

1972

**TURF CONFERENCE
PROCEEDINGS**

Sponsored by the

MIDWEST REGIONAL TURF FOUNDATION

and

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PROCEEDINGS OF THE
1972
MIDWEST REGIONAL TURF CONFERENCE

	<u>Page</u>
President's Report.....John Dunlap	3
Executive Secretary's Report.....W. H. Daniel	3
Challenge of Change.....M. A. Pekarek	4
Progress Toward Better Turf.....Fred V. Grau	4
Students Today and Tomorrow.....K. T. Payne	9
Our Short Course on Chemicals for Turfgrass Usage.....R. P. Freeborg	12
Changing to Turf Management.....William C. Brazeau	13
Expanding Responsibility and Authority.....James W. Brandt	15
Let's Get Involved!.....David Harmon	18
Expanding Responsibility and Authority.....Richard B. Craig	20
Expanding Your Authority.....Charles Hedges	22
How to Promote and Not to Promote Golf.....Ted McAnlis	23
How to Promote Golf in 1972.....Dudley Smith	25
Golf Promotion - My Ideas.....Bill Lyons, Jr.	26
Golf Promotion.....Ariel C. Hunt	28
Sterilizing with Anhydrous Ammonia.....Wm. E. Lyons	29
Dreams and Reality in Golf Course Design.....W. Bruce Matthews	30
Construction Challenges.....Brent Wadsworth	31
Over-Grooming is Over-spending.....Paul Voykin	35
Growth Regulators.....James A. McAfee	38
The Right Amount of Water-Root Hair Viewpoint.....Paul E. Rieke	39
Nutrient Storage and Movement Under Turf.....Paul E. Rieke	41
Getting the Work Done.....Harold Zimmerman	44
Percolating with PURR-WICK.....Ted McAnlis	46
The Second and Third Greens.....Birdie Shelton	48
PURR-WICK To Date.....Editor's Note	49
Selected Sand and Organic Constructed Green.....O. Lee Redman	49

More on Next Page!

The 45 talks included in these Proceedings are condensations of talks by speakers before sections and divisions of the 1972 M.R.T.F. Conference. We appreciated the willingness of the speakers to participate and prepare material for your reading. Proceedings of each annual Conference since 1948 has been prepared. A limited number of 1962, 1963, 1964 and 1965 Proceedings are available at \$1.00 per copy. Copies of 1969, 1970, 1971 and 1972 are \$ 2.00 each.

A copy of these Proceedings were mailed to:

The 737 attending the 1972 Midwest Turf Conference
One person of each member organization within the Midwest Regional
Turf Foundation not represented at the Conference
List of those in educational activities.

Additional copies are available at \$ 2.00 each from:

W. H. Daniel, Executive Secretary, Midwest Regional Turf Foundation,
Dept. of Agronomy, Purdue University, Lafayette, Indiana. 47907.

	<u>Page</u>
Zoysia into Fairways.....Tom Sams	50
Zoysia into Other Turf.....A. A. Linkogel, Sr..	51
Weather Cycles and Grasses.....R. A. Keen	53
Warm Season Grasses.....R. A. Keen	53
Arsenic and Its Relation to the Environment.....Cecil F. Kerr	54
The Technology of PO-SAN.....Stan Frederiksen	56
Teaming Up on Sod Growing.....Harry Murray, Jr.	58
Selecting and Improving Grasses.....Kenyon T. Payne	60
Leasing and Renting Equipment.....Harry Ranft	62
PO-SAN Use at Oak Park Country Club.....Leon Hartogh	64
PO-SAN at Highland Country Club.....Marvin Scobee	66
Cart Paths and Construction.....Carl Schwartzkopf	66
Sand Trap Maintenance.....James Fischer	69
Developing a Community College Campus.....Ron Dudley	71
Progress with Athletic Fields.....Robert E. Gillie	72
Natural Turf Care Costs - Our Records.....Melvin J. Røbey	75
Artificial Turf - Care and Usage.....E. J. Fuchs	76
Progress with the PAT System.....W. H. Daniel	80

- - - - -

For Lawns - first see articles starting on pages -
18, 38, 39, 41, 60, 62, 71

For Sod Production - first see pages -
4, 29, 38, 39, 41, 51, 53, 54, 58, 60, 62, 64, 66, 75, 76

For Athletic Fields - first see pages -
29, 38, 39, 41, 46, 49, 50, 51, 53, 54, 72, 75, 76, 80

PRESIDENT'S REPORT
Irrigation Sales
Lakeshore Equipment & Supply Company
Cleveland, Ohio

I have always looked forward to attending this Conference and renewing old friendships. The knowledge gained here each year can be used throughout the coming seasons to help us carry out our jobs more easily and more professionally.

The interest in the M.R.T.F. has remained high over the years, and this is a tribute to a high quality of educational material. Attendance has reached over 700, and it attests to your enthusiasm for education. The interest in turf has grown at a fantastic pace in the last 20 years, and the M.R.T.F. has played a major part in this advancement.

We owe a great deal of thanks to the man who keeps this organization going - Dr. Daniel. His interest and enthusiasm over the years has never wavered. Our thanks also go out to Dr. Ray Freeborg and Mrs. Kaye House for their assistance.

It has been an honor and a privilege to have served as President of M.R.T.F. for the past year. I would also like to thank the Board of Directors for their support and ideas concerning future Conferences. As long as interest and quality remain high the future of M.R.T.F. is indeed bright.

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EXECUTIVE SECRETARY'S REPORT

W. H. Daniel, Dept. of Agronomy, Purdue

The more than 700 attending this Conference are a tribute to the continued enthusiasm for turf information so characteristic of our Midwest Turf Conference. We would thank you for coming, and thank the more than 50 speakers for their preparation and presentations.

The entire turf field is moving rapidly. New ideas are coming fast, new companies are developing, new sod growers, new golf courses, new athletic fields will continue to come about. Of considerable interest is the fact that we have 40 undergraduates taking their major in Turf Management at Purdue - this is twice our normal group. Certainly we must be alert to their employment opportunities, as well as their technical training.

We have spent much time during the past year developing and encouraging the concept of PURR-WICK rootzone, and the PAT (Prescription Athletic Turf) System. These become specialties, so much general information is required. For example, 4000 copies of leaflet No. 40 - the PURR-WICK Rootzone System - have been distributed, and at this Conference the first of 3000 copies of the first revision are available to you. We have made five revisions in the PAT System already as ideas have matured and systems have proven. There will be further revisions.

Your membership in Midwest Turf Foundation - there are over 360 members - has given a strong support for Midwest Turf since its inception in 1945. Your dollars are well used. We have tried to be efficient and productive for that is what you expect. Please keep up the contact!

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CHALLENGE OF CHANGE

M. A. Pekarek, Director, Speakers Bureau
National Cash Register Company, Dayton, Ohio

A fast-moving review of today's dynamic marketplace - A people, a technology, a nation - - constantly being challenged by a world rapidly changing around them was presented. The main thrust deals with -

- (1) People
- (2) Pride
- (3) Productivity
- (4) Professional performance
- (5) Technology
- (6) Profits and return on investment.

Experienced through "real life" situations, the message takes on additional impact through the use of visual aids.

("Challenge of Change" has been enthusiastically received by capacity audiences throughout the United States and Canada.

(A brief summary).

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PROGRESS TOWARD BETTER TURF

Fred V. Grau, Consulting Agronomist
College Park, Maryland

When Dr. Daniel asked me to discuss "Progress Toward Better Turf," I said to myself - "This will be a cinch!" But -- when I sat down and started to chart our PROGRESS it was a bigger job than I realized.

Fifty years ago the U.S.G.A. Green Section was just getting its feet on the ground. The staff was small and severely restricted. Men who take care of golf courses were known as greenkeepers. The only institution that taught anything about turf was the School of Hard Knocks. Golf was the "rich man's game" and anything connected with it did not merit assistance from tax-assisted institutions. Grass seeds used to establish turf were the same as those used by farmers to plant pastures. Bordeaux mixture was used to check severe outbreaks of disease. Sulfuric acid on an ice pick checked individual dandelion plants. The only book in existence was Piper & Oakley's, Turf for Golf Courses, published in 1917. Fairway mowers were pulled by horses, shod with leather boots. Greens mowers were "people pushed." Most of you here today never had a chance to see things as they were in these "Dark Ages."

If we were to jump 50 years and begin to evaluate present-day progress, the contrast would be striking. But, progress is not made by hurdling a span of 50 years in a day. So, let us review some of the more important events that have brought us to this point in time.

Rhode Island has conducted turfgrass research continuously for more than 70 years. Some fine contributions have been made there. Connecticut was in the lime-light 60 years ago, but the work there has been spasmodic. The book, Turf for Golf

Courses, was published 55 years ago, and very few turf workers today can say that they own a copy. It is a classic!

Progress in Better Turf was enhanced 50 years ago when the United States Golf Association brought into existence the GREEN SECTION, which was designed to answer some of the problems of golf turf, primarily for its member clubs. This fine organization functions effectively today, having survived some heavy storms along the way.

Some highly significant events in turf history evolved in the period 1928 - 1930, developments that speeded our progress toward Better Turf. The National Greenkeepers Association was begun with Col. John Morley of Youngstown, Ohio, as the spark plug. The names have been changed to better project the image of the professional turfgrass manager, now the golf course superintendent.

In this same period of 42 years ago, turfgrass research was begun at Penn State under Prof. H. B. Musser, and at Rutgers, New Jersey, under Dr. H. B. Sprague. With the exception of the lean war years, with rationing of every sort, turfgrass research and education have grown and flourished at these and other institutions. Their success has stimulated and encouraged other land-grant colleges to rearrange their programs.

How many remember the "ACID THEORY?" It held that weeds disappear as the soil is made more acid. It worked, too! Trouble was, before too long, there wasn't any turf. Today we use lime in large amounts to excellent advantage.

Progress in fertilizers was made slowly. In my primitive research at the University of Nebraska in 1927, I had three materials -- bone meal, sulfate of ammonia, and cottonseed meal. We used these at the old Shrine Club where I was greenkeeper. The turf was playable, but quality left something to be desired. Many of the primitive customs then popular have disappeared. One is the annual spring reseeding of fairways with common Kentucky bluegrass using a wheelbarrow seeder. Another is the use of potato forks for aerating hard turf. Then we had fescue fairways, and even fescue greens, all gone today.

The year 1935 marked real progress toward Better Turf when a group of greenkeepers from Philadelphia convinced the Dean at Penn State that the turf interests in the state needed an extension agronomist. I had just completed my doctorate at the University of Maryland and was chosen to fill the position, the first in the U.S.

The selection of better strains of turfgrasses began about 1910 in Connecticut with Mr. J. B. Olcott. This work passed through several phases until the U.S.G.A. Green Section began the classic collection of the "C" series of creeping bentgrasses. The "pie greens" scattered over the U. S. were extremely helpful in evaluating different grasses under play. Some of the "C" strains became parents of the now world-wide Penncross bent -- others are still around, still contributing. True progress was made when the late Prof. Musser developed the poly-cross, which was named Penncross, a seeded creeping bent, the first superior seeded bent. It was released in 1953.

Has anyone of you tried to use hydrated lime and sulfate of ammonia at the same time? I thought that this simple chemistry demonstration evaporated in 1931 when I first visited a club in the Washington, D.C. area. The greens were brown for quite a while. Not long ago I learned that this elementary mistake was made in Hawaii when someone was hydroseeding crownvetch. The ammonia effectively killed the seeds and the inoculant so that the net result was zero. Later today you will hear how ammonia has been used by Bill Lyons for sterilization in a controlled manner. Yes, we progress!

For many years the most popular blend of materials for putting green construction and topdressing was a 1-1-1, sand, soil, and organic matter. Gradually the importance of the sand fraction became evident, and the relative value of the organic matter dwindled. Last week we heard a 10-year evaluation of the Soil Modification

trials at Penn State where infiltration rates were most affected by sand. This type of information is most valuable to golf course architects and builders. From Dr. Daniel you will learn how 100% sand in PURR-WICK System can be used effectively in several ways. His innovations deserve careful scrutiny.

The real breakthrough in fertilizers came in 1946 when Dr. K. G. Clarke at Beltsville, Maryland, developed UREAFORM. Ureaform incorporated Safety, as well as "slow release," but it was not an instant success. There was skepticism and innuendo. Gradually acceptance grew so that, today, most turf fertilizers contain significant percentages of UF nitrogen. Now we have a wide choice of safe materials including coated prills, I.B.D.U., and straight UF's.

Great progress toward Better Turf was made in the period 1945 - 1950. Because of the war, turfgrass activities were at a low ebb. The U.S.G.A. tapped me for Director of the Green Section in August 1945, and I settled at Beltsville, Maryland, collaborating with the U.S.D.A. For some reason Synergism started operating. The first aerifier was designed and construction was started. It was demonstrated at Beltsville, and in Philadelphia in 1946, and at Penn State in 1947. Soil cultivation as we know it today was on its way!

Southern turf was started on its road to brilliant achievements when Dr. Aamodt (U.S.D.A.) and I visited Dr. Glenn Burton at Tifton, Georgia, in 1946. A modest money grant, with U.S.D.A. blessing, launched Dr. Burton on his series of successes with warm-season grasses. This has been real progress toward Better Turf in the areas where cool-season grasses can be used only for winter play. Who in turf has not heard of Tifgreen (328) and Tifway (419) and Tifdwarf?

In 1946 the world learned that the American Society of Agronomy had recognized Turf as an equal with all other agricultural crops. I am proud that, for eight years, I was retained as Chairman of the Turf Committee. Today Turf is an integral part of the Society which has greatly influenced land-grant institutions everywhere.

Education in turfgrass had lagged sadly behind research until 1946. This was the year that I "found" Jim Watson at a Texas Turfgrass Conference and sent him (and the funds) to Prof. Musser at Penn State where he earned the first Ph.D. degree in Turfgrass Management. Since then others have followed suit at Penn State and at other institutions to become the leaders in research, education, extension and service. This program of developing and training leaders has had more to do with Progress in Better Turf than any other thing I know in my 45 years in this field of endeavor. I hope that we can continue the program.

Grass, the 1948 U.S.D.A. Yearbook, was a great step in progress. More reprints (separates) were ordered and printed from the turfgrass section than from any other yearbook in history. It is a classic and deserves to be in every library. It is a priceless historical reference point.

It was in this period that Merion Kentucky bluegrass was being evaluated as B-27 in comparison with 150 other selections. B-44, B-5, and B-12 very nearly got the nod, but a severe leafspot infestation put Merion way ahead of whatever was in second place. Seed growers put the pressure on to release B-5 and B-12 because they were heavy seed producers, better than Merion. B-27 produced better turf - so, we named and released Merion in 1950. Who can measure the impact that this grass had on Progress? Joe Valentine, Burt Musser and I were made Honorary Directors of the Merion Bluegrass Association. Grass breeders in many states redoubled their efforts to produce a bluegrass that would be superior to Merion. As you well know, we now have several that are better in some respects. Blends dominate today, combining the best characteristics of several and masking their weaknesses.

At home in College Park, Maryland, I have an old hand-pushed Toro putting green mower. I am saving it for the Turfgrass Museum whenever and wherever it is built and dedicated. Later we had an innovation called the "Overgreen." A Jacobsen-built machine, this long-handled power unit pulled three putting green mowers. It was a time-saver, but, for some reason, it disappeared from the market. Few units are left to remind us. Now progress in mowing putting greens means triplex, or 3-unit self-powered machines that save time and manpower. They spell Progress, but only when they are properly adjusted and operated.

Progress toward Better Turf can be measured in terms of Turfgrass Associations and Council that have developed in many states. They have had powerful effects in promoting broad turfgrass programs. We will be able to measure this progress better when we have achieved a series of coordinated programs where waste and duplication are minimized and available funds are used to the best possible advantage.

Musser's book Turf Management was a big step in our progress. The revised edition lacked something, but we may yet see another revision. On the subject of books, Turfgrass Science, an A.S.A. publication, marked yet another milestone in progress. Since then Dr. John Madison has published two books, and Dr. Beard has a new one on the presses.

Let us not forget the continuing effects of periodicals such as Golfdom and the Golf Reporter. Three items in my memories are the reprints of "Turf Round-ups" of 1950, 1951, and 1952 which were published in Golfdom. For instance, in 1950, I wrote this "Wanted" note: "A sturdy inexpensive machine which can be used for the rapid economical lifting and introduction of 2-inch plugs of superior creeping grasses into established turf without taking the area out of play and with virtually no inconvenience to the players." ... "LIBERAL REWARD - The reward will be the satisfaction of having contributed to the further development and the more economical maintenance of Better Turf." These 20-year old "Round-up" reprints are avluable as historical reference points concerning the broad turfgrass status in the United States.

In June 1935, my steps were guided to the Gift farm near Virginville in Berks County, Pa., where I discovered Penngift crownvetch. Better Turf on roadsides dates from that period. Today, where crownvetch has been established on slopes, maintenance costs have been reduced virtually to zero. Erosion has been minimized - Beauty and the Environment have been enhanced. This is Progress!

In 1928, I used to water fairways at night pulling a heavy water cannon around, plus a 2-inch hose full of water. That was hard work! From this we have progressed thru traveling sprinklers, to snap-on, to the current fully automatic irrigation systems. These sophisticated advances become less important as we learn to develop and grow grasses that produce the best quality turf with minimum water.

The work that we did with Zoysia as Beltsville still influences many golf courses, parks, and lawns in the transition zone. For low-cost maintenance, Zoysia grasses have huge potential for Better Turf.

Looking back over my shoulder I must relate that my paper, "Turf - A World Concept," at the Sixth International Grasslands Congress at Penn State in 1952, had its effect in promoting progress in our chosen field. Never before had Turf been recognized by this organization.

In 1961, my Company, Grasslyn, produced the first Blue Tag Certified Penngift crownvetch seed. It was a memorable occasion and a big step forward.

In 1969, five turfgrass workers were honored by being elected FELLOW in the American Society of Agronomy. This definitely spelled PROGRESS.

The Pennsylvania Turfgrass Council, which was organized in 1955, grows stronger each year. This, and similar organizations, are the basis for continuing progress toward Better Turf. I extend congratulations to those who have guided the Midwest Regional Turf Foundation so successfully over all these years.

Sod production started to expand when growers learned about Merion and the quality of sod that it produced. We've come a long way from pasture sod and the gooseneck sod lifter. Better seeds, irrigation, weed control, and sod lofting-rolling-transporting has revolutionized the industry. Now we can buy bluegrass sod that has been established vegetatively, giving a quality never before believed possible.

Weed control got off the ground about 1945-1946 when 2,4-D was becoming popular. Later, at Penn State, dry blends of 2,4-D and fertilizer were successfully formulated and used. Today we can selectively kill almost every major weed in turf in the U.S. by pre-emergence, by post-emergence, and by systemics.

Disease control has had a fascinating development since the days of Bordeaux mixture, thru the mercurials, the thirams, and, once again, systemics. Environmentalists will affect our work with pesticides for years to come. Thanks to the dedicated pathologists we have made tremendous strides.

Introduction of seeds of improved varieties into established turf has been made highly successful thru the perfection of the Scarifier-Seeder. Reports by superintendents at turf conferences confirm this phase of progress.

Communications in turfgrass still leave something to be desired. We are riddled with skepticism, provincialism, and sometimes, just plain ignorance. Through conferences such as this, the barriers gradually are smashed. Education in the universities, encouraged by scholarships, is filling the ranks of turfgrass managers with trained people who know how to think. As alumni groups grow, communications will improve.

The METRICS are on the way - so be prepared. This system of measurements should have been universal many years ago.

Some progress has been made in preparing specifications, but we lack unanimity. Given a problem, five turf men could develop five different ways of doing the same job with different results. To correct this sad situation, it will take good communications and continuing education.

The 1966 Turfgrass Survey in Pennsylvania developed authentic figures which gave Turf the status of almost the Number 1 crop in the state. These figures were gathered by the Crop Reporting Service and have had considerable impact world wide.

A friend called me from California recently and told me that he had developed a way to "program" fertilizers for 3-month, 6-month, and 12-month release patterns. Results in the field have proved the lasting effects through a full year of growing weather.

Dr. Daniel's work on subterranean heat deserves recognition in our Parade of Progress. His PAT system for playing turf is real progress.

Each year at equipment shows it is exciting to see the new things that have been made available. I shall not attempt to catalog them. We must give great credit to the fertile imagination, and to the patient engineering by those who have produced these miracles of progress.

I've appreciated the chance to come before you again, and I've enjoyed helping to develop a Sense of History in evaluating Progress Toward Better Turf. We look back only to avoid the mistakes of the past, and to be better prepared for that which lies ahead. Great things are in store for those who study, who learn how to think, and who are receptive. Ours is an honorable profession whose workers are dedicated to a cleaner environment, appreciative of the meanings of the term "Ecology," and who work toward the betterment of their contemporaries.

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STUDENTS - TODAY AND TOMORROW

K. T. Payne, Crop Science Department
Michigan State University, E. Lansing, Michigan.

It's been a pleasant task to put some thoughts together on today's students, because, while we work with them daily, and indeed we have two college-aged sons and a daughter living at home with us now, we don't back off and consider how and why they are ticking until given an opportunity such as this provides.

My experience, in addition to our own children, comes from coordinating our Turfgrass Management program of some 70 young men, and teaching several classes in that curriculum. In planning this, I found our Ombudsman, our former Vice President for Student Affairs, and our Assistant Dean of Students helpful.

In order to put today's students in perspective, we need to compare them with those of the past. During the depression of the early 30's and through much of that decade, the gaining of a college education for many was a traumatic exercise, involving long hours of work, low pay, financial incumbrance in the form of student loans, threadbare clothing, and Adlai Stevenson shoe soles. How well I remember a brother agronomy major at Kansas State who survived on a 5¢ bowl of soup into which he would dump the entire contents of the sugar bowl for lunch and dinner each day. In summers, the 60-hour work week at 10 to 20¢ per hour brought a profound appreciation for the occasional Saturday when the boss said you could knock off early - at five o'clock - without pay, of course.

The fact that few college educations were achieved without hard work for self-support, resulted in a respect for just how much each classroom hour was costing, as well as providing exposure to one, or perhaps several potential career opportunities. Most students entered college with a relatively clear idea as to what they wished to prepare for, and changing major fields of study was the exception rather than the rule.

Another contributing factor to this stability of purpose was the greater awareness that children had in their homes of just what it was that Dad did to make a living, and a more intimate understanding of what both parents sacrificed to provide a home and an education for their children.

World War II, and the opulent years since, have changed much of this for the student of today. Typical of this is the fine Michigan farmer and his wife who sat in tears in an office on our campus recently wondering how and why their son had gone wrong. "Was he required to get a job to help finance his education?" "Surely not! We have sacrificed at home so that he wouldn't have to slave at Michigan State the way we did when we went through." In my opinion, this simple admission reflects an attitude which is responsible for difficulties many of our young men and women experience in seeking career directions today.

"Everything is different - and nothing is different."

This quote from some unknown bard carries much truth as comparisons are made between Joe College and Betty Coed of the '20's and '30's, and the In-group swingers who are "Doing their things" on the modern campus. The difference seems to be in degree, and perhaps in attitude. Bathtub gin and bootleg whiskey gave rise to marked-out imbibers, just as pot smoking and pill gulping affects today's freak-outs. Fortunately the proportions of students pursuing these activities were and are very small indeed, and seem to be about the same for both times.

Let's examine some of today's attitudes and see how they look from a layman's viewpoint. I profess no sociologist's skill or insight.

Our young men and women have not only grown up in an era of affluence, but they have lived in a fantastic age of scientific achievement. Exposure to television has had a remarkable result in providing knowledge at an accelerated rate, but also in bringing a worldly awareness that was hardly available on a crystal set, or an Atwater-Kent. They have seen John and Robert Kennedy shot in cold blood, Neal Armstrong take his giant step, Watts and Detroit, and President Nixon and Mao. Not once, but on many instant replays with reasoned analyses from different viewpoints, available at the press of a remote control button to another channel.

The 18 to 23 age group have much more in common today than yesterday because of this communication. They are much more conscious of the social scene, and therefore are, perhaps, more prone to idealism. They are thus made more vulnerable to a kind of conformity which makes them easily led. They are extremely reticent about criticizing a fellow student because of his actions or his values. They are also impatient with Archie Bunker's thinking which castigates a man because of his color or his creed. They choose to judge the individual on what he is and what he does rather than on his ethnic progenitors.

They are acutely aware of the "elitist" concept. Not only do the fraternities and sororities - the so-called socially elite - have trouble with recruitment, but this now carries over to the honoraries - the scholastic and activities elite. They look with skepticism on being set apart from their fellows, and thus express a sensitivity which is difficult for the "establishment" generations to understand.

