

TURF CONFERENCE PROCEEDINGS

sponsored by the
**MIDWEST REGIONAL
TURF FOUNDATION**

and

PURDUE UNIVERSITY
West Lafayette, Indiana

1979

PROCEEDINGS OF THE1979MIDWEST REGIONAL TURF CONFERENCE

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The 39 talks included in these Proceedings are condensations of talks by speakers before sections and divisions of the 1979 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 have been prepared. A limited number of 1971, 1972, 1973, 1974, 1975, 1976 and 1977 Proceedings are available at \$2.00 each, as well as additional copies of these Proceedings. From:

W. H. Daniel, Executive Secretary
Midwest Regional Turf Foundation
Department of Agronomy, Purdue University
West Lafayette, IN 47907

A copy of these Proceedings has been mailed to:

- The 516 attending the 1979 Midwest Turf Conference
- One person of each member organization within the Midwest Regional Turf Foundation not represented at the Conference
- A list of those in educational activities

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PRESIDENT'S REPORT

Kermit D. Delk, Superintendent
Springfield Country Club, Springfield, Ohio

As President of Midwest Regional Turf Foundation, may I welcome all who are here.

We will be sharing and evaluating experiences and ideas in this learning process. One must evaluate these and have a willingness to make changes as necessary.

We cannot assume that the circumstances that led us to some previous decision or action will remain the same. With this in mind, we can apply these new experiences and ideas to our daily work which can enable us to have a more rewarding year.

I would like to express my deep appreciation to Dr. Bill Daniel, his staff, and the Board of Directors for the past two years. Thank you for your confidence and direction during this time.

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CORRELATED CONFUSION CLARIFIED

Walter Weber, Environmental Consultant
Indianapolis, Indiana

Hillsboro, Indiana welcomes one with an interesting sign proclaiming, 'The home of 600 happy people and a few old soreheads'. One could conclude those few are unhappy and confused because no one took time to communicate about their worries.

Communication is more than words. The communication media converts useful information into interesting news. It has the power to create and direct controversial issues. Those communication people have rendered a great service. They are recognized as the authority by many people. They want to report accurate information. People's opinions concerning the food they eat and the safety of pesticides are definitely influenced by the mass media. The many benefits from pesticides is continuous news, but too often this is not recognized. Today we have a mushrooming trend towards many non-pesticide organizations, while some of the long established conservation groups have become infiltrated with anti-pesticide philosophies. A few organizations will be mentioned. (1) The Environmental Defense Fund (EDF), with a huge grant from the Ford Foundation. (2) World Wildlife Fund - US. A January 1979 fund raising letter stated, "New pesticides pose additional perils to entire ecological systems." It was signed by Russel E. Train, President. Does that name sound familiar? (3) Group For Organic Alternatives To Toxic Substances (GOATS). (4) Citizens Against Toxic Sprays (CATS). (5) Coalition For Economic Alternatives. (Argues for hand labor over defoliants for forest management).

The people-frightening, anti-pesticide forces have a knack for talking about things they do not understand. Their psychological warfare with environmental scare literature presents a deliberate manipulation of the fears of the unknown. The professional worriers listen. Many of the environmental alarmists know very little about pesticides, but are well versed in environmental threats, litigation, and regulatory procedures. The exaggerated fear which has been generated about pesticides in the minds of the public has resulted in misguided public opinion, and many unnecessary restrictions. Some of those restrictions have resulted in environmental destruction. The sad part is that many environmental alarmists are trying to get still more restrictions. The chemical industry is required to spend millions every year to establish the safety of pesticides, while the Federal EPA is spending an equivalent amount of your money to challenge those findings. We must remember that when a chemical, or some of its uses are once banned, all the talking in the world will not bring it back.

Concerned people have two choices. They can ignore the people frighteners who encourage restrictions and destruction of useful chemicals with creeping encroachment of regulations. The other choice is to exert special effort to communicate with opinion makers and people influencers about environmental protection and people benefits from protective chemicals.

In addition to the well informed people in our universities, extension service, and Agri-business, we have at least four prominent national organizations doing a great job of telling about the importance of protective pesticides. These include, but are not limited to (1) Council For Agricultural Science and Technology (CAST). (2) National Agricultural Chemical Association (NACA). (3) National Council For Environmental Balance. (4) American Farm Bureau Federation, with over three million member families. I apologize to the many fine journalists and reporters, or other active organizations, but space is limited.

Now I would like to propose an easy to remember organization called PUPPSS. This is not a tax deductible, tax exempt outfit. There are no initiation dues, no membership fees, no assessments, but you can become a lifetime member if you do what the last S stands for. The initials mean PROPERLY USED PESTICIDES PROTECT SAFELY. The extra S can mean SPEAKER, or SPEECH WRITER, or you might have a better idea. It really does not matter, just as long as you become an active, enthusiastic individual telling about the many good sides of pesticides. People are going to write or talk about pesticides. If no one speaks up for pesticides, those who speak against them will be the only ones heard.

A few recent examples will be given. The 1978 National Wildlife Federation mailed literature to the schools in which DDT was blamed for thin egg shells. This was repeated on the 29 Ja 79 presentation of Wild Kingdom. My January 1979 edition of Audubon magazine refers to the use of herbicides for improving 3-1/2 million acres of rangeland, then states that in the opinion of EPA the potential hazards seem to outweigh the benefits. (Remember, those are EPA opinions, not mine.)

The 21 Ja 79 issue of The Indianapolis Star carried an article stating that fertile soil and healthy plants would deter insects, implied that many insecticides may leave toxic residues, and extolled the idea of biological controls.

Some of the baseless allegations against pesticides are attention-getting devices and are repeatedly used as fund raising ideas. It is extremely important that knowledgeable individuals who are versed in the use of chemicals should be looking for opportunities to call public attention to the tremendous benefits. Your voice, in a real way, can make an important difference. Some anti-pesticide people are light years removed from realities and think we can live in the imagined glories of the past.

My February 1979 issue of Scientific American quotes from the corresponding 1879 issue of one hundred years ago, "If Mr. Edison wishes public faith in that electric light of his to remain steadfast, he will have to give an early demonstration of his claim that it is a practical success." You know that properly used pesticides have demonstrated their success, but there are many people who are not aware of it. They have to be told. People must be told that some of the proposed ridiculous unworkable regulations which sound so deceptively good are as insulting as they are potentially devastating to the user and to all consumers of food, fiber and recreational facilities.

We have so many great things to protect and so many good things in the way of useful chemicals to use for that protection. We should be helping other people understand about the great accomplishments of properly used pesticides. Are you recognizing the opportunities to help others explain the values in a manner that people can understand? No extensive user of pesticides gets up in the morning and asks himself, "I wonder what I can spray today?" He knows that saving a spray is like saving money in the bank - sometimes lots of money.

Three words seem to be in everyone's vocabulary today. These are: ecology, environment, and pollution. Ecology is not new. The word was introduced by Dr. Haeckel in Germany in 1869. There are some important 'cides' to ecology. These include herbicides, insecticides, fungicides, rodenticides, etc.

Population and pollution seem to go together. Some folks tie pesticides and pollution together, but properly used pesticides are not a major contributor. It is true that one does some contaminating when he uses pesticides, but it is a temporary intentional contamination with a purpose of controlling a pest. The objective is to improve the environment for desirable plants, domestic animals, or human comfort.

The average non-user of pesticides has no concept of what this country would be like without pesticides. The banning of several persistent pesticides has resulted in the use of more expensive, inconsistent, short-lived, weaker substitutes which require more frequent application, and less control. It is unfortunate that decisions of scientific investigations have been made by non-scientists. It is a defeat for science and the public when circumstantial evidence and well publicized hypotheses lacking in clinical proof are substituted for documental evidence.

Perhaps those misinformed people who are talking against pesticides have never had their attention drawn to the tremendous contributions and the thorough evaluations before a pesticide can be labeled for use.

Some folks erroneously conclude that when a pesticide is known to affect laboratory rats in a certain way at high levels they correlate it to man saying the physiology is similar. They do not explain why a rodenticide (as norbormide) will affect Norway rats without affecting roof rats or house mice. They do not acknowledge that experiments on animals provide only presumptive evidence that similar effects could occur in man. Users of pesticides acknowledge the value of integrated pest management. They recognize the value of insect predators, parasites, resistant strains, cultural practices, and many other factors. They appreciate the work of scientists in learning about insects emitting an odorous secretion for communicating with other creatures of the same species. Many would like to use those sex attractants, or pheromones, as they are called, but here again the EPA has made it so expensive it is virtually impractical for a company to proceed. In acknowledging the academic value of biological control many people realize they have not given too much control during times of heavy infestations.

How is the public to know about pesticides unless the truth is told? Most people are open minded and want the facts. They are not interested in the dizzying sense of intellectual confusion. There would be less misunderstanding if someone took time to explain the positive side. The easy way out is to say nothing, but nothing constructive happens until someone does something.

The dissemination of positive information has happened because knowledgeable program directors, TV and radio reporters, newspaper and other journalists have used their talents in converting useful information into interesting news. These people want your help. Trying to stop misinformation is like stepping on a partially inflated balloon. The air just shifts to another area. It is much easier and more important to prevent misinformation.

People who work with pesticides have a vast storehouse of knowledge. No one is better qualified to understand and explain the positive side. The professional user is familiar with the tremendous benefits. They realize there are some risks, but there are many risks in not using them. They recognize there are no harmless products, but there are harmless ways of using them. They recognize that chemical safety depends on man's intelligent use.

The public must be told that properly used pesticides are not destroying our wildlife or poisoning people's bodies. It is people who are poisoning people's minds. The pollution is pollution of the mind, not the body. Remaining silent is neither a virtue nor a service.

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A BROADER VIEW OF GOLF

Ronald W. Fream, Golf Course Architect
Old Town, Los Gatos, California

It might be a bit presumptuous to attempt to expound on new concepts or new ideas in golf. There is nothing in golf which has not been done before. Some new and improved tools (clubs, balls, etc.) have appeared; scientific advances in the approach to seed-bed preparation and irrigation have occurred; pedigreed grass has replaced indigeneous; turfgrass maintenance is no longer a job but has become a profession, yet the essence of golf - the challenge, the philosophy, the basic field upon which the game is played - remains unchanged from 400 years ago. To attempt to duplicate the original, the historic and classic courses which remain is an absurd gesture of futility. To ignore the origins, the essence, the subtlety of the great and wonderful courses of antiquity is ignorance. Nothing being done today in golf course architecture - relative to the design strategy, challenge and integrity of the origins of the game is new or original. To expound otherwise is to acknowledge one's ignorance and lack of understanding.

Golf is a dynamic and changing game. Golf is one of the very few sports where every site is different, every game a new game. Repetition, monotony, boredom, and stereotyped appearance have no place and no justification. Golf is not meant to be played with the regimentation of a tennis court or a 25 meter Olympic pool. Golf is a game of chance, luck, skill, courage and daring, of reward and penalty. Perhaps a 20 handicapper will not agree with me. However, the game of golf was never intended to appease a high handicap golfer. Learn, improve, increase your ability or retire to the sidelines. One look at some of the real golf courses of the world and the point is undisputed. The Old Course at St. Andrews, the real Muirfield and short but great Prestwick offer no recourse, no reprieve, play it as it lays or don't play. Tragically, there are few golf courses in America where the true essence of golf remains. American golfers by and large expect to hit the perfect second shot regardless of whether that shot landed in the fairway, the rough or a fairway bunker. Wall-to-wall fairway is not golf, it is a "cop-out" for marginal ability. Future limitations of water or energy may abruptly terminate the wall-to-wall manicured situation and force golf back to a more natural environment.

There have been advances made in golf in the past 200 years. Actually, most significant advances have only occurred in the last 20 to 25 years. No advances have been made in how the game should be played - none ever should. Advances in the unseen, in the technological aspects of golf have occurred and should continue to occur.

The technological aspect of golf is a subject far removed from the consideration of many persons associated with golf. There are golf course "architects" who do not know the difference between bluegrass and Bermudagrass. There are golf professionals whose egos feel intimidated and threatened if they don't break par for every round. There are untold numbers of golfers who expect to play par golf when their ability is actually little more than that of a gorilla. Was golf ever invented, or more properly, created to cater to the inferior egos and inferior abilities or inabilities, rather than developing the skills to play the game as it was intended? Golf did not evolve in a formal, manicured garden. Golf evolved in a sand hill wasteland where even the rabbits had trouble making a living. Unfortunately, evolution and affluence have combined to subdue the real origins of a grand game. The result is a contradictory set of standards which neither do credit to the traditions of the game nor properly reward the effort of today's more astute golfer.

Golf course design is an undefined and unregimented term for the basic effort of placing 18 sausage-shaped outlines on a single piece of paper, representing a plot of ground, in some comprehensible configuration for future translation onto that plot of ground. There are no hard and fast criteria defining who is or who should be a golf course designer. Many persons assume, for better or worse, that being able to play the game well automatically confirms the ability to design or create well. Such an assumption is just as valued as assuming that a journeyman carpenter is also a capable building architect. Many golf courses have been designed with about as much significant results as the old cliché about the committee charged with designing the horse which turned out to be the camel. The end product just does not do the job intended.

Golf is a game which is growing in popularity. While many Americans think of golf as an American game, giving scant attention even to St. Andrews and the British Open, the fact is that beyond the sheltered shores of America the game is prospering very well, thank you. In fact, over the past several years, since the recession of 1969-71, and the unilateral increase in gasoline prices extracted by the Arabs, golf has grown at a more rapid rate elsewhere than within America's comfortable shores.

Building golf courses in situations beyond the comfort of America requires a certain adjustment and adaptation not often mentioned in Golf Course Management, Golf Business or Golf Digest. Nonetheless, construction of, and the use of, golf courses in Third World and emerging countries is a very significant and expanding market.

The game does not change! Regardless of where the course is to be built, the design results cannot greatly differ from others over the centuries. Hopefully, the design does consider the specifics of the site; the climate, the soils, the terrain, the natural vegetation, the objectives and budget of the client. However, there are so many stereotyped, rubber stamp designed golf courses in America, let us not try to export that monotonous, repetitive product elsewhere. Design to fit the site, be creative, innovative, daring and challenging; copy the old masters and the impact of nature. In design, do what is different and unexpected, don't design to a corporate tradition or trademark. An expected end product may be all right in a can of Coke, but knowing before you begin that the finished product is going to offer particular teeing situations or repetitive greensites is not what real golf is made of. Innovative design actually is itself repetitive of some long existent situation in Scotland, only modernized and perhaps stylized.

Once we have progressed beyond rubber stamp design, it is time to consider the necessities of design implementation. Although golf courses are being constructed in many parts of the world, the means and methods of accomplishing the construction do vary. Perhaps it is useful here to quote a recent visitor to the United States, the Vice Premier of the People's Republic of China: "It doesn't matter whether the cat is black or white, so long as it catches mice." Our experience, over more than 15 years of international golf course architectural efforts, has proven that the end product can be achieved regardless of whether 30 bulldozers or 1,200 people do the work. Methods and materials change with culture, society, climate, and environment. The end product, the objective never changes: First class golfing conditions built to modern standards for a traditional playing result.

Construction by machine or by hand really is of no concern, the final result can be comparable and equally as desirable. More important is the selection of seedbed amendments, the subsurface drainage considerations, the turfgrasses to be used and the means to maintain the turfgrass after planting. Hand labor can do marvelous things.

There have been some golf courses built in more or less remote areas which are equal to or superior to almost every course in America. Vast construction budgets, unlimited promotion, ridiculously high maintenance costs do not necessarily equate with quality end product.

The selection and choice of construction materials is important. Graded sand may not be available, but coral sand or unsegregated river sand is. Particularly sized drainage gravel may not be available merely by placing a telephone call. A telephone may not even be available. But hand labor to make small stones out of big ones with sledge hammers might well be available. Corrugated plastic drainage pipe is convenient but not necessarily obtainable in some localities. Cement or fired clay tiles can be obtained and the result is equally as effective, though perhaps not as efficient. Select ground pine bark or sphagnum peat moss humus may be unattainable or rather expensive to import but sugarcane debris (Bagasse), rice hulls or pomus from the wine grape squeezings are nearly free for the asking.

An automatic irrigation system that does everything but shine the Superintendent's shoes is the dream on most American golf courses; push one button and have a machine do all your thinking. In localities where most members of the maintenance crew have never even seen a quick coupler valve and impact sprinkler head, the idea of installing full automation must rank with some of the grand mercenary quests for greed in this country. Simple, functional, manually operated irrigation systems which put the premium on dependability and not on advanced technology are a vital component of a successful golf course in areas where few of the persons responsible for the operation of the system can even read, let alone read an English language operations manual. Any attempt to sell American sophistication to a user who may have never owned or operated a motor vehicle before the arrival of the putting green mower is classic ignorance.

The long term problem with many golf courses is the lack of proper initial concern for seedbeds, drainage and turfgrasses. When working in localities beyond the shores of North America, avoidance of these basics is a sure recipe for disaster. There are all too many mediocre golf courses in America to have us export this same mechanical, pedestrian and untalented product.

Understanding the basics of turfgrass maintenance, and why turfgrass responds to particular seedbeds, climates and maintenance practices is very important. The recent improvements in turfgrass, primarily Pennncross and Emerald bentgrass, the turf type bluegrasses and ryegrasses, and hybrid Bermudagrass present a selection of turfgrasses which, if chosen wisely, can offer outstanding playing surfaces under virtually any climatic situation. The basic problem remains one of selection. When many golf course architects do not really understand the difference between Adelphi Kentucky bluegrass and Tifdwarf hybrid Bermuda, what can be the result when seeding specifications are written using some pre-packaged, all purpose blend rather than the correct grass for the particular environment.

The selection of grasses must also extend to the site and means of maintaining the planted grass. When labor costs \$8.50 an hour including fringe benefits, the approach is somewhat different than when labor costs \$2.50 per day. This labor cost factor also influences just what maintenance equipment is to be purchased.

Super sophistication turfgrass maintenance equipment is readily available, for a price. What is not always available is dependable after-sales service. In the more out-of-the way areas, this matter of inadequate or totally lacking after-sales service and spare parts availability is even more important. To have sophisticated equipment and to have properly functioning sophisticated equipment are two different things.

Although the procedure followed to design and build the course in a remote area is much the same as it is in America, modifications must be made to accommodate local requirements and abilities. Adaptability is the key. Use the proper but simple procedure. Don't become obsessed with doing it like you would at home. Keep it simple, unsophisticated, functional, labor intensive, rugged, dependable and results oriented.

Beautiful, challenging, fun golf courses can be successful anywhere in the world. The means to achieve the objective may vary, but the end product must always be decidedly in the highest interests of true, original and traditional golf.

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DESIGNING FOR MAINTENANCE

Ronald W. Fream, Golf Course Architect
Old Town, Los Gatos, California

Without intelligent maintenance practices properly applied, a golf course will deteriorate. The quality of construction effort, the utility of the design, the beauty of the site are each a very important contributor to a successful golf course. Taken as a whole, a golf course will reflect the sum total of the various parts which are combined to create the original effort. That cliché from the computer industry, "Garbage in - garbage out" also holds true for a golf course.

The golf course architect is the individual generally responsible for the creation of the golf course. The contribution to this creation actually varies with the person or group of persons who combine their efforts to achieve the architectural result. "Designed-in" problems which manifest themselves at a future time is a frequently encountered result of inadequate architectural effort. Even a very skilled golf course superintendent will have problems growing quality turfgrass if the seedbed that turf is to be grown in is incorrect. An irrigation system will not solve your watering requirements if the system does not apply the water where and when needed.

A well adjusted triplex mower is of little consequence when the ground is too muddy to support the passage of the mower. A mechanized sand trap rake is not efficient when the sand traps are half full of water because of poor drainage. If the side slopes around a green or tee are so steep that hand operated rotary mowers are necessary, maintenance costs go up. Tree varieties which have voracious root systems, brittle branch structure, short life spans, obnoxious fruit or low headed growth characteristics are not among those desirable for planting on the golf course. Real estate housing units encroaching into areas of golf play and turfgrass maintenance create unique problems of personal safety, security and vandalism. Within the course also, extreme care must be given to preventing or eliminating potential safety hazards due to misdirected golf balls.

Most maintenance problems on a golf course originate on the drawing board. These problems may actually be built into the design plans or they may result from omission. The ability of the golf architect to prevent the inception of future problems rests quite naturally with the education and experience of the individual architect. If the

architect has an awareness of the needs of turfgrass for sunlight, well drained and fertile soil conditions, proper fertility levels, trafficability, maintenance equipment capabilities and similar fundamentals, prevention of future problems can result. To consider only the playability of a course or only the artistic design beauty while developing the layout plan will lead to numerous future problems. As both the great golfer, Bobby Jones, and the great golf architect, Alister MacKenzie, have said: The ability to play golf well does not automatically give one the ability to design golf courses well.

Before the design concept is ever roughed out on paper, the architect must study the site. The features of no two golf course sites are ever identical. Micro-climates, surface or subsurface soil differentiation, vegetative changes, topographic changes, vistas or horizontal perspectives differ and each has its own impact on design. A thorough study of the site is essential. To merely lay out 18 stick drawings on a piece of paper is within the capacity of almost anyone, especially a golfer fantasizing as a golf course architect. To marry a design concept to a piece of land, combining playing strategy, topographic adaptability, scenic beauty, variety, challenge and concern for long term turfgrass maintenance is quite another matter.

The alignment or location of a particular golf hole can influence initial construction costs dramatically and influence turfgrass maintenance evermore. Not everyone can truly "read" a topographic plan, yet that plan is the basic foundation of design. On flat sites, being able to move and place soils to create and provide drainage is as important as not running a hole up a 3 to 1 slope in a mountainous location.

Site clearing must be carefully done. In higher elevations and northern climates, shade problems and frost retention must be considered. Tree removal or planting must provide for early day sun to warm up the greensites or teeing areas. In tropical climates, shade to cool the golfer is desirable without overshading to the detriment of the hybrid Bermudagrasses. Leaving strategically placed trees within a fairway or near a greensite can occasionally provide a golfing challenge not otherwise found. Indiscriminate clearing can be wasteful economically and aesthetically. Too little clearing can result in humid, disease-laden pockets in the summer months or fairways so narrow the sun seldom reaches the turf enough to encourage proper growth. Excessive shade in wet climates can also promote drainage problems.

Teeing surfaces are obviously a necessity. However, small tees or even very long ones which restrict the available teeing surface in the areas of normal playing length cause extensive maintenance problems. There is no paragraph in the rules of golf which dictates the size or shape of the teeing surface. Yet, small tees, rectangular, square or otherwise are commonly observed. So too are these same tees with washboard surfaces so worn the golfer finds difficulty securing a suitable teeing stance.

Together with large teeing surfaces should be the enhancement of the seedbed mixture on the teeing surface. Depending upon native soil types and local climatic conditions, a variety of methods are available to amend and drain the teeing surfaces to encourage healthy and prolonged turfgrass growth. Variety in teeing area size, arrangement, and orientation can also add more interest and challenge to the game. It is far better to have too much rather than too little usable teeing surface.

Fairways, due to their extensive area, are generally not treated to extensive soil amending during the construction process. Problems can be prevented if top soil is retained for replacement over fill or cut sites. "Borrowing" the top soil from fairways to build tee or bunker mounds is really robbing the fairway. During the fairway grading process, consideration must be given to providing both surface flow and subsurface drainage facilities. The introduction of contoured swales can provide ample

surface drainage in some cases. Evaluation of local soil conditions, climate and rainfall are necessary to make a proper determination. The soils of one portion of a golf course may not be the same in a nearby portion; therefore, an almost hole-by-hole review of drainage requirements may be necessary. Whatever the drainage needs, they can and should be determined in advance and indicated on the drainage plan. To ignore fairway drainage initially will only cost more to correct when the problems associated with or caused by poor drainage arise as they will with time and use.

Sand traps or bunkers are as essential to golf as greens and tees. Anyone who has ever visited any of the great courses of Scotland would never doubt their place in the game. The tendency to eliminate bunkers in the name of efficient maintenance or speed of play is a most unfortunate one. Golf is a game of tradition. To emasculate the game does justice to no real golfer although such emasculation may enhance a profit statement or placate a hacker.

Bunkers can be designed and constructed to provide challenge, beauty, suspense and also can be maintained for reasonable cost. Too small a bunker can be more costly to maintain than a large dramatic one built to accommodate the mechanized rake and triplex mower. Drainage problems can be prevented or eliminated without difficulty and with modest cost. The choice of sand placed within the bunkers can be both playable and maintainable. The tendency to shave the edge of the bunkers is a very expensive luxury which basically serves the inferior golfer to the cost of all golfers. A tufted turf fringe around the edge can be attractive, traditional and economical to maintain. Exit from a bunker was never intended to be an easy, casual automatic experience when golf evolved. A bunker was a hazard to be avoided if you could. If not avoided, the error was penalized. Shallow fairway bunkers where a three wood is casually used for recovery are no more justified than the green side bunker where the putter is used to recover. The depth of the bunker is more a personal opinion, so long as it is primarily machine rakable regardless the depth. Bunkers were intended as penal hazards in the beginning and should be so today.

Irrigation systems have the greatest potential for expense problems. Given today's availability of fully automatic, centrally controlled, programmable, tensiometer activated, do-everything systems, the tendency to over-sophisticate is often encountered. More is not necessarily better. Efficient coverage, dependable operation of pumping plant and system, uniform application to the specific requirements of the particular site are vital. Soil infiltration rates and porosity, rainfall frequency and quantity, wind conditions, site topography, turfgrasses to be used and budget available are conditions some peddlers of irrigation equipment overlook or ignore. Regardless of the brand of product used, the system must fit the particulars of the individual site. A factory "engineered" plan, drawn by someone who has never reconnoitered the site or studied the local weather records is no bargain at any price. A rubber stamp irrigation system design which works in Florida may not work in Los Angeles or Hawaii. Over elaboration with centralized automation to do everything without the superintendent having to watch the sprinklers can be costly and unnecessary.

An experienced, independent irrigation engineer can match an irrigation system to the golf architect's designs, the site requirements and the superintendent's needs while specifying the most reliable and cost effective products and materials. Equally important is the inspection service which the irrigation consultant should provide during the installation process. Who better can review the installation works to assure compliance with material and method specifications. An "as-built" drawing, accurate and precise, is essential for long term operation and maintenance of the irrigation system. The irrigation consultant should, at the very least, review and confirm the accuracy of such a record drawing. More desirably, it should be the irrigation consultant who prepares the actual document. A copy of the "as-built"

should be submitted to the golf course architect as well as to the project owner and golf course superintendent for permanent reference.

Golf is a game of putting. Fifty percent of the game is played on the green; another 25 percent is played directly at or to the green. Why is it then that so often the putting greens are given no more consideration than that given to making cookies with a mold? The greensite is the most important portion of any course, yet it is at the greensite where so many of the problems of maintenance are to be found. Quite possibly, many of the maintenance problems are the result of ignorance on the part of the persons designing or constructing the greensites. Some problems occur due to the disregard for known potential problems at the time of construction, either by avoidance, omission or perhaps for economy of construction. There is no economy in ignoring or avoiding correct greensite construction procedures except for the developer who will off-load the course to someone else before the problems manifest themselves. Some golf course architects, or persons calling or considering themselves golf architects, will disregard the needs for proper construction merely owing to a lack of knowledge, awareness or appreciation for the correct methods.

In any event, there are numerous examples throughout the world of golf where round, flat, rubber stamp greens regularly die out with summer heat or turn to a bog after a brief rain. Design alone will influence long term maintenance somewhat, but a combination of undesirable designed-in situations together with seedbed agronomic deficiencies will sooner or later result in costly problems.

Greens designed to drain only to the front, into the fairway approach area are very common. Given a little rain or an irrigation valve which sticks, the front of the green and that adjacent fairway approach will become a spongy quagmire. Green drainage outlets into any traffic pattern area will soon cause soil compaction related problems.

The installation of subsurface drainage lines within the green putting area is essential. How much drainage line is used becomes another matter. The more the better is somewhat more expensive initially, but agronomically desirable over the long term. The type of drainage gravel to be used in conjunction with the drainage lines and the gravel layer beneath the putting surface seedbed must be carefully selected as to particle size and freedom from silt and clay. The surface design contour of the putting area must provide for several discharge outlets, not always to the front. Drainage lines can also be added to good advantage in the apron beyond the edge of the putting surface in areas of concentrated traffic, whether golfer or maintenance equipment, to assist in removing excess soil moisture.

The seedbed used in the putting surface must be carefully formulated. Too many examples exist of the "old style" greens or even those of recent years, which were constructed of local soil alone or which contain a high proportion of soil. There is no valid reason to include soil, top soil or otherwise, in a putting green seedbed mixture. One day even the U.S.G.A. will acknowledge this fact. The small benefit received from including ten percent or so "top soil" in the greens mix to retain nutrients is offset with time and use by the fact that concrete is also made by mixing large and small particles together that firmly compact. Compaction due to golfer and mechanical traffic is the foremost causative agent of turfgrass maintenance problems. A putting green seedbed mixture designed to resist compaction is of primary importance. Specially graded sands, combined with a proportion of organic humus will provide the porosity and resistance to compaction desirable for putting green turf whether bentgrass or Bermudagrass. Amendment of the slopes and approach area around the putting surface with humus, sand or a combination, as the particular native soils dictate, is a wise investment of modest cost and noticable results.

Design of putting greens is a very personal thing. What is "good" design to one person may not be to another. However, all too many greens appear to be from the same mold. This is a symptom of the fact that some of the people who design greens (and golf courses) have little or no design sense. Functionally, a green might play very well; however, after playing 18 similar greens, the enjoyment may not be the same. The design of any green must include consideration of the particular approach shot requirements or objectives. The surrounding environment and visual setting of the greensite must provide a harmonious balance with and diversity from the other greensites on the course. A distinct effort to provide aesthetic, creative visual beauty is necessary. Certainly an awareness of the needs of turfgrass maintenance must be given high priority. These are a considerable number of factors to consider. Thinking in basic, stereotyped, fundamental terms alone yields the rubber stamp result. To design creatively need not add cost to construction budgets. Diversity, challenge, beauty, playability, and maintainability can all contribute to long term success.

Whatever the design or the construction methods, it is the turfgrass which makes the golf course. Keep in mind that "all turf is grass but not all grass is turf". Great design efforts can go for naught when the grass is inferior or blighted. Mediocre design efforts can pass for better if the grass upon which the game is played is a first-class turf. Selection of the grass to be planted on any portion of a golf course must be carefully done. Arbitrary selection of the species or varieties to be used, or disregard for high standards of seed quality and purity will soon manifest themselves in a mediocre, weed-infested stand of grass. Inferior grass varieties or a weed-infested turf will cause numerous maintenance problems which can be corrected only with considerable effort and expense.

Throughout all of the above discussion has run the implied need for a knowledgeable golf course superintendent to manage the maintenance of the golf course. There are fewer golf professionals who can competently manage turfgrass maintenance than they think there are. Keep the pro in the golf shop. Put a professional golf course superintendent in charge of turfgrass maintenance.

Preventing maintenance problems on any golf course begins with the golf course architect. For established courses, remodeling, renovation, and for those classic few, restoration, should be done with the same concern as for proper new construction.

Irrigation system modernization and conversion from manual to automatic or pumping plant replacement can occur as part of a renovation project. A long range Master Remodeling Plan can provide the roadmap to guide an established golf course renovation program as cash flow and need permit. Comprehensive planning, consultation, and careful consideration are important aspects of the process to develop the long range Master Plan. Once accepted, the Master Remodeling Plan should be followed diligently, thereby eliminating the sometimes devastating arbitrary decisions of ephemeral green committees or dogmatic Green Committee Chairmen.

In summary, when contemplating golf course construction efforts of any scope or extent, design the golf course with creativity and technical awareness, build it right the first time and maintain it professionally. The result will be of benefit to all golfers.

