develop now. Thank you.

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IRRIGATION TODAY

Edward Roberts, Jr., Vice President
Golf Course Superintendents Association of America
Chatham, New Jersey

The presentation I am about to make on this panel is a bit out of line with the title "Irrigation Today." We may speak of irrigation today, but it is to the future that we must look, plan and prepare for if we expect to maintain high standards of fine turf management.

Irrigation is a term used not too long ago when thinking of the arid regions of the west. It has developed tremendously this past decade, especially since it was invaded by the field of electronics. Here in the east we have put the emphasis on water for greens and tees and thought of fairways only when they become dry. Over the years the quality of turf decreased whenever a dry season hit. There are those who advocate a transition to the warm season grasses as an answer to good turf on fairways. I feel, and I am speaking of northern New Jersey, we are too far north for this. The cold facts were very evident only a couple seasons back when much Bermuda was lost south of us. What then remains? The demand for low cut turf dictates Bents. If this is to be, then one must incorporate into his maintenance program sufficient moisture to maintain good turf. A review of the past few seasons very vividly brings to mind the fact that the west is not the only area pumping water. It has awakened others as it has me, we must give more attention to this problem of keeping ample moisture in the soil.

The stories you may have read covering the water shortages in our area tell of the measures being taken to conserve water as well as how to obtain additional supplies. The situation is as serious as the bleakest picture painted. I can see even greater problems as the population growth increases. Located in such an area, we also have water problems. These problems are compounded with the ever increasing play. At Fairmount C. C. we are trying to determine which avenue we should take to adequately irrigate our golf course. Our source of water is a deep well with pump delivering 365 gals. per minute. This has proven to be insufficient. The logical thing to do was look for more water, so we started talking about another well. This is by no means a five and dime item. As time passed and more discussion evolved around a new well, we found it would be no easy task getting state approval. We then asked ourselves how efficiently are we using the present system. The course is laid irrigation wise in four distinct sections. Each section is fed by a 4" transite line from the main, breaking down to 3" in the fairway and 2" and 1¼" for feeder lines to tees and greens. Snap valves at 90 foot spacings run down the center of e each fairway. Experience has proven that through the utilization of labor we must work all heads within one area. Complete that area, then move to the next. In doing this we are restricting ourselves to the volume capacity of one feeder line to operate as many heads as possible. There is a noticeable decrease when the last couple go on. It was mentioned that we do this due to labor. We would have men running all over the golf course for one and two heads if we were to try and get maximum effort out of the system. Pursuing our problems further, we decided to investigate automatic systems and how they might help. We were surprised to hear that our present capacity should be sufficient to irrigate 18 holes via an automatic system. We have also discovered that our present snap valve lay out requires little additional pipe. Material needed is rotary popup neads, valves, wire and controllers. Rough estimates of cost is not much more than twice the cost of another pump and well. We are told that with a system such as ours programmed properly we could simultaneously have heads come on in the various sections of the course, with all 4" lines delivering the maximum effort of the pump. This would result in a better water pattern than I now have from the present system.

One of my greatest problems is providing golf, free of watering schedules. We cannot complete all tees before early play due to the fact that volume permits only sufficient water for greens. The tees follow and always seem to catch golfers on the front nine. Again in the evening the twilight group encounter the fairway heads as they play right up to dark. We start early evening watering due to the labor problem. It is becoming difficult to find a reliable man to do this job.

We are convinced that the answer to our problem is an automatic system. With a good system properly managed there should be no pools of water lying around and th there should be no runoff. We are well aware that anything involving moving parts and electricity is subject to malfunction. It would appear that this could be kept at a minimum. Therefore, we have decided to set up a pilot test study to determine what equipment is best suited for our use. The 10th hole was selected for the test. (Oral descriptions with slides were given).

It appears that such an installation will ultimately indicate the minimum requirements needed for our course. I firmly believe that we can grow good turf with much less water than has been used in the past. The difference will be in application. As I see it, an automatic irrigation system is the ideal guardian and manager for spending your gallons, allocating just what is needed, where it is needed, when it is needed.