The past two years have brought a great change in their perspective of activism as a means of accomplishing change. The threat of the draft and of premature death in a steaming jungle, when the cause was not clearly defined, was a direct and justified concern to young men and women. The plight of inner city blacks and other minority groups and their frustrated poverty, both as to means of livelihood in a wealthy nation, as well as the lack of an equal opportunity for education and accomplishment, has been dramatized vividly, and has been responded to with concern and with empathy.

Thus, events taking place off-campus often had a greater effect than those on-campus, and the student riots were an expression of the frustration of not being able to do anything about it. Most students caught up in the riots were those who had never had to work for self support, and the poorer the student, the less likely he was to be in trouble.

But the affair at Kent State marked a turning point in this pursuit. Students realized that violence can be counter-productive, and they are now turned off by physical violence. They have begun to find that they can accomplish so-called individual freedoms through normal channels. Some feel that they have turned off too much, that the comparative calm on our campuses is a sign of despondency, exhaustion and despair; that anything will work. The idealism of the young is laudable -

commendable- admirable; but the clash between idealism and pragmatism will be hard to settle - there are few simple answers.

Yet, what they have accomplished is truly remarkable. The lowering of the voting age to 18 with its attendant drinking permits; the relaxation of dormitory regulations to a point of non-existence; the admission to partnership and areas of responsibility almost equal to those of the faculty in the administration of university affairs; the right to vote locally in university communities, and being seated on city councils and university control boards would all have been viewed as out-right hearsay only a decade ago. At M.S.U. recently, students played a major role in voiding a proposed ten million dollar cross-campus highway project because of its attendant threats of pollution and to esthetic standards. Charges of air pollution by a single high school student resulted in the halting of burning thousands of dead elm trees, and a highly profitable wood chip industry resulted.

Today's student is more aggressive, more aware of his rights, more demanding of these rights, more impatient with insincerity, generally more polite, more completely educated, more healthy, and certainly more concerned for others than was his predecessor.

But, some of his gaps are astonishing!

As the NOW generation, they have little sense of history and scorn its study. They want to fight pollution and poverty, but have no understanding of the expense involved. They want to question and challenge the professionals without realizing that to do so effectively you must have the competency of a professional. They want to share administrative responsibilities without understanding how demanding of time, and indeed how boring most university committee meetings are.

After great and successful effort to gain seats, one M.S.U. department of 900 students cannot get ONE student to run for election to the departmental advisory committee. As professors, having grown accustomed to long hair and beards, and knowing that many who are thus equipped are fine young men, it is startling to visit the Job Placement Office on campus and to observe the absence of beards and headbands on men waiting for interviews. Most do not realize that maturity, judgment and wisdom come only with experience - not just because you reach a certain age.

A word on the "New Morality." Most feel that sexual habits haven't changed a great deal on campuses. Attitudes and frankness about the subject have changed dramatically on our campus since a comprehensive and professional colloquium was held two years ago. But, we see no evidence that numbers of students buying the new morality are much greater than 30 years ago. It seems that the twig is still pretty bent - or straightened - by the time they leave their homes.

The "communication gap" and the "generation gap" are indeed real. But, they always have been. I have puzzled over the term - "...failure to communicate" many times, because I have often felt inadequate in this area. On asking a student about this recently, I received a brilliant answer, and I shall no longer wonder what it means. He said, "I feel that the inability to communicate is when someone tries to convince me of something on which my mind is already made up."

Those of us who work closely with students are stimulated and challenged by them. It is a thrilling experience to be a participant in this important formative part of so many young lives. Our confidence in their ability to handle technical problems has never been in doubt, for they have the skills, the ambition, and the energy to do a better job than we did. But, those of us at universities know that with their sensitivity, their awareness and their concern, they also will do a more complete job of helping their fellow man than has yet been done in the history of civilization. So, we see sayingslike -

Have a nice day!
Make love - not war!
Try it - you'll like it!
Everything is different, but in true values nothing is different.
Let's hope it never changes.

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OUR SHORT COURSE ON CHEMICALS FOR TURFGRASS USAGE
Offered Jan. 17-21, 1972.

R. P. Freeborg, Post Doctorate
Purdue University

We are all aware of the present concern about environmental pollution, especially that pollution for which pesticides used in agriculture (including the turf industry) are supposedly responsible for. Because of this, potential pesticide controls are either with us now, or will be in the near future. Recent steps towards registration of pesticide applicators is only one move in the direction of control. It involves both oral and written testing of one's knowledge about available chemicals and ability to use them.

A recent report from Park Maintenance stated that Illinois is currently requiring registration of individuals who employ or directly supervise other people who apply pesticides. Licenses are required for custom and public applicators and operators. In Indiana, as of January 1, 1972, there is a new registration and restriction law. Under this law the new Indiana Pesticide Review Board has the authority to restrict sales and use of pesticides.

One example of the more extreme demands placed on one's knowledge of chemical pesticide use is found in Vermont. As reported by Farm Technology, January, 1972, 91 chemicals for pest control carry use restrictions on all or some formulations. Pesticide applicators and dealers must both pass a written and oral exam to obtain a license. Although this is an extreme example, it foretells the future. Certainly it points up the need for sources that will serve to educate pesticide applicators so they will be prepared to meet these new demands.

Thus, in answer to an obvious need for education, the Midwest Regional Turf Foundation offered, through Purdue's Department of Continuing Education, this short course entitled, "Chemicals for Turfgrass Usage." Thirty-seven registered and participated in all course work, discussion sessions, and tests. Yes, we had tests. Over 200 true-false questions were given. It was necessary that a grade of 65% or better be made in order to pass. Grades ranged from 93 to 66%. Attendance at all sessions was required.

Lectures were offered by qualified University personnel, as well as by industry representatives, who excelled in their respective fields. Meetings were scheduled in their respective fields. Meetings were scheduled as follows:

Monday	-	1:30 - 4:30 P.M., & 7:00 - 9:00 P.M.
Tuesday	-	9:00 - 11:30 A.M., 2:30 - 4:30, & 7:00 - 9:00 P.M.
Wednesday	-	do
Thursday	-	do
Friday	-	9:00 - 12:30 P.M.

There was a total of 27 hours of direct classroom contact. For that much classroom contact Purdue could offer college students two credits. On Friday certificates were awarded for satisfactory completion of the course work. Subjects discussed included:

- Wetting agents
- Growth regulators
- Fertilizers
- Herbicides
- Insecticide and rodenticides
- Fungicides
- Nematicides

Lectures were also presented on:

- Spray techniques and equipment
- Environmental pollution by pesticides - a scientist's viewpoint, and
- Introduction to pending legislation, and
- Problems related to establishment of controls.

Industry supplied spec sheets for 124 chemicals. From University Extension departments we received 30 manuals on weeds, insecticides, fungicides and plant identification. These were distributed to those in attendance.

Plans are now in progress for the second short course in 1973. Let this be an early invitation to you to attend.

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CHANGING TO TURF MANAGEMENT

William C. Brazeau, Senior, Purdue University

My purpose this afternoon is four-fold -

1. To tell you how I view Turf Management.
2. To reach the potential student with my remarks.
3. To emphasize that managing turf is only a small part of Turf Management.
4. To offer some thoughts and suggestions to the student considering furthering his education in Turf Management.

My situation was somewhat unique in that I was 26 years old, married, and had two children when I decided to change to Turf Management. This, however, worked to my advantage because I was able to look at the situations with more maturity than I would have, say fresh out of high school.

After several visits with superintendents in the area, I found Turf Management to have two dominant characteristics that attracted me to it. First, Turf Management offers a multitude of challenges. Second, Turf Management is extremely dynamic - changing every day.

Let us take a look at some of the challenges of the field. The Turf Manager must be knowledgeable in many fields. Turf Management is really Urban Agriculture, and contains enough subject matter and challenges for a couple of lifetimes.

1. You, as a Turf Manager, must be an Agricultural Engineer to best use or design an irrigation system, piece of equipment, or innovate as you do so well.
2. You must be an Ornamental Horticulturist and a Floriculturist whether you work with parks, golf courses, cemeteries, or highways.
3. You must have a thorough knowledge of soils and soil fertility through agronomic study.
4. You must be a plant protection expert. This demands that you have a good understanding of Entomology, Plant Pathology, and Weed Control whether you are working with turf, trees, shrubs, or flowers.
5. You are called on to be landscapers and landscape architects in varying degrees. This is, perhaps, one of today's biggest challenges in the Urban Agricultural scene.
6. Recent years have made you ecologists. This forces a review or gain of knowledge in chemistry, soil conservation with special attention to erosion, runoff and drainage. It has made us especially aware of the environment in general. It has demanded that we keep up with pesticide technology - this is an immense study in itself.
7. The Turf Manager must be a businessman in every sense of the word. He must have a working knowledge of accounting and record keeping. He must be an economist and be good in labor relations. Proper communication techniques cannot be over-emphasized. He must be a public relations man whether he is involved in local politics, or the selling, or promotion of a new product.
8. This list could go on and on, so it is not complete. It was long enough, however, to attract me. I believe the more the Turf Manager uses knowledge from these various fields the richer his life will be in accomplishments and financially.

The dynamic nature of turf is obvious to most of us here today. Everyday a new product, piece of equipment, irrigation system, or grass variety might be introduced. The fact that over 700 turf oriented people have been attending this Turf Conference each year tells me there are a lot of people interested in "what is new in turf." Proceedings from various turf conferences seldom repeat from year to year, and this is evidence for how fast this change is occurring. I think Turf Management is still in its infancy, and you and I have a lot to look forward to.

Finally, I have some comments for the student considering Turf Management. I have three important prerequisites for this student -

1. He must understand the challenges of the field and that the demands on him will be high.
2. He must realize the dynamic nature of the field, and that he will be expected to keep up with the changes.
3. He must realize that Turf Management is really Urban Agriculture and the responsibility is big.

If he understands this, and is still as enthusiastic as ever, I say he will have a bright future. The opportunities are there. The number of golf courses keep growing. The four day work week means more use of highways and recreational areas. Leisure time, more than ever before, is a large part of a person's life. This puts demands on landscapers, landscape architects. It puts bigger demands on research on the university and corporate levels. It increases the need for extension workers in the Turf Management field. Once research produces, the demand goes up for turf oriented people to promote and sell.

The costs of college are high - initially high and difficult to justify. One must spread this expense over a lifetime because he is really investing in the rest of his life by furthering his education. I feel it would be too bad and foolish not to continue with school because of being short a few dollars.

There are ways to ease the costs. Schools and Associations offer scholarships, grants and loans. For example, the Golf Course Superintendents Association of America (GCSAA) has a scholarship program well worth looking into. They have been very generous to me over the past two years. Sod growers and sod associations and universities have funds available for schooling. Your local lending institution will have government backed interest-free loans available to their customers in amounts up to \$ 1,000 per year. No interest is due on these loans while the student is in school, and no interest or payments begin until nine months after the student leaves school.

If the student takes the four-year approach (or even the two-year approach) to turf study he might find it cheaper to take some courses at a local college. The first two years of a four-year program can easily be completed at a local school. If the student maintains a "B" average while doing this, he should be able to transfer to any turf school in the country.

The student should try to pay all existing debts while still working and before he starts school. Here I refer to car loans, personal loans, and the like. He could prepay insurance policies and other fixed expenses so as to lighten his monthly financial obligations while in school.

Part-time work (and part or full time work for the spouse) is available from or around the university while the student is in school. So, do not let the costs scare you away. There are ways to ease the way.

In conclusion, I want to say the Turf Industry can always use top people. You, as turf-oriented people, are in the best position to recognize interested and talented individuals. You are in the best position to get them started on the right foot. The universities and the practical experience gained through your summer employment programs will do a great deal to develop the student. By changing to Turf Management I feel I have made a good decision. It should be an interesting and challenging life and, therefore, very rewarding.

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EXPANDING RESPONSIBILITY AND AUTHORITY

My Experience

James W. Brandt, Supt. - Mgr.
Danville Country Club, Danville, Ill.

How many of you golf course superintendents can truthfully say - "My sole responsibility is for the care of the golf course?" In most every instance, you will find the golf course superintendent may be responsible for one of the following:

1. Golf cart fleet
2. Club house grounds including flowers and landscaping
3. Club house building, pro-shop building and grounds.
4. Club heating plant
5. Club roadways and entrances
6. Tennis courts
7. Swimming pools - cleaning and maintenance of equipment
8. Curling rinks
9. Ski jumps and/or snow mobile trails

There are many other areas of responsibility that the golf course superintendent may have been required to assume. If you have done any of these and not received additional monies for the newly assumed responsibility, then you have been guilty of selling yourself short.

Since Dr. Daniel has asked for case histories, I will proceed to give you my case history at the Danville Country Club. I was hired as the Golf Course Superintendent in March of 1953. At the time of accepting the position, the grounds chairman told me that in addition to being in charge of the maintenance of the golf course, I would be responsible for the following:

Two complete water systems, one for the golf course and one from a deep well for the club house. (These both proved to be woefully inadequate. At the conclusion of the first season I told the grounds chairman that we must change water systems or change golf course superintendents.

In charge of a coal fired furnace for club house heating. Tennis courts, club house building - outside structure only. Swimming pool. As a golf cart fleet was added in later years, I was given the responsibility of maintaining a 40-cart golf cart fleet.

As far back as 1960, the Golf Course Superintendent was making more in salary than the club manager. This proved to be a great bone of contention to the club managers as they came and went.

In March of 1965, when I returned from the Midwest Turf Conference, I had a note to call the club president. I made the call and the president informed me that a committee would like to meet with me. I had no idea as to what the meeting was all about. I was somewhat taken back when without any prior knowledge of what was to take place, the president said that the board would like for me to take on the responsibility of club manager, as well as remaining as the golf course superintendent. He gave me the following reasons:

1. We think that you are the finest golf course superintendent in the country. We are afraid that we will lose you to some other club. If you will agree to do both, then we think that we can make it attractive enough that no other club will be able to hire you away.
2. The membership knows you and will want you to succeed.
3. You have had all the responsibility other than the food and bar operation for some time. We do not expect you to ever become a chef or bartender, but you will have the responsibility of hiring same.

I asked for a week's time to make the decision. At the end of the week's time, I agreed to take the added responsibility under the following conditions:

1. I would have complete authority to hire or fire any club employee with the exception of the golf professional who was under contract to the Club.
2. The function of the various committees would be relegated to the proper function of being a policy making committee rather than being involved in Club operation. I knew that it had been past procedure for the house committee to hire the club house personnel. It then became the very difficult task of the club manager to try to work with these people.
3. The Club would adequately compensate me for the additional responsibilities.

All conditions were met to the satisfaction of both parties, and I became superintendent-manager March 16, 1965. Now that I have held both positions for seven years and look back, what has been my greatest challenges, problems, and satisfactions?

I really think the greatest challenge is to convince other members of my chosen profession -- that of being a golf course superintendent; that I can fulfill the responsibilities of both professions adequately at the same time. No one questioned my ability when I had complete charge of six golf courses. I believe that one does not question the ability of a superintendent who may be in charge of 36, 54 or 72 holes or more of golf course. How can you take care of a 9-hole or 18-hole golf course? You cannot do it by yourself. The success of anyone's operation has to be in the area of recruitment and training of help. You must both delegate authority and responsibility. This is what management is all about, whether you are managing a golf course, club house, or manufacturing plant.

The problems that I have encountered have been in the ratio of about 10 to 1 - the 10 times great problems being with Club employees as opposed to having few problems with the membership. How do you handle a grounds employee who is operating one of the new riding greens mowers, fails to notice a hydraulic leak, and runs all the oil out of the system in a perfect pattern on your 18th green that can be seen from the dining room and men's grill? How do you handle a waitress who inadvertently dumps a tray of food on the head of the house chairman?

One thing you must do is to budget your time. You must set aside two or three times per day to check on your golf course. You must alert the membership that you have definite hours when you will be available to consult on parties, wedding receptions, etc., and most importantly, you must set aside time to be with your family.

Our table of organization of the Club designates responsibility in all areas. The Assistant Manager is answerable only to the club manager. The Chef is in charge of buying for the kitchen, the Head Bartender buys liquors and bar supplies, the Assistant Manager buys all additional Club supplies. Controls are exercised by doing a complete financial statement each month with complete inventories, and a complete profit and loss statement along with percentages of cost on food and beverage sales. Another definite aid is that there are no cash sales for any food or service of the Club. This greatly reduces opportunity for theft or misuses of income from sales.

The bookkeeper serves as office manager and is responsible for the complete set of books. An independent auditing firm is hired to audit the books. The hostess is responsible to the Assistant Manager, and she is in charge of the waitresses and bus boys. The Assistant Manager is responsible for cleanliness and overall appearance of the interior of the Club. The foreman on the golf course is in charge of all work assignments. I hire personnel, but all golf personnel know that the foreman has the authority of discharge of any grounds employee. We believe that we have all facets of the operation and areas of responsibility designated.

The greatest frustration that a superintendent who becomes manager can have is in the job satisfaction. As a superintendent it is easy to see the results of one's endeavors. As a manager the results are abstract rather than something visible. You can do a party, or a wedding reception beautifully, and in four hours the Club can look as though it is a disaster area.

My greatest satisfaction has been in the things that we have been able to do on the course since I have taken the dual role. Our equipment is new and the finest obtainable. We have a completely automatic irrigation system. We have a new maintenance building containing 6,000 sq.ft. that is under construction.

Now, the great question is - if you leave the Conference and are approached, or

have been approached by your club to assume additional responsibilities of club house management, what should your answer be? I firmly believe that if you are a top superintendent you can handle the additional responsibility. The salary increase, as well as your complete areas of responsibility, should be defined.

Budget your time, surround yourself with competent employees, be in complete authority, then success in both fields can be yours.

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LET'S GET INVOLVED

David Harmon, Director of Recreation
Williamsburg Inn, Williamsburg, Va.

It is indeed a pleasure to be back at Purdue, where I graduated, after a ten year absence. I would like to talk to you about my favorite subject - advancing the golf course superintendent - out of the barn - into the club house. Each golf course superintendent may have the desire and ambition to some day manage an entire golf operation in addition to just maintaining the golf course.

Since many of you have a college degree or the equivalent, you certainly have the ability to pursue a career in this area. It makes much sense to me! Since the condition of the turf determines the daily operations, a golf director who is a superintendent will have fewer problems in daily management decisions. The modern golf course superintendent can handle the complete job efficiently with a little hard work and a well-organized staff.

Many of the new resorts now opening are following this practice of using trained superintendents as directors. Examples are found in Florida, Virginia and the Myrtle Beach, S. C. areas. Here golf professionals are being put on a retainer and work under the Director. The owners now control the income from all sources - the pro shop, food operation, green fees, and golf cars.

Now, let me take a moment to tell you of the events preceding my becoming a Golf Director. After graduating from Purdue's Turf Management program in 1962, I accepted the job as golf course construction superintendent for a new housing-golf project in Southern California. With the completion of the course, I moved to Portsmouth, Virginia, as construction superintendent for the golf course architect, Arthur Jack Snyder. During the construction of the Cedar Point Golf Course, I was hired by the Club to remain as superintendent. This is where I worked for seven years before moving to Williamsburg, Virginia, as Director of Recreation for Colonial Williamsburg Foundation.

As Director of Recreation for this 18th Century Historical Resort Town, my responsibilities expanded to involve not only the maintenance of an 18-hole course, "The Golden Horseshoe," and a 9-hole course, "The Spotswood," but also two **swimming** pools, 6 tennis courts, a fleet of 70 golf cars, the golf clubhouse, which includes the locker rooms, grill and company-owned sports shop, a special croquet court, and two official lawn bowling greens. To handle these activities my staff includes a clubhouse manager, two golf professionals, a tennis pro, two lawn bowling pros, an assistant golf course superintendent, and a pool manager.

During the peak of the season it requires over 60 employees to handle the guests visiting from our hotels and lodges. In order to supervise such a large

operation, it is necessary for exact organization and communication among my managers. To help facilitate this, I use devices such as the ordinary telephone, G.E. two-way radios, continuous weather receiver, two-way private telephone lines between my office and the tennis courts, pools and golf car building, staff meetings and regular employee meetings. Each of my managers is responsible for the employees in his area with only the managers reporting directly to me daily.

Education of individual employees is a very important part of my overall program. Therefore, I see that each qualified employee attends every seminar, convention, or trade show that pertains to their specific job. For example, in 1971, I attended the P.G.A. Merchandise Show in Florida, Mid-Atlantic Turf Conference in Baltimore, G.C. Supts. Conference in Denver, Charlotte, N.C. Merchandise Show spring and fall, and O. M. Scotts Virginia Turf Seminar, plus local and regional turf conferences.

I also see that each manager has every available trade magazine for his personal use. Appropriate films are shown to employees throughout the year during our employee meetings. These films are available from the U.S. Golf Association, National Golf Foundation, and other private sources. Many of the films help to illustrate the proper way to do the job for the employee.

Now, take a tour through Williamsburg and the Sports Facilities available to our guests.

In 1926, Mr. John D. Rockefeller, Jr., became interested in the preservation and restoration of eighteenth century Williamsburg, and therefore devoted his personal attention and resources to the fulfillment of this goal.

The purpose of Colonial Williamsburg, a non-profit educational organization, in the words of the Board of Trustees, is "to re-create accurately the environment of the men and women of eighteenth-century Williamsburg, and to bring about such an understanding of their lives and times that present and future generations may more vividly appreciate the contribution of these early Americans to the ideals and culture of our country."

Williamsburg was first settled in 1633. An early street, the Duke of Gloucester, was laid one mile long from the Capitol building to the College of William and Mary. Today along this street over 88 buildings have been restored for public viewing. The street is 6 poles wide, or 99 ft. in width. Over 1 million people toured Williamsburg in 1971.

In this early capitol of Virginia, from 1699 to 1780, a remarkable body of men grew to political maturity, including George Washington, Patrick Henry, and Thomas Jefferson.

The Governor's Palace was built in 1720 under the direction of Governor Spotswood. Fire destroyed the building in 1781, but was reconstructed in 1930. It was the elegant residence of seven royal governors, then of two state governors, Patrick Henry and Thomas Jefferson.

The Wren Building, the original building built in 1694, is the oldest academic building in English speaking America in continuous use. The Raleigh Tavern was the most famous, and dedicated to Sir Walter Raleigh.

The Printing Office on August 6, 1736, made the first issue of the Virginia Gazette, the oldest newspaper in the colony. The same paper is still in print today in Williamsburg as a weekly. 25 other eighteenth century Colonial trades are performed in craft shops throughout the town.

The original building of this site, Christiana Campbell's Tavern, was known in 1765 as a tavern that offered accommodations and meals. Chowning's Tavern was first opened in 1766, served a lesser clientele. King's Arms Tavern specialized in traditional southern dishes, such as Virginia ham, fried chicken, scalloped oysters, roast beef, Sally Lunn bread, and was the most elegant of the taverns.

Williamsburg Inn is a modern hotel of 175 rooms, designed after the manner of resort architecture of the early nineteenth century. The Motor Inn, Lodge, Conference Center and all are connected by a free bus system. My office is in the Golf Clubhouse. The Clubhouse Grill served over 40,000 lunches in 1971 - 34 inside seats and 34 outside seats in season.

The Sports Shop has three fulltime sales clerks. We think female employees are better with customers. 35,000 rounds of golf were played in 1971. One of our Lawn Bowling greens is Penncross bent, and one green is 328 Bermuda. Over 2500 guests participated in 1971.

Today it is said there are as many tennis players as golfers; therefore, 6 new courts were built in 1971; 2 Har-Tru courts and 4 cork carpet courts at a cost of courts \$ 11,000 each. Automatic sprinklers on simple timeclocks on the Har Tru courts has eliminated night labor.

Swimming pools are a very important part of any recreational complex. 25,000 persons used our two pools in 1971. One pool is heated for cool weather swimming. We open April 16 and close October 31.

Rental of golf cars is a profitable business today. 70 Club cars are owned by C.W. Tee to green continuous cart paths permit use of cars in wet weather. We use three full-time mechanics. 1971 gross income was \$ 90,000.

G.E. two-way radio - same as police use. Three in use on golf course.

Spotswood Golf Course is an executive 9-hole, par 31 couse, with 1 par-5, 2 par-4's, and 6 par-3's. Built during the 1940's.