MY EXPERIENCE IN DEVELOPING GOLF COURSES

Chuck Hegan, Golf Course Owner
Crown Point, Indiana

Introduction: In 1961, I left an accounting business and started in the golf business by leasing an 18-hole course with a burned out clubhouse. I rearranged the course and added a modest clubhouse in 1962. In 1965, I leased a second course twenty miles away. The tees were small, the greens were 2000 to 2500 square feet, and the courses were 5500 and 5800 yards. The mains were two inch water lines from unstable ditches, pushed by gasoline powered pumps. Greens and tees were watered by 5/8 inch hose and roller base sprinklers.

Architect and/or Builder: Always wanting my own golf course, and seeing mistakes in the planning of courses I played (as well as other courses built by a builder without separation of architect and builder) I decided to hire an architect and let him guide me on construction of a course of my own.

In 1968, I bought a 160 acre farm under contract and started searching for my architect. (An architect represents about 3% of the total cost, an attorney 1% and an hydraulic engineer 1/4%). And believe me, they are worth it. I've played many courses in the last forty years; have run three golf courses, and these are three services I'll use for any course I build.

After a year of questioning and almost hiring a reputable builder only, I picked my architect, introduced him to my attorney, and showed him the farm I owned, plus three other locations I was negotiating on if I sold my farm, for which I had an offer. The architect advised me to sell the farm and buy a spot near Merrillville - a mile from a major shopping area at I-65 and US 30. The farm was 160 acres, the new spot in 1971 was 206 acres.

Financing and Planning: The architect was responsible for layout, design development, reviewing bids and on-site supervision. His work was to be done as I released it, and payments to be made as the various stages were completed. If I wanted to, I could halt the project at any stage and not be liable for the balance of the contract.

Based on the architect's estimates, in 1973 I obtained a commitment of \$450,000.00 for balance due on land, the architect, attorney, construction and construction interest. This amount did not include maintenance equipment, touch-up cost, electric entrance, and roads and storage. Income from the other courses was to help, but as time proved, the incomes from the other courses were not adequate. The clubhouse was later to be a separate mortgage.

The paper design work for an 18-hole championship course was finished in the fall of 1973, and the on-site staking of fairways, tees, greens and range was done in the winter of 1973-74.

The course was to have automatic-watered tees, greens and fairways. The greens were to be large enough for heavy traffic, but not too excessive as to require costly maintenance; adequate bunkering a must, with ample area between greens and traps, and no violent angles on the greens. The greens and traps were to be tiled, as well as an additional five miles of course tiling to a pit in the pumphouse from where water was to be pumped uphill into a diked ditch going through the property. Part of the property was in a flood plain, and the old dike had to be repaired.

Since 80% of the ground was open, six lakes were to be built to control play, as well as for scenic effect, and to provide a water reservoir for our well storage. We couldn't rely on the ditch (although clean) because in watching it, I found that during August and September, 1973, it almost went dry. The higher lakes overflows were tiled to eventually intercouple to the main reservoir lake alongside the pumphouse and well. All drain tile were sent to a separate pit in the pumphouse and automatically pumped into the diked ditch. In the spring with the five miles of tile I added, plus some three miles of existing farm tile, we are dry right after the frost is out, despite the ditch sometimes being six feet above our flood plain. This area can't be developed for residences but is fine for golf.

The course and range was laid out on 150 acres of internal ground and flood plain. Approximately 52 acres of perimeter road frontage and land adjacent to neighbors was kept out for future condominium or apartment development.

Work Planning: I acted as general contractor with a full-time superintendent with 20 years experience in course maintenance, but no experience in construction or automatic irrigation. The architect was on site once or twice a week as needed or available. The only contracts given were to the architect, irrigation contractor, pumphouse and tree clearing. The heavy equipment and drainage was time and material.

Miscellaneous cleaning up was done by hired help as was the seeding of fairways and stolonizing of greens. We used Toronto C-15 stolons for our greens. On fairways and tees, a mix of annual rye, some fescue, and three types of bluegrasses was used. Roughs were annual rye, fescue and Kentucky bluegrass. Lime and fertilizer were applied at the end of August, 1974.

Construction: Tree clearing was to start first, but due to a wet spring, tree clearing and finding a farmer to plow up the open areas (approximately 80% of 150 acres for course and range) was not started until June 13, 1974. Because of interest cost, the plan in 1973 was 18 holes in one year or we would be in money trouble.

On July 1, scrapers started knocking off knobs, filling pockets and putting in bases for greens and tees. Lakes were started after making test bores to determine our retention problems and the lake material moved immediately for fill or for base. If let to set, the wet lake material would have taken a year to dry before we could have moved it.

The green bases were completed August 5, and the tiling of greens, traps, and course was completed August 11. An underground wire for three-phase service was trenched in six foot deep to the pumphouse site at the center of the course at the end of July before the drainage tile was put through that area.

The pumphouse was to be built in July, but didn't get completed until April of 1975. (I'll cover this later).

Sand mix for greens and tees was brought in and prepared at three mixing sites from August 7 through August 23. Irrigation construction which was to start in early July did not get started until August 15, and then proceeded much too slowly and was not completed until April of 1975.

Seeding was started a little late, August 26, and finished ahead of the irrigation, about September 30. The big scrapers were out September 9, and the finished topping of tees and greens by dozers was complete September 11, 1974.

Since the irrigation wasn't ready, we had to rely on nature for our fairway and rough water supply, but held up stolonizing greens until October 18. On October 21 the irrigation contractor was able to complete enough irrigation work (not wiring of pumphouse) to give us limited water. Our watering was limited to greens only, as only six heads could be run at one time, and only by manually opening valves. Despite the lack of automatic water, we had a good fall stand of grass in our fairways and roughs.

Problems: On approximately January 8, 1975, we had a four-inch rain and discovered the local old-time farmers' knowledge of high flood marks was inaccurate. A hole in the dike flooded us through a four-acre section of ground owned by a neighbor. My eleventh fairway was too low to drain effectively, and my seventh green was built below flood level.

The spring of 1975 was dry as was the winter after the January rain, and the tees and greens needed water. I had to bring in another contractor to open the irrigation system as the original contractor would not show up. By the time we got the water to tees and the greens (after blow outs on all four-inch and larger pressure points), we had lost over one-half of the grass through drying on tees and greens. We had to buy more Toronto for weak spots in the greens and re-do six tees. Irrigation lines were not compacted as required by the contract, and most of them sank or washed out over the fairways.

In 1975, I bought my neighbor's four acres for twice its value, raised my dike four feet, filled my neighbor's dike hole, hired a new contractor to finish my irrigation system, raised a low fairway three feet, replaced all major thrust blocks, and went back to the bank broke, and luckily borrowed another \$175,000 to stay alive.

The course was opened on June 24, 1975. That year, without a clubhouse, we took \$18,000.00 from green fees, range, carts, and soda pop.

The 1975 cost to correct the problems went close to \$250,000.00. 1976 was much improved, and the bank approved a mortgage for the clubhouse in 1977, for which I hired an architect, and I again acted as general contractor. The clubhouse went 20% over budget and was not completed until March 1978, but was a great success. In 1978 I bought 50 new electric golf carts and had to borrow again. Now that it's 1979, and we have a three-way liquor license, including Sundays, the anticipated gross (excluding pro shop equipment) is for over \$500,000 - for green fees, carts, range and restaurant.

My New Dream: Now I'm planning a new course.

In 1977 my attorney offered me 175 acres of his farm in Crown Point. Since then, I have worked much harder in depth at better planning regarding money, lay-out approval, budgeting, knowledge of contractors, our soils, types of grasses to use, erosion control, zoning utility needs, scheduling, and feasibility.

Differences in my new project, as opposed to the past one, are as follows:

1. Instead of borrowing \$390,000.00 for 10 years for construction, this time (5 years later) I'm borrowing \$1,300,000.00 for 20 years.
2. The architect will supply a detail of bids and an on-site supervising architect. He will supply:
 - Detailed time schedules for various phases of construction.
 - Completed detailed layouts for my approval of the course, maintenance equipment, buildings, roads, cart paths, pumping plant, and drainage.

3. I will have my own superintendent with construction experience on the site and will check all work in detail, as well as test all sand and peat deliveries, and greens and tees during construction. All construction draws will be approved by my architect, my superintendent, myself, and my attorney.
4. Irrigation system will be fully automatic, and fairways will be double line. Fairways, tees, and greens will all be bent.
5. There will be four sets of tees, with the course ranging from 5250 to 7250 yards.

Construction will be done over a two-year period. In the summer and fall of 1979 we will rough stone our entrance roads, clear our fairways, dig our lakes, do the heavy earth moving and shaping the course and building our bases for tees and greens. After that we will put in our drainage system. This will allow for the 1979-1980 winter and spring to settle the soil, thereby allowing us to level sunken pockets the next summer before applying our finish mix to tees and greens. The pumphouse and electric will be ready by the early summer of 1980 and will be placed in traps during fall of 1980, but cart paths on hillsides will not be added until the spring of 1981, just prior to the opening of the course. We will hold up construction start of the clubhouse until the fall of 1980, with completion in time for our first full operational year 1981.

Recognizing that the average golfer wants to score well and that the better player wants to be challenged, the endeavor is to make the course interesting without making it too tough or too easy for both average and good players. This course is being designed to provide a test of the golfer's ability to execute a variety of shots. If the design is successful and the course is good, it will establish its own reputation and play will take care of itself.

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RECREATIONAL TURF IN EUROPE

John Souter, Consultant
Perthshire, Scotland

A. Problems, Investigation, Maintenance

Problems are normally created, either intentionally or otherwise, by our industry itself through faulty specifications, lack of material control, careless and bad workmanship, and sometimes by poor husbandry by the groundsman after the completion of the contract.

We all are striving, yearly, to eliminate these and create a scheme of work which can be easily controlled and is acceptable to all concerned. Experienced operators who care and groundsman who have a pride in their work are the basis of any success we have had.

B. Site Investigation - Planning

Too often we have taken short cuts and omitted many aspects which play an important part in the overall design and aftercare of our playing surfaces. We suggest the following as a basis for our scheme.

Soil profiles dug over the area to check for a uniformity or otherwise of our base structure.

Soil analysis of mainly the top 9" (23 cm). The readings show many of the basic problems with our particular material; e.g., whether packing, too silty, too free flowing, etc.

Site survey which shows the levels existing and allows us to make proposals on the information available. The outlet point will play the most important part of our survey as it will determine the control of flow we can achieve.

C. Materials Available

From bitter experience these must be checked at source and again on site and the training of site foremen to understand the basics of particle size is essential. All material should be delivered to the site three or four days prior to use, if possible, and samples can then be taken back to the laboratory for testing and clearance.

Washed, clean material only should be considered. Silty or dirty gravel may soon clog the slit spaces in plastic pipe thus reducing the flow rate to the outlet point.

D. Method Of Construction

This should be decided after all the information is available. Decisions regarding falls, the formation of a crown, construction of manhole or outlet chambers, sizes of pipe can then be made. The job specification can be prepared showing the method, type of materials used in the construction, type and quantity of fertilizer and seed, and lastly the aftercare specification for the next 2-3 years (minimum).

Machinery sheets. These include the type of trenchers to be used, the number of tractors and trailers, any specialist machine required, a list of spares to be carried together with notes of the nearest repair shop.

Selection of Staff. Probably the most critical aspect is choosing the most suitable foreman to liase between the client and the designer. Experience and natural ability are high on the list of priorities. Any client likes to feel the man on "his" job is good.

Client Discussion. Before any contract is entered into we try to cover all aspects of the construction and after maintenance with the club committee and Head Groundsman. He, after all, will either cooperate during the construction, or he will not; will carry out the programme set out after completion, or he will not. We have found that when the Head Groundsman was fully involved from the start that these contracts have been our most successful.

Finally - make sure the person you deal with has enough money! That he understands the meaning of provisional sums and extra over items. It is important that he attends the interim site meetings re progress and then sends you a cheque within the stipulated period.

Once the contract has been signed and starting and completion dates are agreed, endeavor to keep the client informed, especially during inclement weather as he will try to understand if you discuss matters with him.

E. Maintenance

It is important that some form of systematic programme is carried out and our suggestions are as follows:

During April-early May apply a nitrogenous fertilizer (34% N) at 1 cwt/acre.

Overseed mid-May using a suitable mix such as:

- 70% Manhattan perennial ryegrass
- 15% Kentucky bluegrass
- 15% creeping red fescue

Application rates are now as low as 1/2 cwt/acre once an installation has been completed.

Spiking, using either the tractor mounted or motorized hand operated machines should be carried out weekly, care being taken that the surface is not wet or greasy when the operation is carried out.

Sand dressing during mainly end June/July. This should be applied using tested material only (in excess of 75% in the medium/fine fraction and less than 11% in the 125 micron size). Apply approximately 40 tons per acre in two-three directions over the pitch area and brush well using a tractor mounted power brush or chain harrows.

Autumn fertilizer. Any suitable fertilize should be applied at a rate around 2-3 cwt/acre.

Worm control. Encourage and DO NOT KILL.

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GOLF AND BOWLING GREENS IN SCOTLAND

John Souter, Consultant
Perthshire, Scotland

Golf in Scotland started on the Links or coastal dune areas. Many of our famous courses such as St. Andrews, Muirfield, Troon, Carnoustie, and Turnberry, where Open Championships are held, are "natural" each with its own special character.

The care of these courses has, over the years, been entrusted to that amazing breed of men -- the Scottish Greenkeeper. They had no knowledge of critical tension or hydraulic conductivity but they did have what cannot be taught - a sensitivity or feel for their job.

My earliest recollection of this, although I did not understand it at the time, was meeting with the late Jim King of Luffness Golf Club, East Lothian. He annually, during October, lifted three greens, set them aside, dug over the base, tramped and raked, relaid the turf, and proceeded to top dress almost daily (with dune sand only, of course) until he created his new putting surface. When I eventually managed to ask him why he did this, the reply rather staggered me. "Because I've got too much root."

Equally, he did not kill the worm. "It brings up the finest top dressing in the land - FREE". He was a Scot, thrifty, and a real gentleman. There were also those who thought he had some of the finest greens in Scotland. Switching or brushing was carried out each morning to disperse the casts and to remove any early morning dew. What was significant was that annual meadow grass (Poa annua) was unknown in his greens; only the finest fescues grew. He knew that if his roots could penetrate the material under the turf (and dune sand has almost constant 89-92% of medium to fine particles and normally only a maximum of 3% under 125 microns) that the fine leaved fescues remained. He also understood that by adding predominately "soil" based top dressing he slowly lost his finer leaved grasses and Poa soon crept in.

There was, however, a problem in that when the greens became "older", i.e., as they reached 5-6 years after relaying, dry spots appeared. These seemed to be the areas where the root depth or root thatch as we called it, was greatest. Some trials were carried out using wetting agents worked into the base prior to relaying, but this never appeared to give lasting results. Eventually we decided that his own "experiments" gave a fine putting surface and unless we can improve on what some thought was perfection, then he may be, as he has been to me, the real teacher. It was always a pleasure to call and see many of these greenkeepers. They always had time to stop and discuss their problems or ideas if you were interested in listening. What I did not

know then was that they started work usually around 5 a.m., and were sometimes to be found watering their greens, by hand, at midnight.

Bowling is one of our more popular sports and is no longer thought of as an "old man's game". The green should be square with a minimum side length of 40 yards and a maximum of 44 yards. It is flat and over the playing surface should have a tolerance of $\pm 1/4$ ". It requires skill and accuracy during construction and the aftercare treatments are all important.

Ditches are set prior to the turf being laid and are there to catch the bowls. Banks can be perpendicular or no more than 30° to it. They are turfed and require to be a minimum of 9" above the finished level of the green.

The game is played by individuals (singles), pairs, triples, or fours using a white ball or jack and four bowls which are biased, i.e., they roll inwards from the right or left to the jack. Play commences during April and ceases around the end of September, when the main turf programme takes place. The area is heavily scarified in two directions and the resulting dead material disposed of. Hollow coring then takes place and the cores removed. Top dressing compost, comprising 7 parts medium/fine sand, 2 parts sedge peat, and 1 part sterilized soil is then applied at a rate of between 2-4 tons per green. This is well brushed in, preferably by drag mat or brush and in several different directions.

An autumn fertilizer at 1-1/2 cwt/green and a preventive fungicide, mainly to control fusarium, are applied and the green laid by for the winter. In the spring, the area may be lightly scarified and a spring and summer fertilizer applied at 1-1/2 cwt/green. Light feeds of around 3/4 cwt/green can be applied at 4-5 week intervals. A little and often is sometimes best.

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SAND ONTO ATHLETIC STADIUMS

John Souter, Consultant
Perthshire, Scotland

Since 1969, when we made our first sand slit hopper and thought we knew all the answers, many methods, depths, and types of materials have been tried. It is only since 1974 that a pattern has emerged that appears to be affording us a more stable, harder wearing, and yet porous surface. Over the years we have tried and rejected the following operations.

A. Mixing a gritty sand into the top 9" of soil having previously drained the area at 5 yard intervals, herring bone fashion. Initially the results were good, but after three years the surface had "compacted" and our good grass variety replaced with Poa annua.

B. Injecting sand and grits to depths which varied from 10"-14" by mole plough and vibrating sand hopper. These we attempted to run or intersect over existing drainage, if present. Again the early results were good but eventually (in as short a period as nine months) the surface returned to its original state.

C. Top dressing the complete area with sand dressings during the summer months. Vibro slitting and spiking were then carried out. These mostly resulted in failure, except one on a clay base which had a fall of 1:100 from goal to goal. Once the wet

winter weather was with us the rain would penetrate the base material quickly enough, and as most play is during these wet months the resulting surfaces were similar to mud pies or porridge.

D. Draining and sand slitting the existing surfaces using Davis machines (4" and 2" chains), backfilling the plastic pipes with gravels, grits, and sands to the surface. This was more successful, but often resulted in undulations in the drain runs which were not helpful to soccer as the ball is on the ground most of the time.

During 1974 a decision to open our small laboratory was made. This ensured strict quality control of all materials. Patience and observing nature also played an important part in our research and eventually our installation technique developed, resulting in the operation taking 2-3 years.

Year 1 - Testing, grading to final formation levels, amelioration of top surface and seeding. Excavating and construction of outlet manhole and main periphery drains.

Year 2 - Setting off area, drainage, slitting, and sand dressing.

Year 3 - Sand dressing plus maintenance programme commences in full.

First Year: After the analysis of the existing soil has been checked over, many areas, the amount of medium, fine particle sand required to be added to the varying depths of the soil is calculated. Selections of this material can be made from various sources and availability of quantity verified. We may require some 700 tons which must be delivered and checked prior to use.

The final surface formation, e.g., crown, end to end slope or side to side slope is then agreed. To break up the existing sod, light rotovation is necessary and the area then ploughed to a suitable depth ascertained from the soil profiles.

Grading is carried out by tractor and blade or Warnock leveller. Sand is added, evenly, to the complete area by tractor hopper which is adjustable to heights of 1"-5". Amelioration by various implements such as the Vicon Cultivator is the next stage. Rotovation sometimes results in a "mixing out" of the ingredients. Try to ensure this operation is carried out during dry conditions.

The final grading using the tractor leveller depends on the ability of the operator to make it a success or otherwise. The final surface is hand raked to receive the seed mix. This ensures uniformity and removes any stones present.

After these operations have been approved by the client, preseeding fertilizer is applied at 3 cwt/acre. Grass seed is sown in two directions using Cyclone Major spreaders. We are finding that a mix of:

- 70-80% perennial ryegrass
- 10% Timothy short seeded
- 10% Kentucky bluegrass

in the first year gives us a quick initial cover and then a much more wear resistant surface. This varies in year 2 (no Timothy). Good results have been attained at our main soccer stadiums such as the National Stadium, Hampden Park, Ibrox (Rangers F.C.), Parkhead (Celtic F.C.), and Fir Park (Motherwell F.C.).

The mix is lightly hand raked into the surface. Watering if dry conditions prevail is essential and we normally set up a unit comprising of a 12,000 gallon tank plus four travelling sprinklers and hose.

Second Year: After the season closes, normally at the end of April or early May, the complete area is overseeded with a mix comprising:

70% Manhattan ryegrass
15% creeping red fescue
15% Kentucky bluegrass

The rate of application is around 1-1/2 cwt/acre, and is applied by means of a Sisis Contravator in two directions and diagonally. Setting out the area using a Dumpy level white line markers, and level T bars then takes place and is carried out by our engineer and site foreman. Main lateral drains are excavated by Davis trencher with 4" digging chain and all excavated material taken from the site by trailer. Depths of drain vary from 18" to possibly 30". Plastic pipe is inserted into the drains and backfilled with gravel 3/16"-3/8", grit 1/8", and sand 125-500 mm. The top layer contains a cap mix comprising sand, sedge peat and the correct percentage of soil plus fertilizer and grass seed.

Sand slitting at right angles to the lateral drains then takes place and is set at pre-determined spacing, normally 1-4 yard intervals. These are excavated by a Davis 500 with a 2" chain and scaled front digging unit. All excavated materials are disposed off. CLEAN DIGGING IS ESSENTIAL. The slits are filled with grit and sand and capped off. Watering takes place and after germination the area should be lightly rolled to firm the surface and level the drains and slits. During late June or early July the area is sand dressed in several directions using medium/fine approved material and quantity of 200 tons is aimed at for soccer pitches (110 yards x 75 yards) i.e., approximately 1". When the grass is vigorous this operation can be carried out successfully.

Third Year Onwards: Maintenance is now in the hands of the groundsman and his cooperation is more essential now than ever. We have found, however, that groundsman such as John Docherty at Hampden, Davie Marshall at Ibrox, Andy Russell at Motherwell, Joe Docherty at Celtic Park, and George Hamilton at St. Mirren F. C. make sure that "the amateur turf experts" are not allowed to interfere in their programme and that compliments rather than the continual war of nerves are the order of the day.

During all the operations our ally, the wee worm, must not be forgotten - he spikes, aerates, and allows the surface to breathe!

Thanks are due to the following people for permission to use the slides shown:

Mr. W. Waddell, general manager, Rangers F. C.
Mr. I. Hartnett, ground convener, Hampden Park
Mr. W. McNeill, manager, Celtic F. C.
Mr. W. Samuel, chairman, Motherwell F. C.
Mr. W. Todd, chairman, St. Mirren F. C.

Finally, my personal appreciation to Dr. Victor Stewart (a Scot) now at University of Wales, Aberystwyth, for all his unstinting advice and guidance since 1969.

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PRODUCTION OF QUALITY SANDS IN THE MIDWEST

Dan Warner, Standard Sand Corporation
Grand Haven, Michigan

The Midwest Regional Turf Foundation covers a seven state area which has been blessed with an enormous amount of high quality sand deposits. It's interesting to note that, almost without exception, no two states have the same geological history. More importantly, the majority of sands produced are not suitable for topdressing applications for one reason or another.

Bank sands and molding or naturally bonded sands contain excessive amounts of clay, which present in these materials are considered beneficial by the foundry industry. It is not uncommon to find clay contents ranging from two to twenty percent. Lake sand, beach sand, and sharp sand, all of which are commonly referred to as dune sand, is quite the opposite. Small amounts of clay and impurities are removed through processing, rendering a clean, well sorted material containing approximately 97% silica. Silica sand, like dune sand, has a wide distribution range, and generally requires some type of washing to remove small amounts of clay and silt.

Used sand, mortar sand, and concrete sand, although not considered industrial sands, deserve some mention because they are readily available in most states. As the name implies, used sand is any material which has been used in a foundry sand mixture. The grains exhibit a carbonaceous coating or skin deposit and are black in color. These sands may be found in a wide range of sizes with varying amounts of unused clay and binder material coating the grains. Mortar and concrete sands are very coarse and used primarily by the construction industry. They differ in that concrete sand could contain as much as 35% stone between the 8 and 20 mesh sieves, while mortar sand usually contains less than 15%.

The states of Wisconsin and Illinois are favored with excellent silica sand deposits, the most unusual of which is the St. Peter Sandstone Formation. This deposit, when washed of its slight clay content, contains 99.5% pure rounded grain silica. Producers in Fairwater and Portage, Wisconsin, as well as Ottawa and Wedron, Illinois, market sands which are generally much finer than what your specification calls for. In order to make their materials acceptable to the foundry industry, they must screen out the coarser grains. This by-product, in addition to being suitable for topdressing, is a very good abrasive material for sandblasting. Unfortunately, the supply is short and the demand is high. Producers are able to rid themselves of this material at a high price without regard to quality. Grading sand by screening and blending is very difficult and consistency is extremely hard to maintain. There are a number of Wisconsin golf course superintendents who will agree that each truckload of this coarse grade by-product is liable to exhibit completely different characteristics.

The silica sands of Missouri are considered light quality materials. Therefore their use is limited almost exclusively to the glass industry. Two of the largest deposits, located in Festus and Klondike, contain large amounts of fines, which in most cases are not screened out. Because of this, the price is considerably lower than that of the higher quality Wisconsin and Illinois silicas.

Ohio contains the largest variety of industrial sands in the midwest. For example, along the Lake Erie shoreline occur vast deposits of dune sand; the northeastern portion of the state is covered with bank and molding sand deposits, while the central and southern regions contain sandstone formations, which in some cases test out to nearly 100% pure angular and sub-angular grained silica. As much as I hate to admit it, the dune sands and silica sands are available at reasonable prices in grades which would be suitable for topdressing your greens.

Kentucky, on the other hand, is much less fortunate. To my knowledge, there are few, if, in fact, any, active industrial sand operations. The majority of the sand used by the Kentucky foundry industry comes by rail from surrounding states, and the price per ton reflects this transportation cost.

In north central Indiana, around the area of Logansport, there is a very substantial bank sand deposit. Even though this material has a grain structure resembling that of southern Michigan dune sand, excessive amounts of clay render it useless as a topdressing material. Along the southern shore of Lake Michigan, around Gary, there are huge dune sand deposits. However, this area is highly industrialized, making property values extremely high and prohibiting the mining of these deposits. As with Kentucky, foundries in Indiana are supplied by surrounding states, primarily southern Michigan.

Used sand, mortar sand, and concrete sand, as previously mentioned, are available at very reasonable prices throughout the midwest. In fact, in the case of used sand, many foundries would be happy to pay you to haul this material away. Today's binder systems utilize a wide variety of chemicals which remain on the sand grains following use. Some of these chemicals are considered highly toxic, which makes disposal a very costly proposition. The Environmental Protection Agency and state DNR officials have imposed tough restrictions on solid waste disposal practices. I have been told that there are a number of golf courses in Ohio that are using this material for topdressing applications. If you are using spent sand, I would suggest that you pay a competent lab to run a complete chemical analysis so that you know exactly what you're putting on your greens and into your turf. The foundries furnishing you with this material can tell you the chemical composition of their particular binder systems. Mortar and concrete sands are also being used, and with a good deal of success. If the problems caused by the stones present in these materials are tolerable, I would suggest that you continue their use. If not, there are better sands available. I must warn you, however, that the price of quality is not low. You should be sitting down when you investigate other sources of sand.

This leads us to my favorite state. In Michigan, industrial sand is mined from several sources for a variety of uses. The major source is the coastal dunes located along the western shore of the Lower Peninsula and along some of the shoreline of the Upper Peninsula.

For many years Michigan's dune sand has been consumed by the foundry and glass industries, as well as sandblasting companies and the railroad for use as an engine traction material. In 1977, much to everyone's surprise and delight, a recreation oriented industry began to consume this mineral resource. Today, many golf courses throughout Michigan, Indiana, Illinois, and Wisconsin are finding this material, which contains in excess of 80% between the .50 and .21 millimeter sieves, ideally suited for use in topdressing their greens.

A survey conducted by the Michigan Department of Natural Resources, in conjunction with The Sand Dune Management and Protection Act of 1976, revealed seven producers operating within the state. These seven extracted some 5,450,000 tons and controlled recoverable reserves totalling 256,765,000 tons. At existing production rates, present reserves should not be depleted until the year 2030. However, Michigan is blessed with an abundance of high quality sand deposits. Of the 65,000 acres of prime dune-land within the state, sand companies own or control only 3,000 acres. Barring future legislation contrary to the mining of these deposits, we will continue to lead the nation in industrial sand production well into the twenty-first century.

Geologists tell us that thousands of years of natural wind sorting has resulted in vast deposits of well sorted dune sand consisting of 95% pure sub-angular grained silica. The remaining 5% is divided between oxides of aluminum, titanium, iron, calcium and magnesium. Eliminating these impurities, or as we like to call them, "beneficial non-silica particles", has presented sand producers with their greatest challenge. Some of us have met that challenge with new and sophisticated processing techniques, while others have not. If you are concerned with the pH level of your top-

dressing and are considering using a dune sand, by all means select a supplier that has!

Before going into the actual production of sand, I'll like to speak briefly about a ploy used by most sand salesmen when questioned about impurity levels in their product. They like to speak in terms of pH values, and you should not fall victim to their deceptive tactics.

As you know, calcium and magnesium carbonates have a substantial effect on pH values. However, some of these elements present in dune sand are not water soluble and will not influence pH readings. Because of this, the foundry industry developed an acid demand test which more accurately measures carbonate concentrations.

It is known that when equal amounts of a neutral distilled water, hydrochloric acid, and sodium hydroxide are mixed, the pH will remain neutral. If an equal portion of sand were mixed with the water/acid solution, the carbonates within the sand would consume a portion of the acid. By back titrating with sodium hydroxide to a neutral pH, the exact amount of acid consumed could be determined. This number is then referred to as the Acid Demand Value.

The nature of the test method is such that these values range between zero and fifty. An Acid Demand of zero would indicate that the sand had no reaction with the acid and for all practical purposes was neutral. On the other hand, an A.D.V. of fifty would indicate a very basic sand which consumed 100% of the acid. These two chemically different sands could very easily have the same pH value. As an example, our sand in its raw state has a pH of approximately 8.5 with acid demand values ranging between 35 and 45, meaning it would consume 70 to 90% of the acid. By processing this material we are able to reduce the acid demand to less than 5, yet the pH value remains at approximately 8.5.

Now that I have completely confused you, let's move on to the methods of producing a quality sand. The facility that I am going to describe belongs to Construction Aggregates Corporation and is located in Ferrysburg, Michigan. Just to set the record straight, Standard Sand is a subsidiary of Construction Aggregates.

Our mining operation, as all others, consists of extracting the material by the use of either a front-end-loader or a crane. The raw material is unloaded into a nearby hopper and transported via conveyor to a surge pile for processing. Some companies are forced to truck their raw sand to their processing facility because the plant is located some distance from the deposit. As you can imagine, conveying is much less expensive.

In our case, the raw material is drawn from the surge pile at a rate of 300 tons per hour, diluted with water, and passed over a screen to remove the roots, stones, and other foreign matter. The sand passing through the screen is made into a slurry consisting of 30% solids and is pumped to our cyclones for primary washing. The cyclones are equipped to remove essentially all of the minus 140 particles. The washed sand discharged out the bottom of the cyclones can then be diverted to either our dewatering devices or to our flotation plant for further processing.

I'm going to concentrate on the flotation process simply because this is the material that we have sold to numerous golf courses. We built our flotation plant in 1975 for the specific purpose of eliminating the "beneficial non-silica particles" that I referred to earlier.

As simply and as briefly as it can be explained, the flotation process or more specifically, froth flotation, involves chemical treatment of a sand pulp to create conditions favorable for the attachment of carbonate particles to tiny air bubbles. These air bubbles are carried to the surface of the pulp and form a stabilized froth which is skimmed off while the sand remains submerged.

Sand flotation is a very sophisticated process and there a number of critical steps involved. First of all, the cyclones must remove all of the silt and clay which, even in small amounts, will have a disastrous effect on the final outcome. In addition, the cyclones must deliver a slurry consisting of 75 to 80% solids to our first conditioning tank. At the point of the cyclone underflow an anionic fatty acid is metered in at a predetermined rate, generally between 1/4 and 1/2 pound per ton, and the very critical conditioning phase begins.