Here's looking into the future when I can see those heads pop out of the ground and challenge anyone to sut them off. A word of caution. We are only breaking the surface in automatic irrigation. There is much to be learned, mistakes will be made. Go slow, explore the market, read all you can on the subject and look well before you leap.

SOIL MODIFICATION

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Soil modification is undertaken to improve or maintain such physical and chemical properties as resistance to compaction, internal drainage, infiltration, percolation, aeration porosity, surface resiliency, moisture availability, cation exchange capacity, and nutrient efficiency. Modification of soils for golf course use has been practiced to varying degrees for half a century or more on a trial and error basis. Only recently have serious efforts been made to study the problem to meet individual situation needs. Unsatisfactory results of soil modification may be attributed to improper amendment proportions, type and quality of amendment materials, poor mixing practices or degradation of initially adequate soil conditions.

Many commercially available materials are currently being promoted for soil modification purposes. Knowledge of their use and long term value is limited. Improper use of these materials for the purpose of averting or overcoming the effects of compaction can create other problems in turfgrass production. In addition differential amendment prices added to already high construction costs of these areas requires performance data to justify their use.

A soil modification project was initiated at Penn State in 1961 with the following objectives:

1. To determine the physical properties of peat, perl-lome, calcined clay, blast furnace slag, wunderly slag, and three sands in the laboratory and to make comparisons of their combinations with a Hagerstown silt loam soil under laboratory and field conditions.

2. To determine the resistance of the mixtures to compaction under laboratory and field conditions using a number of physical measurements.

3. To determine if laboratory test data can be used to prescribe mixtures where modification is desired.

Physical measurements used in the experimental setup include determination of total porosity, aeration porosity, infiltration rate, percolation rate, moisture retention, moisture availability, resistance to compaction, drought susceptibility, disease incidence, nutrient availability, root distribution and irrigation requirements.

Physical characteristics of the various amendments have been thoroughly studied in the laboratory and this information will be available in published form in the very near future. Addition of sand to a mixture usually resulted in increased percolation rate and aeration porosity; conversely, the water retentive capacity and amount of available moisture for plant use were decreased.

Generally, these mixtures containing greater than 60% added sand content by weight had an excessive percolation rate. Excessive percolation rates are usually indicative of low moisture holding capacity and may result in excessive leaching of nutrients. Under such circumstances more frequent irrigation and fertilization would be required.

All laboratory mixtures received two levels of compaction. The results of this treatment on percolation rate indicated the importance of using some peat in a

mixture if maximum benefits from the addition of coarse textered amendments are to be realized.

Field plots of mixtures containing greater than 60% added sand (by volume) were difficult to establish requiring two or more weeks of extra attention. Field results substantiated the laboratory results that where the amount of coarse material exceeds 60% there appears to be excessive infiltration, less available water requiring frequent irrigation and considerable leaching of nutrients. The playing surface also appears harder than desired. Where the coarse material is used in amounts less than 50%, compaction occurs quite readily resulting in poor aeration, poor infiltration, shallow roots, a soft surface for play and increased disease incidence.

Results of permeability studies indicate that a coarse sand of narrow particle size range (80% of the particles between .5 mm and 1.0 mm) is more effective than a concrete sand or a fine sand in increasing the percolation rate of a mixture. There are indications that sands finer than .5 mm in size may be used for modification, but the amounts of sand required will be greater. Calcined clay used in the proper amount will perform as satisfactorily as coarse sand although there may be considerable cost differential.

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EFFECT OF PRE-EMERGENCE HERBICIDES AND SEVERAL PHOSPHORUS LEVELS ON THE CONTROL OF POA ANNUA

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Previous investigators, beginning with work conducted by the U.S.G.A., Green Section, have worked with herbicides to control Poa annua. More recently, workers at Purdue University investigated various herbicides including lead and calcium arsenate. Some of the work at Purdue indicated that an excess of P interferred with arsenate uptake and thus reduced the effectveness of the arsenicals. DeFrance and Kollett, Rhode Island, (1959) obtained partial success in Poa annua control with copper compounds.