Golden Horseshoe Golf Course was designed by Robert Trent Jones in 1963. C-7 bent greens, 419 Bermuda tees and fairways, Ky. 31 fescue roughs. Course measures 6,743 yds., par 71. Has 5 lakes and 52 sand traps. Budget for 1972 of \$ 135,000 with a crew of 1 assistant, 1 mechanic, and 16 gardeners. It has a semi-automatic irrigation system. We have a leaf problem as no-burning laws create problems. Mr. Rockefeller requested the surroundings of the course be left alone with no buildings or roads boarding the course.

In summary, Let's get involved - seek opportunities for using your abilities!

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EXPANDING RESPONSIBILITY AND AUTHORITY

Richard B. Craig, Supt.,
The Camargo Club, Cincinnati, Ohio
Jack Nicklaus Golden Bear Golf Center, Mason, Ohio.

Expanding the responsibility of a golf course superintendent to more than one golf course is really no big thing. It is basic to appreciate that it would take the superintendent of an 18-hole course more time and effort to plan, program, and organize an 18-hole operation than if he only had 9 holes. The same thing is true on

up the ladder - 36 holes over 18, 54 over 36. The more holes or responsibility there is, the more time and effort must be taken away from physical work, and time and effort spent on supervision, planning, programming, etc., or let's call it managing. So what I am saying is - that to be a superintendent on two or more golf courses, the man just needs to apply himself - he has to spend proportionately more time managing, more time in training personnel under him, and then delegate responsibility to capable people in his organization, letting someone else make the hour by hour decisions and adjustment of working personnel and equipment.

The title of this part of the program, "Experience in Expanding Responsibility," is a little premature for me because I have only been in this situation six months, and all of these months have been in the winter, so the experience or test of my ability to organize and plan, etc., is to come. However, I can mention how I am trying to organize myself to accomplish this expanded opportunity.

It was realized that having a capable and qualified assistant on each course was imperative and agreed upon by both courses involved. No way can anyone take on a double responsibility without having competent people to whom they can delegate some of the responsibility. No way can one man be two places at once, so again there has to be a person on the course at all times that can answer the hour by hour questions, and adjust and manipulate the available manpower and equipment. So, the responsibility of handling the men, scheduling of their working hours, planning their jobs from day to day, training, supervising their work, and the maintaining of all payroll and personnel records was delegated to the assistants. In addition, they are responsible for use, operation and repair of irrigation system, and the accomplishment of the agronomic programs.

The hiring and firing of labor, the development of our programs - fertilizer, fungicide, insecticide, herbicide - we do together. In addition, we sit down and plan together for the coming week and month what works needs to be accomplished, and discuss the best way to accomplish this work.

This leaves me with the responsibility of all purchasing, budgeting, and all the records therein, the instructing of the assistants, review of the next day's work schedule, coordination and communication between golf maintenance and the other course departments - Club house Manager and Professional - the inspecting and critiquing and overall supervising of each maintenance operation.

The hardest thing for me to do is to put my thoughts and experiences into clear communication with assistants, keeping the orders or procedures simple, yet complete enough so there can be no misunderstanding about what is meant or how to do it.

An area of management that I feel I'm not doing a very good job is in motivation of my personnel. Even though the assistants handle the men from day to day, I feel it is important that I keep a working contact with the men. I'm not finding, or better not taking enough time each day to talk to a few of my employees, giving them the praise and personal acknowledgement of the good work they are doing, taking time to explain the meaning or reason for the job that they are doing. This I know will give us a more stimulated group of employees, each doing his job with a desire of doing it better, collectively pulling them together into a team to produce the best possible golf course.

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EXPANDING YOUR AUTHORITY

Charles Hedges, Hunting Creek C. C.,
Prospect, Kentucky

There are various ways one can expand their authority. For example, you can go from a 9 to 18, to 27 holes, or more. You may prefer to choose the route I have taken, going from a Superintendent to General Manager. You will have to bear one thing in mind, that each time you expand your authority you are also assuming more responsibilities, and let's hope you are also expanding your salary at the same time.

I had one thing in mind when I assumed the position of General Manager at Hunting Creek Country Club. I wanted to prove that I could do the job, and so far have proven my point. This is by no means the end of the line for me. As for being a Club Manager, I would not prefer the job as a lifetime profession.

Instead of elaborating on the last seven to eight years, I would like to point out a few things that might save you some trouble or grief, although there are no two clubs, or two jobs, or two personalities alike. Say you are assuming the responsibilities of a General Manager. This puts you in a whole new ball park.

In assuming charge of the overall operations, you'll have to give a lot of consideration and work extra hard with food and beverages. As I pointed out earlier, you're expanding your authority, assuming more responsibilities, and if you are thinking of moving up and hoping to get by on a 40-hour week, then I would suggest you change your mind right now. As for any individual desiring to do this, this is strictly up to himself because only he knows his capabilities and how far he is able to go.

One of the problems was I found a little resentment from some of the members in the fact that a greenskeeper (as they refer to us) could possibly take over the duties of their club. The other one that really surprised me is that you have some resentment from your club personnel. They have a tendency to feel the same way - where does the golf course superintendent get the knowledge that he can come in and take over the whole operations and succeed! Well, you really have to convince them that you are capable, that you are the man for the job, and that you can do well. You have been there awhile as superintendent, and you are fairly familiar with the overall operations.

But, the whole thing - even as a superintendent - is that you have to make yourself known. You have to make yourself presentable; that everybody on your course knows their superintendent as "so and so." I've heard superintendents complain - if he wants to be known he's going to have to make himself known.

The superintendent will have to put across either in his dress, or his attitude so the members will know who he is when they see him. The better you have sold yourself as a superintendent the easier it is going to be to sell yourself for expanding your authority. We spend a great amount of money each year with the National Golf Course Superintendents Association to give us publicity, but I don't think they can ever give each individual the publicity he needs. He's going to have to get up and get known.

I would like now to do a little selling job here as for a Superintendent going from that position to General Manager. I think he is probably as capable of doing this as a Club Manager would be. You are already a manager for your golf course, managing maybe \$ 100,000 a year, so now you'll be managing maybe a half million a year.

Now, I'll admit that I have had some very hectic and tiring days in the past two years since I assume the responsibilities of Hunting Creek, but I would do it again tomorrow. In fact, right now I'm very excited and waiting for the next move. Like I said earlier, I have no intentions of being a club or general manager the rest of my life. I doubt very seriously if I would end up working long enough at one place to receive a 20-year gold watch, but believe you me I am very excited right now anticipating another move, and expanding my authority even that much further.

Editor's note: Mr. Hedges moved to: Diamond Head Corporation, Mountain Side, N.J., April 1.

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HOW TO PROMOTE AND NOT TO PROMOTE GOLF

Ted McAnlis, Pres., Briarwood Golf Course
Broadview Heights, Ohio

The subject of promoting golf has two aspects: promoting golf in general, and promoting one's own golf course. On promoting golf generally, a great job is already being done for us, by television for example. Sunshine and green grass cannot have more appeal than it does when one is trapped inside the house during a howling snowstorm while watching the pros on T.V., basking in sunshine and warm temperatures, beating the ball with such ease from tee to green. This has to make the game of golf look attractive, and must do quite a bit to promote it.

Then, the players themselves, from the enthusiastic weekend hacker, to the plus 2 handicapper, do a lot to promote the game. Their enthusiasm, their endless discussion about it, their badgering others to give it a try, help to bring a lot of new players into the game.

Then, the National Golf Foundation does a fine job in promoting the game by assisting the prospective golf course owner, and by encouraging municipalities to build courses. Now several of us, who own and operate public golf courses hopefully for a profit, have at one time or another cringed at the thought of the tax-free government-owned and operated golf courses because they are hard to compete with. However, the municipal or park course isn't all bad. The low green fee, which usually prevails, makes it easier for new players to try the game. It is only when municipality or park board begins to act like they are General Motors, grabbing off choice land, building golf facilities with reckless abandon, inundating an area with golf holes until the private operator is forced to build houses, or grow corn on his track, that the government operation gets a little hard to take.

After all, a quick check of National Golf Foundation statistics show that the private entrepreneur and not the government has answered the call for additional golf facilities. Without the private operator of public golf facilities, there would not have been such a golf boom because there would not have been enough places for the new golfers to play.

With all this and other promotional activity going for us, where can the individual operator get involved in the general promotion of golf? Over the years, I have been forced to the conclusion that providing a practice area and lessons for new players is an important part of the golf operation. And, it does not have to be a free practice area - a self-supporting driving range is actually preferable to the

traditional free practice area because players don't have to furnish their own practice balls, and, of course, it can even help the profit picture. This is one area which was relegated to secondary importance when Briarwood was built, and that was a mistake.

And lessons! I know several people, my own wife for one, who will not go out on a golf course for fear of embarrassing themselves by their lack of ability. Yet, in our area the opportunity for taking lessons is nearly non-existent. I also believe that inexpensive group lessons help promote the game, especially for juniors, women and even retirees. Then, take an interest in the new golfer, and if you have a teaching pro, have him give out with a few free tips - they will not detract from the lesson business.

Promote junior golf. Help the local schools with their golf program if you can. At Briarwood, we have had as many as three high schools and two colleges using the course for practice and home matches. And, I do not advocate giving the golf away. I don't believe it is necessary or even appreciated many times. We arrange for the boys to practice at half price, and the schools pay half-price for matches. For our colleges we arrange a flat fee for the golf season of April and May.

Promote women's golf! Although our long water carry from a down-hill lie on #18 has turned off a lot of lady golfers, our nine-hole ladies group grew from 20 to 75 in three years. Many of the ladies had never touched a club before joining the league. Also, the ladies will do the work for you. After I had started the league and ran it for one year, the ladies took over and built it into a very successful operation.

Promote retirees' golf! We have neglected this approach at Briarwood, but I believe it has potential. My father-in-law, recently retired, had not played golf for 40 years. I got him a set of clubs, he moved to Florida and plays golf almost daily.

Everything the owner does for the general promotion of golf will do even more for the promotion of his own golf course. Another area I feel is important is speeding up play. Many people have told me that they have given up the game because it takes too long to play. A concerted educational effort on the part of everyone in golf is needed. We have adopted a double-starting time (wave) system on weekends to help speed play with the result that an average of one hour was sliced from the time for a round. The system takes a great deal of attention and enforcement to make it work.

When it comes to promoting one's own course, I suggested the title - "How not to do it" - to Dr. Daniel because I've had so much experience on that subject. I have tried a lot of ideas, and a great many of them have gone floppo.

Some special promotions that we have tried:

2 for 1 - A local golf newspaper ran this promotion for weekday play. About the only coupons we got in were from people who would have been out playing the course anyway.

Weekend P. M. Club - To promote weekend afternoon play we offered a \$ 60.00 card entitling the player to unlimited golf after 3PM on Saturday and Sunday for the entire season. After advertising it in the local papers for several weeks, and posting signs in the clubhouse, we sold a romping-stomping total of five.

Weekend couples league - Another promotion for weekend afternoon play. While several couples signed up, attendance was so irregular that the league folded after one month.

Weekend special - For a nine-hole fee after 3 PM on weekends, players can play as many holes as they like. A few doctors and a couple of kids took advantage of this last year, but we aren't giving up on it quite yet. This year we are considering including the riding car in the deal.

Handouts - When Briarwood first opened we had handouts printed and I sent a couple of the boys from the maintenance crew up to the entrance of the nearby city course to hand them out to golfers going into the parking lot. This approach did bring a few players over who did not even know we existed, and it also went a long way toward improving our relations with Mr. Rini, the Superintendent-Manager of the city course, who even went so far as to accuse us of closing his entrance gate on one busy Sunday morning, thereby causing many of his golfers to go elsewhere. Needless to say we would certainly not have indulged in any such chicanery.

The Coupon deal - for 16 weeks we advertised in a trade paper that "This coupon and \$ 1.00 will entitle the bearer to 9 holes of golf." In 16 weeks we redeemed about ten coupons.

The Fourth of July Special - This one may actually have worked. We advertised weekday rates for our first Fourth, including the entire preceding weekend. Turns out it was our busiest weekend to date. This was during the first year we opened.

To make a long story short, I soon decided that the best way to promote one's golf course is to provide a nice golf course. No other form of advertising does as much as a golfer telling his buddy that he liked Swampy Links - give it a try!

One other tough lesson I had to learn, and still have to struggle with - DON'T GET MAD AT YOUR CUSTOMERS! Earl Crane, a few years back, handed out some scratch pads at the top of which was printed - "Isn't it a beautiful day friends - just watch some bastard louse it up." This seems to be a frequent occurrence on the links, but even when you have to throw someone off your course, I believe it is better to say in a soothing manner, "I'm sorry sir, but I am going to have to refund your money," instead of yelling - "Get the hell off the golf course!" And, when a player accosts you with the likes of - "You dirty SOB, take your lousy course and go to H---!" - my advice is to smile sweetly when you reply "UP YOURS!"

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HOW TO PROMOTE GOLF IN 1972

Dudley Smith, Supt., Silver Lake Golf Club,
Orland Park, Illinois

In 1970, at the National G.C.S.A.A. Conference in Houston, I addressed the group on the problems of maintaining a heavily played golf course. One statistic I mentioned was that 91,000 people bought green fee tickets at Silver Lake in 1969. In this past season, 1971, that figure rose to 101,600. For the same period, weekend and holiday golfers only increased from 28,000 to 29,000. Thus, I would assume that our course is operating at capacity on weekends. Allowing that the weekend golfer must wait on every shot, and that this pleasure will take 5-1/2 hours of his time, the poor fellow teeing off at 2:30 will either be devoured by mosquitos, or dampened by the sprinklers as he totals his score in the moonlight.

Why then promote golf? Don't we have a captive audience?

The answer is that COMPETITION demands it. The semi-private golf courses in the Chicago area are this country's finest. If I can provide a neat golf course with good turf, then I am doing my job. When the parking lot is full, I have more money with which to make my job easier. Improvements like cart paths, replacing diseased elm trees, resodding tees with superior varieties of grass, rebuilding out-dated Poa annua greens, updating my machinery would be impossible without that green-fee income. If it is not raining and our parking lot is empty, I better look at the golf course in a hurry to determine why.

Silver Lake golfers are not steady customers because the dining room served a great cheeseburger, or the bartender had a fabulous personality. They enjoyed the golf course better than the last course they played.

The figures in my operating budget are staggering. 1971 exceeded 1961 by \$ 100,000. This is our advertising, this is our golf promotion, returning the dollars into the golf course from whence it came. When I overhear comments like: "aren't these fairways beautiful," or "that has to be the largest green I've ever seen," or "I'll bet that hole they're digging is a new lake. Wow, this place is tough enough already," then I surmise that we are promoting golf in the right direction.

We cater to golf outings on our North Course only. The regular golfer, our "bread and butter," will leave in disgust if he finds both courses monopolized by a tournament. We have many high school, collegiate, inter-city matches on the North Course, but the South Course is always available for your phone reservation. I feel being branded a "tournament" golf course is a detriment to encouraging golf play.

Working at a daily fee enterprise, and trying to treat each dubber as a desirable customer, taxes one's patience. The women want the boys to wear shirts; the men insult their long hair. "Can't that machine be turned off while I'm putting?" "Why do you always water with hoses the day that I play?" The employee that cracks and verbally attacks the golfer must be discharged, or all our golf promotion just went up in smoke.

Silver Lake is in the midst of a population boom. At present newspaper ads, pro-shop discounts, special green fee concessions, etc., are unnecessary. The golfers are here and the best kept golf courses will lure them. Send me more of your tense and troubled business men to play eighteen holes, and I'll try and send them home smiling for supper.

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GOLF PROMOTION - MY IDEAS

Bill Lyons, Jr., Lyon's Den Golf,
Canal Fulton, Ohio

Maybe something I say will cause you to think of some past experiences that helped make you a successful business owner or operator. Maybe you will even pass them along to the guys in the room like myself.

Profit's not a dirty word, and money is the name of the game. We greet our customer before he leaves the highway to enter Lyons Den Golf Course with the feeling that this is a nice place. Flowers broaden the parking lot, adding warmth and

a personal touch. Think about this for a moment: A grave yard with stone monuments is a cold sight, but add a few flowers and it does something - you tell me. More flowers around the clubhouse add beauty and color to what would otherwise be a white, oblong structure.

Greetings inside the clubhouse are made with a very personal touch. Call the customer by name, shake his hand, and ask about his well-being, the family, etc. BUT MAKE HIM FEEL IMPORTANT!

We are a play-pay golf course - NO MEMBERSHIPS. Advertise? Sure we advertise; in fact, we have over 3000 different advertising agents - walking, talking, living advertisements - OUR CUSTOMERS. You're thinking, "Advertising costs money." Sure it does and we pay it with a smile. Play ten rounds and get one free, a 10% dividend -- not bad.

We also try to promote golf by a well maintained course. Greens are mowed every day, tees every other day, fairways are mowed every other day, and roughs every third day. Ballmarks are removed from greens every day before mowing. Cups are changed every day, and sometimes twice a day, depending on the amount of play. Regular mowing keeps playing conditions at their finest.

Flower beds as well as flower accents are scattered over the entire golf course. These are used to add color, and/or break the monotony of otherwise just another grassy area. The ninth tee has a large triangular-shaped bed the entire length of the tee. Crocus, daffodil, tulip and hyacinth bulbs planted in the fall add beauty in the early spring. After these are done blooming we plant red geraniums, white petunias, red salvia, and red cannas. The functional and esthetic value of these flowers cannot be measured in dollars and cents. Just what value flowers have in promoting golf I'm not sure, but I can tell you that even our most calloused players notice them. A couple of years ago we did not plant the large bed by the ninth tee and even people we thought could have cared less commented - "What happened to the flowers?"

Another little trick we use to promote golf is to keep our equipment in good repair and nice looking. "Paint and putty deceives the devil" a used car salesman once told me. Every winter we go over all equipment - mowers, tractors, tee benches, ball washers, flag poles, sprayers, fertilizer spreader, in essence everything. WHY? Well, 3 reasons, 2 of which are or should be obvious -

1. To make needed repairs.
2. To make sure each piece will do what it is supposed to do when you need it in the middle of summer
3. A coat of paint will make each piece look nice and new.

Use bright colors, something your wife would never paint the living room at home. Don't let beat up, bent up, rusty equipment distract from the beauty you've spent manhours and monies to create.

When working on the course don't be afraid to spend a few moments talking with the customer, or wave at him from the tractor seat - again anything to make him feel like an individual and not just another golfer. People like to be noticed and made to feel important. The more you make people feel welcome, the greater the chances that they will be back to play your course again and again.

When the golfer leaves the course it is very important he leave with a positive attitude about the course. Don't have him leave muttering such things as -

1. Hot aching feet and burned out fairways, or
2. Couldn't tell the ball from the dandelion seedheads, or
3. With all that green slime on the lake I couldn't see the water let alone the ball, or
4. Roughs are supposed to be rough, but that is ridiculous.

You can be sure that he will think long and hard before he returns if this happens, and you will have just put the kabosh to your efforts to try and promote golf.

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GOLF PROMOTION
Comments and Conclusions

Ariel C. Hunt, Ass't. Park Supt.,
Evansville Park Dept, Indiana.

I have really not given much thought to golf promotion, but rather the promotion of a healthy, well-groomed turf. It has been my experience that more golfers will play the game on the course that has the best greens, tees and fairways - in that order.

On our two 18-hole golf courses in Evansville there is a dramatic correlation between the amount of revenue, and the planned and not planned maintenance of the course itself.

In 1969, Golf Course "A" was renovated. All the greens were rebuilt according to U.S.G.A. specifications, and was only open part of the year. The revenue representing only greens fees was \$ 32,000. In 1970, a program of maintenance was carefully followed and the revenue rose to \$ 54,419, or an increase of some \$ 22,000.

In 1971, the program was intensified - remarks were made that the course was better than it had been in 20 years. The revenue in 1971 was \$ 78,679, or an increase of over \$ 24,000! The revenue was more than the course had ever produced in the history of its existence.

On the other hand, Golf Course "B", which did not follow the good maintenance plan and whose public relations was something to be desired, gave a different "dollar" picture.

In 1969, (the course was open the entire year), the revenue in greens fees was \$ 40,753. In 1970, \$ 59,021, an increase of \$ 18,000+. In 1971, \$ 53,844, a decrease of \$ 5,000+!

There are two main areas that promote golf:

1. One must have a well-groomed course with healthy turf
2. Public relations must be good.

The Pro on the course must be friendly and understanding. He should give lessons and see the course has good playability. He usually is the person who hears the golfer's grievances, and can correct them or pass them onto the superintendent. Technical questions raised by the golfing public should be answered by someone who is knowledgeable in the establishment and maintenance of turf.

Finally, if your course has reached its capacity, one must still promote golf by good sound maintenance practices. After all, we want to at least keep the golfers we already have!

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STERILIZING SOIL WITH ANHYDROUS AMMONIA

Wm. E. "Bill" Lyons, Lyons Den Golf, Inc.
Canal Fulton, Ohio

Dr. Ray Keen, Horticulture Department, Kansas State University, introduced us to the experimental work he and his staff had done with Anhydrous Ammonia last year at the Penn State Turf Conference "Cheese-Bar".

By applying 500 lbs. of AA (400 lbs. of N) on the surface to an undisturbed buffalo grass pasture that had become very weedy, he had gotten a sterilization effect 2" deep. They killed many weeds that were resistant to herbicides. The buffalo grass healed over the area, picking up the residual N for increased growth. In the greenhouse seeding was done 24 hours after AA sterilization, with 100% results.

This method appealed to Lyons Den owners because it has many advantages to offer. It is an ideal method where spring turf seedings must be carried out. Next, it will supply all the nitrogen the plant needs for one season at a cost of only \$ 21.00 per acre for AA.

After ten years of hard usage, our turf has been weakened with diseases, and vegetative bents have become a problem in the bluegrass fairways. The AA program looked to us like a method to sterilize the old turf - at the same time keep the course in play while introducing a superior strain of bluegrass vegetatively. (This will be described by Mr. Ben Warren in his talk - "Pennpar and A-20."

With no experience with AA we tackled the job of building a practical unit that could safely apply the material. This train, so to speak, called for a 3-plow tractor, 1 anhydrous ammonia pressure tank, a steel chamber unit 10 ft. wide and 6 to 8 ft. long (into which the AA is released), and last a 50 ft. long skirt made of poly-vinal chloride to retain gas at the surface until absorbed by soil.

Dr. Robert Miller, Ohio State University, helped us with our test run. He applied grass seed, and before it had time to absorb soil moisture, the ammonifier was passed over it. He took seed to the growth chamber and his results showed a 95% kill.

The prepared seedbed had optimum soil moisture for working and planting. All spring growing surface weed seeds were killed 100%. The deep-rooted bind weed produced new crowns at a 2 to 3" depth and grew very well, as did dandelion and dock. These were no problem in turf as they can be eliminated with herbicides. Quackgrass was not encountered in the test plots.

We experimented with the same rate of AA in a heavy stand of bluegrass very close to overhanging trees. Turf was killed, but no damage from the little gas that escaped to the trees. The bluegrass rhizomes recovered. We plugged in a small area of A-20 bluegrass. In spite of work being done, on June 9 the plugs all survived and began putting out new growth.

The 10 year old turf had a heavy thatch 1-1/2 to 2" thick. This acted as an absorber for the AA. Some crabgrass came into a very heavy thatched corner of plot. Where thatch was thin, no noxious seedlings appeared.

Much work remains to be done to modify the test machine. We learned tha AA comes into the steel chamber at 28° below zero. It must be brought up to air temperature quicker than we did with test machine.

How will we overcome the thatch problem? How much more AA might it take under certain conditions? We don't know yet. We are hopeful that a research team from a university might lend us a hand to further man's knowledge of a most promising turf renovating technique.

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DREAMS AND REALITY
In Golf Course Design

W. Bruce Matthews, Golf Course Architecture,
Grand Haven, Michigan

Dreams -To design and construct a golf course that everyone will enjoy playing, and any superintendent can develop and maintain fine turf -

Another type - the heavily trapped Pro-type course with great water carries artificial to a great extent, and designed to be an extreme test for the playing golf Pro and their television program. We will discuss the type we can all play.

Golf Course Archiect - We can all be self-styled Golf Course Architects. One group has undertaken the job of registering Golf Course Architects - the American Society of Golf Course Architects. At present a group of 50 and their membership committee, examines the applicants, their completed courses, their ability to prepare plans and specifications, and their business ethics, or customer relations, so very few of the self-styled Golf Course Architects are accepted because to them it's a part-time job. Some are really contractors and offer their services as architects free.

Reality - How do we arrive at this golf course that we all enjoy playing? Once property lines are established the study beings. A topographical map is necessary - this may be 100 ft. per inch, or 200 ft. per inch, and we prefer 2 ft. contour lines.