This is the heart of the entire process since it is the fatty acid which produces the hydrophobic film on the carbonate particles. Numerous lab experiments showed that we needed a minimum of five minutes retention time to effectively disperse the fatty acid throughout the entire load. To accomplish this, we installed two nine foot by nine foot tanks complete with 36" propellers. We calculated that each tank would have a 2-1/2 minute retention time while running at 350 tons per hour. This was not the case at all, and in 1977 we found ourselves adding a third conditioning tank to the system. We now have a total retention time of six minutes while running at 300 tons per hour.

Once the slurry is properly conditioned, it is fed to the first of four 500 cubic foot flotation cells where make-up water is added to reduce the solids back to 35%. Intense agitation and aeration occurs in the mixing zone at the bottom of these cells. It's within this portion of the cell that contact between the conditioned pulp and controlled air is made. The carbonatized air bubbles are lifted hydraulically by the recirculated pulp in the middle of the cell. At this point a calm separation zone is created which permits the floatable particles to separate from those that will not float, and a stabilized froth is formed on the surface. This froth is skimmed off and the finished product is pumped to our roto-scoops and sand screw for dewatering.

This, in a nutshell, is the flotation process which is the most effective way of reducing the carbonate content of a sand. There are other less complicated and less expensive methods, but, quite frankly, they don't begin to compare to the effectiveness of a well run flotation system.

Once dewatered, the sand is conveyed to a radial stacker for stockpiling over one of three tunnels. By stockpiling the coarse material over one tunnel and the fines over the others, we're able to blend during loading to adjust screen distribution, fineness, and acid demand to meet our customers' specifications. Our stockpile consists of 42,000 tons of live storage which can be loaded in trucks or into lake freighters for shipment to ports in Canada, New York, Illinois, or Wisconsin.

I have saved any mention of quality control for last because it's really the main thrust of our operation and something we're quite proud of.

Our program begins with prior testing of the sand dunes to determine what type of material we will have available for mining. A number of samples are extracted throughout the year with test results recorded on a large topographical map. From this data, which includes a screen distribution, fineness, clay content, and acid demand values, we're able to formulate a mining plan conducive to meeting customer specifications.

Each of our major customers has a completely different demand with respect to sand quality, and therefore we must base our production schedule on a very strict shipping schedule.

Additional samples are collected at both the pre-screen and the finished product belt. Each sample is representative of 300 tons of production, and the test results are compared to measure both plant efficiency and finished product quality. Results from the finished product samples are then recorded on an inventory control sheet which is used to design a loading plan for both truck and vessel shipments.

During shipping, samples are collected by the truckload or every 3,000 tons in the case of a boat load, and these results are mailed to the customer. In addition, small composite samples are saved for future reference. These small samples have saved us thousands of dollars on a number of occasions. Self unloading vessels also transport coal and salt throughout the Great Lakes and have a nasty habit of contaminating our sand. I speak from experience when I say there is no headache more severe than 27,000 tons of contaminated sand on a customer's dock.

Our operation, which produces 650,000 tons per year, is simple by comparison to other facilities which separate the sand by individual grain size and then blend various sizes together to produce a number of different sized products. We have never felt compelled to do this for a couple of reasons. First of all, it is extremely difficult to produce a consistent product time after time, and secondly, we have been quite successful with our present operation.

In conclusion, I'd just like to say that most midwest producers are very quality conscious, and ship reasonably consistent products. Not all of them have the type of sand that you are looking for, nor do they have the additional capacity to meet your demand. I know that some of you have been disappointed by the apparent lack of interest in your market on the part of sand producers in your areas. You must understand first of all that most producers are sold out and are hard pressed to meet the increasing demands of their present customers. Opening up more mining operations would solve this problem; however environmentalists have made this an extremely costly proposition. Secondly, your market at present is not large enough to capture the interest of most producers. This is not to say that nobody is interested! Our company has the capability of shipping sand to a number of different ports which eliminates stockpiling problems. In two days, we are able to produce enough material to supply the entire midwest topdressing demand. If we had to stockpile this sand for the entire year at our plant site we too would find it difficult to supply your industry. We're pleased that this is not the case, and we are looking into opening docks in Chicago and Peoria, Illinois. Transportation and handling costs definitely escalates the price of this material; however, availability, quality, and consistency should be your primary consideration.

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SAND TOPDRESSING

Ray Knapp, Superintendent
Tuckaway Country Club, Franklin, Wisconsin

Before starting a sand topdressing program we must assume that a problem exists. There would not be much reason to switch to a different program if there are no problems. Sand topdressing can be used as a solution to some maintenance problems.

I would like to review the reason why some superintendents in the midwest have started a sand topdressing program and what they expect it to accomplish.

The main reason we started a sand topdressing program at Tuckaway was because of a clay layer at about three inches below the surface. This layer caused a problem of standing water after heavy rains. We felt that we could not do much about the layer. It was just below the depth of the aerifier tines. By using sand topdressing for four years this problem has been reduced.

For most superintendents the biggest greens problem is caused by low infiltration rate. This leads to shallow root growth and deteriorating greens. With sand topdressing on a short term basis many superintendents have noticed increased root growth. This is especially true when topdressing and aerifying are combined. On a long term basis, a greater benefit could be expected as depth of sand increases.

After starting on a sand topdressing program many superintendents have noticed a reduction of disease. Most of the reports I have heard indicate a reduction of pythium; however, I'm sure there is a reduction of other summertime diseases. My experience shows a 1/4 to 1/3 saving in summertime fungicide because of lower rates of material used on a preventative program. The reason for this disease reduction is probably because of elimination of thatch and better air relationship. The first would be that the surface will dry out sooner. This will reduce the moisture needed by the fungus disease for maximum growth. The other advantage is with the air to root relationship. With an increased amount of air in the soil the plant will be better able to withstand physiological stress and thus the grass would be able to resist the disease attack and to recover faster.

Since being on a sand topdressing program at Tuckaway we have eliminated any thatch. By doing this we no longer have a problem of scalping puffy turf during warm wet summer periods.

One of the benefits of sand topdressing that the golfers have brought to my attention is a reduction of footprints around the green cup. The afternoon golfers now have conditions nearer those of the morning golfers. The reason for this improvement stems from the fact that sand does not compact like clay and organic matter.

For the time remaining we are going to discuss various budget aspects associated with sand topdressing. We will cover material, labor and equipment requirements.

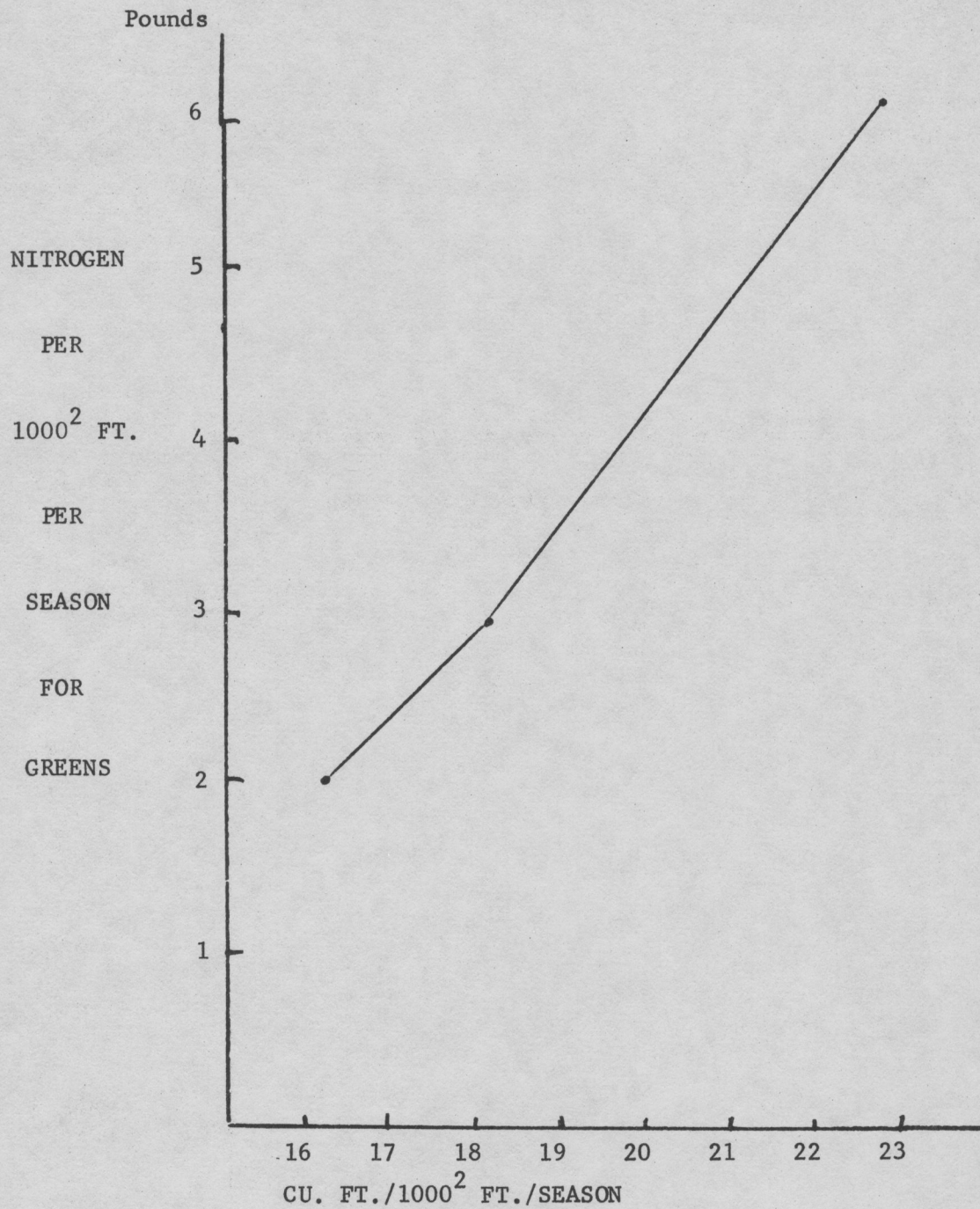
The amount of material needed for the first two years will depend on the amount of thatch build-up. For heavily thatched greens it may take 30-40 cu. ft./10,000 sq.ft. for this period to eliminate the thatch. After the thatch has been eliminated the sand requirement can be determined by the pounds of nitrogen used.

Graph I shows the relationship of nitrogen usage to the amount of sand needed to maintain no thatch on greens in southern Wisconsin. This graph shows that for the amount of nitrogen commonly used for this area 16-23 cu.ft. of sand/10,000 sq.ft. per season is needed to maintain a no-thatch condition.

The labor requirement will vary with the amount of mechanization in handling sand and type of equipment used to apply the sand.

SAND REQUIRED TO MAINTAIN NO THATCH AT DIFFERENT N LEVELS

Based on data from 3 golf courses in Wisconsin - R. Knapp, 1/78



GRAPH 1

Graph 2 shows the difference in the efficiency of the drop spreader in comparison to the broadcast spreader in cu. ft. material handled per man hour at different application rates. This chart points out that the labor hours are better utilized when using the broadcast spreader.

Another advantage of the broadcast spreader is a lower initial cost on a per unit basis when compared with the drop spreader. This is especially important when you consider that two drop spreaders are needed, compared to one broadcast spreader, to easily get 18 large greens completed in a day.

The maintenance cost on the broadcast spreader would be less. There are fewer parts. Furthermore, the parts are less likely to need replacement.

A question I cannot answer is which type of spreader gives the most even distribution. From talking to many superintendents I have found that no one is dissatisfied with either type. From the information gathered so far, we cannot determine which type will be better for long term usage.

Summary of Program

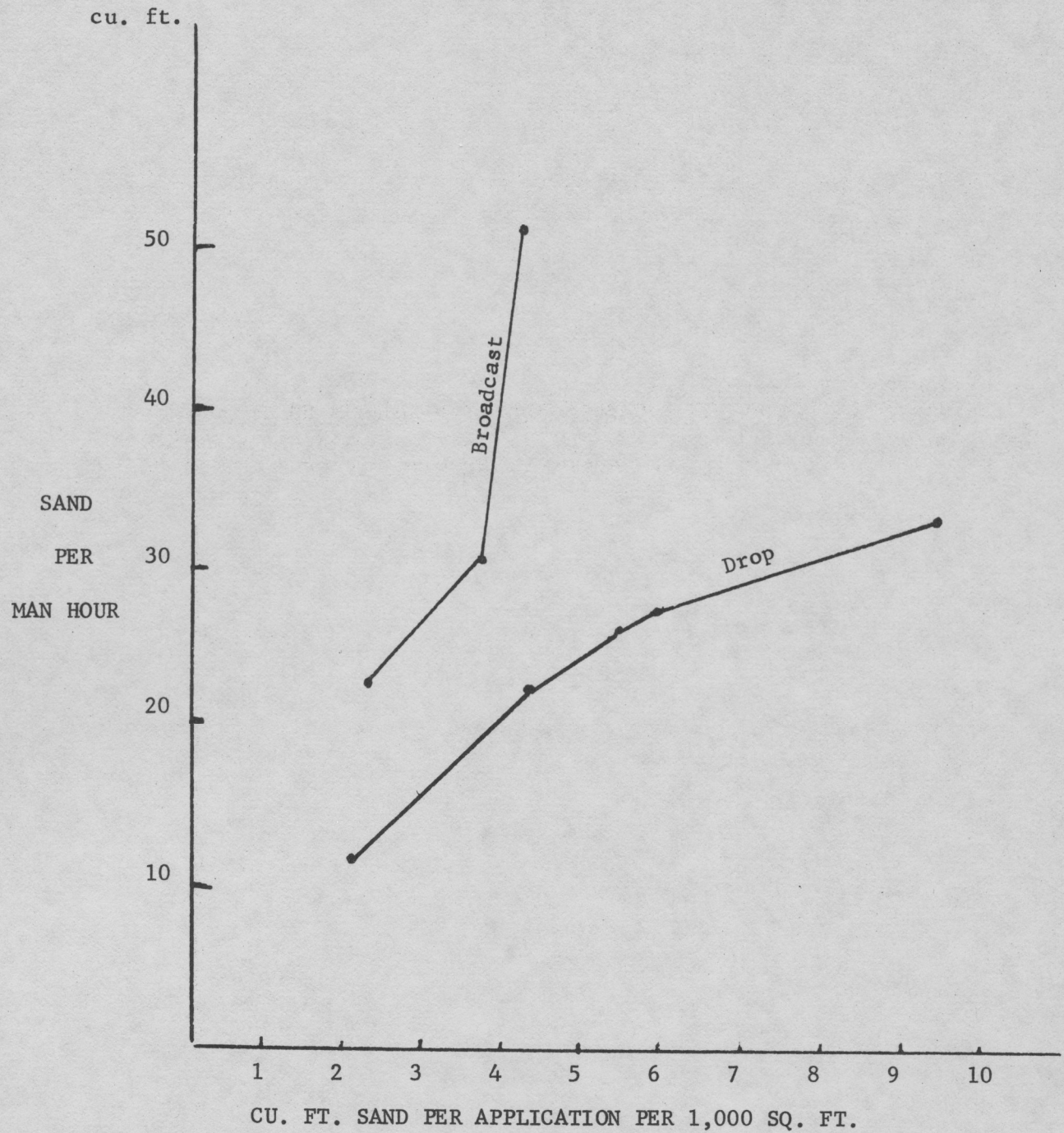
1. Main reason - raise surface of green, improve drainage, and further bury clay layer found three inches below surface.
2. Quality - Lakeshore sand from Michigan dunes.
 - a. ~ 6 cu.ft. material applied/1000 ft.²
 - b. 5-6 applications per year
 - c. totals 30 cu.ft./1000 ft.²/yr.

% by weight		Opening in inches			Range
		mm	inches	mesh	
5.2	on	.5	.0165	32	upper level of medium sand
54.3		.25	.0083	60	upper level of fine sand
39.6		.18	.0059	80	medium level of fine sand
0.8		.12	.0049	120	lower level of fine sand
.1		.10	.0035	170	upper level of very fine sand

3. Method of application - 2 topdressers, drag mat behind utility vehicle, dump truck and front-end loader. Some use artificial turf, upside down.
4. Time - 3-4 men, 8 hours = 24-32 manhours
5. Buildup over first season - 1/2"; cumulative after 3 years ~ 1-1/2 inches
6. Significant results
 - a. Reduces and eliminates thatch
 - b. No aerification nor verticutting - after first two years
 - c. Graininess of greens eliminated
 - d. Putting - faster, truer, yet ball holds well. Also less footprinting around cup late in day
 - e. Little abrasive action from traffic on leaf blades nor mower blades due to small sand size
7. Cost savings -
 - a. Less fungicide needed (probably due to lessening of thatch)
 - b. Aerification and verticutting machinery and labor reduced and later eliminated
8. Cautions -
 - a. Once on a sand topdressing program you must not switch back to a topmix or layering will result
 - b. Monitor available phosphorus levels on greens because sandy soils tend to become P deficient

SAND APPLIED WITH DROP SPREADER VS. BROADCAST SPREADER

Based on data from 6 golf courses in Wisconsin - R. Knapp, 1/78



GRAPH 2

SAND TOPDRESSING

Jim Vaughn, Golf Course Superintendent
Oakland University, Rochester, Michigan

Sand topdressing at Oakland University was initiated as a means of correcting a construction problem. The original topmix was prepared by plowing a five acre plot of sandy loam soil, trucking in additional sand, and disking the two together. The result was dirty sand.

This mix was hauled to the site in earth movers, spread, and compacted by a dozer ("to prevent settling later"). After seeding, the green was rolled with a cultimulch which left grooves three inches wide by one inch deep. Not only could you not putt on the resultant surface, you couldn't mow it without scalping the grass ridges.

Displeasure ran rampant! The surface had to be leveled, and fast. Since the mix was primarily sand to begin with, and nothing worked into the turf easier than sand, the solution was obvious.

Washed mason sand was used, but we elected not to "bury" the surface in pure sand. Our topdressing procedure is always used in conjunction with aerifying. The sand is spread over the plugs and the two are drug in together. We always overseed with Penncross before dragging.

The process is quick and easy. Three to five yards are applied per green. A steel drag mat is used to blend the sand and existing mix. Care must be taken not to over-apply. Excess sand is very difficult to "work in".

We have followed this procedure for two and one-half years, and the results are very satisfying. The greens are "firm", but most new greens are. Leveling was accomplished early in the program.

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TOPDRESSING WITH SAND - MY EXPERIENCE

Louis E. Miller, Superintendent
Louisville Country Club, Louisville, Kentucky

Thirteen years ago I took the position of Superintendent at the Louisville Country Club, and one of the major problems that I noticed right from the start was the heavy thatch conditions that prevailed on all of the greens. The bad part of the problem was that the members liked the thatchy greens because the cushion made up for a poorly hit shot and the ball would hold on the green. The thatch was so bad that you could reach inside the cup and pick up the turf like it was a carpet. The roots wouldn't even penetrate the thatch into the soil layer. The thatch was a good one and one-half inches thick.

I informed the greens committee that the thatch was going to go. They couldn't have been more cooperative, and were prepared to take the flack from some of the membership, especially some of the older members who had grown accustomed to the spongy greens. Another important point to mention here is that only about two of the greens had any tile under them, and they were all composed of a very heavy clay mixture. The physical construction of the greens was a thatch layer over a clay base, and that was all. Not to detract from my predecessor, because he did what he could, but his hands were tied. They didn't even want a greensaire on the greens. Consequently, he had to use an old Westpoint aerifier, and it wouldn't even penetrate the thatch.

For the first few years my program was that of aerification, vertical thatching, using a mat-a-way with knives on two inch centers, removing both the cores and thatch and then topdressing. The program I used at the time was not readily accepted by most people; I had to make the choice after some serious deliberation and elimination. In coming up with the topdressing mix, I eliminated any peat, mainly because of the already present heavy organic layer. That left sand and soil. It was difficult to get a good grade of soil that would not ball up, so to speak, when mixed with washed sand, and in view of the fact that Dr. Daniel was doing extensive work with calcined clay at the time, I felt that mixing the medium washed sand with the processed clay would give me a good consistent mix that would not only true up the putting surface, but at the same time would drag into the aerifier holes and vertical slits easily.

We applied the material quite heavily, 1/4 to 5/16 inch, and worked it well into the green. Due to the shock not only to the green, but to the membership, we did this just two times a year - in the spring and fall. After a period of about two years we could notice the thatch really starting to disappear, and after the third year it had been completely decomposed. We had also pushed our roots down to five or six inches and had a good, resilient putting surface.

I know that you hear a lot about "layering", using a different material on the topdressing program than the green is composed of. I disagree with that theory and have nine greens of the old construction to back up my theory. The thing that I do agree with is that once a sand topdressing program has been started, it is necessary to stay with it and not switch back and forth, because then you will get layering.

Nine of our greens have been rebuilt since I started the sand topdressing program, but the topdressing program on the old nine greens has not changed in thirteen years. I have had some people say that the calcined clay could be eliminated, but if I did so, then I would have a change in the topdressing material, and, as a good friend with many years in the field of turf management and construction told me, "Boy, if you have something that works for you and is doing a good job, don't mess it up."

That pretty well sums up my feeling also. It has been a good program and has worked well. These old greens will be replaced with new greens of USGA type construction within the next three years, but the sand topdressing program will continue until they have been rebuilt. The main reason - because it works.

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SAND TOPDRESSING - HOW WE DID THE JOB

Marvin Laird, Superintendent
Lincoln Greens, Springfield, Illinois

First we aerated the greens with a Ryan greensaire with 5/8" tines, removed the plugs and spread sand on the greens about 3/8" thick with a Cushman top dresser. The sand we ordered was supposed to be graded as follows: 100 percent to go through a number 40 screen, and zero percent to go through a 200. We then raked the sand with a Toro sand rake machine with a Jacobsen greens mower brush fastened to it. We raked the sand until it was dry. At this time the holes were about half filled. Next we used hand ware house brooms to brush the sand into the holes. Next we watered the greens for about ten minutes and then

opened them for play. We then topdressed about every three weeks very light with a Lely spreader with a topdress ring.

The players noticed the improvement within two days and commented about the improved greens the rest of the season.

The reasons we started sand topdressing are as follows: We didn't have a local source of good topdressing material. We were aerating the greens spring and fall. We were verti-cutting the plugs and using them as topdressing. It took at least a week for the greens to recover and be as good as they had been before we started. Usually in two or three weeks we would have a couple of days of heavy rain, and the greens would be compacted as tight as they were before aerating. Our greens were always hard and compacted, and during periods of stress the grass would become weak and thin.

We had to try to make an improvement. My advice would be, if you don't have any problems with your greens, don't make any changes.

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ADVANCING PUBLIC GOLF

Marvin Laird, Superintendent
Lincoln Greens, Springfield, Illinois

Lincoln Greens is an 18-hole golf course, complete with a driving range, practice green, chipping green with sand trap, a six-acre bluegrass sod nursery, a bentgrass sod nursery, a tree nursery, and also six lighted tennis courts.

Lincoln Greens is owned by the City of Springfield, and operated by the Springfield Recreation Department. William C. Telford was elected mayor of the city in April 1971, and the Recreation Department is under the direction of his office. In order to provide the public with the best golfing facility in the area it has been Mayor Telford's goal to make as many improvements at Lincoln Greens as time, money, and manpower would allow. At this time I would like to describe some of those improvements.

At our entrance area we put a wood shake roof, shrubs, and decorative rock around the entrance sign. Also on our entrance road we have a 135 yard par 3 hole where the tee sits back against the road. We dug a lake on each side of the narrow fairway, and installed a fountain in each lake. The fountains each have a 4 foot and 2 foot ring. They are connected to our irrigation system and controlled by automatic valves and timers. One of the lakes has an island with a willow tree in the middle surrounded by shrubs. We covered the islands with plastic and washed gravel before the lake was filled. The fountains don't control algae as well as we had hoped, but they certainly add to the scenic view.

We constructed three rustic-type shelters on the course, each 20' square with shake roof, men's and women's flush toilets, a bench and rest area, and electric drinking fountains. We have four of the electric drinking coolers on the course. They are the ice bank type and are supposed to produce up to 10 gallons cold water per hour. They are designed to operate on 90 volt 90 watts at the cooler. We have been using them for two years, and they have worked great.

Golf Car Paths - We have installed some golf car paths almost every year and now have over two miles of asphalt paths. We have car paths from all greens to tees (not tees to greens). Our method of installing car paths: Cut out the area with a sod cutter and flare out the entrance and exit ends to at least two times the regular width. We have the hot mix asphalt with our own 2 ton dump truck, dump and level it at a three inch depth. It will compact down to two inches. We use a ground powder to compact the asphalt; it works better for us than a roller. We extended our golf car paths around our yardage markers at the tees and at the benches and ball washer posts to eliminate hand trimming.

We have ball washers, benches, and trash cans on all tees and trash cans at the middle of No. 1 and 10 fairways on each side. The players do a good job of using them.

One project we started that didn't work very well was to install decorative bark around trees. We trimmed out around the trees and put in the bark, but it soon discolored, dogs and mowers scattered it, and it was not a worthwhile project.

In August of 1974 it had been hot and dry for about sixty days and every area that wasn't watered was brown. At this time we had a Toro water system for the tees, greens, and a single row fairway system. As with most of the systems installed fifteen years ago, there was no water between the tees and fairways for about 150 ft., and with the heavy golf car use, this area was dust. The Mayor said there was no excuse for grass being brown for lack of water when we were sitting on a lake full of water. We decided to water the entire golf course. We chose a Binar 2-wire control system, and Buckner in-line valves. We laid out the system for heads on 90 ft. triangular spacings, and marked where to dig the heads and what direction to pull pipe with a Fox Valley hand paint gun. We then went to the existing Toro fairway head, dug it up, and replaced with in-line valves, each valve controlling three heads. We then pulled in from valves to heads.

We pulled the water line in with an M-30 Vermer vibra-plow. We didn't change the mains or trench any lines. We pulled in over 90,000 ft. of 1-1/2 inch poly pipe that came in 300 ft. coils and rated at 100 psi with a 25 year warranty. We used the same machine to pull in the control wire. We installed Armatex boxes over the valves. For any necessary service work on valves or decoders, they are in an Armatex box in the middle of the fairway where the old fairway heads originally were. To drain the system for the winter we rent a 600 cmf air compressor and connect it to our water system at our parking lot and cycle the controllers. This takes 4-5 hours. We have been using this water system for four years and have had very few problems with it.

The next project was tees. In October last year our tees looked pretty sick. The crabgrass was brown; the bluegrass was trying to make a comeback. We decided to convert to C-7 Cohansey bentgrass. We started by digging around any heads that were on the tees, and trimming them down so they would be lower than any equipment would penetrate. We then used a moleboard plow and plowed the tees, then had approximately three inches of washed mason sand tailgate spread on them. We leveled the sand with a York rake, then spread two inches of peat on top, and roto-tilled everything together, shaped and leveled with a York rake, and finish graded with a Toro sand trap machine with a scraper on the back. It does a good finish job. Next we sodded the edges and the tees with bluegrass, then spread stolons - 8 bushel per 1000 sq.ft. We applied the stolons on 20-22 October. We opened the tees for play the following June. After three years' use the bent tees are still holding up well. On short par 3 holes there are a lot of divots out, but they heal fast. On two par 3 holes we have two tees. We have not plugged or topdressed to date. We mow at 1/2" three times per week with a greens mower.

We have fairway yardage markers on all holes except par 3 holes. We use a white pine tree for the 200 yard marker, an upright yew for the 150, and a globe shaped yew for the 100 yard marker.

We constructed a new parking lot at the clubhouse area, leaving most of the large trees and some sod as green area in the parking lot to break up the large expanse of asphalt. We installed a water system in the green areas and around the parking lot during construction.

In our shop and maintenance area we went from a one-car garage and an open pole shed to a modern metal building to go along with our two existing buildings, and then laid asphalt in the complete shop area. This has been an asset both in clean buildings and equipment. There was a house trailer near the shop area which served as the Superintendent's living quarters. This was sold, and in its place a nice, big brick home moved in.

Most of our course is too flat for good drainage, and conventional tile doesn't work in our heavy clay soil. We have areas with 4" clean field tile, with 2-3" soil on top, and the water will not go through the soil into the tile; the water sits on the surface and kills everything. We have tried several methods for drainage, but so far, the one that seems to work best is to install tile about 18-20" deep and cover with 3-4" fine gravel. Fill the trench to overflow with washed mason sand.

Equipment: For communication we use a radio system consisting of two hand-held portable radios, and a base station that can be used as a 12 volt mobile unit or a 110 volt base station. For fairways we use F-10 Jacobsen mowers with brushes to keep the grass standing up. For roughs we use two 7-gang pull-type Toro mowers with brushes. For spraying or fertilizing we use foam markers to show where we have been. We also own and maintain a fleet of 50 golf cars. This works out well for us because we can keep a couple of men working on golf cars during the winter and so keep a permanent crew ready for spring.

These are a few of the many projects and concepts we have changed or initiated at Lincoln Greens. As for 'advancing public golf' - our number of rounds has increased from 30,000 to 50,000 rounds.

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PLANT ANALYSIS, A BIG PLUS FOR THE PROFESSIONAL TURF MANAGER

D. B. Pfleiderer
Lebanon Chemical Corporation, Danville, Illinois

Plant analysis has become an increasingly valuable tool to the professional turf industry. Today it eliminates guess work in fertilizer formulation and feeding programs. Thus plant analysis puts turf fertilization in the proper perspective - from an art to a science.

What is plant analysis, and how does it differ from other plant fertility diagnostic tools? Probably the best way to describe it is to look at the tests available today. Many years ago fertility feeding programs resulted from trial and error. How does the grass look, especially color-wise? The next tool used was soil testing. In fact, it's still used today. It's an excellent tool, but it's limited in that it measures the nutrients available in the soil. More recently, tissue testing has become popular. Tissue testing uses sap from the tissue, but because the sap varies considerably with the time of day, weather, and leaf position, results vary considerably. Most recently,

plant analysis has become a very reliable and accepted test. It uses tissue, the grass clippings. It measures the nutrients in the sap and what the sap has been doing the last month. If major nutrients are available in the soil (as measured by soil testing) and uptake measured by plant analysis, it's a winning combination. This makes proper fertilization a science.

But how does plant analysis help the professional turf manager today? Probably the greatest use is by commercial companies to build fertilizers with needed and balanced ratios. With the aid of plant analysis, it's possible to build a complete fertilizer to meet the entire needs of turf, including secondary and micro-nutrients. Couple this with the additional benefit of plant analysis to help determine feeding programs. Plant analysis can measure nitrogen release patterns, seasons of heavy feeding, nutrient source uptake, and so forth. Thus, scientific products and programs can be developed for the professional turf manager.

Soil tests for micro-nutrients never seem to accurately reflect plant uptake. Now with plant analysis, best micro-nutrient amounts and sources can be measured. Even plant response to new nutrient sources helps determine if products show promise.

In the future, expect more use of plant analysis on individual golf courses for detailed fertilization programs. This will be essential to the professional manager who demands the ultimate in turf response. Also, look for plant analysis to be used to recognize diseases, especially those that may be fertility related.

Turf fertilization is a matter of balance of all nutrients needed for maximum results. Plant analysis is the best diagnostic tool available today, and in the future, to measure both effectiveness and efficiency of turf products and programs.

Range and Desired Nutrient Level in Kentucky Bluegrass Clippings
40 Samples Over 4 Years From PAT System, Purdue University.

	<u>Highest</u>		<u>Adequate</u>		<u>Lowest</u>
		%		%	
Nitrogen	5.8		5.		2.0
Phosphorus	.94		.5		.35
Potassium	3.8		3.0		1.2
Calcium	2.1		.5		.28
Magnesium	.42	ppm	.3	ppm	.18
Iron	647		200		80
Manganese	160		50		27
Zinc	54		30		11
Boron	30		9+		3
Copper	13		8+		4
Moly.	3.1		1.4		.7
Aluminum	872		<200		24

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SULFUR COATED UREAS - 32-0-0-0-0-24
CANADIAN INDUSTRIES LTD. PROCESS

R. A. Brown, National Sales Manager
The Andersons, Maumee, Ohio

Many people think that sulfur coated urea is a new concept and still in the experimental stage. Actually it has been under development for over 15 years; tested in 29 different countries on everything from ornamental turf to pineapples.