It was not until the advent of several pre-emergence herbicides that excellent control of Poa annua was obtained. Goss, Washington Experiment Station, obtained control of Poa annua with several of the pre-emergence crabgrass herbicides applied to the soil surface before planting.

The objectives of this study were to determine 1) the effectiveness of several pre-emergence herbicides on the control of Poa annua, and 2) the interrelationship of herbicides with several levels of P.

In this trial herbicides and P were compared in a split plot design with eight levels of P and two planting dates. Five-inch clay crocks containing potting soil were used in this study. The potting soil tested very high in P and K and had a ph of 6.4. P was thoroughly incorporated into the soil with a soil mixing machine at the rate of 0 - 109 - 218 - 436 - 873 - 1746, and 3492 P lb/A. Because of the high level of P in the potting soil, another series of cultures were set up with two p H levels - 4.8 and 6.5. This soil tested medium in P. One hundred seeds each of Poa annua were seeded in one-half of a 5-inch crock and divided with a label and watered as needed.

The study was evaluated in terms of plant counts obtained approximately 25 days after planting. Cultures were harvested 48 days after planting, cut at ground level,

and dry weights obtained. Soon after harvest a second planting was made in the other one-half of the crock. These plants were counted and harvested similar to the first seeding.

Several pre-emergence crabgrass herbicides were applied to eleven bentgrass varieties including Pennlu, Arlington, Penncross, C1 and C19, Old Orchard, Metropolitan, Washington, Congressional, Cohansey, Collins, and Seaside, largely to determine toxicity of these herbicides. The herbicides and rates were R4461 - 15#/A, DMPA- 15#/A, CaAs - 5#/M, Siduron - 12#/A, PbAs - 5#/M, and DCPA - 10#/A. Herbicides were applied 5/4/65 in water except for Pb and CaAs which were applied in the dry form after which all herbicides were watered into the soil.

Summary

1. Trifluralin at 2#/A gave a complete control of Poa annua for both planting dates and all levels of P.

2. At both planting dates high levels of P reduced the effectiveness of CaAs and to a lesser degree DCPA.

3. On a plant count basis DMPA was more effective than R4461, however, the reverse was true on a crown weight basis.

4. An average of all herbicides including the control indicated a decrease in Poa annua control at higher P levels for both crown and plant counts.

5. Less control of Poa annua at pH 6.5 than at 4.5.

6. Little if any injury was observed except with the following:
Siduron injured the Washington bentgrass variety very severely.

7. DCPA - slight injury observed on Cohansey.

8. CaAs - severely injured Old Orchard, to a lesser degree Metropolitan and Seaside, and some injury to Pennlu and Arlington

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SOD PRODUCTION

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The production of sod has rapidly developed within recent years from the "Pasture stage" into a highly specialized industry. Large acreages, resembling pampered king-sized lawns, are being devoted exclusively to the production of as high quality sod of improved varieties of selected turfgrasses. Animals no longer are permitted to roam and graze these areas. Terminology such as "cultivated" or "nursery grown" has been adopted by the industry as a means of distinguishing it from the pasture-type sod.

Efficient production of a high quality sod involves certain basic principles and practices associated with turfgrass culture. The degree to which they are understood and incorporated into a production program will greatly influence the success achieved in obtaining a uniform and dense carpet of green above the soil and more importantly a well developed extensive rhizome and root system below the soil. Let us consider factors which contribute toward the production of a high quality sod.

Selection of land area - Careful and critical inspection of the field or site should be made to determine its suitability. Such factors as soil drainage, soil texture, stoniness, availability of water, and weed infestation are important considerations.

Seedbed preparation - Proper soil preparation requires more patient and painstaking techniques than is normally required for other agricultural crops. Carelessly prepared fields may affect not only the stand of turfgrass obtained, but also its future management. Seedbed preparation involves physical as well as chemical conditioning.