The property is examined for natural green and tee sites, and the connecting of these lead to the many possible route plans. After several days study, the best possible plan is selected and prepared for preliminary discussion with the client. Many of our new courses are in real estate projects, and are considered the major attraction in selling lots or homes. Smart developers realize they need a golf course that the people will enjoy playing - something to bring them back.

An important feature of the Golf Course Architect is his ability to visualize a golf hole in the undeveloped state, and to develop these good golf holes into a plan for construction. This insures proper land use.

Writing good specifications for golf course construction is a very difficult assignment. This requires an up-to-date knowledge of soils, heavy equipment, turf-

grasses, irrigation equipment and practice, as well as surface and subsurface drainage. Knowledge of the game of golf, maintenance practices, and operative experience are all vital. Each person can only carry the limits of his own knowledge, and experience is still of major importance.

When we assume that we have designed and constructed our golf course that we can grow fine turf on and people will enjoy playing, we come to ^{the} determining factor - The Golf Course Superintendent. He can make or break the project. If the client is willing to pay a fair salary and hire a capable man, his problems are over. Good playing conditions are essential if we are to get the most enjoyment from our golf courses.

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CONSTRUCTION CHALLENGES

Brent Wadsworth, The Wadsworth Company
Plainfield, Illinois

Recently at a statewide turf conference the question was asked of those attending - "How many have had the opportunity of working on a new golf course during their careers?" Amazingly there were over 20% of those present who had actually been connected with a new golf course. In order to be successful in each of our occupations we must meet the needs of the majority of people each of us serves.

From the owner's point of view, he wants the best golf course available for the money he has to spend. He pursues a course from A - an idea, to B - a plan, to C - Building, to D - teeing up the ball. First, the owner should provide the proper funds to obtain the results which he desires. Secondly, he must provide a site to meet the budget. If, as is the present trend, a golf course must be constructed in an old gravel pit, a swamp, or flood plain, or on nature's rocky surface, or in a garbage dump - then funds must be adequate to overcome the inherent problems of site manipulation. More and more golf courses are being built on areas like this, especially around big cities where land is at a premium. But, how do average people wanting to own a golf course know how much to spend and what they will get for their money?

They must either research the subject, or with much more ease and accuracy, obtain the services of a golf course architect. Now enters the first person specializing in a trade which gets the owner from A to D, and helps to smooth out the problems. In order for the golf course architect to do his job adequately, he must possess several important qualities:

1. Communicative abilities
2. Artistic expression
3. Analytical power
4. Civil engineering knowledge
5. Visual grasp
6. Administrative ability to obtain and produce a final product for the owner.

Once the owner commissions an architect to design a golf course, the show begins. The owner will, at this point, confer the responsibility of the entire project on his shoulders. Basic elements of the path are then determined by him.

Can he accept it and produce the value the owner wishes? If he does his job he certainly can make things move properly and smoothly.

Next the owner and the architect call in the builder - the people with the men, equipment and knowledge to produce the facility. It's up to them to overcome the obstacles and forces of nature - and there are many, as everyone well knows - the most of which are:

1. Ground conditions, and
2. Weather conditions

The builder has his orders - produce and deliver on time the product which the architect has designed. As I said last year at this Conference - how well the builder does, is how well he is able to carry out on the ground the desires and wishes of the golf course architect.

And next, the golf course superintendent's turn - the specialist in the field of maintenance. He takes what has been given to him by his predecessors along with the blows of nature, and produces a playable product.

By this time the budget may be depleted if proper planning has not been accomplished. So, it's up to the superintendent to produce something quickly with, many times, very small funds. He must work extra hard and make thoughtful decisions count. His job is hard during the initial growing period as time is of the essence. Everywhere he looks there is work. For those of you who have taken on your shoulders the responsibility of a new course, you know only too well of which I speak. The word "new" is deceiving in that the actual amount of work to be done is often greater than on an existing course. So, he must dedicate himself to hard work during this period.

But, why is a new course so tough to get going? Basically, it's mother nature. Almost always she does not cooperate. It's either too cold for the new grass to grow, or it's too hot for the new grass to grow, or it's too dry, or finally, it's too wet. Certainly, we've all experienced these forms of difficult conditions, but they become more pronounced during the time immediately following construction.

And finally, the golfer - it's now his turn to take a crack at it. Analyze the mistakes, build up the greatness of it all, or just quietly move the ball over the newly constructed facility. His is the horn which never stops blowing - on and on for as long as a course is in existence. So, this is the path or the course, if you will, which most new courses follow - to greatness or disaster, or most probably inbetween. This is how the needs are produced, but still what are those needs?

Today those needs can be defined further in terms of values received at each level of the process. Did the investment produce the desired results? That question seems to be answered quite often with a "Yes, but." In other words, something might have been done different. So, it is for we who are in business of serving others to do that different thing to produce a better product each time. Build on our mistakes as well as those of others, but more than that, build on the successes - those things which have turned out to be fine results for the efforts involved.

It seems that everyone is interested in the design and construction of new courses, the least of which is not the superintendent. There is no doubt that he is interested in the work for he is also a builder of new things himself, and many superintendents have fine ideas.

It is important to have development processes occur whereby all the professions contributing to a project have the opportunity to present ideas. We should

all give each other an opportunity to present his own thoughts, and begin to make the team effort one of understanding of each other's problems and desires. Considerations - let's make a real contribution to each other.

But, today's needs have evolved into golf courses of certain basic features. It is only to what extent or degree that determines a course's final cost -

1. Clear the woods
2. Grade in the tees, greens, bunkers, ponds and fairways
3. Install putting surface mediums for green grass growth
4. Provide for under-drainage
5. Install automatic watering systems
6. And finally, plant bentgrass greens. For fairways and tees - lots of choices here.

These are the basic needs that most courses seek today.

How do these needs relate to the new challenges in construction? Let's examine them from an operational standpoint -

1. Clearing - Currently we all know the efforts to abate pollution. You as chemical applicators are well aware of these new attitudes. As a result, many states and cities have passed no-burning laws and, as a consequence, clearing trees and removing rubbish has raised the costs of this operation extensively. Wood chipping machinery is presently being developed to assist in the clearing work and could very well be the best way to handle this future requirement. Currently, we are being forced to change our ways in this area of work.
2. Rough grading - The era of the big earth movers has changed this aspect of golf course construction in the last few years - most especially in regard to rubber tired machinery. Today highway hauling limitations are the basic restriction to the use of larger machinery. Production has increased greatly because of the larger equipment use. But again, pollution concern has focused attention to water run-off and heavy erosion on areas laid open from earth work. Efforts are beginning to be made to regulate and minimize the amount of area which can be graded and exposed to erosion, thereby lowering the mud and silt pollution in our streams, rivers and lakes. Where existing vegetation is out of play - "let it be" is the new guide word, and thus natural non-maintained areas will become more and more popular.

Also, the new federal Occupational Safety and Health Act will be requiring the expenditures of great amounts of money to meet the new safety regulation. The ultimate provider will be the owner, and again, he will have to spend more to accomplish the same objective. Other governmental regulations require registration and operational permits for construction, and are becoming more difficult and costly to obtain.

3. Greens Base Construction - Developments in this area are changing as well. New ideas are being produced which hopefully are improving our green putting surfaces.
 - a. They are reducing the effects of heavy traffic
 - b. They are reducing the effects of disease
 - c. They are providing better mediums to grow better turf.

You have all heard of the PURR-WICK green, the U.S.G.A. green, the sand-mix green, as well as the many greens base additives. Well, our friends are still working to produce new ideas - new ideas for growing better turf. We should all encourage their continued efforts in this regard.

4. Drainage

- a. Surface drainage - more effort is being made to increase rapidity of run-off and allow golf courses to be able to play quicker after rainfalls. Move the water quickly somewhere - ponds, creeks, pipes. Anywhere, but where the golfer is going to be hitting it.
- b. Sub-surface drainage - This is still a basic requirement in soils which doesn't allow water to percolate through quickly. It's the hang-over after the heavy rainfall that must be disposed of. But, also the underground spring is still a forceful element in natural land areas. They must be met underground and disposed of if a course is to be well maintained.

This work many times falls on the superintendent as it is difficult to forecast the whereabouts of such natural obstacles at the time of construction. And, of course, it would not make sense to spend for something that is an unknown quantity until the problem is completely exposed.

5. Irrigation - Today's needs are yesterday's luxuries. This is true of automatic irrigation. Currently very few courses are being built without some kind of automatic irrigation being incorporated into them. The improvements here have been spectacular, but there will be more. The field is yet young and the market volume still is of great potential. Manufacturers are just beginning to work towards refined equipment. We can all look forward to rebuilding systems again and again in the future as new developments are produced.
6. Turf, or Grassing - It's the new grasses that have made the headlines currently. Look at the bluegrasses - so many of such fine quality that it is now the dominant fairway grass in the north. Remarkable improvements in other grasses as well, but none mean more to us in the golf course business than the new improved varieties of the bluegrasses. But, if we are to have great bluegrass fairways, then they must be pure bluegrass, and must be maintained in that condition. And, throughout the crabgrass belt, the use of Zoysia is beginning to dominate.

The bentgrasses still need work in my estimation. We must continue to work for that all-encompassing grass for the putting surface. Something that overcomes almost everything, and most of all will keep ahead of the synthetic turf.

More sod is being used in prime locations to control primary erosion, and for establishing edges of key features. More costly - initially yes - but money saving in the long run.

And, there are other new things happening in the building industry - the price of manpower has increased so rapidly that the cost of a hand is worth as much as the cost of the heavy machine he operates. It's definitely slowed the interest in new construction. The rates have increased beyond production improvements, and because of this golf course owners will have to be prepared to pay more. But, hopefully the present price stabilization efforts will slow the rise and help us all.

Another current trend is towards the new golf courses being built by specialists in the field of golf course construction. These firms are striving to concentrate on this area alone, equipping themselves with specialized golf course construction equipment, together with trained personnel. How much they become involved in the specialty is in a large part dependent on the time spent at the occupation, the dedication with which they attack their work, and finally how well they understand the plans and ideas that they are to carry through to completion.

In summary, the greatest challenges facing the builder of today are:

1. Finding the developing cooperation and understanding with all professions involved in the building of a new golf course.
2. Meeting the new safety and environmental requirements of governmental concerns.
3. Developing superior putting green grasses, together with superior rootzone mediums that are simple to construct.
4. Creating new methods of underground drainage systems.
5. Providing improved means to control the effects of nature on newly constructed courses.

Yes, nothing is static. Every move we make requires re-evaluation from many different aspects - most especially in light of new knowledge which is springing forth from many sources today.

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OVER-GROOMING IS OVER-SPENDING

Paul Voykin, Supt., Briarwood Country Club,
Deerfield, Illinois

During the last few recession years American golf courses, especially the private country clubs, have been in a serious financial situation because of skyrocketing operation costs. These operational costs have increased so much that many clubs are having difficulty keeping their heads above water. Some, as you know, have sold out to home builders and high-rise developers. Others are desperately looking to fill their decreasing memberships, and reluctantly lowering their application standards in order to exist. In the Chicago area the situation is becoming gloomy.

Many concerned meetings have been held in our area, and some have been productive in finding solutions to cut down operational costs. The first place they look, of course, has been where they always lose the most money - the clubhouse. I have never known a large private club to ever come out in the black. The best managers are heroes when they can maintain or reduce operational costs lower than the neighboring private country clubs.

What about the golf course? The officials are looking in our direction with a very frugal eye. What can the superintendent do to cut down expenditures? It's your turn now! Hell! It's been our turn since I got into this profession twenty years ago. But, this time the situation is obviously different and their concern is more grave. Even though we have always tried to be conservative and have held tight reins on our expenditures for many years, we, too, have been caught up in this inflation and have had to increase our budgets annually in order to keep up with higher wages and accelerating maintenance costs. But, ironically in spite of bigger and better budgets, we are being short-changed by the economy. We are getting less for the Club's dollar -- our labor staffs have been reduced. The parts for our machinery are more expensive and less durable, and equipment and supplies are getting costlier every year.

Another additional expense that has come upon us very suddenly is we can't burn trash any more, but must haul away our dead leaves and trees to state approved dumping areas. But, all the time without any letup in sight, the demand for agroeconomic perfection and achievement keeps hammering at us. And, we have nobly succeeded with fantastic results. Our golf courses are meticulously groomed and maintained. But, this continuing pressure on grooming and spotless maintenance of our

superb golf courses and trying to keep up with the inflated dollar has increased our budget to alarming proportion.

We are in a serious rut, and gentlemen, I have a startling fact to reveal. You are responsible! The best among you in the audience are to blame for the situation we are in. You, that I have admired so much and tried to emulate, have brought us to this predicament. The problem, before I get shot by a past friend or teacher, is over-grooming of our golf courses. My contention is that if we did less grooming the country clubs could save money and have a more challenging golf course with fewer headaches. Let me say that I definitely do not advocate reverting to the European type of maintenance, which by American standards is really cow pasture grooming. However, many golfers who travel overseas are crazy about them, and think they have arrived at Mecca. And this fact, gentlemen, supports my argument today.

Please also understand that I am not in any way talking about reducing the upkeep of our greens and fairways. I am talking only about possibly reducing the cost of grooming in other areas that we so diligently maintain now. In my opinion we can let some of the areas grow a little shaggy, a little hippy, and still have a great golf course. At Briarwood we mow our greens at a tight $3/16$ of an inch, and our wide bent collars at $1/2$ " or less.

Our loping aprons that meet the fairways in the front are cut at $3/4$ of an inch, and then we use a triplex to mow around the traps and the back mounds of the green. This is all accomplished before we even come to the rough, which is also mowed too short and too frequently (but my members love it that way). The fairways are mowed from $5/8$ to $3/4$ of an inch, with a strip or two around our fairways which we call intermediate rough.

Especially for the ladies, I mow from tee to fairway because the ladies' tee is too far away from the "nice grass." Our tees, which except to be level, are really not that important. They are mowed too frequently, seeded, sodded, and fertilized too often. The tee banks are also mowed constantly so as not to look shabby. The precarious mowing of fairway bunkers, and the laborious hand-mowing around all trees on the golf course, also devour a lot of time and expense. At my Club this never stops, and missing a day or two because of a steady rain gets me into a nervous dither.

On cultivating around shrubs, around tees, over-edging of traps, mulching every leaf that drops in autumn, and mowing out-of-the way areas all require time. I found this out last year when I left unmowed all season two acres on the west side of my course. No one complained. In fact, no one even noticed - except the birds, rabbits and butterflies. They loved it, and even a few wild flowers came up. Gentlemen, what I am saying is that it's becoming expensive to maintain 160 acres. The machines are going constantly.

And, now I want to correct once and for all the chronic complaint by us superintendents that the membership is playing too much golf, and are interfering with our work. It's the other way around - we are the ones that are interfering with their play. We have spoiled the golfers rotten with expensive, around-the-clock grooming. Let me give you an analogy -

Remember when we used to go to a barbershop to get a plain, ordinary haircut. The haircut was cheap because that's all we needed to look nice and neat. But now, it's a different story. We have a thing called hairstyling. In order to look even nicer, we have our hair rinsed with a little coloring; then razor-cut, styled with a hot-air blower and set with a hair net, and finally perfumed with men's hair spray. All this is created by a hair stylist who, instead of recommending more use of a hair comb, recommends a special electric brush and stud hairspray.

And, instead of talking mostly about baseball in reply to our questions, tells us about hair shampoo and men's body deodorants, and even advises us that, perhaps, a moustache would look so-o-o-o nice. However, all this extra grooming costs money and it's alright as long as we can afford it, but once we can't, then over-grooming is over-spending. And that applies to our golf courses.

Now, the first important question you will ask is - how much will this save?

April to October time sheets, 1971
Briarwood, Paul Voykin showed

	<u>Hours</u>	<u>Cost</u>
Mowing rough	700	\$ 2100
Professional around greens & some tees	350	1050
Triplex around tees & traps	400	1200
Small rotaries around trees	250	750
		<u>\$ 5100</u>

I only chose these items because they are four maintenance items which I feel I could reduce by 50%, or by about \$ 2500.00. It would still give the membership a presentable, but slightly tougher, and a definitely more interesting golf course. Some of you, perhaps, are not too impressed by such a seemingly meager saving of \$ 2500.00. That doesn't sound like much. But gentlemen, the point is in a tough ball game every run counts, and besides we can accomplish other important savings. For example, in machinery. I know that I could save an impressive amount on this item of machinery over the years because, instead of having my present two or more pieces of equipment for the four jobs that I mentioned - rotaries, triplex, rough and Pro - I could get along with one piece of machinery in each category. Also, there would be a substantial saving in having to use less fertilizer and pesticides because the grass would be longer, and therefore be stronger and better able to cope with the elements with less attention. Traffic damage by carts would definitely decrease.

Now, the question is - Why don't I do it? My reply is that unless other outstanding courses in my area agree to follow suit I wouldn't try it with a ten-foot pole. I would be afraid; I think that unless I had it in black and white I might jeopardize my job. I am not exaggerating - the accent on quality grooming in my area is that important. I don't dare do less maintenance. The problem is also compounded by 200 other greenskeepers at my Club who play other clubs in the area, and then come back and tell me what great shape your courses are in.

But, I stand by what I have said here today. In the near future we may have to sit down with our chairmen and show them, with cost charts, that grooming everything meticulously is ridiculous. Letting the grass grow longer and become a little more like St. Andrews will actually make the game a little more challenging and more enjoyable, and the way golf should be - the way it was meant to be.

The playing areas are the same for everyone, hard or easy depending on your ability. Golf is the only accepted game where we can make an established area easier or difficult by maintenance techniques. We have spoiled the golfer to the point where he is possessed with always having the ball in play. The playing trend has swung from accuracy to an emphasis on long-ball hitting (and never landing in trouble). I believe the paramount objective of the founders and architects of this wonderful game was not this idea of present-day "hairstyling" conditions and excessive grooming.

In conclusion, I would like to say that I was significantly impressed to enthusiastically present this topic to you after reading the results of the C.D. G.A. questionnaire after the first draft of this speech already finished. Under

item 6 answers to question - "Do you feel that green maintenance and capital improvements may require future limitations due to financial pressure?" The majority from our Chicagoland area answered - LESS GOLF COURSE GROOMING.

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GROWTH REGULATORS

James A. McAfee, Graduate Assistant in Turf,
Purdue University.

Although growth regulators have been around for several years, it is just recently that we have begun to hear much about them. One of the main reasons for this revived interest is that scientists are learning more and more about how these chemicals work at the molecular level in the plant. This new knowledge will allow scientists to develop growth regulators which will give consistent results. Inconsistency was one of the main complaints of the early growth regulators on the market.

Professional turfgrass managers are mainly interested in growth regulators which either promote or inhibit some process in the plant. Probably one of the most widely used group of growth regulators in turfgrass are the herbicides. Most herbicides work by either blocking some essential growth process in the plant, or by causing extensive growth in the plant, which eventually results in death of the plant.

A good example of an inhibitory growth regulator in turfgrass is Po-San (Mallinckrodt). This chemical inhibits or reduces seedhead formation of Poa annua plants, as well as stunting the growth of the Poa annua. Both of these factors give the desired grasses a better chance to survive and establish a good turf. Po-San is mostly used for fairways on golf courses.

The use of chemicals to retard growth of grass is one of the hottest issues concerning growth regulators. For the last two years, we at Purdue have screened some 35 different growth regulators for their effectiveness in retarding growth rate. At present we have narrowed down to less than five compounds, which have shown promise as growth inhibitors. However, additional information as to their effect on root growth, rhizome growth, and tillering on different grasses is needed before they can be released to the public and professional turf managers.

Growth regulators definitely have a future in turf. Properly used, they will help the professional turf manager, as well as the public maintain better turf at less cost and less time.

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THE RIGHT AMOUNT OF WATER-ROOT HAIR VIEWPOINT

Paul E. Rieke, Dept. of Crop & Soil Science
Michigan State University, E. Lansing, Michigan

Healthy, vigorous turfgrass leaves are about 80% water unless the plant is under moisture stress. At 60% it is badly wilted. The succulence of turf is due to the water content. This water is provided to the leaves by the root system, and most of the water is taken up by the tiny root hairs near the active growing tip of the roots.

Sufficient water must be provided by the root system to satisfy transpiration needs. When transpiration exceeds the rate that roots can supply water, the turf wilts. The amount of water used by the turf is a function of climate, water holding capacity of the soil, moisture level in the soil, and the management applied to the turf (1,2,3).

In Michigan, Indiana, and Illinois the greatest difference between potential water needs (evapotranspiration) and precipitation occurs in July. Using average figures, about 4" of water will be the minimum needed during July in southern Michigan and northern Indiana. Unfortunately "average weather" seldom occurs while the unusually wet or dry conditions are more typical. The summer of 1971 was unusually dry in central Michigan. For example, resulting in at least 6" of irrigated water as a minimum requirement in July.

The water holding capacity of the soil is dependent on soil texture and rooting depth. Sands, of course, hold much less available water than soils higher in silt and clay. Rooting depth is also significant in that the plant can only obtain water from the soil to the effective rooting depth. Shallow rooting of greens in mid-summer necessitates careful and frequent irrigation since the available water is rapidly removed from the surface 2 to 3" of soil.

As water is removed, the remaining water is held with greater tension making it more difficult for the plant to obtain sufficient water rapidly enough. Wilting usually begins in mid-afternoon when the water use rate is the highest and the soil is becoming drier.

Water use rates are also affected by several management practices, such as mowing, wetting agents, cultivation, compaction, and by disease or insect attacks.

Shallow rooting limits soil contact by the roots reducing the amount of water which can be taken up. For example, assume a bentgrass or Poa annua green has an effective rooting depth of 3" in July, and the soil is a fine sand which would hold 1.2" of available water per foot of soil. This would mean the turf can extract about 0.3" of water from the soil to that rooting depth. If the water use rate on a hot windy day is 0.25" per day, this shows the necessity of irrigating daily. On the other hand, if the water use rate is 0.1" per day, irrigation frequency could be reduced.

Factors which tend to cause short root systems on turf are heavy nitrogen fertilization, heavy irrigation, poor drainage, compaction, short mowing height, acid soil conditions, root injury due to pests or chemicals, or environmental conditions, which may tend to reduce root growth, such as high temperatures (1,2).

Too much water due to over-irrigation, or poor drainage, results in increased leaching of nutrients, increased compaction, reduced rooting, increased Poa annua invasion, increased wear susceptibility, and generally reduced turf vigor and quality (1).

A deficiency of water results in wilting, but ultimately leads to reduced vigor, color, density, recovery from injury, and quality of turf as well. The question then can be asked - How can the moisture content of the soil be determined in order to maintain optimum moisture in the soil? It would be well if we could "Ask the plant." In a sense this is done with some of the techniques practiced. For example, footprinting - when the grass will not spring back to its original position after walking on the turf - is an indication that the leaf is quite flaccid and wilt is imminent.

One can also look for those tell-tale spots which show the typical bluish-green color before wilt occurs. Such spots may be due to sandy soil or organism activity, or they may be areas which receive less irrigation. One must know his turf, soil, and irrigation system well if he is to depend on this approach.

An alternative to "Asking the plant" is to "Ask the soil." Visually examining a sample of the soil obtained with a soil probe is one means of doing this. The ease with which a metal rod can be pushed into the soil, or some of the simple, inexpensive soil moisture sensors which can be pushed into the soil have been also used to estimate soil moisture. These are not particularly accurate, but with experience they may be helpful. The user must know the soil and turf conditions extremely well to use these techniques effectively.

More sophisticated and expensive approaches utilize moisture blocks of tensiometers. Moisture blocks buried in the soil have wires to the surface which can be attached to a meter above the ground to make moisture measurements. The moisture blocks operate most effectively in moisture ranges somewhat drier than the levels generally desired for putting green turf.

A tensiometer may be defined as a water tension meter. A porous ceramic tip is attached to a plastic tube and buried in the rootzone of the turf. A gauge is connected to the top of the tube which is sensitive to the tension (or suction) on the water in the tube. Water moves freely through the ceramic tip, making this instrument sensitive to changes in water levels in the soil. As the soil becomes dry, some of the water moves out of the tube through the ceramic tip, causing a slight vacuum in the tube, raising the reading on the gauge.

The tensiometer is probably the best measure of soil moisture tension from a root hair point of view. As soil becomes drier, the root hair cannot as easily obtain water from the soil, and this is readily reflected in higher readings on the tensiometer. The 15 to 25 centibar moisture tension reading is generally considered the best range for turf (3).

The tensiometer is not presently used extensively by superintendents for determining moisture needs for turf, but it has proven a valuable research tool. This is illustrated in data obtained at the University of California (4).