To those of us interested in turf, sulfur coated urea represents the combination of the most important major nutrient for turf - nitrogen, and the most important secondary nutrient - sulfur, in a single prill. These two important and necessary nutrients together are in themselves advantageous. Add the slow release benefits, and we really have something to work with.

It is important to note that urea is the best source of water soluble nitrogen for turf from an availability (lasts longer with less leaching), economical (highest concentration of nitrogen), and agronomical (low salt index per unit of nitrogen, only 1.6 salt index) standpoint. Sixteen years ago there were only 13 states with soils deficient in sulfur. Today, more than 30 states have sulfur deficient soils, as sulfur is no longer available in adequate amounts from rainfall or regular mixed grades of fertilizer. For this reason, we must supplement fertilizer with sulfur which is both available and economical. Now we can create a fertilizer containing nitrogen and sulfur that will uniformly feed turf all of its nitrogen in one growing season, and at competitive cost. This is a very important breakthrough in the turf fertilizer field.

The fusion of the urea and sulfur is formed in five basic steps. In the first step urea is heated to prepare its surface for sulfur coating. It then enters a rotating drum to be sprayed hydraulically, first with sulfur and then with the wax sealant. The product is cooled, coated with diatomaceous earth conditioner to prevent caking, screened, and transferred to storage for testing.

You understand the need and importance of nitrogen for turf, but some may not be aware of what value sulfur is to turf.

The more nitrogen that is fed to and used by turf, the greater its need for sulfur. Sulfur deficiencies in turf have the same visual signs as nitrogen deficiency - yellowing of leaves, faint scorching of leaf tip. When used in combination with proper ratios of nitrogen, phosphorous and potash, sulfur offers the following benefits:

1. Improves water penetration in soil
2. Increases availability of iron, manganese, copper, zinc and boron to the plant
3. Improves soil structure
4. Builds healthy protoplasm and plant tissue to help resist drouth, disease, and winter damage
5. Enhances color
6. Promotes turf growth and density
7. Aids the turf response when used in combination with nitrogen
8. Helps keep alkalinity in balance
9. Aids nitrogen release from organic matter
10. Improves recuperation capacity

In test plots sulfur improved turf color when the same amount of nitrogen was used on both plots. The darker green plot on the right had sulfur added.

In another test, the dark green plot on the right had an additional 3-1/2# sulfur per 1000 sq.ft.

The dark green plot on the right received nitrogen, phosphorous, potash and sulfur. The lighter green plot on the left received same amounts of all nutrients except sulfur.

The green strips were fed with ammonium sulphate 21% N plus 24% sulfur, and the yellow strips were fed with same amount of nitrogen from ammonium nitrate, 33% nitrogen.

The plot that received 100# S/acre had no fusarium disease. The plot receiving only 50# S/acre developed a severe case of fusarium.

With this better understanding of the need for sulfur you can see why we call the uniting of nitrogen and sulfur the perfect marriage.

How and why does sulfur coated urea release its nitrogen and sulfur? If you put a prill of sulfur coated urea under a microscope, the surface is full of tiny rivelets and lines resembling a finger print. There are no two finger prints alike, and there are no two prills of sulfur coated ureas alike either. It is because of this difference that we have a steady release rather than everything releasing at once.

The wax coating acts as a sealer to help keep moisture out and fill in pores and fissures. When wax is worn off, either mechanically or by nature, the sulfur coating will allow moisture to be absorbed through its shell into the area. This causes a pressure to build up inside. Microscopic holes occur through the sulfur and the nitrogen solution leaks out. Because of the varying thickness of wax and sulfur and the fracturing that happens, the prills release at a different rate depending on their own physical makeup and the way the elements work on them. While soil acids, and, to a very small degree, bacteria, do affect some release, moisture is the most important factor and yet excessive moisture or high temperatures do not markedly increase the rate of nitrogen release.

If we take 10 prills of sulfur coated urea and apply them April 15, three would start to release as soon as they received moisture and release for two to three weeks. In other words, 30% will start to release the first week, and the balance gradually over a period of 150-180 days.

There has been considerable concern about the sulfur coating breaking in shipment, while being spread, or from foot, golf cart or maintenance equipment traffic, causing a quick release or nitrogen to either burn or show erratic color. There is, in fact, an actual breakage or fracturing that takes place from the time the product is shipped and actually releases. This fracturing amounts to approximately 30% and it is this percent that gives us our immediate release the first week after application. Normal foot and vehicle traffic does not exert enough pounds pressure per square inch to crush sulfur coated urea when it is on a turf cushion. On a couple of tees, where heavy sulfur coated urea applications were made, excessive foot traffic did increase the percent of fracture. The results were quicker tee recovery which was beneficial instead of detrimental.

C.I.L. has a super-fine sulfur coated urea prill screened especially for green use. When this product is used, it should be rinsed into the turf to help prevent mower pick-up. If the green is mowed with the basket, the mower can pick up 8% of the product only on the first mowing. If the basket is left off the mower on the first mowing, up to 10% of the product may be fractured by the blades of the mower. This 10% would not create any burn or damage and would just speed up the initial response. Regular size sulfur coated urea can be used on greens, but we do not recommend it.

When all the nitrogen has oozed out of the sulfur coated prill, a hollow shell of sulfur remains. This hollow shell is very fragile and easily crushed. Usually up to 80% of the sulfur is available to the plant the first year and the balance the second. It is because of this lengthy process that the sulfur portion only slowly effect the soil pH. It is important as a nutrient, rather than pH conditioner.

Sulfur coated urea release is not dependent on warm soil temperatures for release so it is available from cool spring through to cool fall. High temperatures or too much moisture do not cause excessive release so it is safe under all conditions.

I have had only one complaint from a golf course superintendent who said he put on 1-1/2# N per 1000 sq.ft. from sulfur coated urea and burned his turf. As it turned out, he applied a mixed grade of fertilizer that wasn't even our product, and didn't contain any sulfur coated urea. I have heard another story about a superintendent who lost his job because he burned all his fairways with sulfur coated urea. It turned out he used a fertilizer that contained a percentage of sulfur coated urea, not all sulfur coated urea. He did damage three fairways, but the cause of the trouble was not the fault of the fertilizer, and certainly not the sulfur coated urea. Many times products containing a percentage of sulfur coated urea will be referred to as sulfur coated urea, giving the impression that they are 100% sulfur coated. The greater the percent of sulfur coated urea in a mixed grade of fertilizer, the safer it is from burn or quick release.

Sulfur coated urea is another one of several sources of slow release nitrogen. We are very fortunate to have a variety to choose from.

1. Activated sewerage sludge	6-7-0
2. Ureaformaldehyde	38-0-0
3. Isobutylidene Diurea (I.B.D.U.)	31-0-0
4. Sulfur coated urea A.I.M.*Process	36 N + 17 S
5. Sulfur coated urea C.I.L.** Process	32 N + 24 S

Some of these products will work better than others for many reasons, some known and some unknown, but unless we give them a fair and realistic trial, we won't know what we might have missed.

In these days of inflationary costs, we should all become better shoppers and better buyers to help keep costs down. C.I.L. sulfur coated urea is one of the most economical sources of slow release nitrogen presently available. Every ton of C.I.L. sulfur coated urea contains 480# of sulfur which is worth about \$62.00 if you were to buy it alone. Sulfur coated urea releases all of its nitrogen the year of application; it doesn't carry over for one or two more years, so you can receive good results with less product. These economy factors make C.I.L. sulfur coated urea a product well worth your strong consideration.

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APPLYING TECHNOLOGY FOR INSECTS

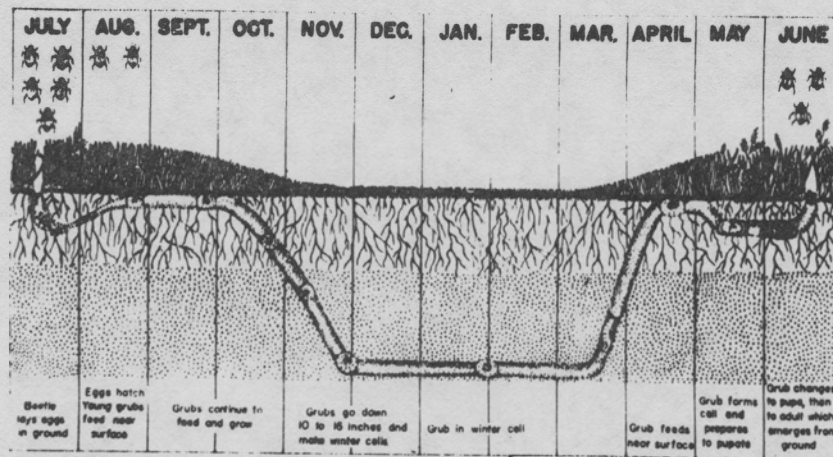
Jeff Lefton, Agronomist
ChemLawn Corporation, Indianapolis, Indiana

There is a need for us to stop and analyze those pesticides and techniques available to handle the turf insects of our customers. Before too many weeks go by you should think about the insects in your area in a systematic way. Consider the following:

1. What are the life cycles of the lawn insects in your area?
2. What is the lawn damaging stage of these insects?
3. When can the insect be controlled with insecticides?
4. What are the best insecticides available for the problem?
5. What are the limitations in using these insecticides?

This is not a complete list of questions. The application of thinking before doing is illustrated by grubs below.

Grubs are the larvae of hard-shelled beetles. They are whitish, have brown heads, and usually are found lying in a C-shaped position in the soil in the rootzone of grass. The life cycle of a typical grub problem in central Indiana is shown below:



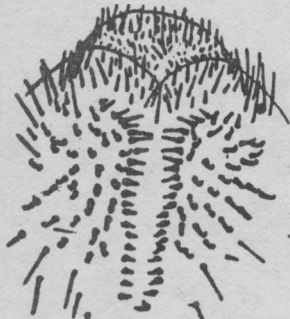
One-year life cycle of northern masked chafer.

The most effective time to control any grub is during its early instar (young) stage. For example, the above occurs during late summer to early fall. The insecticides are not effective on the egg stage, pupa stage, adult stage or on older grubs in the early spring.

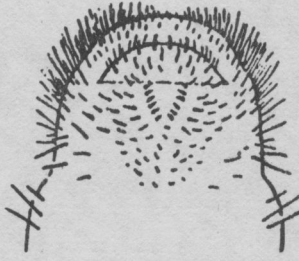
Identify the grubs in your area and ask your local county extension agent about their life cycles. To tell one grub species from another involves looking at the "raster", which is a group of bristles on the last segment of the larvae. The pattern of bristles of several grubs located in Indiana are illustrated below.



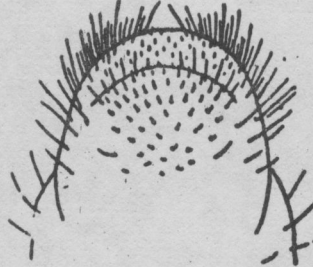
Bottom side of last
segment bears the raster



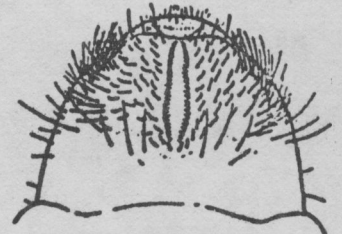
European Chafer



Japanese Beetle



Masked Chafer



May Beetle

Grubs damage lawns by chewing on the root system. Therefore, the target is underground. The only way to get the insecticide to the target is to water in the application. If an application is made to a thatchy turf a pre-watering is suggested prior to the insecticide treatment.

The insecticides available for grub control include Diazinon, Dylox, and Proxol. They are effective if used correctly. These materials are designed to limit the intensity of the grubs to a point whereby the turf can compete favorably. These materials do not eradicate all grubs in a lawn. It is important to note that a re-infestation can occur due to the short residual of these materials. Learn as much as you can about all the insecticides available to you. Select the best product for your situation.

Another area of interest for all of you is developing a cholinesterase testing program. The majority of the insecticides used by lawn care firms are organophosphates. This includes materials like Dursban, Diazinon, Dylox, Proxol, and Aspon. These materials can effect an enzyme in our bodies called cholinesterase.

Cholinesterase is an enzyme found in the blood and in most body tissues. This enzyme assists us in the regulation and control of muscle functions. In order for a muscle to contract, a nerve impulse or signal must be transmitted to the muscle itself. In order for this signal to reach the muscle it must pass a small gap called the neuromuscular junction. At this junction a chemical switch is turned on by the release of a material called acetylcholine. Acetylcholine goes across the gap and stimulates the muscle to act. After the muscle has acted it must then relax. Cholinesterase is the enzyme that relaxes the muscle. In order to have a smooth muscle function with appropriate muscle contraction and relaxation a proper balance between acetylcholine and cholinesterase is necessary. All voluntary and some involuntary muscle functions involve these biochemical systems.

There are two basic types of cholinesterase. One is referred to as pseudo, false or plasma cholinesterase. The other is RBC, or red blood cell cholinesterase. In a monitoring program one can choose either, or both, cholinesterases.

To establish a cholinesterase monitoring program several items must be considered and evaluated. First, several methods are available to measure cholinesterase. Many of these methods cannot be interpreted. NIOSH (an arm of OSHA) recommends the Michel Methodology.

Secondly, a base line level is necessary for interpretation. The amount of cholinesterase in the blood is variable. One healthy person may have plasma or serum cholinesterase concentrations that are two to five times greater than another equally healthy person. Variations in cholinesterase level among normal people is the reason that we establish a base line cholinesterase level for each employee. This way we know the normal level of cholinesterase for each person prior to exposure to insecticides. Then repeat testing allows a meaningful evaluation as to whether the insecticide exposure is affecting your cholinesterase level.

Generally, it is advisable, when obtaining a base line, which can be thought of as a pre-exposure level, to include RBC and plasma cholinesterase base lines. The normal values for the Michel Methodology is 0.41 to 1.66. For RBC cholinesterase, it is between 0.4 and 1.25. If a person's cholinesterase level is naturally low he should not be exposed to organophosphates or carbamates.

The third step in establishing a monitoring program is a routine cholinesterase test. It is our belief that, after the initial test, when using relatively less toxic compounds, such as Dursban, Diazinon, Dylox, etc., the plasma cholinesterase test is sufficient. It is our belief that if this plasma cholinesterase test falls below a 0.5 delta ph units, we also encourage that you take an RBC test, to make sure it is not dropping. Generally, what you will find in using these relatively less toxic organophosphate materials, is that the RBC cholinesterase value will stay constant, while the plasma cholinesterase value will drop considerably. When using more toxic compounds, such as methyl parathion, for instance, the cholinesterase generally is a mirror of each other. In other words, as the plasma cholinesterase drops, so does the RBC. As you might envision, these compounds are much more dangerous then. What we have here, with these other compounds, is a safety mechanism (a window), that allows us to look inside and see any possible exposure, without being subject to any probable adverse effects. However, with the use of the more toxic compounds, you are not afforded this luxury.

Some laboratories that do perform this test include Smith-Kline Laboratories in St. Louis; our labs, the CLC Labs in Columbus, Ohio, and also the Biomedical Science Laboratories, which are a division of Dow Chemical, located in California and elsewhere. It is my suggestion, that if you are having problems in locating a laboratory, to look in the phonebook and try to find P.M.I. They are located in the telephone book, in the white pages, under Physical Measurements Instruments. This is a medical concern that does blood drawing. They can send the blood sample to a qualified laboratory and return the results directly to you.

Lastly, make sure you keep good records. Our record keeping is presently done on a card as shown. If any of your are interested, I will be glad to send you a copy of this card.

Dow Chemical Company has published a booklet called, "Dursban Insecticides - Suggested Handling Porcedures for Custom Lawn-Spray Application", which contains some excellent information on biomonitoring. I suggest you get a copy from your local Dow representative.

Remember - an informed employee is a safe employee. An understanding of the insects in your area will allow better utilization of the pesticides available to you.

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AETINIUS BEETLE - MY EXPERIENCE

Larry Runyon, Superintendent
All Seasons Country Club, Lake Ozark, Missouri

We had a lot of dry wilt, some wet wilt, and the occasional observation is that a little bit of water or syringing will cure that. But on closer examination, as you peel the turf back, you might see these little white rascals down there, and that is the Aetinius in the larval stage. In some areas, after the second generation, we were counting up to 500 per square foot. This is an area where the surface does not show any damage, but if you peel back the turf you see they just completely sheared the roots.

One of the reasons these rascals will sneak up on you is that they can be down there working, and you won't see any damage until all of a sudden you get into a stress period where the temperature gets up into the high 90's, and then your turf starts pulling out on you.

As a member of the Musser Turfgrass Foundation, I called Dr. Grau and told him of the Aetinius, and he came down. The reason he did is that the Musser Foundation was sponsoring graduate student Cliff Wagner at Ohio State with Dr. Niemczyk, and they were studying the Aetinius beetle. Very little was known but the result of tests Dr. Wagner was making. With Aetinius damage the bluegrass just disappears. When dealing with a turf problem I don't understand, I believe in bringing in professional help because we are dealing with several million dollars.

It appeared maybe Diazinon would give some control, and we brought a helicopter in and proceeded to spray wall to wall with Diazinon 80. It takes approximately six days with a ground rig and we still miss a lot of the high areas. A helicopter can do a better job in one hour for less money. Bringing this helicopter in and doing the job with one spray cost me \$9.00 an acre, which amounted to \$500.00. Our No. 1 hole is a dog-leg, and he just went right into the trees and whipped that right in there and it was amazing. And in some areas where he could, he got below the tree line.

A shot of the back of the seventh green shows Aetinius damage. They started out right in the low area and then they worked in both directions.

Our golf course is carved right out of the oak, and it gets extremely difficult in July and August to maintain turf. We have eight greens that get no air circulation.

About the same time all this is happening we have a malfunction in the irrigation system on the 18th hole so it lost much turf. On the right side of the highway is our executive nine which is on a totally different water system and it looked normal.

We were faced with the problem of replanting fairways. We made the decision to replant all these damaged fairways with Westwood bermuda. There were several reasons for this decision. First of all, these lie right in the middle of the heavy play and we wanted something that was very aggressive and which would give us a fast cover, and Westwood is one of the fastest movers I've ever seen, and it appears to survive the winters in the transition zone quite well.

On this golf course, all of the topsoil, if you can call it that, was hauled in from the bottom of a later catfish farming operation, and was put on top of solid rock. There is a lot of silt and clay in it and packs easily. For a machine to put stolons down we had to get the fairways super-saturated. We put the stolons into the planter and it brings the stolons right down in front of those disks and the disks then push them into the surface.

The golfers hated us! I'll tell you one thing - when you start doing something like this in the middle of the golf season you had better have your P.R. work pretty well put together. Every evening I would put on a pair of dark glasses and a wig and go up to the 19th hole and have a couple of beers, and I didn't have a bit of trouble.

When we stolonized these fairways some showed more damage than others immediately after planting. The fairways soon recovered and were 85-90% Westwood bermuda. We feel it's going to be a lot easier to maintain.

Dr. Niemczyk was involved in the spraying program. Through their research they were looking for something that blooms in the spring and corresponds to the time to spray. It appears that black locust is a good indicator. There are a lot of things that bloom at this time - forsythia, and a lot of dogwood. But we did find some black locust about five miles from the golf course and we kept those under observation. I might add that at this time I saw great numbers of the adult Aetinius beetle. Dr. Niemczyk said, "Don't worry about it; it's not time yet." I was taking samples of the adults to Dr. Niemczyk, and he was running tests to see where they were on the egg laying cycle, and he wanted to wait until the last possible minute, so he ran tests on three fairways, not only for us but for Ciba-Geigy. They used a ground rig and sprayed one-half of the fairway and the other half was unsprayed.

Not quite a year later almost all Westwood bermuda was solid over the fairway.

When Dr. Niemczyk thought it was time to spray we had a cold snap that put everything off a little, and at this time the black oak was just starting to bloom.

Here again we are applying Diazinon by helicopter. Most of the guys you see flying are Viet Nam pilots. This guy had a 700 head dairy farm and he just got sick and tired of it, especially when there were guys right next to him that were crop dusting, working just two or three months out of the year, and driving Cadillacs. So he sold his dairy farm and went to flying a helicopter, and this is his fourth year in the business.

And, after all this, you might think you'd just throw up your hands and say the heck with it, but all it takes is one Missouri sunset in the Ozarks, and by golly, you are ready to get up the next morning and go back to it.

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THATCH - SOME IDEAS

Tom Mascaro, Turf Fiber Products
1934 N. E. 151st St., N. Miami, Florida

Thatch holds too much water to really play on it, golfers' feet get wet and they object to that, and it impedes the movement of materials. Thatch is a great filter. Nitrogen will move down through thatch very easily, but phosphorus, potash, lime, and other materials tend to remain where they are placed. You can build nice layers above the soil surface. Sometimes you are no longer growing above the soil. It's true hydroponic from here on in, and when a person has this situation he had better not go fishing. It's a seven day a week, twenty-four hour a day job to keep it going.

Here's an accumulation of one year's thatch in bermuda grass from some work at Mississippi State. It's easy to grow, but we have to control it. Dry spots can really be the accumulation of thatch, deeper than we suppose. Sometimes the dry spots are due to different grasses on greens. The root system is pretty shallow, and you can lift it off.

Aerification is one method of topdressing for it brings up soil and mixes it with the thatch. This adds bacteria to the thatch and starts decomposing. So a good program of aerification will do wonders in thatch control. If the thatch has gotten beyond that type of treatment, aerification isn't going to do much good. I think we have to go back to renovation.

Here's a layer of thatch you can aerify all you want, but it's going to take years and years to get rid of it using that method. So that isn't the total answer. In the early days of the aerifier, you know they were designed for fairways and they put them on greens right away. I wish John McCoy was here and he could explain how they exploded one of his greens. Well, we brought up soil and broke through the thatch because there were no known methods in those days to do anything about it. We went to this type of machine for a number of years, and then we went to the punchers. All these machines helped in controlling thatch because they physically removed cores and they were swept off, gotten off the area, and it does a lot of good in removal.

Aerification will help under certain conditions. It mixes the soil layer with the thatch and helps decompose it. This is an interesting picture because it's going to lead into what I will say later on. This golf course was managed fairly well. He was getting a little thatch and then topdressing and then a little more thatch and then topdressing - not quite getting all the thatch off before topdressing was applied. Then the war years came along, and the word went out that there should be no more topdressing - you don't need it. Remember that? And everybody got away with it. And you can. You can get away with it. I can take over your golf course and make it look like a million bucks for two to three years, and then I'll move on to another course. But during the war years the thatch accumulated, there was no topdressing. I can say this with, I think, a great deal of authority because in 1936 with I got into the business of dealing with golf courses, I was selling topdressing. In those days all the golf courses would shut down on Mondays, and every golf course topdressed on Monday morning. That was standard practice. Here again is terminology. What is topdressing? In Otto's book and in Wayne's book it might be thought of as an inch or an eighth of an inch. Jim might say no, it's a quarter of an inch. Another might say half an inch. Topdress once a year. Topdress three times a year. Topdress once a month. Topdress every Monday. We have never defined what topdressing really is and what it does, and

here again, I think we need to give a lot of thought to topdressing, and certainly the first objective should be to stay out of the golfer's way and give him a good green, which you necessarily have to go to - to very light topdressing and more often. This costs a little more money, but I think it's well worth it. Frequent topdressing will certainly give the golfer a good green all the time. Topdressing helps control disease. Topdressing does a lot of things. It's one of the cultural practices that we've forgotten about.

Mechanical removal of thatch is not a new idea. It was done in the days of the original power mowers. They had wire brushes on the front of the mower to bring up the mat and cut it off, all kinds of drage and verything else to try to get rid of that grain. So then we came in with a mcachine that cuts vertically, and there are a lot of them on the market. Here agin, definition is pretty hazy, because when you say verticut, which is a trade name, and I had nothing to do with that before, what does it really mean? What does verticutting mean in your own mind? Does it mean once a year, or does it mean once a week or does it mean every two or three weeks? Everyone has a different idea about a verticut. Verticutting, in my mind, and the reason we designed the machine, is simply to cut those prostrate leaves as they form which meant frequent use of the machine, and not very deep, just to keep the grain under control. Well, the first thing that happened - everyone wanted a machine with a bigger motor to go deeper, so instead of a verticut we go to renovating, and most verticutters of today are really renovators. So, in your choice of a machine, look for those qualities that are going to give you a true cut. In my opinion, only enough grass should be taken off to make the green better, not worse. In other words, if we can verticut a green, and a golfer comes out there and plays on it and says, "Boy, this is great!" then you have done your job. If you renovate and you can't use the green for a week the golfers get pretty unhappy. So, here again, light topdressing, verticutting, is simply an operation that has to be done frequently and very lightly.

In the early days we had all sorts of methods of gathering material, but we did keep it under control, but in itself it can't control thatch. In other words, it takes a combination of all these things we're talking about. We have modern machines that do a good job for us. I don't think they're being used properly. I think they're being used too rapidly. I think they're being set improperly in many cases. Not enough re-search has been done to pin down what true verticutting means. In the early days we attempted to do fairways, and there were all sorts of machines available for that operation. There was one where we did the verticutting very lightly, and even bagged it up as we went along. It was cumbersome, with three engines, and it didn't sell. I suppose this sort of thing is going to come back in a different form, for verticutting can be done very quickly and efficiently on large areas. There were other machines which were called vertical mowers which were really renovators. Machines like this did a great job. Where there was a lot of thatch you could get in there and rip it out and start over again.

We also found that many superintendents used mowers as verticutters. They just set the mower down and shaved it off, especially on bermudagrass in the south. With a traction type mower which couldn't take it for the wheels would slide, they would set the mower down maybe a quarter of an inch and mow and vacuum that off and then set the mower down again and vacuum some more off, and they just gradually got that thatch down to size after five or six mowings. When the hydraulic machines came in this was one of

the first applications we put it to. We set the mower down and just shaved it off. This is becoming a common practice now on many southern courses. They do it in August. Now here is a gal driving a hydraulic machine, and you can see she is really shaving that stuff down. You do this to a fairway, and it's a one-time operation, but there is so much material to come off that it takes about three or four vacuumings to keep up an operation like this. I think you are going to see more and more of this as time goes on. Here again, we need more work to tell us when should we do it, can we do it on some of our cool season grasses, and if so, when?

Warren Bidwell, when he went to Philadelphia Country Club, developed a new philosophy. When you get in on a new job, and it's your one and only chance to make a showing, from there on in you had better not bother the golfer. He saw his opportunity. The thatch accumulation at Philadelphia Country Club was fantastic. On bentgrass fairways there was about 2-1/2 to 3 inches of thatch. It had just accumulated over the years, and no one had tried to do anything because it would disturb the golfer. A new man coming on a job can get away with a lot of things, and Warren took advantage of that, and went in and renovated 18 fairways, knowing full well that from there on in he had better maintain them, and keep it down to size because he'd never have that opportunity again. So this is what he did. He cut those fairways deep and brought up a tremendous amount of material and cut it crossways, and you can see that the seed coming through those slits is really something. He reduced the thatch by about half with this operation. From there on in, he used cultural methods to keep the thatch under control. pH was adjusted, he used aerification, and other things necessary to keep the thatch decomposing. And he did a great job, and today Philadelphia Country Club is not bad.

And then was had the scorched earth approach. When you just go in and burn everything off. This was in the days of sodium arsenate, and we can't use that today, but we have other materials that will kill grass right down to the ground and then start over again. Just burn it all down with chemicals and aerify it over as many times as possible. We used to say, "When it looks like it's ruined, it's half finished." Just keep going until you have all that material worked up to get a good seedbed and start over. After you've started over again it's time to get it under control and keep it that way. This means perhaps more frequent mowing, it means a lot of things so far as cultural methods are concerned.

The last, and most important thing, in my opinion, is topdressing. That's how I cut my eyeteeth in this business. Topdressing was standard practice in the early days. It has disappeared in many areas. It is coming back. Some superintendents are doing it - not as much as they used to, but it's done in so many different ways that it's hard to define what topdressing really is. When you have three men pushing a spreader like this, putting in a half-inch of soil, that's not topdressing, in my book. There's a lot of ways to do it. When you talk of the superintendents in days gone by you will find they did it the nice, easy way. Mal MacLaren in Cleveland had trained men. They didn't have topdressing machines (and I kind of wonder about the efficiency of some of the machines we have today), but they had men who were artists with shovels and they could spread topdressing real thin over an area, and drag it over, and work it in, and walk right off, and it was a beautiful green when they were finished. We may see that coming back. Here is heavy topdressing. Of course, this is an overseeding operation, and this is spreading it on pretty thick, and you can bet your boots the golfers are not going to play on there for a while.

We have many ways of dragging greens. We have all kinds of vehicles to help us to move along and do a pretty good job. My greatest fear in thatch control, and I see this being associated with sand topdressing. I have lived through about five sand eras in my lifetime, and we're going through another, and it's going to be interesting. I'm ready with my camera in another two or three years to get some pictures of some dead greens. Sand is a great material. There's no question about it. The only problem, I think, is that we need a little bit of clay in it as a buffer to hold the nutrients and to keep the bacteria going. I think that pure sand might get us into trouble. When we talk about sand, again we need definition. John Madisen wrote an article about using sand topdressing. Was it sterile sand or dirty sand? How big were the particles? Were they big ones or little ones? We are not defining what we're talking about. One may say, "I'm using nothing but sand topdressing", but that could mean almost anything so I think when you go home from this conference, start asking yourself questions. Define what you're doing. I'm a great believer in sand. I think it's the best way to build a green or any turfgrass area, but I think we should know a little bit more about what we're doing. Some superintendents are starting to invest in some equipment. Sherwood Moore up in Connecticut has bought himself a nice rig here and he's making topdressing like crazy. He's going back to the older methods of doing it. This is the soil and he mixes it with sand, and his topdressing will be about 85-95% sand. But here again, define sand. It must be the right sand for that operation.

A great deal of research has been done on the subject, and I suppose it will continue. I hope it will. At Rutgers, Ralph Engel took an original site soil and he changed it into a good soil, and he did it with cultural practices. He took the plug you see as the original site soil and over here, after three years, after he aerified, and got the thatch under control, you can see how he is beginning to build real good soil. If you look at the right side, with an adjusted pH and a little nitrogen, he had a pretty dynamic soil, one that was really alive and working well.

So, these are some thoughts you can take home with you. I hope I've given you some ideas.

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THE TURF PICTURE

Carl H. Schwartzkopf, North Central Director
U.S.G.A. Green Section, Crystal Lake, Illinois

Being the last speaker of the session has its advantages and disadvantages. Before a picture or photograph can be printed in the positive form, it must be developed from a negative transparency. Consequently, when discussing the turf picture, it is possible to discuss the negative, as well as the positive aspects. In this day of nostalgia, many individuals enjoy looking at pictures of days gone by. This morning I'd like to review with you some of the pictures that we might have seen in years gone by, those that we presently may observe, as well as some that may appear in the future.

In the past, the turf and vegetation was maintained with the use of sheep, scythes and sickles, the latter being powered by man. The first lawnmowers were also powered by man. Later on, horses were used for mowing large areas, such as fairways. Sickle bars were frequently used to cut the rough a couple times a year. The grass clippings in the rough areas were allowed to dry, then collected and stored as hay for the winter months so the horses had food to eat. The horse ultimately gave way to mechanization

in the form of steel-wheeled tires on a tractor. Although the use of a tractor was a significant breakthrough in mechanization, ridges and tracks would frequently occur on moist or wet soils. As time progressed, the steel wheels were converted to large rubber tires that reduced the damage to the turfgrass plants.

In the early history of putting green maintenance, the use of hand, push mowers was a frequent occurrence. With the passing of time, the hand-powered greens mower was eventually mechanized with a small engine. After many years of cutting the putting greens with small engine powered walk-behind mowers, the riding Triplex greens mower as we know it today became a reality.