Before actual seedbed preparation, physical conditioning procedures involving soil drainage, subsoiling, land leveling, green manure cropping, clean cultivation or fallowing may be necessary.

Actual conditioning of the sod in the process of preparing a desirable seedbed may involve plowing, rototilling, discing, harrowing, and culti-packing. The objective of using such implements is the preparation of a level, smooth, firm and finely granulated but not pulverized seedbed. Unless the necessary precautions are taken to obtain such a seedbed, problems involving uniformity of stand, and operation of maintenance and harvesting equipment can be expected.

Chemical preparation primarily involves incorporation of adequate lime and fertilizer. Soil test information can serve a very useful purpose in determining the lime and fertilizer requirements. Sufficient lime should be added to adjust the soil pH to approximately 6.5.

Fertilize generously to get new turfgrass seedlings off to a vigorous start. A 1:1:1 ratio of fertilizer applied at a rate to provide 100 pounds of actual N per acre will be satisfactory for most situations. If soil test information indicates a very high or low level of P and K, select appropriate ratios of fertilizer to conform to the nutriend level of the soil. Apply at a rate to provide an amount of nitrogen equivalent to 100 pounds N per acre.

Incorporate soil insecticides for control of grubs and other soil-borne insects Insecticide treatments are particularly important if insect problems are known to be present or sod is intended for inter-state shipment. Chlordane, dieldrin, aldrin, heptachlor are examples of insecticides which can provide long-lasting protection.

Seeding - Select top quality, certified or registered seed of improved turfgrass varieties adapted for the location in which the sod will be produced and marketed. Use the seed tag as an aid in determining the quality of seed selected. Certified seed gives a considerable measure of assurance of high quality, but under present certification standards and labeling requirements this in itself is not adequate in determining quality of a particular lot of seed.

Plant light to medium rates of seed. Heavy seeding rates will provide a dense cover sooner than lighter rates. The lighter rates favor root and rhizome development. Choose the most favorable time for seeding. The most successful plantings are made during the late summer - early fall period. Successful seedlings can be made during other periods but will encounter more difficulty in becoming established Use appropriate seeding techniques for establishing a uniform and well-spaced stand. Such factors as depth of planting, condition of seeder, operation of seeder, and soil moisture conditions are important considerations.

Once established a new stand of turfgrass must be aided in its development into a mature sod with a maintenance program. Close and constant attention must be devoted to providing favorable growing conditions for efficient and rapid

development. Such factors include:

Fertilization - Primary requirement is for nitrogen if adequate P and K levels were established in seedbed preparation. Apply nitrogen in increments of 50 to 60 pounds N per acre as needed to maintain color and growth of turfgrasses. A number of nitrogen sources are available. Select a source which is found to be most economical and efficient for your operation.

Mowing - Maintain a high height of cut until sod is fully developed. Adjust frequency of mowing to rate of growth of turfgrass. Infrequent mowing introduces a clipping problem.

Irrigation - Assurance against soil moisture stress conditions is vitally necessary. Follow a program of thorough watering, but as infrequently as necessary to maintain favorable soil moisture.

Weed Control - Selectively remove weed competition with appropriate herbicides. Materials such as 2,4-D, 2,4,5-T, 2,4,5-TP, MCPP and dicamba are effective in controlling many bothersome broadleaf weed problems. Use at preferred times and correct concentrations to avoid turfgrass injury.

Insect Control - Recognize and treat insect problems at an early stage. Sod webworms, army worms, cut worms, and chinch bugs can cause serious damage.

Harvesting - Various types of mechanical aids in this area have been developed involving cutting, handling, loading and unloading. Further advances in mechanization needed for more efficient harvesting.

A thin-cut (3/4 to 1-inch) sod most desirable. Thick-cut sod increases handling problems and takes longer to knit to soil after transplanting. Mature sod which has no immediate market may be stored under a medium maintenance program. Intensify maintenance program when getting ready for sale.