<u>Irrigation program applied</u>	<u>Water used during year - inches</u>
1. Same as nearby golf course	43
2. Based on evap. from large open pan	39
3. When tensiometer reading reached 15 centibars (this is still moist soil)	38
4. When tensiometer reading reached 40 centibars	31
5. do 55 " (quite dry soil)	27

There were no differences in the bermudagrass turf due to irrigation, resulting in a significant reduction in water requirements compared to standard irrigation practices. These data support the thesis that much turf is over-irrigated, especially on the higher quality turf found on many golf course.

A few turf managers are using tensiometers as a guide for irrigation in southern California, but there are some limitations in their use; location of the tensiometer with respect to variability in soil or turf in a given turf area, depth of rooting, cost, problem with vandalism. The fact that the tensiometers must be removed from the soil each winter in the Midwest are important factors.

Although there are limitations in the use of tensiometers under turfgrass conditions they are a valuable research tool. This research need not be restricted to experiment stations, however. The inquisitive superintendent can use the tensiometer to learn more about the effectiveness of his own irrigation program. But, one must understand the capabilities and limitations of the tensiometer before using the results to change the irrigation program.

Finally, as root hairs absorb water, small localized drier areas occur. At reduced water tension, capillary water movement may equalize (say over night), but at medium and drier soil the water around root tips may be readily depleted. Thus, leaf wilt indicates root tip need.

In response, two things normally occur - we repeatedly water to avoid possible stress. And we apply much more than just replacement water.

The active root tip and its root hairs are the water crew for the entire plant. Keeping them supplied with (internal) energy, outside air (oxygen), plus available water, is the challenge.

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NUTRIENT STORAGE AND MOVEMENT UNDER TURF

Paul E. Rieke

The soil provides 13 nutrients which are known to be essential for plants: they are nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), and sulfur (S), all macronutrients, while the micronutrients (those needed in smaller quantity) are iron (Fe), manganese (Mn), copper (Cu), zinc (Zn), boron (B), molybdenum (Mo), and chlorine (Cl). Most of these nutrients are provided in sufficient quantity for turfgrasses by soils. Fertilizer applications most commonly provide NPK. Others may be also needed in certain situations.

Nitrogen

Nitrogen warrants such attention because it affects the turf in so many ways. Included are shoot growth, shoot density, root growth, color, tolerance to temperature and moisture stress conditions, disease susceptibility, wear tolerance,

recuperative potential, and competition of the turfgrass with weeds and other turfgrass species. Nitrogen is added to the soil by fertilizing, in rainfall, and by nitrogen fixation carried on by certain soil microorganisms. In addition, nitrogen can be added to the soil in topdressing material, including with peat, manure or by clippings returned to the turf.

Inputs of nitrogen by biological nitrogen fixation are probably small under turf. Nitrogen in rainfall could approach 20 to 40 lbs. per acre, but is usually not considered directly in turfgrass fertilization. Of course, clipping return is merely a recycling of the nitrogen already present. If one assumes that 200 lbs. of green clippings (80% moisture) are returned to the turf per 1,000 sq.ft. annually, and that they average 5% nitrogen (dry weight basis), this amounts to 2# of nitrogen being recycled in the clippings. This amounts to a very light fertilization with each mowing with ready release of N. Higher values would be evident if heavier nitrogen applications, or a longer growing season prevailed.

The reservoir of nitrogen tied up in the soil organic matter is an important source of nitrogen when soil temperatures are warm and peak microbial activity occurs. This was observed on plots located at Traverse City on a heavily irrigated sand, and at East Lansing on a moderately irrigated fine sandy loam. Soil nitrate levels were determined in soil samples taken every two weeks during the growing season. At both locations, but particularly at Traverse City where clippings were returned, the soil nitrate levels in the plots receiving no nitrogen reached a peak in August and early September.

Recently K. R. English, in M.S. thesis, found soil nitrates to increase markedly in an unfertilized plot of Merion Kentucky bluegrass sod grown on Houghton Muck. This organic soil had a total nitrogen content of about 2.9%. If the dry soil weighs 400,000 lbs. per acre this means over 11,000 lbs. of nitrogen is tied up in the organic matter of the soil in the surface 7". As it decomposed slowly, only a small total of that amount will be released at one time, but this points out the importance of judicious nitrogen fertilization in late summer especially.

Mineral soils might contain about 0.15% nitrogen by dry weight. Most of this nitrogen is essentially unavailable for the turf to use since soil organic matter in mineral soils is usually relatively resistant to further decomposition.

Nitrogen losses by leaching can be appreciable if sound management practices are not followed, especially on irrigated sands. The soil nitrate study described above included several nitrogen fertilizer treatments at each location, which were applied to Merion Kentucky bluegrass. Data were obtained in 1970 and 1971 from the 0-6, 6-12, 12-18, and 18-24" depths. When very high rates of nitrogen (6 or 8 lbs. per 1,000 sq.ft. annually) were applied in soluble form (ammonium nitrate) in April, there was appreciable leaching. When this treatment was divided into 3 applications during the growing season, the apparent leaching of nitrate into lower horizons was much reduced.

Use of organic (or slow release) nitrogen carriers - milorganite urea-formaldehyde and isobutylidene diurea - reduced the nitrate levels in the soil during spring and early summer, but in late summer the nitrate levels in the subsoil (to 24") were somewhat higher than in plots receiving ammonium nitrate in 1970 data. The 1971 data suggests similar trends except a very dry summer and limited irrigation resulted in very little nitrate nitrogen appearing in the soil, even in the 0 - 6" depth. This was attributed to the nitrogen fertilizer particles staying in the thatch layer, which was discarded when the soil was sampled.

There was more leaching of nitrates on the sandy soil at Traverse City. This may be explained by the heavy irrigation rates applied, the sandy nature of the soil, heavier nitrogen rates applied, and the return of the clippings on Traverse City plots.

On the basis of these studies we have prepared guidelines on nitrogen fertilization to keep nitrate leaching to a minimum:

1. Use no more than 1.5 lbs. nitrogen per 1,000 sq.ft. (60 lbs. per acre) on turf in any one application,
2. Apply nitrogen only to actively growing turf,
3. On sandy soils use irrigation judiciously to reduce leaching,
4. If clippings are returned reduce nitrogen rates accordingly,
5. Use slow release forms of N, and
6. On sandy sites, especially where water sources could be contaminated with nitrates, it is well to consider the use of creeping red fescue, or other low nitrogen requiring turfgrass.

Phosphorus

Phosphorus does not leach readily through soils. Most soils have a high capacity to tie up phosphorus either by attraction to the clay particles, or by forming less soluble iron and aluminum phosphates if the soil is acid, or calcium phosphate if the soil is alkaline (above pH 7.0). An example of the tendency for phosphorus to collect in the surface soil is illustrated in data taken from one of our research plot areas. The 0-2" depth had a soil phosphorus test of 70 lbs. per acre. The 4 - 6 and 8 - 10" depth samples tested 25 and 6 lbs. phosphorus per acre, respectively.

Under general turf conditions in Michigan we recommend no phosphorus when soil tests exceed 40 lbs. per acre (Bray P₁ test) when tested in our laboratory. The sorption capacity of the soil for phosphorus could be exceeded, of course, and phosphorus could move downward, but such rates of application would far exceed reasonable phosphorus fertilization for turf. Greater concern should be raised about the effect of imbalances of phosphorus which could induce a deficiency of iron or other nutrients. When arsenates are being used for Poa annua control, phosphorus applications should also be restricted since an application of phosphorus containing fertilizer can offset the arsenate influence.

Potassium

Potassium is a cation (positively-charged) - as such it is attracted to the cation exchange capacity (negatively-charged) on clay minerals and soil organic matter particles. This tends to hold potassium from leaching through the soil. It can be leached, however, with excessive irrigation, especially from sandy soils. Also, ammonia applications favor leaching of K by replacement. More frequent and usually higher potassium rates will be required on heavily irrigated sands to account for the greater leaching losses.

Data in Table 1 show the tendency for potassium to stay near the surface of a fine sandy loam soil. Increasing nitrogen rate caused a decrease in soil potassium test due to greater amounts of potassium removed from clippings.

Table 1. Soil potassium tests as affected by depth of sampling and rate of nitrogen application.

<u>Annual nitrogen rate</u> lbs./1,000 sq.ft.	<u>Depth of sampling, inches</u>			
	<u>0-2</u>	<u>2-4</u>	<u>4-6</u>	<u>6-8</u>
		lbs. of K		
4	274	134	108	108
14	197	120	101	96

Certain soil minerals have the ability to fix potassium, that is, to tie up potassium within the structure of the mineral. This takes potassium out of soil solution and prevents its leaching, but it is not available to the plant until it is released from the mineral again. Soils which have such minerals may contain great quantities of potassium, but soil tests may not be high. On such soils response to potassium may not be apparent.

Others

Calcium and magnesium are closely related to soil pH. If pH is acceptable for the turf both of these nutrients are usually present in adequate quantities in the northern Midwest. In some cases a need for magnesium may occur. Soil testing is the best means for determining magnesium needs.

Sulfur can be leached from the soil in the sulfate form. Heavy rainfall and irrigation, especially on sandy soils, contribute to sulfate leaching. Reports of sulfur responses on turf are most common in Washington and Florida. This need for this nutrient will probably become more widespread as more stringent air pollution controls are employed which will reduce sulfur additions to the soil by rainfall.

The micronutrients, iron, manganese, copper and zinc, are normally present in much more than sufficient quantities for turf. If soil pH is too high, however, they are often not in available form. Deficiencies of iron are especially common on shallow-rooted cool season grasses (particularly bentgrass and Poa annua) as well as on many of the warm season grasses. In the Midwest many greens have become considerably higher in pH because of irrigation with hard water. We find pH values of 7.4 to over 8.0 common on greens in Michigan. Lowering soil pH can make the iron more available again.

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GETTING THE WORK DONE

Harold Zimmerman, Golfway, Inc.,
Kettering, Ohio

Beautiful golf courses are not built overnight - they take many hours of study, planning and knowledge of construction. In a few words here's my experience of construction and completion of a golf course as I see it -

First, the site selected should be thoroughly investigated as to availability to water and electricity. There should not be any question when the job is half done as to the adequate water supply in the areas that will have to be irrigated to keep the grass growing.

After the site has definitely been decided, the owner of the site should contact a reputable architect for the right plans and the best specifications. Golf course construction can be too costly not to go with the best and the experienced. The architect has a great deal of responsibility working hand in hand with the contractor to build a successful golf course.

The clearing of the land is very important. An experienced contractor can offer a practical view of the land, amount of land clearing debris disposal, and the most feasible methods, rock removal, burning permits and the degree of erosion.

After the staking of all the area, the course itself is laid out. Now you are ready to salvage all the topsoil from tees, greens and cut areas. Place the topsoil in areas easy to get to, but not in the way of the installation of the water system nor other work traffic.

Electricity is on the priority list in the construction of a golf course. It is so necessary from the very early part of construction, yet it sometimes is a slow procedure to obtain the permit. As soon as possible the electricity should be to the service area, the pump site, and to the club house. The contractor must contact the power companies as early as possible.

There are many new pieces of equipment for excavation which will be faster and more efficient. One of them is the elevated scraper. An efficient and understanding operator can be a big help. Their skill and knowledge can make the work easier for you, also less tiresome for themselves. The timing of the excavation is very important to the speed of the completion. In the staking and the excavation it is necessary to obtain easy slopes. In doing so they are easier to maintain later; also more pleasant to the eye.

As the sub-base of your greens and tees is brought up to the grade, they should be compacted. The settling of the ground should not leave any depressions, making it ready for the topsoil so you have a firm base - same contours for the finish grade.

Drainage is very important, and it is one place where both the contractor and architect should take some extra study. Some time should be spent in studying the topography of the land to know where water pockets are, or damp conditions exist. The drainage is important because we must keep in mind the completed golf course, the time element of the players, the length of time the players would be held up from play after a hard rain, the ease of drainage on the tees, greens or the fairways.

When the sub-grade is accepted by the architect and by the owner, real stress is then placed on the green contours. In an overall picture a well-contoured green in the sub-grade is as important as in the finished grade. Room should be left on the outside of the apron to install your topsoil to the depth of 6". After the entire course has been completely contoured to the liking of the architect and the owners, the water lines should be installed immediately. In doing that the lines can be so compacted that there will not be any settling. The topsoil can be replaced and there will be uniformity in drainage and thickness of topsoil.

A vast difference of opinion, according to each architect and contractor's experience and knowledge, is the topmix for greens. The contractor must abide by the decision of the architect. From my experience I prefer that the mixture be prepared away from the green site, then hauled to the site. In this way you have more efficiency in the mixture and saves wastefulness. Today soil is used less and less while all sand and peat, or sand over plastic as recommended by Dr. Daniel called PURR-WICK, or 6 parts sand, 3 parts selected topsoil, 1 part peat to be laboratory described, called USGA perched intimate mix, are the trends.

As you know, some courses have few, and some are overloaded with sand traps. The construction of the traps should coincide with the contours and the building of the greens. Traps are very difficult and tedious to build. Here is the place to have the most experienced operators on the equipment because they must understand the contour of the trap and the construction for proper drainage. Traps should be surface drained so that you have no pockets inside the traps to hold water. Ideally no surface water should ever run into the trap. Plan slopes carefully or intercept the water.

Sand can be placed into the traps either before or after the seeding. Placing sand into the traps before seeding will avoid truck tracks on your newly seeded ground, and ^{give} a better overall picture of the green. Placing sand in traps is a tedious procedure. It must be done by hand, and hand labor is expensive. It must be placed and raked with care.

Finally, the part which to the layman is so important and sells the course to the golfer is the grass. Again, the architect has to specify the seed a contractor uses. The selection of the best available for that locality is vitally important, and many new ones are available. Before the seeding takes place the right kind of fertilizer must be installed. This must be worked into the top surface in preparation for the seeding. It is well to remember that after a contractor has been given his release, the maintenance crew takes over. The sooner this can be arranged the better.

Watering the newly seeded areas is a constant job. Never overwater, but keep the soil damp at all times, carefully watching that the soil doesn't crust over. The weather conditions have a great deal to do with the watering. Sometimes you have to water greens three or four times a day. Fairways in dry weather should at least be watered once a day.

Mowing should start on fairways when the grass is $2\frac{1}{2}$ " or 3" high; the greens at $1\frac{1}{2}$ " high. Once started, the mowing of the greens should be governed by the growth, leaving the mower set at $\frac{1}{2}$ " for two or three mowings; then drop it gradually to $\frac{1}{4}$ " as the runners take hold.

Getting the work done efficiently and quickly to me is like building a monument to my fellow golfers. I enjoy playing golf, when I can, and I enjoy building a well-designed golf course. Golfers are the best advertisements for a course as they will tell their friends about a course. Pleasing most of the players is necessary, but getting the work done by the architect and contractor comes first.

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PERCOLATING WITH PURR-WICK

Ted McAnlis, Golf Course Architect,
Cleveland, Ohio

Having promised our golfers at Briarwood that we would build them a practice green in 1969, early in 1970 we decided that we had better get with it. Having become intrigued with the PURR-WICK concept while attending the Midwest Regional Conference, we decided to give it a go. As excavation began it wasn't long before we discovered how tricky it was leveling those tiers in the confined area of the green. However, we eventually persevered and were ready to proceed.

This installation being made with economy in mind, we chose to use 4" coiled drain pipe as the water barrier between tiers. This was the least expensive method and material we could devise at the time. We did manage to succeed with this pipe, but the lightness and flexibility of the pipe made it difficult to keep in place. We overlaid the subgrade with 10 mil plastic, using a folded overlapped joint for sealing. Construction proceeded according to established procedure, using sawed $1\frac{1}{2}$ " plastic pipe for drainage, covering that with coarse sand, then adding the green sand. Green area was 7,200 sq.ft.

The green sand was purchased directly from a bank run without any washing. While this reduced the cost, it meant that some fines were present in the sand. The sand itself was of medium-fine texture. This led me to choose a depth of 18 to 24" for the green. In retrospect I believe this depth was too great, and 18" would have sufficed.

To the top 4" of sand we mixed ureaform and 0-20-20 fertilizer at 4# per 1,000 sq.ft. rate. We also mixed calcined clay at 100# per 1,000 sq.ft. Into one-half of the green we also mixed two exchange resins, using Rohm & Haas IRA-68 and IRA-93, at the rate of 1/2 cu.ft. per 1,000 sq.ft. each.

Peat was mixed into the upper 2 inches, and the green seeded to Penncross at the rate of 1# per 1,000 sq.ft. The green was topped off with a mulch of peat.

Perhaps of more interest than the details of construction is our experience with our PURR-WICK green. The green was seeded in July, 1970. Our irrigation facilities for the green were inadequate for the germination period, and cover was established relatively slowly. We opened the green in October, 1970, although we still had several areas that had not filled in. The following spring we reopened the green. Because of cool weather and heavy use, we closed the green on two or three occasions when the grass was not growing rapidly enough to repair injury and wear. However, with warm weather and normal growth rate, we were able to keep the green open non-stop throughout the remainder of the season.

During the summer the green was watered only four times as compared to our normal green watering schedule of 100 or more times. The green was fertilized on our regular program, with two additional feedings totaling 1 lb. of nitrogen more.

During the summer the green endured heavy traffic with little ill effects. To assist us in spreading the traffic, we eliminated cups in the green and positioned the flags and ball lifts on the green by sticking them into the sand to a 4" depth. This provided a target for putting, and we had only a few comments from golfers.

While the sand has compacted and is firm of foot, we have had no difficulty with water percolation and drainage. Root growth is excellent, with massive rooting to a depth of 4 to 6".

This past fall we tested ball-holding characteristics of the green by hitting several shots to the green. A medium iron was used. Balls hitting the green tended to bounce off rather than holding. With topdressing and additional thatch growth, ball-holding characteristics should improve, however.

In general, we are very satisfied with the performance of the green, and are planning on using PURR-WICK greens on a nine-hole addition which is being planned. Two important changes are planned for the new greens -

First, the depth of the sand will be reduced from 24" to 20", even though the sand to be used is considerably finer than used in the practice green. This will reduce the amount of material required, and should help keep the surface more moist, which, in turn, could improve ball-holding.

Secondly, the subgrade will be sloped rather than stepped, thereby simplifying grading. Water barriers will have to be increased to a height of 10 inches to provide the equivalent ponding action with respect to the surface, and additional sand will be required as compared to the stepped subgrade. For a 6,000 sq.ft. green with 6" lifts approximately 100 tons/1,000 sq.ft. will be required.

A drain pipe will be installed above each barrier. A riser will be used to control the level of the pooled water. On pool or reservoir areas over 10 ft. wide an additional drain pipe will be installed at the midpoint of the pool. We have not been able to detect any effect of the exchange resins mixed into half of the practice green on color or growth rate.

Actual Construction Cost for PURR-WICK Green, Briarwood C. C.

Green Area: 7,200 sq.ft. Five tiers, 6 inch steps

Materials

Sand 18 - 24" depth (770 tons)	\$ 1640	
Plastic film (10 mil)	165	
Exchange resins ($\frac{1}{2}$ green only)	310	
Sand for leveling tiers	75	
Fertilizer (38-0-0 & 0-20-20)	75	
Calcined clay and peat	100	
Seed & pipe for drainage	50	
Total material costs		\$ 2415
Subgrade excavation	\$ 800	
Finish grading - machine hours (10 hours) (including spreading sand over green)	\$ 200	
Hand labor (150 hrs. incl. supervision)	750	
Installing exterior drain line (400 ft.)	200	1950
Total cost		\$ 4365
Cost per sq.ft.:		
material	.34	
labor & machinery	.27	
total	.61	

Editor's note: Using the sloping subgrade and removable 12" plywood baffles between plastic, and Cor-flow 2" drains, will reduce labor in future construction.

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THE SECOND AND THIRD GREENS

Birdie Shelton, Supt., L & N Golf Club,
Brooks, Kentucky

In the fall of 1968, we built the first PURR-WICK putting green. My members loved it, so had no trouble to sell then on building another one. We finished construction and seeded with Penncross late in the spring of 1971. However, did not open it until my Bermuda ones went dormant; then closed it to play after about 4 or 5 weeks. Will open it again April 1 - that being the date we go from temporary to regular greens. While the green was open had nothing but compliments from the players. The green will hold just about any shot thrown into it. The ball seems to do less damage than on the U.S.G.A. green.

In 1970, I built a PURR-WICK tee, sodded it with Zoysia and opened it in July of that year; kept it opened until fall; reopened it in spring and played it

all last year. You may ask how about the sand shifting under your feet - well it doesn't.

The cost of building a sand green in my area is about \$ 3,000.00, excluding supervision. This is my third progress report. We have two greens and 1 tee, and plan to build more.

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PURR-WICKS TO DATE

-Editor's Note-

A revised leaflet No. 40 has been prepared in which a sloping of subgrade, plus higher baffles are new features. These simplify equipment use, save much hand-labor, and allow faster installation. Copies of No. 40 are available on request. Initially 4000 were prepared. Now 3000 are available.

To date at least 72 greens in nine states, plus 3 tees in three states, have been reported.

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SELECTED SAND AND ORGANIC CONSTRUCTED GREEN

O. Lee Redman, Supt., Bellerive C. C.,
Creve Coeur, Missouri

No. 13 green at Bellerive C. C. is located near a large creek and at the base of a hill. Air movement is greatly restricted due to trees on three sides.

The green had very poor internal drainage. Turf could be kept on the green until the occurrence of wet weather in the hot, humid portion of the summer. The roots would survive only at the very top, the turf would begin to die. Many methods were tried to relieve compaction, but these were not successful.

The decision to rebuild the green was based on the fact that the new green would have to provide good internal drainage to be successful. The following 3 methods of construction were considered:

1. U.S.G.A. mix
2. PURR-WICK System
3. Selected sand-organic.

The selection and decision to use the Selected Sand-organic method of construction was based on the following factors:

1. Bentgrass performance in Arkansas and Texas on this mixture,
2. Deep root system of bentgrass over summer months,
3. Various cost factors of each,
4. Degree of accuracy of construction.

Samples of available sand sources in the St. Louis area were collected and sent to the Agri-Systems, Inc. in Texas for testing. The results on the selected sand to be used were:

A. Mixture ratio of 8 sand to 2 sawdust	
B. After compaction: large pores	22.40%
C. " " small pores	21.76%
D. Permeability inches per hour	4.80

Construction was started in August, 1972. The new green was staked out, using grade stakes for the elevations needed. The subgrade was made to simulate the finished grade by design. The slopes were graded down around the new green.

The subgrade was then trenched in herringbone design, using 6 inch wide trench at 10 ft. intervals. The drainage pipe was 4" perforated flexible pipe. The pipe was covered with pea gravel to trench-full. Then, 5" of pea gravel was spread over the entire subgrade surface. A poly-mil liner was then put into place around the entire outer wall of the green. This was to impede lateral movement of water from the sand-organic mix into the surrounding silt-clay wall.

Next came the selected sand-organic mixture hauled in from off the site. The greens mix was spread and compacted with a small track dozer to a depth of 14 to 18 inches. Both hand-raking and a tennis court brush-roller was used to contour the surface. The construction had all been completed in one week.

For two weeks the new green was watered and fertilized in preparation for seeding. The green was seeded to Penncross bentgrass on September 7, 1971, at a rate of 1.5 lb. of seed per 1,000 sq.ft. The germination of new seed showed after a week and coverage looked good.

Fertilizer applications were made often along with trace elements because the sawdust was taking up nutrients for decomposition. After sixty days the green was well covered and opened for play. The root depth was about 1-1/2 inches at that time. Localized dry spots were not a problem. At this time, March 1, 1972, the root depth is 4 inches and the turf looks very good. The big test will come next July here in St. Louis. It is the performance at that time that will tell the success of this construction method.

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ZOYSIA INTO FAIRWAYS

Tom Sams, Supt. Audubon C. C.,
Louisville, Kentucky

As I related to you at last year's Midwest Turf Conference, in the summer of 1970, we plugged 2" Meyer zoysia plugs in 15 fairways at Audubon C. C. in Louisville where I am Superintendent. We disregarded three Par-3 holes that we could come back at a future date and sod these fairways from our 2-acre plus nursery. Using 2 RMF 4-hole plugging machines to make the holes, we planted by hand from trailers that we constructed, literally millions of plugs on 9" and 18" centers. Beginning on May 10, 1970, we completed the job exactly four months later on September 10, 1970.

Our main concern the first winter after plugging was the extent of loss of plugs, especially those that were planted in late August-early September. We were

prepared to reactivate the watering system if we noted any dry cold conditions. Fortunately for us, we had a reasonably mild-wet winter. The loss of plugs was very negligible.