Also, in the early days of greenskeeping, weeds were a common sight and an accepted fact throughout the turf world. When sufficient labor existed, the greens were hand weeded. Fortunately, many chemicals, such as herbicides, insecticides, and fungicides were developed for other agricultural crops and could be used on turfgrass plants with minimal damage in some cases, and without injury in many other instances. Due to the size of the turfgrass industry, it has frequently been a stepchild in the world of agriculture, thereby utilizing products and materials developed for other crops. With the high cost of research and development, as well as government regulations for registration, the chemical companies should not be faulted for failing to develop additional interest in the turfgrass market.

Also, in the early days of greenkeeping, the putting surfaces were the only areas that were irrigated. Irrigation in the early days was in the form of hand watering. As time continued, the tees eventually became irrigated, followed by dragging hoses on the fairways. The irrigation of golf courses has gone through many stages of development from hand watering to dragging hoses on fairways, quick coupling valves, to the present day automatic irrigation system.

Presently, the majority of golf courses have a center line, manual, quick coupling irrigation system or a means of irrigating automatically. In the present day, the majority of tasks in golf course maintenance are mechanized to one degree or another, from large seven and nine-gang fairway mowing units to power sand raking machines, along with modern chemical spray application equipment, as compared to mixing ingredients in a 55-gallon drum and applying them with a proportioner as was done in the past.

Throughout this period of technological changes in equipment and chemicals, the individual who is responsible for the care of the golf course has also made many changes. Initially, he was referred to as the greenskeeper and, in many instances, was the individual who owned the farm before it was converted to a golf course. Today, the golf course superintendent is not only an educated and trained turfgrass manager, but also an accountant, personnel manager, purchasing agent, etc.

Having leafed through the pages of history in golf course management and maintenance as well as discussing some of the present day activities, we are brought to the future. As this time and point, your guess as to what will happen in the care and maintenance of golf courses is as good as mine or the person sitting next to you. Consequently, this time gives us the opportunity to dream as well as wishfully think of some of the things that we would like to see in the future. The list might include mowing equipment that rides on an air cushion. Equipment riding on a cushion of air would eliminate the need for wheels, thereby helping to minimize some of the traffic, compaction, and mechanical damage that frequently occurs in the form of rutting. Also, a golf cart without wheels would help eliminate the worn areas alongside tees and around greens.

The ultimate goal of plant breeders is to develop a grass that can tolerate drought, resist disease infection, and discourage insect infestation. With the increased play that many golf courses receive, it may be also possible or desirable to develop a plant that would maintain its dwarf characteristics, thereby minimizing the need for more frequent mowing. Should it not be possible to develop the ultimate grass plant, it will be necessary to look for methods of applying chemicals more efficiently and developing new equipment.

Regarding equipment, it would be desirable for the manufacturers to continue to develop mowers, sprayers, aerifiers, etc., which will help to increase the speed and efficiency of the operation, thereby helping to reduce maintenance costs.

It is important to realize that the manpower requirement for maintaining a golf course is never going to be totally reduced because man is such an important factor in the personal touches of the golf course maintenance program. However, it may be within the realm of possibility in 20 to 25 years where the equipment will not only float across the turf, but will be radio controlled from the operator who is sitting under the shade tree.

No matter what the future holds as far as improved turfgrasses, chemicals, or equipment, it is important for the superintendent to realize that energy costs are going to continue to increase as is the labor bill, along with the cost for water. Consequently, the need does exist for finding more efficient ways to complete the many tasks needed in maintaining the golf course.

We all have heard the expression, "Build a better mousetrap and the world will beat a path to your door." If you are the individual who builds a better piece of equipment or develops a better means or method of mowing and maintaining a golf course, or finding the ultimate grass plant, the world may not beat a path to your door, but your contribution to the industry can be a very significant development in the future history of turfgrass management.

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KEEPING BENTGRASS

Louis E. Miller, Superintendent
Louisville Country Club, Louisville, Kentucky

It is amazing to me that Dr. Bill Daniel can sum up a person's trials and tribulations in just two words, "keeping bentgrass". If someone had told me thirteen years ago that life would be like it often is in the summer, then quite likely I would have sought employment in a shoe store. Making my decision, however, I still wouldn't want to trade places with anybody.

The maintenance of bentgrass fairways is nothing new throughout the midwest. The degree of success experienced by the individual doing the maintaining is often another story. For eleven years we experienced varying results in maintaining bentgrass fairways at the Louisville Country Club, always improving on our program. Nature has a way of making you humble when you are feeling your proudest and her cruelest punches came in assorted ways. We always felt that our success with the fairways was good, but for various reasons some years were better than others.

Originally the fairways were seeded with a mixture of Highland and Astoria colonial bents, common bluegrass, and approximately seven percent Pennncross. Through eleven years of management the bent took over and the bluegrass was completely eliminated. In some fairways the Pennncross took over and the results were excellent. For these eleven years the fairways were on a Chip-Cal program and this aided in the control and elimination of crabgrass, goosegrass, and Poa annua.

The summer of 1977 seemed to be the breaking point in determining just where we were going with the bent fairway program. Seven inches of rain in ten days, with the daytime temperatures above ninety-two for twenty two straight days helped us make up our minds. Keep in mind that our predominant fairway grass up to this point was the colonial bent. The rains started on June 20, and by July 1 I could see that we were suffering greatly from wet wilt. By the morning of July 5 the damage was apparent, and we had lost approximately two acres of fairway turf of a total of forty acres.

We hosted the Tri-State Golf Tournament in August of 1977 so every effort was made to reestablish grass in the now dead areas. Using a Rogers seeder, we started seeding these areas with a mixture of Seaside and Pennncross bentgrass. In many areas we literally plowed through mud to get the seed in the ground. It was far from ideal seeding conditions, but then you do a lot of things in not so desirable conditions when you have to. As an added insurance, we broadcast Manhattan ryegrass seed over the areas with a shoulder type crank seeder. The hot weather continued, and in another five days we had one more inch of rain.

Within six days we saw germination of the bent and rye, and felt that with just a little break in the weather we would have a reasonable stand of grass in the seeded areas. This, however, was not to be our luck. As the hot weather continued, the seed would germinate and then die due to the high daytime temperatures, often in excess of ninety-six degrees. We went through the Tri-State Tournament looking as bleak as we have ever looked in the first week of August.

Finally, around the third week of August we started seeing grass germinate. The weather was still quite hot, but the grass was slowly getting established. The amazing thing about the areas that had wilted out earlier was that the stands of Pennncross that had been there for eleven years were withstanding the high levels of heat and moisture and looked great. The seeding patterns that we had seeded six weeks earlier were easily visible, and the grass began to thrive. The thing that was even more impressive was that the bent and rye made a beautiful stand together and we had a tight turf by the second week of September.

In 1978 the areas that we had seeded in 1977 were by far the best fairway turf we had. On August 15, 1978, we started a major renovation job on the fairways. Because it was so hot during the day we started at six in the evening and worked until after dark, doing two to three acres a night. The process used was a double aerification with a Ryan aerifier using the 3/4 inch closed spoon, drag the cores in with a chain link fence mat, slice and seed the fairways with the Rogers seeder, using Seaside bentgrass at 40 pounds per acre, vacuum the thatch brought up by the seeder, broadcast a mixture of Manhattan and Pennfine rye over the area at 60 pounds per acre, and then spray the fairway with a water soluble fertilizer with a 10-52-8 analysis. The fairways were watered with ten minute cycles four times in a 24 hour period, and we could see germination in five days' time.

The only problem encountered during the renovation was germination of goosegrass which hampered the spreading of the desirable grasses in some areas. In doing this again, I would also spray the fairways seeded with Tupersan. We found that during the summer of 1978 the combination of the rye and bent could be mowed at a height of 5/8ths inch without any difficulty, and that when the bent comes under stress, the rye will fill in. I feel that this mixture of grasses is a partial answer in the Louisville area, but that it is going to take a couple of years to evaluate it properly. In the meantime, the new stand is looking good and has come through the winter well. With only one pound of actual nitrogen applied to the fairways since they have been renovated, our plans call for only one pound during the 1979 growing year. All other cultural programs will remain the same as before.

(Editor's Note: Spread the seed first, then do the aerifying, dragging, and verticutting over and through the seed. Seed close to or in the soil survives best!)

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SEED, USING THOSE NEW GRASSES

Kent McFarland
Indiana Seed Company, Inc., Noblesville, Indiana

The 1970's saw turf managers employ a new cultural practice - genetic control. The Plant Variety Protection Act helped insure a flow of better turf cultivars. Turf men started selecting seed to prevent problems rather than to replace problems. What benefits are expected from these improved cultivars? Increased tolerance to disease, wear, and drought, better color, lower fertility requirements, and less frequent mowing are some of their advantages.

The cost of seed has remained relatively constant over the past ten years. In view of today's inflation rate, this makes seed a true bargain. What else is the same price today as it was ten years ago?

Grass is a living thing. It gets old and worn just as a machine does. It loses its ability to tolerate its environment. New strains of disease come along to infect previously immune turf or a turf can just lose its immunity. And we demand more from our turf today than ever before.

Superintendents, looking at the advantages of the new cultivars, the relative cost of seed, and the cost of maintaining an old turf have been quick to use these new varieties in overseeding programs. Compacted soils, pesticide residues, and heavy thatch accumulation have led some to the practice of destroying existing turf and starting over.

So what seed are the golf turf managers using? With bentgrass we are hard pressed to find a replacement for Pennncross. Penneagle, recently released from Pennsylvania State University, shows much promise for overseeding fairways and tees and for seeding new greens. It reportedly provides an excellent putting surface, requires less nitrogen, and will compete with Poa annua. Emerald bentgrass had not been well received in Indiana.

The Kentucky bluegrasses still demand the most attention. Turf managers have over fifty bluegrass cultivars to choose from. Indiana Seed Company is currently selling 18 bluegrasses, with more on the way. However, of these 18, we can recommend only 11. Price, availability, and popularity further reduce this list to where we are actively selling seven cultivars. Our customers use a similar method of elimination.

Helminthosporium diseases have all but eliminated the use of the common types, e.g., Park, Delta, Newport, etc., on closely mowed, fine turf. Striped Smut and Fusarium blight have greatly reduced the use of Merion, Windsor, Fylking, and Nugget. From the list of survivors of this elimination, superintendents make their final selections.

Now comes the real dilemma. How do you choose? What is that deciding factor? Is it competitive ability, shade tolerance, nitrogen requirements, wear tolerance, establishment rate, color, price, density, texture, vertical growth rate, salesman's ability, or an advertisement in a turf trade journal? Strangely, the last two seem to sell most of the grass seed. With all these factors to consider, plus the lack of consistent, objective, agronomic information, the decision of what seed to plant becomes more difficult than deciding the when, where, and how to plant that seed.

Most of our customers study the available literature, talk with fellow superintendents and other turf experts, and then talk to us for help in their final decision. As a result of this process, Baron, Touchdown, Adelphi, Glade, and Sydsport have become our most popular bluegrass cultivars. We predict Touchdown will become our leading seller in 1979, in only its second year of marketing. Why such an instant success? Touchdown has scored well in almost every facet of every test it has been in. It is competitive against Poa annua. It is low growing and drought tolerant. It makes a strong sod quickly even under low management regimes. These factors will be paramount to a cultivar's success in the future.

The most revolutionary happening in recent turf history has been the increased use of perennial ryegrass in fine turf. Beginning with Manhattan in 1967, there are now a dozen truly turf-type perennial ryegrasses being sold. These vigorous grasses are being successfully used to renovate many turf areas. They are wear tolerant and they can compete in Poa and bentgrass turfs. Their resistance to Fusarium blight has made them quite valuable where this disease is a serious threat to existing bluegrass turf.

The rapid establishment rate of the turf-type ryegrasses have led turf authorities to caution against the use of more than 30% ryegrass in a mixture to keep a proper balance of species. However, many turf managers have been using these grasses alone in special instances such as cart paths, worn tees, and overseeding into pure bluegrass populations. Tests indicate these new perennial ryegrass varieties are as shade tolerant as any bluegrass, making them an excellent choice in shaded areas.

Manhattan and Pennfine have been front runners in the ryegrass revolution and still remain the most popular. So good are these varieties that to improve on them would be difficult, but not impossible. Dr. Reed Funk, Rutgers University, did not stop with the development of Manhattan. Derby, Regal, Diplomat, Citation, and Yorktown can all trace their parentage back to Rutgers' germplasm. Most recent releases from there include Fiesta, Blazer, and Yorktown II. These new varieties promise to extend the uses of ryegrass even further because of their improved density, longer persistence, increased disease resistance, and slower rate of vertical growth.

If the turf-type ryegrasses are 20 years behind the bluegrasses, the improved fescues for fine turf use must be 20 years behind the ryegrasses. The next decade should see vastly improved fine fescues, quite possibly even a fine-bladed, turf-type tall fescue.

The methods and timing used in getting these new grass seeds into the ground vary greatly. The Rogers seeder still rates as the most popular and efficient method of overseeding. Any method that provides adequate seed/soil contact can be used. Coring, in conjunction with slit-seeding helps insure good contact. If a seeding program works for you, stay with it.

Pelletized turf seed will be introduced in the U.S. this year. The grass seed is encapsulated in a hard coating containing starter fertilizer. Superior seedling survival, increased vigor, better color, significant germination increases in surface seeding, better penetration of thatch by the seed, and elimination of bird losses are some of the advantages associated with coated seeds, according to the manufacturer.

Ten years ago Flyking and Pennstar were new and quite promising. Grasses like Touchdown and Adelphi had not yet been developed. Five years from now our new grasses of today may have been pushed out by Wabash, Shasta, Enmundi, Columbia, or some other cultivar not yet named. And the trek will continue as we work toward better turf through genetic control. To date we have no "perfect" turf grass. But, by blending the best of our new varieties, we are closer to this goal than ever before.

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HYDROMULCHING FOR THE TURFGRASS INDUSTRY

Keith Ahti

Northrup King Company, Minneapolis, Minnesota

- A. Hydromulching - what is it?
 - 1. Land reclamation
 - 2. Highway roadsides
 - 3. Erosion control
 - 4. Turf industry
- B. Advantage of hydromulching
 - 1. Cost: sodding, seeding, hydromulching
 - 2. Efficiency
 - 3. Rapid turf establishment
 - 4. Seed areas inaccessible to mechanical seeders
 - 5. Reduces moisture loss
 - 6. Prevents erosion
 - 7. Minimum traffic on seedbed
 - 8. Accurate spot applications
 - 9. Combine seed, fertilizer, mulch, fungicides
 - 10. Mulch enriches soil
 - 11. Uniform stand establishment
- C. General applications for hydromulching
 - 1. New turf establishment:
 - Home lawns
 - Commercial/industrial turfs
 - Parks, cemeteries
 - Athletic fields
 - Playgrounds
 - Highway rights-of-way
 - Golf courses

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NORTHROP KING CO.

1979 PROFESSIONAL TURF FORMULATIONS

GENERAL TURF MIXTURE	SPECIAL PARK MIXTURE	PREMIER TURF MIXTURE	SWIFT & SURE MIXTURE	SHADY TURF MIXTURE	PREMIUM SOD MIXTURE	ATHLETIC PRO MIXTURE	OVERSEEDER II MIXTURE	MEDALIST NORTH MIXTURE	WINCHESTER MIXTURE	LANDSCAPE PRO MIXTURE	BOULEVARD MIXTURE
Adelphi Kentucky Bluegrass		15%			25%	25%	20%	15%			
Aquila Kentucky Bluegrass	35%	25%	15%		25%						
Glade Kentucky Bluegrass				20%	25%						
Kentucky Bluegrass	35%								40%	30%	
Newport Kentucky Bluegrass				30%							
Nugget Kentucky Bluegrass				20%							
Parade Kentucky Bluegrass		25%			25%	25%	50%	15%		10%	
Park Kentucky Bluegrass	15%	15%	15%							15%	30%
Annual Ryegrass	10%								15%		
Goalie Perennial Ryegrass								35%			
NK200 Perennial Ryegrass			20%			50%	15%	35%		20%	
Pennfine Per. Ryegrass		10%	20%				15%				10%
Perennial Ryegrass									15%		
Atlanta Chewings Fescue		25%		15%							
Creeping Red Fescue	40%		30%						30%		
Dawson Creeping Red Fescue											30%
Ruby Creeping Red Fescue		30%		15%						25%	
Scaldis Hard Fescue	10%										
'Fults' Puccinellia distans											30%

FIFTEEN YEARS OF TURF IMPROVEMENT

Don Street, Co-Owner
Old Oakland Golf Club, Indianapolis, Indiana

Old Oakland Golf Club, 11611 East 75th Street, Indianapolis, Indiana, is a private club serving its members for annual dues plus a daily fee charge for rounds played by each member and guest. It is owned and managed by Jack Keesling and Don Street. The turf manager since March 1965 is Hubert List, better known to most people as Mr. Dempsey.

The golf course was designed by Charles Maddox, Sr., and built by his son, Bill Maddox, in the year 1964 and opened for play May, 1965. The acreage of the course is flat to gently rolling terrain. The maximum change in elevation is about 32 feet. The soil is a heavy clay loam type. All tees, bunkers and greens were given enough elevation to clearly define their functions on the course. The 18 playing greens, plus two practice greens, total nearly four acres of putting surface. The teeing areas total over six acres and there are approximately 50 acres of fairways. The remainder of the 150 to 160 acres is taken up by rough and/or low land and woods. Hundreds of trees of over 40 varieties have been planted throughout the years to outline the fairways and enhance the beauty of the course, as well as to provide shelter from mis-hit golf shots. The greens were constructed with an on-site mix of soil, sand and peat with a gravel wick system for drainage and then planted with Toronto C-15 stolons. The fairways, tees and berms were seeded with common Kentucky, red fescue and rye. A pond was dug between the 10th and 18th fairways to catch runoff water when it rained and also to be supplied by a water line from a well. This pond would then be our source for watering the course. The original storage pond has been expanded in an area adjacent to our 13th fairway which just about doubles our water storing capacity and also helps immensely in draining the 13th and 14th fairways and rough areas. In addition, we put another well down near this area to feed the storage pond when the demand is excessive in hot dry spells. This storage pond has an overflow tile that takes the excess water about 500 yards to another drainage area. Without this control we could have been in serious trouble on more than one occasion. The soil taken from this pond area was used to extend 50 yards of teeing area on the back of our 11th tee and 50 yards additional teeing area for women on the front of our 10th tee. We also relocated our 5th tee which directed the first 250 yards of the 5th fairway through a wooded area. This change improved the safety factor on two holes. At the same time, we dug another holding pond to eliminate a wet area on our 16th hole which, by the way, is the most cursed and discussed hole on the golf course. Since I do not have my slide presentation, I brought an aerial view of the course which you may feel free to look at and ask any questions later on today. The soil taken from the pond on the 16th hole was used to build a new tee station at 18. This improved the area and doubled our tee space. These new tees were seeded with a blend of Windsor and Merion and have been a good improvement to our course. While I'm talking about ponds, our newest addition is 120 yards long, tear drop in shape, located between the 9th fairway and the 1st fairway. This pond is improving the drainage of our driving range, 1st fairway, 9th fairway, and 6th fairway. This flat area took too long to drain through the slit trenches we had put in in previous years. The material from the pond was mounded and shaped into a nice hill that adds character to our 6th and 9th holes, as well as to the general landscape.

Our water system designed by Mr. Maddox is of a loop type. Originally our water was pumped by a six cylinder Chrysler engine until we switched to a diesel. The pipe in our water system is mostly transite. The outlets were installed in the center of the fairways right on through the center of each green with a sod cup in the center of each green. Our tee outlets are to the side of the tee stations. All of our sprinkler heads are set by hand, and the radius of water from each head is 90 to 100 feet.

Due to the large size of our tees and greens the yardage of our course can vary from 6100 to over 7000 yards, but it is played most of the time in the 6400 to 6500 yard range. The course is designed so most pin placements are visible, but, due to the depth of the greens, it is very difficult to get shots close to the pin. The trees we have planted through the years are coming into play more and more each year.

Looking back to the early years of the course, it seems like tons and tons of soil were hauled to areas that got washed out before the seed could establish itself.

Dempsey and his crew wore out an aerifier working on greens and berms.

Our original fairway and rough mowing equipment was used Roseman mowers. They took a beating until our turf got better, but Dempsey always had them operating. In fact, I still don't know how he found time to do all the things he did. We like to think he had some good help in Jack and myself, but we know he inspired Lee Redman, Scott Street, and Bill List because they are all successful turf managers on their own jobs today.

It is pretty hard to pinpoint when you did specific things and at what rate. I know we have been in touch with Purdue all these years, and I know we have followed suggestions from other turf managers we felt were successful.

Starting in late 1969 things got a little easier when the Jacobsen Greensking came on the scene, followed by the Toro Turfmaster. Can you imagine the scramble for the three-gang riding mower as opposed to walking behind that single unit?

Then in 1970 along came the F-10, and we thought we had arrived. It had its problems, but Dempsey got it straightened out. In fact, I don't believe we have ever purchased a piece of equipment that hasn't needed something done to it, but, in the long haul, we do get a lot of mileage out of our equipment.

We have been on a Balan program since it first came on the market for Poa control in fairways and tees, and we feel it has been worth it. We have used Betasan and Pre-San for Poa control in our greens and are pretty well holding our own.

In 1971 we started using Scott's products N-K for fairways supplemented with FF II since 1974 to control leaf spot. We are using Scott's greens fertilizer and their fertilizer with D.S.B. Over the years we averaged four pounds of nitrogen per thousand on our fairways and tees and eight pounds per thousand on our greens.

Dollar spot has been one of our persistent problems, but we are seeming to be holding our own using Acti-Dione, Thiram, and Daconil 2787 for broad spectrum control.

We have had good insect control on our fairways with granular chlordane. Obviously, we will have to use something else in the future.

In 1974, we overseeded fairways, tees and berms at 30 pounds to the acre with Victa-Windsor blend and a small percentage of Manhattan rye. Since then, our fairways and tees have been the most improved and in the best playing condition.

Our greens are beautiful and fun to play. Our members and guests may play poor golf, but they seldom blame the greens. Dempsey keeps them fed, watered, verticut, aerified and cut as frequently as time and conditions permit.

In 1975, after ten or eleven years of working on our equipment in an old farmhouse, Dempsey came up with a new 4000 sq.ft. maintenance and storage building. Now he doesn't want to go home at all, but his assistant, Mark Semick, makes him go.

In thinking about what I have tried to point out about growing grass at Old Oakland, it is pretty obvious that drainage has been a big item for us, and I'm sure it's nothing new to a lot of you. Our biggest problem this spring is getting 1500 tons of sand in our traps.

In closing, I would just like to say our goal at Old Oakland has always been to provide the best playing conditions possible for our golfers by keeping our greens cut at 3/16" or lower, and our fairways and tees cut at 3/4", and roughs at 2". With the dedication of our turf manager and the motivation he passes on to the people around him, how can we fail?

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WAYS TO ENCOURAGE GOLF COURSE PLAY

Cecil R. McKay, Jr.

McKay Golf & Country Club Properties, Lansing, Michigan

I would like to give you just a short background on the source of my information. McKay Golf Properties has been exclusively involved with golf courses for the last 14 years. During this time we have developed files on over 500 golf facilities. We have been involved with many sales, appraisals, and some consultant work. We currently have around 160 golf courses on our list that are for sale. At least that many more in another file could be for sale, but we lack information. We also have a list of around 1,800 prospects who are looking to buy golf courses at the present time, plus a list of several thousand "non-current" prospects. Our experience with this vast number of facilities gives us a rather unique insight into the operation and management phases of golf operations. We are constantly given the opportunity to look at a facility, then look at its operational income and expenses, then study the procedures that were used to produce these results. By studying the best parts of many successful operation, we can better advise new owners how to promote and operate profitably.

My discussion on encouraging play is oriented toward the daily fee type of course, however, similar kinds of programs can be of benefit in attracting membership to a private club.

Most discussion on increasing play is centered around speeding up play, but the problem I am attacking is the one of finding golfers and inducing them toward more play. Of course, installing the same programs in a course that already has a high volume can create a pressure that will induce higher fees, and a resultant higher profit.

The first things we look for in a profitable golf facility are the physical attributes. Location, topography, and climate are important, but there is little we can do to change these. What we can change are condition and appearance. First impressions are often the most lasting. The maintenance around the entrance, parking lot, and club house gives the golfer his or her first impression of the facility, and the better we can make it, the better our image will be. A few flowers, shrubs, and a good cleanup job will give the impression of a first-class facility deserving a first-class fee.

When we look for more profitable income at a golf facility we look at, in order of importance:

1. Green fees and membership dues
2. Rentals and driving range
3. Bar
4. Pro shop and food

From the above listing of importance, it is implied that a strong emphasis on green fees will be more profitable than promotion of food sales.

Historically, golf courses have been either private clubs operating non-profit with a high amount of prestige and service, or at the other end, municipal courses operating an impersonal type of non-profit, no-service golf. Today, nearly half of our golf facilities in the United States are daily fee operated-for-profit golf courses. This is similar to the large turn-around in our retail industries. A few years ago, the trend went to big discount type department stores, big cash-and-carry lumber yards, etc. The golf course owner who does not adapt to new methods of merchandising and promotion may find himself in the same relative position as the old full-service corner grocery store or full-service lumber yard.

How do we promote golf? The low handicap golfer, by his nature, plays a lot of golf and is capable of entertaining himself out on the course. He merely asks for a well kept, challenging facility. The middle and high handicap golfer presents a different situation. Ask a high handicapper why he does not play more golf and the typical response is, "Not enough time." Ask the same individual a few other leading questions and you will invariably find that he has time for other pursuits such as tennis, swimming, boating, fishing, camping, or hunting. Lack of time can then be translated into lack of desire. Our challenge is to instill more desire into that individual toward the playing of golf. We must get the occasional golfer to play more golf. Golf is a form of entertainment and entertainment means enjoyment, and anything we can do to increase enjoyment of the game produces more rounds of golf.

First of all, let's combine resources to upgrade the golf courses in our community. If your neighbor's golf course is in poor condition it does not mean his golfers will come to you - they may go to some other sport! Ideas might include:

- Get your courses accurately measured and marked. This will help end the confusion golfers have in determining what club to hit with and will assist them in judging distances. One of the best ideas I have seen recently was to have the yardage to the center of the green printed on each sprinkler head. This can be done with a tape label marker. Many courses have 150 yard markers, and this is good if they are accurate.

- Condition your course, build tees that the golfer can push his tee down into without using a hammer, fairways that can be hit off from, roughs where the golfer can find his ball, and hit out of, also greens that are consistent, not too fast or too slow, traps that are consistent and well maintained.

- Get helpful aids, understandable directions to the next tee, benches at tee positions, trash baskets, ball washers, golf car paths in critical areas, fresh cold drinking water in strategic areas, restroom facilities, and rain shelters.

- We are in the habit of saying that you should work to clean up and fix up your course to make it enjoyable for the ladies to play. Ladies are becoming a bigger percentage of the golf market, and, let's face it, they are neater, cleaner and fussier than men. If you cater to the ladies and can please them, you will find that the men will also enjoy your course more.

Our next approach, after making certain that we have the most enjoyable facility we can produce, is to find more rounds of golf. We must find new golfers and induce the existing golfers to play more rounds. This can be achieved by:

- Teaching golf. A golfer enjoys the game more as his proficiency in playing increases. This does not mean the golfer has to become a low handicapper, but he should be able to move around the course with a minimum of lost balls, or embarrassment. Group teaching clinics emphasizing etiquette are very helpful.

- Use more "fun" type events and organized activities. When you hold a special golf activity, give explicit directions and information to the golfer. Never assume that the individual knows what a Scramble or Best Ball or Scotch Ball is. Most persons are not quite sure and may feel a little embarrassed to ask.

Fun type golf activities are what the name implies. They may be mixed scrambles or other types of events. National Golf Foundation publishes a book entitled Planning and Conducting Competitive Golf Events containing approximately 80 pages of ideas at \$3.20 per copy. Another book entitled 101 Ways to Play Golf is published by the Golf Press at 60¢ per copy.

Many course owners come up with their own ideas such as a recently invented "Instant Replay". Under the rules of this golf match, each team is given several opportunities to call for an instant replay of a golf shot. It can be one replay per hole, or it can be ladies against the men where the ladies are allowed to call for an instant replay. This is played by waiting for the opponent to make his or her shot, call for an instant replay to see if the opponent can do it again. This could be a good way to lose friends!

The key to success is to have well organized golf events, with well explained rules, and a strong effort to see that everyone has fun.

So far, we have been talking about events that you as course manager can set up and sponsor. Now let us take a look at outside events that someone else sponsors.

Golf leagues can be very profitable, of properly set up. It is up to you as manager to help the league form and to vote in rules that will be in the best interest of both the league and the golf course. A golf league, for those who are unfamiliar with the term, is formed by a group of persons who will play golf together once a week for, generally, 14 to 20 weeks. A 40 man league, for example, might have a fixed tee-off time from 5:00 to 5:35 every Thursday afternoon with half the group teeing off on the back nine and half on the front nine. They play nine holes each week and get points very similar to the operation of a bowling league, complete with trophies and banquet at the end of the term of league play. National Golf Foundation publishes a booklet on how to form and maintain a golf league.

Golf outings can be very profitable. This is where a business or manufacturing firm or bank might sponsor a golf outing at your course. You can be sure that, in most cases, whoever is in charge of the outing for the sponsor does not know as much about running it as you do, and probably does not have the time that it takes to make the event successful. Not only should the course manager be out promoting these types of outings, but he should also be certain the plans are properly made and carried out. Every outing should be a successful event where every participant has a good time and wants to come back. Make certain that if awards or prizes are to be given out, they are planned in advance and participants are given good, clear information. Another area that should be thought through in advance is how the event should be handicapped.

If you recommend handicaps by the Calloway system, for example, you should have a chart available and be prepared to explain it thoroughly to whomever will be making the computations.

Let's go into one golf course owner's program that produced income, excitement, and a few new golfers. This enterprising owner instituted a chit money program. He printed his own "money" in denominations ranging from \$250.00 to \$10,000.00 (cash value was 1/1,000th of face value, so that a \$1,000.00 bill is worth \$1.00). This means that the owner could give a \$10,000 prize in a scramble that is redeemable for \$10.00 in his club house. This could be compared with gift certificates, but the chit money is accepted for anything from beer to golf car rental. He can even give change in "chit money". The nice part of this program is that it is impressive giving out \$10,000, \$20,000 or \$50,000 prizes. It is appreciated by the customers since they do not have to spend it in the golf shop; they can buy beer, rent golf cars, or pay green fees with it. Naturally, the owner would prefer to have the chits used for green fees or car rental as these are higher profit areas. Next year this owner is planning on placing the club champion's picture on the largest denomination of bills, hoping all of his friends and relatives will want to keep a copy for a souvenir (at \$10.00 per copy). We have some printed sheets on how to run a chit money program if you are interested.

So far, we have been discussing ways to promote play. Remember, a while ago I mentioned that the number one source of income is from green fees and memberships. Now I would like to take a look at the number two source of income which is golf car rentals. We have many kinds of situations.

In one case, a lady in Vancouver, British Columbia was operating an 18 hole course with 55,000 rounds of golf a year. This club has only four golf cars but does a land office business in renting shoes at \$2.00 per round.

There is also a lady in North Carolina operating an 18 hole course with 50 golf cars plus 20 member-owned cars. She charges a \$4.00 trail fee for member-owned cars and ends up with \$72,000 in golf car revenue. Since her only investment is in 50 cars, this is not bad.

We have a Michigan golf course with 30 electric golf cars producing a little over \$50,000 revenue (which is \$1,700 per golf car). This is an excellent return in a fairly short golfing season.

A good golf car program does not happen by accident. It is created by management. Golf cars must be clean, kept in good repair, kept in conspicuous view of the golfers, and promoted. A golf course with a reasonably good availability of clean, well maintained golf cars will do a better business in golf car rentals - and in green fees.