In addition to the above mentioned factors, sod production involves familiarization with market development, sales techniques and sod placement procedures. Plans for marketing should be established before production begins.

Sod production as a specialized industry has made many advancements, but it still is in its infancy. The striking improvement in quality as a result of improved cultural techniques and availability of high quality seed of improved turf-turfgrass varieties perhaps more than any other single factor has stimulated the surging interest in the use of sod for establishing lawns. I foresee a continued increase in the demand for sod as long as the industry continues to progress in more efficient production and has a high quality product to offer. New Jersey has initiated a sod certification program as an aid toward continued progress in improving sod quality. Quality will provide the pathway to quantity.

NITROGEN ON ROOT GROWTH

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Nitrogen is usually supplied to turf as ammonium or nitrate ions. Generally, under field conditions these two forms of nitrogen seem to have no different effects upon turf except that the nitrate ion is usually slightly quicker in action than the ammonium ion.

Shoots and roots of plants usually increase to a point with the increase of N fertilization. Further increases of N fertilization produce smaller increases of root growth and larger increases of shoots.

It appears that plants have well developed root systems but poorly developed shoots when grown where N fertility is low enough to limit the top growth. The opposite is the case where an excess of N is available to the plant.

Temperature and light are interacting factors with N fertility affecting root development. There seems to be sufficient evidence to show that only when more energy is being supplied by photosynthesis than is being utilized carbohydrates are stored and root systems develop. It has been shown that cool season grasses usually increase in carbohydrates during the winter. This corresponds to the period of the greatest root development. Nitrogen applied during the winter may increase the phytosynthetic activity thereby increasing energy available to the roots if the top growth is not excessively stimulated.

Heavy nitrogen application to bentgrass usually increases top growth and reduces root growth at all temperatures. Differences are much less at low than high temperatures.

Night temperatures that stimulate bentgrass top growth reduce the carbohydrate content and root yield. This is accentuated with high N fertilization.

Experimental data show that bermudagrass top growth, root growth, and carbohydrates generally increase with temperatures to 95 F. However, if high night temperatures are associated with high day temperatures bermudagrass phytosynthetic efficiency is reduced and both tops and roots are reduced. Roots are affected more than tops.

In both bentgrass and bermudagrass top and root growth is reduced by shade; roots being reduced in greater magnitude, especially with high nitrogen fertility. Bermudagrass is more unfavorably affected by shade than bentgrass. This is particularly true with root development under high N fertility.

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MARYLAND TURFGRASS RESEARCH REPORT

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The turfgrass research program at the University of Maryland was initiated in July, 1964. This report, made 18 months later, deals primarily with results of two short-term experiments. They are: 1) Tufcote bermudagrass establishment, 2) Weed control in established turf.

Tufcote Bermudagrass Establishment. Warm-season grasses, mostly bermudas and zoysias in Maryland, should be planted in late spring and early summer for best

results. Weed competition is usually greatest during this period, especially from weedy grasses such as crabgrass and foxtail, and from broadleaf weeds such as spurge, carpetweed and many others.

Chemicals are badly needed which can be used at the time of bermuda planting to control the weeds but which will not injure the bermuda. Several weed preemergence herbicides, developed primarily for use on crabgrass, were applied to newly sprigged Tufcote in one experiment in July, 1964 and in another in June, 1965. Chemicals were applied about one week after planting except the methyl bromide bromide and one of the simazine treatments which were applied immediately before planting. Results obtained from the July, 1964 experiment are reported in Table 1 below.

Table 1. Tufcote bermudagrass establishment study. Sprigs planted July 16, 1964; treatments applied July 23, 1964.