In early April of 1971, we pushed the Zoysia from its dormancy, using a complete 50% organic fertilizer. Following Dr. Bill Daniel's recommendation, we did not cultivate the fairways during the season. In the areas where we were able to control the competition with sodium arsenite and DSMA, the growth was remarkable. During the course of the season, we had many interested visitors view the Zoysia to note the progress we were making. Most were very surprised.

One of the facets of the operation that I am most proud of was the P.R. job my Committee and I did on our members. We had the foresight to constantly keep them informed, through periodic mailings of our intentions and expectations. Fortunately for us our prognostications for the most part materialized.

I can't over-emphasize the value of constant communication when undertaking any major project.

For the next few years, now that I have been assured of survival, I will attempt to create conditions most favorable to the growth of Zoysia. I will reduce to a minimum the use of fertilizers and water, knowing that under these conditions the Zoysias will prevail over the Bermudas. I will also use Siduran to help eliminate the Bermudas. All these factors, combined with the normal winterkill that we get in our area, should help our cause greatly.

In conclusion I have to say that with all the trials and tribulations that we endured, this past season has to be the most gratifying of my career as a golf course superintendent.

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ZOYSIA INTO OTHER TURF

A. A. Linkogel, Sr., Link's Nursery, Inc.,
St. Louis, Missouri.

My experience goes back over twenty years on different machines and methods of introducing Zoysia sprigs, or plugs into other turf, without interfering with the play of golf.

One of our first methods of trying to introduce U3 Bermuda into bluegrass turf was to aerify a couple of times, spread sprigs with a manure spreader, roll, and keep very wet the first week. This worked pretty good with Bermuda, but golfers were not too satisfied with the rough wet fairway.

I, then, finally came up with a sprigging machine that seemed to be a great improvement. It was made to fit on any 3-point hitch tractor - a coulter to slice a slit into sod with a shoe following to open up slit, a roller in the rear with the man's weight on it to compress slit back into place. The man would feed the stolons into slit from a drum mounted on machine to hold stolons. This did a good job, and golfers seemed to be satisfied with good results.

Then there was a machine on the market called the Pray Planter. It was made for plowed ground planting with a shovel cutting a trench, and it automatic-

ally shreds the sod and dropped the stolons into furrow. So, I took my machine mounted under Pray Sprigger removing the shovel, and this worked a lot faster shredding the sod, and planting stolons into slit automatically. Two men could plant several acres a day. All of the private clubs then went to Bermuda, but after four or five years spring deadspot wiped out most of the Bermuda.

Clubs became a little discouraged with Bermuda, and started to think about Zoysia on fairways. We tried the same method of Bermuda planting with Zoysia, and here we ran into a little trouble. Sprigging Zoysia was quite a bit different than Bermuda. We could sprig a whole fairway with Bermuda, and then apply water. With Zoysia, unless you would sprig a small area and then apply water, it worked fairly well, but not getting water to the stolons for as much as one hour in hot weather you lost a lot of sprigs, and you had to keep it soaked for the first ten days.

We found out plugs worked much better with little water, so we took our sprigging machine, changed the shoe that followed the coulter slit. A man would sit on the rear of the machine and place plugs into the slit. This did a good job but was slow and tiresome for the man placing plugs into slit. When planting 1 foot apart, 1/2 to 3/4 acre per day was a good day's work for two men.

So, I began to think of automatic planting - watching the man placing plugs into slits upright he would get tired. Then he would just drop or throw plugs into slit, the plugs would fall upright, sideways, and upsidedown. So, watching this planting over the summer, I saw no difference between the plugs planted upright or sideways. I did notice a little difference in the plug planted upsidedown the first year, although they did not die, but were slower in getting started. I also found out that a plug dropped from a 3 ft. height would fall upright 80 to 85% of the time, so I came upon the idea of making an automatic plugger.

It is a 2-point hookup. Rear wheels are swiveled so as to make sharp turns. Tractor picks up front of machine for turning. It is a 2-row planter, shoes spaced 36" apart, so you can plant rows 36", or by splitting rows plant 18" or 1 ft.

The coulter is motor driven so as to cut a slice through the sod. These fingers on coulter are of hard steel. Fingers can be bent zigzag to give a wider slit in sod, to give more space for the plugs in planting into old sod. I set it to cut about 1/2" slit. A slide of the shoe follows into slit, raising up the sod on each side to give room for the plug to fall into.

The rear wheels carry most of the weight of the whole machine, and the axle is on a pin so it can follow the contour of the ground. Tires are 18 x 950 x 8. They follow over slits in sod to compress plugs tight into slit.

The shoe has an adjustment to depth, and also to tilt forward or backward. A rubber tired wheel next to shoe is a depth control. Both shoes work independently, and are spring loaded to follow contour of ground.

The hopper is 6' long and 36" wide, so it can be loaded with a front loader. The man feeds the plugs onto the belt from which the plugs fall down the cage into the slit made by the shoe. This chute is made out of strips of metal so the man can see that it does not clog up. The machine is geared to drop the plugs 12" apart. Plugs falling this distance, no matter if the plugs are put on the elevator upsidedown, will fall 80 to 85% upright, and maybe 10% sideways, 5% upsidedown. On the hopper you will notice 2 hinged gates to open as to pull plugs into elevator.

It takes about 15 minutes to plant the 3000 plugs this hopper can hold. Three men can plant 1.5 to 2 acres per day, 1 ft. apart. These machines are now available.

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WEATHER CYCLES AND GRASSES

Ray A. Keen, Dept. of Horticulture, Kansas State University,
Manhattan, Kansas

While the literature is replete with examples of periodic behaviour of weather and climate, there is little probability (less than 10%) that any climatologist will project a climatological chart from which one could determine the probability of success when choosing between cool- and warm-season grasses for the next 5 to 10 years of growth. Such a prediction would make for less expensive conversion from cool- to warm-season grasses (and vice versa) in the Transition Zone.

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WARM SEASON GRASSES A Review and Preview

Ray A. Keen

Definition: Warm season grasses grow during the frost-free season, and turn brown the rest of the year.

U-3 Bermudagrass was the first Bermuda to successfully invade the Transition Zone, or "crabgrass belt" after W. W. II.

Being in a "warm season" climate cycle, we started breeding Zoysia and Bermuda. When I'm as old as Fred Grau I'll release a Zoysia. It will take that long to get one better than Meyer.

We have released "Midway" and "Midiron" - 2 Bermudas for summer use in the Transition Zone. "Midway" for lawns and fairways; low thatch, medium fine, ^{blue-green,} low fertility 3 - 5#N/M. None after August 1.

"Midiron" for your gridiron, tees, playground and other high summer traffic areas. Not a high N. grass - 3-6#N/M. It will thatch. None after August 1.

Prospects for the Future

There is a flood of cool- and warm-season grasses for their respective regions. None look too good in the Transition Zone. Will New Jersey (Rutgers), Beltsville, Missouri, Kentucky or Kansas come up with "the grass" first?

Ky 31 fescue was a good example. Like U-3 Bermuda, it is starting to have trouble - dollarspot (Sclerotinia homeocarpa).

Evolution occurs faster in the twilight zone, and we will have to select our own grasses. They may be waiting for us, just as the best bentgrasses were a generation ago.

Certainly grasses from seed for the Transition Zone are a whole generation away.

1. Select germ plasm,
2. Make crosses of desired parents,
3. Screening and identifying germ plasm,
4. Selection and combination of desired grasses,
5. Testing over entire Transition Zone,
6. Release, jointly if desired.

ARSENIC AND ITS RELATION TO THE ENVIRONMENT

Cecil F. Kerr, Chipco Turf Products Manager
Rhodia Inc., Chipman Division, New Brunswick, N. J.

It appeared that golf course superintendents had lost most of their valuable needed tools to maintain beautiful golf courses. In July of 1970, the New York State Department of Environmental Conservation issued a list of 72 restricted chemicals. The original intent of the new regulation was that these restricted chemicals would be applied only by a custom applicator. In the original document, chlordane could be used only for termite control. Arsenicals were restricted to 4 lbs. of active ingredient per acre. Mercury compounds and DDT were banned completely.

Several superintendents, associations and researchers wrote letters to the New York Commissioner of Environmental Conservation defending tri-calcium arsenate, chlordane and mercurial compounds. Researchers explained the expertise, knowledge and responsibility that professional golf course superintendents possess.

New York changed their recommendations to allow usage of calcium arsenate, lead arsenate and chlordane on turf by permit. The new program is sound. Better utilization of chemicals will result from their sensible approach. They have recommended changes for restricted chemicals for 1972 that will allow professional managers to use restricted chemicals. They have attempted to develop uniformity between their requirements and those of the Federal Government.

Several Golf Course Superintendent Associations, leading turf researchers, distributors, over 50 golf course superintendents and the Executive Committee of the Golf Course Superintendents Association of America wrote letters to the Director of Pesticides Regulation Division, Environmental Protection Agency, Washington, D. C. These letters were in defense of the usage of tri-calcium and lead arsenate to control Poa annua on greens and fairways.

Arsenicals are widely distributed in nature; soils contain, occurring naturally, from 0.2 to 40 ppm of arsenic. Arsenic and phosphorus are very similar - they exhibit the same valences, and have nearly the same molecular properties. Factors which affect the behavior of phosphate in the soil will also affect the behavior of arsenate. Phosphates and arsenates are either fixed or absorbed by plants. Fixation is greater in a fine silty clay colloidal soil. Chelated iron and zinc increase fixation of arsenic. The addition of iron and zinc to the soil will decrease available arsenic by increased arsenic fixation.

Liming the soil increases the displacement of phosphate by arsenate. The availability of arsenates and P_2O_5 is increased as the pH increases from acid to pH of 7.

Some crops may be injured by concentration of arsenicals, especially on light sandy soils; however, most plants thrive on accumulations of arsenicals. The yields of peas, radishes, wheat, potatoes, turnips, sorghum, soybeans and cotton are increased on heavy soils, such as Davidson clay loam, even with applications of as much as 1,000 lbs. of calcium arsenate per acre. (One unusual use of arsenic is to favor sweet fill of grapefruit - applied in April to affect harvest months later).

High levels of phosphate will overcome arsenate by antagonistic action. Increasing phosphate levels caused less arsenic uptake in plants. Many researchers have reported that arsenic and phosphorous remain in the soil surface. Dr. R. P. Freeborg of Purdue University, collected data that demonstrated that arsenicals tend to remain primarily in the upper 4 inches of the soil. Neither phosphorous or arsenic leach appreciably in the soil. Thus, they contribute little to pollution of lakes and streams. Dr. Paul Rieke, Soil Scientist of Michigan State University, has conducted greenhouse studies demonstrating that arsenates do not present a serious threat to ground water contamination, or related pollution problems. He states that the arsenates should remain available to the professional turf manager for the control of Poa annua.

Bent, bluegrass, Zoysia, Bermuda and fescue grasses are extremely tolerant to arsenical formulations. Many researchers recommend tri-calcium arsenate for Poa annua, crabgrass and soil insect control. There is no acceptable substitute for tri-calcium arsenate for effectively controlling Poa annua. All other materials may seriously injure bent, or prevent overseeding, or not affect existing Poa annua.

Professional golf course superintendents have a thorough knowledge of their soil type, pH, phosphate level, zinc and iron requirements. Purdue University is completing studies with atomic absorption spectrometry analysis that will aid us in computing the approximate amount of arsenic in the soil.

With repeated applications of tri-calcium arsenate, as arsenic becomes available through the roots, gradual removal of Poa annua is possible. Control is maintained with light applications (2 lbs. 48% tri-calcium arsenate per 1,000 sq.ft. annually).

Arsenicals have nutritional and medical uses. They have been used for treatment of sleeping sickness, malaria, and many other diseases. Phenyl arsenic acid is fed to chickens, turkeys, swine and calves as dietary supplements.

Arsenicals are not accumulative beyond the biological amount naturally found in the human body. Most species excrete arsenical dosages in the urine during the first 24 to 48 hours. Many animals, after continued feeding of arsenicals, can withstand extremely high dosages. The health and vigor improves with continued feeding of low levels of arsenic.

In 1940, the United States Golf Association, Green Section, reported that arsenical treatments to turf can be made to kill insects or weeds without introducing any menace to the bird population. Birds are repelled by arsenicals and do not eat either lead or calcium arsenate.

In early October of 1971, the U.S.D.A. arsenical committee submitted a report to the Federal Environmental Protection Agency recommending that lead and calcium arsenate not be used on golf courses. On October 29, several leading turfgrass researchers, technical representatives of industrial firms, and Melvin B. Lucas, of Garden City Golf Club, met with the U.S.D.A. committee in Beltsville, Maryland, submitting technical data defending arsenicals. The U.S.D.A. reversed their decision. They submitted an amended report recommending tri-calcium arsenate for Poa annua control.

Dr. Paul Alexander, and the Executive Committee of the Golf Course Superintendents Association of America, wrote to the Director of Pesticides in Washington supporting arsenicals, stating: "The Golf Course Superintendents Association of America represents over 2,400 golf course superintendents. We are firmly convinced that these men, because of their educational backgrounds, actual agronomic experience and professional integrity, are extremely well-qualified to use the chemical tools which are vital to the growth and management of fine turf."

The Federal Environmental Protection Agency, Office of Science and Technology, and U.S.D.A. Arsenical Review Committees are submitting favorable reports recommending the wise use of arsenicals by professional turf managers.

Calcium and lead arsenate are applied on a prescribed basis. Soil types, pH, phosphorus level and percentage of Poa annua are analyzed. A ten point program for gradual removal of Poa annua is recommended:

1. Drain the low areas.
2. Correct soil acidity.
3. Omit phosphorus in fertilizer program.
4. Overseed often, even at time of application.
5. Aerate and open thatch as needed.
6. Vary application rates according to existing conditions of soil type, pH, percentage of Poa annua, and phosphorus level.
7. Gradually achieve Poa annua control (2 years about average).
8. Maintain control with light annual applications.
9. Limited liquid phosphate may be used as a counter-action if Poa annua is dying too rapidly.
10. Apply on frost-free ground.

Arsenicals are essential in order to maintain healthy turf. We cannot overlook the value of healthy turfgrass as an anti-pollutant, as a basic oxygen producer, and as a prime erosion control agent. The wise use of arsenicals will maintain a suitable habitat for wildlife, and eliminate unsightly weeds and harmful insects on golf courses and recreational parks, providing a beautiful environment.

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THE TECHNOLOGY OF PO-SAN
IN THE CONTROL OF
POA ANNUA ON FAIRWAY-TYPE TURF

Stan Frederiksen, Mgr., Specialty Agricultural Products,
Mallinckrodt Chemical Works, St. Louis, Missouri

Poa annua is a weed grass - - considered the worst of all weed grasses by most professional turf managers. It is known as the "problem grass" in that while it has a fine appearance under optimum conditions (and you may want to take a good look at a picture of healthy Poa annua in your Mallinckrodt TURF PEST MANAGEMENT HANDBOOK).

Poa annua is the very first turfgrass to "go out" under the stress of summer's heat - - and the very first to be killed by winter's cold. Worse yet, practically all sound turf management practices (such as watering, vertical mowing, soil aerating, fertilization, etc.) which are designed to benefit bluegrasses, bentgrasses, fescues and the like, favor Poa annua also. Poa annua grows so

prolifically that during periods of its maximum growth, usually spring and fall, it often forms a turf so "tight" that the germination and development of the desirable grasses are literally smothered - not only those already present in some percentage (either as growing grass or as seeds in the soil), but also in newly seeded areas heavily infested with Poa. In this latter case, the tight Poa annua turf cover is often so dense that the desirable seeds, even if drilled properly into the soil with modern seeding equipment, just "do not have a chance" against the Poa competition. Either the new seeds just get lost in the Poa mat and never even get to the soil, or, if they do reach the soil, they are smothered out. Overseeding any heavily Poa-infested turf area with desirable grass seed is normally a complete waste of time, money and seed.

Yes, Poa annua is the "problem grass" and turf managers are almost universally agreed that fairway Poa has got to go! But, how?

Prior to 1970, there was no way to remove Poa from heavily infested areas without losing much turf cover. Post-emergence chemicals, those that kill the growing plants, couldn't be used, because anything that would kill Poa would also kill the desirable turfgrasses. The use of pre-emergence chemicals, while excellent in keeping Poa out of non-infested turf, or in eliminating Poa from turf areas where it occupied only a very small percentage of the total area, is completely unacceptable because because the pre-emergence chemical in the soil kills all turfgrass seeds, not only Poa seeds, as they germinate.

In 1970, Mallinckrodt offered PO-SAN, a chemical system that permits gradual elimination of Poa. It has no pre-emergence effect, does not require special preparation of turfgrass areas prior to treatment, and it does not kill any existing grass, not even mature Poa, except possibly under conditions of extreme heat stress. PO-SAN provides for gradual weakening, because as the Poa retreats, the desirable grasses may fill in the vacated areas; thus, continuous, playable fairway turf cover during the process. Even better, desirable grasses seeded into areas immediately following a PO-SAN treatment have a much improved chance to germinate, develop and survive because there is greatly reduced Poa competition.

PO-SAN is a carefully formulated system of growth retardants, with special solvents and additives, packaged as one-half gallon of Formulation A, and 1/2 gal. of Formulation B. The two parts are kept separate, because in their concentrated form they are not chemically compatible for long periods of storage.

In use, the contents of both half-gallon containers are poured into 30 to 50 gals. of water, which is being thoroughly agitated. The resulting solution is sufficient to treat from two-thirds to one full acre, and should be applied as a fine spray with a carefully calibrated boom-type sprayer on the turf foliage, and be allowed to dry on the grass blades at once. It should not be applied just before heavy rain is expected. PO-SAN treated areas should not be watered for several hours, so that the PO-SAN can dry thoroughly on the grass blades.

Now, consider the spring application first. About the time of the first mowing, the applications are best made when the Poa is green and growing, but with seedheads not yet showing. Within a week or so after the spring PO-SAN treatment, all the treated turf will turn somewhat chlorotic (sort of a slight yellowish green appearance). Leave an untreated check plot so you can identify this more readily. It is normal for this chlorosis to appear - it is the sign that the PO-SAN is doing its job. Within a couple of weeks the chlorosis will disappear, and all treated areas will turn a deep green. The untreated check areas will turn almost white with Poa seedheads. In the treated areas you will find anywhere from no seedheads at all to less than about 10% of the normal seedheads.

The reduction of Poa seedheads is the key to spring PO-SAN use. To use the words of Dr. Roy Goss of Washington State, "When you destroy the capacity of Poa to reproduce itself, the species must ultimately disappear." The PO-SAN treated Poa later seems to put more of its growth effort into developing sturdier Poa plants, which appear to resist heat and drouth far better than untreated Poa.

In fall a PO-SAN application is again desirable. Before the flush of fall Poa seedheads appears, apply PO-SAN - a gallon in 30-50 gals. of water to about three-fourths of an acre. It will stunt the Poa, inhibit Poa seedhead production, open up the turf, and actually kill any tiny Poa seedlings that may just be germinating, and in the one-leaf stage.

Then, after the PO-SAN treatment, overseed with your favorite bluegrass or bentgrass, preferably with a good seed drill, or some other means of assuring that the seeds come into contact with the soil. Water and fertilize normally to encourage the germination of the new desirable seedlings, being careful to use a non-burning fertilizer.

PO-SAN has now been in use on a number of courses from coast to coast on a full-fairway basis for several years. We have been authorized to use in our ads testimonials as to the performance of PO-SAN - see the January, 1972 issue of Golf Superintendent magazine- statements, pictures, and telephone numbers - you may call them on a "collect" basis.

In conclusion, our Company has a written guarantee to the effect that PO-SAN will perform as claimed in the label and in the data sheet so long as the PO-SAN is applied in the manner exactly prescribed.

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TEAMING UP ON SOD GROWING

Harry Murray, Jr., Ryan Equipment Company,
Akron, Ohio

I have always considered the Midwest Turf Conference the Granddaddy of Turf Conferences because so many states started their own turf programs after attending this one. This is a reflection on the growth of our industry.

Speaking of growth, how does business look for you in the coming year? If you believe what the experts say this could be one of your better years. In a speech given by Dr. Kenneth McFarland at the American Rental Association meeting two weeks ago in Atlanta, Georgia, he stated that 80 million people go to work every day, even with 6% unemployment. That in 1970, which was a recession year, savings reached a record breaking 54 billion dollars. Savings in 1971 broke that record of 59 billion, and 1972 is expected to break that record. Just think of what would happen to this country and the sod industry if people started spending all that money!

At the Indianapolis Rotary meeting on January 25 of this year, Vice President of the New York National Bank, Mr. Kenneth Sprang, stated that in the past 20 years the United States has gone from a manufacturing country to a service country. That we are down from 70% to 58% in manufacturing. He stated that the auto consumption looked good for 1972 and would carry over into 1973.

The consumer index will go down, housing will go up, interest rates have reached their low, and the gross national product increase for 1972 would be 6%.

The February 17 issue of the Wall Street Journal shows housing starts in January to be a record - up 4.8%. In talking to some of you at the Ryan Service School, most people are optimistic about the coming year.

But, what about the price of sod? Our Michigan friends say they have received only a .03¢ raise in the price of sod in the last ten years. To overcome this, they are considering a Marketing Program. They are voluntarily asking the government to put controls on how much sod can be produced. You will notice I said voluntarily asking the government because that is the only way controls could be put on.

The sod industry has grown to where there are state associations located throughout the country - Ohio and Texas being the two newest that I know about.

Speaking of Texas, if any of you have grower friends down that way, the next time you go to church say a little prayer for them. The new fungus that has hit St. Augustine grass has put several growers out of business. At the present time there is no known cure. The disease is expected to spread throughout the south. Home lawns are being wiped out by the hundreds.

We at Ryan Equipment Company are concerned and interested in you and your industry. The Company has come a long way from 1946 when Gordon Kindlien and Earl Nystrom founded the K & N Machine Works. They set up shop in a 12' x 28' garage in Gordon's back yard. The first year the Company established itself as a general machine shop, specializing in tool and plastic mold making. That year the first little Christmas tree was decorated with shavings from the lathe. Pete Pfenning and Sam Kindlien, Gordy's father, were the first two employees during 1947.

In 1948, K & M Machine purchased the manufacturing rights for a sod cutter designed by Steve Ekholm, owner of a small manufacturing company, and Art Ryan, a commercial landscaper. The machine was redesigned - called the Ryan Sod Cutter. That year also found the Company moving into a new 30' x 40' building on Edgerton Street in St. Paul.

In 1949, Pete Pfenning went on the road selling 12" Ryan Sod Cutters. During 1950, the Company started making an 18" cutter. In 1954, the cut-off attachment was introduced. Grant Tigwell joined the Company, and by the end of the year, there were 25 permanent employees. By 1957, distribution was started in Europe and England. It cost \$ 300.00 air freight to ship a sod cutter. No one wanted to wait 30 days for them to come over by steamer.

In 1962, Pete Pfenning and Grant Tigwell both died of heart attacks. By now the Company had 60 employees. During 1963, the Company moved to a new building on a 16 acre turfgrass farm, and the Company was changed to Ryan Equipment Company. In 1969, the owners sold the Company to Outboard Marine Corporation, of which Ryan Equipment Company is now a subsidiary. We have over 100 employees and world-wide distribution. The standards that have been set for us are high, but we intend to maintain them.

We have been asked - 'Why didn't we build the sod harvester?' The primary reason is because of non-uniformity within the industry. The widths of cut, and differences in whether the customer wants to roll, fold or slab his sod. If there was some standardization within the industry we would reconsider our position. There are less than 1000 growers in the country. The amount of harvesters that would be sold is estimated at 25% of the market. Uniform standards would help in production and maintain reasonable cost.

Today we build 5 different size cutters: 12 - 15 - 16 - 18 - 24 inch. Twelve and 18 inch cutters are most popular, and we make them in advance. All other cutters are made as orders are received. Durability of the machine has sold itself. Some sod cutters in use today are 8 to 10 years old.

Frank Buschini, our salesman on the east coast, and myself have been the first Ryan factory personnel to visit many of the sod farms. The information received from these visits have caused some changes in our equipment. The new ram system is one example. We also are holding sod service schools. The information exchanged in these meetings has been most helpful.

In closing, we are serving the industry, and will continue to build the type of high quality equipment that you expect.