A good operator will know his costs involved for running golf cars: for fuel, for cleaning, and for depreciation. Any time a car can be sent out for a fee greater than cost, it probably is more advantageous to send it out than to leave it parked in the shed. We have a number of owners who will, in slack times, make a package plan, such as \$13.00 for two golfers and golf car on Friday afternoons. The key is to be flexible and try to fill up the course and golf cars during slack periods, even if a discount must be given. A golf car or a golf course sitting idle cannot make money. To help golf car rentals, the conditions of the course must also be acceptable. Bumpy car paths, washouts, or wobbly bridges all discourage golf car traffic. (We know of one course that, on their advertising brochure, showed a golf car smashed

up against a tree in the rough. When we visited the course, which was quite hilly, we found many smashed up golf cars. This is not the condition or impression one would wish to face the golfer with).

In November, 1978, in Orlando, Florida, the National Golf Foundation held their 4th annual Daily Fee Workshop. This session was sprinkled with many profit-motive golf operators who brought real, genuine excitement to their golf facilities: Vince Alfonso and his "World's Best Hot-Dog", Gus Novotny with his girl starters on the driving range, Bill Lyons with his never-ending ideas on golfers' aids such as trash bags on his hand golf cars, or Jim Bailey with his fascinating concepts in personal human relations - the concepts for promotion were, seemingly, never-ending, but they all had several common denominators:

1. A challenge to be constantly looking for new ideas and programs. Your management can get stale, and even the best new ideas can run their course. So you must constantly change. (Don't forget that worn out idea, though, as reinstating it several years later might produce results once again.) The real experts in promotion are the discount stores and the TV advertising agencies. Just look at the variations they use to get your attention!

2. Maintain a constant awareness of the individual golfer and his or her needs. This means keeping up the beauty of your golf course, clean restrooms, soapy water in the ball washers, a friendly, courteous atmosphere. As Vince Alfonso stated, "You can spend your money anywhere, but nobody appreciates it more than we do."

As a parting thought, we would emphasize: A beautiful clubhouse with a poorly maintained golf course will lose money. A good manager with a poorly maintained golf course will lose money. Sometimes a good golf course with a poor manager will make it, but if we can put a well maintained golf course together with a good manager, we have a winner.

This group, you people who cared enough to attend this conference, are potential winners. So, let's get out to our courses, get excited about this wonderful business, get our golfers enthusiastic, and make a barrel of money.

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GOLF COURSE FAILURES AND RECOVERIES

Cecil R. McKay, Jr.

McKay Golf & Country Club Properties, Lansing, Michigan

Let's start from the bottom and work up.

I. Why does a course fail?

- A. Poor management - inside or outside
- B. Under-capitalization, or poor financing
- C. Lack of population to support the course
- D. Competitive position in the community

Poor management - could mean too much management. We observed several courses that hired a superintendent and an assistant superintendent, pro and assistant pro, food manager and assistant food manager, club manager and assistant club manager. They had more managers and highly paid personnel than GOLFERS! This chain of management may work in a club with \$1 million or more income, but in a course with \$100-200,000 income can be a disaster. We recently had several courses with extremely poor management, where one owner bragged that the highest paid man on his course only received \$3.00 per hour - and it looked like it! We have seen courses with absolutely no management, even to the extreme point where members took turns mowing greens and collecting fees!

We have seen extremely profitable and successful operations fail, or falter when turned over from father to son or from good manager to bad manager. We have conversely seen poor operations grow profitable through new, better management.

Under-capitalization or poor financing - can happen in several ways. A developer may build a course in connection with a subdivision in hopes that he can sell platted lots to meet his debt requirements. Many times ecological problems slow down his sales program, or financing becomes difficult, forcing him into bankruptcy.

An individual might build a course without proper capital to operate until a level of profitability can be reached, or an individual might buy a course for more than it is worth, or with terms that are too restrictive to allow the business to flourish.

Lack of population - is a difficult problem to overcome. Population can be permanent or transient (tourist). If the course is located in the Bad Lands of South Dakota or the northern wilderness of Wisconsin, the problems can be formidable. Most courses to some degree or another have genuine restrictions placed on them due to population. There is little an existing course can do other than to look for programs that will draw play from a wider geographical area. Certainly the value of the golf business is dependent on its ability to draw play and a golf course in a non-populous area will have less value.

Competitive position - is an interesting part of the golf business to study. A strong competitive market quite frequently creates a stronger community orientation towards golf, hence a stronger, more profitable golf market.

A municipal golf course operated by the government is most often thought of as an unfair form of competition, however many times these "Muni" courses serve a genuine purpose of satisfying the needs of the beginners, and creating golfers. Once the golfers' interest in the sport is captured he or she is more inclined to patronize the privately owned courses where a more personalized atmosphere is provided.

Many times the competitive position of a golf course is strongly influenced by economics of the area. Some areas have an economic make-up that would warrant a first class deluxe course with consequent high fees. Other areas might be far better suited to a rather plain economically constructed course with a lower level of maintenance and low fees. A course that is over built or under built may lose its competitive advantage. Competition from other sports is a most significant factor. Golf as a business is competing for the recreational dollar.

If the community is highly oriented towards tennis, or boating or fishing, or other events that compete for the recreational dollar, golf business can be affected. The best competition to have is another golf course, the worst can be another sport.

Occasionally we get government intervention in fee structures, taxation or ecological considerations that interfere with a golf course competitive position, but sometimes these same similar restrictions are imposed by private individuals such as developers or adjacent land owners.

II. Typical failure signs and sequence of events.

1. The course begins to produce a cash loss without sufficient reserves to ride out the period of difficulty.
2. The owner cuts back on expenses to try and balance the budget. Typically the expenses cut back are those related to maintenance. Grass may be cut less often, less water, fertilizer and chemicals are used, equipment is allowed to deteriorate.
3. Low level maintenance further deteriorates, income losses increase, and a strong, swift downhill path is followed.

III. Problems a new owner must face in overcoming a failure.

1. Repair of equipment. In order to achieve good, efficient maintenance it is essential to have good operating equipment, so a new owner must start by repairing, replacing, and up-dating equipment. Generally the cost of this endeavor is relatively simple to ascertain, and anticipate. Unfortunately, money spent on repair or replacement of equipment is not too noticeable to the golfer and may not be fully appreciated.
2. Restoration or improvement of golf course. This is the area where a new owner can produce dramatic results that the golfer will notice, appreciate, and talk about. Many times a relatively inexpensive input of effort can make instantly noticeable improvement. By merely instituting a good maintenance program, the golfers can be convinced that the new owner is working for their benefit.
3. Overcoming bad reputation and credit. Sometimes this is not as easy as it sounds, but the best proof is in performance. We always try to see that if a course is sold, the new owner makes certain the bills are paid. This can be negotiated as part of the sale. Even in bankruptcy situations, the small creditors should be taken care of. A bad account at the local lumber yard, for example, could create a bad feeling in the community. Conversely, if the new owner goes overboard in an effort to settle local accounts his standing in the community is greatly increased.
4. Overcoming player disenchantment. The first step is to clean up and shape up the facility such as previously mentioned so that the golfers will notice the change, and appreciate the fact that management is trying. After the cleanup process, a strong program of personal type promotional contact should be made. Identify and meet with the members or nucleus of dedicated players who are still around. Get out in the community and meet the businessmen. Don't be afraid to give away some free rounds of golf! The key is to induce golfers to come out and look you over, then let word of mouth do your major selling job. The best promotion available is one golfer telling another. Set up some good active programs and activities, and then make certain the golfers are informed of them. Try to get golfers or members involved in the activities so that they can feel a part of the club. Solicit suggestions from the golfers and inform them of your plans. This will assure them that you are progressive and are forming a winning organization they can be happy with and proud of. It might help to let the golfers know some of your problems

in rebuilding the facility, so that if progress seems slow they will understand. Don't overdo it as a golfer is not coming out to your place to listen to you problems! Golf is a game of enjoyment and an enjoyable atmosphere is what your customer looks for.

IV. Success Stories

Now on the brighter side of this presentation, we can take a look at some success stories - where a poor business made good, or where a good business became excellent.

1. A nine hole course in Michigan had the business completely run down and a very poor history. The owners were ready to close up and forget it. The course was leased (very economically) to a couple of energetic young lads who, with no money, but a lot of work, resurrected the course. It was then sold to a new, enterprising owner and has been all up-hill. Two years from no income to a profitable situation.
2. A nine hole course in Florida, with a situation almost identical to the above, was taken from no income to over \$100,000 in one year, then sold at a very tidy profit.
3. An 18 hole course in Michigan went through several failures, triggered by the death of the owner, then a poor lease situation, then a poor partnership arrangement. But finally a good energetic manager stepped in, overcame the stigma of past failure, and the business is now successful and growing.
4. An 18 hole course in Michigan was bought by an energetic new owner. He didn't play golf, but he certainly was enthused, and very well liked. His first year the business doubled; his second year went up by 25% again! This dynamic fellow actually went out knocking on doors to promote his business. He set dollar goals for his business and he not only met them, he bettered them. His volume went from \$63,000 to \$130,000 to \$180,000 and kept climbing! His golf outings went from 6 to 60 to over 100! These outings ranged in size from a dozen to 600 persons. The most delightful problem a golf course owner can have is how to keep increasing the size of the parking lot enough to accommodate all the golfers!
5. One final, delightful two-stage success story. A nine hole course in Michigan was operated for a number of years at an income level of around \$60,000. It was making a small profit. The course was then bought by a very personable golf pro, who, in two years, brought the business up to around \$115,000. He decided that a 9 hole course was not sufficient to support two golf pros (he and his son), so he sold the course to another golf course owner from the area. The new owner had an excellent reputation for high quality maintenance and operation. He built a new nine, changing the course to 18 holes, enlarged the clubhouse, and even before the project was completed, he had created so much excitement that the facility was booked solid, with a waiting list of leagues. There was no big fanfare, no expensive promotion; the golfers knew what was happening, they knew the owner's reputation, and it was like opening a new MacDonalds hamburger stand - an instant profitable success. This success, typical of many, was due to the owner's personal attention to detail, his concern for his golfers, his excellent maintenance, and his wife's equal ability, enthusiasm and dedication.

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THE UNUSUAL IN '78, MY AREA

Tom Sams, Superintendent
Audubon Country Club, Louisville, Kentucky

The theme for this segment of the program, 'The Unusual in '78, My Area' sums up my feelings 100 percent for this past year. The problems that confronted us were, in part, primarily the result of two straight severe winters in our area which saw record-breaking prolonged snowfall and cold temperatures.

Beginning in 1977, the very long, cold spell that we experienced winter killed a very good portion of the bermudas in our area with the hybrids suffering much more than the commons. Combining the winter kill with a very late spring, the bermudas didn't have much growing time to recover fully. We were then subjected to a more severe winter in '78. This really compounded our problems as far as the bermudas were concerned. The recovery by the common bermudas was about a month before the hybrids, which was evident in August. In our area, the ideal condition for growing warm season grasses is to have a blanket of snow on the dormant grasses during the cold, windy winter months, (the protection that a snow cover gives is two-fold), and an early, warm spring. Well, we had those conditions in 1978, and we still suffered a considerable loss of turf.

The resulting voids in the turf due to this winter kill loss forced some superintendents, myself included, to attempt to encourage a faster recovery rate through increased cultivation, fertilization, and irrigation. The weed infestation, primarily goosegrass, that resulted from this attempt to foster recovery, negated the effort.

Winter kill wasn't the only problem created by the severe winters. Another problem was a fungus on our greens like we have never experienced before. I'm not referring to any isolated cases, but to the great majority of bentgrass in our area. In my case, Dr. A. J. Powell, turf extension specialist of the University of Kentucky, paid me a visit in early March about the time the snow was melting on the greens. Taking into consideration that the only disease that we in the Kentuckiana area ever see after the winter months is a little snow mold on Poa annua, Dr. Powell and I made a tour of a few greens. What we saw was quite shocking - a very high infestation of killing disease on all of the greens we looked at. To myself I said, "Hell, this looks like brown patch, but who ever heard of brown patch in the winter time?" Not wanting to show my ignorance by making a snap judgment that would prove to be wrong, I said nothing. (I've been burned on many occasions by making quick judgements and decisions.)

Upon leaving, Dr. Powell took a few cultures with him to have the plant pathologist at the University of Kentucky attempt to find an answer. The findings were that we had cool season rhizoctonia - a first for me after 23 years in the business! Once the diagnosis was correctly made, the cure was simple, although in some cases two spray applications had to be made.

Another unusual happening in our area this past season was the high infestation of goosegrass and crabgrass. Again, it was not in isolated cases, but the great majority of courses had this problem.

As Louis Miller, editor of the Kentuckiana Klippings, "Why the pre-emergence herbicide failure this year?" It seems just about everyone you talk to is extremely unhappy with the performance of the particular herbicide that he used. In most cases, two applications were used, with the first going down in early to mid-April. Louis went on to say that it wasn't the case of breaking the soil barrier by mechanical means

because aerification was done prior to putting down the herbicide applications. It wasn't a wet year. If anything, it was more on the dry side. The products most commonly used were Dacthal, Balan, Betasan, and some Tupersan. As Miller says, "All of these products have proved adequate in the past so why the failure this year?" In his attempt to find an answer, Louis questioned many, to no avail. The problem did not only exist on golf courses, the custom lawn applicators in our area also had some poor results as did some cemeteries and commercial establishments. In further quoting Louis Miller, he states that the big question that remains is, "What do you do next year to prevent this same thing from happening?" The weed seeds are definitely in abundance from the '78 crop and ready to germinate this coming season.

In discussing this problem with a few herbicide manufacturers' reps, they are very aware of this problem and their thoughts were that to achieve a better control, we may have to go to a higher rate along with an additional application.

There were many pluses in our area this past year which included very little damage from hot weather diseases, the zoysias fared from very good to excellent, with the only problem coming from a little leaf spot in the spring, the perennial ryegrasses continued to show a great deal of promise on fairways and tees and banks, and even the bluegrasses looked good.

In conclusion, I must say that after 23 years in this business, I thought I had a fairly decent amount of knowledge in the turf management field. I sometimes wonder...

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USING ZOYSIA IN THE TRANSITION ZONE

Lee Redman, Superintendent
Bellerive Country Club, St. Louis, Missouri

I. History

- A. Bermudagrasses were popular for ten years with the success of U-3 hybrid.
- B. Bluegrasses can provide turf but not tight cut fairways during the summer stress periods.
- C. Ryegrasses have been helpful but cannot match the durability and low height of cut that zoysia provides.
- D. USDA test plots and research of late 1940's provided the hybrid Meyer Z-52 zoysia.
 1. Evansville Country Club for some 20 years
 2. Alvarado Hills, Lawrence, Kansas, 1967 - now 36 holes of zoysia on tees, fairways, and around greens
 3. Most all private clubs in Kansas City and St. Louis are either total zoysia or committed to that end result
 - a. exception is Westwood bermudagrass on three courses in St. Louis and doing well
 4. Slow growth and costs have held back the move to zoysia.

II. Methods of Installation

- A. Plugging zoysia
 1. Manual tools
 2. Mechanical methods using larger equipment
 3. Most commonly used on
 - a. new golf course construction
 - b. golf course nurseries
 - c. sod farm operations
 - d. home lawns

- B. Planting by stolons
 - 1. Single row planters
 - 2. Hydro-mulcher
- C. Sodding approach
 - 1. Total coverage - costly, limited to tees and smaller areas
 - 2. Strip-sodding - most accepted method at established clubs for the least inconvenience to membership.
 - a. width may vary but it takes two growing seasons to cover between strips at 12" spacings
 - b. 4" stripper blades available for verti-cut sweeper which will reduce labor costs of installation
 - 3. Important for success
 - a. use quality sod, free from problem insects and sod which has been maintained at a close desirable height of cut.
- D. Cutting height and frequency
 - 1. 3/4" to 1" for first and second years after planting
 - 2. 1/2" to 3/4" afterwards - 5/8" at Bellerive has proven best for me
- E. Watering
 - 1. Higher requirement than expected to keep lush fairways - more like the requirements of bluegrass than bermudagrass
- F. Chemical weeding
 - 1. Preemergence - caution to avoid washing problems and aerial runners
 - 2. Postemergence - very tolerant to many types
- G. Thatch and controlling this problem
 - 1. Fertilizer not to be overdone
 - 2. Vertical mowing - good
 - 3. Aerifying during prime growing season - July in St. Louis - has been most successful
 - a. too early - crabgrass infestation
 - b. keep sod moist
 - c. plant early in season for more growth

III. Zoysia Management

- A. Insects
 - 1. Chinch bug
 - 2. Bill bug
- B. Diseases
 - 1. Large brown patch - cool season
 - 2. Springtime leaf spot, related diseases appearing as yellow areas slow to green up
- C. Fertilizer requirements
 - 1. First and second years of planting - 5# A.N./1000 sq.ft./yr
 - 2. Third and fourth years after planting - 1# to 2# A.N./1000 sq.f.t/yr
 - 3. After fourth year - 1/2# to 1# A.N./1000 sq.ft./yr
 - a. iron supplement helpful to color
 - b. earthworms bring soil to surface to aid in biological decomposition of thatch
- D. More months of green grass as compared to bermudas, 7 months vs. 6 months, and winter playing surface superior to bermuda because leaf structure does not break down.

IV. Decision is Yours!

- A. If you decide to undertake a zoysia program you must manage for that grass alone
- B. Many courses have made the change and are glad they did
- C. It makes my summer a whole lot easier - something less to battle during the golfing season. Maybe, just maybe, a cool day will come along, and then I have only my greens to worry about.

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INDUSTRIAL GROUNDS MAINTENANCE

Norm Hoffherr, Grounds Superintendent
Mead Johnson Co., Evansville, Indiana

Several months ago I received a call from Dr. Bill Daniel asking if I would share with you some of my responsibilities and experiences I have encountered as a supervisor of an industrial grounds complex. In looking through the Conference Proceedings dating back to 1960, which I have, I was surprised to find practically nothing on this topic had been discussed to any extent. This raised the question in my mind, "Why?".

It would be appropriate at this point to establish what I feel has become a close relationship of job responsibilities and define the cause or reason for more technical knowledge being needed. I am sure all of you will agree that as a whole the 'turf and landscape industry' has become more and more intermingled, especially within the last ten years. The largest contributing factor, I feel, was public acceptance of slogans such as "Keep America Clean", "Keep America Green", "Green Survival", "Operation City Beautiful", and many more. This acceptance caused a boom to both the turf and landscape industry in that public sentiment now demands that new construction must be landscaped whether it be a home, service station, restaurant, bank, factory, or golf course. This growing acceptance by the public for better quality turf has been felt on the golf course, causing superintendents to become more knowledgeable and to use more expertise in their general turf management programs. It has also forced many to expand their horticultural knowledge in maintaining trees and shrubs. These responsibilities are very closely related to the role of the industrial grounds supervisor in that he or she is often responsible for maintaining large areas of well groomed turf, as well as for large numbers of trees and shrubs in and around the complex of buildings.

The use of insecticides and fungicides on many plant cultivars presents no real problem, but the use of herbicides on turf, whether they be post or pre-emergent, can be extremely complex. The dangers involved with herbicide use in and around trees and shrubs can use all the past knowledge and experience one can apply.

I would like to discuss with you some of the specified aspects and responsibilities of my position as an industrial maintenance supervisor and share some problems and experiences encountered over the years. A general description of my job responsibilities is to plan and supervise the overall operation of the grounds department in developing, maintaining, and caring for the company grounds, plantings, and turf areas. Maintain grounds, roadways, parking lots and sidewalks in a clean and safe condition. Some of the specific responsibilities entailed in this brief description are to plan and supervise the sweeping of sidewalks, parking lots, roadways, keeping these areas free from leaves, paper, and debris, remove snow and ice from said areas and arrange for contracted labor and equipment to supplement the grounds work force in the event

of a heavy snowstorm. To provide for normal maintenance and care of turf areas, shrubbery, trees, and ground covers, and schedule sprays, fertilization, and pruning programs as needed to maintain turf, shrubs, and trees in a healthy condition at a level consistent with company standards.

The use of chemicals also requires me to be certified and licensed by the state and to keep detailed records of the types of chemicals used, amounts used, concentrations, and what they were used for, in compliance with state and federal laws and E.P.A. regulations. We are also very conscious of O.S.H.A. regulations, and place strong emphasis on employee safety. Other duties are to maintain planters in our office buildings, have them refurbished when needed, hire outside contractors to repair or resurface our parking lots, instruct and train new employees coming into the department, inform employees of company policies, recommend disciplinary action if needed, and conduct monthly training, safety, and communications meetings with the employees.

In our company, as in all manufacturing companies, you cannot forget the paperwork. Some of these responsibilities include maintaining personnel records, as hours worked, signing of job tickets, absenteeism, vacations, provide information to the manager of the department in preparing the budget, and issue purchase requisitions for supplies and equipment used by the department. I also plan and design landscape schemes for areas being reconstructed, and provide assistance, when asked, to our Engineering Department in preparing cost figures for the planting material needed for these projects. In addition to these responsibilities, I will also soon assume the responsibility for managing the Insect and Rodent Control (P.C.O.) Program inside the buildings of the plant.

One of the problems is that, due to the many facets of responsibilities involved, it is difficult to find time to be out on the grounds with the crew. The Grounds Department crew consists of six year round employees, plus five part time employees who are hired for the summer months. We do all our planting, trimming, fertilizing, spraying for insect and fungus control, pre-and post-emergent weed control on turf and ornamental beds, and chemical soil sterilization in non-cropped areas. A daily morning clean-up is made of all plant properties. In addition, four off-premise properties are also mowed, trimmed, and maintained - including snow removal. All turf areas are cut and trimmed a minimum of once per week. The shrubbery is trimmed at least twice per season, and all trees, shrubs, and turf are sprayed for insect and fungus control on a regular schedule.

The department has all its own equipment, including renovator, aerator, aero-seeder, two 200 gallon sprayers, CO₂ hand sprayer, four 14 HP tractors, trim mowers, snow blades, pay loader, electric and hand shears, Ford 3000 tractor, 1600 tractor, large street sweeper, Parker Vacs, pick-up truck, and four Cushman trucks.

Mead Johnson and Company is a nutritional and pharmaceutical products company which is a subsidiary of Bristol-Myers Corporation. The Evansville plant is located on 62 acres near the downtown district along the Ohio River, employs over 2500 people, and the facilities afford 950,000 square feet of floor space. The plant, manufacturing nutritional and pharmaceutical products, as you would imagine, has placed very high standards on the products and also on cleanliness in and around the plant. These high standards have also been placed on the appearance of the grounds. A well planned and maintained landscaped grounds is a valuable asset to any company by providing a clean, neat, and aesthetic atmosphere in which the company can conduct its daily business.

It also provides the same for the employees of the company by offering them a pleasant, green environment when they come to work. Keeping a clean and well-maintained landscaped grounds also helps create good public relations with the community where the company is located. All areas within the plant were landscaped originally, and as the company grew over the years, the need for more buildings and more employees created a need for more parking facilities, so additional acreage was secured. As the change came about, each area was landscaped conforming to the original landscaping plan, and the Grounds Department expanded both in manpower and responsibilities.

The grounds at the Evansville plant comprise approximately 23 acres of turf, 4600+ trees and shrubs, consisting of over 70 species, seven square city blocks of parking area, plus an additional paved parking area slightly over three acres. All of the city streets around the lots, and all areas within the plant are swept on a daily basis, which represents 4-1/4 miles. The parking lots and other non-street areas are swept two times per week, which is approximately 14 acres. The parking lots are landscaped primarily with Taxus densiformis and Euonymus alatus, which provide a screen for the lots while also providing beautiful contrast of fall color as the leaves of the euonymus turn a brilliant reds. There are 62 islands in the lots, each having two pin oaks per island, which now measure about 14 inches in diameter.

Every building in the plant is landscaped, whether it be office or manufacturing, with a variety of planting material. Screening material for fences and walls consists of American holly, Canadian hemlock, pine, and several species of upright junipers. A large variety of planting material, such as forsythia, flowering quince, rhododendrons, azaleas, abelia, magnolia, and flowering crab, has been used at Mead Johnson to provide various effects for both spring and fall color when blooming. Trees were selected to create special effects - bark of the white birch, the London plane, or for shape - the sassafras tree because the scaffold branches of this tree are irregular and gnarled, making it a beautiful tree for certain locations. Some trees and shrubs were used for this display of fruit, such as the Washington thorn, jet beads, pyracantha, and for the purpose of providing a break from the height of a building, the European hornbeam. One tree that was used to provide lift in a narrow confined area is the pyramidal English oak (Quercus Fastigiata). This tree grows to about 70 feet, has a columnar growth habit, can be grown in areas having very limited space, has a 3"-5" oak shaped leaf, and is a very unusual and beautiful tree. The English oak could well be substituted for the Borolinsensis Poplar, which is so widely used, but is a very short lived tree.

The 23 acres of turf at Mead Johnson are predominantly bluegrass, and this does present problems. I can well remember Dr. Daniel making the statement, "If you can grow and maintain bluegrass in the Evansville-St. Louis area, you can grow it in almost any area in the United States." Most of the soil in our area is a clay, quite heavy, and presents both compaction and drainage problems. This creates the need for a program to correct this condition with the addition of soil amendments such as sand or calcined clay, installing vertical trenching, and tiling, practicing a continuing aeration program, and other useful practices. With Evansville being in the transition zone between the north and south, the weather poses many problems in maintaining both turf and shrubs. The growing season is quite long, but weather conditions fluctuate quite drastically. There are many periods of cool, wet weather in the spring, but during June, July, and August the weather generally is extremely dry with temperatures in the 100° plus range for extended periods. This is accompanied by extremely high humidity most of the time which favors severe outbreaks of fusarium. Almost all turf diseases run rampant at various times. In the spring, the moist and damp conditions create a beautiful environment for the development of many pathogens.

This dictates a scheduled spray program to control various infectious diseases on the trees and shrubs such as tar spot, leaf spot, cedar apple rust, apple slab, and many others. The winters in Evansville, especially during the past three years, have also presented special problems for a number of species of plant material. Normally, temperatures will drop to zero, but after a day or two, will jump back to normal. The past three years we experienced extremely cold winters with temperatures of 21° below zero and staying in the temperature range of 0° F, with highs below freezing for extended periods. This has caused repeated damage to many plants such as American holly, magnolia grandiflora, ilex, taxus, and some foliage damage to Canadian hemlock. This was due to the frozen soil, high winds, and transpiration loss during the prolonged period of sub-zero temperatures. Other ornamentals such as euonymus patens, Burford holly, and pyracantha, which normally grow well in our area, have been severely damaged or killed during the past three winters. This has caused many of us to take a long hard look at what plants we will use or recommend in the future concerning winter hardiness.

During the past several winters we have had far above average amounts of snowfall at Evansville and snow removal has presented a very big problem. This problem is compounded if the snow falls during the night because the employees are at work by 7:30 a.m., and the lots are full of cars. Our policy is to grade and haul all snowfalls above two inches from all streets within the plant, all parking lots and sidewalks, plus the lots and walks at five off-premise properties. I am on call 24 hours per day, including weekends and holidays and call the grounds crew in anytime after midnight, depending on the amount of snow that has fallen. If the snowfall has been heavy, I also call in a firm to supplement the grounds crew which supplies graders, loaders, and all the trucks needed. Several large tractor trailer dump trucks are used to make the long hauls. Both time and cost for snow removal have been cut substantially.

Many problems have been inherited. The person creating the original landscape design thought only of the ultimate effect being created, and gave little if any consideration to maintenance problems which will remain for years to come. Some of the problems are placing plants susceptible to wet feet in heavy clay, low areas, with no provisions being made for the addition of soil amendments or drainage. Another is plant location, which includes the wrong plants being used in extremely sunny or shade locations, or in areas with limited space where their ultimate size would outgrow the space. Another common mistake is to use plant species which are known to be prone to attacks by fungus or insects, as are certain cultivars of flowering crabs, or bores in the green ash.

In the early 1970's, a new complex of buildings was erected 14 miles west of Evansville on Highway 62, near Mt. Vernon, Indiana, and is called Mead Johnson Park. The turf area consists of 130 acres, and some 450 trees and ornamentals were planted. The soil at the Park is very tight, heavy textured clay with little organic matter, and has a layer of hard pan near the surface. This creates a very wet condition allowing no soil percolation. What was planted? Taxus, which we all know is one of the plants that absolutely cannot stand wet feet. One bed containing 64 taxus had been replanted three times. When it became my responsibility, the soil was dug out four feet deep, perforated drainage tile was laid in gravel at the bottom of the bed, and it extended into a sewer drain. The area was filled with friable topsoil, and 64 taxus replanted. That was four years ago, and today all the taxus are specimen plants.

I stated earlier that our blacktopped parking lots have 62 islands in them containing 124 pin oaks which now average 14 inches in diameter. These islands are only three feet in diameter. There is no way of getting nutrients and the oxygen necessary to sustain the root system. This involves another problem because a declining or sick tree is more prone to borer and insect attack. The roots being forced to grow

near the trunks of the trees are also breaking the curbs of the islands. To resolve this problem, I am gradually taking out the pin oaks and replacing them with one Bradford pear per island. The Bradford pear is a beautiful tree, and at this time is practically free from insects and disease and should not pose problems in the future in breaking the curbing.

Something a little different in the problem solving area is bird control. We have a large pin oak in a strategic location, which for years had been a roost for starlings every winter. I tried everything, including electric noise devices, to drive them away, but nothing worked. Last summer I read an article about a successful experiment that was conducted over four years at Rice University. This article stated that control had been achieved by severely pruning the infested tree and also eliminating all small stubs, spurs, and branches. I tried this on the pin oak early last fall before cold weather drove the birds to this tree. I was not only able to keep the tree from being removed, but was able to retain the natural shape of the tree, and to date, have 100 percent control.

At one time I had problems with the crew being careless with tools, either losing them, letting them lay on the job site and complaining someone else had used them and left them full of mud, or let them get rusty. A locker was built for each person, and each has his own key for the locker. Each crew member was issued a full set of tools for which he is held responsible. This eliminated arguments and has practically eliminated the necessity of tool replacement, except when they are actually worn out. Each person has also developed a sense of pride in keeping his tools clean, sharp, oiled, and in good condition.

In conclusion, let me say that management of turf and ornamentals presents a real challenge. You have to use all the knowledge and expertise available to combat problems, many of which are uncontrollable, due to changing weather. But when the headaches and worries are over, it is a rewarding experience to feel you have met the challenge and have helped lend a hand to old Mother Nature by providing a green and beautiful atmosphere for all of us to live in.

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ROUNDUP POTENTIAL AND PRACTICES

Edward Jordan
Monsanto Company, St. Louis, Missouri

I would like to share my experiences using Roundup in fine turf renovation and Roundup uses in grounds maintenance. These characteristic uses are basic to the areas of golf courses, home lawns, or commercial landscapes.

Fine turfgrass renovation was made available to the professional applicator by the expansion of the Roundup label in the spring of 1977. Roundup is applied to green vegetation and moves into the plant through the green portion of the plant. It translocates to both above and below ground plant structures, and usually brings about a total kill of the target plant.

The renovation basics are:

1. Application of the proper rate of Roundup per acre in recommended rate of water to the area to be renovated.

2. Delay of the tillage, coring, slicing or aeration for seven days to allow proper translocation to all parts of the target plants.
3. Reseeding into the dying vegetation in a manner assuring good soil-seed contact.

Tests were arranged with Steve Frazier, Superintendent of Meridian Hills Country Club in Indianapolis. The label rate of 2 quarts of Roundup/acre applications were made on August 8, 1977 onto a fairway containing a mixture of established grasses - bluegrasses, bentgrasses, zoysia grass, nimblewill, and an assortment of summer annuals and broadleaf weeds.