Treatment	Pounds per acre	Tufcote injury 1/	Weed Control 2/		Winter Survival
			Broadleaves	Grasses	
Zytron	16.3	0	10	9	95%
Dacthal	12.0	1	9	6	79
Methyl Bromide	436.0	3	10	10	87
Treflan	0.75	2	10	10	82
Betasan	21.8	0	3	3	53
Simazine 1*	2.5	10	10	10	8
Simazine 2*	2.5	4	10	9	27
Check	--	0	0	0	78

* Simazine 1, applied before sprigging; Simazine 2, after sprigging
1/ Rating-0=no injury, 10=complete kill (9-16-64)
2/ Rating-0= no control, 10=complete control (9-16-64)

Zytron gave the best results in this study--no Tufcote injury, extremely good weed control, and 95 percent of the plants survived the first winter. Dacthal and methyl bromide gave reasonably good results. Other treatments were poor in at least one aspect. Betasan prevented stolon rooting even though the stolons almost covered the soil surface. Winter survival probably reflects how well the bermuda was established during the previous summer and fall rather than showing a direct effect of the chemical on the grass.

In the June, 1965 experiment methyl bromide, Treflan and simazine before-planting were dropped and Azak, Balan and hand weeding were added. Hardly any weed competition was encountered in this study either because few weed seeds were present in the soil or because the bermuda grew so rapidly with frequent irrigation, fertilization and mowing, that the weeds never became established.

Simazine seriously injured the bermuda as it did in the previous experiment (see Table 1). Pre-San (same active ingredient as in Betasan) again prevented stolon rooting. Heavy winter-kill is expected in these plots. Data will be recorded on winter injury in Spring, 1966. The injurious effects of these chemicals--simazine and Betasan or Pre-San--show that they should NOT be used on Tufcote bermuda sprigs. More information must be collected and analyzed before any of these treatments can be recommended for general use.

Weed Control in Established Turf. Three experiments with almost identical treatments were established in the spring of 1965 in different regions of Maryland. They were located at: 1) Green Hill Yacht and Country Club near Salisbury; 2)

University of Maryland Golf Course, College Park; and 3) Beaver Creek Country Club near Hagerstown. Because of extremely dry conditions at the Beaver Creek and University of Maryland plots, very little data could be collected from these locations. Plots at Green Hill generally gave good data.

Results with treatments used at recommended rates are summarized very briefly below. Reprints of a paper published in the Northeastern Weed Control Conference Proceedings - 1966 gives complete details for all of these experiments and are available from the author.

a. Crabgrass Control (Green Hill Plots only). Granular formulations of Zytron and Betasan gave 90 to 100% crabgrass control when applied at 15 and 19 lbs. of active ingredient per acre, respectively. D-263 granular (experimental) at 6 lbs. Bandane at 35, Tupersan granular at 20 and Dacthal wettable powder at 11 lbs. per acre gave 80 to 90% control.

b. Goosegrass Control. (Green Hill and University of Maryland plots) D-263 granular at 6 lbs., TOK-3 (experimental) at 8 lbs., Tupersan wettable powder at 10 and 20 lbs., and Azak granular at 10 lbs. per acre significantly reduced goosegrass germination.

c. Annual Bluegrass (Green Hill and University of Maryland plots) Zytron and TOK-3 injured mature annual bluegrass plants which were present in the plots when treatments were applied. None of the nine herbicides (representing 14 formulations) used in this study affected fall germination of annual bluegrass when applied in the spring at rates recommended by the manufacturer. Higher rates of some chemicals did reduce germination, however.

d. Turfgrass Improvement (Green Hill Plots only). Zytron and Bandane treatments resulted in a significant but unexplained increase in Kentucky bluegrass turf density.

Other Experiments

Several other research projects are now underway both on our Plant Research Farm and at other locations around the state. They include: species and variety evaluations, fertilization, grass mixtures for athletic fields, weed control and a sod production study. Most of these are long-term experiments and insufficient data have been collected to date for a satisfactory evaluation.

One very striking difference was observed in a bluegrass fescue management study. Half of the plots were mowed at $1\frac{1}{2}$ inches, the other half at $2\frac{1}{2}$ inches. At the end of one year the plots cut at $1\frac{1}{2}$ inches had 47 times as many crabgrass plants as those cut at $2\frac{1}{2}$ inches. This difference will very likely become evey more striking in the future.