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SELECTING AND IMPROVING GRASSES

Kenyon T. Payne, Dept. of Crop Science,
Michigan State University, E. Lansing, Michigan

The improvement of grasses has been going on since man began bringing selection pressures on native species in the forest margin areas of Erosia in pre-historic times. As herds of ruminants were grazed in flocks, only plants with low growing crowns and possessing the ability to produce stems and leaves from growing points near to the soil line were able to survive.

Although there are nearly 10,000 recorded species and 600 genera of grasses, only about one-half dozen cool season species are of importance to us, and three of these provide for most of our turfgrass needs.

While dramatic gains have been realized in the plant breeding improvement of many of our field and horticultural crops such as corn, wheat, soybeans and tomatoes, progress in producing more adapted and satisfactory varieties of turf-grasses, as well as the forage crops, such as alfalfa and brome grass, has been less and much slower. Reasons for this are relatively simple. In the first place, the grass acotypes available to us from our grandfathers were relatively satisfactory, and by the nature of their heterogeneous inheritance, they were better able to withstand stress from weather and pests than a homozygous, self-pollinating crop such as wheat or oats.

Secondly, the economic value of a pasture or home lawn was less directly measurable in dollars. This lessened the emergency for improvement.

But, the greatest contributing factor has been that most species are cross-pollinated, are difficult to manipulate by controlled breeding techniques, and are polyploid and highly heterozygous which greatly increases the difficulty of establishing and maintaining genetic gains. Thus, a smaller number of scientists have been willing to enter this field because a plant breeder could expect to make more rapid and obvious gains in other crops. Furthermore, there has not been a willingness to support this work because of many of the factors above. The country club orientation of the turfgrass industry did not thrill many deans of agriculture when support for ag research was being allocated.

(1865),

Soon after the discovery of the laws of inheritance by Gregor Mendel in

1900 scientists began providing an understanding of how characteristics are passed from generation to generation. The increased emphasis on scientific research since World War II has resulted in refinements in genetics, cytogenetics, genetic mutation and physiology, as well as laboratory equipment and methods, which can be applied to the more complex problems of turfgrass breeding. Coupled with this, the development of an affluent society provided increased support and, indeed, demands for higher quality turfgrasses.

In the cool, humid regions, the discovery of Merion Kentucky bluegrass marked a turning point in turfgrass improvement. Here for the first time was a variety highly superior to all others in quality and beauty, but more importantly, possessing a level of resistance to Helminthosporium leafspot which far surpassed levels of resistance of existing varieties. Its apomictic pattern of reproduction meant that seed produced from it would give rise to plants nearly identical to the mother plant.

With this discovery, turfgrass breeders took heart, and much effective effort is underway today.

In contrast to most of his crop breeding associates, the turfgrass breeder is not interested in yield. Indeed he would be happy with no yield if other factors, such as recuperative potential and spring color restoration, could be accomplished without upward growth. The characters sought in producing an improved turfgrass variety are somewhat more subjective than physical (actual) in measurement. Uniformity of color and general appearance, density, texture, growth habit and smoothness (for golf greens) are difficult to identify.

The goal of the breeder is to produce a variety which is equal to the best available varieties in most major characteristics and truly superior in at least one. With the passing of recent plant protection legislation, he is also interested in at least one character which will permit definite identification of the variety.

He starts his program by stating his goals, then selecting methods for accomplishing these. The next step is to collect materials from as many sources as possible. Available varieties, plant introductions from government gene pools, other scientists working with the same species, and single plants found to have good qualities from an old fairway or lawn are the major sources of initial acquisition.

Establishing single plant nurseries from these sources is the next step, with each single row of plants coming from a given seed lot. Field notes are taken to determine the best families, and from these the best individual plants are selected. These may be crossed individually, or placed in an isolated nursery where superior plants can intercross and another generation of selection follow. As an example, at M.S.U., Dr. Vargas and I are concentrating on developing red fescue varieties with a strong spreading habit and resistance to Helminthosporium leafspot.

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LEASING AND RENTING EQUIPMENT

Harry Ranft, Turf Specialties Company
Indianapolis, Indiana

My audience is a group of business men conducting a business operation - a golf course facility, so let's call this a business session. Then we can expand our subject to Ownership - Leasing - Renting. Now we can condense to THE COST OF PERFORMANCE OR SERVICE. Actually we are not considering the purchase of a piece of equipment. We are seeking an end result. Our greens and fairways require mowing or aeration. Our greens require a topdressing - we think of shredders, of mixing, screening, and spreading topdressing. Numerous other jobs.

So, our problem is - how do we obtain the desired performance or service economically? Economy is one factor which contributes substantially to profit. And profit gentlemen - is the name of the game - your game. And believe me, contrary to what some people would have us believe, profit is not immoral, sinful, or illegal. Profit is the lubricant which keeps us going. And, it is a worthy goal; it benefits every person in this country. Your profits are measured by higher salaries as you perform your duties more effectively, efficiently and economically.

Now, how do we buy the performance or service which we are seeking? Do we buy our equipment on a straight lease? Do we buy on a lease-purchase agreement? Or, do we buy temporary ownership on a rental contract? Only you can make your own decision. You are responsible for the success or failure of your business.

Robert Irving in his booklet "Equipment Rental, a New Force in our Economy," among other things - "when tools or equipment are needed for consistent use throughout the year, buy or lease them. When the need is for an hour, a day, a week, a month, or a season - rent them. When in doubt study all the costs of buying, leasing or renting - and be guided by what is most profitable." Over simplification? Possibly! But, let us look into it.

Leasing

First, what is involved with a lease, or a leasing agreement, or contract? Old Cal Coolidge used to say, "You hire the money." You, the user, select the equipment, and the leasing company buys it from the dealer, and in turn leases it to you. The terms of the lease may vary, but usually may run for a year, 3 years, 5 years, or even longer. In turf the 3 and 5 year terms are most popular. Payments are computed on a monthly basis, and can usually be tailored to fit in with your income producing months. For a ball park figure I was quoted last week by a local leasing company the monthly payment of \$ 33.50 per \$ 1,000.00, for a 40 month lease. Deposits also vary and range from first and last payment to 5%, 10%, etc.

Leasing is not yet too competitive in the turfgrass maintenance equipment market. But, there are leasing companies scattered over the state, and their job is to move their money. Consult with your tax man - the IRS have some ideas on leases also. When you have gathered this information pay your banker a little visit. He knows your financial picture better than any other financial institution, and in addition he has, in many cases, a more personal interest in your success. Leasing will permit you to acquire the use of a piece of equipment right now - not several years from now when the price is higher, and when your cash position will justify a purchase.

It is no great trick to show that a Triplex Greensmower acquired on lease will save in labor cost sufficient funds to justify a leasing deal. Also, that a

golf cart rented out to your players will generate funds that will also justify a leasing arrangement. I have heard a representative of a leasing company state that it does not make any difference how much you pay on a lease provided you can generate a larger amount in service value or income. However, we are all interested in the difference between income and outgo. Can you turn over your available cash (or save on the labor expense outgo) a sufficient number of times to justify the expense of leasing? Leasing permits, of course, an orderly and accurate preparation of budgets, as certain of your expenses are already fixed on a monthly basis.

Leasing also has some tax advantage over outright ownership, I understand, provided you obtain the proper lease. This may also apply to insurance expenses. Also, as a business operation you have that depreciation factor to consider. This also is something for your tax man to mull over. Some factors shared by ownership and leasing are obsolescence, which you risk when you buy either way, equipment maintenance, storage.

To sum it up, it is wise to sit down and figure your total dollar cost of your equipment either way, and then your total dollar cost of the money you hire, and compare the figures with a reasonable estimate of the labor expense saved, or the income generated. And, don't forget your players - leasing will permit you to acquire those manicured greens and the carpet-like fairways, and the rides in the golf cars. And, your employees will perform more efficiently on Triplex Greens-mowers, and easy to handle hydraulic equipped tractors.

Triplex Greens mower - an 18- hole course

Leased may be \$ 120.00 per month, or \$ 240.00 per month for 6 months, or \$ 1440 for the year.

Assume 100 cuttings in a 6 month season. This is usually a 12 hour job (4 men, 3 hours each) at \$ 3.00 per hour (including insurance, wages, taxes, F.I.C.A., etc). Your labor cost is \$ 36.00 a day, or \$ 3600 for 100 cuttings. The average time required to complete the job with a Triplex is some 4 hours. Labor cost, therefore, is \$ 12.00, or \$ 1200 for the 100 cuttings.

<u>Purchase</u>		<u>Lease</u>	
Cost of Triplex	\$ 3500	Triplex yearly lease cost	\$ 1440
Recovery or saving in labor: 3 yr. x \$ 2400 ea.	<u>7200</u>	" " labor "	<u>1200</u>
Resulting cap. & svgs. (less maintenance)	\$ 3700	Total labor & lease cost	<u>\$ 2640</u>
		Yrly. labor cost w/walkers	\$ 3600
		" " " w/Triplex	<u>1200</u>
		Yearly savings in labor	\$ 2400
		Less cost of lease	<u>1440</u>
		Total net savings per year	<u>\$ 960</u>
		\$ 960 x 3 years	<u>\$ 2880</u>
		and no capital!	

Renting

Many lists of equipment necessary for the maintenance of golf courses includes pieces of equipment which are used infrequently. This type equipment represents over 50% of the items. The cost of equipment is high, and a substantial amount of your funds, therefore, can be tied up in inactive inventories. Buildings are required to house the units, mechanics and parts inventories are necessary in order to keep them going. As is common with all industry, this type equipment becomes more costly each year and more sophisticated. This means more frequent changes in models as more costly and more sophisticated units are produced

in order to perform in a more effective or efficient manner.

During the 1960's one company launched over 6 models of a very popular machine in 9 years - each model an improvement over a previous model. At the recent Turf Conference in Cincinnati, we had a chance to look at 5 or 6 powered sand trap rakes, each one different to a degree. Just a few years ago there was one similar product in the marketplace. This type equipment lends itself readily to the rental market. In the words of Robert Irving quoted earlier, "When the tools or equipment is needed for an hour, a day, a week, a month, or a season - rent them. Just as buying or leasing means long-term ownership, rental means short-term ownership."

Renting of equipment and practically anything else has developed into a substantial industry. Renting, at all levels of our economy and in all types of industry, is rapidly becoming "a way of life." Decker states - "It is a dynamic new industry on the American business scene. It is the fastest-growing service industry in our economy." Incidentally, you are also in a service-industry, and probably know that for the first time in the history of our country, and probably for the first time in the world among industrial nations, the service industry contributed more to our GNP than manufactured products. Alvin Toffler in his runaway bestseller "Future Shocks" calls it Rentalism. And, in addition to his observations and forecasts in the book, he devotes as much space in the notes section as he does to any other subject.

The rental industry is here to stay - beyond doubt. It is the least expensive way of acquiring the end result you are seeking. What is equally, if not more important, is that required equipment will be available when it is needed. The advantages of renting equipment are obvious detail - you avoid the risk of obsolescence; you conserve cash; avoid the expense of storage facilities; least maintenance shop, mechanic or parts required; property tax and certain other expenses eliminated; forecasting and preparing accurate figures for budgets; obtaining the correct machine for the job, develop new techniques, and you do not have old equipment cluttering up your shop.

The cost of renting - this will vary depending upon travel time, if you want it delivered. At the yard, the cost would be somewhere equal to or a wee bit less than the cost of money. A \$ 2,000 aerator would cost the owner of a 9-hole course about \$ 130.00 for a spring and fall greens aeration. Interest on the \$ 2,000.00 piece of equipment would be \$ 140.00 at 7%.

Unfortunately right now the rental of much turfgrass maintenance equipment is not available in all areas. But, it will be - if you get after your local rental yards.

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PO-SAN USE AT OAK PARK COUNTRY CLUB

Leon Hartogh, Supt., Oak Park, Illinois

I have made three applications of PO-SAN - the spring of 1970, and the spring and fall of 1971. The 1970 application was applied on a one acre section of my #7 fairway on April 19 in 1970. The results of this test plot was impressive. The PO-SAN was applied right after the first Poa annua seedheads were

spotted. After the ninth day the turf reached its peak in the chloridic stage, and after the 15th day it was a much darker green than the check area. It remained visibly darker for a period of approximately 3 weeks. During the season this area also seemed to me to be more disease and drouth resistant than the untreated area. The control of seedhead formation in this area was virtually 100%.

After observing the results of this test, the Greens Committee agreed to test Po-San on a larger scale in '71. It was decided to try it on 16 acres. With the arrival of spring it was evident the ice storm of January 4 had taken its toll. We had 3 days the latter part of February when the temperature reached the high 60's. The turf in the low areas and pockets where the ice remained until the third day was lost. The areas were from 3 to 4,000 sq.ft.

By April 26 there still wasn't any evidence of the Poa starting to form seedheads, which is the signal to spray the Po-San, but with the loss of turf I was anxious to start overseeding the fairways. They don't recommend using Po-San on new seedlings, so I had to apply it before I started overseeding. This was April 26, one full week later than when I applied it the year before, so I decided to go ahead. The Po-San was applied and the overseeding begun.

By May 5 rows of new seedlings could be seen in the grooves left by the Aero-blade seeder; germination was not impaired any by the Po-San; knotweed also started taking root in the barren areas.

The spring of 1971 was unusually cool and dry. Although we got good germination from our new seed, the existing grass did not respond as you would expect it to in a normal year. The cool weather also had effect on the reaction of the Po-San. It took from April 26 until May 19 for the grass to reach the peak of its chlorodic stage. This is almost 2 to 2-1/2 weeks longer than normal. It was May 18 before the first Poa annua seedheads started to appear. This was one full month later than the year before. So, I applied the chemical 3 weeks too early.

Instead of the almost 100% seedhead control I received the year before, I only got around 80% control. Seeds were taken by Mr. Serbousek of Mallinckrodt Chemical from the treated and also from the check areas for testing. Thirty seeds from each area were planted. In the treated area 2 out of the 30 germinated, and in the check area 27 out of 30 germinated. So, the Po-San still gave favorable results even though applied too early.

The fairways at Oak Park have a very heavy thatch buildup. In the fall of 1971, we started a fairway renovating program. The program we are following for the next 3 years is Po-San spring and fall, followed by double aerification with 3/4" coring tines. We then overseed with an Aero-blade with a seeder attachment. The fairways are then swept with a sweeper, fertilized and watered.

I mentioned before about the knotweed that came in the area where we had loss of turf due to the ice. Ten days after application of Po-San in the fall the knotweed had disappeared.

I am happy to report that the fall application took a more normal and expected course. By following this program I am working with Mother Nature rather than against her. By giving her a birth control pill and not allowing a new seed crop, also introducing desirable seed to take the place of Poa we should be in the right direction.

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PO-SAN AT HIGHLAND COUNTRY CLUB

Marvin Scobee, Supt., Indianapolis, Indiana

My observation of Po-San control at Highland C.C. began with a fall, 1971 application on all 18 fairways. Most fairways had approximately 85% Poa annua and foreign weeds. The material was applied when seed started to appear, and new plants were in the 2-leaf stage. No seedheads matured, and small plants were killed with no damage to older plants, except yellowing for 2 weeks, which we expected.

The grass came back a deep, natural green. 90% of all clover, knotweed, and chickweed was killed. With no competition the grass seed germinated perfectly.

1. All fairways were applied August 31, September 1, and September 2, 1971.
2. On September 7 and 8, 1971, used 4 gal. Po-San mix in 100 gal water to 3-1/3 acres. Accurate and uniform application is very essential. Be sure the nozzle and spray boom are clean, and calibrated correctly and accurately. We used a 21 ft. boom; however, we had a narrow lap pattern.

We sprayed while dew was on to act as a marker. We tried dye, but had no success with it. Something needs to be worked out as a marker.

3. On September 15, 16 and 17 we seeded fairways to Highland bent - 40 lbs. per acre drilled in. Water good. This is very important.
4. On September 28, 1971, applied 250 lbs./acre of 18-5-9 fertilizer. We got some burn on ends of a few fairways where we lapped too much. Water good.

I recommend you inform your Board of Directors and Greens Committee of the program as to what to expect on yellowing. They will be better qualified to answer any questions the members may have.

I am planning to make my second application this spring just as seedheads start to appear. I hope to apply a day before the heads show. I plan, also, to use the same program on all tees this spring. Also plan to experiment on a few greens.

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CART PATHS AND CONSTRUCTION

Carl Schwartzkopf, Mid-Continent Agronomist, USGA
Green Section, Crystal Lake, Illinois

Whatever our personal opinions are of golf carts, we can be certain of two things: First, the carts are here to stay, and second, they will increase in numbers. "Golfdom" Magazine, February, '72, provided the following information:

Private clubs in 1969 and 1970 averaged 32 carts; in 1971, 33.
Increases for 1972 are: private clubs by 4 carts,
semi-private club by 6,
public course by 12.

The introduction of the golf cart has brought some blessings to people in golfing. However, they have done little to make the superintendent's life easier; in fact, they have made it more difficult. Let's look at some of the advantages of golf carts:

1. They have made the game more enjoyable for some people, and have enabled others to get in more than a single round in a limited period.
2. People who were formerly unable to play for health reasons, are now often able to play golf.
3. Hilly layouts are more enjoyable, and at courses where caddies are not available, the golf cart in part overcomes this problem.
4. It is important to realize too, that the revenue from golf carts helps many clubs to balance their budgets.

Now, let's look at the other side of the coin and view some of the disadvantages. Heavy traffic damage is apparent to the casual observer, as worn spots, discolored turf, and bare soil showing through sparse, run-down vegetation is obvious. Bruising by cart traffic is the most common damage to turf. As traffic increases, especially cart traffic, the soil structure breaks down and we have compaction.

Even the strongest, most vigorous grass plant that is well managed has its limits, and can tolerate just so much traffic. Once this tolerance point has been reached, we have only two choices: we can reduce or spread the traffic, or we can provide a non-turf surface to use that will stand up under cart traffic, namely, a cart path or road. Golf cart paths in many situations are necessary. Paths on a golf course may be built beside tees, around greens, or in other areas that receive concentrated traffic.

The last option is having a continuous path from the first tee to the 18th green, winding through the golf course. This is practiced in several areas, such as Hawaii, Florida and Southern California on resort courses that receive a heavy amount of tourist trade.

Let's discuss the actual construction of the path or road itself, paying particular attention to types of material used, the depth of the material, the width of the cart path, and the shape or contour of the path.

Materials used in cart path construction include: sand, soil, gravel, pine needles, redwood and other types of wood bark and wood chips, peanut and pecan hulls, shells, concrete and asphalt. The gravel base topped with asphalt is the most popular. The most important step is to have a well-constructed base.

Remove existing sod and soil to such a depth that the finished asphalt surface will be level with the soil. The center of the path may be 2 to 3% higher than the edges to provide for drainage. Another variation in providing drainage would be to swale the path, or make the center lower to drain the water, or carry it off from the center area. This would help to control erosion at the edge of the path.

After assuring that the path will drain, place 3 to 4" of gravel or crushed stone for the foundation, being sure that the material is compacted. The crushed type of stone is being used more because it is easy to handle, compacts easily, makes a smooth, even surface, and does not erode readily. The use of pea gravel is discouraged because it does not pack as tightly, or compact as readily as crushed stone. Be sure to roll till firm, and compact. Make sure the soil on the

sides of the cut is not broken down. This is of primary importance if the soil is a sandy type texture. Much improved results are obtained if barriers are placed along the edges.

Asphalt is available in different grades or qualities for different uses, such as for streets, parking lots and driveways, so be sure to check with your local supplier as to the types available in your area. After the asphalt has been firmed with rollers, allow it to harden before it is used - usually 8 to 12 hours is sufficient. After the path is in, be sure turf damage to sides of the path is repaired by filling in the low areas and sodding if on a hillside.

There are alternate methods of building cart paths. One that has received a considerable amount of attention and favor recently in building cart paths and/or roads with 4 to 6", and in some cases 8", of asphalt without a base or foundation. Some installation contractors claim that it is more reasonable, practical and efficient than to bother with the base of gravel method outlined earlier, when the cost of putting in the foundation is taken into consideration.

Asphalt paths hold up amazingly well and with minimal maintenance if installed properly. The most frequent forms of cart maintenance are:

1. Applying a sealer coat about every 2 to 3 years. This sealer coat is available in various colors, such as green or brown, to compliment the immediate area.
2. The other form of maintenance required is to repair breaks when they occur. Cold patches can be used to repair small breaks or eruptions when hot mix is not available. Large breaks should be repaired with the same hot mix used in the original construction because cold patch is not long lasting.

Some clubs have a long-range master plan, where they plan on installing cart paths and roads for maintenance equipment, with eventual plans of connecting all the paths and roads throughout the golf course.

The appropriate places to build cart paths are beside tees and in the congested areas around greens where the traffic always seems to funnel. With few golfers being able to accurately place their shots in the fairways, we should allow carts to move at will and randomly throughout the fairway and rough areas. This method distributes the traffic sufficiently, causing minimal wear in any one location. It may be summarized as Mr. Richard Tufts once said, "The inherent inaccuracy of the golfer will serve to distribute the traffic." Building the cart path 8 ft. in width will also provide an adequate road for maintenance equipment.

The parking problem can also be controlled by using a small curb along the edge of the path, or by burying several cement blocks 3 to 4" in the ground and planting flowers in the holes of the cement blocks. The flowers add color to the course, and brighten up what could be a dull and worn area.

We can readily see that the problem of the superintendent is how to live with carts. As you may well expect, there is not a panacea, but the answer might have many parts, such as:

- A. Careful regulation of their use,
- B. Educating the drivers where and where not to go,
- C. Increased use of cart paths.

(Editor's note: A small vertical trench at one edge of path, with 2" slitted tile drain tube, backfilled with pea gravel can improve stability and drainage).

SAND TRAP MAINTENANCE

James Fischer, The Toro Company,
Columbus, Ohio

In the past years mechanization on golf courses has reduced the labor content of maintenance tasks and permitted a higher level of grooming. Automatic irrigation systems, the Triplex Greensmower, and the 9-gang fairway mowers are examples of this mechanization. An area on golf courses, which has high labor content and has only recently had work done in mechanizing the tasks, is the sand trap.

The objective of this presentation is to review the various tasks performed maintaining sand traps, how they are being mechanized, and discuss briefly a comparison of labor cost savings when raking is mechanized. In a review of sand trap maintenance of activities on golf courses in several areas of the country, we find that maintenance consists of performing the following tasks:

1. Raking - to accomplish
 - A. Removing of golfers foot prints,
 - B. Break crust caused by sand compaction from irrigation and rains,
 - C. Repair and level washouts caused by rain, and move sand to higher levels.
2. Edging - to control growth of grass and provide a sharp line.
3. Cleaning - to remove leaves and debris blown. Also, removal of weed growth; however, frequent raking can prevent weed growth.
4. Adding new sand - as required to fill in washout areas after heavy rains, and to replenish sand blown or thrown out.

Now, let's take a look at the labor content of these tasks as recorded on various golf courses this past year:

Location	<u>Minneapolis</u>	<u>St. Paul</u>	<u>Portland</u>	<u>Florida</u>	<u>Los Angeles</u>
traps	86	50	45	52	65
Labor/hr. \$	2.15	2.50	2.50	2.35	2.75
Edging hrs.	346	158	100	300	728
Cleansing hrs.	997	172	150		136
Raking hrs.	<u>120</u>	<u>542</u>	<u>650</u>	<u>2910</u>	<u>2080</u>
Total cost \$	3146	2180	2245	8378	8097

It appears a mechanical rake can easily perform 70% of the total tasks performed in maintaining sand traps.

To review some equipment built for raking sand traps and equipment on the market today, let's first look at how one innovative superintendent and his mechanic approached the problem. An Allis Chalmers model "G" tractor was equipped with dual wheels to provide flotation and a 9 ft. wide rake mounted at the rear with hydraulic lift. This machine does an excellent job of raking, but because of its size is not able to work well in small traps, or complete the raking close to irregular edges of traps.

Two years ago a major farm equipment company entered the market with a 6 ft. rake mounted on a garden tractor. This machine received a lot of interest, and performed well in many conditions. It is limited in its ability to maneuver in small areas, and in loose sand conditions, and, therefore, has only been a partial answer to mechanizing the raking task. A farm quipment dealer in Florida installed this same rake on their garden tractor with similar results.

Another innovative superintendent in Florida built a rake using golf car axles, a simple frame and 4-wheel drive. This machine performs well and has been the most successful machine marketed to date.

In May of 1972, the Toro Company will begin delivery of its Sand Trap Rake. This machine will be a professional design by the same engineers that designed the Greensmaster 3, Parkmaster 9, and Spartan 7, introduced the past two years. The outstanding design features on this unit are:

Maneuverable 3-wheel design,
Operator conveniences and comfort,
A rake for all sand conditions,
New trouble-free modern drive systems,
Quiet operation.