Six plots were set up utilizing equipment which is readily available to the turf industry consisting of:

Seed measured and banded

1. McCormick grass drill
2. Rogers seeder

Broadcast seed/incorporated

1. spiker
2. Grasslands aerifier, plus verticut
3. Ryan Greensaire aerifier, plus verticut
4. Toro verticut

Seeding was done on the seventh day after spraying with a Northrup King Overseeder II mixture at the recommended rate. The seed on the broadcast plots was applied before incorporation steps were taken. Plots were evaluated at 7, 14, and 21 days after seeding, and again in April 1978.

Conclusions: All methods are readily acceptable and can be successfully utilized by commercial applicators in renovation with the exception of the McCormick grass drill where the disk openers are spaced too far apart for desirable stand of turfgrasses.

The Rogers seeder needs to be run both directions for satisfactory stands and quick coverage. All broadcast procedures proved very satisfactory. Although differences in early emergence were noted, with more rapid germination in plots which had the greatest soil brought to the surface, these differences were non-measurable in the spring of 1978.

The test area was left open to play and cart traffic throughout the renovation procedure. It supported traffic and was playable during the total renovation procedure.

It appears we now have a satisfactory procedure to quickly and easily change from a less desirable to a desirable turf. A method which is quick and efficient on recreational areas or lawns with the selection of equipment available to the commercial applicator.

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ADDING IMPROVED TURF-TYPE RYEGRASS TO BLUEGRASS

Oscar L. Miles, Superintendent
Broadmoor Country Club, Indianapolis, Indiana

Before results can be achieved, one has to first decide what standard of maintenance is desired by the membership and at what level one's club can realistically afford.

Broadmoor's management team bases its realistic goals on one or a combination of four levels of maintenance. The highest level is called optimum, then above average, then average (or good), and the fourth level would be below average or minimum. Each individual golf course area can then be categorized. Broadmoor's categories are:

- Optimum - greens, tees, clubhouse lawns and flowerbeds
- Above average - fairways, aprons, intermediate rough, sandtraps, grass bunkers
- Average - deep rough, practice range, hazard banks
- Below average - out of play areas and heavy woods

With each step up in the desired result category, maintenance costs increase dramatically. In 1979, reaching for results for above average fairway turf requires a budget of \$15,000 for purchase of fertilizers, seed, and all pesticides. This somewhat conservative figure would be quite a bit higher if we didn't have a comprehensive turf management program which allows me to anticipate our supply needs for quantity purchasing and competitive bidding during the off-season.

It is our pre-budget objective to prepare optimum result turf management programs for all respective areas, and then work down to a realistic objective that can be financed within the total operating budget. When our budget committee looked at reaching for results in this manner, it became apparent that it is not financially feasible for me to plan a fairway turf management program greater than above average results.

Now that I have expressed our goals and limitations, I would like to share with you some ideas and observations from my experiences during the past few years - some disappointing and others gratifying.

The fairway management program at Broadmoor Country Club has evolved into what I call the "Broadmoor Six, Three, Three - Green Is Beautiful Plan". During the spring and fall (a six month period) we promote the improved bluegrass and turf-type ryegrass population. In June, July, and August we encourage the survival of Poa annua. Poa annua comprises 40 percent of the turf population. Consequently, we do what we can to keep this 'friend' healthy and green. Green is beautiful to our members; brown, dead turf makes them very unhappy. The last quarter of the year the turf may be resting, but I am very busy evaluating the successes and failures of previous programs in an attempt to modify our present program which, hopefully, will prove more successful during the next golfing season.

In 1975, 76, and 77 we dedicated our fairway turf improvement efforts to a comprehensive slit-seeding program using improved bluegrass varieties and broadcast overseeding of turf-type ryegrasses. After three disappointing years of attempting to establish improved bluegrasses, I would have to agree with the statement of Dr. J. M. Vargas, Michigan State University Turf Specialist to the Mid-Atlantic Golf Course Superintendents Association, "You are going to get eight cents back on the dollar when you use perennial rye, as opposed to five cents on the dollar for Kentucky bluegrasses."

This brings us back to the old bug-a-boo in turf management - 'the Poa annua; friend or foe?' controversy. It has been a 'foe' to bluegrass seeding success and a passive 'friend' which doesn't discourage success when seeding the more aggressive turf-type ryegrasses. My plans are to "love and care for" the Poa annua during the summer, and limit any reseeding to the three cooler months when this turf disturbing method will least interfere with the fewest number of golfers. Using ryegrass has given me the opportunity to compromise with the paying members and not sacrifice my responsibility to encourage establishment of improved grasses.

What is our ryegrass overseeding technique? We literally cover the ground with seed, 15 to 21 seeds per square inch or at a rate of 8 to 10 pounds per 1000 square feet. Since it is a bunch type grass it is necessary to have close contact of individual plants to achieve the density necessary to support a golf ball. The majority of our members like the ball to set up high enough so they can sweep under the ball when they hit a wood or long iron shot. I am of the opinion that the majority of players don't have the physical strength or ability to hit down and through a short cut tight lie. An exception might be when they hit a shot with the short or wedge irons.

I realize the golf pros and low handicap golfers want a very close cut fairway turf. This is impractical for us. Broadmoor Country Club is located in a very difficult climatic region which is not conducive to growing satisfactory bentgrass or bermuda fairway turf. With our unique soil, age, of course, and other built-in problems, improved turf-type ryegrasses fit well into our scheme of things. The past four years we have used Manhattan, Pennfine, and Derby ryegrasses. I prefer Pennfine or Derby. They both blend very well into the existing bluegrass-Poa annua turf.

After broadcast seeding of large fairway areas, soil is brought to the surface by using a fairway aerator equipped with 5/8 inch thatching spoons. The area is aerated from 4 to 8 times, in different directions, with the number of times aerated depending upon the amount of soil we want on the surface to cover the seed.

On green approaches and localized fairway spots (less than 1/2 acre), we use the Ryan Greensaire II equipped with 5/8 inch spoons. The machine is set to maximum penetration (4 inches). Once over the area with the Greensaire is usually sufficient to bring up enough soil for adequate seed-to-soil contact.

After aerating, the area is verti-cut in two directions with a Hahn Tournament Triplex equipped with verti-cut reels. We have found that we get excellent soil core breakup and a slight thinning of the turf with this method. The verti-cut reels are preset 1/8 inch off a level concrete floor. What I want from this verti-cutting is sufficient topdressing from the verti-cut plugs to cover the seed. We do not try to dethatch the turf. In fact, the less grass injury the better for rapid recovery of existing turf.

The area is mowed immediately, fertilized, and then watered to bring the existing turf out of shock. (Mowing helps roll the turf and soil for good seed-to-soil contact.) What about dragging? No, I didn't forget it; we don't do it. I don't like to drag-mat the area. I don't want the seed and soil dragged back into the aerating holes. I want an even stand of new rye seedlings. After verti-cutting I don't want any physical rearrangement of the soil and seed.

By following this procedure during the cooler, damper months of spring and fall, it normally isn't necessary to water more than two or three times a day. A light watering about 9:00 a.m., 1:00 and 6:00 p.m. seems to be just about what the seedbed needs to enhance germination and seedling survival. Water this way for about a week and then water only as soil and grass need it.

In less than ten days after this seeding operation our members can see the results of our reaching for improved fairways. In the past, attempting to show members the tiny bluegrass seedlings coming up in the slits became next to impossible. Sometimes it was really embarrassing. Besides, who am I to say those seedlings were not Poa annua plants?

The introduction of improved turf-type ryegrasses in fairway turf at Broadmoor Country Club is an annual practice that works well in our "6-3-3 Program". Give it a try! I think you will be pleasantly surprised by the good results. It is helping me accomplish our goal of 'reaching for above average results on fairway turf'.

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P.A.T. FIELDS, MY EXPERIENCE

Roy Zehren, President
Natural Athletic Turf, Inc., Mequon, Wisconsin

I would like to start my talk with some brief background history before going into my experiences with P.A.T. I started landscaping in 1945, then formed Zehren Landscape Co. in 1954, specializing in landscape construction.

In 1972 I met Dr. Daniel in Milwaukee and became very interested in the P.A.T. and Purr-Wick sand concept. In 1974 I formed Natural Athletic Turf, Inc., solely to construct P.A.T. Systems as a subcontractor to P.A.T., Inc., of Lansing, Michigan.

The first field built by P.A.T., Inc., was Engleman Field at the University of Wisconsin, Milwaukee. It took us 53 days to build that field. The "prescription" sand used on this field was near perfect; therefore we ended up with an ideal field. However, we did have problems. The field was used seven days a week during days and evenings for soccer practice and league games, girls field hockey, track and golf practice, intramural games, and by the students and neighbor kids in the evenings and on weekends. It did not have much time for recovery! In 1974 no additional maintenance was performed other than mowing the turf. We used fertilizer at installation time and again thirty days later. By December 12, 1974, we had roots 12 to 13 inches deep. By 1975, the UMW maintenance crews only mowed as needed and fertilized with Milorganite. Little or no watering was ever done. By 1976 the field was in bad shape. The roots had retreated to the surface and were now only 1-1-1/2 inches deep. They made the mistake of keeping too much water in the system by keeping the overflow valve at four inches. They were short on N, P and K and the pH had risen to 8.5. In 1976 we helped them on a new maintenance program. We then put them on an aerating, topdressing with sand and peat, and the proper corrective fertilizer program. The same for 1977, except we used sand for topdressing. All the topdressing sand used was the same prescription as the construction sand. After aerating, topdressing, and fertilizing, we overseeded, watered and kept everyone off the field for thirty days. We now had a good field. The only major maintenance after this was repairing the goal areas on each end. We did this using sod four inches thick.

In 1975 at Saginaw Valley State College we had a few problems. This construction took only 39 days. The field was ready for play in 44 days. However, problems

developed the second year. We found out later the sand supplier had cheated on the specifications. There was too much clay and silt in the blend. The pore space was wrong, and it held too much water too long. However, they refused our assistance so I don't know the condition of the field today.

Summary: The most important factor for a good athletic field, golf tee or green construction is the proper "prescription" sand. Fifteen to twenty percent off on either end of the size scale can be disastrous. The "do it yourself" construction by some athletic field managers and golf course superintendents is seldom correct because they do not use the right prescription sand. Example: Our first golf green constructed had a very difficult time getting established. Again, the sand supplier cheated. It was not the same sand we tested before the job started or after the first load was delivered. It was 18 percent too coarse, and the seedlings dried out while germinating and died. After aerating and topdressing with peat and calcined clay, it recovered and is now a very lush green. I recommend using the same sand for topdressing as used in the construction. The best size range is from .15 mm to .84 mm.

Second most important is watering. The most common mistake is leaving too much water in the "pan". In 1978 both golf courses where we constructed tees in 1977 did not have to be watered the entire year other than 'watering in' the fertilizer. The third most important thing is the additives that are blended in the top profile. It must be properly proportioned amounts of sand, peat, calcined clay, colloidal phosphate and dolomite, plus the proper fertilizer. We found IBDU, coarse grain, the best source of nitrogen. This topmix profile is being changed and improved with experience and can vary with each field or installation. We also found out the ideal way to establish turf on a P.A.T. or Purr-Wick System is to seed. The drawback on this is the length of time needed to establish a turf strong enough to allow play. The next best method is to sod with washed sod. We did this on one golf tee by washing out all the soil from the sod. It started rooting in one day, and was actually cut after three days. It was ready for play in less than two weeks. We had roots four inches deep in seven days, and ten inches of roots in less than thirty days.

Last, but not least, is proper maintenance. Taking core samples every few months is most important. Additives and fertilizer can then be used properly. Watering is very important. Too much water causes shallow root systems and lack of air and oxygen for good growth. On the other end, a too dry condition causes wilt, tearing of the turf, slow growth, and root damage. These systems cannot be maintained as regular conventional turf.

I see these systems as changing the turf industry in the United States, and possibly in the world.

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LAWN CARE INDUSTRY

E. E. Bredeson
Swift Chemical Corporation, Winter Haven, Florida

Today less than five percent of some eight million acres in home lawns in the United States have been touched by lawn care businesses. Now in a dramatic upward growth spiral accounting for a near billion dollar business in 1976, the estimates for 1977 run as high as one and one-half billion dollars in lawn care and service on a national scope.

The Post War II home building boom and the push into the suburbs turned many Americans into novice gardeners, and pushed home and garden supplies to a healthy \$4.5 billion in 1960. A 1976 statistic from U.S. Home & Garden Supply Merchandiser shows that \$9 billion dollars were spent by Americans on home and garden supplies, an indication that a sizeable number of home owners are still do-it-yourselfers. Regardless of this, the chemical lawn care business is the "growingest new marketplace."

Precisely when it became clear that there was a living to be made in approaching the homeowner, chemicals in hand, and offering to refurbish a damaged lawn, or when it became apparent that a frustrated homeowner might relinquish control of his well-won half acre, it is difficult to say. However, it was not until the mid-fifties that the technological know-how was blueprinted, with the assumption that 'chemical lawn services' could be rendered to home owners at a cost which would be equal to or lower than a trip to the garden store and some diligent man hours. But the lawn care service business as it is known today was not mastered, and the modern lawn care service did not evolve until the early 1960's.

U.S. Professional Market for Pesticides & Fertilizers - 1976:

<u>Product</u>	<u>\$ Million</u>	<u>% of Total</u>
Pesticides		
Herbicides	\$ 157	24
Insecticides	150	22
All other pesticides	<u>67</u>	<u>10</u>
	\$ 374	56 %
Fertilizers	247	38
Soil conditioners	<u>37</u>	<u>6</u>
Total	\$ 658	100 %

The dramatic growth demonstrated by a few companies, while an index to the rapid growth of the entire market, reflects only minutely the growth potential for the lawn care industry in the years ahead. Would a \$12 billion dollar figure jar your imagination just a little? Opportunities in the lawn care service business of the future are unlimited.

Why the big switch? Modern times have turned American lawns into an outdoor living room for everyone to enjoy.

1. Economics of service
2. Professional results
3. More leisure time to relax and enjoy family and beautiful yard
4. Keep up with the Joneses

Who are the customers?

- Single dwelling homeowners
- Apartment and condominium dwellers
- Schools
- Churches
- Cemeteries
- Banks
- Businesses - all types
- Office Buildings
- Government

Lawn care businesses in the U.S. will have an additional 1.8 million new residential property owners to solicit for business each year for the next four years, or 7.2 million new homes by 1981. These figures are based on reports released by the National Association of Home Builders (NAHB) in Washington, D.C.

7.2 million new homes by 1981 translated into dollars - \$720 million of new lawn care business for the taking.

The geographic distribution of lawn care businesses encompasses almost the entire United States, with the highest density areas occurring in New York and New Jersey. A very substantial segment of the industry appeared in Florida with a sizeable upswing in Ohio, Indiana, Illinois, and Michigan.

One of the greatest problems for the lawn service professional is customer education. By informing the public the lawn service professional can make intelligent analysis of a particular turf problem and be accepted as a true professional. In order for the lawn service account to be most successful, the professional must at all times be the 'doctor', and the customer must be the 'nurse' - maintaining the lawn between applications. Today's homeowner is aware that more is involved than just fertilizing and killing weeds. Each year more and more homeowners want and demand professional lawn care.

Many customers with turf still wait to be serviced, mainly because they are not aware of services offered. Complete professional lawn care service for residential, commercial, and industrial customers includes:

- | | |
|------------------|----------------|
| - seeding | - fertilizing |
| - insect control | - weed control |
| - fungus control | - thatching |
| - aeration | - soil testing |

Dollar Volume - Lawn Service Business:

	\$500,000 plus.....	7.6%
\$100,000 -	\$499,000.....	25.8
50,000 -	99,000.....	23.5
25,000 -	49,999.....	21.2
10,000 -	24,999.....	12.9
9,000 -	or less.....	9.0

Season-by-Season Lawn Care Calendar:

<u>Schedule</u>	<u>Type of Application</u>
Early spring - Feb./March/April	Pre-emergent crabgrass and foxtail control plus a heavy rate balanced fertilizer.
Late spring - May/June	Dandelion and broadleaf weed control. Chinchbug-sod webworm-adult billbug control. Standard rate fertilizer
Summer - July/Aug./Sept.	Dandelion and broadleaf weed control Chinchbug-sod webworm-adult billbug control Light rate fertilizer
Fall - Sept./Oct./Nov.	Heavy rate balanced fertilizer. Also broadleaf weed control if necessary.

Example:

<u>Sq. Ft. Lawn Area</u>	<u>Cost Per Application</u>	<u>Annual Cost - Four Applications</u>
5,000	\$16.	\$65.
6	18.	72.
7	19.	79.
8	21.	86.
9	23.	93.
10	25.	100.
15	33.	135.
20	42.	170.
25	51.	205.
50	95.	380.

Note: Some services now add service charge for making call.

Service is most important. Customers demand:

- Friendly business-like attitude
- Quick response to service call
- Qualified lawn care Professional
- Care to lawn and surrounding plants
- Professional equipment
- Satisfactory results - beautiful turf

The professional lawn care organization keeps each customer advised on such subjects as:

- Reliable information on fertilizers and pesticides
- Accurate measurement - application rate and charges
- pH and liming
- Soil testing and interpretation of tests
- Prompt service
- Both short and long term turf care
- Proper mowing guidelines - cutting height
- Frequency-pattern-clippings-mower operation
- Aeration and thatch removal
- Watering
- Grass seed and seeding
- Broadleaf weed analysis
- Insect and disease analysis

One can and will get into a good argument on the subject of dry vs. liquid fertilizers. It depends on whether you are talking to the dry lawn care service account or the liquid lawn care service account. For now, at least, the pros and cons are equal.

Service is the key to business:

- Offer client a choice of dry or liquid turf fertilizer and pest control.
- Offer client a choice of premium or competitive lawn care program.
- Customer with turf problem - in direct relationship to program or not will receive prompt attention from turf specialist in correcting it.
- Continues beyond product and personnel. Offer brochure describing the basic applications offered.
- Offer lawn seminars.

Professional Blueprint for turf development and maintenance:

- Start with good seed
- Water regularly
- Feed adequately
- Mow properly as the growth rate demands
- Reseed and repair when needed
- Test soil annually
- Adjust pH if necessary
- Remove thatch
- Aerate or verticut
- Roll as needed
- Prevent quick lush growth - slow release fertilizers (I.B.D.U. and U.F.)
- Kill weeds - use proper weed control
- Kill insects and pests - use proper insect control
- Stop fungus growth - use proper fungicides
- Control nematodes

A professional lawn care training program should include:

Identification of turf insects, weeds, and disease
Knowledge of fertilizer carriers and characteristics

- nitrogen
- phosphorus
- potassium
- micronutrients

Pesticides - how and why each works

- what insects controlled, rates of application, and timing for best results

Herbicides - selective and non-selective

Turf disease control

One of the most valuable reputations that any lawn service can acquire is that of a 'professional advisor'. Your customers and prospects alike will look forward to your calls.

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TEN YEARS OF PROVIDING SERVICES - THE HYDRO LAWN STORY

Jerome R. Faulring, Owner
Gaithersburg, Maryland

As the theme of this year's Conference is 'Experience with Ideas', I have elected to present this topic as an historical review of my experience to date in the turf management industry. Although the first 3-1/2 years of my exposure to this industry involved commercial sod production, the session attendees are most interested in the lawn care industry, I will therefore mention my sod production experience only briefly in the light of how it led to my present involvement with Hydro Lawn.

I believe a chronological review of Hydro Lawn is the best approach because it will enable you to see how Hydro Lawn's strategies have proven to be either successful or unsuccessful in its formative years. As many of you are just starting out or have had only a few years of involvement, I hope you will be able to discover some ideas that will stimulate your thinking and be helpful in your own operations. Additionally, I believe the case study type of approach can be very interesting as well as informative.

My career in turf management started with an agronomy degree from Purdue in January of 1970. After graduation I became employed by Summit Hall Turf Farm, Gaithersburg, Maryland. Responsibilities changed rapidly over the 3-1/2 years spent at Summit Hall.

Initially I worked in the retail sod installation division as a customer consultant, with about 25 percent of my time devoted to retail sales in the Washington, D.C. market area. In addition, I worked on several research projects of which the "Combination Turf" of zoysia and cool season grasses growing in the same environment was given greatest priority. Zoysia grass variety improvement was second in importance and several hundred off types resulted from the germination of Meyer Z-52 seed. Much progress was made in both of these research efforts, but unfortunately management de-emphasized research, and the work was lost.

During the second year retail sales was a major effort. I became involved with the lawn care industry by becoming an 'after hours' consultant to National Turf Service who was just starting operations. They patterned their organization after the then locally dominant "automated" companies such as LAWN-A-Mat and Lawn-King. I assisted National Turf primarily with program design and material selection.

During my third year I was promoted to Farm Manager, which involved all aspects of planting, growing, harvesting, and shipping of sod from their 1000 acre farm, of which 400 acres was then in sod production.

These three years provided a good background in the areas of marketing, advertising, personnel and sales in preparation for the lawn care industry, but I was totally unprepared to accommodate the critical need for financial expertise. I was approached by William W. Quay, Jr., who then managed a landscape maintenance company, to consider starting a lawn care firm.

Pro Turf, Inc. is born. In October 1972 we incorporated as ProTurf Inc. and began operations in January 1973. During the first eight months of 1973 I continued to work for Summit Hall, as my partner managed our new venture on a part-time basis while he also maintained a position with the landscape company he had been working for. In September of 1973 we both left our employers and worked full time for our struggling new venture.

1973 ProTurf strategies. As the "automated companies" dominated the lawn care scene in 1972 we designed our programs and methods to compete with them in a similar market segment at similar levels of pricing. That first year we had a very custom approach to program design on an individual customer basis as our primary selling point.

We applied fertilizers dry, performed mechanical seeding and aeration services and applied our pesticides with a 100 gallon sprayer. We advertised in The Washington Post newspaper, which was our greatest strategy mistake because we found ourselves driving 150 miles per day on many days to service only six or seven accounts. We should have selected a much smaller geographical market segment in which to work. We serviced both warm and cool season grasses, which compounded our scheduling problems.

Due to great pressure from ITT, owner of O. M. Scott & Sons, we changed our name to Professional Turf Inc., trading as Professional Turf Corporation.

To get started, we borrowed \$10,000, obtained a \$5,000 line of credit, of which we used \$2,000, financed two trucks and bought a few thousand dollars worth of used miscellaneous equipment. The net result of 1973 was about 150 customers and a \$5,000 loss on sales of almost \$64,000. We had no money in the bank and no prospect of obtaining any additional working capital to start 1974.

1974. With the help of our attorney, we managed to borrow an additional \$15,000. We decided to create a somewhat standardized approach to program design for 1974 and developed a nine-treatment program for cool season grasses and a five-treatment program for warm season grasses. We resisted correcting our market strategy error which was dramatically compounded by our commitment to treat most lawns nine times during the season.

We decided that a strong competitive feature would be to apply ground limestone on a regular basis to combat the generally acid soils found in our market area. Knowing that to do this in dry form would be a major scheduling problem, we designed and had built a custom slurry lime applicator unit at a cost of over \$18,000. We planned to apply pesticides with the same unit. The net result was that this unit couldn't spray a slurry of lime, and was barely capable of spraying pesticides. Eventually this white elephant became known as the "Banana" and became our experimental unit that underwent extensive modification through the next few years.

Because the unit couldn't spray lime we took a tremendous chance to fulfill our customer contractual commitment and purchased a Finn Bantam 8 hydroseeder to spray the slurry lime. Again, we had no guarantee of the system working, and I spent the first week spraying only 20 lawns. After a daily modification, I was able to spray 100 lawns in the second week, and believe it or not, suspended 50 pounds of lime in each three gallons of water in the tank. The problems associated with such a dense slurry are too numerous to mention, but it is possible to make the concept work. This innovation led to successful sales tool we still use today.

With hindsight, I view both the purchase of the unsuccessful custom unit and the Finn Hydroseeder as a significant turning point that allowed us to succeed rather than go bankrupt or remain an unprofitable struggling firm for years to come. Although we subconsciously recognized the importance of having the capability to spray slurries of insolubles, we did not at that time really appreciate the benefit from spraying insoluble fertilizers. A very important feature of having these two units was to force us to experiment with equipment and realize ultimately that we had the aptitude to completely design and manufacture equipment to satisfy our own unique requirements.

From the beginning we were overseeding almost every lawn annually with a Roger's model 524 seeder. Production was so low that we knew we would have to stop seeding if a better system couldn't be implemented. But all our competitors seeded, and we felt that to stop seeding would result in dramatically reduced sales. Therefore we decided to try hydroseeding existing lawns with our new Finn seeder. The truth is, even we did not think a lawn care program would sell to the masses without seeding. Everyone I talked to said hydroseeding existing lawns couldn't work without mechanical seedbed preparation. At a chance meeting with Dr. A. J. Powell, who was then at the University of Maryland, I proposed my idea and he said it might work without seedbed preparation if I increased the seeding rate and the rate of water used. With no experimentation I overseeded about 250 lawns in the fall of 1974 with the hydraulic

method. Good weather, consumer education and a little luck caused results beyond our greatest expectation. Only a handful of the 250 lawns were disappointments so we were on our way to a very exciting competitive innovation. After about 8000 hours of tearful agony between my partner and myself in 1974 we lost another \$8,000 on sales of \$108,000 with about 250 accounts. To compound all this we were advised that ChemLawn had targeted Washington as one of their expansion markets in 1974. They didn't arrive because of the energy crisis. That crisis development worked in our favor as we were allowed another year to develop our strategies to compete with ChemLawn. By the end of 1974 we were committed to the liquid/slurry system and actually finished the season applying both fertilizers and herbicides with spray application. Many of you were well into liquid programs by then, but we were somewhat isolated from the exploding midwest market. We were truly ignorant of what was happening on the national scene. Beyond that I was skeptical of the liquid approach using only soluble sources of fertilizer. We proved to ourselves in 1974 that we could apply insoluble fertilizer sources in spray form which was all we needed as the efficiency gain was very obvious. That, coupled with the successful overseeding technique and heavy rate lime application, created the program design strategies that are still dominant factors in our 1979 operation.

1975. Knowing that ChemLawn was starting operations in our market area in the spring of 1975, we began developing ideas on how to compete with their high volume low price strategy. As it appeared Professional Turf might actually make a profit in 1975, and because we had no guarantee that ChemLawn would be highly successful, we decided to leave P.T.C. operations as they were and start a new division to compete directly with the ChemLawn mode of operation. Therefore, in September of 1975 we began the Hydro Lawn division with one truck and one man spraying lawns while I handled the sales effort. It was then that we committed ourselves to hiring quality people by securing Mr. Greg Richards with a Master's degree in turf pathology. We again modified the "Banana" to spray seed without mulch so that we could maintain our seeding strategy at lower cost. Greg somehow made the truck work and we got acceptable results. We really didn't know exactly where we were headed but realized something was going right because we acquired 344 new accounts in six weeks which was about the same account load that P.T.C. had as a result of three years work.

In 1975 we converted all of our applications to the slurry application technique which was probably the single most important reason we made a profit. Production per man hour rose rapidly and we found the lawn quality results to be very encouraging. We experimented with just about every fertilizer source available and yes, we burned a few lawns, but none so bad as to lose the account. 1975 ended with sales of \$178,000, a combined account load of about 700, and at last a profit of almost \$10,000.

1976 strategies. With what seemed like nothing to lose, we decided to triple the Hydro Lawn capacity for 1976. Feeling pretty good about the previous fall's Hydro Lawn sales, we decided to de-emphasize P.T.C. and put most of our effort into Hydro Lawn. We hired three new men, added two more trucks which were modified Reinco Hydro-seeders, and started the year with an average Hydro Lawn account load of only about 100 per truck. That was probably the greatest risk we ever had taken to date as we calculated that in order to break even we would need to increase our account load by 500 percent. With an unbelievable effort from everyone and an expensive advertising campaign, we managed to increase our account load by 700 percent to 2,100 accounts or 700 per truck serving a market area about 100 miles long by 50 miles wide.

For 1976 we took another costly gamble by building a 5,000 gallon batching tank in which we premixed the final dilution lawn spray formulas. The product was pumped directly into the spray trucks which saved about three manhours per day for all five trucks then working for P.T.C. and Hydro Lawn. To everyone's surprise, and about \$10,000 later, the batching system worked and paid for itself during its first year of use. We have now increased that same batching system to 27,000 gallons in capacity.

1976 ended with \$443,000 in sales, or an increase of about 250 percent over 1975, and against all odds, we made a profit again. Combined P.T.C. and Hydro Lawn operations had about 3,000 accounts. It was in 1976 that we finally developed our current strategy of buying each source of nitrogen, phosphorous, and potassium separately and created our own final analysis in the batch tank. We also committed our program design to the extensive use of urea formaldehyde nitrogen and even today almost 50 percent of our total nitrogen is derived from U.F. The excellent results and exceptionally high safety factor resulting from combining U.F. with urea and low salt index sources of phosphorous and potassium has eliminated burn potential from our program design.

1977. With all that growth in 1976, we felt destined to achieve any level of growth we desired in 1977. The Hydro Lawn trucks caused much downtime so we decided something had to be done. Anyway, one of the Reincos was destroyed in an accident at the end of the 1976 season, the "Banana" was constant trouble, and the other Reinco was in rough shape. So we decided to design a new spray rig. The equipment available to our industry in 1976 was not really designed for slurry sprays and seeding such as we had grown accustomed to and I felt confident that we could build our own at lower cost. That was important because our resources were very limited. Putting together all of our previous experiences we designed and manufactured six new units during February of 1977. With virtually no testing we just hoped that the new design could spray granular products and seed. Somehow, we got them on the road by early March, spent a couple of hours testing the units, and put them to work. They worked. They worked so well, in fact, that downtime has just about disappeared from our operation. Remembering that we needed at least 5000 Hydro Lawn accounts to break even with six trucks and two managers, we set about the business of selling and spraying. Even though we increased our account load by over 240 percent to 5,100, it was just barely enough to support the overhead we had that year. During the course of 1977 we made a serious error by adding five trucks to the fleet in September and did not achieve sales to carry them profitably. Combined operations yielded 6,000 accounts, \$870,000 in sales, and a small profit. But we made it through the winter and secured sufficient working capital to get off to a good start in 1978.

1978. Because our market area was so big we were losing a lot of money in lost production time due to travel. Therefore we opened a branch operation in Springfield, Virginia, to get into the center of that market area. In addition, we expanded our chemical care fleet and changed a key strategy. Instead of overseeding most lawns every year, we developed the strategy of selling one program with no seeding and one with seeding in the fall of 1977. This worked well and we made it policy in 1978. We also decided to revert to the old P.T.C. practice of offering a more intensive overseeding that included mulch. To accomplish this on a volume basis we invested over \$60,000 in a chassis and a 3,000 gallon Finn Hydroseeder. This program has proven very successful and profitable. In 1978 we realized that P.T.C. was not going to grow significantly even though sales remained stable for almost three years without any advertising. At the end of the 1978 season we merged the two marketing divisions into one, and now offer services only under the Hydro Lawn trademark.

After six years of operation the combined P.T.C. and Hydro Lawn effort resulted in 10,000 accounts at the close of 1978 and bright prospects for continued growth in sales and profits in 1979.

So, what have I learned about running a lawn care business during the last six years? Obviously, time does not permit me to more than highlight certain factors that I deem very important.