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NITROGEN SOURCES FOR TIFGREEN BERMUDA TEES

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Uniform, high quality turf is the objective of all workers involved in development, management and production of turfgrasses. One of the prime factors in producing this kind of turf is proper fertilization. Nitrogen is one of the most important nutrient elements.

Tifgreen bermudagrass plots received activated sewage sludge, amm nium nitrate, urea and two sources of ureaformaldehyde in 1964 and 1965 at rates of 6, 12, and 18 pounds of nitrogen per 1000 square feet per year. Visual ratings of turf color, vigor and density-texture were made at two-week intervals throughout both seasons.

Turf quality improved with each increased rate of nitrogen. Urea consistently produced a superior turf quality as compared to other sources at the 6-pound level and quality equivalent to several sources at higher levels. The 18-pound nitrogen was the only fertility rate which consistently gave acceptable vigor and density-texture ratings except for the ureaforms during the first season.

Sod regrowth potential was determined by shoots grown in a dark room growth chamber. In general the plugs collected in December, which had received slowly available nitrogen sources, produced more total dry weight and shoots per plug than the readily available sources. In the June sampling plugs which had been fertilized with activated sewage sludge generally produced more regrowth per plug than with other sources.

No significant relationship between the numbers of infective larvae of the nematode, Hypsoperine graminis, and the nitrogen sources and rates were found in this study.

Proper use of fertilizer materials rather than source appears to be the most important aspect of nitrogen fertilization. You must meet the needs of the plant and still stay within your economic boundaries.

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WINTER PROTECTION OF GREENS

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During late fall, winter and early spring, greens are subject to varying degrees of mechanical or physiological injury. Such is directly related to the physical condition of the plant, the soil environment, weather and traffic. The uncertainty of weather and the certainty of damage during adverse winters (with attendant expenditures of time, effort and money for repair) would seem to dictate the use of protective measures when possible.

Mechanical injury is caused by man and may be direct or indirect. Direct damage is caused by traffic when the grass is covered by frost or when it is dormant or semi-dormant and the soil is partially or completely frozen. Indirect mechanical injury is produced by traffic on partially frozen or wet soil. The injury may be immediately evident (visible--soil displacement) or delayed (invisible--soil compaction). Protecting greens against mechanical damage involves controlling, diverting or preventing traffic when adverse weather or soil conditions occur.

Physiological damage suffered by plants in the winter is generally referred to as "winterkill". "Winterkill" may be caused by disease, desiccation, low temperatures and, sometimes suffocation and scald.

Protection against suffocation, scald and to an extent disease is related to improvement of drainage -- surface and internal -- and the avoidance of succulent plant tissue.

Prevention is the best protection against disease. Fungicides are available for this purpose.

Other forms of physiological winter injury are related to low temperature damage -- desiccation, chilling and frost injury. Desiccation is basically a wilting phonomenon and occurs when plants transpire moisture more rapidly than the roots can absorb it. Windswept greens are more subject to desiccation, but it may occur anytime soil is partially or completely frozen. Protection techniques include maintenance of adequate soil moisture and use of covers to conserve moisture.

Chilling injury is not a factor with adapted turfgrasses but is important only when selecting shrubs and flowers. Frost injury may occur in all plants and is caused by ice formation within the cells (intracellular), between the cells (intercellular) or on the outside of plant surfaces. Rapid drops in temperature cause ice to form within cells and is fatal. The degree of "hardening", rapidity of thaw and traffic, influence the extent of damage from intercellular and external ice or frost.

Methods of protecting greens from frost injury vary with play and availability of alternate playing areas. Techniques include sprinkler irrigation, soil warming, and the use of covers such as snow, various mulches and polyethylene blankets. Removal of frost when play is expected is necessary to prevent damage.

Sound management practices are basic to an effective winter protection program. Early fall practices are especially important because food reserves are stored at this time. The plants must draw upon these reserves for initiation of growth the following spring -- or -- each time during the winter months when temperatures conducive to growth occur.

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