Now that mechanization of sand trap raking is here, let's look at how much time and labor can be saved. This past summer in a time study with prototype machines, Toro engineers found that it is easily possible to rake 15 sand traps per hour. Because the operator is comfortable, he can rake all sand traps on a golf course with 50 traps in less than four hours. In hand-raking, a man averages 7 to 8 traps per hour. In summary, raking time is cut in half by mechanization.

First looking at the private club, 6 month operation we see the following 5 year savings:

St. Paul Minn - Cost comparison - 5 years - 20 traps

<u>Manual</u>		<u>Machine</u>
--	Cost	\$ 1,500
\$6,775	Labor	3,387
	Operating costs	500
<u>\$6,775</u>	Total	<u>\$ 5,387</u>

The other extreme is a public golf course open 12 months. Here the savings is much greater:

Plantation, Fla. - Cost comparison - 5 yrs. - 60 traps

<u>Manual</u>		
--	Cost	\$ 1,500
\$34,255	Labor	\$17,126
	Operating costs	1,000
<u>\$34,255</u>	Total	<u>\$19,626</u>

As you can see, mechanization of sand trap raking can save labor costs on all golf course operations.

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DEVELOPING A COMMUNITY COLLEGE CAMPUS

Ronald G. Dudley, William Rainey Harper College
Palatine, Illinois

On October 8, 1967, groundbreaking ceremonies were held for the construction of the first six buildings of William Rainey Harper College at Palatine, Illinois. A 200 acre campus site was acquired by the Board of Trustees of Illinois Junior College District 512 in 1966, and is located at the intersection of Illinois Route 62 and Roselle Roads on the far northwest corner of Cook County, Illinois.

Harper College has enjoyed an average increase of 18% a year in student and staff population growth. The fall 1971 enrollment of 9,000 students, with an anticipated enrollment of 12,000 students in the fall of 1972, reflects the fantastic growth of our young institution, now a fully accredited, comprehensive community college. The first phase was completed in 1969, and we anticipate Phase II will start in the spring of this year. We anticipate that the Palatine campus will be completely constructed by September of 1978, and will consist of 16 academic and service buildings.

The physical plant organization has grown with the college from a very humble beginning with our first director, Mr. Robert Hughes, and his capable secretary, to a six department division, employing 85 employees, and 20 part-time and student-work-study employees. Our mission at Harper College is to provide the facilities for the intellectual growth of our students. We feel that the contribution to the educational enrichment of Harper College students will be reflected in their achievements on our campus and in our community.

The Grounds Department at Harper College has a particularly severe challenge in maintaining two and a half miles of roadways, 27 acres of parking lots, 13,000 ft. of walkways, and the areas which surround our permanent buildings. We say that the challenge is severe because of the phase construction of our campus. Our college, like other Illinois schools, can expand only when resources are available. At the present time we are completing an interim plan to provide for the addition of 5 acres of new parking lots, and 56,000 sq.ft. of new buildings on our campus.

The most severe problem that we have faced is a lack of irrigation facilities. With the help of Dr. Freeborg, we have completed plans for a complete irrigation system of our campus which we feel will overcome our water problems, and provide us with a most beautiful campus.

The architect's model of our campus shows the placement of 16 buildings on the south side of our lake. The architectural firm of Caudill, Rowlett & Scott of Houston, Texas, have designed our college, with the architectural theme of "The Village Concept." The center of the campus is involved in academic pursuits with pedestrian traffic only. Parking lots are located on the outer periphery of the campus.

Since the first phase of our construction did not provide for Physical Education facility, the College decided to retain rather than to demolish a building which housed 300 thoroughbred jumping horses, and was operated by the Tri-Color Farm. With a little planning and a lot of innovation, by paving the floor and applying a little paint, a few lights and a lot of muscle, our Physical Education Department was able to provide our students with a good program.

Our Grounds Department inherited the forge building, and with a little innovation, such as adding light, heat and a little insulation, the Grounds Shop came into being. At the present time, our Department is providing complete land-

scape care for 125 acres. We are in the process of removing 5 acres of Merion sod to provide for construction activity which will begin late this spring. Our turf areas are well established and responding to the care we have given them.

Since we are a commuter College, we have much traffic on our campus. At the present time there are 2472 parking places to accommodate our campus population of 9500 people. The maintenance of 27 acres of parking lots requires a great deal of planning. With our anticipated enrollment next fall of 12,000 students, we are presently planning the construction of an additional parking facility, which will serve at least 1,000 additional automobiles.

Our philosophy on snow removal is to provide machinery which will enable our Department to operate at peak efficiency. Occasionally it becomes necessary to maintain snow removal equipment. Our Department has the mechanical know-how to keep our snow removal fleet in service. Our 3/4 ton Dodge truck is used for distribution of de-icing compounds, which will provide us with problems in the spring.

Our high loader removes windrows of snow from the parking lots. In our location it is not impossible to have 28 inches at one time. We make every effort to clear our parking lots as soon as possible after the storm. Removed snow from the inner campus is accomplished concurrently with the removal of snow from our campus roads and parking lots.

We were able to eliminate a drainage problem adjacent to our Learning Resources Center by using the new plastic perforated Cor-flow. So far, the performance of these drains has more than met our expectations. We intend to install more of this material in our athletic areas as weather permits.

We are also responsible for the care of athletic grounds, particularly the football fields (both game and practice), which are a challenge to any Grounds Department.

Harper College has operated on the Management by Objectives principle for the past five years, and even though this is a career-risk system, it has produced results. In addition to short and long range objectives, we have accepted the challenge of training our employees the "Harper Way." Finding qualified people in today's labor market is next to impossible. At Harper we have the will and the way. Excellence is our motto.

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PROGRESS WITH ATHLETIC FIELDS

Robert E. Gillie, Supervisor of Grounds
Fort Wayne Community Schools, Indiana

Fort Wayne Community Schools is a system having about 44,000 students, with 63 sites, with building and 8 sites vacant. The sites total 915 acres. The buildings occupy about 100 acres, and the blacktop areas for parking and drives take up another 100 - 110 acres, leaving about 700 acres of turf.

We are concerned today with turf, and particularly with athletic turf. We plant turf because it gives the best appearance for the lowest maintenance cost. We plant trees and shrubs, carefully selected and located, to enhance building appearance. We discourage flower beds because of high maintenance costs, coupled

with the fact that neglect contributes to a negative effect, and we won't pay for the labor to maintain them.

Our schools range in size from 1.1 acre site in the older city, to an 80 acre site of one of the new high schools on the city limits.

The Grounds Department operates with myself as Supervisor of Grounds, 3 skilled full-time men from the maintenance area, and uses grounds custodians at the high schools, with mowing and snow removal help from our junior high school custodial engineers.

In selecting equipment we have some pre-requisites. Since a piece of equipment must serve from 3 to 63 sites, it must road travel, and we must have snow removal equipment to serve the sites, we use tractors with mountable equipment and hydraulic lift. If I had a single site I would use different equipment, or at least judge it differently to select equipment.

In athletic turf we have both physical education classes to serve, as well as our team sports programs. Most of my discussion concerns football fields.

In Junior High Schools we have eight track and field installations. I apply sulfate of ammonia in mid-February to all athletic fields, both high school and Junior High School, and make a late spring and early fall application of additional fertilizer on Junior High School fields. Wear is not a major factor on Junior High fields because of lower player weight and activity, although each field will have about 9 games a season, plus practice time. Since wear is not severe, 2,4-D sprays take care of most weed problems. Crown rebuilding is needed about every eight to ten years. Overseeding is occasionally done, but aeration with either the Tractaire or Rogers Aerator is a regular practice.

In the past we had one high school field with a good (3500) seating capacity, so most games were played there. In 1970, our North Side field had 44 games, plus it was used for physical education any day the weather permitted.

In 1971, we opened two new stadiums, each having seating for 5000. Starting with opening night, we set three attendance records for football in Fort Wayne, reaching capacity with the last game of the season.

Preparing for these and other fields calls for working with architects in writing specifications. We have little choice about soil type since a school must serve a specific attendance area. Most of our soils are heavy clays, and do not drain well. Working with architects is not my idea of rewarding effort since the thoughts I express don't seem to be translated to effective specifications for good future maintenance. Similar guidelines were given to 2 firms of architects for identical projects developed at the same time. Here are the written specifications which resulted:

Seed Mixture Problems

The same instructions were given to two architects for two athletic fields under construction. The two specifications were:

1. "The following shall be used to formulate 100 lbs. of seed mixture -
 - 20 lbs. Merion bluegrass
 - 20 lbs. Common bluegrass, minimum 26 lbs. per bushel
 - 20 lbs. Park bluegrass
 - 20 lbs. Delta bluegrass
 - 10 lbs. Pennlawn red fescue
 - 5 lbs. Chewings fescue
 - 5 lbs. Perennial ryegrass

The above mixture shall be well blended and spread at a coverage rate of four (4) lbs. per 1,000 sq.ft."

2. "Grass seed shall be fresh, recleaned seed of the latest crop of at least 85% purity and 85% minimum germination. Seed shall be delivered to the site in original, unopened containers which shall bear the vendor's guarantee of analysis. Seed mix shall contain 70% to 80% bluegrass in at least 3 varieties, with 1/4 or more to be Merion bluegrass. The balance of the mix shall be red fescue and/or chewing fescue, and not more than 5% of the total to be annual, or perennial rye.

"Grass seed shall be sown evenly with mechanical reader, or by hand at the rate of not less than three (3) lbs. per 1,000 sq.ft."

We have on the high school level two major stadiums, 8 miles apart, and the previously used stadium. In addition we have 8 practice areas, and 2 temporary practice areas. In 1972, for the first time, we will have baseball on our high school sites, with 4 of our 8 schools using school site diamonds. Tennis, fortunately, is all on hard-surfaced courts.

Maintenance of our athletic areas consists of a fertilizing program, weed control, insect control, overseeding, and when needed, crown rebuilding. Irrigation is all above the surface, with 2 pipe systems and 7 crawlers, plus a Rain-train 660 for use where needed. For the first time in 1972, I will have fields where I can keep traffic off before June, but I still have 3 schools which must use all their area for physical education classes.

Our fertilizer program begins in mid-February, with an application of sulphate of ammonia (1#N per 1,000). In late April or early May, we will apply a crabgrass control, probably in a fertilizer mixture. Since we will also be seeding, the control is pretty well limited to Tupersan. In early July, we will apply a mixed fertilizer (1#N per 1,000). About one week before opening we will apply a foliar spray application (while we are applying an insecticide). About mid-October we will apply a potash, preferably a sulphate type. Weed control consists of 2,4-D, plus Dicamba.

Insect control is dual-purpose. An application for soil insects will be made in the spring. Prior to, and during the season, Malathion or Seven will be used for above surface insects to make playing conditions better.

Aeration will occur with a Tractaire spiking when soil conditions warrant. If thatch buildup looks likely, then the Rogers Aerator may be used.

Overseeding is two-fold. One program utilizes the Rogers seeder. We will use this in the spring, and again after the season is over if weather permits. I have overseeded with pure bluegrass blends in the past, but beginning this season I started adding Manhattan rye to the mix. I will also use Manhattan rye in the future if wear during the season gets too bad. The other overseeding practice is one I received from Bill Daniel. Spread 5# of seed EACH week before the games, or before the last practice of the week on practice areas, during the season. If you are not doing this now, and you take nothing else from this meeting this week, your time here will be well spent.

Progress, because of new facilities built and soon to be acquired, will allow me to try the topdressing mixes I hear and see Mel Robey using on the Purdue practice field.

We also are looking hard at the new PAT System with subsurface irrigation, and may install one or two fields in the near future.

NATURAL TURF CARE COSTS - OUR RECORDS

Melvin J. Robey, Superintendent Athletic Facilities
Purdue University, Lafayette, Indiana

"Natural grass is facing a challenge from the installation of artificial turf on football fields today. In some ways the artificial grass would be an improvement over many of the poorly maintained natural grass fields around the country. Fortunately, in the last year the natural grass proponents have been given a reprieve. The jury is still debating the controversial issues of artificial turf vs. natural grass fields. (Dr. Fred Grau)."

So, what are we, the turf managers, going to do about it? This is our last chance to try and check the installation of artificial turf on football fields. We've got about one year to solve the problems of the natural grass fields, educate the people who make the decision, and to destroy the myth that artificial turf is King, the perfect answer to every Athletic Director's dream.

My subject, Natural Turf Care Costs, is one step towards tearing down one myth the artificial turf companies would like everyone to believe. The following three quotes summarize what the artificial turf companies would like everyone to believe about maintenance costs of football fields:

Quote 1 - Grounds Maintenance, 1969 -

"Although installation costs for a football field average around \$ 250,000 to \$ 300,00 with artificial turf, maintenance of the playing surface is reduced from \$ 25,000 to \$ 30,000 to about \$ 5,000 a year."

Quote 2 - Big Ten Athletic Director, 1971 -

"We are delighted to be able to put in a surface (Astroturf) that will do away with the periodical \$ 30,000 resodding jobs, eliminate costly maintenance and reduce knee and ankle injuries."

Quote 3 - Tartan Advertisement, 1970 -

"Tartan turf virtually eliminates the high annual maintenance expense inherent in the typical stadium field."

All three of these quotes are misleading, and do not necessarily represent the true story. Yet, everyone believes them because no one has shown them to be wrong.

Another quote I will read to you pretty well places the responsibility square in the lap of any turf manager who wants to stop the steady advancement of artificial turf. Are we going to accept the challenge, or ignore a problem and hope it will go away? The following quote is from the Midwest Landscaping Magazine, 1971:

"We haven't seen comparative figures, but the difference between maintaining real grass is apparently remarkable. It's only a matter of time before the 3M Company gets its cost down low enough, and turf maintenance costs go high enough that artificial turf will be the only green seen at college, high school, and municipal playing fields across the country."

I have been keeping very accurate records on the maintenance costs of our football fields here at Purdue. The figures include all of the labor and material used to date.

The actual cost to maintain the playing field at Purdue for one year was \$ 4,475.00. This figure is only one-sixth the \$ 30,000 the artificial turf companies want everyone to believe. Next year, the maintenance cost will be even less since the field will not have to be resodded. Approximately \$ 3,500.00 is a close estimate of the maintenance costs for the coming year. This figure is lower than the \$ 5,000.00 (artificial turf companies estimate) to maintain an artificial field for a year. In conversations with people who actually have to perform the maintenance on artificial fields, they secretly tell me the cost is much higher than \$ 5,000.00. Often the maintenance men wish they had a natural grass field again.

The cost of sodding the entire stadium, for labor and maintenance was \$ 2,600.00. This figure is ten times less (than what the artificial turf companies want you to believe) than \$ 25,000.00 it supposedly costs to sod a field.

It appears to me that someone has not been giving all the facts on maintenance costs of artificial turf, or natural turf fields. Anyone spending \$ 25,000 to \$ 30,000 a year on the maintenance of a natural grass field must not be trying to do the best job with the least amount of expenditures. While on the other hand, a \$ 5,000.00 maintenance cost per year for an artificial turf field is not a realistic figure either. For example, Cincinnati has two machines each costing \$ 25,000 and requiring a union operator - just to suck off water.

In summary, it seems we ought to try and set things in their proper perspective. First, whether the cost is \$ 5,000 or \$ 25,000 a year to maintain a field, the figures represent only a drop in a very big bucket in operation of running a professional stadium, or a college stadium and fielding their teams.

Examples of some costs involving a football team (figures from a 1969 survey which did not include Purdue's team):

<u>Item</u>	<u>Cost/year</u>
Policemen & gatemen	\$ 64,000.00
Meals for athletes	46,000.00
Clothing & equipment	39,000.00
Telephone bill	23,000.00
Movies of games	20,000.00
Team transportation	18,000.00*
Football shoes	10,000.00
Tape	10,000.00

*Low for 5 away games in season. \$ 35,000 to \$ 40,000 more accurate figure.

And, the list goes on and on.

Another point to consider is that management has failed, in most cases, to hire competent personnel to manage the maintenance of their grass fields. Management has also failed to supply an adequate budget for a maintenance program needed to have a top-notch field. Consequently, when the grass failed to perform to the front office's expectation, it was the grasses fault, not theirs for not giving it a fair chance to succeed. Then all of a sudden the front office, which the week before couldn't afford a \$ 1,800 aerifier, comes up with a staggering \$ 350,000 to \$ 500,000 to finance the installation of artificial turf.

When the verdict is brought in by the jury, will it be in favor of natural grass or artificial turf? The answer depends on what the turf managers do with the reprieve we have been given. There are a few big, busy stadiums which must have

artificial turf. But, for colleges, high schools and many areas, it's a different story.

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ARTIFICIAL TURF - CARE AND USAGE

E. J. Fuchs, Civic Center Redevelopment Corporation
St. Louis, Missouri

Construction of Busch Stadium was completed in May of 1966. For the first four years the playing field was real turf; the first two years Zoysia-bluegrass mix, and the third and fourth years, Tifway 419 Bermudagrass. The field was completely resodded prior to the start of the baseball season in 1967 and 1969, and partially sodded prior to the 1968 season. The cost of labor and sod to completely sod the approximately 128,000 sq.ft. of playing field figured out to be about \$ 20,000.

Because of the overlapping of the baseball, football and soccer seasons in our multi-sports stadium, and most of all due to the daily practice of the football team, the turf steadily deteriorated each season even though the best materials were provided and well-planned work schedules adhered to.

Problems which confronted us every September through December were wearability, play reaction, limited usage and appearance. The wear was so intense and the weather conditions so adverse that the real turf could no longer answer our needs. There had to be some type of artificial material that could replace the real turf. So, after an extensive study by our staff, AstroTurf was chosen, with the concurrence of baseball and football, as the best product available for the variable needs of all.

After some 40 baseball games and 10 soccer games, the field looked good. After completion of football the same season, all turf would be gone. After the football season in 1969, work began on the new artificial turf field. First, 12 inches of sod, soil and electric heating cables had to be excavated from the site. Crushed stone was then spread and rolled until a thickness of 4" was reached. Three courses of asphalt were poured and rolled until a total thickness of 7" was achieved.

After the final course was rolled, the complete surface of asphalt was flooded and no areas, where water ponded, were accepted if they were deeper than the thickness of a nickel. The total cost of the site preparation was \$ 265,000.

The poly vinyl chloride energy absorbing pad was cemented to the asphalt. The sheets are 4 ft. x 8 ft., and 3/4 inch thick. As the workers spread cement ahead, the turf was rolled out. The total cost of turf and pad material, and labor was \$ 436,000.

The warning track around the field is 20 ft. wide, and is a 3M Tartan polyurethane elastomer, 1/2 inch thick. It was installed using 3M special equipment at a cost of over \$ 75,000.00. This is the completed field as it appeared in April of 1970. The total cost of everything was \$ 843,377, or about \$ 6.60 per sq.ft.

At the end of the 1971 season, that is ^{two} full seasons of activity, included: 162 baseball games, 25 football games, pro, college and high school; approximately

200 football practice sessions, 14 soccer games, 8 circus performances, 4 full days of religious meetings, and countless baseball practice sessions.

For the Shrine Circus setup, sheets of 1/2 inch plywood were used to cover and protect the infield portions. Last year the plywood was replaced by 5' x 20' rubber mats, which served the same purpose, to protect the turf from dirt and grease and concentrated loads.

In July of 1970, the Jehovah's Witnesses Midwest Prayer Convention lasted 4 days and was in session, on and off, from 9:00 A.M. until 7:00 P.M. each day.

The equipment now used to maintain our field include - a pile brush used to scrub the nylon pile. A 6-ft. wide brush is rotated by the power takeoff from the tractor. The field is flooded, a mixture of ammonia and detergent is applied, and then this brush is driven back and forth until the pile is scrubbed clean. The Zamboni water removal machine, designed and manufactured by the Zamboni Company, costs \$ 21,800. It follows behind the pile brush, and is capable of removing 70% of the effluent. It has a suction head 6 ft. wide, and travels at a speed of 7 MPH. As the soiled water is sucked up, it is discharged from either side to a distance of 60 to 80 ft. Two men and a supervisor can clean the entire field in 8 hours.

It is also used for removal of rain water before and during an event, as needed. Most of the water can be removed from the outfield turf in less than 30 minutes. We estimate that at least 3 baseball games were saved last year because we were able to remove most of the water from the field.

Two styles of dry vacuums are used to remove surface debris and dust and dirt particles, especially in the infield and base path areas. These are both American-Lincoln machines, and were adapted for use on artificial turf. These vacuums are used each day during the season. Cost, about \$ 1,000 each.

The Turf-Vac machine was designed by the Monsanto Company, and manufactured in California at a cost of approximately \$ 7,500. It is used for removal of painted stripes and markings. After a 30% solution of ammonia has been sprayed on the paint and allowed to soak for about 20 minutes, this machine is used. A 12" brush in the front works the dissolved paint loose from the fibers, a fresh water rinse follows, and a wet vacuum picks up the effluent, which is then discharged from an attached hose into a sewer. All football markings can be removed in 8 hours by 6 men.

The Dearborn 500 line striper, which was developed for use on artificial turf, has grooves in the wheels to ride on a 3/8" aluminum cable, which is tightly stretched between permanent anchor points, which are located throughout the field. The numerals, hash marks and restraining lines are painted on with 2" wide hand rollers, using stencils. The field can be completely striped in 8 hours by 4 men. This briefly describes the type of equipment which has replaced the lawn mower, top-soil spreader, seed spreader, and other real turf machinery.

Some of the advantages of artificial turf are:

1. Cost of maintenance. Cost to maintain real turf in 1969, which included 6 full-time men, one supervisor and all materials, was over \$ 80,000. The cost to re-sod was almost \$ 20,000, so that the total budget for the playing field in 1969 was some \$ 100,000.

The cost to maintain artificial turf in 1971, which includes only two full-time men, one supervisor and all materials, was about \$ 40,000. This indicates considerable savings.

2. Flexibility of uses. We are now able to schedule such events as circuses, religious meetings, football practice the morning before a baseball game, and other events not possible on grass.
3. Aesthetics. The field is now green all year, summer or winter, and provides a pleasant background for the fan in the stands, as well as the TV viewer at home.
4. Fewer games cancelled. The Zamboni machine does such an excellent job removing water from the surface that games can be completed now that could not have been played due to wet field conditions on natural turf.

Some of the problems associated with artificial turf are:

1. Cleaning. The material adjacent to the dirt areas becomes caked with the dirt and sand particles, which are very difficult to remove. The vacs remove some of this dirt, but not all. After the baseball season ends, the buildup dirt is blasted from these edges with water.
2. Heat. Some of the ball players, especially baseball outfielders, have complained that the material gets so hot during afternoon games that their feet burn. Artificial turf was more uncomfortable than standing on grass. Measurements were taken at various times during the summer and the material is usually 20 to 30° hotter than grass.
3. Fading. The material has faded some since installation in 1970, but it is hardly noticeable.
4. Pile crush. Continued traffic over any one area will cause pile crush. This condition can be corrected by the use of the pile brush against the grain of the pile.
5. Painting. There are now two types of paint available for AstroTurf, one-game paint which is used when the football season overlaps the baseball season, and one-season paint which is used after the baseball season. Both paints rub off easily when wet, and most of the field has to be re-striped before every football game.
6. Injuries. The baseball trainer reported that there has never been an injury caused by artificial turf other than a minor skin burn from time to time. The football trainer reported that since the installation of artificial turf the major injuries are about the same as on real turf. Both stated that most of the players have accepted artificial turf, but there are still some who complain, especially those injured while playing on it.
7. Wear. The turf is showing some signs of wear and will have to be replaced sometime in the future. We estimate that less than 5% of the material has worn away after the first two years of full usage.

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PROGRESS WITH THE PAT
(Prescription Athletic Turf) SYSTEM

W. H. Daniel, Dept. of Agronomy
Purdue University

Since conceived in December, 1970, and first tested as a model in January, 1971, much has happened. As of May 8, 1972, the contract for the first installation was awarded at Goshen High School, Indiana.

Publicity and prcmotich have been intense.

We prepared a mimeograph, and discussed with many turf interests. We included report in 1971 Proceedings.

Grounds Maintenance prepared an excellent article and distributed 40,000 copies in their February '72 issue. We secured by purchase 1500 reprints for distribution, and over half are out by May 8, 1972.

We are now applying for patent through Purdue Research Foundation, which will take time. When a patent is awarded then a base fee charge for specifications can lead to wider creditability and architectural inclusion as a specific in plans.

The idea of suction pumping, with moisture control, has proven very acceptable. The first installation will be most enlightening.

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