1. Accounting. A strong background in accounting or a bright accountant working for your company is absolutely essential. You must develop realistic pro-forma cash flow statements for at least one year into the future in order to make sound decisions about every other phase of your operation.
2. Profits. Absolutely your only reason to proceed is to make a profit. The mere fact that you or your accountant say that the company is profitable means nothing unless you fully appreciate what profit is and how it impacts future decisions. Look more to percent profit than to gross sales as an indicator of your success. Also, know what profit means to your cash position in future months. For example, a 10 percent profit at year end doesn't necessarily mean you have any money in the bank and certainly doesn't imply that you automatically have the financial resources to expand, if that is your intent.
3. Expansion. Expand your business slowly unless you have unlimited resources. Don't be fooled into expansion at a pace that is supported by financial resources but not by competent and experienced staffing. Beyond financing, staff is the most important key to success.
4. Starting capital. If you are planning to start a new lawn care business, don't do it unless you can put your hands on long term financing equal to at least fifty percent of your projected budgetary needs for the first year. The number of accounts you acquire the first year and the attendant cash flow will not be enough to pay the bills on time for the first four to six months of actual operation. Even if you survive the first year or two without adequate financing, it will catch up with you sooner or later and make life miserable until sufficient profits are retained to cause a desirable asset to liability ratio.
5. Equipment. Durable, trouble free equipment is the most important consideration. A liquid operator should buy equipment that is capable of handling heavy slurries. Many companies in existence today bought their trucks without considering materials and then were forced to use products of either questionable value or quality because of handling limitations. Technology will change this circumstance, but at least in the next several years it will still be necessary to use products designed for dry application if the best lawn performance results obtainable is your goal.
6. Staff. Don't be afraid to spend a little extra on salary expense if you have a choice. Hydro Lawn currently has a staff of which most people are college trained. Nationally, there are spot shortages of college trained people and this trend may continue for several years, but make every reasonable effort to find good people. College people are generally interested in good results, usually make good salespeople, result in a high level of good public relations and are easy to communicate with internally. Possibly most important of all, they will upgrade the level of professionalism radiating from your organization and dramatically improve the market's perception of you. Caution: highly trained staffs can be very demanding of management.

7. Pricing of services. Be aware of competitive pricing and don't assume you have any advantages distinct enough to obtain business at any lower price level, but price your services according to your cost of operations. Charging too little is the greatest disservice you can do for your customers because you leave no margin or cushion to accommodate the unexpected. Generally, I feel the industry is undercharging in 1979 and we could see some unexpected business failures this year and next as a result of the unstable nature of fuel and material costs at the present time. Historically, Hydro Lawn has tried to stay with the major competition in terms of pricing while at the same time providing more services. This has created financial strain in certain years. We are now aware of competitive pricing but charging for our services based on our cost of operation. Although price is important to the market we have determined that customer loyalty and program results will override their price comparison shopping habits.

8. Research. During our formative years, we relied almost entirely on our-side research data for program design and material selection. We learned some hard lessons and now commit a substantial budget to research for both agronomic and equipment design issues. Everything you plan to do on a customer's lawn should be studied at least one year in advance. Research also means studying your local market conditions such as soil types and chemistry. We work in such a large market area that there are many significant differences from one market segment to another. For example, we have natural soil pH levels that range from 4.0 to 7.5 and our soil types range from deep sand to heavy clay to almost 100 percent shale covered with one or two inches of topsoil. It is also important to note that your local university will usually cooperate fully with your needs for a small financial consideration. For example, for \$400 we got a season long turf insect population study done by the University of Maryland for our entire market area. We had to buy some insect light traps and collect the traps daily, but the same project would have cost thousands more if we had done the entire project on our own.

9. Market. Limit your service area to the smallest possible segment in which enough potential customers exist to support your sales goals. Your potential profit level will be dramatically effected by efficient routing of service vehicles. I am certain that the primary reason we lost money in the beginning was due to our lack of productivity per man hour. You can't make a nickel driving from one account to another, and in fact that drive time is very expensive.

Research your market potential. The only way to forecast growth potential and financial requirements for expansion is to know precisely how many lawns of what average size are available for your company to service. There is a variety of techniques available to do this, none of which is very costly. The worst mistake you can make is to say the sky's the limit. There is in fact a very definite market potential size, and you'll only get a portion of that total.

10. Advertising. Honesty is definitely the best policy. There are still too many organizations implying their ability to perform miracles. Promote the industry as well as your own organization. The stronger and bigger the industry, the better off we all are. In 1979 Hydro Lawn has taken this position strongly, and we are committing about one-sixth of our advertising budget to promoting professional lawn care.

11. Position company. From the outset you should determine what you want the market's perception of your company to be. Obviously, consider liquid versus dry or a combination. Each company in all industries has an identity that the public associates with it. Easy examples are IBM, Coca-Cola, etc. But even a very small company will very soon develop a distinct market perception toward itself. Be sure that that perception is what you want it to be and manipulate your strategies and policies to develop the company image the way you want it to be.

In summary, I hope that no one will infer that what has or has not worked for Hydro Lawn is the final word. My only intent here is to stimulate your thinking by discussing what I have experienced. I have personally seen ideas work very well in one organization and be a complete failure in another organization. I think the most important concept is to let your own personality dictate your strategies and modes of operation.

Many will say that if you want to start a hamburger stand you follow the leader and try to duplicate the MacDonald success story. Such a strategy has been tried in almost every industry and very few ever succeed in realizing success by following the leader. As an industry we all have similar objectives, but how we get the job done is potentially just a variable. The important thing to remember is that even an apparently successful organization has problems, and for all you know they may be working hard at changing the one strategy that you deem to be an important key to success. I now consider Hydro Lawn fairly successful, but if I had it all to do over again, there would be some very dramatic changes in many areas of the operation.

Although the future of our industry is bright, and in most ways it is easier to get started today compared to six years ago, the odds for success and survival in any industry today are still very low. Don't run out and get started until you are very prepared.

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WE'RE STARTING

Chris and Randy Bellinger, Owners
Bellinger's Professional Grounds Maintenance, Lafayette, Indiana

Chris and I have been in business a little over one year. We are in the grounds maintenance business and share a fifty-fifty partnership. I feel pretty lucky to have a partner so good looking. It's been hard at times working with my wife; she's very congenial, and she works hard, but it's a bit difficult getting used to a tube of lipstick in every piece of equipment. Not only do we have equipment and chemicals salesmen calling on us, we also have the Avon Lady.

What we would like to talk about is starting your own business. We would like to touch on a few points which we feel might interest you. Hopefully we can encourage and inspire those of you who are contemplating starting your own business. We'd like to give you the confidence in yourself which maybe you feel you lack. We don't feel that anyone can start his own business unless he truly feels compelled to do it. You must have a reason. So what we want to do is talk about how we started our own business.

The thought process consists of five necessary items which are necessary in making your business dream come true. The first one, and very important, is that you must decide what you want to do. This means what type of business do you want? The second item in thought is, what services do you want to offer? For instance, do you want to offer mowing only, a fertility and weed killing program, soil sterilizing, and so on and on. Do you want to offer a combination of services? You have to make this decision. In combination with that is the third item. Who do you want to serve? Is it the home owner, the commercial customer, or industry? Maybe all three. The last two items are in conjunction with one another. Where do you want to locate? Is there a need for your service in that area? There is no sense in starting a business in a community which you despise even if there is a need. You won't be happy. The same thing is true in another sense; if there's no need for your service in the community in which you want to locate then you're going to go broke, and that won't make you happy either. So I would like to tie all these items together and give you our situation.

Chris and I decided that we wanted to do total grounds maintenance. The services we wanted to offer are mowing, trimming, fertilizing and weed control, tree and shrub pruning and fertilizing, parking lot sweeping, soil sterilization, tree planting, flower planting, insecticide and fungicide applications on trees and turf, dethatching, leaf removal and snow removal. We've done a considerable amount of overseeding watering, and - get this one - window washing.

Chris and I both like working in large areas where we can take our machinery and stay for the day. This, of course, lends itself to industrial grounds, and this is where we wanted to concentrate our efforts. During our first year we maintained Rostone and Alcoa, but it left us some open space so we found it necessary to take on a few homeowner accounts. Going into our second year we have four industrial accounts and have increased our acreage by double the amount of last year. We're finding that we're getting a lot more requests from home owners, so it looks as though we may have to expand our business at the home owner level to take care of the demand.

When you start to make up your equipment and expense list you will be doing a lot of shopping around. You will want to get prices on tools, such as rakes, hoes, shovels, a grinder, and maybe you'll even need a welder. The machinery you use is one of the most important items for your success. You want machinery which is versatile, quick, and efficient. If it has attachments, you want to make sure they can be changed rapidly and easily. Find out what the maintenance record has been on the machines you are considering. You don't want something which has a record of a lot of breakdowns. What is the availability of the machine? Can your dealer have it when you want it? Does your dealer stress service and are parts readily available? Get brochures on all your equipment. We sold our first two industrial accounts with not a piece of equipment to our name, but we told them that if we should get the account, we would be using 'this' and show them the brochure.

When you have your expense list all made out and in complete detail you need to make up a price list for your services. This is also a big job because you need to determine how much you should charge to mow an acre. How much do you charge to fertilize? To soil sterilize? The only way Chris and I could come up with a price was to add up our expense of each service on a given area - say, one acre. We would figure out how much gas, oil, and depreciation on the machine during a one acre run.

We would then add our labor costs, and then add a profit. Do not let your labor costs, if you're doing it yourself, become the profit. They should be figured as a separate entity. By no means undersell yourself. Charge a price at which you will make your desired profit, and do quality work, and your'll be OK. Once you have your established price list then you know that this is what you have to make in order to meet your expenses. By no means should you ever undercut a competitor's bid just to get the job. You'll go out of business faster than you started.

Once you get acceptance from the customer you need to start ordering materials and equipment you will need to carry out your services. In order to do this you're going to need some financial backing. Actually, all the time you're planning your business you should be figuring a way in which you can get the money. It might be from a bank, or a friend, or, if you're real lucky, you've been saving enough yourself and don't need to borrow money. Don't think that the expense list which you wrote out earlier is the amount of money you need to start initially. Your expense list include one full year of expense, and say you're renting a building you pay rent month to month you don't need the full year's rent at the beginning. When buying equipment try to work something out with your dealer so that you can make two or three payments on the equipment later on in the year. In this way, if you are borrowing money, you won't have to borrow so much because later on during the season the money you will be receiving from your services will be coming in to make the payments. At this time you can also finalize details on the building from which you will be operating. Be sure to give yourself plenty of time to get things organized before you begin to work.

All that's left now is to start working!

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I'VE CHANGED

Doug Myers, Superintendent
Youche Country Club, Crown Point, Indiana

My personal story spans over a period of the last couple of years. In 1976 and 1977 I was employed as a golf superintendent in Crown Point, Indiana. It was a very rewarding position with much personal satisfaction.

In the summer of 1977 I talked to a close friend in the lawn care business. We were comparing my future in each field, and the rewards of each. During the next few weeks my wife and I evaluated the lawn care business and what we could expect in the following years. In the fall of 1977 we decided to return to our hometown in the Indianapolis area to start a lawn care service.

How did I start my new lawn care business? The following will list most of the things:

1. Bank loan - financing was obtained through my family bank
2. Truck - C-65 Chevrolet, purchased through local dealer
3. Spray tank - ordered from a friend in the lawn care business
4. Lawyer - formed a corporation in the State of Indiana
5. Insurance - full coverage insurance obtained with an independent agent because of a better rate

6. Accountant - explained how to set up books, daily reports done by my wife, end of the month accounting agency
7. Printing - created and designed own brochure and business forms
8. Advertising - used door-to-door, newspaper ads, friends
9. Water source - local Farm Bureau Co-op
10. Market area - radius 12 miles maximum, included banks, funeral homes, businesses, professional buildings, homeowners
11. Location - home in country, cut overhead
12. Business phone with answering service
13. Two programs offered - reached a wider market

What would I have done differently in my first year?

1. Surveyed my market area more intensely
2. Started with more capital
3. Leased my truck instead of purchasing

In November of 1978 my old golf club notified me that they were in need of a golf superintendent for the coming season. It was my belief that if I returned to my old club my cash flow problem would be somewhat relieved. I discussed my plan of moving my business to the Lake County area. My board members and I agreed that I would be employed as their golf superintendent and after hours I could operate a part-time lawn care business.

Since January 1979 I have been employed as Golf Superintendent of Youche Country Club, Crown Point, Indiana. This year I plant to maintain enough accounts to pay for business costs. It is my expectation, with continued growth, to hire labor to operate my business. I plant to operate as a silent owner for the next few years once enough accounts are obtained to necessitate a full-time employee.

The past couple of years have been hard to start a new business. My experience in the lawn care business proved that I needed more financial backing than I had anticipated. One can realize that lawn care can be a sleeping giant, but only in the right geographic area and with proper planning.

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HYDROSEEDING AND LAWNFEEDING

Bob Person, Marketing Manager
Finn Equipment Co., Cincinnati, Ohio

Erosion control, revegetation, reclamation, highway beautification, golf course construction, and landscape construction are a few of the projects involving the planting of grasses. Hydroseeding really isn't new; in fact, it was in 1953 that the Finn Equipment Company developed the first HydroSeeder for commercial use. Its first usage was to apply seed and fertilizer to the steep cuts and fills on the West Virginia turnpike.

This application was rapidly accepted as a most uniform and economical method to apply seed, fertilizer, and in some cases, lime to not only steep cuts and fills but to almost all disturbed areas involved in the expanding highway program. In 1959, a new "Processed Fiber Mulch" was developed that could be mixed in the HydroSeeder along with seed and fertilizer and sprayed directly to the seedbed. This one-step application broadened the usage of the HydroSeeder to include smaller areas, such as home lawns and industrial sites.

The application today, typically, is a HydroSeeder, ranging in size from 800 gallons to 3000 gallons, loaded with a slurry mix of seed, fertilizer, and mulch that will cover approximately 12 to 14 square feet per gallon of slurry. The slurry can be sprayed from the discharge tower on top of the HydroSeeder or from an extension hose at lengths up to 400 feet. When extension hoses are used, a valve at the end of the hose allows the applicator to regulate the pressure so that close areas around landscape plantings can be seeded without over-spraying.

To provide you with a rough idea of the costs of hydroseeding, let me pass on to you what our customers tell us. "The bigger the job, the more economical." 1-1/2¢ to 2¢ per square foot is a ball park figure that would cover most projects. Specific material costs and rates of application are the true determining factors.

The building of HydroSeeders and mulch spreading equipment has been our company's primary function for over 25 years. Just five short years ago we expanded and designed what we call the LawnFeeder for chemical lawn care. Our objective was to build a spray tank that could spray granular lawn care products in slurry form. Now in our fifth model year, I'll have to say we did succeed in obtaining this objective.

The basic principles of the LawnFeeder are mechanical agitation and a centrifugal pump. The agitator, 22" in diameter, with large paddles, is hydraulically powered and has a variable speed control. This speed control is essential when working with the various soluble and non-soluble granular fertilizers. A speed can be selected to provide uniform mixing without causing foam, nor settling of material in the bottom of the tank.

The centrifugal pump used on the LawnFeeder is capable of passing a 3/4" solid and is highly resistant to abrasion. There is a by-pass from the pump to the tank; however no agitation is received from this by-pass. This pump is also powered hydraulically with a variable speed control. When the applicator makes his routine bucket check, he can precisely calibrate the gallon per minute rate to match his walking speed.

I have mentioned hydraulic power. What we have done is mounted a pressure compensated hydraulic pump to the truck PTO and eliminated all shafts, bearings and belts. This system was selected for its high reliability, hopefully eliminating any equipment down time during the busy lawn care season.

We have found 5/8" hose to be more successful than 1/2" when handling heavy loads of insoluble fertilizers. Three nozzles are supplied with each LawnFeeder. They are: the vee-jet, the flood-jet, and the hollow cone. The specific selection is really up to the individual applicator's preference. The vee-jet and the flood-jet discharge a uniform pattern, but are difficult to match passes without overlapping. The hollow cone, on the other hand, has a reduced concentration at the outside of each pass and can be overlapped 1-1/2 feet without getting a double application to the turf. In addition, the hollow cone has a very large single hole and is almost impossible to plug.

During the past two years we have attempted to work directly with various fertilizer manufacturers to test the compatibility of their product and our LawnFeeder. Not all products have been successful. Sulphur coated urea received too much damage after the first hour of agitation. The sulphur coating was cracked, destroying its slow release characteristic. Corn cob and vermiculite fillers caused some problems by swelling up in the water, then plugging the nozzle.

The LawnFeeder offers unlimited flexibility in product applications. It is not necessary to purchase a blended product, but rather combine the individual products and do your own blending in your LawnFeeder. Some products can be purchased as wettable powder or as granular. A considerable savings can be appreciated by purchasing the granular over the powder. Both work well in the LawnFeeder.

The tank is constructed of mild steel with an interior epoxy paint. The epoxy paint holds up fair and does require a touch-up each year. Stainless steel would be ideal, but the cost is prohibitive. Fiberglass was not used because of the stress from the agitator and potential breakage.

Our system operates on a low volume, low pressure principle. Our pump, when set at 38 psi, will produce approximately 8 psi at the end of 300 feet of 5/8" hose and 4 gpm. This low volume, low pressure helps to eliminate possible mist. We don't feel that high gallons per minute are the key, but rather what materials are carried in those four gallons. Any mix ratio above 4 gpm requires a larger tank and truck to carry the load, and appears to be un-economical. Our two tank sizes are 800 gallons which will cover 200,000 square feet per tank load, and 1200 gallons which will cover 300,000 square feet per tank load. Maximum mix capacities are 3 lbs. of dry granular products per gallon of water.

Our LawnFeeder is built as a complete unit and is available from stock. We do very little custom work; however, that is not to say that we are not interested in your requirements. We are committed to being the leader in chemical lawn care equipment manufacture, and your needs are our interest.

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FAIRWAYS TOWARDS BENT

Steve Frazier, Superintendent
Meridian Hills Country Club, Indianapolis, Indiana

I reported to you during the 1977 Midwest Regional Turf Conference about the progress of our conversion of bluegrass-bent-Poa fairways to bent. We are very pleased to date with our program, and I would like to share with you some of our observations and experiences over the past few years.

Initially we used two methods to prepare the seedbed:

First we used a Grasslyn aerifier equipped with 1" open spoons. The fairways were aerified twice, followed by a light overseeding - 5-10 lbs./acre of Penncross bentgrass. We used a Mott hammerknife mower set in a leaf mulching position to break up soil plugs. After mulching, the fairway was matted with a chain link fence or a topdressing mat to help further break up plugs and distribute soil and cover up the seed.

The second follow-up step during the initial renovation was disk seeding using a McCormick small grain drill with a seeding rate of 20 lbs./acre. The first seeding was done going the length of the fairway. There was some damage, and the slit-ted turf needed to be rolled. After this renovating procedure was done, the turf needed about two weeks to root sufficiently to allow cross disking the second time without damaging the turf and chunking out small squares of sod. After the second disk seeding, the slit-ted areas were again rolled to press the turf in contact with the soil.

We have now completed five seasons in our bent conversion program. In the fall of 78 I measured success by the fact that seeding and fairway renovation was restricted to just two acres of fairway that were weakened by standing water after a six-inch rain in August and after a mini-tornado dumped five inches of rain in one evening in September. Also, we continue to use a Ryan Greensaire to aerify and prepare a seedbed around the green collars and approaches.

I feel the prime time for bent overseeding is after Labor Day through the 20th of September. Poa actively has started germinating at our course as early as the 5th of July in areas where the existing turf is weakened or dead. I have often observed Poa sprouting in the cracks created by a fairway mower wheel passing through a weakened or crusted spot in turf. Once the turf thins and is weak, we try to avoid causing fractures, breaks or tears by spiking or making any type of opening in the crust that would allow the Poa seed to germinate and emerge until we are ready to renovate. Our greatest amount of Poa germination takes place from July 20 to the first part of September. After the first part of September it seems the Poa that does germinate is not as competitive and the bent seedling has a better chance to survive. Also, it seems the disk seeder, thatcher seeders or thatching-then-seeding techniques present some problems. I've observed tremendous catches of seed after using a disk seeder; however, the seeding rates with bent are difficult to control because of the fineness of the seed and the narrow disk band. If bent is crowded and seeding rates are too high, the bentgrass seedling has difficulty in reaching maturity and dies in mono-culture disease situations or never develops morphologically to survive either winter conditions following a fall planting or summer conditions following a spring planting. Bentgrass in severe competition stays immature and does not develop the rooting and stolon systems necessary for survival.

Seeding into aerifier holes has several advantages:

1. The seed is in soil-seed contact
2. The seed crown is protected because it is in a hole below the surface of the existing turf
3. New roots develop rapidly in aerifier holes
4. Seeding rates are more easily controlled
5. The mere action of aerification has additional benefits to existing turf.

I feel you have to make a commitment early in the spring, by at least April 20, as to whether or not to manage to keep a Poa-bent complex or to try to finesse the Poa out of your turf.

Basically, in the past we have managed to encourage bent and discourage Poa early in the spring. In late spring and early summer we try to hold Poa until key club tournaments and guest days are completed. When Poa normally starts to wane in the hot summer we use transition maintenance to slowly stress Poa and help bent.

1. In the spring we hold off fertilizing until the bent is growing well and the evenings are warm. We want the bent in a competitive state against the Poa.
2. During the spring we keep the turf in fairways on the dry side as much as possible. This favors bent and not Poa.

3. A strong preventative fungicide program insures an early preparedness for coming hot summer stress periods. (Allow no weakness early in the season.)
4. Mowing is on a regular basis at times when the good turf is not stressed.
5. Dew is removed the first thing in the mornings whenever it is heavy and will not dry by itself by 8:30 a.m.
6. Aerification is beneficial and should be done several times in the spring before hot summer weather.
7. Integrity in herbicide applications is necessary:
 - A. Preemergence limits seeding program until residuals are dissipated. Preemergent application must be correlated with seeding program.
 - B. Broadleaf sprays must be timed and selected so as not to stress the bent.
8. Syringing can be a double-bladed sword. Hold off until absolutely needed.
 - A. Syringe to maintain and keep Poa.
 - B. Hold off syringing until late in the afternoon after new Poa seedlings may have wilted sufficiently to cause injury or stunting.
9. Keep a weather eye out for Pythium.
 - A. Try to get the dew off the grass as soon as possible.
 - B. Water to maintain turf but so as not to provide a medium for Pythium.
 - a. Afternoon watering-syringing so that turf dries quickly
 - b. Early evening when humidity is low
 - c. Rinse off dew early in morning with a syringe cycle

We had the opportunity to work with Monsanto (Ed Jordan) and Roundup in some trials to develop techniques for preparing a seedbed after using Roundup. In one area paralleling our bent nursery that had been prepared for a new seeding, Ed treated a strip of mixed bluegrass-fescue-Poa-bent turf 10' x 760' with Roundup at label recommended rates. The newly prepared adjacent soil-seedbed and treated Roundup strip was seeded and fertilized at the same time one week after Roundup was sprayed. The seedbed was spiked twice and drag matted lightly. The Roundup strip was spiked five or six times. Within five to six weeks we had good playable turf in the Roundup strip, and the soil-seedbed was still struggling. Incidentally, this was done very late in September and was not irrigated. Now, after seeing and managing both renovating procedures, I would unhesitatingly use chemicals in a major renovating program when a change of turfgrass types is desired, if thatch is under control and drainage is not a problem.

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PAT UPDATE - ELEVEN FIELDS

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Research began on 27 Dec. 70 on the idea. A working model was operating in the greenhouse by 10 Jan. 71. The first field was built in 1972. Eleven were built by 1976. How have they performed by 1978?

In summary, all have been enthusiastically accepted. Those managing and using PAT fields have been obviously pleased and proud with the results achieved. At Evansville, Indiana three games were changed to the drier PAT field in 1977. At Lansing, Michigan three games were changed to the PAT field there in 1977. At Purdue the band is always on the field before a game and at halftime, irrespective of rain.

In Washington, D.C. at the Kennedy Stadium the bermudagrass sod was Greensaired and topdressed with sand five times in 1978. In contrast, in 1975 when sodded in April it was not Greensaired until after torrential rains of October. Then it was double Greensaired on Wednesday and sanded, then hosted a pro football game the next Sunday. This illustrates the big change in management.

Most fields have been maintained too wet so that roots are shortened, turf is easily torn, and surfaces look poor. The installation of the moisture sensing probes and controller for moisture measurement has proved necessary to reduce wetness and favor normal root development. The Goshen, Indiana and Evansville fields have sensors, and Purdue and the Orange Bowl of Miami will install in 1979.

Meanwhile, the PAT System has been blessed by a very favorable press, and its potential as a replacement of mud from natural soils, and for artificial turf as a playing surface becomes increasingly evident.

The licensee, PAT, Inc., of Lansing, Michigan, has reorganized and is including sublicensees in order to reach more potential customers. We know the principle of the suction pumps works and has performed very well. The sandbed conservation has been adequate in providing stability to players and maintenance equipment. We've learned to provide ample nutrition, especially in early spring and late fall (for bluegrass). Through tissue tests we've determined that a sandbed can provide balanced nutrition when all elements are provided.

The necessity for vertical cultivation through sod has been repeatedly demonstrated. It just cannot be neglected. Any resodding must have vertical porosity reestablished also.

A new three-dimensional nylon netting, Enkamat, has been introduced into the U.S. It was earlier used in Europe where I saw it in 1977. Increased stability and strength of Enkamat added to that achieved by bluegrass and ryegrass seems to assure the least tearing of the crowns and roots. Initially in Europe and the U.S. the Enkamat was placed 1.5-2.5 cm below the surface - about equal to laying commercial sod over the netting after it has been covered by topmix. This is too deep for most surface benefit. It is now proposed that the points of the Enkamat be turned up so that the cleats will just touch them, and yet cannot be firmly entrapped. Also, this deletes sodding as a program because of the too deep placement. Direct seeding onto the netting, when it is in place, seems the best for starting turf. This is followed by topdressing sufficient to cover the Enkamat. Later sand topdressing to dilute thatch should give maximum turf strength and minimum turf tearing for athletes.

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APPLICATOR EXPOSURE TO PESTICIDES

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Overall, our objective is two-fold. One, to aid the Environmental Protection Agency (EPA) in their pesticide evaluation through collection of accurate data on applicator exposure, and two, to enable the superintendents to better understand the merits of various tank mixes and application procedures.

There is a continued interest in the total concentrations of a pesticide an applicator has contact with during the application of a pesticide. There are also those pesticides that are considered potentially more hazardous to the applicator thus increasing the need to determine exposure levels.

Pesticides that have the greater potential to increase applicator exposure hazards are those currently placed under the RPAR review procedure established by the Environmental Protection Agency. The procedure is identified as a Rebuttal Presumption Against Registration (RPAR). Pesticides that manifest some potential to be toxic are placed in the RPAR review process and, relative degrees of toxicity or lack thereof, are to be determined.

If a product placed under RPAR does demonstrate a potential to be toxic to an applicator or the environment, then it can either be removed from the market or placed in a restricted use category.

It is essential that accurate data relative to pesticide use and exposure be made available to the EPA so they may properly evaluate applicator hazards. These data are not generally available, especially for turf use pesticides.

We, at Purdue were awarded partial financial support to pursue data collection for pesticides used by turf managers that are currently under RPAR ruling. Five turf fungicides and one growth regulator, plus the reason for their RPAR status are listed below:

Benomyl - Tersan 1991 and Scott's Proturf DSB - Reductions in non-target species (earthworms): metagenicity, teratogenicity in rats, reproductive effects in rats, hazard to wild life (aquatic)

Cadmium - caddy, cadminate - Oncogenicity in humans; mutagenicity, teratogenicity, and metabolic effects.

EBDC - Fore, Dithane M-45, Manzate 200 - various fungicides for turf disease control. Oncogenicity in mice and rats; teratogenicity in rats; hazard to wild life (aquatic organisms).

PCNB - Terraclor, Scott's Proturf FF II, Actidione RZ - Oncogenicity in mice.

Thiophanate methyl - Fungo 50, Spot Kleen, Proturf Systemic Fungicide - turf fungicides, mutagenicity and reduction of non-target species (earthworms).

Maleic Hydrazide - Oncogenicity in mice, mutagenicity in plants, flies, rats; reproductive effects on rats.

Other pesticides recently placed in RPAR include: cycloheximide - Actidione TGF
trichlorphon - Dylox, Proxol
DCPA - Dacthal
2,4,5-TP - Silvex
carbaryl - Sevin

In 1978 we were able to collect applicator exposure data at two sites in central Indiana. Pesticides applied at these sites include the benomyl (Tersan 1991), cadmium (cadminate), and cycloheximide (Acridione - TGF). The following applicator exposures were recorded:

Benomyl - (Tersan 1991)
Site I - 11 Sept. 1978

	<u>Measurement site</u>	<u>Absorbant Pad Size</u>	<u>Micrograms of benomyl</u>
Inhalation:	cassette	37 mm	trace
Skin contact:	front (upper)	4" x 4"	negative
	abdomen (lower)	"	negative
	back (upper)	"	negative
	" (lower)	"	negative
	wrist (right)	5" x 9"	52.4
	" (left)	"	117.7
	ankle (right)	"	negative
	" (left)	"	negative

Notes:

1. application rate - 32 oz. formulation/28,000 sq.ft. in 150 gallons of water or 1.14 oz. of formulation/1,000 sq.ft.
2. applications were made with a modified shower nozzle using a John Bean sprayer with a 10 gpm pump operating at 150 psi
3. the same absorbant pad sizes were used for both inhalation and skin contact measurements throughout the study

Site II	<u>Micrograms of Benomyl</u>		<u>Micrograms of Cycloheximide</u>	
	<u>15 Se</u>	<u>20 Oct</u>	<u>15 Se</u>	<u>20 Oct</u>
Inhalation - cassette	10	10	0.2	0.2
Skin:				
upper - chest	10	10	0.2	0.2
lower - abdomen	10	10	0.2	0.2
left ankle	10	10	0.2	0.2
right ankle	10	10	0.2	0.2
left wrist	10	760	0.277	0.2
right wrist	10	570	0.234	0.2
upper back	10	10	0.2	0.2
lower back	10	10	0.2	0.2

Notes:

1. application rate -
 - a. 100 gallons of water per tank load to treat 30,000 sq.ft.
 - b. 45 oz. Actidione TGF or 1.5 oz/1,000 sq.ft.
 - c. 16 oz. Tersan 1991 or 1/2 oz/1,000 sq.ft.
 - d. 32 oz iron sulfate or 1 oz/1,000 sq.ft.

Notes - Site II (continued)

2. Applications made with a John Bean Sprayer at 50 psi traveling 2 mph. An 18 foot spray boom with 8004 tee jet nozzle was used on 15 Sept. and a field jet nozzle on 20 October.
3. The lowest level of detection for cycloheximide is 0.2 micrograms/ml and for benomyl it is 10 micrograms

Site I - Cadmium - 1978

<u>Measurement site</u>	<u>Micrograms of cadmium</u>		
Inhalation:	<u>15 Sept.</u>	<u>16 Oct.</u>	<u>20 Nov.</u>
cassette - total spray time	5	5	3
cassette - mixing time only	-	-	1
Skin:			
upper - chest	16	-	less than 1
lower - abdomen	14	-	" " 1
left ankle	23	-	6
right ankle	32	-	6
left wrist	1,340	524	65
right wrist	1,490	1,000	174
upper back	14	-	" " 1
lower back	26	-	" " 1

Notes:

1. all cadmium application rates were 1/2 oz/1,000 sq.ft. or 14 oz/150 gallon tank to treat 28,000 sq.ft.
2. The lowest level of detection for cadmium is 1 microgram.

Discussion

It is interesting to note that most dermal contamination was encountered on the wrist pads. One can readily see, because of the frequent handling of these fungicides, that the hands and wrists came closest to the pesticides.

The 20 November study was conducted to detect any differences between exposure during tank mix time only and the total mix plus spray time. These data show that during a total tank mix time of 60 minutes the inhalation exposure level is 1 microgram. Throughout the total spray time, including tank mix preparation, the inhalation amounted to 3 micrograms in 240 minutes. Therefore, in 60 minutes of tank preparation the applicator might inhale 1 microgram, whereas in 180 minutes of spraying the applicator had the potential to inhale only 2 micrograms of cadmium. This should point out the importance of proper applicator protection throughout the mix-spray time with emphasis on protection needed at tank mix preparation.

The proper protective equipment for the pesticide applicator is essential for the well-being of the applicator as well as for the legal protection of the golf course superintendent and his club. Label directions should be adhered to as closely as possible. They are written for the protection of the user.

This exposure study will continue through 1979 to determine the differences between techniques such as hand gun applications, spray boom and field jet nozzle. Also, additional measurements will be made to determine accuracy of pesticide application to the site.

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